

**OM-01 OPERATIONS MODEL
REVISED STUDY PLAN**

**SKAGIT RIVER HYDROELECTRIC PROJECT
FERC NO. 553**

Seattle City Light

**April 2021
RSP**

TABLE OF CONTENTS

Section No.	Description	Page No.
1.0	Introduction.....	1-1
1.1	General Description of the Project.....	1-1
1.2	Relicensing Process	1-1
1.3	Study Plan Development.....	1-2
2.0	Study Plan Elements	2-1
2.1	Study Goals and Objectives	2-1
2.2	Resource Management Goals	2-1
2.3	Background and Existing Information.....	2-2
2.4	Project Operations and Effects on Resources	2-2
2.5	Study Area	2-2
2.6	Methodology	2-3
2.6.1	Model Development.....	2-4
2.6.1.1	Model Validation	2-5
2.6.1.2	Develop Base Case and Current Operations Baseline	2-5
2.6.1.3	Consultation Process with Licensing Participants	2-5
2.6.2	Evaluate Alternative Project Operation Scenarios.....	2-6
2.7	Reporting.....	2-7
2.7.1	Model Logic and Validation Report	2-7
2.7.2	Scenario Documentation Report	2-8
2.8	Consistency with Generally Accepted Scientific Practice.....	2-8
2.9	Schedule.....	2-8
2.10	Level of Effort and Cost	2-9
3.0	References	3-1

List of Figures

Figure No.	Description	Page No.
Figure 2.6-1.	Linkage between Operations Model and Instream Flow Models.	2-4

List of Attachments

Attachment A	City Light Responses to LP Comments on the Study Plan Prior to PSP
Attachment B	Example Skagit Operations Model Scenario Request Form

List of Acronyms and Abbreviations

CFR.....	Code of Federal Regulations
CHEOPS	Computer Hydro Electric Operations and Planning Software
City Light.....	Seattle City Light
CWA	Clean Water Act
Ecology	Washington State Department of Ecology
EIM	Energy Imbalance Market
ESA	Endangered Species Act
FARWG	Fish and Aquatics Resource Work Group
FERC.....	Federal Energy Regulatory Commission
ISR	Initial Study Report
LP	licensing participant
NEPA	National Environmental Policy Act
NMFS.....	National Marine Fisheries Service
NPS	National Park Service
O&M.....	operations and maintenance
PAD.....	Pre-Application Document
PRM	Project River Mile
Project	Skagit River Hydroelectric Project
PSP.....	Proposed Study Plan
RLNRA	Ross Lake National Recreation Area
RM	river mile
RSP	Revised Study Plan
RWG	Resource Work Group
SDIDC.....	Skagit County Drainage and Irrigation District Consortium LLC
USACE	U.S. Army Corps of Engineers
U.S.C.....	United States Code
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USR.....	Updated Study Report
WDFW	Washington Department of Fish and Wildlife

WSRA.....Wild and Scenic River Act

1.0 INTRODUCTION

1.1 General Description of the Project

The Skagit River Hydroelectric Project (Project), licensed to The City of Seattle, Washington, and operated through its publicly-owned electric power utility Seattle City Light (City Light), is located in northern Washington State and consists of three power generating developments on the Skagit River – Ross, Diablo, and Gorge – and associated lands and facilities. The Project generating facilities are in the Cascade Mountains of the upper Skagit River watershed, between Project River Miles (PRM) 94.7 and 127.9 (U.S. Geological Survey [USGS] RMs 94 and 127.¹ Power from the Project is transmitted via two 230-kilovolt 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, an Environmental Learning Center (ELC), several recreation facilities, and several parcels of fish and wildlife mitigation lands.

Project generating facilities are all located in Whatcom County, although Ross Lake, the most upstream reservoir, crosses the U.S.-Canada border and extends for about one mile into British Columbia at normal maximum water surface elevation. Gorge Powerhouse, the most downstream facility, is approximately 120 miles northeast of Seattle and 60 miles east of Sedro-Woolley, the nearest large town. The closest town is Newhalem, which is part of the Project and just downstream of Gorge Powerhouse. The primary transmission lines cross Whatcom, Skagit, and Snohomish counties; the fish and wildlife mitigation lands are in the same counties.

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, Diablo, and Gorge lakes.” The legislation maintains the Federal Energy Regulatory Commission’s (FERC) 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).

1.2 Relicensing Process

The current FERC license for the Project expires on April 30, 2025, and City Light will apply for a new license no later than April 30, 2023. City Light formally initiated the relicensing process by filing a Notice of Intent and Pre-Application Document (PAD) with FERC on April 27, 2020 (City Light 2020a). The PAD includes descriptions of the Project facilities, operations, license

¹ 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 Project River Mile (PRM) system are provided throughout this document. For further details see Section 7.0 of the main body RSP.

requirements, and Project lands as well as a summary of the extensive existing information available on Project area resources and early consultation on potential resource issues to be addressed during the relicensing. The PAD also includes an outline of the goals and objectives of this study.

1.3 Study Plan Development

In 2019-2020, City Light convened a number of Resource Work Groups (RWG) to engage agencies and other licensing participants (LP) in a Study Plan Development Process, which provided LPs and City Light the opportunity to submit forms that identified potential resource issues, their potential connection to the Project, information or studies requested, a rationale for studying the issues, and how the information collected by the study could be used to support relicensing. Table 5.1-2 of the PAD provides a summary of all the issue forms submitted during this 2019-2020 process.

Section 5 of the PAD lists the resource studies and management plans proposed by City Light to address select (but not all) issues identified as part of the Study Plan Development Process. While acknowledging the broad interests of LPs, City Light focused its initial draft study plans contained in the PAD on information gaps that were most likely to inform license conditions by a study of potential project effects. City Light developed 24 study proposals, including this Operations Model Study Plan.

On March 13, 2020, City Light released the OM-01 Operations Model Draft Study Plan for LP review and comment. On March 31, 2020, the draft study plan was discussed at a Fish and Aquatics Resource Work Group (FARWG) meeting. City Light reviewed all comments received and released a revised version of the draft study plan on April 28, 2020. The revised draft was discussed on May 5, 2020 and June 2, 2020 at FARWG meetings. Written comments were received from National Marine Fisheries Service (NMFS), U.S. Forest Service (USFS), Washington Department of Fish and Wildlife (WDFW), Upper Skagit Indian Tribe, U.S. Fish and Wildlife Service (USFWS), and NPS and responded to in an attachment to this study plan. A Status Draft of the study plan was provided to LPs on August 6, 2020.

City Light is filing this study plan with FERC as part of its Revised Study Plan (RSP), an update to the version that was filed with the Proposed Study Plan (PSP) on December 8, 2020 (City Light 2020b) and incorporates additional consultation with LPs prior to the filing date.

The Skagit County Drainage and Irrigation Special Purpose Districts represented by the Skagit County Drainage and Irrigation District Consortium LLC (SDIDC) and the Skagit County Dike and Drainage District Flood Control Partnership submitted the study request SDIDC-01 Flood Storage Timing: Study Plan Seattle City Light Skagit River Hydroelectric Project FERC No. 553. SDIDC also submitted the study request SDIDC-02 Irrigation Water Supply: Study Plan Seattle City Light Skagit River Hydroelectric Project FERC No. 553. SDIDC-01 and SDIDC-02 request the simulation of alternative operating scenarios under varying hydrologic conditions. City Light recognizes the need to model a range of alternative operating scenarios for the Project as part of relicensing, many of which will be identified by LPs. However, the Operations Model Study Plan is aimed at describing how the model will be developed and applied. Identifying and evaluating specific alternative operating scenarios, such as those identified by SDIDC, will take place later in the relicensing process. Although this study plan was not revised to address these study requests,

the requests will be accommodated by the overall process, as further explained in Section 6 of the RSP.

PSP comments to the study plan were submitted by Ecology, Upper Skagit Indian Tribe, and USFWS. City Light has addressed the specific comments and suggested edits in this study plan and responded to comments in the PSP comment/response table appended to the main body of the RSP. Modifications made to the study plan in response to comments and since the PSP include adding a fourth technical workshop, clarifying that the Operations Model results will be integrated with both Instream Flow Models (FA-02 Instream Flow Model and FA-05 Gorge Bypass Reach Hydraulic and Instream Flow Model), and providing details for a process to identify and evaluate alternative flow management scenarios.

City Light operations and maintenance (O&M) of the Project affect Ross, Diablo, and Gorge lakes' storage levels, reservoir releases, and the rates of change of each. Any modifications to current operations may affect reservoir storage/surface elevations (which may affect tributaries flowing into reservoirs), flood control, streamflows (including the Skagit River downstream of the Project), fish and wildlife habitat, riparian habitat, wetland and floodplain connectivity, recreation, and hydroelectric power generation. This study will develop a calibrated and validated Operations Model of the Project, with linkages to the Instream Flow Models, to support the evaluation of alternative operating scenarios considered during the relicensing process.

The modeling results will also provide information needed to drive discussion and evaluation of scenarios with LPs and to conduct review under the National Environmental Policy Act (NEPA), Endangered Species Act (ESA), Clean Water Act (CWA) Section 401, Fish and Wildlife Coordination Act, and Wild and Scenic River Act (WSRA). Modeling will also inform future power generation alternatives (for example, the California Energy Imbalance Market [EIM]) and City Light's Integrated Resource Plans (as established by WA State law ESHB 1010). Operations modeling may also consider potential future hydrologic regimes due to climate change and the effects such changes may have on Project operations and environmental resources.

2.0 STUDY PLAN ELEMENTS

2.1 Study Goals and Objectives

The goal of the Operations Model Study is to develop a Base Case scenario representation of Project operations. For purposes of developing the Operations Model, the Base Case represents the Project's operations under the current FERC license. The objective of this study is to develop an Operations Model that represents existing Project operations with reasonable accuracy for purposes of relicensing, and which can be used to simulate potential future operations under a variety of operating scenarios. Simulation of various potential Project operation scenarios considered during the relicensing process will aid in decision-making regarding the effects of those various operating scenarios on water allocation, flood control, fish and wildlife habitat, instream flows, reservoir levels, wetland and floodplain connectivity, recreation, hydropower generation, and other matters affected by flow releases from the Project. The Base Case has specific relevance in FERC relicensing proceedings as it represents the baseline conditions to which other scenarios of potential future operations are compared. In addition to the Base Case, defined by current FERC license requirements, a Current Operation Baseline scenario will be developed to simulate the current fisheries adaptive management by City Light.

2.2 Resource Management Goals

City Light's goal for the proposed study is to develop a tool to simulate Project operations to evaluate the effects of numerous, and potentially competing, alternative future operating scenarios for and with consultation by LPs. The Operations Model will be capable of providing direct or supporting analysis to inform decision-making related to the following potential issues:

- Reservoir storage/refill/outflows/flood control;
- Reservoir water surface level fluctuations (affecting, for example, aquatic and wildlife habitat, riparian vegetation, recreation, navigation, cultural site protection);
- Seasonal targets for reservoir levels under a range of hydrologic conditions;
- Instream flows in the Skagit River downstream of the Project and within the bypass reach;
- Connectivity of wetlands, floodplains, and tributaries to river and reservoirs;
- Power generation and its timing; and
- Aquatic habitat particularly with salmonid spawning, incubating, and rearing flows.

The study will provide information for resource agencies and Indian tribes with jurisdiction in the Project vicinity to address their respective goals and objectives for resource management. Resource management goals were provided by LPs in their study requests identified in Section 1.3 of this study plan. Several agencies and Indian tribes and First Nations have resource management goals specific to reservoir water levels and Skagit River flows. These include the U.S. Army Corps of Engineers (USACE) for flood management; USFWS, NPS, NMFS, Washington State Department of Ecology (Ecology), WDFW, USFS, Upper Skagit Indian Tribe, Sauk-Suiattle Indian Tribe, and Swinomish Indian Tribal Community.

2.3 Background and Existing Information

Adequate information currently exists to develop the Operations Model that meets the above objectives. A summary of the data available is provided in the PAD and includes reservoir area-storage-elevation information for each reservoirs' historical operations data on reservoir water levels, reservoir releases, power generation, and flows downstream of the Project (City Light 2020). The Project's existing FERC license specifies the minimum required fishery releases, flows downstream of the Project and flood control requirements. Current Project operations and flow management requirements are summarized in Section 3.5 of the PAD (City Light 2020).

Additional data searches and literature reviews will be completed to identify and evaluate available and relevant hydrologic data and other information related to historical and projected water quantity within the Project's watershed and affected downstream reaches. As part of this data compilation, City Light will request input from LPs to make sure relevant hydrologic information is considered. For example, the data and literature reviews will include review of the recent study entitled Hydrology, Stream Temperature, and Sediment Impacts of Climate Change in the Sauk River basin (Bandaragoda et al. 2020), which includes the hydrology, stream temperature and sediment effects of climate change in the Skagit River basin. The hydrologic modeling work associated with this report includes analyses of naturalized streamflow at Project reservoir locations (Ross, Diablo, and Gorge) and at sixteen tributaries using future climate change scenarios (Bandaragoda et al. 2020). Additional information related to river hydraulic characteristics and water quantity within the bypass reach and at and below the Project is proposed to be developed as part of the Gorge Bypass Reach Hydraulic and Instream Flow Model Development Study and Instream Flow Model Development Study (i.e., Instream Flow Models). The Operations Model will be closely coordinated with the Instream Flow Models to ensure the models are fully integrated. Such integration will include relationships between releases from the Gorge Development and flows/elevations at points of interest (nodes) in the bypass reach and along the Skagit River downstream of the Gorge Powerhouse.

2.4 Project Operations and Effects on Resources

The Operations Model developed under this study plan will document and define the Baseline scenarios (Base Case and Current Operations Baseline) and will be capable of projecting the effects of alternative operating scenarios on available water storage, flow releases and release rates, lake levels and fluctuations, and relevant issues associated with or dependent upon water availability under different water year types and hydrologic regimes. The Operations Model will inform the continuation or development of new O&M measures that may become license terms under a new FERC license. As outlined in detail in Section 3.5 of the PAD, the three Skagit River developments are hydraulically coordinated to operate as a single project for purposes of flood control, downstream instream flows for resource protection, recreation opportunity, and power generation (City Light 2020).

2.5 Study Area

The scope of the Operations Model Study is the geographic region of the Skagit River from the upper end of Ross Lake to the Gorge Powerhouse tailrace. The Operations Model will include Ross Lake, Ross Dam and Powerhouse, Diablo Lake, Diablo Dam and Powerhouse, Gorge Lake, Gorge Dam, Gorge bypass reach, Gorge Powerhouse, and tailrace. Additionally, the Operations

Model will be integrated with the Instream Flow Models, within their area limits, to evaluate the potential effects of alternative flow/stage measures and timing along the Skagit River within the Gorge bypass reach and downstream of the Gorge Powerhouse. This integration will be simulated within the Operations Model as either flow or stage requirements at riverine nodes. Dynamic hydraulic modeling to simulate the timing and flow attenuation relationship between nodes along the Skagit River and discharge from Gorge Dam, through the powerhouse or into the Gorge bypass reach, will be simulated with the Instream Flow Models. These relationships will then be entered into the Operations Model to allow for the simulation of Project operations to support flow or stage requirements at riverine node locations along the Skagit River within the Gorge bypass reach and downstream of the Gorge Powerhouse.

2.6 Methodology

City Light proposes to develop an Operations Model using the Computer Hydro Electric Operations and Planning Software (CHEOPS™) model. CHEOPS is a flexible, reliable, and easy-to-use tool created more than two decades ago specifically to evaluate a wide range of factors considered during FERC relicensings that may affect natural resources and project operations, including reservoir levels, water uses and generation. One of the many capabilities of CHEOPS modeling platform is the degree to which the Operations Model architecture provides a customized platform to investigate river- and project-specific characteristics, water demands, and constraints of the particular plant and river system being evaluated. Additionally, CHEOPS is designed to be user-friendly; it can be run from PC or personal laptop through an easy-to-use graphical interface and utilizes Microsoft Excel as the output data analysis platform, which allows the Operations Model to be used by LPs with a minimal amount of training or computer know-how.

CHEOPS utilizes daily flows (or hourly if essential to a particular variable), plant generating characteristics, flood control parameters, and reservoir/plant operating criteria to simulate project operation. CHEOPS simulates operations of a plant to meet user-specified goals (e.g., instream flow requirements while meeting other regulatory constraints and power production given the available flow). The Operations Model is fully capable of determining reservoir elevation, headlosses, net head, turbine discharge and spill, power generation, and other user-specified variables in hourly (or higher resolution) increments. The proposed Operations Model will encompass an inflow dataset, including streamflows into Ross Lake, incremental inflows to Diablo and Gorge lakes, as well as incremental flows to nodes along the Skagit River downstream of the Gorge Development. The Operations Model will allow for the evaluation of variables and constraints including inflows, reservoir operations, unit performance and generation capacity, operating characteristics and constraints, time-of-day generation, minimum flows, water level fluctuation constraints, and other user-specified variables. The Operations Model will include characteristics of the three Project reservoirs' powerhouses and water conveyance structures, as well as incremental tributary flows and hydraulic relationships at select nodes along the Skagit River. The Operations and Instream Flow Models will be designed to work in tandem, where the Operations Model simulates Project operations, and the Instream Flow Models simulate the riverine flow hydraulics (depth, velocity, water surface elevation, etc.) downstream of the Gorge Development, either downstream of the Gorge Powerhouse or through the Gorge bypass reach. The Instream Flow Models will define stage discharge rating curve relationships at key node locations (to be defined as part of the Instream Flow Models) along the Skagit River downstream of the Gorge Development. Once developed, these stage discharge relationships will be

incorporated into the Operations Model, enabling the Operations Model to simulate Project operations in support of specific stage or flow objectives at these key node locations. Figure 2.6-1 shows a conceptual schematic of the linkages between the Operations Model and the Instream Flow Model.

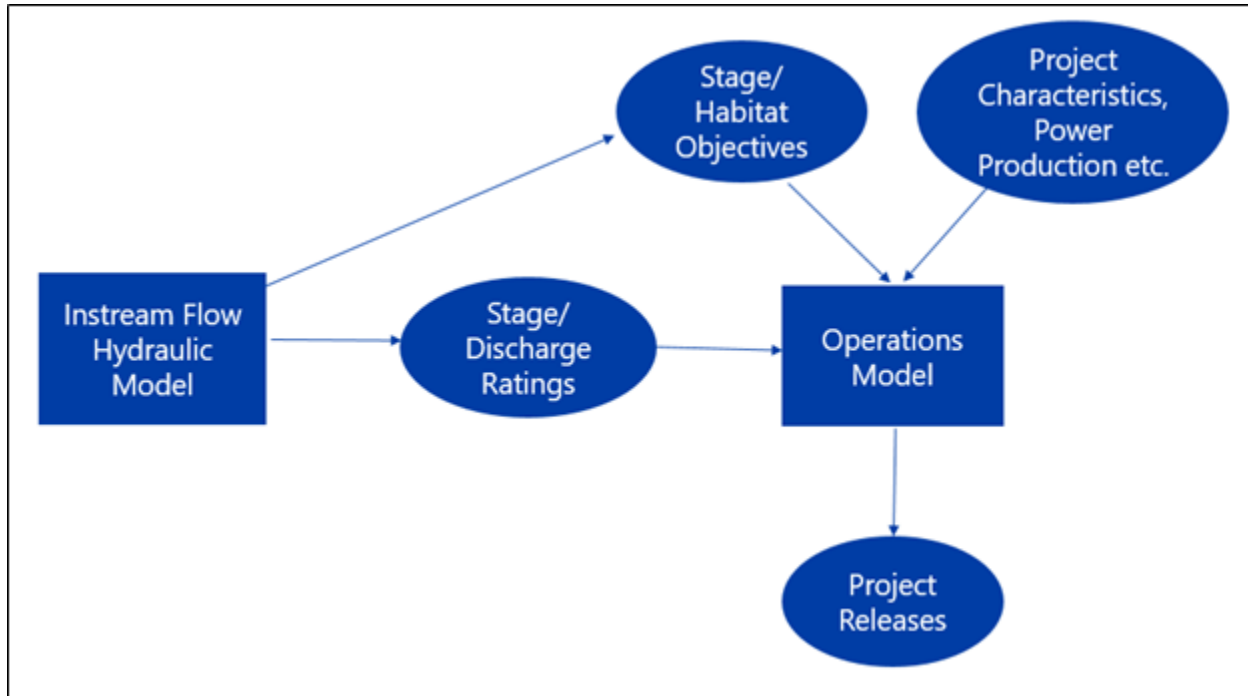


Figure 2.6-1. Linkage between Operations Model and Instream Flow Models.

The proposed approach is to use the Operations Model to perform simulations (Model runs), comparing outputs/effects relative to a Baseline scenarios. This alternatives analysis process will then show the direct effect of proposed operating protocols on Project operations and other endpoints of interest as compared to the Baseline scenarios.

2.6.1 Model Development

Major Operations Model development activities include:

- Assembly and compilation of historical operational data;
- Assembly of system information pertaining to the physical and operational characteristics of the Ross, Diablo, and Gorge developments;
- Development or identification of an inflow dataset;
- Initial Operations Model development using physical data such as reservoir storage curves, dam spillway capacity, headwater curves, tailwater curves, turbine performance curves, generator performance curves, as well as operational data, including minimum flows, operation/dispatch routines, and operating/elevation limits; and
- Model validation and establishment of the Base Case scenario.

This study will be considered complete when the Operations Model has been developed and validated, and the Baseline scenarios have been developed. Separate from the study, the Operations Model will be utilized to simulate alternative operations scenarios identified by City Light and LPs through the relicensing process.

2.6.1.1 Model Validation

Operations Model validation (i.e., determining that the Operations Model is well-founded and fulfills the purpose for which it was constructed) will occur in two steps. In the first step, the Operations Model will be evaluated by comparing the Operations Model output to the period of the historical record that represents current operations, specifically, mean daily flows, reservoir elevations or storage, generation, etc., over an appropriate representative period of recent operations. City Light will establish the appropriate representative period with input from the LPs. It is expected that there will be some differences between the Operations Model output and the historical record because changes in operating strategy can over time, changes in equipment performance occur with age, and minor and major unplanned outages occur. More importantly, it must be recognized that all input data contain measurement errors. Where substantial differences cannot be explained, the Operations Model logic/input data will be adjusted so that the Operations Model output estimates better reflect historical values.

The second step will verify that the computer Operations Model is a reasonable representation of the Project's operating rules. This will be done by making a number of model runs and comparing the results with actual Project data.

2.6.1.2 Develop Base Case and Current Operations Baseline

The Operations Model will be configured to represent current FERC license requirements as well as how the Project is currently operated, including all physical, regulatory, and contractual constraints. The underlying assumption is that this Base Case represents the current FERC license requirements and other agreements, and the Current Operations Baseline represents current operations, including fisheries adaptive management measures. All subsequent Operations Model runs will be compared to both the Baseline scenarios, Base Case and the Current Operations Baseline.

2.6.1.3 Consultation Process with Licensing Participants

City Light proposes to engage the resource agencies, Indian tribes and First Nations, and other interested parties through a series of study workshops at key milestones through both the development and execution of the Operations Model. A minimum of four full-day study workshops will be conducted, and it is envisioned these study workshops may include the following:

Workshop 1 – General Model Introduction

- a. Morning session: Operations Model Methodology/Overview
 - i. General overview of Operations Modeling
 - ii. Operations Model functionality
 1. General overview

- 2. Custom functionality specific to the Project
- iii. Operations Model development outline and next steps
- b. Afternoon session: Hydrology
 - i. Review of available data
 - ii. Climate change
 - iii. Riverine node selection

Workshop 2 – Scenario Discussion

- a. Half-day overview of scenario development and execution process
- b. Review and modify example scenario request form (attached to this study plan)
- c. Document potential operational scenarios of interest identified by LPs

Workshop 3 – Operations Model validation and establishment of Base Case and Current Operations Baseline

- a. Morning session: Operations Model validation
 - i. Data sources
 - ii. Project operations
 - iii. Validation results
- b. Afternoon session: Base Case and Current Operations Baseline
 - i. Operations as required under the current FERC license and other agreements
 - ii. Fishery management operations

Workshop 4 – Operations Model LP training

- a. Full day Operations Model execution
 - i. Example scenario development
 - ii. Analysis of scenario results

2.6.2 Evaluate Alternative Project Operation Scenarios

The Operations Model will be capable of evaluating alternative Project operation scenarios developed by City Light and/or LPs. Once developed and validated, the Model will be used to analyze and assess various proposed operating scenarios. Modeling scenarios will be consistent with City Light's non-consumptive and storage water rights.

As noted, Model training will be provided to the LPs in Workshop 4 and access to the Model with the Base Case and Current Operations Baseline scenarios will be provided as part of this training.

A scenario request form, similar to the example provided in an attachment to this study plan, will be used to develop requested model scenarios. Evaluation of operating scenarios and potential resource impacts will be done in coordination with other Project models and resource study

information. A model output template will be developed to provide consistent information on modeling results for each of the scenarios evaluated.

The consultant developing the models will maintain the model runs and a record of results of operational scenarios evaluated. The model output will be summarized to track the key interest areas and to compare the system response to changes in operation from the Base Case or Current Operations Baseline scenario.

The following are examples of LP requested alternative operations scenario topics:

- Alternative flood operation procedures
- Alternative seasonal drawdown extents
- Alternative basin inflows
- Structured flows into the Gorge bypass

Note that simulation models are decision support tools and are not intended to simulate or predict exact future conditions on a daily or annual basis. The models are tools for comparing different scenarios. The Operations Model will use historical inflows to simulate likely future conditions, as if the inflow will occur in the same pattern in the future as occurred in the past. Additional model sensitivities relative to changes in inflow hydrology due to potential climatic conditions can be employed in the modeling process as needed.

2.7 Reporting

Two primary reports as well as additional technical memorandums, as necessary, in support of the workshop process are anticipated.

2.7.1 Model Logic and Validation Report

A report summarizing the Operations Model development, including detailed summaries of all input parameters and sources, Operations Model validation, Base Case, and Current Operations Baseline settings will be prepared. The Operations Model Logic and Validation Report will include the following elements:

- Project introduction and background;
- Study area;
- Methodology;
- Discussion of the hydrologic data review and inflows utilized in the Operations Model;
- Discussion of Operations Model setup and the operating rules for each development and downstream modeled nodes, validation of input parameters, and definition of modeled Base Case and Current Operations Baseline scenarios;
- Results provided in graphical and tabular format compared to historical reservoir elevation and flow release data, including discussions of Operations Model validation;
- Documentation of workshop and training process; and

- Literature citations.

2.7.2 Scenario Documentation Report

After the scenario modeling is completed, it is anticipated that a Scenario Documentation Report will be prepared and included in the Updated Study Report (USR), with addendum reports as necessary if modeling continues beyond the USR. This report will incorporate results from other applicable models to provide a comprehensive report out on each scenario that is analyzed. This report will include the following elements:

- Scenario inputs incorporated into each of the analyzed scenarios;
- Modeled results provided in graphical and tabular format;
- Modeled results from other models applicable to the scenario (e.g., Instream Flow Models); and
- A comparison of results as relative differences between scenarios and the baseline scenarios.

2.8 Consistency with Generally Accepted Scientific Practice

The proposed methods for this study are consistent with professional and scientific practices, and the overall approach is commonly used in relicensing proceedings. CHEOPS has been widely employed to evaluate physical and operational changes considered during FERC relicensing of well over 75 individual hydropower developments. CHEOPS has been used in all areas of the country to assist owners with assessing, optimizing, and managing their hydropower operations. Accordingly, CHEOPS has proven applicable to a broad range of sites and operating conditions and has been relied upon by LPs and FERC staff in numerous FERC relicensing projects including, but not limited to:

- AmerenUE – Osage Hydroelectric Project (FERC No. 459)
- AmerenUE – Taum Sauk Pumped Storage Project (FERC No. 2277)
- Brookfield Renewable – Bear Swamp Pumped Storage Project (FERC No. 2669)
- Chelan County PUD – Lake Chelan Hydroelectric Project, (FERC No. 637)
- Duke Energy – Keowee-Toxaway Hydroelectric Project (FERC No. 2503)
- Duke Energy – Catawba-Wateree Hydroelectric Project (FERC No. 2232)
- Grant County PUD No. 2 – Priest Rapids Hydroelectric Project (FERC No. 2114)
- Sabine River Authority – Toledo Bend Hydroelectric Project (FERC No. 2305)
- SMUD – Upper American River Hydroelectric Project (FERC No. 2101)

2.9 Schedule

Model Development:

- Develop Project Operations Model – April 2020 to August 2021
- Consultation Workshop 1 – April/May 2021

- Consultation Workshop 2 –May 2021
- Validate Model and Establish Base Case – January 2021 to May 2021
- Consultation Workshop 3 – June 2021
- Draft Model Logic and Validation Report – Summer 2021
- Consultation Workshop 4 – August 2021
- Final Model Logic and Validation Report (Initial Study Report [ISR]) – March 2022

Scenario Identification and Evaluation Process:

- Preliminary Operations Model (excluding downstream of Gorge integration) will be available for use and initial scenario simulation available – Q4 2021
- Preliminary alternative scenario identification and evaluations, review results, modify scenarios, and discuss with LPs – September – December 2021
- Preliminary modeling tool integration with Instream Flow Models, and preliminary relicensing study results available for use – Q1 2022
- Alternative scenario identification and evaluations, review results, modify scenarios and discuss with LPs – January – September 2022
- Continued alternative scenario evaluations and discussions with LPs (as needed) – October 2022 to March 2023
- Scenario Documentation Report (USR) – March 2023

2.10 Level of Effort and Cost

The initial cost estimate for development of Operations Model associated with this study is approximately \$200,000. The cost of the scenario identification and evaluation process is not included in this cost estimate.

3.0 REFERENCES

- Bandaragoda, C., S. Lee, E. Istanbuluoglu, and A. Hamlet. 2020. Hydrology, Stream Temperature, and Sediment Impacts of Climate Change in the Sauk River Basin, HydroShare. [Online] URL: <http://www.hydroshare.org/resource/e5ad2935979647d6af5f1a9f6bdecdea>.
- 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.

This page intentionally left blank.

OPERATIONS MODEL REVISED STUDY PLAN

ATTACHMENT A

**CITY LIGHT RESPONSES TO LP COMMENTS ON THE STUDY PLAN
PRIOR TO PSP**

Table 1. City Light responses to LP comments on the study plan prior to PSP.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
1.	Steve Copps, Jim Myers, and David Price (NMFS)	04/13/2020	General Comments	Each plan suffers from an abbreviated scope and lack of clarity in guiding hypotheses and the questions the studies are designed to answer. From NMFS' perspective, the study plans should clearly state the anticipated utility of the proposed research in understanding the past, current, and future effects of the project on ESA-listed salmonids, Critical Habitat, Essential Fish Habitat, and Treaty Trust Responsibilities. Fish habitat includes a diverse assemblage of aquatic and terrestrial species that are affected in time and space by the operations at the dams. Further, the study plans should clearly state the anticipated utility of proposed research in understanding the status quo, assessing ongoing project effects, and predicting the effects of future management plan scenarios under a new license, including climate change scenarios.	City Light acknowledges the need for consultation with NMFS related to its regulatory responsibilities as required in the FERC process and that the information resulting from the study program is intended to inform consultation with NMFS during future steps within the process. The FERC process schedule positions the integrated environmental analysis subsequent to the completion of the study program and prior to the filing of a Project License Application.
2.	Steve Copps, Jim Myers, and David Price (NMFS)	04/13/2020	General Comments	The study plans should describe in detail how they will inform our collective understanding of fish and aquatic habitat and ecology. To that end, the study plans should be forward thinking in connecting the anticipated results between these and other study plans. The connections between study plans should be made explicit now to ensure researchers are thinking ahead about the utility of their data from both technical and analytical perspectives and so that plans and associated cost estimates fully reflect foreseeable tasks. Explicitly making these connections will also assist NMFS and other LPs understand exactly how our data needs will be met through multiple study plans.	The integrated environmental analysis referred to in Comment #1 will specifically address links across resource areas. City Light will work with the RWGs to integrate information from related studies as part of the ILP process.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
3.	Steve Copps, Jim Myers, and David Price (NMFS)	04/13/2020	General Comments	<p>The geographic and temporal scopes of the draft Geomorph and Operations Model study plans are insufficient. The Geomorph study should be extended to include the full extent of project effects on geomorphic processes. That includes at a minimum, downstream to Puget Sound and upstream through the bypass reach and Stetattle Creek where the project precludes a known population of ESA-listed steelhead from migrating and spawning. The Geomorph and Operations Model draft study plans should be developed to improve our collective understanding of historical processes (including pre-dam conditions) so that they can be compared to the status quo and future management scenarios.</p> <p>New comments from Brock Applegate (WDFW) provided on 05/05/2020: Currently, the Project blocks downstream and upstream fish passage with current project and operations. SCL should consider this existing condition.</p> <p>SCL has some effect below the confluence of the Sauk River. Cumulative effects below the Sauk River confluence, which would include effects from this hydroproject, impact the estuary through lack of sediment and wood and disconnected channels and wetlands through loss of usual timing, duration and magnitudes of flows.</p>	<p>Please refer to the Geomorphology study plan for City Light's respective responses for that study.</p> <p>The FERC baseline is existing conditions, and therefore pre-dam conditions are not considered in this study plan. Project effects would more than likely be indiscernible in the lower reaches of the Skagit River and Puget Sound given the complex array of factors contributing to existing environmental conditions in the lower reaches of the Skagit River. City Light plans to assess the nature of the Project's contribution to cumulative effects downstream of the Sauk River confluence using existing available information as part of the relicensing process.</p> <p>Response to comments provided on 05/05/2020: Thank you for your comment. Additional discussions regarding the issue of Project fish passage are anticipated and City Light welcomes discussion of this issue with LPs in the future.</p>
4.	Steve Copps, Jim Myers, and David Price (NMFS)	04/13/2020	General Comments	<p>The draft study plans would benefit from collaboration within the FA Group to harmonize LP comments and explore opportunities for improving efficiency and</p>	<p>The requested collaboration is underway, as evidenced by the 2019-2020 voluntary study identification process, including this study plan and associated comment response effort.</p>

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				<p>utility of the anticipated results in meeting the needs of all License Participants.</p> <p>New comments from Brock Applegate (WDFW) provided on 05/05/2020: Many LPs would not consider this a collaborative process. SCL telling LPs to submit their study request to FERC does not represent a collaborative process. SCL did not choose a collaborative licensing process, the Alternative Licensing Process (ALP). I would describe the identification of study issues as the most collaborative process in the voluntary exercise. Currently, the LPs consult on study plan creation. However, SCL can choose their desired licensing process and the way they will consult with the LPs.</p> <p>The LPs currently consult on the study plans. We can agree to disagree.</p>	<p>Moreover, City Light will continue collaboration with LPs regularly throughout the ILP process.</p> <p>Response to comments provided on 05/05/2020: Thank you for your comments.</p>
5.	USFS	04/13/2020	General Comments	<p>Quantification of sediment (bedload) and wood arrest by project operation and consequent downstream resource impacts. This is a significant omission and is a clear project effect on downstream resources now and into the new license.</p>	<p>Thank you for your considered comment. The reservoir sedimentation study at reservoir locations with specific resource related concerns, and the shoreline erosion study will provide some information of relevance to the stated concern. Ongoing wood management activities will also provide information on wood inputs to the reservoirs. City Light is committed to expanding the wood management activities under the current PM&E measure to address sediment deposition at these tributary confluence locations, if access issues are identified.</p> <p>Cross-sectional transects of the mainstem downstream of the dams (i.e., to establish</p>

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					<p>stage/discharge/habitat relationships for the instream flow study) should also provide information of relevance to consider how the Project is interrupting bedload transport from upstream--where those transects are positioned in locations where gages were previously established (i.e., by examining changes in cross-sectional area, some effects of interruption in bed-load transport over time may be inferred).</p> <p>City Light acknowledges that most study plans put forward are focused on collecting information and developing tools that inform our understanding of existing conditions that may or may not support current and future environmental resource objectives in the Skagit River downstream of the Project (i.e., Gorge Dam to Sauk River.) These studies should expand our understanding of the limiting factors to fish populations that could be further addressed through the implementation of the current (or modified) instream flow program, through identifying and implementing active restoration projects that address these limiting factors in a strategic manner (e.g., reflective of Skagit River Chinook, steelhead and bull trout recovery plans), and through effectiveness monitoring from which appropriate adaptive management measures can be identified and actioned upon. City Light, favors this type of resource benefit management approach (i.e., identifying locations in the Skagit River below the Project and then targeting eventual PME measures to improve ecological function at those locations) and looks forward to further discussions with</p>

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					<p>all LPs for means to explore this approach in concert with meeting their resource management objectives.</p> <p>The current studies, including the Operations Model, are parameterized by work that can be done within the 2-year time frame prescribed by the ILP and for which there is current evidence of a resource impact. While it is recognized that the dams interrupt sediment and wood transport, we are not aware of current evidence from this effect on resources of concern, which is one of the qualifiers through which study plans are to be approved by FERC. Hence, a study of the scope proposed cannot be accommodated under the time line and qualifiers of the FERC study plan program, but will be considered in in consultation with the LPs in the subsequent 'integrated environmental effects analysis' step of the relicensing process, and/or under future management plans resolved through settlement agreement under the new license.</p>
6.	USFS	04/13/2020	General Comments	Evaluation of geomorphic change as a result of project effect. The study plan attempts to study the existing condition without isolating the project effect on the resource of concern.	See Comment Responses #1 and #5.
7.	USFS	04/13/2020	General Comments	Address the geomorphic change downstream as a consequence of the range of flows released by the project not just peak flows. It seems imprudent to omit nearly the entire range of flow conditions from analysis when attempting to study project effects on downstream resources.	This comment has also been submitted as part of the Geomorphology from Gorge Dam to Sauk River Study Plan. City Light is working on responding to this comment in that study plan. Please refer to the applicable response to this comment in the Geomorphology from Gorge Dam to Sauk River Study Plan when available.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
8.	Brock Applegate (WDFW)	04/13/2020	Section 1.2 Relicensing Process	<p>“This study plan reflects the RWG consultation effort, and City Light will continue to engage the RWG structure in the preparation of the Proposed and Revised Study Plans.....”</p> <p>New comment provided on 05/05/2020: Outside of the study issue identification, most LPs don't consider this a collaborative process. The LPs consult on the current study plans. WDFW understands that SCL can choose the licensing and consultation process. We appreciate all processes that helps us to work with SCL.</p>	<p>Section 1.2 and 1.3 were redrafted to better describe the 2019 process. Formal consultation does not begin until after the PAD is officially submitted. Although the informal 2019 process leading up to the development of draft study plans did not result in consensus regarding all issues raised by LPs, City Light views this process as a collaborative effort (i.e., the action of working together).</p> <p>Response to comment provided on 05/05/2020: City Light appreciates your agency’s input and looks forward to working with you to address resource issues during the relicensing proceeding.</p>
9.	Jon-Paul Shannahan (Upper Skagit Indian Tribe)	04/12/2020	Section 1.3 Study Plan Development	<p>“City Light operation and maintenance of the Project affect Ross, Diablo, and Gorge lakes’ storage levels, reservoir releases, and the rates of change of each.”</p> <p>O and M also affects tributaries flowing into reservoirs, as well as downstream segment of the free flowing Skagit River, please add affect.</p>	Thank you for this observation. Edits have been made to address this comment.
10.	Jon-Paul Shannahan (Upper Skagit Indian Tribe)	04/12/2020	Section 1.3 Study Plan Development	<p>Comment on Issue Forms list:</p> <p>Suggestions is either add to list in comprehensive way; or remove section given the depth of studies this will inform.</p> <p>CR07 Ross Lake Geomorph study CR06 Bypass Reach Survey CR08 Downstream FA02 Aquatic Invasive Species Plan FA03 Recreational fisheries FA04 Fish Passage</p>	Agreed. City Light concurs with this suggestion and have removed references to these issue forms from this study plan. Text has also been added to Section 1.3 to better explain the role of the issue forms in contributing to City Light’s suite of study proposals.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				FA05 FA06 FA09 Littoral and riparian Habitat FA11 Spawning.. FA12 Effective fish... FA33 Juvenile Outmigration flows Etc...	
11.	Rick Hartson (Upper Skagit Indian Tribe)	03/31/2020	Section 1.3 Study Plan Development	Comment on Issue Forms list: Missing: geomorphology, beavers, others – still need to do full comparison of issue forms submitted	Thank you. See Comment Response #10.
12.	Jon-Paul Shannahan (Upper Skagit Indian Tribe)	04/12/2020	Section 1.3 Study Plan Development	“Modeling would also inform future power generation alternatives (for example, the California Energy Imbalance Market [EIM]).” Modeling can also support SCL’s Integrated Resource Plans as established by WA State law ESHB 1010	Thank you. Edits have been made to incorporate this suggestion.
13.	Rick Hartson (Upper Skagit Indian Tribe)	03/31/2020	Section 1.3 Study Plan Development	“Operations modeling may also consider potential future hydrologic regimes due to climate change and the effects such changes may have on Project operations and environmental resources.” Also consider alternative PME regimes, which may result from adaptive management or changes in energy market over course of license.	Comment acknowledged. Alternative PME regimes can be evaluated following the results of the relicensing studies and in consideration of the results of the integrated environmental effects analysis to be conducted after the FERC study program is completed before an application for a new license is submitted.
14.	Brock Applegate (WDFW)	04/13/2020	Section 1.3 Study Plan Development	“Any modifications to current operations may affect reservoir storage/surface elevations, flood control, streamflows, fish and wildlife habitat,...”	Thank you. Edits have been made to address this comment.
15.	Judy Neibauer (USFWS)	04/13/2020	Section 1.3	“Any modifications to current operations may affect reservoir storage/surface elevations,	Thank you. Edits have been made to address this comment.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
			Study Plan Development	<p>flood control, streamflows, fish and wildlife habitat,..."</p> <p>Plants? Are there sensitive plants in the project area, including on the transmission corridors? For all studies explain how data and assessments might be used/shared between resources, i.e., fish, wildlife, and plants/riparian areas, cultural, recreation.... I am curious about how flow scenarios might encourage non-native species and affect riparian or sensitive plants. Operational modeling could take into consideration key data from the vegetation mapping study to determine affected areas.</p>	<p>Please refer the question regarding sensitive plants to City Light's Terrestrial Resources Work Group Lead.</p> <p>Regarding cross resource coordination, please See Comment Responses #1 and #2.</p>
16.	Judy Neibauer (USFWS)	04/13/2020	Section 1.3 Study Plan Development	<p>"Any modifications to current operations may affect reservoir storage/surface elevations, flood control, streamflows, fish and wildlife habitat, riparian habitat, wetland and floodplain connectivity,..."</p>	Thank you. Edits have been made to address this comment.
17.	Brock Applegate (WDFW)	04/13/2020	Section 1.3 Study Plan Development	<p>"Model of the Project to support the evaluation of alternative operating scenarios considered during the relicensing process."</p> <p>The LPs would like the ability to try different scenarios to see the effects on all resources. WDFW requests that we have a transparent discussion with economic data involved to research scenarios.</p>	<p>The workshops identified in Section 2.6.1.4 are intended to integrate the LPs in the model development process and to be transparent about key steps in model development. City Light also will provide training to the LPs for model execution--including scenario development and analysis of results. Once model development is complete, City Light welcomes the LPs engagement in running different scenarios. To support this, a process will be developed for the LPs to request scenarios to be simulated and results documented within the licensing (e.g., a scenario request form or other process developed in coordination with LPS will be used). Additionally, City Light will provide</p>

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					<p>LPs access to the model for simulation of LP trial scenarios.</p> <p>Economic modeling is outside the scope of this study plan however City Light will work with LPs to develop an acceptable reference scenario for approximation of economic differences between trial scenarios.</p>
18.	Brock Applegate (WDFW)	04/13/2020	Section 1.3 Study Plan Development	<p>3rd Paragraph – Add red text</p> <p>“The modeling results would also provide information needed to drive discussion of scenarios with the LPs and conduct review under the National Environmental Policy Act (NEPA), Endangered Species Act (ESA), and Clean Water Act (CWA) Section 401.”</p>	Thank you. Edits have been made to address this comment.
19.	Judy Neibauer (USFWS)	04/13/2020	Section 1.3 Study Plan Development	<p>“Modeling would also inform future power generation alternatives (for example, the California Energy Imbalance Market [EIM]).”</p> <p>This modeling should also be used to meet the Fish and Wildlife Coordination Act components of FERC (i.e. Section 10j in the FERC process)</p>	Thank you. Edits have been made to address this comment. The study program and subsequent integrated environmental analysis and NEPA document will provide the information necessary for LPs to execute their statutory responsibilities under the Federal Power Act.
20.	USFS	04/13/2020	Section 1.3 Study Plan Development	<p>The FS recommends only including those issues, and referencing those issue forms, that are explicit goals and/or objectives of this study plan. If methods are not designed to study the specific data gaps identified in the issue forms, then issues should not be included here. Alternatively, describe in sufficient detail how conclusions drawn from this study plan will inform project effects on the issues brought forward in this paragraph.</p>	See Comment Response #10.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				The FS recommends adding Wild and Scenic River Act (WSRA) as another law requiring information needed for regulatory compliance.	Thank you. Edits have been made to address this comment.
21.	Judy Neibauer (USFWS)	04/13/2020	Section 2.0 Study Plan Elements	<p>I found a great source that identifies what Study Guide Criteria should be addressed in these study plans. Maybe you have seen it, but here is the link...</p> <p>https://www.ferc.gov/industries/hydropower/gen-info/guidelines/guide-study-criteria.pdf</p> <p>...sorry if you already have discussed this.</p>	City Light appreciates the input.
22.	Jon-Paul Shannahan (Upper Skagit Indian Tribe)	04/12/2020	Section 2.1 Study Goals and Objectives	<p>“The Base Case has specific relevance in FERC relicensing proceedings as it represents the baseline conditions to which other scenarios of potential future operations are compared.”</p> <p>Since operations are driven by power generation and/or economic profit, the Tribe is requesting that a related goal be added in connection with this or supported by this effort. The related goal is a modeling support tool in connection with, or inside the existing model platform of CHEOP, that can forecast Base Case and Alternative Project Scenarios economically. The goal would be to provide a transparent and reasonably accurate estimate of the economics of the different operational scenarios. Understanding the economic analysis ultimately being used by the utility for their planning and decision making is their own imitative, however educating LPs with the transparency of an economic assessment tool would aid future discussions and understandings.</p>	See Comment Response #17.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
23.	Jon-Paul Shannahan (Upper Skagit Indian Tribe)	04/11/2020	Section 2.1 Study Goals and Objectives	<p>“In addition to the Base Case, defined by current FERC license requirements, a Current Operation Baseline scenario will be developed to simulate the voluntary fish-protection flows released from the Project”</p> <p>Rick lets see about your comment going somewhere below in document. Because the section is Goals and objectives, and after establishing BaseCase why do they throw out “we can model our voluntary fish protection flow” – PR suggestion is request that example be removed. Plus is it really voluntary fish protection-thought 2011 Biop made them requirements?</p>	Comment acknowledged.
24.	Rick Hartson (Upper Skagit Indian Tribe)	03/31/2020	Section 2.1 Study Goals and Objectives	Another useful scenario would be Minimum Operations – reservoirs remain at low pool. Though not realistic economically, this would provide a helpful reference for understanding resource impacts and developing impactful PMEs	Thank you for this suggestion. Separate from the study, the Operations Model will be utilized to simulate alternative operations scenarios identified by City Light and LPs through the relicensing process. City Light will work with LPs to identify and evaluate individual scenario requests. Typically, scenario requests from different LPs may overlap with one another or be outside the physical capability of the system. Each scenario request requires a detailed review and will be discussed with LPs on the most efficient application of requested scenarios.
25.	Brock Applegate (WDFW)	04/13/2020	Section 2.1 Study Goals and Objectives	“Project operation scenarios considered during the relicensing process will aid in decision-making regarding the effects of various operating scenarios on water allocation, flood control, fish and wildlife habitat,....”	Thank you. Edits have been made to incorporate the suggested text.
26.	Judy Neibauer (USFWS)	04/13/2020	Section 2.1 Study Goals and Objectives	“Project operation scenarios considered during the relicensing process will aid in decision-making regarding the effects of various	Thank you. Edits have been made to incorporate the suggested text.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				operating scenarios on water allocation, flood control, fish and wildlife habitat, instream flows, reservoir levels, wetland and floodplain connectivity,.... ”	
27.	Brock Applegate (WDFW)	04/13/2020	Section 2.1 Study Goals and Objectives	<p>“In addition to the Base Case, defined by current FERC license requirements, a Current Operation Baseline scenario will be developed to simulate the voluntary fish-protection flows released from the Project.”</p> <p>Didn’t the fish-protection flows become part of the license, which no longer makes them voluntary? Does this refer to the adaptive management in flows that SCL does every season? WDFW does appreciate the past consultation with the Co-Managers on flows for spawning and incubation.</p>	Thank you for the comment – the practices commonly referred to as “voluntary” have indeed been codified into the License since the 2013 amendment. There are still elements of spawning and incubation flow management that may be considered voluntary or adaptive however this language and the operational descriptions will be clarified in the next iteration of this study plan.
28.	Judy Neibauer (USFWS)	04/13/2020	Section 2.1 Study Goals and Objectives	I had that question too, but it seems that the 2012 Biological Opinion, says they are implementing a new amendment that included what use to be voluntary flows. If this is this correct it should be mentioned somewhere here, and in the existing information section?	Thank you. See Comment Response #27
29.	USFS	04/13/2020	Section 2.1 Study Goals and Objectives	The FS Recommends identifying, at least preliminarily, the possible project operation scenarios that SCL anticipates evaluating (as mentioned in section 2.2) here in 2.1. In particular, an operations scenario that incorporates climate change impacts to seasonal flow regimes seems prudent given the length of the new license.	<p>Thank you. See Comment Response #24. This process may include alternative hydrologic conditions such as potential impacts of climate change.</p> <p>Also as noted in section 2.3, as part of the hydrologic data compilation, City Light will request input from LPs to make sure all relevant hydrologic information is considered. Typically, a contiguous long-term hydrologic period is selected to ensure the evaluation of wet, dry, and normal conditions; including extended multi-year conditions, such as multi-</p>

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					year droughts. Additionally, scenarios can be simulated with alternate hydrologic conditions which represent potential climate change conditions.
30.	Jon-Paul Shannahan (Upper Skagit Indian Tribe)	04/11/2020	Section 2.2 Resource Management Goals	2 nd Bullet – Comment “Reservoir water surface level fluctuations (habitat, recreation, navigation)” Cultural site protection	Thank you. Edits have been made to address this comment.
31.	Ashley Rawhouser (NPS)	03/25/2020	Section 2.2 Resource Management Goals	3 rd Bullet – Comment “Seasonal targets for reservoir levels under a range of hydrologic conditions” What is the range? Is this based on climate change scenarios and/or hydro extremes over the last license period or since the dams were constructed ? Can you be more specific?	Thank you. See Comment Response #29.
32.	Jon-Paul Shannahan (Upper Skagit Indian Tribe)	04/12/2020	Section 2.2 Resource Management Goals	3 rd Bullet – Comment “Seasonal targets for reservoir levels under a range of hydrologic conditions” Climate change and climate planning data. SCL has been participating in many climate change forums. Given the long temporal length of the potential FERC licenses, the Tribe expects all new and relevant climate data applicable to the Skagit and the Utility operations will be used to test future operating scenarios.	Thank you. See Comment Response #29.
33.	Jon-Paul Shannahan	04/12/2020	Section 2.2 Resource	“Several agencies have resource management goals related to reservoir water levels and Skagit River flows. These include the U.S.	Agreed. Edits have been made to incorporate the Upper Skagit Indian Tribe, the Swinomish

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
	(Upper Skagit Indian Tribe)		Management Goals	<p>Army Corps of Engineers (USACE) for flood management; U.S. Fish and Wildlife Service (USFWS), NPS, National Marine Fisheries Service (NMFS), Washington State Department of Ecology (Ecology), National Park Service (NPS) and the Upper Skagit Indian Tribe tribes.”</p> <p>Given court affirmed Treaty Rights and Sovereignty status please use Proper pronouns in this section, as relating to resource management authority. I’m aware of three tribes that have federal fishing rights in the Skagit watershed</p>	Indian Tribal Community, and the Sauk-Suiattle Tribe.
34.	Ashley Rawhouser (NPS)	03/25/2020	Section 2.2 Resource Management Goals	<p>“Several agencies have resource management goals related to reservoir water levels and Skagit River flows. These include the U.S. Army Corps of Engineers (USACE) for flood management; U.S. Fish and Wildlife Service (USFWS), NPS, National Marine Fisheries Service (NMFS), Washington State Department of Ecology (Ecology), National Park Service (NPS) and the Upper Skagit Indian Tribe tribes.”</p>	Thank you for your suggestion. Please note that “NPS” is identified earlier in this paragraph, and “National Park Service” is first used in Section 1.1.
35.	Judy Neibauer (USFWS)	04/13/2020	Section 2.2 Resource Management Goals	<p>According to guidelines for the ILP...this section should also include Information about public input considerations...Maybe you have this somewhere else?</p> <p>See this link: https://www.ferc.gov/industries/hydropower/gen-info/guidelines/guide-study-criteria.pdf</p>	City Light appreciates the input.
36.	Brock Applegate (WDFW)	04/13/2020	Section 2.2 Resource Management Goals	<p>“City Light’s goal for the proposed study is to develop a tool to simulate Project operations for the evaluation of the effects of numerous, and potentially competing, alternative future</p>	Thank you. Edits have been made to incorporate the suggested text.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				operating scenarios for consultation by the LPs.”	
37.	Judy Neibauer (USFWS)	04/13/2020	Section 2.2 Resource Management Goals	2 nd Bullet – Add red text Reservoir water surface level fluctuations (aquatic and wildlife habitat, riparian vegetation, recreation, navigation)	Thank you. Edits have been made to incorporate the suggested text.
38.	Brock Applegate (WDFW)	04/13/2020	Section 2.2 Resource Management Goals	4 th Bullet – Add red text Instream flows in the Skagit River downstream of the Project and within the bypass reach	Thank you. Edits have been made to incorporate the suggested text.
39.	Judy Neibauer (USFWS)	04/13/2020	Section 2.2 Resource Management Goals	5 th Bullet – Added new bullet and comment “Connectivity of wetlands, floodplains, and tributaries to river and reservoirs” It seems that connectivity of adjacent tributaries should be thought about both above and below the dams. It could be lumped into aquatic and wildlife habitat...but needs to be thought about early in development of a study, rather than later, when fish passage studies are designed...so that data can be gathered with the geomorphology and sediment deposition studies can include these areas too.	Thank you. Edits have been made to incorporate the suggested text.
40.	Brock Applegate (WDFW)	04/13/2020	Section 2.2 Resource Management Goals	7 th Bullet – Added new bullet “Aquatic habitat particularly with salmonid spawning, incubating, and rearing flows”	Thank you. Edits have been made to incorporate the suggested text.
41.	Brock Applegate (WDFW)	04/13/2020	Section 2.2 Resource Management Goals	“These include the U.S. Army Corps of Engineers (USACE) for flood management; U.S. Fish and Wildlife Service (USFWS), NPS, National Marine Fisheries Service (NMFS), Washington State Department of Ecology (DOE), National Park Service (NPS),	Thank you. Edits have been made to incorporate the suggested text. Please also See Comment Response #33.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				Washington Department of Fish and Wildlife (WDFW), and the tribes.”	
42.	Judy Neibauer (USFWS)	04/13/2020	Section 2.2 Resource Management Goals	<p>“These include the U.S. Army Corps of Engineers (USACE) for flood management; U.S. Fish and Wildlife Service (USFWS), NPS, National Marine Fisheries Service (NMFS), Washington State Department of Ecology (Ecology), National Park Service (NPS), Washington Department of Fish and Wildlife (WDFW), and the tribes.”</p> <p>Should BIA be included here too....maybe they come in later, but should figure this out before these get developed to far down the road...</p> <p>USFS? They likely have some resource management goals in some areas, especially along roads and transmission corridors?</p>	<p>Thank you for the suggestion. City Light supports BIA involvement however they have not participated in the process to date.</p> <p>Please also See also Comment Responses #33 and #43.</p>
43.	USFS	04/13/2020	Section 2.2 Resource Management Goals	<p>The FS recommends adding the USFS as an agency with resource management requirements including but not limited to, the National Forest Management Act (NFMA) and Wild and Scenic River Act (WSRA)</p> <p>The FS recommends maintaining consistency throughout the suite of study plans by referencing the following FS management planning documents:</p> <p>1990 Mt. Baker Snoqualmie National Forest Land and Resource Management Plan (LRMP)</p> <p>1994 Record of Decision - Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the</p>	Thank you. Edits have been made to address this comment. Please also See Comment Responses #33 and #43.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				Northern Spotted Owl - Attachment A to the Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl. 1983 Skagit River Management Plan Volume II.	
44.	Ashley Rawhouser (NPS)	03/25/2020	Section 2.3 Background and Existing Information	<p>“A summary of the data available is provided in the PAD and includes reservoir area-storage-elevation information for each reservoirs’ historical operations data on reservoir water levels, reservoir releases, power generation, and flows downstream of the Project (City Light 2020).”</p> <p>What section of the PAD contains info on reservoir storage volumes for the different reservoir water level elevations?</p> <p>Tables 3.5-10 to 12 only include outflows from 2014 to 2018. Will this study provide info for the entire license period? It would be beneficial to assess flows (peak, min, and duration) through the project starting when each of the dams were completed.</p>	<p>Operations data is not typically available for the entire license period. The model will be developed, calibrated and verified utilizing available operations data. Once this development process is complete, and it is determined that the model adequately represents the Project, the model will then be utilized to simulate scenarios over a longer and more varying hydrologic period. As part of the hydrologic data compilation, City Light will request input from LPs to make sure all relevant hydrologic information is considered in development of the long-term hydrologic dataset for model application.</p> <p>Area-storage-elevation information is provided in the PAD in section 4.4.1.2.</p>
45.	Jon-Paul Shannahan (Upper Skagit Indian Tribe)	04/11/2020	Section 2.3 Background and Existing Information	<p>“Adequate information currently exists to...”</p> <p>“Adequate data exists” and Preliminary Review of PAD 3.5.3 influences this comment. What data gaps exist for entire period of record for operations across all three reservoirs? Does inflow data exist across temporal and spatial scale to cover historic conditions?</p>	<p>Thank you for your questions. Adequate physical and operational information exists to develop an operations model of the Project. The hydrologic dataset to be utilized in the simulation of the operations model will be determined as part of this study. Please also See Comment Responses #44 and #29.</p>

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
46.	Rick Hartson (Upper Skagit Indian Tribe)	03/31/2020	Section 2.3 Background and Existing Information	<p>A summary of the data available is provided in the PAD and includes reservoir area-storage-elevation information for each reservoirs' historical operations....”</p> <p>Does this account for sedimentation and changing reservoir capacity over time?</p>	Area-storage-elevation information was provided in the PAD in section 4.4.1.2. As part of this study, Project records will be reviewed for additional data sources to provide the area-storage-elevation relationship for each reservoir.
47.	Brock Applegate (WDFW)	04/13/2020	Section 2.3 Background and Existing Information	WDFW agrees. If we only have four years of data, we should have more information on flows.	Thank you for your comment. See Comment Response #44.
48.	Jon Riedel (NPS)	03/27/2020	Section 2.3 Background and Existing Information	<p>“A summary of the data available is provided in the PAD and includes reservoir area-storage-elevation information for each reservoirs' historical operations data on reservoir water levels, reservoir releases, power generation, and flows downstream of the Project (City Light 2020).”</p> <p>IT is important to consider the range of flows represented by our highly variable climate, including positive and negative phases of the PDO and ENSO</p>	Thank you for your comment. See Comment Response #44.
49.	Judy Neibauer (USFWS)	04/13/2020	Section 2.3 Background and Existing Information	<p>“Current Project operations and flow management requirements are summarized in Section 3.5 of the PAD (City Light 2020).”</p> <p>Since this is a separate study plan. Identify a table showing what information you currently have, the questions it will help address, and show how new information will either add to that assessment, or have its own question it will answer. Mixing sources of information can be hard to compare if collections vary across time...and by types of data collected.</p>	Thank you for your suggestion. City Light has opted to refer readers to existing information where it is available in the PAD. Also, please See Comment Response #44 above.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				Attach an appendix to this study, or right here, add the words in here to identify what background data you will use in the study, so folks know what data still needs to be collected and so that it will help show that data is comparable and usable...	
50.	Ashley Rawhouser (NPS)	03/25/2020	Section 2.3 Background and Existing Information	<p>“The hydrologic modeling work associated with this report includes analyses of naturalized streamflow at Project reservoir locations (Ross, Diablo, and Gorge) and at sixteen tributaries...”</p> <p>Which tributaries? Is this the proposed scope/geographic extent? Are you proposing to expand Bandaragoda 2020 to Skagit basin? Is there a scientific reviewed publication to accompany the web site?</p>	Thank you for your comment. Bandaragoda 2020 was identified as a potential data source of hydrologic data for this study, as well as the Instream Flow Model Study, and will be evaluated as part of these studies. The geographic scope and data available within Bandaragoda 2020 have not yet been reviewed, so it is not yet known which tributary data, if any, will be applicable to these studies. See Comment Response #44.
51.	Judy Neibauer (USFWS)	04/13/2020	Section 2.3 Background and Existing Information	Can you include a list of the 16 tribs here? Are they key tributaries for fish and flows?	Yes. The 16 tributaries referenced in the Study plan are part of the Bandaragoda 2020 research. This research is identified as a potential data source for the Operations Model Study, not necessarily key tributaries for fish and flows. Also, please See Comment Response #50 above.
52.	Brock Applegate (WDFW)	04/13/2020	Section 2.3 Background and Existing Information	<p>“Additional information related to river hydraulic characteristics and water quantity at and below the Project is proposed to be developed as part of the Instream Flow Model Development Study.”</p> <p>I would work closely with the DOE on this one. SCL will need the information for their 401 water certification.</p>	Thank you. We anticipate working closely with Ecology to consider how results from this study and that of the Water Quality Study plan can be implemented to meet their needs for 401 Water Quality Certification.
53.	Brock Applegate (WDFW)	04/13/2020	Section 2.3 Background and	The Operations Model study will be closely coordinated with the Instream Flow Model	We concur. See Comment Response #52.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
			Existing Information	Development Study to ensure the two models are fully integrated. I would reiterate that you should work with DOE for the reason above.	
54.	Brock Applegate (WDFW)	04/13/2020	Section 2.3 Background and Existing Information	“Development and flows/elevations at points of interest (nodes) along the Skagit River downstream of the Gorge Development.” Does this refer to river cross sections or something different?	Thank you for your question. For this study, node locations are cross sections along the Skagit River downstream of the Gorge Development and will be identified as part of the Instream Flow Model Development Study.
55.	Judy Neibauer (USFWS)	04/13/2020	Section 2.3 Background and Existing Information	“Development and flows/elevations at points of interest (nodes) along the Skagit River downstream of the Gorge Development.” As you develop flow models, include in the model, additional points of interest (at rec sites, boat launches, tributary mouths, depositional areas, etc.) where the flow releases cause impacts within the reservoirs. We may need to work together to identify these issue areas and their timing, magnitude, and duration. This gets at the timing, magnitude, and duration of the flow events and potential operational effects to aquatic species and other wildlife. It would also be good to know if there are operational or maintenance procedures that cause SCL to stop spilling for any reason...and what the timing, magnitude, and duration of those events are.	Comment acknowledged. Downstream areas of interest would be identified through the Instream Flow Model Development Study, as a node location that could then be integrated into the Operations Model. The Operations Model will provide lake levels on a sub-daily basis for the duration of the scenario simulation. Comment acknowledged.
56.	USFS	04/13/2020	Section 2.3 Background and Existing Information	The FS recommends including all available hydrological data for the period of record in the operations model. It is important to capture the full range of flows that can be anticipated which would include extreme years and highly	Thank you. See Comment Response #44

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				variable climate conditions associated with positive and negative phases of the PDO and ENSO.	
57.	Jon-Paul Shannahan (Upper Skagit Indian Tribe)	04/11/2020	Section 2.4 Project Operations and Effects on Resources	<p>“The Operations Model will inform the continuation or development of new operations and maintenance (O&M) measures that may become license terms under a new FERC license.”</p> <p>Can the model be used to inform pump storage currently being proposed or considered in draft PAD?</p>	Yes, the model can simulate pump-storage operations under consideration in the PAD.
58.	Judy Neibauer (USFWS)	04/13/2020	Section 2.4 Project Operations and Effects on Resources	<p>This is a section described in the study plan guidelines that I shared earlier...where you can to talk about how the results from the Project will affect the resources.</p> <p>This section could link up to the goals and objectives above and share how the information will be used to assess effects.</p> <p>This section just seems like it lacks description, and more like a general statement, without the details of how the data will be used to address the effects...Maybe add a paragraph showing how data will be used in the effects analysis...you could put that in a table too?</p>	Comment acknowledged.
59.	USFS	04/13/2020	Section 2.4 Project Operations and Effects on Resources	Does SCL anticipate having those operation scenarios ran as part of this study plan, or will they become available at a later time (possibly NEPA review period)? The FS recommends clarification on when the outputs from those other scenarios will be made available for review.	Identifying and evaluating operational scenarios are envisioned as a subsequent step to the Operations Model Study (focused on model development only) and per the schedule are to occur no earlier than 2022.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
60.	Jon-Paul Shannahan (Upper Skagit Indian Tribe)	04/11/2020	Section 2.5 Study Area	<p>“The Operations Model will include Ross Lake, Ross Dam and Powerhouse, Diablo Lake, Diablo Dam and Powerhouse, Gorge Lake, Gorge Dam, Gorge bypass reach, Gorge Powerhouse, and tailrace.”</p> <p>The Utility has shown their climate sensitivity and leadership in many forums on many climate change issues; Will study area include large glaciers inside the Skagit Watershed, particularly in the upper watershed that feeds the three reservoirs?</p>	Thank you for that acknowledgement. See Comment Response #44.
61.	Brock Applegate (WDFW)	04/13/2020	Section 2.5 Study Area	<p>“The scope of the Operations Model Study is the geographic region of the Skagit River from the upper end of Ross Lake to the Gorge Powerhouse tailrace.”</p> <p>If this model includes stream flows, I would recommend the study area extends to the downstream water gauge, where SCL will measure flow and ramping rates.</p>	Thank you for the recommendation. The downstream reach will be part of the Instream Flow Model Development Study, with node locations to be incorporated into the operations model. Node locations will be identified as part of the Instream Flow Model Development Study.
62.	Brock Applegate (WDFW)	04/13/2020	Section 2.5 Study Area	<p>“Additionally, within the study area limits of the Instream Flow Model, the Operations Model will be integrated with the Instream Flow Model to evaluate the potential effects of alternative flow/stage measures and timing along the Skagit River.”</p> <p>Does this include the Skagit River below the powerhouse?</p>	Yes, please See Comment Response #61.
63.	Judy Neibauer (USFWS)	04/13/2020	Section 2.5 Study Area	<p>“Additionally, within the study area limits of the Instream Flow Model, the Operations Model will be integrated with the Instream Flow Model to evaluate the potential effects of alternative flow/stage measures and timing along the Skagit River.”</p>	Thank you for your suggestions. See Comment Response #61.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				<p>You will likely need to be able to explain effects from spill operations to areas downstream of dams, upstream of dams, and to tributaries where effects go some distance upstream.</p> <p>Maybe you have existing information downstream of the Gorge Power house to the mouth of the Skagit? If yes, you can include that statement in here and the data below in background information. Show how you will be using previously collected information along with new data to identify affected resources.</p> <p>If no, you should include data collection points downstream of the dam to the mouth in the study to so you will be able to see where habitat issues may form. Points of interest would be areas like tributaries, key spawning habitat, etc. to show how they are impacted with different flow scenarios.</p> <p>You will want to be able to show the level of affects to habitat and populations both upstream, downstream of dams and at key tributaries; that will be expected from operational and maintenance work flows/drawdowns and from climate change scenarios.</p>	
64.	Jon Riedel (NPS)	03/27/2020	Section 2.5 Study Area	“Dynamic hydraulic modeling to simulate the timing and flow attenuation relationship between nodes along the Skagit River and discharge from Gorge dam will be simulated with the Instream Flow Model.”	Thank you for the suggestion. See Comment Response #61. Also, Bandaragoda 2020 was identified as a potential data source. See Comment Response #44.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				Would be helpful to have a map showing where these nodes are., presumably including 16 streams already modeled in Bandaragoda.	
65.	Brock Applegate (WDFW)	04/13/2020	Section 2.5 Study Area	I agree with Jon. A map will prove useful. SCL will need to consider the gauges, one below and one above the powerhouse as well to measure flow and ramp rates in the bypass reach and below the powerhouse. We might have less questions if the LPs could see these areas on a map. See Comment #37)	See Comment Response #61.
66.	Ashley Rawhouser (NPS)	03/25/2020	Section 2.6 Methodology	1 st Paragraph – Comment City Light proposes to develop an Operations Model using the CHEOPS™ model (Computer Hydro Electric Operations and Planning Software). Citation needed for source of the model.	CHEOPS is a modeling tool developed by HDR, and customized to represent a Project. Several examples of use of the model in other FERC license applications are provided in Section 2.7 of the Study Plan.
67.	Brock Applegate (WDFW)	04/13/2020	Section 2.6 Methodology	1 st Paragraph – Comment Will LPs have the ability to run their own scenarios with this model selection?	Yes, please See Comment Response #17.
68.	Brock Applegate (WDFW)	04/13/2020	Section 2.6 Methodology	1 st Paragraph – Comment “CHEOPS is a flexible, reliable, and easy-to-use tool created....” If CHEOPS is a proprietary model, I am concerned about the “black box” that the numbers enter and the lack of transparency.	See Comment Response #17. Additionally, all model inputs and outputs are provided in text file format which can be evaluated.
69.	Ashley Rawhouser (NPS)	03/25/2020	Section 2.6 Methodology	1 st Paragraph – Comment “CHEOPS is a flexible, reliable, and easy-to-use tool created more than two decades ago specifically to evaluate a wide range of factors	Two examples are provided in section 2.7

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				considered during FERC relicensing that may affect natural resources and project operations, including reservoir levels, water uses and generation.” Can you provide citations of where this has been used in the PNW?	
70.	Ashley Rawhouser (NPS)	03/25/2020	Section 2.6 Methodology	1 st Paragraph – Comment “Additionally, CHEOPS is designed to be user-friendly, it can be run from PC or personal laptop through an easy-to-use graphical interface and utilizes Microsoft Excel as the output data analysis platform, this allows the Operations Model to be used by LPs....” Thanks. This helps with transparency. Is the software open source/free? Where/how do we access?	You are welcome and the comment is appreciated. The model will be available to LPs; please See Comment Response #17. The model is not open source, but all model inputs and outputs are provided in text file format which can be evaluated by the LPs. The model has a user friendly interface and allows for the retention and easy tracking of scenarios. Model output is in either text files or DSS format, and is easily evaluated within excel. There are several excel based tools to help automate the evaluation of model output, and these are often customized to specific Projects areas of interest.
71.	Judy Neibauer (USFWS)	04/13/2020	Section 2.6 Methodology	2 nd Paragraph – Comment “The Operations Model will include characteristics of the three Project reservoirs powerhouses, and water conveyance structures; as well as incremental tributary flows and discharge rating curve relationships at select nodes along the Skagit River.” Can you identify nodes or points of interest in reservoirs, so that we can see at what reservoir elevations, key tributaries becomes disconnected and/or connectivity becomes an	Thank you for your questions. The model utilizes level pool elevation-storage relationships to account for reservoir storage. If key elevations are identified, evaluations of duration and magnitude at those elevations could be estimated from the model output data. City Light currently mitigates for potential effects on fish migration/passage resulting from sediment and woody debris deposition in Project reservoirs, and intends to continue the effort. The 1991 Settlement Agreement stipulates that City Light is to survey for and

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				issue? I am also interested if any passage barriers show up in the reservoir itself as water levels decrease. Can you add in reservoir bathymetry into the model so you can see if there are any passage barriers or shallow areas that show up in the reservoirs as they drop?	remove transitory barriers to spawning migration in tributaries to Project reservoirs. City Light has agreed to expand the annual barrier surveys and barrier removal efforts beginning in 2020 following NCC approval.
72.	Ashley Rawhouser (NPS)	03/25/2020	Section 2.6 Methodology	3 rd Paragraph – Comment “The proposed approach is to use the Operations Model to perform simulations (Model runs), comparing outputs/effects relative to a Base Case scenario.” Again, it would be good to know the range of conditions you are proposing to model.	See Comment Response #17. Future scenarios have not yet been identified.
73.	Jon-Paul Shannahan (Upper Skagit Indian Tribe)	04/11/2020	Section 2.6 Methodology	2 nd Paragraph – Comment “The proposed Operations Model will encompass an inflow dataset including streamflows into Ross Lake, incremental inflows to Diablo and Gorge lakes, as well as incremental flows to nodes along the Skagit River downstream of the Gorge Development.” Inputs should also include direct precipitation, seasonal snow melt, and glacier inputs, can you explain how these variables are captured or if not how the data gap will be managed?	Thank you for your suggestions. The inputs identified would be represented in the hydrologic dataset to be developed as part of the study.
74.	Jon-Paul Shannahan (Upper Skagit Indian Tribe)	04/11/2020	Section 2.6 Methodology	2 nd Paragraph – Comment “The proposed Operations Model will encompass an inflow dataset including streamflows into Ross Lake, incremental inflows to Diablo and Gorge lakes, as well as	See Comment Response #44. Also, note that the data review has yet to be completed, so data gaps are not yet known.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				incremental flows to nodes along the Skagit River downstream of the Gorge Development.” What spatial and temporal data gaps exist and what methodology will be used to address?	
75.	Rick Hartson (Upper Skagit Indian Tribe)	03/31/2020	Section 2.6 Methodology	2 nd Paragraph – Comment “The Operations Model will include characteristics of the three Project reservoirs powerhouses, and water conveyance structures; as well as incremental tributary flows and discharge rating curve relationships at select nodes along the Skagit River. These discharge rating curve relationships will be developed as part of the Instream Flow Model Development Study.” Why do both Operations Model and Instream Flow Model include tributary inflows downstream of Gorge Powerhouse? Clarify this apparent redundancy and how these two models will be integrated.	Thank you for your observation and questions. The tributary flows will be incorporated into the modeling efforts to represent total flow at identified node locations. The Operations Model will incorporate the Instream Flow Model node locations downstream of Gorge discharge. The Operations Model will be capable of evaluating reservoir operations to attempt to support flows/stage targets at these node locations.
76.	Brock Applegate (WDFW)	04/13/2020	Section 2.6 Methodology	3 rd Paragraph – Comment I agree. Should we assume that SCL will run anything that most LPs agree with running, within reason?	See Comment Response #24.
77.	USFS	04/13/2020	Section 2.6 Methodology	The FS appreciates the level of detail and logical sequencing of the methods described in this section.	Comment acknowledged, thank you.
78.	Judy Neibauer (USFWS)	04/13/2020	Section 2.6 Methodology	Is there a 3-d type of a model that you can use along with this model to show data visually? A model that will show how flows will inundate streams/ channels/ wetlands, as well as show	Comment acknowledged. The suggested methodology is outside the scope of this study. City light agrees this methodology is exciting

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				how a reservoir drains across time under several scenarios we choose? I have seen this done with watershed restoration and it can be very helpful.	and powerful when used in the appropriate context.
79.	Ashley Rawhouser (NPS)	03/25/2020	Section 2.6.1 Model Development	1 st Bullet – Comment “Assembly and compilation of historical operational data.” What time period?	Thank you for your question. The time period will be identified as part of this study. See Comment Response #44.
80.	Brock Applegate (WDFW)	04/13/2020	Section 2.6.1 Model Development	1 st Bullet – Comment SCL should have a conversation with the LPs on the historic inflow data.	See Comment Response #44.
81.	Ashley Rawhouser (NPS)	03/25/2020	Section 2.6.1 Model Development	3 rd Bullet – Comment “Development or identification of inflow dataset.” Does this refer to the 16 tribes discussed earlier?	Bandaragoda 2020 was identified as a potential data source. See Comment Response #44.
82.	Jon-Paul Shannahan (Upper Skagit Indian Tribe)	04/11/2020	Section 2.6.1 Model Development	3 rd Bullet – Comment “Development or identification of inflow dataset.” Please see early comment about precipitation, (rain and snow melt), and glaciers	Comment acknowledged. See Comment Response #17.
83.	Ashley Rawhouser (NPS)	03/25/2020	Section 2.6.1 Model Development	4 th Bullet – Comment “Initial Operations Model development using physical data such as reservoir storage curves, dam spillway capacity, headwater curves, tailwater curves, turbine performance curves, generator performance curves, as well as operational data including minimum flows,	Yes, the data will be reviewed through the Workshop Process and documented in the study report.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				operation/dispatch routines, and operating/elevation limits.” All of this info will be made available to LPs? When?	
84.	Brock Applegate (WDFW)	04/13/2020	Section 2.6.1 Model Development	WDFW would support this availability.	See Comment Response #83.
85.	Brock Applegate (WDFW)	04/13/2020	Section 2.6.1 Model Development	4 th Bullet – Comment “Initial Operations Model development using physical data such as reservoir storage curves, dam spillway capacity, headwater curves, tailwater curves, turbine performance curves, generator performance curves, as well as operational data including minimum flows, operation/dispatch routines, and operating/elevation limits.” Can we consider ramping rates as well?	Thank you for your question. Yes, the model can simulate ramping rates. This would be a part of future analysis after model development is completed.
86.	Judy Neibauer (USFWS)	04/13/2020	Section 2.6.1 Model Development	4 th Bullet – Comment Can you add in reservoir elevations at which the tributaries might disconnect or become a connectivity barrier. Also, add any bathymetry that shows any shallow areas, or barriers within the reservoirs themselves during operational drawdowns. Same question as above....	Thank you for your suggestion. The model utilizes level pool elevation-storage relationships to account for reservoir storage. If key elevations are identified, evaluations of duration and magnitude at those elevations could be estimated from the model output data.
87.	USFS	04/13/2020	Section 2.6.1 Model Development	The FS recommends clarity on whether the assembly and compilation of these development activities will be available for iterative review by the LPs during the licensing process? In particular the development and identification of inflow data.	See Comment Response #44. The Workshop process will facilitate LP review and engagement in data review and selection.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				The FS recommends having the following statement in the Study Plan Development section 1.3: “Separate from the study, the Operations Model will be utilized to simulate alternative operations scenarios identified by City Light and the LPs through the relicensing process.”	Edits have been made to address this comment.
88.	Jon-Paul Shannahan (Upper Skagit Indian Tribe)	04/11/2020	Section 2.6.1.1 Model Validation	<p>“In the first step, the Operations Model will be evaluated by comparing the Operations Model output to the period of the historical record that represents current operations,....”</p> <p>Will LPs and Utility work collaboratively to address this model input or assumption? Annual records over the last license term represent significantly different water budgets and demands.</p>	Yes, the Workshop process will facilitate LP review and engagement in data review and selection.
89.	Brock Applegate (WDFW)	04/13/2020	Section 2.6.1.1 Model Validation	<p>1st Paragraph – Comment</p> <p>“In the first step, the Operations Model will be evaluated by comparing the Operations Model output to the period of the historical record that represents current operations, specifically, mean daily flows....”</p> <p>WDFW would recommend that we consider the time period from which SCL will gather the data. Other utilities on the river have started to adjust the years to more recent years because the average of those years better represents what will happen in the future.</p>	Thank you for this recommendation. See Comment Responses #44 and #88.
90.	Ashley Rawhouser (NPS)	03/25/2020	Section 2.6.1.1 Model Validation	2 nd Paragraph – Comment	Thank you for your question. Review of available data and the time period to be evaluated will be identified as part of the Study.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				<p>“This will be done by making a number of model runs and comparing the results with actual Project data.”</p> <p>Can you provide more detail on the data will be used to build the model and the data will be used to validate?</p>	
91.	Brock Applegate (WDFW)	04/13/2020	Section 2.6.1.1 Model Validation	<p>2nd Paragraph – Comment</p> <p>I agree with Ashley. We would prefer more detail at these steps.</p>	Comment acknowledged. The workshops will facilitate LP review and engagement in data review and selection. There may not be substantial differences, this is not known until the Model development and data review is initiated.
92.	USFS	04/13/2020	Section 2.6.1.1 Model Validation	<p>The FS recommends clarity on whether during the validation of the operating model that input data with “substantial differences” that cannot be explained will be available for iterative review by the LPs? Can SCL identify when during the relicense process that will occur.</p>	See Comment Response #91.
93.	Jon-Paul Shannahan (Upper Skagit Indian Tribe)	04/11/2020	Section 2.6.1.2 Develop Base Case and Current Operations Baseline	<p>“The Operations Model will be configured to represent current FERC license requirements as well as how the Project is currently operated, including all physical, regulatory, and contractual constraints. The underlying assumption is that this Base Case represents the “No Action Alternative” or the current FERC license requirements, and the Current Operations Baseline represents current operations, including voluntary measures. All subsequent Operations Model runs will be compared to both Base Case and Current Operations Baseline.”</p> <p>Upper Skagit Indian Tribe TEAM THINK THROUGH NEPA? Base case no action</p>	City Light welcomes further discussion regarding use of base case for comparison to additional operational scenarios. While base case is defined by current operations, this does not limit the ability for LPs and City Light to explore scenarios that are beyond the scope of current operations.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				current operations baseline is current operations?? The significance here is lost with confusing language???	
94.	Judy Neibauer (USFWS)	04/13/2020	Section 2.6.1.2 Develop Base Case and Current Operations Baseline	<p>I am confused as to what you are calling voluntary flows. In the current USFWS BiOp we have for the Skagit, we covered a set of 4 voluntary flows, and they were adopted into the license. Wouldn't that be the Base Case...and the no action alternative at this point?</p> <p>Page 16 of that BiOp shows that you are implementing flows for Steelhead and Chinook with a down ramp rate; for Salmon fry protection; for Chum spawning, and for Chum Incubation. It looks like you have been implementing them since 1995 in the BiOp.</p> <p>Are there other flows that you are operating at, that are not currently covered in a Biological Opinion? Please review the 2012 Biological Opinion and describe what your current operations are, especially, if these flows are not considered "Base Case" flows here or for the next license.</p>	See Comment Response #27.
95.	Brock Applegate (WDFW)	04/13/2020	Section 2.6.1.2 Develop Base Case and Current Operations Baseline	<p>"The underlying assumption is that this Base Case represents the "No Action Alternative" or the current FERC license requirements, and the Current Operations Baseline represents current operations, including voluntary measures."</p> <p>SCL should make sure that these measures did not get integrated into the license already.</p>	See Comment Response #27.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
96.	Ashley Rawhouser (NPS)	03/25/2020	Section 2.6.1.3 Model Logic and Validation Report	SCL should also provide all data and metadata used to develop the model in an electronic (.csv or .xlsx) format to LPs. A sensitivity analysis should also be conducted.	Agreed. Model input and output is available in .csv format. Additional simulations will be evaluated after this study is completed.
97.	Brock Applegate (WDFW)	04/13/2020	Section 2.6.1.3 Model Logic and Validation Report5	7 th Bullet – Make edits below Any LP agency correspondence and/or consultation	Thank you, edits made to address this comment.
98.	Jon-Paul Shannahan (Upper Skagit Indian Tribe)	04/11/2020	Section 2.6.1.4 Consultation Process with Licensing Participants	“City Light proposes to engage the resource agencies, tribes, and other interested parties...” LP base or ?	“other interested parties” is includes LPs as well as others with an interest in the relicensing process..
99.	Brock Applegate (WDFW)	04/13/2020	Section 2.6.1.4 Consultation Process with Licensing Participants	“iii. Riverine node selection” Will the LPs select or will SCL tells why they have selected the nodes?	In collaboration with the LPs, nodes will be identified as part of the Instream Flow Model study.
100.	Brock Applegate (WDFW)	04/13/2020	Section 2.6.1.4 Consultation Process with Licensing Participants	“ii. Voluntary operations” Voluntary operation should not include any measure already in the license, but more adaptive management changes done because of consultation.	Thank you for your comment.
101.	USFS	04/13/2020	Section 2.6.1.4 Consultation Process with Licensing Participants	The FS appreciates this section of the study plan. Thank you for the addition.	You’re welcome, glad it was helpful.
102.	Jon-Paul Shannahan (Upper Skagit Indian Tribe)	04/11/2020	Section 2.6.1.5 Evaluate Alternative	“The Operations Model will be capable of evaluating alternative Project operation scenarios developed by City Light and/or LPs.”	Thank you for this observation and comment. See Comment Response #24. Evaluating alternative operations scenarios are intended to

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
			Project Operation Scenarios	Not knowing the need, cost, or technical expertise, degree of needed information etc.. to run the model, if any of the above limit model runs. Then, we should address early on a process for deciding how alternative model selection is identified and run. Utility presents reasonable case in this outline of study design, “the models capable of evaluating alternative project operations”, but Steering Committee will need to address process for evaluating different alternatives put forth by Lps and Utility that receive official modeling. Just because it is capable doesn’t mean we have agreement to see what it says.	be a process that occurs after the study is complete.
103.	Jon-Paul Shannahan (Upper Skagit Indian Tribe)	04/11/2020	Section 2.7 Consistency with Generally Accepted Scientific Practice	<p>“Accordingly, CHEOPS has proven applicable to a broad range of sites and operating conditions and has been relied upon by LPs and FERC staff in numerous FERC relicensing projects including, but not limited to:”</p> <p>Does CHEOPS support pump storage operations, and any examples of using CHEOPS for feeding economic modelling?</p>	Yes, the model can simulate pump-storage operations.
104.	Brock Applegate (WDFW)	04/13/2020	Section 2.8 Schedule	<ul style="list-style-type: none"> Initial Study Final Report (ISR)– March 2022 ISR Meeting Requests for study plan modification (in needed) <p>This language better represents the format that FERC likes, based on the use of Federal Power Act language.</p>	<p>The model is crucial to inform discussions regarding proposed operations. While the FERC process allows for two seasons, it is City Light’s intent to complete the model on the timeline proposed. Therefore, the requested edits have been removed.</p> <p>Response to comment provided on</p>

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				<p>New comment provided on 05/05/2020: I have included two steps in the process that FERC requires. FERC requires the ISR Meeting and the report. Why not include the edits? SCL will conduct them whether one or two seasons. How About: --Final report of the Initial Study Report (ISR) --ISR Meeting</p>	<p>05/05/2020: Thank you for your comment. The schedule reflects the timeline for this study only, not the larger ILP process.</p>

OPERATIONS MODEL REVISED STUDY PLAN

ATTACHMENT B

**EXAMPLE SKAGIT OPERATIONS MODEL SCENARIO REQUEST
FORM**

SKAGIT RIVER PROJECT RELICENSING - Request for Operations Model Run

Ross

	<u>Pool Elevations – Spill*, Target, Minimum</u> (All elevations are NAVD 88 unless otherwise specified)			<u>Minimum Discharge Flows</u>	
Date	Maximum/ Full Pool (Spill) Elevation (ft)	Minimum Elevation (ft)	Target Elevation (ft)	Minimum Daily Average Discharge (cfs)	Minimum Continuous Discharge (cfs)
January 1					
February 1					
March 1					
April 1					
May 1					
June 1					
July 1					
August 1					
September 1					
October 1					
November 1					
December 1					
December 31					

*Spill elevation, is the elevation at which the model will begin to spill to prevent going above.

Discharge Stabilization (rate of change)

Lake Level Stabilization (rate of change)

Other

SKAGIT RIVER PROJECT RELICENSING - Request for Operations Model Run

Diablo

	<u>Pool Elevations – Spill*, Target, Minimum</u> (All elevations are NAVD 88 unless otherwise specified)			<u>Minimum Discharge Flows</u>	
Date	Maximum/ Full Pool (Spill) Elevation (ft)	Minimum Elevation (ft)	Target Elevation (ft)	Minimum Daily Average Discharge (cfs)	Minimum Continuous Discharge (cfs)
January 1					
February 1					
March 1					
April 1					
May 1					
June 1					
July 1					
August 1					
September 1					
October 1					
November 1					
December 1					
December 31					

*Spill elevation, is the elevation at which the model will begin to spill to prevent going above.

Discharge Stabilization (rate of change)

Lake Level Stabilization (rate of change)

Other

SKAGIT RIVER PROJECT RELICENSING - Request for Operations Model Run

Gorge

	<u>Pool Elevations – Spill*, Target, Minimum</u> (All elevations are NAVD 88 unless otherwise specified)			<u>Minimum Discharge Flows</u>			
Date	Maximum/ Full Pool (Spill) Elevation (ft)	Minimum Elevation (ft)	Target Elevation (ft)	Minimum Daily Average Discharge (cfs)		Minimum Continuous Discharge (cfs)	
				Day	Night	Day	Night
January 1							
February 1							
March 1							
April 1							
May 1							
June 1							
July 1							
August 1							
September 1							
October 1							
November 1							
December 1							
December 31							

*Spill elevation, is the elevation at which the model will begin to spill to prevent going above.

	<u>Maximum Discharge Flows</u>			
Date	Maximum Daily Average Flow (cfs)		Maximum Instantaneous Flow (cfs)	
	Daytime	Nighttime	Daytime	Nighttime
January 1				
February 1				
March 1				
April 1				
May 1				
June 1				
July 1				
August 1				
September 1				
October 1				
November 1				
December 1				
December 31				

SKAGIT RIVER PROJECT RELICENSING - Request for Operations Model Run

Date	<u>Flow Rate of Change</u>		
	Daily Amplitude Decreasing (cfs/day)	Hourly Change (cfs/hour)	
		Decreasing Rate Daytime	Decreasing Rate Nighttime
January 1			
February 1			
March 1			
April 1			
May 1			
June 1			
July 1			
August 1			
September 1			
October 1			
November 1			
December 1			
December 31			

Recreation Flows in Gorge Bypass Reach

Dates	Gorge Bypass Flow (cfs)	Remarks	Start Hour	End Hour

Discharge Stabilization (rate of change)

Lake Level Stabilization (rate of change)

Other

Additional Information

This image shows a single sheet of white paper with horizontal blue ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

SKAGIT RIVER PROJECT RELICENSING - Request for Operations Model Run

Current Project Operations

To help in the formulation of alternative scenario requests, the following is an excerpt of the current Project operations outlined in the *April 2020 Skagit River Hydroelectric Project Pre-Application Document (PAD)*.

1.1 Project Operations

The three Skagit River developments are hydraulically coordinated to operate as a single project to control flooding, provide flows in the river downstream of the Project that are protective of salmon and steelhead reproduction and rearing, provide recreation at Ross Lake, and supply power. Operations at each of the Skagit developments are described below.

1.1.1 Reservoir Operations

While the primary purpose of all three Project reservoirs is to provide water for generation, each one has other purposes and is operated differently. Article 302 of the current Project license requires that City Light comply with requests for operational changes from the U.S. Army Corps of Engineers (USACE) during flood conditions. In addition, operations at each reservoir involve managing woody debris that enters the system from the shorelines or tributaries.

1.1.1.1 Ross Development

Ross Lake is the primary storage for the Project and is drawn down in the winter to capture water from spring runoff and to provide for downstream flood control. City Light typically begins drawing down the reservoir shortly after Labor Day. Storage capacity at a normal maximum water surface elevation of 1,608.76 feet NAVD88 is 1,435,000 acre-feet; usable storage is 1,052,000 acre-feet which is 68 times the combined usable storage of the other two reservoirs. If needed, the reservoir can be surcharged by 2.5 feet to the top of the spill gates to absorb an additional 95,000 acre-feet. The lowest licensed water surface elevation is 1,480.76 feet NAVD88, 127 feet below the normal maximum.

Article 301 of the current Project license addresses flood control operations at Ross Lake. Specifically, City Light is required to:

- Provide storage for flood control: 60,000 acre-feet by November 15; 120,000 acre-feet by December 1 (1,598.76 feet NAVD88) and through March 15.
- Release only such flows as are necessary for normal generation at all three Project developments but no more than 5,000 cfs (plus or minus 20 percent allowance for operation latitude) whenever the National Weather Service, Northwest River Forecast Center, forecasts that the natural flow at the gaging station near Concrete, WA will equal or exceed 90,000 cfs, in 8 hours, on a rising stage of flood.
- Surcharge the reservoir if the water surface elevation reaches 1,608.76 feet NAVD88 before flood recession occurs to provide the greatest reduction of discharge downstream.
- Comply with the USACE “Details of Regulation for Use of Storage Allocated for Flood Control in Ross Reservoir, Skagit River, WA” (revised May 1967), which is incorporated into the Project license by reference.

License Article 403 addresses recreational uses at Ross Lake and requires that City Light:

- Fill as soon as possible after April 15.
- Achieve full pool by July 31.
- Maintain full pool through Labor Day subject to adequate runoff, anadromous fish protection flows downstream of the Project, flood protection, spill minimization, and firm power generation needs.

SKAGIT RIVER PROJECT RELICENSING - Request for Operations Model Run

1.1.1.2 Diablo Development

The primary function of Diablo Lake is to reregulate flows between the Ross and Gorge developments. The storage capacity of Diablo Lake is 50,000 acre-feet at a normal operating water surface elevation of about 1,211.36 feet NAVD88. The lake typically fluctuates only 4-5 feet daily.

1.1.1.3 Gorge Development

The primary function of Gorge Lake is to regulate downstream flows for fish protection. It has a gross storage capacity of 8,500 acre-feet at normal maximum water surface elevation of 881.51 feet NAVD88; usable storage is only 6,600 acre-feet. Gorge Lake typically fluctuates only 3-5 feet.

1.1.2 River Operations

The specific flow measures and ramping rate restrictions included in the Project license as amended in 2013 and the 2011 Revised Fisheries Settlement Agreement (FSA) Flow Plan are described below by species and life stage.

1.1.2.1 Salmon Spawning and Redd Protection

The spawning periods for each species as identified in the Revised FSA Flow Plan are as follows:

- Chinook Salmon – August 20 to October 15 each year.
- Pink Salmon – September 12 and ends on October 31 in odd years.
- Chum Salmon – November 1 and ends on January 6 each year.

During the spawning period of each salmon species, daily flows may not exceed 4,500 cfs for Chinook Salmon, 4,000 cfs for Pink Salmon, and 4,600 cfs for Chum Salmon unless: (1) the flow forecast made by City Light shows a sufficient volume of water will be available to sustain a higher incubation flow, thereby permitting a higher spawning flow; or (2) uncontrollable flow conditions are present. The seasonal spawning flow for each species is defined as the average of the highest ten daily spawning flows at the Newhalem gage during the spawning period of that species.

In addition, the current Project license requires City Light to provide minimum flows, which are dependent on spawning flows, during the salmon incubation period. For purposes of this requirement, incubation is presumed to begin on the first day of the spawning period identified for each species and end on April 30 for Chinook and Pink Salmon, and May 31 for Chum Salmon. As a result, instantaneous minimum flows are provided from August 20 through May 31 each year (see Appendix C of the Revised FSA).

1.1.2.2 Salmon Fry Protection

The salmon fry protection period specified in the Revised FSA Flow Plan is January 1 through May 31.

To minimize fry stranding, the Project license requires City Light to limit daily down-ramp amplitude; maintain minimum flows throughout the salmon fry protection period that are adequate to cover gravel bar areas commonly inhabited by salmon fry; and limit down-ramping to nighttime hours except in periods of high flow, as follows:

- Down-ramp Amplitude – The down-ramp amplitude is limited to no more than 4,000 cfs.
- Down-ramping Rate – During periods of daylight, no down-ramping is allowed from the moment when the flow at Marblemount is predicted to be $\leq 4,700$ cfs. Down-ramping may proceed at a rate of up to 1,500 cfs per hour as long as the flow at Marblemount is predicted to be $> 4,700$ cfs. During periods of darkness, down-ramping is allowed at a rate up to 3,000 cfs per hour.
- Salmon Fry Protection Release – To maintain a predicted Marblemount flow of 3,000 cfs during the

SKAGIT RIVER PROJECT RELICENSING - Request for Operations Model Run

salmon fry protection period, the Project must release up to 2,600 cfs.

1.1.2.3 Steelhead Spawning and Redd Protection

The steelhead spawning period specified in the Revised FSA Flow Plan is from March 15 – June 15 each year. This spawning period is divided into three sub-periods: March 15 – 31, April 1 – 30, and May 1 – June 15. Each sub-period is treated separately for the purpose of determining succeeding steelhead spawning and incubation flows. Planned flows may not exceed 5,000 cfs for March steelhead, 5,000 cfs for April steelhead, and 4,000 cfs for May – June 15 steelhead, unless the forecasted inflow and storage is great enough to provide incubation flows that are at least as high as the spawning flows. As stipulated in the Revised FSA Flow Plan, any planned spawning flows greater than these flow ranges are not to be implemented without prior discussion with the Flow Plan Coordinating Committee (FCC). The actual spawning flow for each sub-period is defined as the average of the ten highest daily spawning flows at the Newhalem gage during that sub-period.

The incubation periods for each steelhead spawning group starts on the first day of the spawning sub-periods and ends on June 30 for March steelhead and July 31 for both April steelhead and May – June 15 steelhead. An instantaneous minimum incubation flow for each day of the incubation period is provided as follows:

- Incubation flows during the first ten days of each spawning sub-period are based on the planned spawning flow.
- Thereafter, daily incubation flows are based on the average of the highest ten daily spawning flows that have occurred up to that day. Appropriate incubation flows for any given day are determined by the season spawning flows in Appendix G of the Revised FSA.
- During the month of August, the instantaneous daily minimum flow at Newhalem gage is 2,000 cfs.

1.1.2.4 Steelhead Fry Protection

Newly emerged steelhead fry are protected from potential stranding by limiting daily down-ramp amplitudes and rates and by maintaining minimum flows from June 1 – October 15 adequate to cover gravel bar areas commonly inhabited by steelhead fry. Implementation details include:

- Down-ramp Amplitude – The maximum 24-hour, down-ramp amplitude is limited to 3,000 cfs when flows at the Newhalem gage are $> 4,000$ cfs. When flows at Newhalem gage are $\leq 4,000$ cfs, the down-ramp amplitude is limited to 2,000 cfs per day from June 1 – August and to 2,500 in September and October. During the month of August, down-ramp amplitude is further restricted to 500 cfs per day when flow insufficiency provisions are in effect (see Revised FSA Section 6.4; City Light 2011).
- Down-ramping Rate – When the Newhalem instantaneous flow is $\leq 4,000$ cfs, the allowed down-ramp rate is up to 500 cfs per hour. When the Newhalem instantaneous flow remains $> 4,000$ cfs, a down-ramp rate of up to 1,000 cfs per hour is allowed.
- Steelhead Fry Protection Flow – Minimum flows at the Newhalem gage must be the higher of flows specified in Appendix I of the Revised FSA Flow Plan or by required steelhead incubation flows. During the portions of June and October excluded from the steelhead fry protection period, minimum flows are determined by required salmon incubation flows.

SKAGIT RIVER PROJECT RELICENSING - Request for Operations Model Run

Fry protection at Newhalem gage.

Month	Minimum Sufficient Instantaneous Flow (cfs) ¹
January	²
February	1,800
March	1,800
April	1,800
May	1,500
June	1,500
July	1,500
August	2,000
September	1,500
October	1,500
November	²
December	²

1 Minimum flow may be reduced to 1,500 cfs when natural flow on the inflow day is less than 2,300 cfs (Section 6.3.3.2 (3) of the Revised FSA).

2 Minimum flows in these months are determined by incubation flow requirements.

1.1.2.5 Steelhead and Chinook Salmon Yearling Protection

To protect steelhead and Chinook Salmon yearlings from stranding and to minimize local displacement from foraging habitats down-ramp rates are limited to < 3,000 cfs/hr from October 16 to January 31 each year.

1.1.2.6 Other Flow Management Measures

The Revised FSA Flow Plan recognizes that some impact to anadromous fish spawning, incubation, and rearing may occur notwithstanding the protection measures described above, particularly when uncontrollable flow events occur. In addition to the downstream flow requirements, it was recognized that specific voluntary actions may be needed to better protect salmon and steelhead spawning areas, redds, and fry as a result of new information on the effects of flows on spawning, incubation, and fry survival. These voluntary actions are cooperatively developed through the FCC, which considers Project system flexibility, economic ramifications, and potential effects to all anadromous species and life stages at a given time. Critical data considered include tributary inflows between Newhalem and Marblemount and field monitoring of redd locations. Implementation of voluntary actions typically involves development of a proposed action by City Light during or at the end of the spawning season for each species (or spawning group in the case of steelhead) and whenever uncontrollable flow events occur during the spawning, incubation, and rearing periods. The proposal is then presented to the FCC for review and discussion to reach consensus on a plan of action.

**RA-01 RECREATION USE AND FACILITY
ASSESSMENT REVISED STUDY PLAN**

**SKAGIT RIVER HYDROELECTRIC PROJECT
FERC NO. 553**

Seattle City Light

**April 2021
RSP**

TABLE OF CONTENTS

Section No.	Description	Page No.
1.0	Introduction.....	1-1
1.1	General Description of the Project.....	1-1
1.2	Relicensing Process	1-1
1.3	Study Plan Development.....	1-2
2.0	Study Plan Elements	2-1
2.1	Study Goals and Objectives	2-1
2.2	Resource Management Goals	2-2
2.3	Background and Existing Information.....	2-3
2.4	Project Operations and Effects on Resources	2-5
2.5	Study Area	2-5
2.6	Methodology	2-7
2.6.1	Inventory and Evaluate Existing Recreation Facilities	2-7
2.6.1.1	Inventory Recreation Facilities	2-10
2.6.1.2	Facility Condition Assessment	2-10
2.6.1.3	Accessibility Compliance Assessment	2-12
2.6.1.4	Recreation Use Impact Assessment.....	2-13
2.6.1.5	Gorge Lake Boat Launch Ramp Assessment.....	2-13
2.6.2	Identify Recreation Uses and Visitor Attitudes, Beliefs, and Preferences	2-14
2.6.2.1	Observation Survey.....	2-14
2.6.2.2	Visitor Survey	2-15
2.6.2.3	Sampling Approach and Data Collection	2-19
2.6.2.4	Trail-Specific Use Counts.....	2-21
2.6.3	Estimate Current Recreation Use at Recreation Resource Areas	2-21
2.6.3.1	Recreation Facility Use and Occupancy	2-21
2.6.3.2	Recreation Use Estimate	2-22
2.6.4	Identify Future Use and Demand Opportunities.....	2-25
2.6.4.1	Existing Unmet Demand Assessment.....	2-25
2.6.4.2	Future Recreation Demand Assessment	2-25
2.6.4.3	Regional Uniqueness and Significance Assessment.....	2-26
2.6.5	Data Entry and QA/QC Review of Data.....	2-28
2.6.6	Data Analysis and Report Preparation.....	2-28
2.6.6.1	Data Analysis	2-28
2.6.6.2	Report Preparation	2-28
2.7	Consistency with Generally Accepted Scientific Practice.....	2-28
2.8	Schedule.....	2-29

2.9	Level of Effort and Cost	2-29
3.0	References	3-1

List of Figures

Figure No.	Description	Page No.
Figure 2.5-1.	Location map of the Skagit River Project.....	2-6

List of Tables

Table No.	Description	Page No.
Table 2.6-1.	Study area recreation facilities that will be inventoried and evaluated for condition, ADA compliance, and use impacts.....	2-8
Table 2.6-2.	Facility condition evaluation categories and criteria.	2-11
Table 2.6-3.	Overall facility condition evaluation ratings, categories, and general rehabilitation timeframes.	2-12
Table 2.6-4.	Level of accessibility compliance categories and rating system.	2-12
Table 2.6-5.	Recreation use impact assessment categories and rating system.....	2-13
Table 2.6-6.	Study areas and sites for the observation survey (use spot count).....	2-16
Table 2.6-7.	Survey areas, study sites, and specific locations for the visitor survey.	2-17
Table 2.6-7.	Trail counter study locations.....	2-21
Table 2.6-9.	Study area recreation facilities where use and occupancy will be estimated via study observation surveys and use counts.....	2-23
Table 2.6-10.	Study area recreation facilities where use data will be collected via non-study methods (as available).....	2-24
Table 2.6-1.	Regional uniqueness categories and rating system.....	2-27

List of Attachments

Attachment A	City Light Responses to LP Comments on the Study Plan Prior to PSP
Attachment B	Study Site Maps
Attachment C	Facility Assessment Forms
Attachment D	Visitor Survey Instrument

List of Acronyms and Abbreviations

ABA	Architectural Barriers Act
ADA	Americans with Disabilities Act
CFR	Code of Federal Regulations
City Light	Seattle City Light
DLA	Draft License Application
ELC	Environmental Learning Center
FERC	Federal Energy Regulatory Commission
FPA	Federal Power Act
GPS	Global Positioning System
ISR	Initial Study Report
LP	licensing participant
NCI	North Cascades Institute
NEPA	National Environmental Policy Act
NPS	National Park Service
OHV	off-highway vehicle
O&M	operation and maintenance
PAD	Pre-Application Document
PRM	Project River Mile
Project	Skagit River Hydroelectric Project
PSP	Proposed Study Plan
QA/QC	quality assurance/quality control
RARWG	Recreation and Aesthetics Resource Work Group
RCO	Recreation and Conservation Office
RD	recreation days
RLNRA	Ross Lake National Recreation Area
RM	river mile
RSP	Revised Study Plan
RWG	Resource Work Group
SR	State Route
U.S.C.	United States Code
USFS	U.S. Forest Service

USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USR.....	Updated Study Report
WDFW	Washington Department of Fish and Wildlife
wse	water surface elevation

This page intentionally left blank.

1.0 INTRODUCTION

1.1 General Description of the Project

The Skagit River Hydroelectric Project (Project), licensed to The City of Seattle, Washington, and operated through its publicly-owned electric power utility Seattle City Light (City Light), is located in northern Washington State and consists of three power generating developments on the Skagit River – Ross, Diablo, and Gorge – and associated lands and facilities. The Project generating facilities are in the Cascade Mountains of the upper Skagit River watershed, between Project River Miles (PRM) 94.7 and 127.9 (U.S. Geological Survey [USGS] RMs 94.2 and 127).¹ Power from the Project is transmitted via two 230-kilovolt 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, an Environmental Learning Center (ELC), several recreation facilities, and several parcels of fish and wildlife mitigation lands.

Project generating facilities are all located in Whatcom County, although Ross Lake, the most upstream reservoir, crosses the U.S.-Canada border and extends for about one mile into British Columbia at normal maximum water surface elevation. Gorge Powerhouse, the most downstream facility, is approximately 120 miles northeast of Seattle and 60 miles east of Sedro-Woolley, the nearest large town. The closest town is Newhalem, which is part of the Project and just downstream of Gorge Powerhouse. The primary transmission lines cross Whatcom, Skagit, and Snohomish counties; the fish and wildlife mitigation lands are in the same counties.

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, Diablo, and Gorge lakes.” The legislation maintains the Federal Energy Regulatory Commission’s (FERC) 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).

1.2 Relicensing Process

The current FERC license for the Project expires on April 30, 2025, and City Light will apply for a new license no later than April 30, 2023. City Light formally initiated the relicensing process by filing a Notice of Intent and Pre-Application Document (PAD) with FERC on April 27, 2020 (City Light 2020a). The PAD includes descriptions of the Project facilities, operations, license

¹ 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 Project River Mile (PRM) system are provided throughout this document. For further details see Section 7.0 of the main body RSP.

requirements, and Project lands as well as a summary of the extensive existing information available on Project area resources and early consultation on potential resource issues to be addressed during the relicensing. The PAD also includes an outline of the goals and objectives of this study.

In 2019-2020, City Light convened a series of Resource Work Groups (RWG) to engage agencies and other licensing participants (LP) in the Study Plan Development Process. Discussions with LPs continued in early 2021 with a series of topic-based discussions following filing of the Proposed Study Plan (PSP) on December 8, 2020 (City Light 2020b). This study plan reflects RWG and LP discussion and study requests and comments submitted by LPs.

1.3 Study Plan Development

For City Light, LPs, and FERC to evaluate the Project's recreation resources, including existing recreation opportunities and whether those opportunities are meeting recreation demand, an inventory and assessment of recreation facilities and opportunities, and visitor use within the study area, is proposed. This study plan addresses elements of the RA01 (Recreation and Visitor Use), RA02 (Recreation Inventory), RA04 (Whitewater Recreation), RA10 (Visitor Use Impacts), and FA03 (Recreational Fisheries) issue forms provided during the 2019 Study Plan Development Process.

On March 12, 2020, City Light released the RA-01 Recreation Use and Facility Assessment Draft Study Plan for LP review and comment. On March 24, 2020, the draft study plan was discussed at a Recreation and Aesthetics Resource Work Group (RARWG) meeting. City Light reviewed all comments received and released a revised version of the draft study plan on June 18, 2020. The revised draft was discussed on June 25, 2020 at a RARWG meeting. Written comments were received from U.S. Forest Service (USFS), U.S. Fish and Wildlife Service (USFWS), Washington Department of Fish and Wildlife Service (WDFW), Upper Skagit Indian Tribe, NPS, North Cascades Institute (NCI), and Nlaka'pamux Nation Tribal Council and responded to in an attachment to this study plan. A Status Draft of the study plan was provided to LPs on August 6, 2020.

City Light is filing this study plan with FERC as part of its Revised Study Plan (RSP), an update to the version that was filed with the PSP and incorporating additional consultation with LPs prior to the filing date. The following study requests pertaining to recreation facilities and visitor use were submitted: USFS-01 Recreation Facility and Use Study, and NPS-15 Recreation Facilities and Visitor Use Study. The NPS and USFS study requests were substantially identical. This study plan addresses, with significant modifications, many of the elements identified in the study requests listed above, as explained in Section 6 of the RSP.

PSP comments to this study plan were submitted by American Rivers/Trout Unlimited, American Whitewater, Nlaka'pamux Nation Tribal Council, NPS, and USFS. City Light has addressed the specific comments and suggested edits in this study plan and responded to comments in the PSP comment/response table appended to the main body of the RSP. City Light has made several modifications to the PSP based on these comments and further discussion with LPs. In particular, City Light has added 47 non-Project recreation facilities to the study area for a variety of different study elements, increased the target number of visitor surveys, increased the number of survey

days, added new trail accessibility evaluations and trail counters, and made modifications to the visitor survey instrument.

2.0 STUDY PLAN ELEMENTS

2.1 Study Goals and Objectives

The goals of this study are to determine: (1) the condition, accessibility, and use impacts of study area recreation facilities; (2) the preferences, attitudes, and characteristics of the study area's recreation users (3) current study area recreation use and activities; and (4) future demand for study area recreation facilities and opportunities.

Goal 1 Objectives (Determine the Condition of Project Facilities, Impacts, and Accessibility)

- Determine the condition of the Project recreation facilities.
- Evaluate accessibility at select study area recreation facilities.
- Inventory select study area recreation facilities and trails and document recreational use and access impacts (e.g., erosion, user-created trails, trash/waste disposal, etc.).
- Evaluate the usable periods of the Gorge Lake Boat Launch ramp.

Goal 2 Objectives (Determine the Preferences, Attitudes, and Characteristics of the Study Area's Recreation Users)

- Describe recreation visitors and their trip characteristics, including seasonality and access routes, by recreation facility and type of user (anglers, boaters, campers, hikers, etc.).
- Describe user preferences and expectations at recreation facilities, including water surface elevation; level and quality of interpretation and posted information; and condition of recreation facilities.
- Identify any recreation issues such as safety, conflicts, and crowding.
- Describe recreation visitors' activities (including primary activity and all activities engaged in while visiting) at recreation facilities.
- Describe recreation visitors' socio-demographic characteristics.
- Describe recreation visitors' access experience and any potential barriers to participation in recreation activities.

Goal 3 Objectives (Current Study Area Recreation Use and Activities)

- Identify the amount, activity type, and spatial and temporal distribution of existing and desired recreation use within the study area, and, where reasonable and possible, describe historical recreation use trends within this area.
- Identify the current facility capacity/occupancy of study area recreation facilities.
- Identify recreation opportunities within the study area that may have unmet demand.
- Identify potential constraints or barriers to recreation use.
- Assess the regional uniqueness and relative significance of the study area's primary recreation opportunities.

Goal 4 Objectives (Future Demand for Activities)

- Roughly estimate future recreation demand within the study area through the term of the new license (30 to 50 years).

2.2 Resource Management Goals

In addition to providing information needed to characterize Project effects, this study will provide information to help LPs with responsibility for recreation and land use within the Project area to identify potential measures for consideration in a recreation management plan for the Project. To that purpose, City Light has the following goals:

- Determine the adequacy of the Project's recreation facilities to meet the current and future recreation demand for the Project.
- Ensure the safety of the public in its use of Project lands and waters and Project recreation facilities.
- Identify user conflicts and resource impacts as a result of recreational use.

The study will provide information for resource agencies and Indian tribes with jurisdiction in the Project vicinity to address their respective goals and objectives for resource management. Resource management goals were provided by LPs in their study requests identified in Section 1.3 of this study plan.

Relevant recreation agency resource management goals are summarized below:

- FERC – City Light has a responsibility under the Federal Power Act (FPA) to provide recreation opportunities at hydroelectric projects under FERC's jurisdiction. Per 18 CFR Subsection 2.7 (Recreational Developments at Licensed Projects), "FERC will evaluate the recreational resources of all projects under Federal license or applications therefor and seek, within its authority, the ultimate development of these resources, consistent with the needs of the area to the extent that such development is not inconsistent with the primary purpose of the project." Specifically, FERC requires licensees to:
 - Acquire lands to assure optimum development of the recreational resources afforded by the project;
 - Develop suitable public recreational facilities with adequate public access, considering the needs of people with disabilities in the design of facilities and access;
 - Coordinate efforts with other agencies in the development of recreation areas and facilities;
 - Provide for planning, operation, and maintenance of these facilities; and
 - Inform the public of opportunities for recreation at licensed projects.
- National Park Service (NPS) – NPS manages recreation within RLNRA following the guidance provided in the 2012 RLNRA General Management Plan (NPS 2012). Management of the North Cascades National Park north and south units is guided by the General Management Plan for the North Cascades National Park Complex (NPS 1988). Approximately

70 percent of RLNRA is part of the Stephen Mather Wilderness, the management of which is guided by the Stephen Mather Wilderness Management Plan (NPS 1989). Since many of the Project recreation facilities and opportunities on Ross Lake, Diablo Lake, Gorge Lake, and on the Skagit River downstream of Gorge Lake are located on or adjacent to NPS-managed lands within RLNRA, City Light has collaborated with the NPS on developing appropriate study assessment methods. In addition, NPS coordination will be necessary for City Light to implement selected elements of the study plan at facilities located on NPS-managed lands. NPS will play a key role in the evaluation of study results and implementing a long-term management plan for Project recreation resources.

- US Forest Service (USFS) – The USFS manages recreation in the Okanogan-Wenatchee National Forest and the Mount Baker-Snoqualmie National Forest, which border the Ross Lake National Recreation Area on the east and west sides, the management of which is guided by the Okanogan Forest Land and Resource Management Plan, the Wenatchee Forest Land and Resource Management Plan, and the Mt. Baker-Snoqualmie National Forest Land and Resources Management Plan (USFS 1989; USFS 1990a; and USFS 1990b, respectively as amended by the Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl, April, 1994). Within the Project Boundary, the USFS has jurisdiction over the recreation facilities at the Marblemount Boat Launch (Skagit River) and the Sauk River Boat Launch (Sauk River). In addition, the USFS manages recreation on federal land in the Skagit River Wild and Scenic River corridor downstream of the Project per the 1983 Skagit Wild and Scenic River Management Plan (Volumes I and II).
- Washington Department of Fish and Wildlife (WDFW) – WDFW works with tribes to co-manage the state's fisheries and is responsible for managing wildlife in the state of Washington. WDFW will evaluate visitor survey study results related to angling on the Project reservoirs and in the Skagit River downstream of Gorge Powerhouse.

Additionally, this study plan will identify Project-related recreation opportunities that may help address some regional and/or statewide recreation interests identified by the Washington State Recreation and Conservation Office (RCO 2017). The RCO is a state agency that manages grant programs to create outdoor recreation and conservation opportunities, and is responsible for completing several statewide plans, including ones for recreation, trails, and boating. The RCO's 2018-2022 Recreation and Conservation Plan for Washington State identifies the near and long-term priorities to meet the needs of residents for outdoor recreation and conservation in Washington State. The plan includes five priority areas to meet these needs, including: (1) sustain and grow the legacy of parks, trails, and conservation lands; (2) improve equity of parks, trails, and conservation lands; (3) get youth outside; (4) plan for culturally relevant parks and trails to meet changing demographics; and (5) assert recreation and conservation as a vital public service.

2.3 Background and Existing Information

The Skagit River Project is in a remote area, with steep terrain and harsh winter conditions that both define and limit recreation opportunities. The Project is approximately 120 miles northeast of Seattle and 60 miles east of Sedro-Woolley and the one highway in the vicinity (State Route [SR] 20) is seasonally closed each year, usually from November until April. Nonetheless, the Project

reservoirs and surrounding area provide numerous recreational opportunities and receive a significant level of visitation, especially in the summer.

The Project is unique in that the generation facilities are almost entirely within a national recreation area, the RLNRA, which was established in 1968—after initial licensing and development of the Project—and is managed by the NPS as part of the North Cascades National Park Complex. Additionally, the Project is bordered on the east and west by National Forests and is upstream of the Skagit River Wild and Scenic River System. The Project Boundary also encompasses two towns, which are owned by City Light, and the ELC.

The Project supports public access and recreation activities on Ross Lake, Diablo Lake, Gorge Lake, and the towns of Newhalem and Diablo. Public recreation opportunities within the Project Boundary include developed recreation facilities, trails, dispersed sites, boat launches, and reservoir-based activities. However, most of the recreation facilities within the Project Boundary, as well as those adjacent to the Project Boundary, are non-Project recreation facilities managed by the NPS as part of the RLNRA. Project recreation facilities, on the other hand, are located either on City Light or federal land and managed by City Light.

Local recreation opportunities extend far beyond the Project Boundary. Visitor use ranges from car trips through the Project vicinity on SR 20 with incidental stops to view an interpretive display or photograph one of the Project waterbodies, to multiday stays in a frontcountry campground with excursions onto Project waters for day-use activities, or hikes into the backcountry for a wilderness camping experience. Visitors to the area come from across the United States and other countries. Visitation to the RLNRA is highest in the summer months of July and August with lower levels of recreation activity in the spring and fall shoulder seasons. Closure of SR 20 from November to April limits visitor access to the area and associated recreation use, although cross-country skiing and snowshoeing occur on NPS lands within the Project Boundary. Several NPS facilities in the RLNRA close by the end of September. Adjacent USFS facilities also close by November. Similarly, the road gate at the U.S.-Canada border at Hozomeen is usually closed for the winter season by November.

NPS reports annual use for RLNRA and City Light's 2015 Licensed Hydropower Development Recreation Reports present a picture of overall use of the Project and RLNRA. Overall, visitation to RLNRA generally ranged from 700,000 to 900,000 visitors annually from 2010 to 2020 with a peak visitor use of 1,088,528 visitors in 2019. City Light filed a FERC Licensed Hydropower Development Recreation Report (Form 80 report) every six years from 1997 to 2015 for each of the respective developments; Ross, Diablo, and Gorge. Notably, the Form 80 reports include recreation use at both Project recreation facilities within the Project Boundary as well as some non-Project recreation facilities adjacent to (but outside) the Project Boundary. In 2014, the total use at the Project recreation facilities was 96,596 visitors.

Currently, the Project provides a variety of existing recreation resources and opportunities, which need to be evaluated to determine if these resources and opportunities are meeting current and future recreation demand.

2.4 Project Operations and Effects on Resources

Continued operation and maintenance (O&M) of the Project has the potential to affect recreation resources, including access to Project waters and lands and availability and use of recreation facilities and opportunities. The study results will help inform City Light and LPs on the development of a Project recreation management plan to guide the long-term O&M of Project recreation facilities and opportunities at Ross Lake, Diablo Lake, Gorge Lake, Newhalem, and Diablo.

2.5 Study Area

For the purpose of this study, the study area includes the lands and waters within and adjacent to the Project Boundary (Figure 2.5-1) at Ross Lake, Diablo Lake, and Gorge Lake, the towns of Newhalem and Diablo, and the Skagit River from the town of Newhalem downstream to Marblemount (see maps attached to this study plan).

Importantly, City Light recognizes that the Project is unique given its location within the RLNRA and North Cascades National Park. Because of this unique situation and the existing partnerships that City Light has with the NPS and USFS in co-managing many of the recreation resources within and adjacent to the Project Boundary, City Light has included up to 47 additional study sites (depending upon the study element) in the study area at the request of the NPS, USFS, and other LPs for a variety of visitor use and physical assessments per the study methods in Section 2.6 of this study plan. City Light does not consider these additional study sites (distinguished in the study site tables for each study element in Section 2.6) to be Project recreation facilities. However, City Light has agreed to include these non-Project recreation facility study sites in this study to provide information on recreation use in the Project vicinity and in the interest of partnership with the NPS and USFS and to provide information the NPS and USFS have stated is needed to help inform management of these facilities.

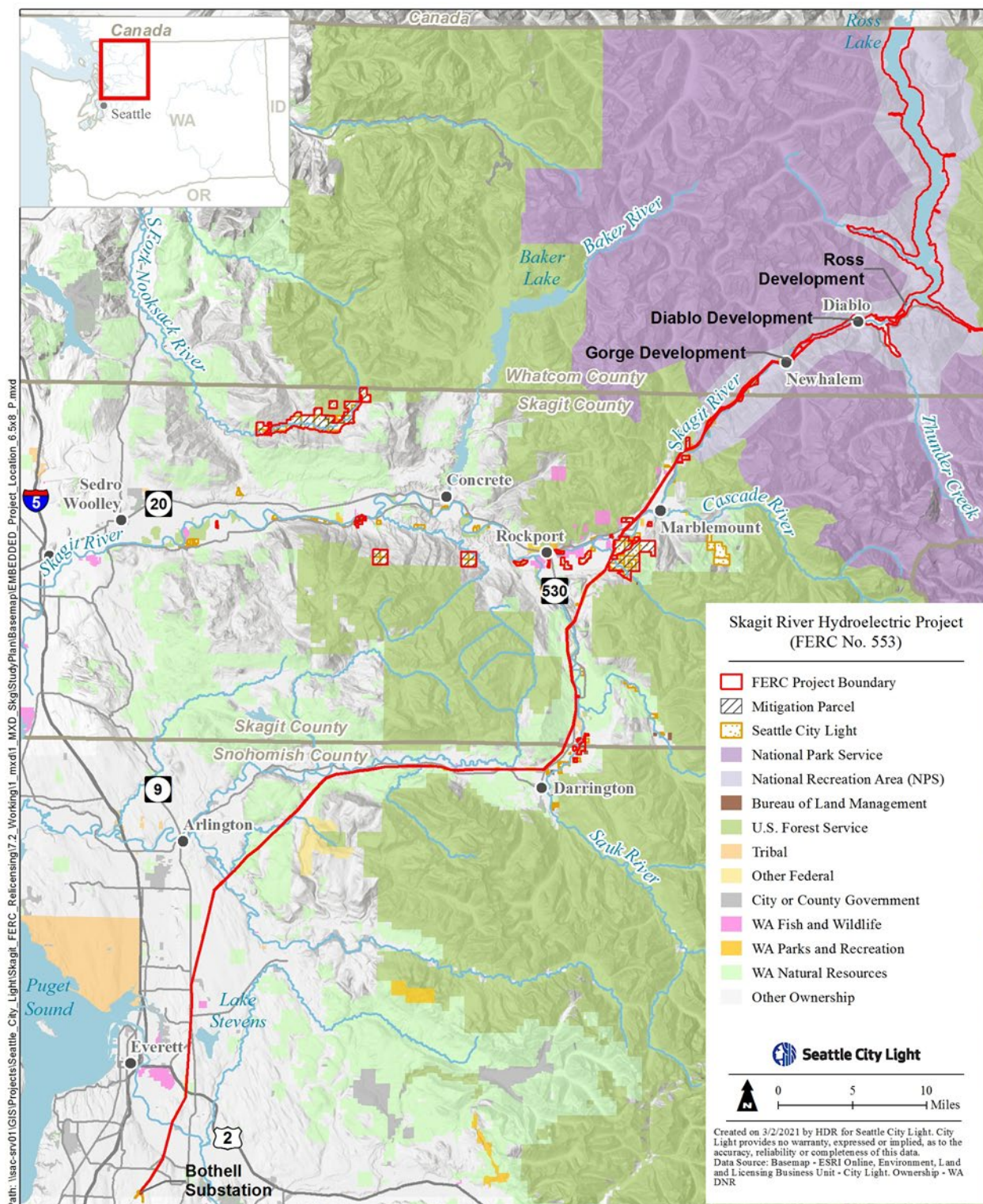


Figure 2.5-1. Location map of the Skagit River Project.

2.6 Methodology

The study will consist of six elements. These include: (1) an inventory and evaluation of study area recreation facilities for condition, accessibility compliance, facility capacity, and/or use impacts, as well as an assessment of the usable periods of the Project's developed boat launch (i.e., Gorge Lake Boat Launch); (2) identifying recreation uses and visitor attitudes, beliefs, and preferences at study area recreation facilities; (3) estimating the current recreation use at study area recreation resource areas (4) identifying future use and demand opportunities; (5) a quality assurance/quality control (QA/QC) review and data entry of visitor and observation survey data; and (6) analyzing the data and preparing the report. The methodology for each of these elements is described below.

2.6.1 Inventory and Evaluate Existing Recreation Facilities

Specifically, this step will include five tasks: (1) an inventory of study area recreation facilities, including the Gorge Lake Boat Launch, picnic areas, signs, interpretive displays, parking areas, restroom buildings, trails, etc.; (2) an assessment of the condition of each site amenity (tables, restrooms, parking areas, other structures, etc.) at Project recreation facilities; (3) an assessment of whether each facility complies with current applicable accessibility guidelines; (4) an assessment of the recreation access and use impacts at all Project recreation facilities and select non-Project recreation facilities; and (5) an assessment of the usable periods of the Gorge Lake Boat Launch ramp. City Light will inventory all the study area recreation facilities identified in Table 2.6-1 and on the maps attached to this study plan. In addition, Table 2.6-1 identifies the specific types of evaluations that City Light will conduct at each facility as not all of the evaluations will apply to each facility. For instance, City Light will not conduct condition, use impact, or accessibility assessments at structures such as the North Cascades ELC, Gorge Powerhouse Visitor Gallery, Skagit Information Center, or Gorge Inn Museum, as these are atypical recreation buildings and constructed to different standards and codes than common recreation facility amenities (e.g., parking areas, restroom buildings, picnic sites, and boat launch facilities). The intent of this recreation facility assessment is not to be a building code compliance exercise, but rather assess the study area's public outdoor recreation facilities.

Table 2.6-1. Study area recreation facilities that will be inventoried and evaluated for condition, ADA compliance, and use impacts.

Resource Area	Land Management	Facility Type	Project or Non-Project Facility	Recreation Facility	Type of Evaluation					Added to the RSP at NPS or USFS Request ¹	Comments
					Inventory	Condition	Accessibility	Use Impact	Trail Accessibility		
Ross Lake	Federal (NPS)	Overnight	Non-Project	Hozomeen Campground			X	X		X (NPS)	
	Federal (NPS)	Day use	Non-Project	Hozomeen Boat Launch			X	X		X (NPS)	
	Federal (NPS)	Overnight	Non-Project	Winnebago Flats Campground			X	X		X (NPS)	
	Federal (NPS)	Day use	Non-Project	Winnebago Flats Boat Launch			X	X		X (NPS)	
	Federal (NPS)	Day use	Non-Project	Hozomeen Lake Trailhead			X	X		X (NPS)	
	Federal (NPS)	Overnight	Non-Project	Ross Lake Boat-in Campsites (19 sites)			X	X		X (NPS)	Includes 19 boat-in locations totaling 59 campsites
	Federal (NPS)	Overnight	Non-Project	Ross Dam Trail (1.0 mile)			X	X	X	X (NPS)	Trail starts at Ross Dam Trailhead along State Route 20 and leads to the Ross Dam area, Ross Lake Resort dock, and the Happy Panther Trail.
	Federal (NPS)	Overnight	Non-Project	East Bank Trail (31.0 miles)				X		X (NPS)	Trail starts at the East Bank Trailhead along State Route 20, winds along the Ross Lake shoreline, and ends at the Desolation Peak Trail
	Federal (NPS)	Overnight	Non-Project	Happy Panther Trail (6.2 miles)					X	X (NPS)	Trail located between the Ross Dam Trail and East Bank Trail
Diablo Lake	Federal (NPS)	Day use	Project	Skagit Tour Dock	X	X	X	X			
	Federal (NPS)	Day use	Project	Diablo Dam Parking Area	X	X	X	X			Includes a restroom building and roadside pullout parking
	Federal (NPS)	Day use	Project	West Ferry Landing	X	X	X	X			Evaluations at the parking area and dock
	Federal (NPS)	Day use	Project	East Ferry Landing	X	X	X	X			Facility consists of a dock only
	Federal (NPS)	Day use ²	Project	North Cascades Environmental Learning Center	X			X			Evaluations at the parking area and shoreline adjacent to the parking area
	Federal (NPS)	Day use	Non-Project	Diablo Overlook			X	X		X (NPS)	
	Federal (NPS)	Overnight	Non-Project	Colonial Creek Campground			X	X		X (NPS)	
	Federal (NPS)	Day use	Non-Project	Colonial Creek Boat Launch and Fishing Pier			X	X		X (NPS)	
	Federal (NPS)	Overnight	Non-Project	Diablo Lake Boat-in Campsites (3 sites)			X	X		X (NPS)	Includes 3 boat-in locations totaling 7 campsites
	Federal (NPS)	Day use	Non-Project	Thunder Knob Trail (1.8 miles)			X	X	X	X (NPS)	Trail starts at Colonial Creek Campground and leads to a knob overlooking Diablo Lake
	Federal (NPS)	Day use	Non-Project	Thunder Creek Trail (1.6-mile)			X	X	X	X (NPS)	Segment from Colonial Creek Campground to the 4 th of July Trail junction.
	Federal (NPS)	Day use	Non-Project	Sourdough Mountain Trail (5.2 miles)				X		X (NPS)	Trailhead starts in Diablo and leads to Sourdough Mountain Lookout before leading back to Ross Lake
	Federal (NPS)	Day use	Non-Project	Stetattle Creek Trail (3.0 miles)				X		X (NPS)	Trailhead starts near North Cascades Environmental Learning Center and leads to away from Diablo Lake along Stetattle Creek
	Federal (NPS)	Day use	Non-Project	Diablo Lake Trail (3.8 miles)			X	X	X	X (NPS)	Trail connects North Cascades Environmental Learning Center to the footbridge over Diablo Lake near the East Ferry Landing dock
	Federal (NPS)	Day use	Non-Project	Diablo Dam Trail (0.5 mile)			X	X	X	X (NPS)	Trail connects Diablo Townsite to road leading to Diablo Dam

Resource Area	Land Management	Facility Type	Project or Non-Project Facility	Recreation Facility	Type of Evaluation					Added to the RSP at NPS or USFS Request ¹	Comments
					Inventory	Condition	Accessibility	Use Impact	Trail Accessibility		
Gorge Lake	City Light	Day use	Project	Ross Lodge Picnic Shelter	X	X	X	X			
	Federal (NPS)	Day use	Non-Project	Gorge Overlook			X	X	X	X (NPS)	
	Federal (NPS)	Overnight	Non-Project	Gorge Lake Campground			X	X		X (NPS)	
	City Light	Day use	Project	Gorge Lake Boat Launch	X	X	X	X			
Newhalem	Federal (NPS)	Day use	Project	Ladder Creek Falls Trail and Gardens (0.4 mile)	X	X					Loop trail; parking is associated with Gorge Powerhouse Parking Area
	Federal (NPS)	Day use	Project	Trail of the Cedars (0.3 mile)	X	X			X		Loop trail; parking is associated with the Newhalem Main Street Parking Area (trail only)
	City Light	Day use	Project	Gorge Powerhouse Parking Area	X	X	X	X			
	City Light	Day use	Project	Gorge Powerhouse Visitor Gallery	X						
	City Light	Day use	Project	Skagit Information Center	X						
	City Light	Day use	Project	Gorge Inn Museum	X						
	City Light	Day use	Project	Newhalem Picnic Sites	X	X	X	X			
	City Light	Day use	Project	Newhalem Main Street Parking Area	X	X	X	X			
	City Light	Day use	Project	Newhalem State Route 20 Parking Area	X	X	X	X			
	City Light	Day use	Project	Newhalem Interpretive Displays (standalone) ³	X	X	X	X			
	City Light	Day use	Project	Newhalem Playground	X	X	X	X			
Skagit River	Federal (NPS)	Overnight	Non-Project	Goodell Creek Campground			X	X		X (NPS)	
	Federal (NPS)	Day use	Non-Project	Goodell Creek Boat Launch			X	X		X (NPS)	
	Federal (NPS)	Day use	Non-Project	Damnation Creek Boat-in Picnic Site			X	X		X (NPS)	
	Federal (NPS)	Day use	Non-Project	Copper Creek Boat Access Site			X	X		X (NPS)	
	Federal (NFS)	Day use	Non-Project	Marblemount Boat Launch			X	X ⁴		X (USFS)	

1 Other LPs in addition to the NPS and USFS requested or supported the addition of many or all of these study sites; however, the NPS and USFS are the land managers associated with these added study sites.

2 The North Cascades Environmental Learning Center also provides some overnight programs.

3 The standalone interpretive displays dispersed throughout Newhalem include: “The Iron Horse of the Skagit,” “Automobiles Come to the Skagit,” “The Meaning of Place,” “Newhalem Company Town,” “Spinning Waterwheel,” “Temple of Power,” and “Chinook Redd.”

4 City Light included the use impact assessment for consistency at Marblemount Boat Launch. USFS only requested the accessibility assessment.

2.6.1.1 Inventory Recreation Facilities

City Light will inventory the number and type of recreation facilities at the recreation facilities listed in Table 2.6-1. For trail study sites in Table 2.6-1, City Light will inventory the facilities associated with the trailhead and not the trail, except where trail assessments are specifically indicated in Table 2.6-1. Photographs will be taken as appropriate as either a representative photograph of similar facilities or of each one-of-a-kind facility. Facilities of interest include picnic sites, campsites, restrooms, parking areas/spaces, boat launch, and recreation signs. This inventory will inform the site capacity for study area recreation facilities (e.g., total parking capacity, picnic capacity, etc.).

All recreation facility-related signs will be inventoried and each type of sign will be photographed and documented (e.g., type of sign, condition, text, location). Representative photographs will be taken as appropriate. City Light will use a basic inventory form (an example form is attached to this study plan).

2.6.1.2 Facility Condition Assessment

City Light will conduct a qualitative assessment of the condition of developed recreation facilities and signs at each of the facilities identified in Table 2.6-1. For trail study sites in Table 2.6-1, City Light will assess the condition of the facilities associated with the trailhead and not the trail. The assessment categories are poor, fair, good, and excellent condition. Table 2.6-2 provides evaluation criteria that will be used by type of recreation facility amenity. City Light will provide the individual condition ratings for each site amenity within a facility as well as an overall facility rating as part of the study report.

Based on the rating of each site amenity in Table 2.6-2, an overall facility evaluation score will be calculated by summing the total of each of the site amenities at each facility. City Light will categorize the overall facility condition using the rating scale, categories, and general rehabilitation timeframes in Table 2.6-3. The general rehabilitation timeframes are not intended to be rigid, but rather guidelines. The purpose of these general timeframes is to understand where the Project recreation facilities rank in terms of rehabilitation priorities.

City Light will use a condition form to evaluate each facility, and an example form is attached to this study plan. City Light's condition assessment form has been used on other relicensings and may be modified based on review of existing information and field reconnaissance.

Table 2.6-2. Facility condition evaluation categories and criteria.

Condition Rating	Condition Description	Examples of Condition by Facility Type			
		Vehicle Parking (surfacing on vehicle spurs and parking areas)	Recreation Site Amenities (tables, , boat ramps, docks, trails and trailheads, etc.)	Recreation Site Buildings (public restrooms and outdoor recreation structures)	Signs (Project and recreation signs)
1 – Poor	All or most facilities are in disrepair and need of immediate reconditioning or replacement. Current conditions create safety hazards and impact function. Little evidence of recent maintenance.	Widespread areas of cracking, eroding edges, potholes, visible subgrade.	Splitting or rotten boards or planks, missing bolts or fasteners, overgrown or impassable trail tread, rutted or eroded trail surface	Rot, leaks, sagging roofs, holes in exterior.	Signs do not exist, sign panels are bent/broken, posts or supports are broken, holes in panels.
2 – Fair	Need for improved maintenance and repair in <u>some</u> areas. No major safety concerns. Repairs should be made, but are not needed immediately.	Limited areas of cracking, eroding edges, potholes, striping faded or lacking, curbs/wheel stops missing or damaged.	Loose bolts or boards, rusted or bent grills, dock boards loose, dock floatation or anchoring in disrepair, early signs of vegetation encroaching on trail width/height, limited areas of trail tread erosion	Surfaces need painting, roof shingles need replacement or repair, inoperable lock, door hinge in disrepair.	Sign panels faded, loose bolts or posts, some text not readily legible.
3 – Good	All facilities in good condition and well maintained. No significant signs of disrepair or aging.	Surfacing still consistent and intact, striping visible but slightly faded, no cracking or potholes.	Materials not clearly new, but fully operable, fasteners and grills secure, boards and planking secure, no signs of damage observed, clear trail tread/width, no signs of vegetation encroachment on trail width/height.	Minor signs of weathering but in functional condition. Facilities operable and only need minor maintenance.	Minor signs of weathering, but fully intact, legible, and secure.
4 – Excellent	All facilities are new, near new, or recently reconditioned and well maintained.	Newly surfaced or resurfaced with clear striping.	New materials, newly built or restored trail surface with clearly defined vegetation clearances.	Newly installed or reconditioned structure	New sign panels and posts.

Table 2.6-3. Overall facility condition evaluation ratings, categories, and general rehabilitation timeframes.

Overall Condition Rating Score	Overall Condition Category	General Rehabilitation Timeframe
1 to 3	Poor	Immediate
4 to 6	Fair	Within 5 Years
7 to 10	Good	5 to 10 Years
11 to 13	Excellent	More than 10 Years

2.6.1.3 Accessibility Compliance Assessment

City Light will assess the developed recreation facilities identified in Table 2.6-1 for consistency with current accessibility guidelines. For the Project recreation facilities located on City Light lands and constructed using City Light funds, City Light will use the 2010 ADA Standards for Accessible Design (ADA) for public accommodations (USDOJ 2010). For the Project recreation facilities located on federal lands, City Light will use the 2015 Architectural Barriers Act (ABA) Standards (USAB 2015). For trail study sites in Table 2.6-1, City Light will assess the accessibility of the facilities associated with the trailhead, where they exist, and not the trail. See the Qualitative Trail Accessibility Assessment section below for methods for qualitatively assessing the accessibility potential for selected trails identified in Table 2.6-1.

City Light will evaluate each facility against these standards and then utilize a rating system that categorizes the level of accessibility at each facility. City Light will use the following three ratings: inaccessible, partially accessible, and fully accessible. City Light will assign a rating using the evaluation criteria in Table 2.6-4. These ratings are included in the inventory form contained in an attachment to this study plan. Notably, this form has been used on other relicensings and may be modified based on review of existing information and the availability of forms developed by the United States Access Board.

Table 2.6-4. Level of accessibility compliance categories and rating system.

Accessibility Rating System and Categories		
0 – Inaccessible	1 – Partially Accessible	2 - Accessible
Little or no consideration for accessibility. Clearly not in compliance with current ADA or ABA standards.	Some accessible facilities, but in disrepair or not up to current ADA or ABA standards (e.g., slopes too steep, docks inaccessible, etc.)	High quality of accessibility. Facilities appear fully consistent with current ADA or ABA standards.

Qualitative Trail Accessibility Assessment

None of the recreation trails identified in Table 2.6.1 meet current accessible standards except potentially the trail at the Gorge Overlook. Both City Light and the NPS have identified eight trails, including two Project trails and six non-Project trails (Table 2.6-1), where additional information is needed to understand the potential to provide enhanced accessible access. As such, City Light will qualitatively assess the developed recreation trails identified in Table 2.6-1 to characterize the general opportunities and constraints to making future accessibility improvements. While these trails are on both NPS-administered and City Light-owned lands, the

same key parameters need to be evaluated to qualitatively understand the opportunities, constraints, and barriers on each trail. For instance, City Light will generally assess the running slope, cross slope, tread obstacles (e.g., rocks, roots), trail width, trail surface material and compaction, and connection to parking and trailhead facilities, among others. City Light will provide a summary of the overall constraints and barriers for each trail in Table 2.6-1, including photographs of representative conditions and notable constraints or barriers during the field assessments and include these in the study report. Notably, this assessment is designed to inform City Light and the NPS on potential trail accessibility improvement options and is not meant as an engineering or universal trail accessibility assessment.

2.6.1.4 Recreation Use Impact Assessment

City Light will also assess the recreation use impacts at each of the recreation facilities identified in Table 2.6-1. For trail study sites in Table 2.6-1, City Light will assess the use impacts of the facilities associated with the trailhead only and not the trail. The recreation use impact assessment at each facility is categorized as low, moderate, or high depending on the amount and dispersion of use impact evidence (Table 2.6-5). Evidence of use impact typically include the presence of litter, dumping, tree cutting, inadequate vegetation clearances around fire pits/rings, visible off-highway vehicle (OHV) use/tracks, trampled vegetation, erosion, human waste, toilet paper, etc.

Table 2.6-5. Recreation use impact assessment categories and rating system.

Use Impact Rating System and Categories		
0 – Low	1 – Moderate	2 - High
Few, if any evidence of use impact are observed at each site	Several signs/evidence of use impact but not extensive or widespread impacts	Extensive evidence of use impact; widespread use with many impacts evident

In some instances, selecting a single impact category may not be practical, and as a result, the impact level may span two categories (e.g., low-to-moderate or moderate-to-high). This broader categorization may be used when a facility has satellite areas where impact conditions vary significantly from the majority of the facility. In addition, City Light will provide the impact assessment form data to LPs in Microsoft Excel format.

The form (as adapted) used to evaluate the recreation use impact and the impact parameters (included in attachment to this study plan) has been used on other relicensing projects (Whitaker and Shelby 2001). The form may be modified based on review of existing information.

2.6.1.5 Gorge Lake Boat Launch Ramp Assessment

In this step, City Light will identify the usable periods of the Project's developed boat ramp at the Gorge Lake Boat Launch facility. City Light will identify the constructed top and lower end of the boat ramp to determine the functional water surface elevation (wse) vertical range of the boat ramp. The boat ramp will be considered functional from the constructed top of the boat ramp down to three feet above the lower end of the constructed ramp. City Light will then use the output from the Operations Model to compare the daily median reservoir wse for the period of record to the functional wse range of the ramp to identify the periods of the recreation season (April through October) that the boat ramp is usable. The output of this assessment will be tables and/or figures

that identify the usable period for the Gorge Lake Boat Launch ramp. Notably, the usable periods and ranges for the non-Project boat launch ramps at Hozomeen and Winnebago Flats on Ross Lake are already known and provided in City Light's PAD, though City Light will evaluate the effect of sedimentation on those ramps as part of a separate relicensing study (i.e., Sediment Deposition in Reservoirs Affecting Resource Areas of Concern study plan). The usable periods and range of the remaining non-Project boat launch ramp (i.e., Colonial Creek Boat Launch) is currently unknown due to an ongoing sedimentation issue, which City Light will also evaluate as part of that same relicensing study.

2.6.2 Identify Recreation Uses and Visitor Attitudes, Beliefs, and Preferences

City Light will conduct observations and visitor surveys to gather information to address the study goals, objectives, and issues at each of the recreation facilities/study sites as detailed below. The study sites for this element of the study include both Project recreation facilities and non-Project recreation facilities.

City Light will conduct the observation and visitor surveys directly at the study site's use areas where visitors are observed (i.e., parking areas, picnic areas, fishing piers, boat launch ramps, docks, shoreline access areas, etc.). City Light will generally observe the overall use patterns at each site during each survey day. City Light will also conduct visitor surveys and record observation use counts where City Light observes overflow use and use in areas immediately adjacent (i.e., within approximately 200 yards) to the formal study sites if City Light is not able to correlate the use area/uses to an adjacent non-study site facility or use (i.e., neighboring trailhead, parking area, campground, residence, etc.).

Refer to the attachment to this study plan for maps of the study sites.

2.6.2.1 Observation Survey

At the study sites listed in Table 2.6-6, City Light will conduct two point-in-time observations/spot counts during each visit to a study site – one count upon arrival and one count prior to departing the site. City Light surveyors will seek out visitors and secure numerous visitor surveys during the time in between the spot counts during each visit. As discussed below in the Sampling Frequency section, City Light will conduct a roving use survey using a stratified two-stage (geographic and temporal) probability sampling approach (Malvestuto 1996; Pollock et al. 1994). City Light surveyors will be visiting each study site at different times on each successive survey day to provide a range of observations/spot count times over the entire survey period, which will allow City Light to summarize uses at different times of the day (i.e., morning, midday, and afternoon).

During observation surveys, the City Light surveyors will count and record the following date, facility, and use parameters as observed from each study site.

- Date
- Time observation started and ended
- Location/study site
- General weather conditions (sunny, partly cloudy, cloudy, rain/snow)
- Observed vehicles (single vehicle)

- Observed vehicles with trailers
- Observed trailers (no vehicle)
- Observed docked boats (as visible from the study site)
- Observed people
- Observed types of shoreline recreation activities (as visible from the study site)
- Observed types of reservoir/water-based recreation activities/watercraft (if reservoir/water views exist; as visible from the study site)
- Observed user conflicts or issues

Observations will be made and recorded by facility to include parking outside provided parking areas. This data will be used to identify the types of recreation activities visitors participate in in the study area. In addition, this data will also be used to calculate aspects of the study area recreation use estimates (see Section 2.6.3 of this study plan). In between the arrival and departure spot counts, the surveyor will administer on-site recreation visitor questionnaire surveys to randomly selected recreation visitors (see Section 2.6.2.2 of this study plan).

2.6.2.2 Visitor Survey

At the study sites listed in Table 2.6-7, City Light will administer visitor surveys during each visit to a study site on each survey day. The visitor survey will collect visitor perceptions, attitudes, and satisfaction levels on current resource conditions (e.g., recreation facilities, recreation use levels, and users' feedback on lake elevations relative to their recreation experience), visitors' zip codes, user characteristics, recreation activities, management concerns, and overall recreation experiences. Non-response bias will also be collected during visitor survey collection, whereby City Light's surveyor will collect the following information from visitors who refuse to complete the survey: reason, observed activity, gender, and age (if possible). For all survey efforts, the number of refusals will be recorded. The visitor survey at the study area recreation facilities will be administered as an on-site, in-person survey as the first option, but will also utilize a mail-back windshield survey at study area recreation facilities if needed to meet the target number of surveys in instances where visitors are not readily available. City Light will number each survey in order to track both on-site response and mail-back response rates. If City Light determines an inadequate number of on-site surveys are being obtained, City Light may adjust the survey plan in order to increase the number of on-site surveys and limit the number of mail-back windshield surveys.

Table 2.6-6. Study areas and sites for the observation survey (use spot count).

Resource Area	Land Management	Facility Type	Project or Non-Project Facility	Recreation Facility/Study Site	Observation Survey Location	Added to the RSP at NPS or USFS Request ¹	Comments
Ross Lake	Federal (NPS)	Day use	Non-Project	Hozomeen Boat Launch	▪ Parking area		
	Federal (NPS)	Day use	Non-Project	Winnebago Flats Boat Launch	▪ Parking area		
	Federal (NPS)	Day use	Non-Project	Ross Dam Trail	▪ Trailhead parking area	X (NPS)	
	Federal (NPS)	Day use	Non-Project	East Bank Trail	▪ Trailhead parking area	X (NPS)	
	Federal (NPS)	Day use	Project	Skagit Tour Dock	▪ Parking area		
	Federal (NPS)	Day use	Project	West Ferry Landing	▪ Parking area		
Diablo Lake	Federal (NPS)	Day use ²	Project	North Cascades Environmental Learning Center (ELC) / Diablo Lake Trailhead	▪ Parking area ▪ Shoreline		Parking specific to Diablo Lake Trail does not exist; part of ELC parking area
	Federal (NPS)	Day use	Project	Diablo Dam Parking Area	▪ Roadside parking area		
	Federal (NPS)	Day use	Non-Project	Diablo Dam Trailhead	▪ Trailhead parking area		
	Federal (NPS)	Day use	Non-Project	Colonial Creek Boat Launch and Fishing Pier	▪ Parking area ▪ Dock ▪ Fishing pier		
	Federal (NPS)	Day use	Non-Project	Diablo Overlook	▪ Parking area	X (NPS)	
	Federal (NPS)	Day use	Non-Project	Thunder Knob Trailhead	▪ Trailhead parking area	X (NPS)	Located along State Route 20
	Federal (NPS)	Day use	Non-Project	Thunder Creek Trailhead	▪ Trailhead parking area	X (NPS)	Located within Colonial Creek Campground
Gorge Lake	City Light	Day use	Project	Ross Lodge Picnic Shelter	▪ Picnic shelter		
	City Light	Day use	Project	Gorge Lake Boat Launch	▪ Parking area		
	Federal (NPS)	Day use	Non-Project	Gorge Overlook	▪ Parking area	X (NPS)	
	Federal (NPS)	Day use	Non-Project	Sourdough Mountain Trailhead	▪ Trailhead parking area	X (NPS)	
Newhalem	Federal (NPS)	Day use	Project	Newhalem Parking Areas	▪ Main Street parking area ▪ State Route 20 parking area		
	Federal (NPS)	Day use	Project	Gorge Powerhouse	▪ Parking area		
	City Light	Day use	Project	Newhalem Picnic Sites	▪ Picnic sites		
Skagit River	Federal (NPS)	Day use	Non-Project	Goodell Creek Boat Launch	▪ Parking area	X (NPS)	
	Federal (NFS)	Day use	Non-Project	Marblemount Boat Launch	▪ Parking area	X (USFS)	

1 Other LPs in addition to the NPS and USFS requested or supported the addition of many or all of these study sites; however, the NPS and USFS are the land managers associated with these added study sites.

2 The North Cascades Environmental Learning Center also provides some overnight programs.

Table 2.6-7. Survey areas, study sites, and specific locations for the visitor survey.

Visitor Survey Area	Resource Area	Land Management	Facility Type	Project or Non-Project Facility	Recreation Facility/Study Site	Specific Visitor Survey Locations	Target Number of Surveys	Added to the RSP at NPS or USFS Request ¹	Comments
Ross Lake Survey Area	Ross Lake	Federal (NPS)	Overnight	Non-Project	Hozomeen Campground	▪ Campsites	384 surveys	X (NPS)	
		Federal (NPS)	Day use	Non-Project	Hozomeen Boat Launch	▪ Parking area ▪ Launch ramp/dock			
		Federal (NPS)	Overnight	Non-Project	Winnebago Flats Campground	▪ Campsites		X (NPS)	
		Federal (NPS)	Day use	Non-Project	Winnebago Flats Boat Launch	▪ Parking area ▪ Launch ramp/dock			
		Federal (NPS)	Overnight	Non-Project	Ross Lake Boat-in Campsites	▪ Indirectly via reservoir access study sites			
		Federal (NPS)	Day use	Non-Project	Ross Dam Trailhead	▪ Parking area ▪ Ross Lake Resort dock		X (NPS)	
		Federal (NPS)	Day use	Non-Project	East Bank Trailhead	▪ Parking area		X (NPS)	
		Federal (NPS)	Day use	Project	Ferry Landings	▪ Parking area ▪ Docks			Located on Diablo Lake but the ferry primarily provides visitors access to Ross Lake
Highway 20 Corridor Survey Area	Diablo Lake	Federal (NPS)	Day use ²	Project	North Cascades Environmental Learning Center (ELC) / Diablo Lake Trailhead	▪ Parking area	384 surveys		Parking for the Diablo Lake Trail is part of the ELC parking area
		Federal (NPS)	Day use	Project	Diablo Dam Parking Area	▪ Roadside parking area			
		Federal (NPS)	Day use	Non-Project	Diablo Overlook	▪ Parking area		X (NPS)	
		Federal (NPS)	Overnight	Non-Project	Colonial Creek Campground	▪ Campsites ▪ Shoreline		X (NPS)	
		Federal (NPS)	Day use	Non-Project	Colonial Creek Boat Launch and Fishing Pier	▪ Parking area ▪ Dock ▪ Fishing pier ▪ Shoreline			
		Federal (NPS)	Day use	Project	Skagit Tour Dock	▪ Parking area			
	Gorge Lake	Federal (NPS)	Overnight	Non-Project	Gorge Lake Campground	▪ Campsites		X (NPS)	
		City Light	Day use	Project	Gorge Lake Boat Launch	▪ Parking area ▪ Launch ramp/dock			
		Federal (NPS)	Day use	Non-Project	Gorge Overlook	▪ Parking area		X (NPS)	
	Newhalem	City Light	Day use	Project	Newhalem Parking Areas	▪ Main Street parking area ▪ State Route 20 parking area			
		Federal (NPS)	Day use	Project	Gorge Powerhouse	▪ Parking area			Ladder Creek Falls Trail parking occurs at this site
	Skagit River	Federal (NPS)	Overnight	Non-Project	Goodell Creek Campground	▪ Campsites		X (NPS)	
		Federal (NPS)	Day use	Non-Project	Goodell Creek Boat Launch	▪ Parking area		X (NPS)	
		Federal (NFS)	Day use	Non-Project	Marblemount Boat Launch	▪ Parking area		X (USFS)	
Total							768 surveys		

1 Other LPs in addition to the NPS and USFS requested or supported the addition of many or all of these study sites; however, the NPS and USFS are the land managers associated with these added study sites.

2 The North Cascades Environmental Learning Center also provides some overnight programs.

Types of Visitor Surveys

On-Site Visitor Survey

The on-site visitor survey will be administered at all study sites where recreation visitors are readily visible and willing to participate. When visitors are not readily visible (i.e., where vehicles are parked and visitors cannot be located), City Light will contact visitors via a mail-back windshield survey. City Light will prioritize securing on-site visitor surveys whenever possible but may need to employ mail-back windshield surveys when use patterns at study sites necessitate their use.

For the on-site survey, only members of a group who are 18 years or older will be asked to complete a survey. City Light's recreation researchers will train surveyors on random selection techniques for choosing groups at a facility and participants within groups, introduction strategies, recording, and tracking refusals. Prior to administering the survey, City Light surveyors will orient visitors using a standardized, detailed map of the study area, including identifying the location of the visitor intercept. Upon completion of a survey by a respondent, the recreation researcher will review the survey for skipped or missed questions and anomalous data or responses in order to maximize the quality of the survey data and minimize anomalous data during data entry.

Mail-Back Windshield Visitor Survey

The mail-back windshield visitor survey will be administered at recreation facilities where recreation visitors are not present, but their vehicles are. City Light anticipates utilizing mail-back surveys, if needed, primarily at parking areas for the reservoir boat launches, river access sites, and trailheads. In these cases, a mail-back version of the visitor survey will be left on vehicle windshields with pre-addressed envelopes and postage for convenient response and return. The survey packet of information left on the windshield will include a cover letter which explains the purpose of the survey. City Light will number each survey in order to track both on-site response and mail-back response rates.

Visitor Survey Development

The visitor survey will address the study objectives. Survey topics will address items such as visitors' perceptions of the following:

- Existing and desired recreation facilities
- Whether reservoir water levels affect visitor's recreation experience
- Satisfaction with shoreline access and opportunities
- Comparison of project recreation resource areas to other regional recreation areas that provide similar recreation opportunities
- Personal safety
- Crowding
- Conflict
- Constraints or barriers to participation that are potentially within City Light's or agencies' control (e.g., lawlessness, trail conditions, campfire use, parking access and fees)

- Ways to enhance their recreation experience

The draft of the survey instrument is attached to this study plan. The survey instrument content (i.e., questions) has been refined in consultation with LPs based on Project-related issues identified in the Study Plan Development Process. Prior to survey implementation, the survey instrument will be pre-tested in the field with recreation users, and refined for clarity, if necessary. The pre-test will include a total of 10 to 15 completed surveys, with the intent to receive feedback on readability, length, and general understanding of survey content. If necessary, minor changes to the survey instrument may be made in consultation with the LPs to make the survey easier to complete and understand. City Light will develop a study area map to assist respondents in orienting themselves and provide an understanding of the area and facility naming conventions. City Light's recreation researchers will provide this map upon intercepting respondents and provide direction to help respondents orient themselves.

Field Reconnaissance, Logistics and Preparation

This task will involve logistical preparation including developing field work logistics and protocols; field crew training; selection of sampling dates; pre-testing field logistics and protocols; and revising schedules, logistics, or protocols based on preliminary findings.

2.6.2.3 Sampling Approach and Data Collection

Target Number of Visitor Surveys

The overall survey area encompasses Ross Lake, Diablo Lake, Gorge Lake, Newhalem and the Skagit River. Within this overall area, the recreation setting is distinctly divided between Ross Lake and the Highway 20 (SR 20) Corridor. The primarily backcountry setting at Ross Lake is characterized by remote, boat-in/hike-in access and opportunities, very limited vehicle access, and limited recreational developments. In contrast, the frontcountry setting along the Highway 20 Corridor at Diablo Lake, Gorge Lake, Newhalem, and the Skagit River is characterized by more and higher levels of recreation development combined with improved vehicle and road access throughout. Based on these distinct recreation settings, City Light has split the overall visitor survey study area into two, separate survey areas: (1) the Ross Lake area; and (2) the SR 20 Corridor.

The target number of visitor surveys for each survey area is based on the estimated recreation use. The overall geographic area of the two combined survey areas roughly aligns with the RLNRA boundaries, where visitation has generally ranged from 700,000 to 900,000 visitors annually from 2010 to 2020 (see Section 2.3 of this study plan). Exact recreation use estimates for the specific survey areas do not exist, but City Light has assumed the visitation to either survey area is at least 200,000 visitors. Thus, using a 95 percent confidence interval with a sampling error no more than +/-5 percent, City Light's target number of surveys for each survey area is 384 surveys, at a minimum, or 768 surveys in total (Salant and Dillman 1994). Since it is not apparent how varied the Project sample population is in its response to various questions, City Light will use a more conservative sampling approach that utilizes a "50/50 split," which assumes the sample population is relatively varied (Salant and Dillman 1994). City Light will make every attempt to secure the identified target number of surveys for each survey area and overall. City Light will continuously monitor the survey returns throughout the survey season to ensure survey targets for each survey area and overall are met during the established study year. City Light may adjust the sampling

frequency or methodology to improve survey responses in order to meet targets. City Light will continue the survey effort throughout the established study survey season (discussed below), even if the target survey numbers have been met prior to the end of the survey season.

Sampling Frequency for Observation and Visitor Surveys

The sampling frequency for the observation and visitor surveys will be divided into two categories – peak and off-peak seasons. The peak season for recreation use is the summer season (July 1 through Labor Day). The off-peak season includes the shoulder seasons of spring (May and June) and fall (Tuesday after Labor Day through October). The closure of SR 20 from November through April limits visitor access to the area and associated recreation use during the winter months. Overall, City Light will conduct a total 35 days of surveying including 18 days during the peak season and 17 days during the off-peak season according to the seasonal sampling frequencies as follows.

The sampling frequency for the peak season (18 survey days total) will be:

- Four randomly selected weekday days per month in July and August (separated by at least one week)
- Four randomly selected weekend days (Saturday or Sunday) per month in July and August (non-consecutive)
- One holiday day (Saturday or Sunday) for each three-day holiday weekend (Independence Day and Labor Day holiday weekends) (two survey days total)

The sampling frequency for the off-peak season (17 survey days total) will be:

- Two randomly selected weekday days per month (separated by at least one week)
- Two randomly selected weekend days (Saturday or Sunday) per month (non-consecutive)
- One pre-selected holiday day (Saturday or Sunday) for the three-day Memorial Day holiday weekend

City Light will conduct up to two selected days of preliminary testing to clarify any problems/confusion with the survey instrument and/or process.

To identify recreation visitor's attitudes, beliefs, and preferences at study area recreation resource areas, City Light will conduct a roving use survey using a stratified two-stage (geographic and temporal) probability sampling approach (Malvestuto 1996; Pollock et al. 1994). During the survey, City Light's surveyor will conduct a recreation visitor survey at all the study sites identified in Table 2.6-7. The survey sample will be stratified by development/resource area, type of day (weekdays, non-holiday weekends, and holiday weekends), and time of day.

Timing of Sampling

City Light's surveyors will conduct the surveys on each survey day in a linear visitation pattern, whereby, the surveyors will start each day at the next study site on the linear visitation pattern. This approach will vary the times each study site is visited to ensure a range of visitation times and potential user groups over the course of the survey period. City Light anticipates utilizing

multiple survey teams to conduct the surveys on each survey day. The final survey team/staff approach will be determined based on field testing and logistics prior to starting the surveys.

2.6.2.4 Trail-Specific Use Counts

City Light will install and maintain a single trail counter on the study area trails in Table 2.6-7 for the duration of the survey season (i.e., May through October). City Light will locate the counters in the vicinity of the trailhead or trail intersection near the Project reservoirs. The exact location will be determined during the installation of each trail counter. Once installed, City Light will record the Global Positioning System (GPS) location of each trail counter and include a location map and summary of trail use as part of the study report. City Light will calibrate the counters following installation, routinely maintain/download the data at each counter during the study season and remove the counters at the end of the study season.

Table 2.6-7. Trail counter study locations.

FERC Project Development	Resource Area	Land Management	Project or Non-Project Facility	Trail Counter Study Site	Added to the RSP at NPS or USFS Request ¹
Ross	Ross Lake	Federal (NPS)	Non-Project	Ross Dam Trail	X (NPS)
		Federal (NPS)	Non-Project	East Bank Trail	X (NPS)
		Federal (NPS)	Non-Project	Lightning Creek Trail	X ¹
		Federal (NPS)	Non-Project	Desolation Peak Trail	X (NPS)
		Federal (NPS)	Non-Project	Little Beaver Trail	X (NPS)
		Federal (NPS)	Non-Project	Big Beaver Trail	X (NPS)
Diablo	Diablo Lake	Federal (NPS)	Non-Project	Thunder Knob Trail	X (NPS)
		Federal (NPS)	Non-Project	Thunder Creek Trail	X (NPS)
		Federal (NPS)	Non-Project	Sourdough Mountain Trail	X (NPS)
		Federal (NPS)	Non-Project	Diablo Lake Trail	X (NPS)
		Federal (NPS)	Non-Project	Diablo Dam Trail	X (NPS)
Gorge	Newhalem	Federal (NPS)	Project	Ladder Creek Falls Trail	
		Federal (NPS)	Project	Trail of the Cedars	

¹ City Light added the Lightning Creek Trail counter at the request of the Nlaka'pamux Nation Tribal Council.

2.6.3 Estimate Current Recreation Use at Recreation Resource Areas

2.6.3.1 Recreation Facility Use and Occupancy

This study element will describe use levels (i.e., occupancy) and observed activities at the recreation study sites in Table 2.6-9, where City Light will be collecting visitor use observation data as part of this study. As part of the study report, City Light will provide a summary of recreation facility occupancy at parking areas and picnic areas and the distribution of observed recreation activities at recreation facilities.

First, City Light will calculate the average existing use levels for several recreation parameters (e.g., people, vehicles, facility occupancy rates/percent of capacity) by season (peak and off-peak) and day type (i.e., weekend, weekday, holiday) during the survey season and describe the occupancy levels at each study site listed in Table 2.6-9.

Second, for each recreation facility or group of facilities in Table 2.6-9, City Light will calculate the frequency distribution of observed recreation activities during the survey season.

2.6.3.2 Recreation Use Estimate

To estimate the recreation use that occurs within the study area, City Light will estimate the existing annual day and overnight visits for the recreation facilities and sites listed in Tables 2.6-9 in recreation days (RD) by developing one use estimate specific to Project recreation facilities and a separate use estimate for non-Project recreation facilities. This division is necessary given the differing data collection methods for the data sources (i.e., Project recreation facilities versus non-Project recreation facilities). City Light will estimate the Project recreation facilities' use based on visitor use data collected as part of this study (see Section 2.6.2 of this study plan) and incorporate additional daily visitor use data from operators of the North Cascades ELC, which provides visitor use programs and services at Project recreation facilities.

For the non-Project recreation facilities use estimate, City Light will utilize a combination of visitor use data collected as part of this study (see Section 2.6.2 of this study plan) as well as existing NPS overnight and day use data, third party data (e.g., Ross Lake Resort), and USFS data (as available)(Table 2.6-10). Where available and provided by other parties, City Light will summarize the use information from the non-Project recreation facilities, but since the data will not be collected as part of this study's methods, City Light may have to summarize the data differently (i.e., general visits instead of RDs) or with less detail (i.e., by week, month, or season) than for the Project recreation facilities' use, where all the data is collected consistently and as part of this study's methodology. The data collection methods and how the data is provided to City Light is beyond City Light's control.

Table 2.6-9. Study area recreation facilities where use and occupancy will be estimated via study observation surveys and use counts.

Resource Area	Land Management	Facility Type	Project or Non-Project Facility	Project Recreation Facility	Use Estimate	Facility Occupancy
Ross Lake	Federal (NPS)	Day use	Non-Project	Hozomeen Boat Launch	X	X (parking area)
	Federal (NPS)	Day use	Non-Project	Winnebago Flats Boat Launch	X	X (parking area)
	Federal (NPS)	Day use	Non-Project	Ross Dam Trailhead	X	X (parking area)
	Federal (NPS)	Day use	Non-Project	East Bank Trailhead	X	X (parking area)
Diablo Lake	Federal (NPS)	Day use	Project	Skagit Tour Dock	X ¹	X (parking area)
	Federal (NPS)	Day use	Project	West Ferry Landing	X	X (parking area)
	Federal (NPS)	Day use ²	Project	North Cascades Environmental Learning Center / Diablo Lake Trailhead	X	X (parking area)
	Federal (NPS)	Day use	Non-Project	Colonial Creek Boat Launch and Fishing Pier	X	X (parking area)
	Federal (NPS)	Day use	Non-Project	Diablo Overlook	X	X (parking area)
	Federal (NPS)	Day use	Project	Diablo Dam Parking Area	X	X (parking area)
Gorge Lake	City Light	Day use	Project	Ross Lodge Picnic Shelter	X	X (picnic site)
	City Light	Day use	Project	Gorge Lake Boat Launch	X	X (parking area)
	Federal (NPS)	Day use	Non-Project	Gorge Overlook	X	X (parking area)
Newhalem	Federal (NPS)	Day use	Project	Gorge Powerhouse / Ladder Creek Falls Trail and Gardens	X	X (parking area)
	Federal (NPS)	Day use	Project	Trail of the Cedars	X	Not applicable
	City Light	Day use	Project	Newhalem Picnic Sites	X	X (picnic site)
	City Light	Day use	Project	Newhalem Parking Areas	X	X (parking area)
Skagit River	Federal (NPS)	Day use	Non-Project	Goodell Creek Boat Launch	X	X (parking area)
	Federal (USFS)	Day use	Non-Project	Marblemount Boat Launch	X	X (parking area)

1 The use estimate will be based on City Light's Skagit Tour records.

2 The North Cascades Environmental Learning Center also provides some overnight programs.

Table 2.6-10. Study area recreation facilities where use data will be collected via non-study methods (as available).

Resource Area	Land Management	Facility Type	Project or Non-Project Facility	Recreation Facility	Use Data Source
Ross Lake	Federal (NPS)	Overnight	Non-Project	Hozomeen and Winnebago Flats Campgrounds, Boat-in Campsites (19 sites)	NPS
	Federal (NPS)	Overnight	Non-Project	Ross Lake Resort	Ross Lake Resort
Diablo Lake	Federal (NPS)	Day use	Project	Skagit Tour Dock	City Light
	Federal (NPS)	Day use	Project	Ferry Landings	City Light
	Federal (NPS)	Day use ¹	Project	North Cascades Environmental Learning Center	NCI (overnight/program use)
	Federal (NPS)	Overnight	Non-Project	Colonial Creek Campground	NPS
	Federal (NPS)	Overnight	Non-Project	Thunder Point, Hidden Cove, and Buster Brown Boat-in Campsites	NPS
	Federal (NPS)	Day use	Non-Project	Diablo Overlook	NPS
	Federal (NPS)	Overnight	Non-Project	Gorge Campground	NPS
Newhalem	City Light	Day use	Project	Skagit Information Center	City Light

¹ The North Cascades Environmental Learning Center also provides some overnight programs.

2.6.4 Identify Future Use and Demand Opportunities

City Light will identify the future use and demand opportunities from three perspectives: (1) assessing the existing unmet demand; (2) assessing future recreation demand; and (3) assessing the regional recreational uniqueness and significance of the Project. Each of these perspectives is described in detail below.

2.6.4.1 Existing Unmet Demand Assessment

Existing recreation use does not always represent the total existing recreation demand because there may be constraints that limit participation. While there are many potential constraints on recreation use (e.g., lack of free time, cost, geographic distance, lack of skills or equipment), a subset of participation constraints may be closely associated with site-specific management (e.g., limited access to lands or water, use limits or full occupancies at facilities, project operations that eliminate or diminish the quality of experiences and opportunities, or the lack of information about available recreation opportunities). To assess the general level of unmet demand for recreation opportunities within the study area, City Light will perform the three tasks described below.

Assess Statewide and Regional Unmet Recreation Demand Information

City Light will review and summarize relevant information from the 2018-2022 Recreation and Conservation Plan for Washington State (RCO 2017). City Light will review other sources of demand from the region, if readily available, including the RLNRA General Management Plan (NPS 2012) and the NPS Comprehensive Survey of the American Public (NPS 2001). The focus of this assessment will be to identify possible recreation activities with substantial unmet demand with a qualitative discussion of participation constraints and whether these constraints are likely affected by Project operations.

Collect Unmet Recreation Demand Information

City Light will collect additional unmet recreation demand information from study area visitors in City Light's visitor surveys.

Identify Potential Activities with High Unmet Demand

City Light will identify potential activities with high unmet demand within and adjacent to the Project Boundary based on the review of unmet demand information derived from the NPS, the visitor survey, monitoring data, and any other regional unmet demand sources (if any). Analysis will also attempt to identify likely barriers or constraints on participation, and whether those are related to Project operations.

2.6.4.2 Future Recreation Demand Assessment

This element of the study will provide information regarding the projected future recreation use within the study area over the estimated period of the new license. For this assessment, City Light will assume a new license term of 50 years. Obviously, projecting the future is a speculative activity, especially over a 50-year period. These projections, though, can be useful for general planning purposes to identify potential management issues that may occur in the future. This approach will include four steps.

Review Existing Recreation Use Trends

Since past use often helps predict future use, City Light will review trends of recent study area recreation use. Likely sources of use data will be: NCI data on ELC visitation, the RLNRA General Management Plan, NPS RLNRA use data, Washington tourism data, fishing license sales, boating vessel registrations (for the counties where the majority of Project visitors originate from), local recreation resources, and recreation equipment sales, where available.

Review Existing Population and Recreation Activity Participation Projections

City Light will summarize existing information on existing and future population rates from the State of Washington Office of Financial Management Department of Finance website (<https://www.ofm.wa.gov/washington-data-research>) for the counties where the majority of the study area visitors originate from. The population growth rates will be used to project the overall study area recreation use estimate over the term of a new license period (i.e., 30 to 50 years).

City Light will also research outdoor recreation activity projections from available sources such as Outdoor Recreation Trends and Futures (Cordell 2012) and other appropriate sources on future projections (as available and applicable). These projection indices will be used to project recreation facility occupancy at study area recreation facilities (refer to Table 2.6-9) over the term of the new license.

Review Reasonably Foreseeable Events that May Influence Future Use

Reasonably foreseeable events in the watershed may reasonably be expected to influence recreation use in the study area over the new license period. If an event is determined to be reasonably foreseeable, City Light will make a qualitative assessment of its potential effect on future recreation use, if feasible.

Estimate Future Recreation Use over the New License Period

Based on historical trends, future growth projections, and likely foreseeable events in the watershed, City Light will use professional judgment to estimate study area recreation use and facility utilization over the expected term of the new license. For this assessment, City Light will assume a license term of 50 years. These estimates must be considered very speculative and will only provide a general indication of how recreation use is expected to change over the new license period.

For the recreation use estimate, City Light will project the use based on population growth rates where the majority of study area visitors reside as identified in the visitor survey element of the study (see Section 2.6.2.2 of this study plan).

For the recreation facility utilization projections (e.g., day use areas, boat launches, and trails), City Light will rely on the activity participation indices in Outdoor Recreation Trends and Futures (Cordell 2012) unless other applicable sources on future projections are available.

2.6.4.3 Regional Uniqueness and Significance Assessment

This component of the study will assess the regional uniqueness of the study area's primary recreation opportunities in three steps.

Review Results of Visitor Surveys

City Light will review the results of the visitor survey that address regional uniqueness and significance. In addition, City Light will identify the primary activities and opportunities of visitors surveyed to help in assessing the overall regional uniqueness in comparison to other regional recreation facilities and opportunities.

Identify Regional Recreation Opportunities

City Light will identify the geographic draw of the study area's primary recreation opportunities identified during the review of the visitor survey results above. City Light will assess the geographic extent of visitors' origins and location of the alternative recreation resource areas where visitors participate in their primary recreation activities. City Light will identify regional alternatives for comparable facilities or areas from sources such as guidebooks, on-line resources, state and national parks, USFS, and county or regional tourism sources.

Assess the Uniqueness and Significance of the Recreation Opportunities

First, City Light will analyze the visitor responses to a typical survey question that asks visitors to rate the relative uniqueness of the project reservoir or resources area they visited. The question has pre-set responses using a 5-point scale with a rating of 1 meaning the reservoir or area provided an "extremely common" opportunity and a rating of 5 meaning the reservoir or area provided an "extremely unique" opportunity. Based on the average responses, City Light will categorize the relative uniqueness of the study area using six categories, as shown in Table 2.6-11.

Table 2.6-1. Regional uniqueness categories and rating system.

Regional Uniqueness Rating System and Categories					
1.0	1.1 to 2.0	2.1 to 3.0	3.1 to 4.0	4.1 to 4.9	5.0
Extremely Common	Common	Somewhat Common	Somewhat Unique	Unique	Extremely Unique

Second, for the study area's most popular primary recreation activities, City Light will identify if these recreation opportunities are of local, regional, or state significance. City Light will determine the level of significance based on the county (United States) where visitors reside based on the following designations.

- **Local Significance:** visitors from counties where the Project resides (i.e., Skagit, Whatcom, and Snohomish counties).
- **Regional Significance:** visitors from the counties surrounding the counties where the Project resides, including San Juan, Island, Kitsap, King, Chelan, and Okanogan counties.
- **State-Wide Significance:** visitors from all other areas outside of the local and regional areas in Washington.

In addition, text will describe what is unique and special about the most popular recreation opportunities based on the comments provided by the visitors on the visitor survey.

2.6.5 Data Entry and QA/QC Review of Data

Following data collection, City Light will enter the raw data into a statistical database program (e.g., IBM SPSS software) that will allow visitor survey responses to be analyzed. Survey responses will be coded, edited and entered for analysis through a separate effort (Section 2.6.6.1 of this study plan). City Light will subject all visitor and observation survey data to QA/QC procedures including, but not limited to: (1) spot-checking visitor/observation surveys to be sure errors were not made during data entry; and (2) reviewing the visitor and observation survey databases for completeness/anomalous data. City Light will conduct these QA/QC procedures both manually by City Light staff and electronically using the statistical analysis program, which has the ability to sort through large quantities of data. If any datum seems inconsistent during the QA/QC procedure, City Light will investigate the problem by going back to the source questionnaire or data form. Values that are determined to be anomalous will be removed from the database if the reason for the values cannot be identified.

2.6.6 Data Analysis and Report Preparation

2.6.6.1 Data Analysis

The survey responses should provide a rich source of information about visitor use patterns, characteristics, preferences, and perceptions. Following data entry and comprehensive QA/QC procedures, City Light will address the study objectives and issues through analysis of the responses to questionnaires and observation data. Descriptive statistics will be employed to explain visitor responses to each of the survey questions, including number of responses and percentage of responses for each survey question as well as averages for select questions (e.g., scale-response questions, general trip characteristics, and some socio-demographic questions). Survey data will be analyzed and reported by recreation resource facility or grouping of proximate similar facilities (e.g., town of Newhalem study sites). City Light will code or categorize the survey data to allow for the additional survey analyses (e.g., seasonality, primary recreation activity, type of site access). Within the analysis, City Light will check for non-response bias through demographics and visitor behavior variables. Observation use data will address the types and frequency of use occurring within each recreation resource area. City Light will provide the raw data to LPs in the statistical program format used (e.g., IBM SPSS software) as well as Microsoft Excel format.

2.6.6.2 Report Preparation

City Light will synthesize the data collected and analyzed into a study report at the conclusion of the study, which will include summary data in tables, attachments and/or appendices; and be further summarized in narrative form. Specifically, the report will include the following sections: (1) Study Goals and Objectives; (2) Methods; (3) Results; (4) Discussion; and (5) Description of Variances from the FERC-approved study plan, if any.

2.7 Consistency with Generally Accepted Scientific Practice

City Light's methodology for planning, implementing, and analyzing visitor surveys is consistent with professional practice (Salant and Dillman 1994; Watson et al. 2000). In addition, City Light will be implementing professionally accepted survey practices for contacting visitors and choosing sample sizes (Dillman 2000). Assessing existing recreation use through a combination of observation and questionnaire surveys is a common practice for large geographic areas that contain multiple accesses to desired recreation use areas (Malvestuto 1996; Pollock et al. 1994; Watson et

al. 2000; Yuan et al. 1995). In addition, assessing future recreation demand through an evaluation of existing use, demographic data, and participation trends and projections in the region is common practice (Kelly and Warnick 1999). Furthermore, this approach has been successfully applied in other FERC relicense proceedings.

2.8 Schedule

- Survey Planning and Coordination May 2021 – March 2022
- Inventory, Condition, Accessibility, and Use Impact Assessments..... June – October 2021
- Boat Ramp Usable Periods Assessment June – October 2021
- Draft Report (Initial Study Report [ISR]) March 2022
- Survey Field Training, Logistics, and Pre-test..... March – April 2022
- Observation and Visitor Surveys May – October 2022
- QA/QC Review and Data Entry July 2021– December 2022
- Data Analysis November 2021 – January 2023
- Final Report (Updated Study Report [USR])..... March 2023

2.9 Level of Effort and Cost

The initial estimate for implementation and reporting associated with this study is approximately \$1,150,000.

3.0 REFERENCES

- Cordell, K. H. 2012. Outdoor recreation trends and futures: a technical document supporting the Forest Service 2010 RPA assessment. U.S. Department of Agriculture, Forest Service, Southern Research Station. Asheville, North Carolina.
- Dillman, D. A. 2000. Mail and internet surveys: the tailored design method. John Wiley & Sons. Hoboken, New Jersey.
- Kelly, J. and R. Warnick. 1999. Recreation trends and markets. Sagamore Publishing, Champaign, Illinois.
- Malvestuto, S. P. 1996. Sampling the recreational creel fisheries techniques (Chapter 20), 2nd edition. American Fisheries Society. Bethesda, Maryland.
- National Park Service (NPS). 1988. General management plan: North Cascades National Park, Ross Lake National Recreation Area, Lake Chelan National Recreation Area. [Denver, Colo.]: U.S. Dept. of the Interior, National Park Service. [Online] URL: <https://hdl.handle.net/2027/mdp.39015021906568>. Accessed March 2020.
- _____. 1989. The Stephen Mather Wilderness Management Plan. National Park Service, U.S. Department of the Interior.
- _____. 2001. The National Park Service Comprehensive Survey of the American Public. Technical Report. June 2001. National Park Service, U.S. Department of the Interior.
- _____. 2012. Ross Lake National Recreation Area General Management Plan. North Cascades National Park Complex. March 2012.
- Pollock, K. H., C. M. Jones, and T. L. Brown. 1994. Angler survey methods and their applications in fisheries management (Chapter 11). American Fisheries Society. Bethesda, Maryland.
- Recreation and Conservation Office (RCO). 2017. State Recreation and Conservation Plan, 2018-2022.
- Salant, P. and Dillman, D.A. 1994. How to conduct your own survey. John Wiley and Sons, Inc. 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.
- United States Access Board (USAB). 2015. Architectural Barriers Act (ABA) standards (2015). Washington, D.C.
- United States Department of Justice (USDOJ). 2010. 2010 ADA Standards for Accessible Design. Washington, D.C. September 15, 2010.
- United States Forest Service (USFS). 1983. Skagit Wild and Scenic River Management Plan (Volumes I and II). Mount Baker-Snoqualmie National Forest, Pacific Northwest Region. Seattle, Washington.

- _____. 1989. Okanogan Forest Land and Resource Management Plan. Pacific Northwest Region. Wenatchee, Washington.
- _____. 1990a. Wenatchee Forest Land and Resource Management Plan. Pacific Northwest Region. Wenatchee, Washington.
- _____. 1990b. Mt. Baker-Snoqualmie National Forest Land and Resources Management Plan. Pacific Northwest Region. Everett, Washington.
- Washington State Recreation and Conservation Office (RCO). 2017. 2018-2022 Recreation and Conservation Plan for Washington State (<https://www.rco.wa.gov/StateRecPlans/scorp/>). Olympia, Washington.
- Watson, A. E., D. N. Cole, D. L. Turnery, and P.S. Reynolds. 2000. Wilderness recreation use: a handbook of methods and systems, General Technical Report-56. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. Ogden, Utah. October 2000.
- Whittaker, D., and B. Shelby. 2001. Lake Britton recreation opportunities and management issues. Confluence Research and Consulting. Corvallis, Oregon.
- Yuan, S.; B. Maiorano., M. Yuan. S.M. Kocis, G.T. Hoshide. 1995. Techniques and equipment for gathering visitor use data on recreation sites. Report 9523-2838-MTDC. U.S. Department of Agriculture, Forest Service. Technology and Equipment Development Program. Missoula, Montana.

**RECREATION USE AND FACILITY ASSESSMENT
REVISED STUDY PLAN**

ATTACHMENT A

**CITY LIGHT RESPONSES TO LP COMMENTS ON THE STUDY PLAN
PRIOR TO PSP**

Table 1. City Light responses to LP comments on the study plan prior to PSP.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
1.	Nikolai Ferrell (USFS)	05/04/2020	Section 1.1 General Description of the Project	Given the study plan objectives ‘Describe Project visitors’ recreation use in the Project Boundary’ (within goal 2 (<u>Goal 2 Objectives (Determine the Preferences, Attitudes, and Characteristics of the Project’s Recreation Users)</u>) and ‘Identify the amount, activity type, and spatial and temporal distribution of existing and desired recreation use within the Project Boundary’ (within goal 3 (<u>Goal 3 Objectives (Current Project Recreation Use and Activities)</u>)) listed on page 2-1, coupled with the lack of Forest Service recreation monitoring data comparable to that proposed in this study plan, the monitoring plan should include primary data collection at these islands within the project boundary.	Thank you for your comments. City Light assumes this comment is in reference to the Marblemount and Sauk River boat launch facilities that the Forest Service operates and maintains. While these facilities are located within the FERC Project Boundary, they are not Project recreation facilities and City Light does not operate or maintain these facilities. This study will only conduct primary data collection at Project recreation facilities.
2.	Brock Applegate (WDFW)	05/04/2020	Section 1.2 Relicensing Process	In-Text Edit: This study plan reflects the RWG consultation effort , and City Light will continue to engage the RWG structure in the preparation of the Proposed and Revised Study Plans (18 Code of Federal Regulations [CFR] §§ 5.11–5.13), and through the relicensing process generally.	Thank you for your comment. Edits to text made to better reflect the RWG and consultation process.
3.	Nikolai Ferrell (USFS)	05/04/2020	Section 1.3 Study Plan Development	18CFR 2.7 (e): [The Commission expects to assume the following responsibilities]: (e) To cooperate with local, State, and Federal Government agencies in planning, providing, operating, and maintaining facilities for recreational use of public lands administered by those agencies adjacent to the project area. In addition, the project boundary is not fixed and may be amended during relicensing or other times as there is also no regulatory	Thank you for your comment. The study is based on the current FERC Project Boundary. The study area is described in Section 2.5 of the draft study plan. No edits made.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				requirement that constrains analysis or study to within the project boundary. It would useful to describe here the differences between the study area and the area encompassed by the Project boundary.	
4.	Brock Applegate (WDFW)	05/04/2020	Section 1.3 Study Plan Development	This study will not help us manage the harvest or the fish in the fisheries, but I guess we might collect some fishing pressure information and facility information like parking and ramps, although only at some of facilities. Besides information on specific sites, I am not sure we learn much with this study for recreational fisheries.	Thank you for your comments. The purpose of this study is not to study the fishery, but rather recreational uses and resources within the FERC Project Boundary. No edits made.
5.	Bob Mierendorf (Upper Skagit Indian Tribe)	04/16/2020	Section 1.3 Study Plan Development	The methodology of this plan should include cross-coordination with the CRWG to identify those recreation sites that are also cultural resource sites (although such sites will not likely be reported in the plan to maintain confidentiality).	Thank you for your comments. A comprehensive resource effects analysis will be developed and integrated during the preparation of the Draft License Application (DLA). LPs will have an opportunity to consider effects of Project recreation, if warranted, on other resources in their review of the DLA in the National Environmental Policy Act (NEPA) process. No edits made.
6.	Brock Applegate (WDFW)	05/04/2020	Section 2.1 Study Goals and Objectives	In-Text Edit: The goals of this study are to determine: (1) the condition, accessibility, and use impacts of the Project's recreation facilities (i.e., FERC approved recreation facilities); (2) the preferences, attitudes, and characteristics of the Project's recreation users at those facilities that FERC approved ; (3) current Project recreation use and activities; and (4) future demand for Project recreation facilities and opportunities. Comment:	Thank you for your comment. The use of the word "Project" implies "FERC approved" and the purpose of this FERC study is to understand the Project's recreation uses. As such, the study area and study sites include FERC-approved recreation facilities, and, where appropriate, some non-Project (non-FERC approved) recreation facilities that provide direct access to Project reservoirs (i.e., visitor survey sites at boat launches on Ross Lake and Diablo Lake). The study plan as written provides City Light with adequate baseline recreation information for its Project (i.e., FERC approved) recreation facilities and resources. No edits made.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				<p>How do you can you get a full understanding of recreationists interests, preferences, and use when you only look at some of the facilities?</p> <p>Comment: How do you find the baseline, when SCL will only look at some of the facilities? Do the other facilities, not recognized as Project facilities, reside on land not owned by SCL or outside the Project boundary?</p>	
7.	Susan Rosebrough (NPS)	04/20/2020	Section 2.1 Study Goals and Objectives	Please see our comment regarding the study area. Expand the scope of this to include all sites within the project boundary and vicinity including NPS managed sites that are affected by on-going project operations. This includes campsites along the reservoirs, all boat ramps, trails alongside and connecting to the reservoirs, and reservoir view points like Gorge overlook and Diablo overlook. This applies to all the goals.	Thank you for your comment. The purpose of this FERC study is to understand the FERC Project recreation uses. As such, the study area and study sites include FERC-approved recreation facilities, and, where appropriate, some non-FERC approved recreation facilities that provide direct access to Project reservoirs (i.e., visitor survey sites at boat launches on Ross Lake and Diablo Lake). The non-Project NPS-managed recreation sites (i.e., boat-in campsites, trails, and reservoir view points) are not FERC Project recreation sites and were developed as part of the larger national park and national recreation area and not for the purposes of providing recreational access to FERC Project lands or waters.
8.	Brock Applegate (WDFW)	05/04/2020	Section 2.1 Study Goals and Objectives	WDFW agrees with this statement. SCL will learn very little about the reservoir fisheries with this study, particularly harvest. The study will only cover some facilities. SCL maintains these reservoirs, which creates fishing pressure and harvest, but refuses to look at the full recreational use in the reservoirs that	Thank you for your comments. Please see the response to Comment #7 above regarding expansion of scope. The purpose of this study is not to study the recreational fishery, but rather recreational uses, which may include anglers. As requested by LPs, City Light has removed the angling questions from the visitor survey questionnaire since they do not adequately address LPs' comments regarding fish populations. LPs still have the opportunity

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				they maintain and impact through their operations.	to submit a study request for a standalone creel survey directly to FERC or as part of their comments on City Light's proposed study plans filed with FERC. City Light also welcomes discussion with the current managers of fisheries for the development of a fisheries-related management plan.
9.	Susan Rosebrough (NPS)	04/20/2020	Section 2.1 Study Goals and Objectives	<p>In-Text Edit: Inventory Project recreation facilities and trails and qualitatively document recreational use and access impacts (e.g., erosion, user-created trails, etc.).</p> <p>Comment: A qualitative assessment is broad and could mean anything from a cursory, less than substantive description to a more thorough observation that delineates locations of erosion, user-created trails. The NPS recommends removing "qualitative" from the objective.</p>	Thank you for your comments. City Light has included the suggested edit in the revised study plan.
10.	Brian Lanouette (Upper Skagit Indian Tribe)	04/15/2020	Section 2.1 Study Goals and Objectives	Waste disposal	Thank you for your comments. Edit incorporated into the revised version.
11.	Susan Rosebrough (NPS)	04/20/2020	Section 2.1 Study Goals and Objectives	Evaluate the Colonial Creek Boat Launch, Winnebago Boat Launch, and the Hozomeen Boat Launch to determine the functional water surface elevation range of each boat ramp. Evaluate the sedimentation happening at the Colonial Creek boat launch and how this will affect access and usability in the future.	<p>Thank you for your comments. The Sediment Deposition in Reservoirs Affecting Resources of Concern draft study plan (Fish and Aquatics Resource Work Group) proposes to evaluate sedimentation at the Colonial Creek, Winnebago Flats, and Hozomeen boat launches. The evaluation of the Colonial Creek boat launch will include its usable ranges.</p> <p>The usable ranges of the boat launches at Hozomeen and Winnebago Flats are already known and this information was provided in the PAD and is provided to the public on the NPS</p>

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					website. Edits were made to the text that clarify the above as it relates to the non-Project boat launch ramps' usable range existing information.
12.	Brock Applegate (WDFW)	05/04/2020	Section 2.1 Study Goals and Objectives	WDFW agrees. SCL's project operations affect all of these recreational facilities. Why would you not look at the effects to recreation?	Thank you for your comments. See response to Comment #11 above.
13.	Brock Applegate (WDFW)	05/04/2020	Section 2.1 Study Goals and Objectives	In-Text Edit: Goal 2 Objectives (Determine the Preferences, Attitudes, and Characteristics of the Project's Facilities Recreation Users) Comment: SCL will not cover everyone recreating on the Project.	Thank you for your comments. See response to Comment #7 above. No edits made.
14.	Susan Rosebrough (NPS)	04/20/2020	Section 2.1 Study Goals and Objectives	Please include the following additional goals/topics - what visitors value, why they choose to recreate in the area, identify issues, desired changes for the future, visitor information needs and current sources of information, visual and dark sky quality and any perceived impacts, and visitors use of adjacent sites for recreation.	Thank you for your comments. The intent of the goals and objectives section is not to state every possible topic that will be evaluated, but rather to identify the over-arching objectives. No edits made.
15.	Brock Applegate (WDFW)	05/04/2020	Section 2.1 Study Goals and Objectives	How about a creel survey for people fishing?	Thank you for your comment. The study's goals and objectives do not include a recreational fishery study, but rather the recreation uses at Project recreation facilities and reservoirs. City Light does not plan to conduct a standalone creel study of the project reservoirs or Skagit River. LPs still have the opportunity to submit a study request for a standalone creel survey directly to FERC or as part of their comments on City Light's

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					preliminary study plans filed with FERC. No edits made.
16.	Brock Applegate (WDFW)	05/04/2020	Section 2.1 Study Goals and Objectives	What if they choose a recreational facility not on the Project recreational facility list? Does SCL not record the information?	Thank you for your comment. The first question on the visitor questionnaire identifies the study site/facility that the visitor was intercepted at. The intent is for the survey administrator to fill in this question and not leave it up to the visitor being surveyed. The visitor intercept protocol will include the survey administrator explaining the intent of the survey and that much of the questionnaire is about the specific recreation facility they are intercepted at and in some instances the Project reservoir that the facility is located at. This administrator-respondent interaction will clarify the intent and minimize the possibility of the suggested site confusion. No edits made.
17.	Brock Applegate (WDFW)	05/04/2020	Section 2.1 Study Goals and Objectives	See comment above.	It is not clear which comment is being referenced. If related to the scope of the study sites, please see response to Comment #7 above. No edits made.
18.	Gilje Kristofer (NCI)	05/03/2020	Section 2.1 Study Goals and Objectives	How is this data being collected for the ELC?	Thank you for your comment. The ELC keeps separate visitor use records which includes basic socio-demographic information. City Light will coordinate with the ELC to get a summary of the ELC data concurrent with the study season for other study sites. No edits made.
19.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.1 Study Goals and Objectives	In-Text Edit: Describe Project visitors recreation use of recreational facilities which are in the vicinity of the Project Bounday (e.g, use of trails accessed from Ross Lake).	Thank you for your suggested edit. The study is focused on FERC Project recreation facilities. The “use of trails accessed from Ross Lake” provide access to non-Project areas and recreation facilities. As such, these are not part of the FERC study. No edits made.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
20.	Susan Rosebrough (NPS)	04/20/2020	Section 2.1 Study Goals and Objectives	Incorporate impact analysis	Thank you for your comment. The use impact analysis is covered under the Goal 1 objectives and detailed in Section 2.6.1.4 of this study plan. No edits made.
21.	Brock Applegate (WDFW)	05/04/2020	Section 2.1 Study Goals and Objectives	Does this only include Project facilities or does SCL have other recreational facilities within the Project Boundary? I would think that any recreational facilities within the Project Boundary should have the label of Project Facilities.	Thank you for your comment. The identification of Project-related recreation opportunities that may have unmet demand within the Project Boundary is not explicit to Project recreation facilities. The study methods in Section 2.6.4.1 detail the various methods for identifying unmet demand. Some of the unmet demand information will come from visitor surveys at Project recreation facilities, but other sources of unmet demand information will be reviewed that are not specific to the Project recreation facilities (e.g., statewide and regional planning documents). No edits made. Regarding terminology, see response to Comment #6 for an explanation of what is a Project recreation facility.
22.	Susan Rosebrough (NPS)	04/20/2020	Section 2.1 Study Goals and Objectives	Recreation Needs assessment: synthesise needs from other study components. Explore new opportunities to meet unmet demand in highway 20 corridor including trails, camping, and ADA accessible facilities; options for meeting needs by re-designing existing facilities.	Thank you for your comments. Synthesis of the recreational needs will be part of the recreation resource effects analysis that will be developed and integrated during the preparation of the DLA, but is not part of this study. LPs will have an opportunity to consider the potential effects of recreation resources in their review of the DLA in the NEPA process. No edits made.
23.	Brock Applegate (WDFW)	05/04/2020	Section 2.2 Resource Management Goals	In-Text Edit: 2.2 Recreational Resource Management Goals	Thank you for your comment. Section 2.2 is a standard, common section in all the FERC study plans and is intended to describe relevant agencies' resource management goals related to the resource being studied. To be consistent with the other study plans, no edits were made to the heading. However, resource agencies and other LPs are encouraged to provide resource

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					management goals specific to the proposed study as well. No edits made.
24.	Dave Pettebone (NPS)	04/22/2020	Section 2.2 Resource Management Goals	What are the “Resources” referred to in the title of section 2.2. “Resource Management Goals”? Typically, a title such as this would reference natural resource management goals but this section seems to be referencing recreation resources such as facilities. Perhaps the title needs to be clarified.	Thank you for your comment. See response to Comment #23 above.
25.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.2 Resource Management Goals	In-Text Edit: In addition to providing information needed to characterize Project effects, this study will provide information to help LPs with responsibility for recreation and land use within and in the vicinity of the Project area to identify potential measures for consideration in a recreation management plan for the Project.	Thank you for your comment. The study states “within the Project area,” which includes the vicinity of the Project. No edits made.
26.	Brock Applegate (WDFW)	05/04/2020	Section 2.2 Resource Management Goals	I would assume that SCL would include all three reservoirs.	Thank you for your comment. All three project reservoirs (Ross Lake, Diablo Lake, and Gorge Lake) are included in the Project and the study area.
27.	Bob Mierendorf (Upper Skagit Indian Tribe)	04/17/2020	Section 2.2 Resource Management Goals	For example, cultural resources.	Thank you for your comment. A comprehensive resource effects analysis will be developed and integrated during the preparation of the DLA. LPs will have an opportunity to consider effects of Project recreation, if warranted, on other resources in their review of the DLA in the NEPA process. No edits made.
28.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.2 Resource Management Goals	In-Text Edit: US Forest Service (USFS) – The USFS manages recreation in the Okanogan-Wenatchee National Forest and the Mount Baker-Snoqualmie National Forest, which border the Ross Lake National Recreation Area on the east and west sides consistent with the	Thank you for your comments. City Light agrees with the proposed edits to this sentence. Edits made to the text to reflect this.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				Wenatchee Forest Land and Resource Management Plan, the Okanogan Forest Land and Resource Management Plan, and the Mt. Baker-Snoqualmie National Forest Land and Resources Management Plan (USFS 1990a; USFS 1989; and USFS 1990b, respectively as amended by the Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl, April, 1994). Within the Project Boundary, the USFS has jurisdiction over the recreation facilities at the Marblemount Boat Launch (Skagit River) and the Sauk River Boat Launch (Sauk River).	
29.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.2 Resource Management Goals	Clarify that these facilities were brought into the Project Boundary and describe SCL's existing obligation for O&M at both.	Thank you for your comment. The Marblemount and Sauk River boat launch facilities are within the Project Boundary, but are not Project recreation facilities. City Light does not operate or maintain these facilities. Refer to Section 4.8 of the PAD for details on any ongoing support by City Light for these facilities.
30.	Brock Applegate (WDFW)	05/04/2020	Section 2.2 Resource Management Goals	WDFW sees a good opportunity to conduct a creel survey?	Thank you for your comment. See response to Comment #15 above.
31.	Bob Mierendorf (Upper Skagit Indian Tribe)	04/17/2020	Section 2.2 Resource Management Goals	Is not the Upper Skagit Indian Tribe a co-manager of fish in the project area?	Thank you for your comment. City Light revised the text to reflect that WDFW and the tribes are responsible for managing fish in the state of Washington.
32.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.2 Resource Management Goals	As currently written, the study plan does not identify interview locations that would target Skagit River anglers. Surveying only anglers captured at interview locations that are not on	Thank you for your comments. The study plan is related to FERC Project recreation and the Skagit River downstream of the Project is not in the FERC Project Boundary. In addition,

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				the Skagit River would provide an inadequate sample for characterizing Skagit River anglers.	City Light removed the angling questions from the questionnaire (see response to comment #8 above). No edits made.
33.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.2 Resource Management Goals	Please include detail of the visitor surveying approaches that will be implemented downstream of the Gorge Powerhouse to provide information on visitor angling behavior.	Thank you for your comment. See response to Comment #32 above. In addition, City Light removed the angling questions from the questionnaire (see response to comment #8 above).
34.	Bob Mierendorf (Upper Skagit Indian Tribe)	04/17/2020	Section 2.2 Resource Management Goals	Need to explain what this means	Thank you for your comment. The highlighted text is language from the Washington State Recreation and Conservation Office's (RCO) 2018-2022 Recreation and Conservation Plan for Washington State and not City Light. No edits made.
35.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.2 Resource Management Goals	Questions 12-17 on the draft survey do not include reference to the Skagit River, how will Skagit River fishing be separated in the survey data from fishing behavior that occurred elsewhere.	Thank you for your comment. See response to Comment #32 above. In addition, City Light removed the angling questions from the questionnaire (see response to comment #8 above).
36.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.2 Resource Management Goals	In-Text Edit: Additionally, the Project is bordered on the east and west by National Forests and is upstream of the Skagit River Wild and Scenic River System.	Thank you – edit accepted.
37.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.2 Resource Management Goals	To what extent do visitors to the Project use these facilities?	Thank you for your comment. These are non-Project recreation facilities associated with the North Cascades National Park and/or RLNRA. However, aspects of the study, particularly visitor surveys at Project recreation facilities, will identify where else in the area respondents visited or intend to visit during their trip/visit. Detailed information about visitors to these non-Project recreation facilities is not relevant to FERC's jurisdiction of the Skagit River Project.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
38.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.2 Resource Management Goals	Need to study the scale and scope of this project related recreation.	Thank you for your comment. See response to Comment #37 above.
39.	Jack Oelfke (NPS)	04/27/2020	Section 2.3 Background and Existing Information	although cross-country skiing and snowshoeing occur on NPS lands within the project boundary.	Thank you for your comments. City Light included the edits to this sentence as proposed in the comment. Edits made to the text to reflect this.
40.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.3 Background and Existing Information	<p>In-Text Edit: Several NPS facilities in the RLNRA close by the end of September. Adjacent Forest Service facilities also close by November, Similarly, the road gate at the U.S.-Canada border at Hozomeen is usually closed for the winter season by November.</p> <p>Comment: However there is still recreational use on USFS lands during winter such as skiing, snowshoeing, backcountry, dispersed camping, etc.</p>	Thank you for your comments. City Light agrees with the proposed edits to this sentence. Edits made to the text to reflect this.
41.	Brock Applegate (WDFW)	05/04/2020	Section 2.3 Background and Existing Information	Overall, visitation to RLNRA generally ranged from 700,000 to 900,000 visitors annually from 2010 to 201 8 ⁹ with a peak visitor use of 1,088,528 905,418 visitors in 201 9 ⁶ (coinciding with the National Park centennial celebration across the U.S.).	Thank you for your comments. City Light agrees with the proposed edits to this sentence. Edits made to the text to reflect this.
42.	Susan Rosebrough (NPS)	04/20/2020	Section 2.3 Background and Existing Information	Add in use data from 2019.	Thank you for your comment. See response to Comment #41 above.
43.	Jack Oelfke (NPS)	04/27/2020	Section 2.3 Background and Existing Information	which was 1,088,528 visitors	Thank you for your comment. See response to Comment #41 above.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
44.	Gilje Kristofer (NCI)	05/03/2020	Section 2.3 Background and Existing Information	Does this include the ELC?	Yes, the Form 80 data for the Diablo Development includes the ELC.
45.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.3 Background and Existing Information	Please summarize the Form 80 data for recreation use in the vicinity of the Project.	Thank you for your comment. City Light edited the text to reflect only the recreational use associated with the Project recreation facilities in this section since the Project facilities are the focus of the FERC study. The use data is based on the supporting documentation for the Form 80 data collection effort in 2014. Regarding non-Project recreational use, refer to City Light's summary in the PAD (Section 4.8.2).
46.	Rick Hartson (Upper Skagit Indian Tribe)	04/17/2020	Section 2.5 Study Area	Need to assess recreation use and impacts along the transmission line corridor and on mitigation lands. Project-related vegetation clearing and access roads along the transmission corridor allow ready access for a variety of users. Mitigation lands are sensitive resource protection areas where increased monitoring of human activity is warranted. Impacts to fish, aquatic, and terrestrial resources may be caused by improper waste disposal leading to water quality concerns, vegetation clearing on uplands and riparian areas, and off-road vehicle use including fords through fish-bearing streams. Upper Skagit Indian Tribe staff have observed such activities at various locations within the project boundary. The extent of these impacts must be documented with this study, or separate studies, so that a comprehensive management plan can be developed for the entire area within the project boundary.	Thank you for your comments. Management of the transmission line corridor and the mitigation lands is an ongoing focus of the current license and City Light welcomes discussion with LPs on how these areas will continue to be managed into the future. At this time, City Light is proposing no new activities for these areas; to the extent that any new activities are proposed for these areas in the future, the effects of those activities will be studied. It should also be noted that the biological, cultural, and geologic study plans will evaluate those resources in the transmission line corridor and on mitigation lands. The information from those studies will be used for the comprehensive resource effects analysis that will be developed during the preparation of the DLA. No edits made.
47.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.5 Study Area	This smaller study area is inconsistent with the objectives of goals 2 and 3 on page 2-1 relative to describing recreation within the project	Thank you for your comments. The study area encompasses the Project Boundary where Project recreation facilities and use are

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				boundary. On page 1-1 and elsewhere, the project boundary is described as larger than this study area.	prevalent. While the study sites for primary data collection (inventory, condition, accessibility, use impact, observation and visitor surveys) are focused on Project recreation facilities, the study does incorporate secondary sources of use information from non-Project recreation facilities and sites as it relates to amount and type of recreation use that occurs within the Project Boundary. No edits made.
48.	Susan Rosebrough (NPS)	04/20/2020	Section 2.5 Study Area	<p>Geographic Scope and Study Plan Area</p> <p>The geographic scope of the proposed study will leave significant facilities and opportunities within the project boundary and area without analysis and understanding. The NPS recommends expanding the scope of the project to include the list of facilities provided in NPS Table 1 [inserted at the end of this comment/response table]. The project affects recreation activities on the reservoirs and in the river downstream. Within the Federal Energy Regulatory Commission (FERC) boundary, the project area provides public recreation opportunities including developed recreation sites, trails, dispersed sites, and recreational use of the reservoirs. Visitors are attracted to the water, the reservoirs, and existing recreation facilities surrounding the lakes. Visitor use has continually increased over the life of the existing license. Many of the recreation sites are within or partially within the FERC project boundary and/or impacted by on-going project operations. The changing lake levels from on-going operations directly impact recreation use. For example, in 2019 due to low lake levels, all campsites on Ross Lake had to be closed, which not only impacted recreation on the reservoirs,</p>	<p>See responses to Comment #s 7, 11, 32, and 37 regarding geographic scope of the study.</p> <p>The geographic scope of this study appropriately focuses on Project recreation facilities and opportunities, primarily at Diablo Lake, Gorge Lake, and the town of Newhalem, where City Light has provided public access and recreational opportunities dating back prior to the establishment of the North Cascades National Park and RLNRA.</p> <p>The development of non-Project recreation facilities and the larger North Cascades National Park and RLNRA are not a result of demand for recreation related to the Project or a change in Project operations. Rather, the increased recreation demand of the non-Project NPS recreation sites and facilities is a result of the development of a much larger, broader North Cascades National Park and RLNRA that dwarf the FERC Project, exceed City Light's requirements related to the Project, and therefore do not fall within the scope of the present study.</p>

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				but also decreased access to recreation opportunities on trails adjacent to the reservoir. The ongoing project operations extend the boating season of the river downstream by delivering more consistent flows into the summer season. SCL is also considering adding pump storage operations to the Skagit Hydroelectric Project. This change in operations has the potential to affect lake levels and recreation activities throughout the project area.	<p>Having said that, City Light looks forward to working with NPS to identify shared management responsibilities within the Project area, including the goals of and data needed to manage each area, and developing management plans for that purpose.</p> <p>To the point on fluctuating water levels at Ross Lake, extreme low or high water years impact Project operations and flood control measures as well as recreational use of rivers, lakes, and reservoirs in this region of the North Cascades where the annual hydrograph is dependent on snowmelt. Low water conditions are a result of the annual hydrograph and complex watershed management protocols, not Project operations.</p> <p>With regard to any proposed changes to Project operations, such as pumped storage, LPs will have the opportunity to consider the effects of these changes on recreational and other resources during the preparation of the DLA if pumped storage or other changes become a part of the project proposal. No edits made.</p>
49.	Brock Applegate (WDFW)	05/04/2020	Section 2.5 Study Area	I agree, although SCL operations affect the fisheries in the reservoirs, SCL will not analyze their effects on the fish and harvest. WDFW manages the fishery in the reservoirs, but will not have creel data for the users of the reservoir. SCL has limited their geographical area of study too narrowly.	Thank you for your comments. See response to Comment #15 above. No edits made.
50.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.5 Study Area	There are several recreational facilities downstream of the Project which are included within project boundary islands. These should	Thank you for your comments. See responses to Comment #s 7, 11, 32, and 37 regarding geographic scope of the study. No edits made.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				be described here. See also comment above about defining study area and compared to the area within the Project Boundary.	
51.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.5 Study Area	As described above, this seems inappropriately limited given for example the statement that the Project serves as a “launching point for a range of recreation opportunities which extend beyond the Project Boundary.” Please explain this contradiction.	Thank you for your comments. See responses to Comment #s 7, 11, 32, and 37 regarding geographic scope of the study. No edits made.
52.	Brock Applegate (WDFW)	05/04/2020	Section 2.6 Methodology	Only assessing the recreation in the Project facilities does not describe the full amount of recreation. SCL project operations affect recreation, but yet SCL will only describe a portion of the recreation it has affect on in and outside the Project boundary, because of the narrow geographic scope. SCL needs to define their impacts on all fishing and recreation in the area from their project operations, not just those confined to the Project facilities. To do define their effects, SCL will need to have a baseline of all recreation in and around the Project Boundary and related to the reservoirs.	Thank you for your comments. The study plan as written is not limited to only Project recreation facilities, but also Project reservoirs. Primary data collection occurs at Project recreation facilities, but the data collected (observation surveys and visitor surveys) is not limited to just the recreation facilities. Regarding geographic scope, see responses to Comment #s 7, 11, 32, and 37. No edits made.
53.	Brian Lanouette (Upper Skagit Indian Tribe)	04/15/2020	Section 2.6.1 Inventory and Evaluate the Existing Project Recreation Facilities	Specify use impacts. The impacts on water quality should be emphasized here. For example, do restroom facilities leach into the water table?	Thank you for your comments. Section 2.6.1.4 and the assessment form in Attachment C to the revised study plan provide the use impact details. This study does not address water quality impacts; rather, the Water Quality Monitoring study will address any water quality issues associated with the Project. No edits made.
54.	Rick Hartson (Upper Skagit Indian Tribe)	04/17/2020	Section 2.6.1 Inventory and Evaluate the Existing Project	Needs to cover access and use of all lands within the project boundary. See comment above regarding importance of documenting impacts along transmission line corridor and mitigation lands.	Thank you for your comments. See responses to Comment #s 7, 11, 32, and 37 regarding geographic scope of the study. No edits made.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
			Recreation Facilities		
55.	Gilje Kristofer (NCI)	05/03/2020	Section 2.6.1 Inventory and Evaluate the Existing Project Recreation Facilities	The ELC is listed on Table 2.6.1	Thank you for your comment. Table 2.6-1 lists the ELC, but only indicates that an inventory of the ELC will be conducted. The condition, use impact, and accessibility assessments are not selected for the ELC in this table. No edits made.
56.	Susan Rosebrough (NPS)	04/20/2020	Section 2.6.1 Inventory and Evaluate the Existing Project Recreation Facilities	Table 2.6-1. The NPS recommends the study scope be expanded to include the sites listed in NPS Table 1. For the majority of the sites, the condition and accessibility information does not have to be collected in the field but can be compiled from reports and databases from NPS. The impact analysis is needed at the majority of the sites.	Thank you for your comments. See responses to Comment #s 7, 11, 32, and 37 regarding geographic scope of the study. No edits made.
57.	Brian Lanouette (Upper Skagit Indian Tribe)	04/17/2020	Section 2.6.1 Inventory and Evaluate the Existing Project Recreation Facilities	Table 2.6-1. Criteria of use impact should be defined. What constitutes a use impact? This could become quite subjective if not defined prior to the evaluation. Is it a use impact to the natural resources? To the integrity of the facility? Both? It would be helpful to differentiate what type of use impact is being evaluated.	Thank you for the comment. The study includes a use impact field assessment form in Attachment C, which provides detailed use impact parameters that will be collected at each respective study site. No edits made.
58.	Gilje Kristofer (NCI)	05/03/2020	Section 2.6.1 Inventory and Evaluate the Existing Project Recreation Facilities	Table 2.6-1. Why is the ELC listed as day use?	Thank you for your comment. In all applicable tables, the text has been edited to reflect overnight use as well as day use. Edits made to the text to reflect this.
59.	Bob Mierendorf (Upper Skagit Indian Tribe)	04/16/2020	Section 2.6.1 Inventory and Evaluate the Existing Project	Table 2.6-1. Does the Goodell Picnic Shelter and Boat Launch, which was built with SCL recreation	Thank you for your comment. The Goodell Picnic Shelter and Boat Launch was constructed with City Light funds under the current license, but City Light has no on-going

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
			Recreation Facilities	funds under the current license, belong on this list?	management, operations, or maintenance responsibility for it, and it is therefore not a Project recreation facility. No edits made.
60.	Rick Hartson (Upper Skagit Indian Tribe)	04/17/2020	Section 2.6.1.1 Inventory Recreation Facilities	Why incidental data collection? This could be important information that should be collected systematically.	Thank you for your comments. City Light has removed this sentence as the use impact assessment (Section 2.6.1.4) that will be conducted concurrent with the inventory will cover use impacts. Edits made to the text to reflect this.
61.	Brian Lanouette (Upper Skagit Indian Tribe)	04/15/2020	Section 2.6.1.1 Inventory Recreation Facilities	Or refuse dump locations.	Thank you for your comment. The use impact form (Attachment C of the revised study plan) includes questions related to litter and dumping at the study sites. No edits made.
62.	Rick Hartson (Upper Skagit Indian Tribe)	04/17/2020	Section 2.6.1.1 Inventory Recreation Facilities	Vegetation clearing.	Thank you for your comment. The use impact form (Attachment C of the revised study plan) includes questions related to vegetation loss, bare ground, and clearances at the study sites. No edits made.
63.	Bob Mierendorf (Upper Skagit Indian Tribe)	04/16/2020	Section 2.6.1.2 Facility Condition Assessment	Table 2.6-2. Many of the cells in this table need to specify objective, empirical, and observable criteria, otherwise the assessment becomes highly subjective, and not “qualitative”, as claimed in the paragraph above.	Thank you for your comments. City Light agrees and has edited Table 2.6-2 to provide clarity between the condition categories, including providing examples. Edits made to the text to reflect this.
64.	Brock Applegate (WDFW)	03/24/2020	Section 2.6.1.2 Facility Condition Assessment	Table 2.6-2. If we don’t describe the difference between good and excellent through some sort of conditions, the evaluation becomes objective. Perhaps lines newly painted equals excellent and parking lines faint and some missing equals good. I am just trying to think of an example.	Thank you for your comments. See response to Comment #63 above.
65.	Jack Oelfke (NPS)	04/27/2020	Section 2.6.1.2 Facility Condition Assessment	Table 2.6-2. I agree with Brock's concern	Thank you for your comments. See response to Comment #63 above.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
66.	Brian Lanouette (Upper Skagit Indian Tribe)	04/17/2020	Section 2.6.1.2 Facility Condition Assessment	There is a lot of room for interpretation here.	Thank you for your comments. See response to Comment #63 above.
67.	Brock Applegate (WDFW)	05/04/2020	Section 2.6.1.2 Facility Condition Assessment	Table 2.6-2. Boat docks should include the part of the ramp that lies underwater. SCL should evaluate the entire ramp for all intended reservoir elevations.	Thank you for your comment. The condition assessment of the boat ramps will aim to assess the full length of the boat ramp surface. However, reservoir water levels may preclude City Light from observing the full extent of the ramps. No edits made.
68.	Brock Applegate (WDFW)	03/24/2020	Section 2.6.1.2 Facility Condition Assessment	I have the same comment as above.	Thank you for your comments. See response to Comment #63 above.
69.	Jack Oelfke (NPS)	04/27/2020	Section 2.6.1.2 Facility Condition Assessment	I agree with Brock's concern	Thank you for your comments. See response to Comment #63 above.
70.	Brian Lanouette (Upper Skagit Indian Tribe)	04/17/2020	Section 2.6.1.2 Facility Condition Assessment	Table 2.6-2. Proper functioning of waste disposal mechanisms (e.g. septic systems, leaky vaulted toilets, storm water runoff systems, and RV cleanouts) should be evaluated for their impacts to natural (particularly aquatic) resources and water quality.	Thank you for your comments. See response to Comment #53 above.
71.	Brock Applegate (WDFW)	05/04/2020	Section 2.6.1.2 Facility Condition Assessment	Table 2.6-2. These two categories seem very like. SCL should create a rubric to describe the differences in the conditions.	Thank you for your comments. See response to Comment #63 above.
72.	Brian Lanouette (Upper Skagit Indian Tribe)	04/17/2020	Section 2.6.1.2 Facility Condition Assessment	Table 2.6-2. It should be noted in the evaluation criteria if the restroom facilities leach waste. A structure could appear to be in excellent condition to the user, but the septic system	Thank you for your comment. City Light understands your concern, but the Project recreation facilities do not include standalone recreation facility related restroom buildings (vault or flush). Rather, the restroom facilities

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				could be faulty and leaching into the river, for example.	associated with Project recreation facilities are located in Newhalem and these are connected to the public sanitation system, which is a separate regulatory and compliance process. As such, this issue is not relevant to the Project recreation facilities. Further, City Light is not aware of any impacts the commenter is referring to. No edits made.
73.	Brock Applegate (WDFW)	03/24/2020	Section 2.6.1.2 Facility Condition Assessment	I like the description of excellent condition.	Thank you for your comments. See response to Comment #63 above.
74.	Jack Oelfke (NPS)	04/27/2020	Section 2.6.1.2 Facility Condition Assessment	I agree with Brock's concern	Thank you for your comments. See response to Comment #63 above.
75.	Brock Applegate (WDFW)	05/04/2020	Section 2.6.1.2 Facility Condition Assessment	I am fine with some leeway in rehabilitation and maintenance, but FERC may find some more specific time units with tasks more enforceable in their license. For example, SCL would draw designs to fix certain Project Facility in License Year 3 and implement fix/maintenance certain Project Facility in License Years 5. SCL would have a better idea of timing if they had more specific guidelines.	Thank you for your comments. City Light recognizes that the rehabilitation schedule will likely be more detailed. However, the intent of this study element is to get an overall view of the condition of the Project recreation facilities so as to inform the development of potential recreation measures. This study will not determine the exact year of rehabilitation. No edits made.
76.	Brock Applegate (WDFW)	05/04/2020	Section 2.6.1.2 Facility Condition Assessment	SCL should strive to understand the time it will take for the task, as well, to make the information useful to write a license article.	Thank you for your comment. Comment noted.
77.	Brian Lanouette (Upper Skagit Indian Tribe)	04/17/2020	Section 2.6.1.4 Recreation Use Impact Assessment	The environmental impact of the Diablo Ferry is not addressed, and should be evaluated in in the Recreation use impact assessment as it pertains to access to the reservoir system.	Thank you for your comment. It is not clear what type(s) of environmental impact the commenter is referring to and City Light is not aware of any environmental impacts related to the ferry. As it pertains to this study, the recreation use impact assessment methodology

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					in this study does not address potential environmental impacts of the Diablo Ferry.
78.	Bob Mierendorf (Upper Skagit Indian Tribe)	04/17/2020	Section 2.6.1.4 Recreation Use Impact Assessment	More clear and precise to say “evidence”	Thank you for your comment. Edits made to the text to reflect this.
79.	Brian Lanouette (Upper Skagit Indian Tribe)	04/15/2020	Section 2.6.1.4 Recreation Use Impact Assessment	Poaching (illegal harvest) and misshandling of fish and wildlife resources (i.e. illegal means for capturing fish or feeding wildlife) should be included as an impact of useage on the resources.	Thank you for your comment. The comment refers to compliance with state or federal wildlife regulations, which is beyond the scope of this study and outside the responsibility of on-the-ground study field surveyors. These issues would need to be addressed by a law enforcement entity, not City Light field surveyors. No edits made.
80.	Bob Mierendorf (Upper Skagit Indian Tribe)	04/17/2020	Section 2.6.1.4 Recreation Use Impact Assessment	In those cases where cultural sites and recreational facilities co-occur, this rating will be helpful to assessing effects. This will require cross-coordination with the CRWG.	Thank you for your comment. A comprehensive resource effects analysis will be conducted during the preparation of the DLA, when LPs will have an opportunity to consider effects of recreational use of the Project, if warranted, on other resources and related to any proposed changes in Project operation in their review of the DLA in the NEPA process.
81.	Rick Hartson (Upper Skagit Indian Tribe)	04/17/2020	Section 2.6.1.4 Recreation Use Impact Assessment	Table 2.6-5. It is not clear how the information collected on the form translates to these ratings. This rating system may be too broad for some purposes. Suggest creating a rating system for more specific resource impacts. For example, a rating for fish and aquatics impacts may consider water quality contamination risk, signs of illegal harvest, riparian clearing, etc.	Thank you for your comment. The rating system and categories allow general classification of the use impacts observed at each Project recreation facility (study site). The assessment provides adequate information to understand the types and amounts of use impacts occurring and has been used in other relicensings to provide this same type of information. However, City Light revised the text to state that it would provide the raw data as part of the report for review by interested LPs.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
82.	Susan Rosebrough (NPS)	04/20/2020	Section 2.6.1.4 Recreation Use Impact Assessment	Table 2.6-5. The NPS does not think this rating system is really sufficient to address true impacts. There are significant difference between types of impacts and what needs to be completed to address the impacts. Vegetation trampling is compounded year after year if it is not addressed some impacts will not /cannot be addresses or changed.	Thank your for your comment. See response to Comment #81 above.
83.	Brock Applegate (WDFW)	05/04/2020	Section 2.6.1.4 Recreation Use Impact Assessment	Table 2.6-5. WDFW agrees. Please create a rubric to create a less subjective assignment of sites to categories. Please consult with the NPS on this rubric.	Thank your for your comment. See response to Comment #81 above.
84.	Susan Rosebrough (NPS)	04/20/2020	Section 2.6.1.4 Recreation Use Impact Assessment	The NPS recommends modifying the impact analysis approach to be able to obtain impact information that could be used to develop license implementation actions to address impacts and feed into the carrying capacity analysis of the recreation facilities. The NPS recommends conducting an inventory of existing recreation sites to identify current impacts to vegetation and soil; presence of ax scars or nails in trees; presence of trash and human waste; and presence of informal user-created/non-designated trails. The data collection should include the total size of the area impacted including designated and satellite sites so that it can be determined if the impacts are included in the existing site or reach beyond the intended area; on and off site vegetation cover; map of user-created trails; and campsite functionality data.	Thank you for your comment. City Light believes the stated methods for the use impact data collection in the study plan are adequate to inform City Light and LPs on potential use impact concerns at study sites. Further, the suggested methodology (Jeff Marian's Campsite sustainability protocol) is specific to campsites in a protected area or wilderness setting. The Project does not have any Project campgrounds; therefore, this protocol is not relevant to the Project. The Project provides primarily developed and hardened day-use recreation facilities, including picnic sites, parking areas, boat docks, boat ramps, and visitor information or education facilities. No edits made.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				The methodology should follow common practices such as Jeff Marian's Campsite sustainability protocol or similar protocol.	
85.	Brock Applegate (WDFW)	05/04/2020	Section 2.6.1.4 Recreation Use Impact Assessment	I agree. Please use something less subjective than mentioned in the text of this document.	Thank you for your comment. See responses to Comment #s 81 and 84 above.
86.	Brock Applegate (WDFW)	05/04/2020	Section 2.6.1.5 Assessment of the Usable Periods of the Gorge Lake Boat Launch Ramp	SCL should make the ramp usable for boats for the average reservoir elevations during April through October.	Thank you for your comment. Comment noted.
87.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.6.2 Identify Recreation Uses and Visitor Attitudes, Beliefs, and Preferences Within the Project Boundary	The referenced table is not included in the document.	Thank you for your comment. The reference to Table 2.6-6 is correct in the text. However, the table on the following page was incorrectly numbered and has been corrected in the revised study plan to Table 2.6-6 (Study areas and study sites for visitor and observation surveys). Edits made to the text to reflect this.
88.	Brock Applegate (WDFW)	05/04/2020	Section 2.6.2 Identify Recreation Uses and Visitor Attitudes, Beliefs, and Preferences Within the Project Boundary	SCL should include non-Project recreation facility areas and this rationale for the rest of the information collection as well.	Thank you for your comment. City Light has included these select non-Project recreation facilities for the observation and visitor surveys in order to characterize the recreational uses where these facilities provide direct access to the Project reservoirs (i.e., boat launches and fishing piers). The other non-Project recreation facilities located within the Project Boundary do not meet this same criterion. Edits made to the text to clarify this distinction.
89.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.6.2 Identify Recreation Uses and Visitor	Also, re: methods for survey—want to ensure we are using all resources at our disposal. Online and social media?	Thank you for your comment. City Light is proposing to use in-person surveys as the primary method of survey administration with mailback surveys as a secondary or backup

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
			Attitudes, Beliefs, and Preferences Within the Project Boundary		method where in-person surveys are not adequate to meet the study targets. City Light has selected the above noted survey administration methods because the focus of the study's visitor use questionnaire is on Project site specific and date specific information. Online surveys often lose the connection to the specific Project study site and date since they are primarily completed after ending their trip and/or leaving the study site/reservoir, where the study is seeking the visitors' input (i.e., loss of site data control). No edits made.
90.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.6.2 Identify Recreation Uses and Visitor Attitudes, Beliefs, and Preferences Within the Project Boundary	Need to add surrounding USFS developed and dispersed sites in order to understand full extent of project related recreation.	Thank you for your comments. See responses to Comment #s 7, 11, 32, and 37. No edits made.
91.	Brian Lanouette (Upper Skagit Indian Tribe)	04/15/2020	Section 2.6.2.1 Observation Survey	<p>Add Observation of fishing usage to this list to aid in evaluating the impacts of recreational use on the natural resources</p> <p>A more focused evaluation of boating traffic is needed to fully evaluate the impacts of recreational boating usage on natural resources. This would entail observing and interviewing boating activity on the reservoir rather than observations made from the shore (shore observations are very limited in scope).</p>	<p>Thank you for your comment. The current study methods include counts of observed people and observed types of shoreline recreation activities, which would include anglers, if observed. However, the study's goals and objectives are not to determine fishing usage, which is typically done via a creel survey (see response to Comment #15 re: creel survey).</p> <p>City Light is not aware of any boating issues on the Project reservoirs related to natural resource impacts. No edits made.</p>

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
92.	Dave Pettebone (NPS)	04/23/2020	Section 2.6.2.1 Observation Survey	<p>Observation Study description does not discuss sampling plan.</p> <ul style="list-style-type: none"> o Need to know number of days of observation, number of observations per day or system for collecting observations. o Use photographic documentation? Automated counters? These would allow for post processing and provide a better documentation library. <p>More generally speaking, it is not clear what resolutions of visitor use data are needed for this study. It seems we are rushing to put a study plan together without identifying what data are needed (e.g. seasonal data, annual data, monthly data, hourly data to describe daily use and demand).</p> <ul style="list-style-type: none"> o Clearly, is not possible to capture all of these onsite locations over extensive periods of time but a goal of the study could be to develop indicator counts that have statistical relationships to site specific use levels. o These indicator counts should be tied to the existing traffic counters. Use at site specific locations can then be estimated from these models. 	<p>Thank you for your comments. City Light has made edits to Section 2.6.2.3 to make it clear that the sampling frequency detailed in this section applies to both the observation and visitor surveys. Further, Section 2.6.2.1 details City Light's observation survey methods (onsite, in-person observation counts) to be conducted concurrently with visitor surveys during each visit to a study site. City Light does not intend to use other forms of observation counts such as cameras or counters. Finally, City Light's methods are designed to provide site-specific use data, by season, day type, and hourly to characterize the types and distribution of use at the Project recreation facilities and facilities that provide direct access to Project reservoirs. The methods detailed in the study plan are consistent with the sampling plans used on many other FERC relicensings to assess recreation use. No edits were made regarding the study methods.</p>
93.	Susan Rosebrough (NPS)	04/20/2020	Section 2.6.2.1 Observation Survey	<p>In addition, the NPS recommends collecting the estimated compliance with self-registry systems, length of stay, and any user conflicts/issues observed.</p>	<p>Thank you for your comment. City Light has made edits to include observed user conflicts or issues during the observation survey and added the time the observation started and ended to capture the period of the observation. City Light did not include collecting compliance with self-registry systems as this is the responsibility of operations staff and not the</p>

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					study field surveyors. The intent of the observation survey is for City Light's study field surveyors to observe recreational use by visitors and not to address compliance or non-compliance with onsite self-registry systems.
94.	Dave Pettebone (NPS)	04/23/2020	Section 2.6.2.1 Observation Survey	<p>Based on our phone call with the study team it was communicated that the observation study will consist of a single observation per day. This will not provide a large enough sample size to produce substantive results that can inform the requirements of section 1.1.1.2, Project Recreation Use Estimates.</p> <p>There are different sampling approaches (e.g. cluster sampling) that can be used for this type of study but they all include multiple observations per day or hour. There are other sampling approaches that can be considered and I suggest that a chosen sampling approach be detailed in this study plan.</p>	Thank you for your comment. See response to Comment #92 above.
95.	Susan Rosebrough (NPS)	04/20/2020	Section 2.6.2.2 Visitor Survey	<u>Data Analysis Plan</u> . Please include a plan on how each question or group of questions will be utilized.	Thank you for your comment. Additional details on the data analysis plan is provided in Section 2.6.6.1 (Data Analysis) of the study. No edits were made.
96.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.6.2.2 Visitor Survey	Additional information is needed on how visitors and groups will be selected to participate. For instance will the surveyor follow a systematic pattern of traveling through parking lots and contact any group they intercept? Will they contact every other (or some other number of groups)? Significant care needs to be established so particular sorts of groups that are easier to interact with (e.g., certain activity groups, certain types of users) are not over-represented in the sample. Once a group is contacted, the plan implies one	Thank you for your comments. The study plan includes details on respondent selection under the <i>On-Site Visitor Survey</i> subsection in Section 2.6.2.2. No edits made.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				individual will be presented with the opportunity to do the survey, but that should be clarified.	
97.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.6.2.2 Visitor Survey	Consider use of an online survey similar to what Washington Trails Association did during the Sustainable roads study on Mt Baker Snoqualmie National Forest several years ago	Thank you for your comment. See response to Comment #89 above.
98.	Susan Rosebrough (NPS)	04/20/2020	Section 2.6.2.2 Visitor Survey	<p>The NPS recommends that the survey locations be defined per NPS Table 1.</p> <p>Page 2-27. Target Number of Surveys. The proposed count data is from 2014 visitor use data. Use has grown since then and NPS recommends using the most recent data to determine the survey counts. In 2019, Ross Lake National Recreation Area had 1,088,528 compared to 710,612 in 2014. A similar breakdown could be used with an increase based on the percentage of increase in use.</p> <p>Which sites were used to develop the count data in 2014, was it all the sites in Table 2.6.10? At a minimum, the NPS recommends that all of the sites in Table 1 be used for a count data for the surveys.</p>	Thank you for your comments. See response to Comment #s 7, 11, 32, and 37 regarding geographic scope/study sites. The target number of surveys was determined based on the 2014 FERC Form 80 data since this is the most recent use data that provides Project recreation use estimates. City Light recognizes that the Form 80 data does also include some non-Project recreation use data, but the 2014 data is still the most recent comprehensive use data for the Project. City Light understands that the NPS has some more recent use data for non-Project NPS use areas (North Cascades National Park and RLNRA), but this data does not include Project recreation facilities (unlike the 2014 data) and this study is a FERC study, not a North Cascades National Park or RLNRA study. No edits made.
99.	Dave Pettebone (NPS)	04/22/2020	Section 2.6.2.2 Visitor Survey	I do not recommend the survey administration being proposed here that splits respondents into on-site and mailback participants. o First, there is no way to gather non-response data from the “windshield survey” respondents. There may be systematic differences between those who complete the mailback surveys and those who don’t and there will be no way to estimate this difference. Furthermore, I do not think that OMB will approve of this approach.	Thank you for your comment. City Light understands the concerns raised regarding mailback surveys. Onsite survey administration is the primary and preferred method, but City Light also recognizes there may be limitations of onsite surveys at some study sites and proposes to use mailback surveys as a backup administration method. While extensive non-response data is not possible, City Light, at a minimum, will track the number of windshield surveys administered and calculate the response

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				<p>o Although there is a potential for a higher response rate by administering an onsite survey there are also some limitations.</p> <p>§ First, there are questions on the survey that ask respondents to forecast some of their plans that may or may not be accurate.</p> <p>§ A mailback survey would address this limitation although it introduces different limitations such as recall bias and potentially a lower response rate.</p> <p>· In other words, a trade off that must consider.</p> <p>§ It would be beneficial if an online survey option can be developed for visitors to complete the survey.</p> <p>· I.e. when respondents get home after their trip they can log on and complete the survey as an option.</p> <p>The NPS recommends that the survey be administered via intercepting individuals so that non-response data can be collected and the surveys can be distributed randomly and that survey respondents be provided an opportunity to mailback their responses with an option to complete the survey online (i.e. when respondents get home after their trip they can log on and complete the survey as an option).</p>	<p>rate. Finally, the use of mailback surveys (while not without drawbacks) is a common practice in FERC relicensings to supplement onsite surveys. City Light will make every reasonable attempt to intercept visitors for onsite surveys. No edits were made.</p>
100.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.6.2.2 Visitor Survey	Or online	Thank you for your comment. See response to Comment #89 above.
101.	Brian Lanouette (Upper Skagit Indian Tribe)	04/16/2020	Section 2.6.2.2 Visitor Survey	Are there any incentives in place to increase user participation (i.e. a lottery for people who mail-back the windshield survey). It can often be difficult to ensure voluntary participation without a motive to do so.	Thank you for your comment. City Light does not propose to include any incentives to increase user participation. City Light understands that mailback surveys have a low response rate, which is why City Light will always attempt to secure onsite surveys and not utilize mailback surveys. As detailed in the

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				User participation in the mail-back survey should be monitored and routinely analyzed to determine if the system is effective. If not, adaptive management should be employed to increase user participation.	study plan, City Light will provide a unique identification number for all mailback surveys so that the response rate may be tracked. No edits made.
102.	Brian Lanouette (Upper Skagit Indian Tribe)	04/16/2020	Section 2.6.2.2 Visitor Survey	Interactions with fish and wildlife should be included in the visitor surveys. This includes a fishing/creeel survey estimate to evaluate the impacts of recreational use on the fishery resources.	Thank you for your comment. See response to Comment #15 above.
103.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.6.2.2 Visitor Survey	In-Text Edit: Whether visiting the Project was the primary purpose of their trip, what activities do they plan to undertake, before, during and after their visit to the Project, etc.	Thank you for your suggested edit. The bulleted list of survey topics is intended to be an example of the types of questions and not be all-inclusive. No edits made.
104.	Dave Pettebone (NPS)	04/22/2020	Section 2.6.2.2 Visitor Survey	The study plan does not include any language about the NPS Information Collections Process (ICR) process which will be required to conduct this survey. If the survey only includes questions from the pool of known question we can anticipate a 4-6 month review period. If the study requires a full review process we can expect a 12+ month review.	Thank you for your comments. Comment noted.
105.	Dave Pettebone (NPS)	04/22/2020	Section 2.6.2.2 Visitor Survey	In terms of the statement "...will utilize questions from the NPS' Programmatic Clearance for NPS-Sponsored Public Surveys Pool of Known Questions (NPS 2015), where possible.", be aware that including questions on the survey that are not on the NPS pool of known questions will trigger the full OMB review that can take over 12 months to complete. Similarly, pre tests without OMB approval can only include 9 or less participants.	Thank you for your comments. Comment noted.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
106.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.6.2.3 Sampling Approach and Data Collection	See comment above about summarizing the data reported on the Form 80 reports for sites located outside of the Project Boundary.	Thank you for your comments. See response to Comment #45 above.
107.	Brian Lanouette (Upper Skagit Indian Tribe)	04/16/2020	Section 2.6.2.3 Sampling Approach and Data Collection	During survey target evaluation, will effort be increased if it is determined targets are not met?	Thank you for your comment. As stated in Section 2.6.2.3, "City Light will continuously monitor the survey returns to ensure survey targets are met during the established study year." No edits made.
108.	Dave Pettebone (NPS)	04/22/2020	Section 2.6.2.3 Sampling Approach and Data Collection	Table 2.6-8. Having reviewed the survey I believe the sample sizes will be too small to provide substantive answers some of the questions. Similar to the observation study, section 1.1.1.2 requires that data from this component of the study be used to generalize and develop estimates for specific locations in the study. The description of the visitor survey component will not provide enough data to develop site specific generalizations. If we only have enough data to roll up to the global level, results will be diluted by experiences of people at the different types of facilities where surveys will be distributed (i.e. boat launch ramps, visitor gallery, museum, picnic areas, etc.) As such I would recommend a minimum sample size of 35 completed surveys at each of the Recreation Facility/Study Site for a total sample size of ~600 completed surveys.	Thank you for your comment. City Light has revised the target survey approach to 35 completed surveys per study site or groupings of study sites, where facilities are neighboring and similar (i.e., Hozomeen/Winnebago Flats boat launches; Colonial Creek Boat Launch and Fishing Pier; and the cluster of Newhalem town study sites). Edits were made to reflect this change in approach.
109.	Rick Hartson (Upper Skagit Indian Tribe)	04/17/2020	Section 2.6.2.3 Sampling Approach and Data Collection	Separate sampling frequency will need to be developed for assessing use and impacts along transmission line corridor and mitigation lands. These areas will not follow the same seasonal use restrictions as the areas around the reservoirs.	Thank you for your comments. See responses to Comment #s 7, 11, 32, and 37 regarding geographic scope of the study. No edits made.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
110.	Susan Rosebrough (NPS)	04/20/2020	Section 2.6.2.3 Sampling Approach and Data Collection	NPS generally supports the timing proposed. However we recommend that the use of the river be counted during the winter months because this project affected use is year-around.	Thank you for your comment. See response to Comment #32 above.
111.	Gilje Kristofer (NCI)	05/03/2020	Section 2.6.2.3 Sampling Approach and Data Collection	The ELC is open and can be full during the winter.	Thank you for your comment. City Light will coordinate with the ELC to get visitor use data collected by the ELC as part of their program, as outlined in Section 2.6.3.2 in the study plan. No edits made.
112.	Brian Lanouette (Upper Skagit Indian Tribe)	04/15/2020	Section 2.6.2.3 Sampling Approach and Data Collection	Is this off peak-season for all recreation activities? What about hunting and fishing? Although a majority of the area is in NPS, some are in USFS. With that, hunting and fishing opportunities often peak in the fall, with some fishing opportunities peaking in the spring. How will the sporting usage be factored into this sampling frequency?	Thank you for the comments. Of note, hunting is not permitted within ¼-mile of any developed site within the RLNRA, which would effectively eliminate hunting as a use within the Project. Nonetheless, the study plan proposed by City Light is for the FERC Project recreation facilities and reservoirs and includes the spring (May-June) and fall (Sept-Oct) shoulder seasons. Thus, the current methodology would potentially intercept hunters or anglers at the Project recreation facility study sites during the off-peak season. No edits were made.
113.	Susan Rosebrough (NPS)	04/20/2020	Section 2.6.2.3 Sampling Approach and Data Collection	Other Survey Methods and Focus Groups <ul style="list-style-type: none"> Based on the results from the surveys and remaining questions, conduct focus group workshops with various user groups and communities to get additional feedback on specific issues, potential barriers to use, and potential management actions to address these issues. Conduct a potential user survey to understand what the barriers to visitation are to the project area. This survey will help us better understand why different communities aren't visiting; or conversely, what recreational facilities would be needed to encourage them to visit? 	Thank you for the comments. City Light does not propose to utilize focus groups as a means of visitor use data collection. Rather, City Light will rely on the study site visitor surveys to provide direct feedback on the Project recreation facilities and resources. Also, a user or market-type survey for a user populations outside the FERC Project Boundary goes beyond the needs for this study and City Light's responsibilities as a licensee. No edits made.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
114.	Susan Rosebrough (NPS)	04/20/2020	Section 2.6.3.1 Project Recreation Facility Use and Occupancy	<ul style="list-style-type: none"> • The NPS recommends that the scope of this study component be expanded per NPS Table 1. • Establish whether existing recreation use levels are below, approaching, at, or exceeding the area's ability to adequately accommodate recreational use without adversely impacting the facilities, ecological, social, or managerial capacity of the area, including the reservoir surfaces, the Skagit River, developed recreation sites, and dispersed use areas. The assessment should incorporate information from the impact analysis. • Use the results of the recreation carrying capacity analysis to help define potential capacity indicators and standards/guidelines and determine whether management actions may be needed to maintain use levels at or below established standards/guidelines. 	Thank you for your comments. See responses to Comment #s 7, 11, 32, and 37 regarding geographic scope of the study. The observation survey methods proposed by City Light are adequate to address the existing physical capacity of Project recreation facilities, and potential social or managerial concerns will be identified through visitor surveys and condition/accessibility/use impact assessments. Further, these study methods are consistent with other FERC relicensing recreation use studies. No edits made.
115.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.6.3.1 Project Recreation Facility Use and Occupancy	It is not possible to assess the adequacy of this approach without an estimate of the number of expected observations by the strata listed here (e.g., day type and time of day) by facility listed in Table 2.6-9.	Thank you for your comments. City Light has made edits to Section 2.6.2.3 to make it clear that the sampling frequency detailed in this section applies to both the observation and visitor surveys. Further, Section 2.6.2.1 details City Light's observation survey methods (onsite, in-person observation counts) to be conducted concurrently with visitor surveys during each visit to a study site.
116.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.6.3.1 Project Recreation Facility Use and Occupancy	Given the small sample size likely to result for each facility in Table 2.6-9 from the sampling frequency identified above on this page, the resulting variances on the observed counts within these strata would likely be very high and yield a confidence interval that would effectively make the visit estimates for the individual facilities statistically meaningless	Thank your for your comments. The methods detailed in the study plan are consistent with the sampling plans used in other FERC relicensings to assess recreation use and are adequate to characterize the use at the FERC Project. No edits made.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				because one would be unable to identify statistically-significant differences in use estimates between many of the facilities listed in Table 2.6-9. That is, the point use estimates may appear different, but the interval estimates of use for each facility would be so wide, that one will be unable to statistically say that use differs across individual recreation facilities listed in Table 2.6-9.	
117.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.6.3.1 Project Recreation Facility Use and Occupancy	How will the time of day of observations be incorporated in development of this observed recreation activity distribution given that time of day can reasonably be expected to influence recreation activity.	Thank you for your comment. As stated in Section 2.6.3.1, City Light will calculate and report the average existing use levels for several recreation parameters (e.g., people, vehicles, facility occupancy) by day type (i.e., weekend, weekday, holiday), and by time of day (i.e., morning, afternoon) during the survey season. No edits made.
118.	Gilje Kristofer (NCI)	05/03/2020	Section 2.6.3.1 Project Recreation Facility Use and Occupancy	Table 2.6-9. Why is the ELC listed as day use?	Thank you for your comment. In all applicable tables, the text has been edited to reflect overnight use as well as day use. Edits made to the text to reflect this.
119.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.6.3.2 Project Recreation Use Estimate	What is the process for ensuring that overnight use counts provided by another source (e.g., NPS campground counts) are not double counted in daytime use during the daytime observation counts (e.g., a camper parking their vehicle at a boat launch during the day) when the use estimate is combined upwards across facilities? That is, a Winnebago Flats campground users that also uses the Winnebago Flats boat ramp represents only one visit to the Ross Lake Resource Area.	Thank you for your comment. Since the study's observation counts use a different methodology than the other, non-Project recreation facility use data, there will be the possibility of double-counting. As such, the Project recreation use estimate, as detailed in Section 2.6.3.2, will provide a distinct use estimate for the Project recreation facilities as well as a separate non-Project recreation use estimate. Ultimately, these are estimates based on a variety of data sources and an explanation of these issues and discrepancies will accompany the reported Project and non-Project use estimates. Edits were made in the text to clarify the development

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					of Project and non-Project recreation use estimates given the inconsistent data collection between the two areas.
120.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.6.3.2 Project Recreation Use Estimate	For example, Ross Lake Resort As stated elsewhere surveys could be distributed here at this facility which clearly is linked to a project feature (Ross Lake). An explanation of why surveys will not be conducted at such sites should be provided.	Thank you for your comment. The Ross Lake Resort is a non-Project facility and City Light did not propose the Ross Lake Resort as a visitor survey study site since visitor's who may use the resort would be intercepted at the ferry study sites and the Ross Lake Resort dock. These study sites are the primary means of visitors accessing Ross Lake and potentially the Ross Lake Resort from this side of the reservoir. No edits made.
121.	Dave Pettebone (NPS)	04/23/2020	Section 2.6.3.2 Project Recreation Use Estimate	This section specifies the necessity of this study to bolster the sample size for the visitor survey and observation study. If the project recreation use estimate for each site are being derived for each Project Recreation Facility listed in table 2.6-9 then we will need to be able to develop reliable and representative estimates at each of these 17 sites from the visitor survey and use observation study. As currently described in this study plan the data derived from this study will not achieve the needs specified here.	Thank you for the comments. City Light has made edits to the text in Section 2.6.3.2 to make it clear that the intent is to develop a use estimate for the Project overall and not each site. Data from each site will be utilized to calculate the overall use estimate, but use will not be reported out by individual site.
122.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.6.3.2 Project Recreation Use Estimate	How will these facility-level use estimates be assessed to determine their statistical reliability? Is there a target size of the confidence interval around the point estimates of recreation use at individual facilities?	Thank you for your comments. See response to Comment #121 above.
123.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.6.3.2 Project Recreation Use Estimate	Section 2.6.3.1 states that observed use levels will be estimated by "time of day (i.e., morning, afternoon)" among others. That stratification is not reflected here, how will it be incorporated?	Thank you for your comments. See response to Comment #121 above.
124.	Susan Rosebrough	04/20/2020	Section 2.6.3.2 Project	. The NPS recommends expanding the scope of the study to include the sites listed in NPS Table	Thank you for your comments. See responses to Comment #s 7, 11, 32, and 37 regarding

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
	(NPS)		Recreation Use Estimate	<p>1. The NPS recommends that estimating the current use include the following steps:</p> <ul style="list-style-type: none"> • Summarize existing data. Analyze existing data on visitor use including backcountry overnight use, Ross Lake Resort use, case incident information/search and rescue, visitor contacts (front and backcountry), Environmental Learning Center use, developed campground use, commercial use, special permit use, hunting harvest numbers, trail counts, creel survey, 2007 visitor use study, the Ross Lake General Management Plan, and USFS data. • Collect visitor use data on day-use including trails, public river use, and other day-use areas. While overnight use is well captured in existing data collection methods, day-use remains unknown. • Collect data through visitor observations and counts, trail counters, and self-registry. • Collect data on the river use only through the winter as this is a year-around use affected by the project. 	geographic scope of the study. This study is focused on the FERC Project recreation use within the Project Boundary and not recreation use in areas outside the Project Boundary, such as the North Cascades National Park and surrounding areas. No edits made.
125.	Susan Rosebrough (NPS)	04/20/2020	Section 2.6.3.2 Project Recreation Use Estimate	Table 2.6-10. NPS does not have use data on this site.	Thank you for your comment. Comment noted.
126.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.6.3.2 Project Recreation Use Estimate	Table 2.6-10. The Forest Service National Visitor Use Monitoring Program does not generate a use estimate for this site. To be incorporated in this analysis, use would need to be estimated at this site as part of the study plan.	Thank you for your comment. The study plan methods do not include collection of visitor use data at non-Project recreation facilities. No edits made.
127.	Dave Pettebone (NPS)	04/23/2020	Section 2.6.3.2 Project	Larger sample sizes will need to be collected.	Thank you for your comment. The study methodology and survey targets are consistent with other FERC relicensing proceedings. City

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
			Recreation Use Estimate		Light's methodology for planning, implementing, and analyzing visitor surveys is consistent with professional practice (Salant and Dillman 1994; Watson et al. 2000) and professionally accepted survey practices for contacting visitors and choosing sample sizes (Dillman 2000). Assessing existing recreation use through a combination of observation and questionnaire surveys is a common practice for large geographic areas that contain multiple accesses to desired recreation use areas (Malvestuto 1996; Pollock et al. 1994; Watson et al. 2000; Yuan et al. 1995). No edits made.
128.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.6.3.2 Project Recreation Use Estimate	For all of these, see comments above as to making user profile surveys available at these sites.	Thank you for your comment. Visitors using the informational and educational centers and tours will be captured at adjacent study sites where visitors to these facilities must park or congregate before visiting the facilities. For example, Skagit Tours and ELC visitors will be intercepted at the ELC parking area study site; Skagit Information Center visitors will be intercepted at the Newhalem Main Street Parking Area study site; and Diablo Lake Ferry visitors will be intercepted at the West Ferry Landing study site (i.e., parking area and/or dock). No edits made.
129.	Gilje Kristofer (NCI)	05/03/2020	Section 2.6.3.2 Project Recreation Use Estimate	Confirm we are collecting the right data during the study period.	Thank you for your comment. City Light will coordinate with the ELC to assure NCI is collecting the appropriate data per the study. No edits made.
130.	Dave Pettebone (NPS)	04/23/2020	Section 2.6.3.2 Project Recreation Use Estimate	Larger sample sizes will need to be collected.	Thank you for your comments. See response to Comment #127 above.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
131.	Dave Pettebone (NPS)	04/23/2020	Section 2.6.3.2 Project Recreation Use Estimate	Larger sample sizes will need to be collected.	Thank you for your comments. See response to Comment #127 above.
132.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.6.3.2 Project Recreation Use Estimate	This will not be a useful way to incorporate Forest Service recreation use because the Forest Service does not have such data. Some other approach much be used to have this use represented in the study. One option is to have this site included following the approach used at other study sites. An alternative is to install a traffic counter at Forest Service sites to more correctly account for recreation at these sites. If that approach is adopted, some on-site observation will be necessary to parameterize the traffic counts to isolate river recreation traffic.	Thank you for your comments. City Light does not intend to conduct observation surveys at non-Project recreation facilities. No edits made.
133.	Susan Rosebrough (NPS)	04/20/2020	Section 2.6.4.1 Existing Unmet Demand Assessment	<p>Which survey questions will be used to collect unmet recreation demand?</p> <p>Review the Ross Lake General Management Plan for unmet demand information in addition to the other sources.</p> <p>Consider the changing demographics in the communities that the project is drawing from and what changes to the facilities may be needed due to cultural changes and consider other potential barriers to visitor use that could be address in license implementation.</p>	<p>Thank you for your comments. Question 20 on the questionnaire is the primary source of unmet demand data. However, other questions related to activity participation may also provide information related to unmet demand. City Light has edited the text in Section 2.6.4.1 to include review of the RLNRA General Management Plan.</p> <p>Regarding addressing changing demographics, City Light's proposed recreation measures for the term of the new license will take into account projections of future need, which will be based in part on demographic projections. These measures will be included in the DLA and FERC's NEPA documents where LPs will have an opportunity to review the basis for proposed recreation resource measures.</p>

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
134.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.6.4.1 Existing Unmet Demand Assessment	Contains ONLY LIMITED INFO ON Forest Service sites and landscapes	Thank you for your comment. Comment noted.
135.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.6.4.1 Existing Unmet Demand Assessment	What about meeting some of this demand with new project facilities and/or contributions to FS and NPS to do so?	Thank you for your comment. The study report will help City Light and LPs evaluate potential PMEs.
136.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.6.4.1 Existing Unmet Demand Assessment	As noted above, delineation of the study area to within the Project Boundary is inappropriate. For example, what about unmet recreation demand that exists for users who use the project as a launch pad for recreation into trails tributary to Ross Lake for example which could extend onto the OKA-WEN and MBS.	See responses to Comment #s 7, 11, 32, and 37 regarding geographic scope of the study. Recreation uses and opportunities outside the Project are not Project related recreation and beyond the scope of this FERC Project study.
137.	Dave Pettebone (NPS)	04/23/2020	Section 2.6.4.1 Existing Unmet Demand Assessment	I suggest a more detailed description about the questions and approach this will be addressed. I don't see questions on the visitor survey, as currently proposed in the attachment C, that would substantively answer this question.	Thank you for your comment. See response to Comment #133 above. City Light is open to adding or replacing questions to better address unmet demand on the questionnaire.
138.	Dave Pettebone (NPS)	04/23/2020	Section 2.6.4.1 Existing Unmet Demand Assessment	It seems that survey results about activities that respondents identify can be crosswalked with estimated use data at particular types of facilities and locations along with the infrastructure assessment to understand how many visitors are able to participate in various activities within the park/study area.	Thank you for your comment. The study report and the comprehensive resource effects analysis that will be developed and integrated during the preparation of the DLA would potentially provide this information. LPs will have an opportunity to consider effects of recreation resources in their review of the DLA in the NEPA process. In addition, per Section 2.6.6.1 of the study plan, City Light will provide the raw visitor and observation survey data to LPs in the statistical program format used (e.g., IBM SPSS software) as well as Microsoft Excel format, which will allow LPs to further analyze the data. No edits made.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
139.	Gilje Kristofer (NCI)	05/03/2020	Section 2.6.4.1 Existing Unmet Demand Assessment	Include NCI data on ELC visitation. NCI has substantial data going back to 2005 for ELC and further back for Newhalem Mountain School.	Thank you for your comment. City Light edited the text to include this data source as part of the “Review of Existing Recreation Use Trends” subsection. Edits made to the text to reflect this.
140.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.6.4.2 Future Recreation Demand Assessment	There should be discussion of how future demand within the project area could affect use (and demand) outside of the project area.	Thank you for your comment. The future recreation demand assessment, as with the study overall, will focus on the FERC Project. Further, the future demand assessment will project Project recreation use levels and primary activities and how they may change over the term of a new license. No edits made.
141.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.6.4.2 Future Recreation Demand Assessment	A robust discussion of changing recreation trends and predicted trends, demand, needs to be incorporated.	Thank you for your comment. See response to Comment #140 above.
142.	Susan Rosebrough (NPS)	04/20/2020	Section 2.6.4.2 Future Recreation Demand Assessment	Please add a review of the Ross Lake National Recreation Area General Management Plan, tourism information from Washington, and the Comprehensive Survey of the American Public to this list as this plan identifies some needs and expected trends.	Thank you for your comment. City Light edited the text accordingly to include these sources for review during the unmet demand assessment and/or the review of existing recreation use trends subsections. Edits made in the text to reflect this.
143.	Susan Rosebrough (NPS)	04/20/2020	Section 2.6.4.2 Future Recreation Demand Assessment	Research and identify alternative ways and adaptive management approaches to address recreation needs over 40-50 years.	Thank you for your comment. The comprehensive resource effects analysis that will be developed and integrated during the preparation of the DLA would potentially provide this information. LPs will have an opportunity to consider recreation needs and proposed measures to address identified needs in their review of the DLA in the NEPA process. No edits made.
144.	Susan Rosebrough (NPS)	04/20/2020	Section 2.6.4.2 Future Recreation Demand Assessment	Conduct a site analysis and alternative locations for the Colonial Creek campground, boat launch, and day-use area. This site is changing due to sedimentation of the reservoir and the boat launch is unusable by motorboats certain	Thank you for your comment. Studying the sedimentation issue at Colonial Creek Boat Launch is included in the Sediment Deposition in Reservoirs Affecting Resource Areas of Concern draft study plan. A comprehensive

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				times of the year. This trend is expected to worsen over the course of the next license. Conduct a site analysis to determine potential solutions to address this issue and explore alternative locations to provide similar amenities to the public.	resource effects analysis will be developed and integrated during the preparation of the DLA when LPs will have an opportunity to consider effects of sedimentation or other phenomena on recreation resources, if warranted, in their review of the DLA in the NEPA process. No edits made.
145.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.6.4.2 Future Recreation Demand Assessment	Include recently completed Washinton Trails Association study of the economic impact OF TRAILED RECREATION IN THE STATE	Thank you for your comment. City Light will review the study for relevance to the study plan methods. No edits made.
146.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.6.4.2 Future Recreation Demand Assessment	How will this information be used to predict future use and what does it mean practically?	Thank you for your comment. Existing recreation use trend data will merely provide insight into the current recreation use trends in the state/region to help City Light and LPs better understand what the future may look like. City Light will include population growth rates to project the overall Project recreation use estimate over the term of a new license period (i.e., 30 to 50 years). City Light will include outdoor recreation activity participation growth rates (Cordell 2012) and other appropriate sources on future projections, if available, to forecast Project recreation facility occupancy over the term of a new license period. Edits were made to the text to reflect the above clarifications.
147.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.6.4.2 Future Recreation Demand Assessment	Include annual OIA reports on recreation trends	Thank you for your comment. City Light will likely utilize the Cordell 2012 outdoor recreation activity participation rate data as it is more relevant to projecting future use by specific types of activities that correlate to the Project. The OIA reports do not have this same specificity and relevance to the study methods. No edits made.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
148.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.6.4.2 Future Recreation Demand Assessment	Here, above and below, this information will be useful if it establishes adaptive management provisions in the new project license.	Thank you for your comment. See response to Comment #143 above.
149.	Rick Hartson (Upper Skagit Indian Tribe)	04/17/2020	Section 2.6.4.3 Regional Uniqueness and Significance Assessment	As noted, these estimates will be very speculative. A more useful approach might development of a monitoring strategy that will be conducted over the course of the license and feed into an adaptive management framework.	Thank you for your comment. See response to Comment #143 above.
150.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.6.4.3 Regional Uniqueness and Significance Assessment	How will this be used to inform the Recreation Plan SCL will provide in its License Application?	Thank you for your comment. The regional uniqueness is simply another data point for consideration. If something is unique to the Project or the area, then it may require consideration for future recreation decision making. But, until the data is collected and analyzed, it is unclear exactly what the data will show and how it will be used for future recreation decision making. No edits made.
151.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.6.4.3 Regional Uniqueness and Significance Assessment	How will this be used to inform the Recreation Plan SCL will provide in its License Application?	Thank you for your comment. See response to Comment #150 above. This data helps inform the regional uniqueness of the Project or the Project's recreation resources. No edits made.
152.	Rick Hartson (Upper Skagit Indian Tribe)	04/17/2020	Section 2.6.4.3 Regional Uniqueness and Significance Assessment	Account for predicted changes to resources over the course of the license term. For example, if the the fisheries reservoir studies indicate changing trends in fish populations, how might this change fishing opportunities and the uniqueness or significance.	Thank you for your comment. If a reasonably foreseeable future event is known and quantifiable, then such an assessment could be made speculatively. No edits made.
153.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.6.4.3 Regional Uniqueness and Significance Assessment	Again, this is good information, how will it be used to inform the Recreation Plan for the Project?	Thank you for your comment. See response to Comment #150 above.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
154.	Susan Rosebrough (NPS)	04/20/2020	Section 2.6.4.3 Regional Uniqueness and Significance Assessment	<p>In-Text Edit: Recreation Needs Analysis</p> <p>Comment: Recreation Needs Assessment</p> <p>The NPS recommends that a recreation needs study component be developed to look at new or improved opportunities for recreation in the project area and identify management strategies to address visitor use for the Recreation Management Plan to be submitted as part of the license application. The study would:</p> <ul style="list-style-type: none"> • Synthesize recreation needs from the recreation resource and visitor use study components and existing plans including the Ross Lake GMP. • Explore new potential opportunities: The GMP identified the Highway 20 corridor along the project area as a potential area for new trails and camping. This study will look at potential opportunities to expand camping and trails in the highway 20 corridor including ADA accessible facilities. • Identify opportunities to identify cultural needs from various changing demographics in the communities that the project draws from (i.e. this could include need for facilities for larger family gatherings). 	Thank you for your comment. A comprehensive resource effects analysis will be developed and integrated during the preparation of the DLA when LPs will have an opportunity to consider recreation needs and proposed measures to address identified needs in their review of the DLA in the NEPA process. No edits made.
155.	Susan Rosebrough (NPS)	04/20/2020	Section 2.6.4.3 Regional Uniqueness and Significance Assessment	Recreation Plan Develop and Considering Conceptual Designs for New and Expanded Recreation Sites: Several sites in the project area are known to be at or approaching carrying capacity or need improvements or re-designs. Other studies and outreach have identified the need for these improvements. This study element will build on the existing information	Thank you for your comment. See response to Comment #154 above. However, the recreation resource effects analysis will be focused on the FERC Project study sites.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				and develop design options to address these needs as well as determine any potential impacts to natural and cultural resources. The study should evaluate the following areas: Hozomeen, Ross Lake parking, Sustainable trail from Ross Lake trailhead to the dam, Sourdough and Stetattle trailheads, Gorge Lake campground and day-use area, Visitor facilities in Newhalem (i.e. shower facilities), Goodell Put-in, Portage Site, Copper Creek Take-out.	
156.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.6.5 Data Entry and QA/QC Review of Data	What happens if the error (anomalous data) rate is high?	Thank you for your comment. The study outlines QA/QC procedures in Section 2.6.6 during data entry. In addition, City Light has edited the text in Section 2.6.2.2 (Visitor Survey) to include QA/QC measures by the recreation researcher upon completion of a survey by a respondent onsite. Specifically, the recreation researcher will review the survey for skipped questions and anomalous data or responses in order to maximize the quality of the survey data and minimize anomalous data during data entry. Edits were made to the text.
157.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.6.6.1 Data Analysis	This “user profile” information data is very important. See comments about broadening the survey outreach beyond “on site” (e.g., Parking lots) above.	Thank you for your comments. See response to Comment #89 above.
158.	Dave Pettebone (NPS)	04/29/2020	Section 2.6.6.1 Data Analysis	I suggest reporting results at a higher resolution based on the data being analyzed in section 1.1.1.2 It seems useful to see these estimates at this resolution since they are important to other results being investigated in this study. It appears that the researchers are going to code the data that will allow them to perform these analyses so reporting these results will not require much additional effort.	Thank you for your comment. City Light has edited the text to provide higher resolution of reporting by site or select groupings of sites (e.g., town of Newhalem sites). Edits made in the text.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
159.	Brian Lanouette (Upper Skagit Indian Tribe)	04/16/2020	Section 2.6.6.1 Data Analysis	Details on the descriptive statistics and rational for model selection are needed.	Thank you for your comment. City Light edited the text in Section 2.6.1 to include more detail on the descriptive statistics that will be used, which is consistent with other FERC relicensing proceedings where recreation visitor survey results are reported. Edits were made to the text.
160.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.6.6.1 Data Analysis	This is inconsistent with statements in 2.6.2 and elsewhere that results will be reported at the facility level.	Thank you for your comments. See response to Comment #158 above.
161.	Dave Pettebone (NPS)	04/29/2020	Section 2.6.6.1 Data Analysis	Non-response bias may be confounded by the mixed survey distribution (i.e. windshield survey).	Thank you for your comment. Comment noted. City Light recognizes this is a limitation of the study design, but City Light considers these acceptable methods to meet the goals and objectives of the study, and these methods have been successfully applied in other FERC relicensing proceedings.
162.	Dave Pettebone (NPS)	04/29/2020	Section 2.6.6.1 Data Analysis	The sample size to produce these desired results will need to be larger to produce reliable results. One observation per day will not provide enough resolution to say anything meaningful about types and frequencies of use occurring within each Project recreation resource area.	Thank you for your comments. City Light considers these acceptable methods to meet the goals and objectives of the study, and these methods have been successfully applied in other FERC relicensing proceedings.
163.	Dave Pettebone (NPS)	04/29/2020	Section 2.7 Consistency with Generally Accepted Scientific Practice	The Dillman approach does not include windshield surveys.	Thank you for your comment. Comment noted.
164.	Bob Mierendorf (Upper Skagit Indian Tribe)	04/17/2020	Section 2.7 Consistency with Generally Accepted Scientific Practice	Who will implement this methodology? What are the professional qualifications required to collect interview data in order to insure analyses will meet acceptable scientific standards?	City Light's field team will implement the study methodology. The field team will be trained by qualified researchers with experience implementing these types of studies using similar methodologies and in numerous other FERC relicensing proceedings.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
165.	Susan Rosebrough (NPS)	04/20/2020	Section 2.8 Schedule	Include OMB approval process	Thank you for your comment. City Light believes only FERC approval, not OMB approval, is needed for City Light to implement this FERC recreation study and visitor use questionnaire within the FERC Project boundary and for the purposes of informing the relicensing process. No edits made.
166.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.8 Schedule	As of 05/04/2020 Federal and State public lands are closed in WA due to COVID-19. This global pandemic may have lingering effects on recreation use. This should be considered when deciding survey timing, techniques, and analysis.	Thank you for your comment. Comment noted.
167.	Nikolai Ferrell (USFS)	05/04/2020	Section 2.8 Schedule	Flagging a typo here—"begin"	Thank you for your comment. Comment noted.
168.	Brock Applegate (WDFW)	05/04/2020	Section 2.8 Schedule	In-Text Edit: 2021	Edit accepted.
169.	Brock Applegate (WDFW)	05/04/2020	Section 2.8 Schedule	In-Text Edit: Initial Study Final Report (ISR)	Thank you for the edit. No changes were made to the schedule in the draft study plan as City Light intends to complete the study within one year and wants to be clear with FERC and LPs on the proposed schedule. City Light believes that it will be beneficial to all parties to have information from the studies available as soon as possible to inform development of management plans.
170.	Brock Applegate (WDFW)	05/04/2020	Section 2.8 Schedule	In-Text Edit: <input type="checkbox"/> ISR Meeting <input type="checkbox"/> Request for study plan modification (if needed) <input type="checkbox"/> Observation and Visitor Surveys (if needed) April – October 2022 <input type="checkbox"/> Facility Inventory, Condition, Accessibility, and Use Impact Assessments (if needed) June – July 2022	Thank you for your comments. See response to Comment #169 above.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				<input type="checkbox"/> Boat Ramp Usable Periods Assessment (if needed) April – October 2022 <input type="checkbox"/> QA/QC Review and Data Entry (if needed) May – December 2022 <input type="checkbox"/> Data Analysis (if needed) November 2022–January 2023 <input type="checkbox"/> Final Report (if needed) March 2023	
171.	Bob Mierendorf (Upper Skagit Indian Tribe)	04/17/2020	Attachment B	In the 3rd map down, the “Goodell Creek Boat Access Site” should read “Goodell Picnic Shelter and Boat Launch”	Thank you for your comments. The name “Goodell Creek Boat Access Site” is consistent with the name in the PAD and in the current license settlement agreement. No edits made.
172.	Bob Mierendorf (Upper Skagit Indian Tribe)	04/17/2020	Attachment B	In the same map, note for accuracy that there is NO creek as shown, that runs west of Newhalem Cr. through NPS’ Newhalem Cmpgrd. and that enters the Skagit across from Goodell launch and picnic shelter.	Thank you for your comments. City Light will work with the GIS team to try to remove that unmarked creek in future maps.
173.	Brock Applegate (WDFW)	05/04/2020	Attachment C	Please include the reservoir elevations that boaters can use the ramp. Inspect bottom end of ramp at low pool.	Thank you for your comments. The usable boat ramp elevations will be addressed in Section 2.6.1.5 and not part of the field inventory and condition assessment. Regarding inspecting the bottom end of the ramp at low pool, see response to Comment #67 above.
174.	Brock Applegate (WDFW)	05/04/2020	Attachment C	How about trail condition?	Thank you for your comment. City Light edited the form to include condition of the trail.
175.	Brian Lanouette (Upper Skagit Indian Tribe)	04/17/2020	Attachment C	Fish and wildlife interactions need to be added to this list. An active creel survey would accomplish this (separate from the volunteer form listed in Appendix C) and should be required due to the project’s ongoing impacts to reservoir fisheries. Existence and ongoing maintenance of project roads, trails, and boat ramps facilitates access to the reservoirs, thereby impacting fishing pressure. Ongoing reservoir operations and mitigation programs	Thank you for your comment. Regarding the creel survey, see response to Comment #15 above. Regarding the restroom solid waste disposal, see response to Comment #72 above. Regarding boating pressure, such an analysis is beyond the scope of this land-based use impact assessment form. City Light edited the impact form to include presence of campsites out of designated areas and evidence of illegal fish and wildlife harvest.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				<p>for resident fish above Gorge impact angling opportunity and user experience.</p> <p>Also, add the status of refuse/solid waste disposal for restroom faculties (see previous in-text comments).</p> <p>The presence of campsites out of designated areas needs to be added to use impact evaluation.</p> <p>Record signs of illegal fish and wildlife harvest.</p> <p>Boating pressure needs to be added to this impact form. Include size of boat and motor, to assess potential for boat wake to erode reservoir shorelines.</p>	
176.	Susan Rosebrough (NPS)	04/20/2020	Attachment C	<p>1. The document talked about recording damage to vegetation from things like hatchet marks etc and this form only addresses cutting down trees.</p> <p>2. Cutting trees - How are you going to determine the difference between what was cut by NPS or SCL for maintenance/site clearing vs visitors?</p>	Thank you for your comments. City Light edited the form to expand tree damage beyond just cutting down trees. Based on site conditions, City Light's recreation researchers will need to make a determination in the field about whether the tree cutting appears to be maintenance related versus visitor related.
177.	Rick Hartson (Upper Skagit Indian Tribe)	04/17/2020	Attachment C	Number of trees over 6" DBH felled.	Thank you for your comments. City Light edited the form to include this item.
178.	Susan Rosebrough (NPS)	04/20/2020	Attachment C	Assess impacts to vegetation, trampling.	Thank you for your comment. Impacts to vegetation/trampling is covered under the "Bare Ground" variable on the form.
179.	Rick Hartson (Upper Skagit Indian Tribe)	04/17/2020	Attachment C	Separate question for ORV stream crossings.	Thank you for your comments. City Light edited the form to include this item.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
180.	Susan Rosebrough (NPS)	04/20/2020	Attachment C	Many of the questions like distance from creeks, fire rings, tent pads availability are not needed for NPS managed sites as they are already covered in the standards	Thank you for your comment. Comment noted.
181.	Susan Rosebrough (NPS)	04/20/2020	Attachment C	An important component that is needed is to understand what bareground is outside the designated site and what is inside. The impacted areas that we are looking for is areas outside of designated tent pads being used for camping, and fire rings being created out side of designated NPS sites. The bare ground category does not help determine if the amount of bare ground is acceptable for the type of site or allow for any way to determine if the amount of bare ground has increased or will increase in the future. Mapping of the sites, amount of bare ground, and user-created trails is needed.	Thank you for your comment. City Light edited the “Bare Ground” question to focus on the areas outside the designated site. Regarding additional quantitative bare ground impact data collection, City Light believes the current use impact information is adequate to make decisions about future site management, particularly as it relates to the FERC Project recreation facilities.
182.	Susan Rosebrough (NPS)	04/20/2020	Attachment D	<ul style="list-style-type: none"> How do we define the term “recreation facility”? Is it a reservoir, a National Forest, a boat ramp, parking lot <ul style="list-style-type: none"> The wording in the latter parts of the survey suggest it is a reservoir or something similar. The term recreation facility vs the terms “reservoirs or areas” will be confusing for respondents. 	Thank you for your comment. “Recreation facility” refers to the facility identified in the first question on the questionnaire. City Light has made edits the questionnaire to make it clear the focus of the questions is on the “recreation facility/reservoir” as most of the questions seek input on the specifics at the Project recreation facility but also the overall Project reservoirs as well. In addition, City Light edited the first question identifying the location of the survey to include the Project reservoir as well as the Project recreation facility where the survey is being administered.
183.	Nikolai Ferrell (USFS)	05/04/2020	Attachment D	In survey question 2, the survey does ask visitors if they also visited Forest Service land on their present visit. However, I think visitors will NOT properly answer this question because they lack reliable understanding of	Thank you for your comment. City Light intends to include a detailed map for the recreation researchers intercepting visitors and for inclusion in the mailback survey package. As such, City Light edited Section 2.6.2.2 to

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				<p>public land agencies and local ownership. As result, 1) it is doubtful visitors will know whether they visited Forest Service land (and certainly not MBS NF versus Oka-Wen NF) unless they are presented with a detailed map, and 2) without a clear definition for the respondent of what the “current trip” entails it is unclear of if they are given us information about the present visit.</p> <p>Survey question 2 could be improved to provide more information about use within the project boundary and periphery lands by including more detailed locations and a map.</p>	include this detail. Regarding potential confusion about what “current trip” means, City Light’s recreation researchers will address this during their introduction and explanation of the survey questionnaire. Current trip is their trip from home that includes a stop at the site where the interview is taking place. Depending upon visitor, the “current trip” may be just a visit to the study site/reservoir or it could be part of a larger trip. Questions 3 and 4 on the questionnaire will inform what type of trip it was.
184.	Nikolai Ferrell (USFS)	05/04/2020	Attachment D	In-Text Edit: Where did you stay? _____	Thank you for your suggested edit. City Light did not adopt this edit since part C of the question addresses where the respondent stayed overnight. No edits made.
185.	Nikolai Ferrell (USFS)	05/04/2020	Attachment D	Could Question 3 be expanded so Forest Service campgrounds are listed as a discreet lodging segment. That would provide the potential ability to describe how frequently recreation users within the project boundary are using FS campgrounds as part of their recreation.	Thank you for your comment. City Light edited the responses to include Forest Service campground.
186.	Nikolai Ferrell (USFS)	05/04/2020	Attachment D	Given the interest stated in section 2.6.4.3 and elsewhere it might be useful to expand this question to gather more specific information on the nearby destinations that are included in the recreation trip to the project. That might include collecting information on a map included in the survey.	Thank you for your comments. Responses to questions 2 and 4 will provide this information. No edits made.
187.	Nikolai Ferrell (USFS)	05/04/2020	Attachment D	In-Text Edit:	Thank you for your comment. The combination of the first and third response options as

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				<input type="checkbox"/> This recreation facility/reservoir or other recreation facility/reservoir in the Project is my primary destination	originally written for this question addresses this suggested edit. No edits made.
188.	Susan Rosebrough (NPS)	04/20/2020	Attachment D	Since we have the zip code already, this is questions could be removed and the information derived from the zip code.	Thank you for your comment. City Light agrees with your suggested edit, particularly to keep the questionnaire as short as possible.
189.	Nikolai Ferrell (USFS)	05/04/2020	Attachment D	In-Text Edit: X. Where did your trip start? _____	Thank you for your suggested edit. See response to Comment #188 above.
190.	Nikolai Ferrell (USFS)	05/04/2020	Attachment D	Should be broken out by day hiking and walking and BACKCOUNTRY hiking.	Thank you for your comment. City Light edited the response options as suggested.
191.	Susan Rosebrough (NPS)	04/20/2020	Attachment D	Please include the following activities: viewed wildlife, viewed lakes, took photographs, had a picnic, camped overnight in backcountry away from lakeshore, camped overnight at boat-in campsite, camped overnight in car/drive-in campground, read educational displays and materials, went horseback riding, went climbing.	Thank you for your comment. City Light edited the response options to include most of these additional options. Respondents have the option to provide “other” responses, if needed.
192.	Nikolai Ferrell (USFS)	05/04/2020	Attachment D	Break out by developed and dispersed	Thank you for your comment. City Light edited the response options as suggested.
193.	Gilje Kristofer (NCI)	05/03/2020	Attachment D	Environmental Education	Thank you for your comment. City Light edited the response options as suggested.
194.	Nikolai Ferrell (USFS)	05/04/2020	Attachment D	On this trip or anytime?	Thank you for your comment. City Light edited the response to specify “on this trip.”
195.	Susan Rosebrough (NPS)	04/20/2020	Attachment D	FA03 Recreational Fisheries Issue form requested a creel survey to be conducted to assess mortality related to recreational fishing and to measure CPUE and HPUE for salmonids. As per comments from SCL at the last RWG, this study is not intended to fill any of those data gaps. Therefore, the NPS recommends that the fishing questions be removed from this survey and that a creel survey be conducted as a standalone study.	Thank you for your comments. City Light agrees that the angling questions are not essential for this study and has removed them. Regarding a creel survey, see response to Comment #15 above.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
196.	Brock Applegate (WDFW)	05/04/2020	Attachment D	Thanks Susan, WDFW agrees. We have standard forms and a survey methods manual to assist SCL in the implementation of the creel survey.	Thank you for your comments. See response to Comment #195 above.
197.	Nikolai Ferrell (USFS)	05/04/2020	Attachment D	Keep the angling questions and expand study area beyond reservoirs including downstream of the Gorge. Study should be able to answer the who/what/where regarding recreational and commercial angers. Could modify the questions as it is not necessary to have a full creel survey to understand public and commercial recreational angling use. It is important to understand the amount of use, the timing of use, access points used, and fishing locations on the river during a range of flows.	Thank you for your comments. See response to Comment #195 above.
198.	Susan Rosebrough (NPS)	04/20/2020	Attachment D	Is this going to be correlated with the level of the reservoir on the day they visited? The NPS recommends that the data be correlated.	Thank you for your comments. The visitor survey data could be correlated to the daily water surface elevation using publicly available elevation data. City Light does not intend to correlate the data as part of the study report. However, a comprehensive resource effects analysis will be developed and integrated during the preparation of the DLA when LPs will have an opportunity to consider Project effects on recreation resources in their review of the DLA in the NEPA process. No edits made.
199.	Susan Rosebrough (NPS)	04/20/2020	Attachment D	We assume this refers to facility conditions. It could potentially refer to other visitor behaviors. We may consider being a little more specific in this this wording.	Thank you for your comment. The question is meant to be general to capture any potential unsafe conditions. City Light edited the question to include “or behaviors.”
200.	Susan Rosebrough (NPS)	04/20/2020	Attachment D	Separate out motorized and human-powered boating activities.	Thank you for your comment. City Light edited the response options as suggested.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
201.	Gilje Kristofer (NCI)	05/03/2020	Attachment D	Parking? Where?	Thank you for your comment. City Light removed the overall crowding response option of “during your entire visit” as it is too vague.
202.	Gilje Kristofer (NCI)	05/03/2020	Attachment D	Crowded parking? Where?	Thank you for your comment. City Light edited the response options to include a parking area response.
203.	Nikolai Ferrell (USFS)	05/04/2020	Attachment D	Add stock use	Thank you for your comment. City Light edited the response options as suggested.
204.	Susan Rosebrough (NPS)	04/20/2020	Attachment D	Separate out motorized and human-powered boating activities.	Thank you for your comment. City Light edited the response options as suggested.
205.	Susan Rosebrough (NPS)	04/20/2020	Attachment D	This is not in the pool of questions. Can this be modified to another question on the list or removed?	Thank you for your comment. City Light has removed this question as Question 20 already addresses this topic.
206.	Susan Rosebrough (NPS)	04/20/2020	Attachment D	Add privacy screening at campsites to this list.	Thank you for your comment. City Light edited the response options as suggested.
207.	Gilje Kristofer (NCI)	05/03/2020	Attachment D	ELC	Thank you for your comment. City Light edited the response options as suggested.
208.	Gilje Kristofer (NCI)	05/03/2020	Attachment D	add ELC	Thank you for your comment. City Light edited the response options as suggested.
209.	Gilje Kristofer (NCI)	05/03/2020	Attachment D	Nonbinary	Thank you for your comment. City Light edited the response options as suggested.
210.	Susan Rosebrough (NPS)	04/20/2020	Attachment D	Include Hispanic or Not Hispanic option in demographics.	Thank you for your comment. City Light edited the questionnaire to include a “Hispanic or Latino” and “Not Hispanic or Latino” options.
211.	Susan Rosebrough (NPS)	04/20/2020	Attachment D	I am putting this as a comment and track changes so it can be seen better. Please add the following questions: • In order to understand where people are going, add the following or similar question (DEST5), that shows all the facilities listed in Table 1. DEST5	Thank you for your comment. City Light’s questionnaire includes a question similar to this (Question 2), focused on the FERC Project resources, not the National Park sites, which are not part of the FERC Project. No edits made.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				What other areas of the park do you plan to visit today? <input type="checkbox"/> Provide a list of specific locations within the [NPS SITE] <input type="checkbox"/> Use a map to show specific locations within the [NPS SITE]	
212.	Susan Rosebrough (NPS)	04/20/2020	Attachment D	Please add the following questions: • In order to better understand if parking is an issue for visitors, Please add the following series of parking questions (parking 10, 15, & 16) or a similar questions.	Thank you for your comment. City Light edited the questionnaire to include the PARKING15 question, but tailored it to the Project recreation facility/reservoir, not the National Park. City Light believes this question is adequate to address parking issues. The other questions (PARKING10 and PARKING 16) are too similar or too specific to the National Park setting (not the FERC Project) to include. Further, multiple questions on parking would unnecessarily add to the length of the survey, which is a concern for City Light during implementation (i.e., response rate).
213.	Susan Rosebrough (NPS)	04/20/2020	Attachment D	Please add the following questions: • To understand information about why people are motivated to visit this area, please add this (RecEXP 12) or a similar question. It is our understanding that we can modify the choices but not the question and still meet OMB requirements. The NPS recommends that we add a choice or two about enjoying the water or viewing the lakes as options.	Thank you for your comment. City Light did not include this question as it is lengthy (i.e., concerns about survey length and response rate) and other questions on the questionnaire are more focused on the recreation use and activity motivations, which is the focus of the survey overall. No edits were made.
214.	Susan Rosebrough (NPS)	04/20/2020	Attachment D	Please add the following questions: • To gather input on night skies, please include the following or similar question (NSKies11):	Thank you for your comment. City Light did not add this question to the questionnaire as it is not clear how the question would provide substantive information to help inform relicensing decisions regarding recreation resources at the Project. Rather, the Project Facility Lighting Inventory study will provide information to inform relicensing decisions

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					related to any Project impacts to night skies. No edits made.
215.	Susan Rosebrough (NPS)	04/20/2020	Attachment D	Please add the following questions: • To gather more input on relationship between lake levels and visitors, look at the new pool of questions (coming out soon) and see if there is a similar question that was asked in the 2005 survey (report published in 2007).	Thank you for your comment. City Light did not add this question to the questionnaire as the question is too vague and location specific to provide substantive information to help inform relicensing decisions regarding recreation resources at the Project.
216.	Susan Rosebrough (NPS)	04/20/2020	Attachment D	Please add the following questions: • To gather input on information sources please include the following or similar question (ITINN 22).	Thank you for your comment. City Light has edited the questionnaire to include simplified question that asks how visitors obtained information; City Light also modified the response options to apply to the FERC project. As written, the secondary question as part of the OMB question ITINN 22 (i.e., helpfulness) is lengthy and not necessary for the relicensing needs. Edits made to text to reflect this.
217.	Susan Rosebrough (NPS)	04/20/2020	Attachment D	Please add the following questions: • To better understand visitor impacts, please add the following or similar question (ATT1):	Thank you for your comment. City Light did not add this question to the questionnaire as it is not clear how the question would provide substantive information to help inform relicensing decisions regarding recreation resources at the Project. No edits made.
218.	Susan Rosebrough (NPS)	04/20/2020	Attachment D	Please add the following questions: • To better understand the visitor's lodging experience, please add the following question after #3, (ACCOM5):	Thank you for your comment. City Light did not add this question to the questionnaire as it is too specific to National Park settings and not the FERC project setting. Further, the questionnaire already has a question addressing visitors' lodging experience (Question 3). No edits made.
219.	Susan Rosebrough (NPS)	04/20/2020	Attachment D	Please add the following questions: • To gather information on unmet needs, the NPS would like to see a general question such as below, "Are there any additional recreation amenities or other changes would you like to	Thank you for your comment. City Light has added the first proposed question as it aids in understanding unmet demand. City Light did not include the other three proposed questions as they are not relevant to the FERC project or

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				see?” This question is not in the current pool of questions but some similar such as the ones listed could work. A new version of the known pool of questions should also be available in the coming months. DEST12 What change or changes would make you stay longer in the area? EVALSERV25 If you or your personal group used any of the above services, please describe any changes you would recommend to the current system. OPMGMT19 If you could ask Seattle City Light or the National Park Service to change some things about the way they manage this area, what would you ask them to do?	needed for relicensing decisions (i.e., DEST12 and EVALSERV25) or an existing question on the questionnaire is similar (i.e., OPMGMT19). Edits were made to the text to include the first question.
220.	Susan Rosebrough (NPS)	04/24/2020	Attachment D	In Text Edit: <i>NPS added table, referred to as NPS Table 1</i> NPS Table 1- Recreation Facilities for Inventory, Condition, Accessibility, Use Impact, Use Counts, and Survey Location	Thank you for your comments. See responses to Comment #s 7, 11, 32, and 37 regarding geographic scope of the study. No edits made.
221.	Susan Rosebrough (NPS)	04/27/2020	Attachment D	In-Text Edit: Hozomeen Visitor Center	Thank you for your comments. See responses to Comment #s 7, 11, 32, and 37 regarding geographic scope of the study. No edits made.
222.	Susan Rosebrough (NPS)	04/27/2020	Attachment D	In-Text Edit: Thunder Creek Thunder Knob Trail Diablo Lake Trail	Thank you for your comments. See responses to Comment #s 7, 11, 32, and 37 regarding geographic scope of the study. No edits made.
223.	Judy Neibauer (USFWS)	05/13/2020	General Comments	Connectivity for fish and wildlife is important. We have not really talked too much about studying how the project lies within any type of connectivity corridor for wildlife. For the new license it would be appropriate to look at adjacent connectivity corridors, to see how the project area intersects with them, and see how the project area could compliment connectivity	Comment noted. City Light encourages USFWS to propose connectivity issues as a discussion topic at upcoming Terrestrial Resources or Recreation Resources Work Group meetings.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				into the future within the term of a new license. This may be a new study, or combined with other studies, not sure where it fits in exactly, but it seems understanding where recreational areas intersect with connectivity would be important to understand.	
224.	Judy Neibauer (USFWS)	05/13/2020	General Comments	Recreational impacts from facilities, fishing, and boat/roads/access trails should be looked at where we have listed / sensitive fish and wildlife species. We will need to understand how these project elements intersect to understand impacts. Key issues that may be connected include how recreation may cause degraded habitat; how recreational fisheries impact bull trout; how recreation impacts spotted owl, marbled murrelet, G. Bear, and G. wolf; how recreation causes invasions of invasive species; and how recreational plans may affect potentially other future listing or sensitive species during the life of a new license. It will be important to integrate information from multiple sources of information and study plans for some of these evaluations.	Thank you for your comments. A comprehensive resource effects analysis will be developed and integrated during the preparation of the DLA. LPs will have an opportunity to consider effects of Project recreation, if warranted, on other resources in their review of the DLA in the NEPA process.
225.	Denise Schultz (NPS)	6/25/2020	Section 2.3 Background and Existing Information	This statement is incorrect and should be deleted. The National Park Service centennial was in 2016.	Thank you for the comment. The statement regarding peak use originally referred to 2016. Redline edits from licensing participants added 2019 visitor use data. The reference to the NPS centennial celebration has been removed from the study plan.
226.	Nlaka'pamux Nation Tribal Council (NNTC)	June 2020	General Comments	See Nlaka'pamux Nation Tribal Council letter included after this table.	Thank you for your comments. City Light acknowledges that NNTC has particular concerns about unanticipated discoveries as they may relate to Traditional Cultural Properties (TCP) and will be

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					<p>consulting with NNTC and other participants of the CRWG. City Light has cultural resources training protocols and unanticipated discovery plans in place for staff and contractors. These protocols and plans will be updated during the relicensing process in consultation with the CRWG.</p> <p>City Light acknowledges that NNTC has already inventoried and identified TCPs within the Project's Boundary as part of the current license and are in the process of evaluating National Register eligibility with the NPS. Any of the recreation sites City Light manages will incorporate management strategies for protection of TCPs in consultation with tribal and First Nations partners and City Light will work in coordination with the NPS for the protection of TCPs on the recreation sites they manage within the Project Boundary.</p> <p>As part of the relicensing process, City Light, in collaboration with the CRWG, is developing Study Plan CR-04, Inventory for Properties of Traditional Religious and Cultural Significance (PTRCS). This study plan will focus on identifying and evaluating PTRCS within the Project Area of Potential Effects, which is currently being developed with the CRWG. Project effects will also be evaluated as part of the relicensing process, and Project-related adverse effects on PTRCS will be resolved in consultation with the CRWG.</p>

NPS Table 1. Recreation Facilities for Inventory, Condition, Accessibility, Use Impact, Use Counts, and Survey Location.

<i>Name</i>	<i>Inventory</i>	<i>Condition</i>	<i>Accessibility</i>	<i>Use Impact</i>	<i>Observation Survey/ Use Counts</i>	<i>Carrying Capacity</i>	<i>Location for Visitor Surveys</i>
Ross Lake							
<i>Green Point</i>	<i>Compile from NPS data</i>	<i>Compile from NPS data</i>	<i>X</i>	<i>X</i>	<i>Compile from NPS data¹</i>	<i>X</i>	
<i>Cougar Island</i>	<i>Compile from NPS data</i>	<i>Compile from NPS data</i>	<i>X</i>	<i>X</i>	<i>Compile from NPS data</i>	<i>X</i>	
<i>Roland Point</i>	<i>Compile from NPS data</i>	<i>Compile from NPS data</i>	<i>X</i>	<i>X</i>	<i>Compile from NPS data</i>	<i>X</i>	
<i>McMillan</i>	<i>Compile from NPS data</i>	<i>Compile from NPS data</i>	<i>X</i>	<i>X</i>	<i>Compile from NPS data</i>	<i>X</i>	
<i>Spencer's</i>	<i>Compile from NPS data</i>	<i>Compile from NPS data</i>	<i>X</i>	<i>X</i>	<i>Compile from NPS data</i>	<i>X</i>	
<i>Big Beaver</i>	<i>Compile from NPS data</i>	<i>Compile from NPS data</i>	<i>X</i>	<i>X</i>	<i>Compile from NPS data</i>	<i>X</i>	
<i>May Creek</i>	<i>Compile from NPS data</i>	<i>Compile from NPS data</i>	<i>X</i>	<i>X</i>	<i>Compile from NPS data</i>	<i>X</i>	
<i>Rainbow Point</i>	<i>Compile from NPS data</i>	<i>Compile from NPS data</i>	<i>X</i>	<i>X</i>	<i>Compile from NPS data</i>	<i>X</i>	
<i>Devil's Junction</i>	<i>Compile from NPS data</i>	<i>Compile from NPS data</i>	<i>X</i>	<i>X</i>	<i>Compile from NPS data</i>	<i>X</i>	
<i>Ten Mile Island</i>	<i>Compile from NPS data</i>	<i>Compile from NPS data</i>	<i>X</i>	<i>X</i>	<i>Compile from NPS data</i>	<i>X</i>	
<i>Dry Creek</i>	<i>Compile from NPS data</i>	<i>Compile from NPS data</i>	<i>X</i>	<i>X</i>	<i>Compile from NPS data</i>	<i>X</i>	
<i>Ponderosa</i>	<i>Compile from NPS data</i>	<i>Compile from NPS data</i>	<i>X</i>	<i>X</i>	<i>Compile from NPS data</i>	<i>X</i>	
<i>Lodgepole</i>	<i>Compile from NPS data</i>	<i>Compile from NPS data</i>	<i>X</i>	<i>X</i>	<i>Compile from NPS data</i>	<i>X</i>	
<i>Lightning Creek Stock Camp</i>	<i>Compile from NPS data</i>	<i>Compile from NPS data</i>	<i>X</i>	<i>X</i>	<i>Compile from NPS data</i>	<i>X</i>	
<i>Lightning Creek Boat Camp</i>	<i>Compile from NPS data</i>	<i>Compile from NPS data</i>	<i>X</i>	<i>X</i>	<i>Compile from NPS data</i>	<i>X</i>	
<i>Cat Island</i>	<i>Compile from NPS data</i>	<i>Compile from NPS data</i>	<i>X</i>	<i>X</i>	<i>Compile from NPS data</i>	<i>X</i>	
<i>Little Beaver</i>	<i>Compile from NPS data</i>	<i>Compile from NPS data</i>	<i>X</i>	<i>X</i>	<i>Compile from NPS data</i>	<i>X</i>	

<i>Name</i>	<i>Inventory</i>	<i>Condition</i>	<i>Accessibility</i>	<i>Use Impact</i>	<i>Observation Survey/ Use Counts</i>	<i>Carrying Capacity</i>	<i>Location for Visitor Surveys</i>
<i>Boundary Bay</i>	<i>Compile from NPS data</i>	<i>Compile from NPS data</i>	<i>X</i>	<i>X</i>	<i>Compile from NPS data</i>	<i>X</i>	
<i>Silver Creek</i>	<i>Compile from NPS data</i>	<i>Compile from NPS data</i>	<i>X</i>	<i>X</i>	<i>Compile from NPS data</i>	<i>X</i>	
<i>Hozomeen Visitor Center</i>					<i>X</i>		
<i>Hozomeen Campground</i>	<i>Compile from NPS data</i>	<i>Compile from NPS data</i>	<i>X</i>	<i>X</i>	<i>Compile from NPS data</i>	<i>X</i>	
<i>Winnebago Boat Launch</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>
<i>Hozomeen Boat Launch</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>
<i>Ross Lake Resort</i>					<i>Compile from Ross Lake Resort</i>	<i>X</i>	<i>At Dock</i>
<i>Ross Dam Trail</i>	<i>Compile from NPS data</i>	<i>Compile from NPS data</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X (Trailhead)</i>
<i>Happy Creek Trail</i>	<i>Compile from NPS data</i>	<i>Compile from NPS data</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	
<i>East Bank Trail</i>	<i>Compile from NPS data</i>	<i>Compile from NPS data</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X (Trailhead)</i>
<i>Happy Panther Trail</i>	<i>Compile from NPS data</i>	<i>Compile from NPS data</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	
<i>Lightning Creek Trail</i>	<i>Compile from NPS data</i>	<i>Compile from NPS data</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	
<i>Devil's Dome Loop Trail</i>	<i>Compile from NPS data</i>	<i>Compile from NPS data</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	
<i>Desolation Peak Trail</i>	<i>Compile from NPS data</i>	<i>Compile from NPS data</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	
<i>Little Beaver Trail</i>	<i>Compile from NPS data</i>	<i>Compile from NPS data</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	
<i>Big Beaver Trail</i>	<i>Compile from NPS data</i>	<i>Compile from NPS data</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	
<i>Pacific Northwest Scenic Trail</i>	<i>Compile from NPS data</i>	<i>Compile from NPS data</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	
<i>Diablo Lake</i>							

<i>Name</i>	<i>Inventory</i>	<i>Condition</i>	<i>Accessibility</i>	<i>Use Impact</i>	<i>Observation Survey/ Use Counts</i>	<i>Carrying Capacity</i>	<i>Location for Visitor Surveys</i>
Skagit Tour Dock	X	X	X	X	SCL data		
West Ferry Landing (parking and dock)	X	X	X	X	SCL data		X
East Ferry Landing	X	X	X	X	SCL data		X
North Cascades Environmental Learning Center	X				NCI data		X
Diablo Overlook	Compile from NPS data	Compile from NPS data	X		Compile from NPS data	X	X
Colonial Creek Campground	Compile from NPS data	Compile from NPS data	X	X	Compile from NPS data	X	X
Colonial Creek Boat Launch and Dock	Compile from NPS data	Compile from NPS data	X	X	X	X	X
Buster Brown	Compile from NPS data	Compile from NPS data	X	X	Compile from NPS data	X	
Hidden Cove	Compile from NPS data	Compile from NPS data	X	X	Compile from NPS data	X	
Thunder Creek	Compile from NPS data	Compile from NPS data	X	X	Compile from NPS data	X	
Thunder Knob Trail	Compile from NPS data	Compile from NPS data	X	X	Compile from NPS data	X	
Thunder Point	Compile from NPS data	Compile from NPS data	X	X	Compile from NPS data	X	
Sourdough Mountain Trail	Compile from NPS data	Compile from NPS data	X	X	X	X	
Stetattle Creek Trail	Compile from NPS data	Compile from NPS data	X	X	X	X	
Diablo Lake Trail	Compile from NPS data	Compile from NPS data	X	X	X	X	
Diablo Dam			X			X	
Gorge Lake							
Ross Lodge Picnic Shelter	X	X	X	X	X	X	X
Gorge Lake Boat Launch	X	X	X	X	X	X	X
Gorge Overlook	Compile from	Compile from	X		X	X	

<i>Name</i>	<i>Inventory</i>	<i>Condition</i>	<i>Accessibility</i>	<i>Use Impact</i>	<i>Observation Survey/ Use Counts</i>	<i>Carrying Capacity</i>	<i>Location for Visitor Surveys</i>
	<i>NPS data</i>	<i>NPS data</i>					
<i>Gorge Lake Campground</i>	<i>Compile from NPS data</i>	<i>Compile from NPS data</i>	<i>X</i>	<i>X</i>	<i>Compile from NPS</i>	<i>X</i>	
Skagit River							
<i>Ladder Creek Falls Trail and Gardens</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>
<i>Trail of the Cedars</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>
<i>Newhalem Creek Campground</i>	<i>Compile from NPS data</i>	<i>Compile from NPS data</i>	<i>X</i>	<i>X</i>	<i>Compile from NPS data</i>	<i>X</i>	
<i>Goodell Put-in</i>	<i>Compile from NPS data</i>	<i>Compile from NPS data</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>
<i>Portage Site</i>	<i>X</i>	<i>X</i>		<i>X</i>	<i>X</i>	<i>X</i>	
<i>Copper Creek Take- out</i>	<i>Compile from NPS data</i>	<i>Compile from NPS data</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	
<i>Goodell Campground</i>	<i>Compile from NPS data</i>	<i>Compile from NPS data</i>	<i>X</i>	<i>X</i>	<i>Compile from NPS data</i>	<i>X</i>	
<i>Upper Goodell Campground</i>	<i>Compile from NPS data</i>	<i>Compile from NPS data</i>	<i>X</i>	<i>X</i>	<i>Compile from NPS data</i>	<i>X</i>	
<i>Lower Goodell Campground</i>	<i>Compile from NPS data</i>	<i>Compile from NPS data</i>	<i>X</i>	<i>X</i>	<i>Compile from NPS data</i>	<i>X</i>	
<i>Thornton Lake Trail</i>	<i>Compile from NPS data</i>	<i>Compile from NPS data</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	
<i>Rock Shelter Boardwalk and Trail</i>	<i>Compile from NPS data</i>	<i>Compile from NPS data</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	
<i>Marblemount and Sauk River Boat Launches</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>

1 Areas highlighted in green are already included in the draft study plan.

Conflict and Opportunity:

When the Nlaka'pamux Nation Tribal Council (NNTC) and Seattle City Light (SCL) signed an Agreement whereby the NNTC was to survey the Skagit Project APE around Ross Lake to create an inventory of Traditional Cultural Properties for the existing license, neither party was aware that in fact the level of the reservoir reached the level of the Nlaka'pamux trail corridor through the Upper Skagit River Valley. Used for millennia, this high-density use area and travel corridor for the Nlaka'pamux was well known by tribal members and was later documented ethnographically. On the shores of this now beautiful reservoir this valley has become a popular destination for modern outdoor enthusiasts.

The recreation mandate of the SCL agreements and the landowner (NPS,) facilitate modern recreational activities, activities that have impacted and will continue to impact cultural sites. Co-existence of both interests is currently not data supported and would be a first step to preserving the cultural sites. Recreation trails have frequently been built along and over traditional trails - for the obvious reason of this being the logical place to cross an area. But in the process, the integrity of the traditional indigenous trail is threatened: the function of the original trail could be lost. The traditional trail is the key to understanding the relationship of Nlaka'pamux to the valley's resources – trail marker trees point to camp sites and other resource trails or resource sites. One expects to find everything one needs for a short or long, summer or winter stay close to, or signposted along this trail. We have found places where the indigenous trail is parallel and very close by but was burdened and obscured by the debris of the recreation trail maintenance. In some instances it has been built over and erased. We have found stumps of culturally modified trees close to modern camp sites – though it must be said these were cut down some time ago. Where there is no clear intention to survey for Cultural Sites before enhancing recreation facilities, many existing traditional sites can be destroyed or over built – not deliberately but through oversight and cultural unfamiliarity.

Western concepts of camps and camping are understood in a temporary context and as such camps sites are given relatively short shift in order of significance. The definition of modern camping involves overnight stays away from home. But, for indigenous nations in the northwest, these sites are part of a whole and permanent cultural, economic and spiritual context. Elders

and early anthropologists have described the traditional Nlaka'pamux life-style as logistically organized, dependent on an intimate knowledge, strategic stewardship of and deep relationship with every part of the territory, from the high mountain ridges through the resource-rich watersheds. At different seasons and for different resources groups from different communities would stay at specific locations for months at a time on a regular basis. These were not temporary encampments and as such of temporary significance: These were homes, they were chosen very deliberately and specifically for their locations. Modified trees show that habitations were constructed, either summer mat lodges or winter dwellings where the depressions are still visible. There is evidence of various land management techniques including intentional burning to improve the berry crops and to attract deer to the fresh green grasses of the spring. The footprint is very light to unfamiliar eyes but to Nlaka'pamux they are at the core of our identity.

Spiritual sites are always found near camp locations and is a primary decision variable for choosing a camp location. Modern recreational camp sites have been built close by a number of Nlaka'pamux spiritual sites. The area was not surveyed for cultural sites prior to the construction of these recreational camps and as a result questions of audio sheds and visual sheds were obviously not considered. There is also the minor but cumulative affects such as: trampling, burning fuel, moving cobbles, obscuring of previous use.

We are in a situation where different interests, cultural and recreational and each absolutely valid in their own way, are in conflict in this long narrow APE. In fact, the modern recreational planner can identify the specialness of the place, they are just seeing how the place is special for their needs, just as Nlaka'pamux identifies it for theirs, as they have for millennia. Any plans for enhancing recreational access and activities could further damages and desecrate cultural sites in the Ross Lake Recreation Area which includes the APE for this relicense. The Relicensing Process could be an opportunity to resolve conflict and find ways to enhance each others interest.

Study Plan does not Address Conflicting Interests

Conflict is inherent within The Draft Recreation Assessment Study Plan The Study Plan Goals and Objectives (2.1) refer only to the Project recreation sites and facilities – they don't include the recreation facilities and activities within the Project Boundary around Ross Lake which are managed by the NPS.

The goals of the study (2.2) include a stated intention to

- * identify user conflicts and resource impacts as a result of recreational use.

The methodology however does nothing to address the conflict between extant traditional cultural sites and recreation activities-or the activities of the people collecting the data for this study. To date SCL and NPS research has not included traditional cultural properties: their focus has been on identifying and researching archaeological sites and physical structures of the built environment. US Tribes and Canadian First Nations have had to take responsibility for the identification and protection of their own cultural sites – a task for which the indigenous people of course have the expertise but a task which nevertheless needs to be included in the comprehensive research required for relicensing - and given equal significance to the other resource research.

The methodology for the Ross Lake area does not appear to include an avenue “to provide information to help LP’s with responsibility for recreation and land use within the Project area to identify potential measures for consideration in a recreation management plan for the Project.” It is clear from the Draft that it is up to the individual LP’s themselves to identify their concerns and to propose management and mitigation measures. But there is no mention of any place where such concerns and proposals would be received, let alone considered or acted upon.

Likewise the Draft Study Plan refers to the legislation for the protection of archaeological and physical buildings sites and it does not note that the legislation is supposed to offer the same protection for traditional cultural properties. This is of particular relevance because of Nlaka’pamux experience over the last decade. While FERC has jurisdiction and the SCL holds the licence in the area, they take no responsibility for any potential or real damage for sites or facilities in the NPS-managed Project Areas. When any concern has been broached the responsibility for any mitigation appears to have been referred back and forth between the SCL and the NPS – and there has been no resolution for the Nlaka’pamux. As the NPS mandate concentrates on archaeology sites at Ross Lake (there are no historic buildings) there is no mechanism in place where such “user conflicts” can be resolved. “User conflicts” – such as protection of the principal Nlaka’pamux trail – is currently our responsibility. It is a great and unnecessary expense and could be easily resolved with co-operation.

The NNTC TCP is not constrained to the Project Boundary: the old trail circulated through the area as a main artery from which many trails lead off. In the light of NNTC experience of cultural surveys and research in all other Nlaka'pamux watersheds, we know that there are many more Traditional Cultural Properties outside of this FERC APE. Recreation trails too, lead away from the shoreline camp facilities to explore the superb mountain terrain around them. Of course the mountains have attracted people from all over the world for the last 150 years and initially they likely followed traditional indigenous trails. But the excellent NPS-camp and SCL-constructed boat access facilities along the banks of the Ross Lake reservoir, within the Project area, now draw thousands of visitors – as documented in the Study Plan. This popular access to areas outside of the Project presents an extension of the Nlaka'pamux concern about preservation of Nlaka'pamux traditional cultural properties. The number of well-maintained new NPS recreation trails for the exploration of the surroundings area would not have been built **but for** the facilities within the FERC APE and the license-based agreement between the SCL and the NPS.

Resolution:

The location co-incidence of the high-density recreation use of the Ross Lake lakeshore and the Nlaka'pamux traditional cultural property was not foreseen – but it exists. This is opportunity for a further **protocol to be developed at least between the SCL and the NPS** and hopefully with the Nlaka'pamux at Ross Lake and Tribes south of the Ross Dam along the transmission and mitigation areas whereby preservation and mitigation issues regarding TCP's are finally identified, protected where possible by avoidance, minimizing affect or mitigating affects of the recreation fueled by this FERC license.

The most immediate concern for the Nlaka'pamux is the protection of our cultural sites within the Upper Skagit River Valley travel corridor. While considering the future of recreation activities here and for drawing up a general management from this research, it is axiomatic that current concerns and problems be addressed in the recreation study plan.

We have noted that many of our concerns deal with unfamiliarity with cultural practices and history of the original inhabitants of the Valley. What is required is an **Unanticipated Discoveries Protocol** training so any SCL or NPS personnel on the ground for any reason would

improve their chances of knowing if they have inadvertently encountered a TCP – such training obviously led by or in conjunction with the Tribes or First Nation who call this area home.

This is critical to all recreation studies for the area – but precisely during the next five years when the lands around the dams and the hydro project will all be meticulously researched for so many different reasons. Twenty-four study plans are currently being developed and more are intended. How does SCL propose to make certain that all the field researchers associated with the relicense process do not damage cultural sites? The NNTC is particularly concerned as to how SCL proposes to co-ordinate with other agencies such as NPS-on all actions that would not be happening **but for** the existing license and the relicense.

NNTC recommends that any management plan or protocol include such a co-operative mechanism, to be negotiated between the interested parties, land managers and agencies who are responsible for actions that result from the FERC license – this should include all work that is funded or required by FERC agreements.

The Recreation Assessment Study should co-ordinate user interests, into consideration early in the planning stages. The existing cultural sites, the living indigenous relationship to the lands are not incidental in the real world, nor in the legislative one ... and it prudent and legally defensible to **incorporate this relationship into the study and management plans from the start.**

Recommendations:

- NNTC to complete survey and documentation of cultural sites within FERC boundary prior to more field scientists working in the APE.
- Training Protocols for all personnel – including for Unanticipated Discoveries Protocol.
- Protocol for protection of existing TCP locations during 5 yr. period of intense multidisciplinary studies in area
- Protocol for delineating areas of responsibility for management for and mitigation measures for TCP's.

NNTC.

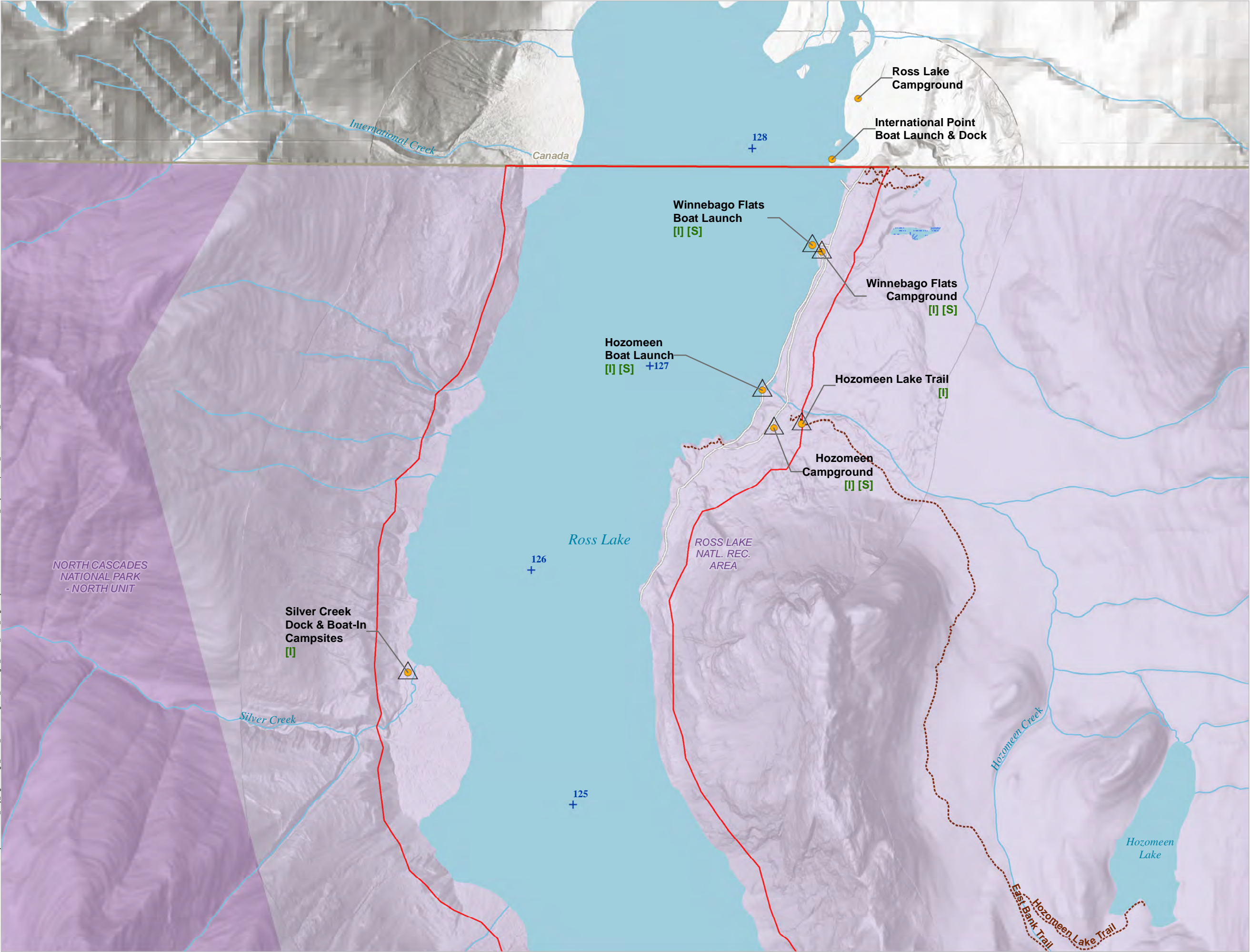
June 2020.

**RECREATION USE AND FACILITY ASSESSMENT
REVISED STUDY PLAN**

ATTACHMENT B

STUDY SITE MAPS

Document Path: \\sac-srv01\GIS\Projects\Seattle_City_Light\Skagit_FERC_Reliensing\7.2_Working\1_MXD_SkagitStudyPlan\Recreation\MAPBOOK_ProfDevelopment_RefFacils_11x17_L.mxd

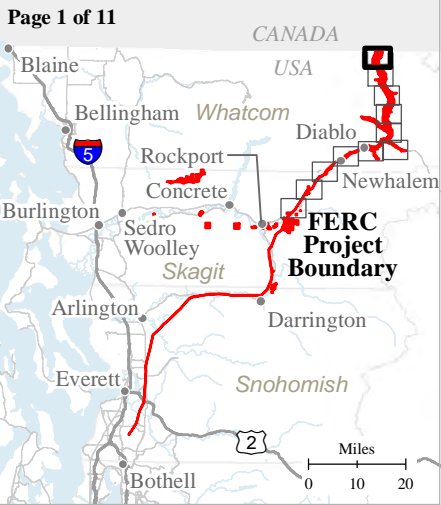
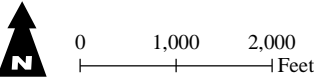


RECREATION USE AND FACILITY ASSESSMENT STUDY SITES (RA-01)

- FERC Project Boundary
- Mitigation Parcel
- Project River Miles (PRM)
- National Park Service
- National Recreation Area (NPS)
- Trail (NPS, non-Project)
- Recreation Facility (NPS/non-Project)
- RA-01 Study Sites

Specific RA-01 Study Elements (see study for details)

- [I] Inventory, Condition, Accessibility, and Use Impact Evaluations
- [S] Visitor and Observation Surveys
- [A] Trail Accessibility Evaluations
- [C] Trail Counter



SKAGIT RIVER HYDROELECTRIC PROJECT (FERC NO. 553)

Created on 3/25/2021 by HDR for Seattle City Light. City Light provides no warranty, expressed or implied, as to the accuracy, reliability or completeness of this data. Data Source: Recreation Sites, Campsites - Seattle City Light. Campsites, Trails - NPS.

Document Path: \\sac-srv01\GIS\Projects\Seattle_City_Light\Skagit_FERC_Reliensing\7.2_Working\1_MXD_SkagStudyPlan\Recreation\MAPBOOK_ProfDevelopment_RefFacils_11x17_L.mxd

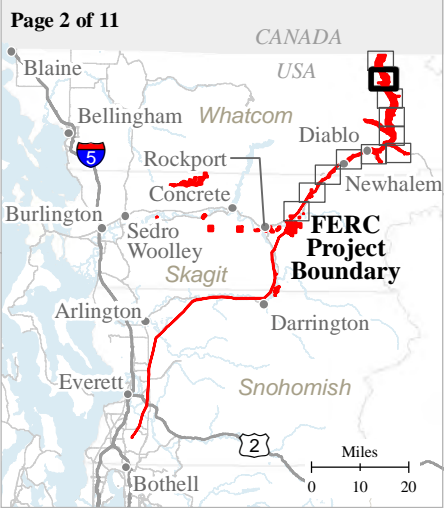
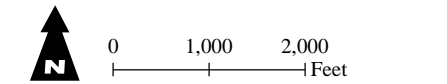


RECREATION USE AND FACILITY ASSESSMENT STUDY SITES (RA-01)

- FERC Project Boundary
- Mitigation Parcel
- Project River Miles (PRM)
- National Park Service
- National Recreation Area (NPS)
- Trail (NPS, non-Project)
- Recreation Facility (NPS/non-Project)
- RA-01 Study Sites

Specific RA-01 Study Elements (see study for details)

- [I] Inventory, Condition, Accessibility, and Use Impact Evaluations
- [S] Visitor and Observation Surveys
- [A] Trail Accessibility Evaluations
- [C] Trail Counter

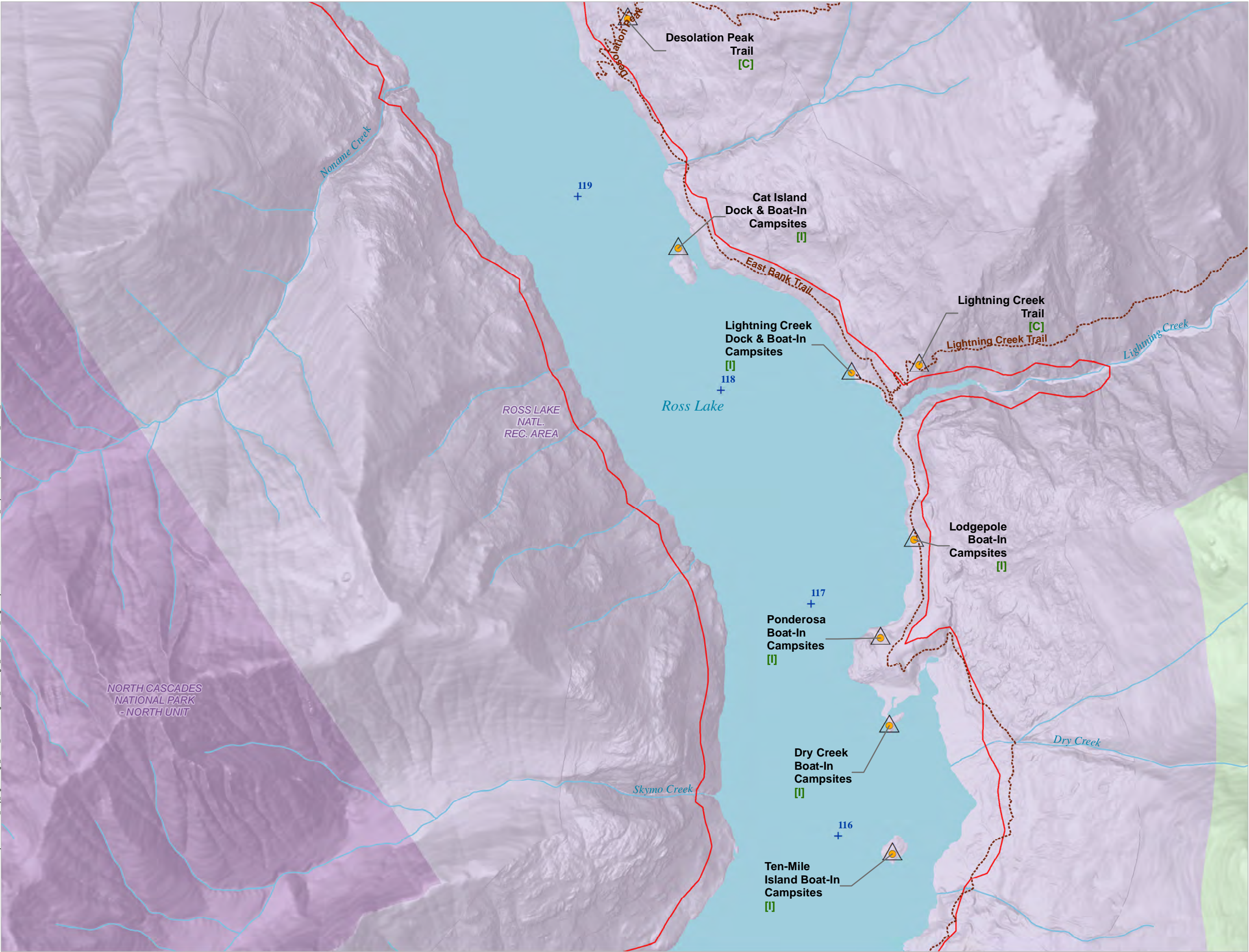


Seattle City Light

SKAGIT RIVER HYDROELECTRIC PROJECT (FERC NO. 553)

Created on 3/25/2021 by HDR for Seattle City Light. City Light provides no warranty, expressed or implied, as to the accuracy, reliability or completeness of this data. Data Source: Recreation Sites, Campsites - Seattle City Light. Campsites, Trails - NPS.

Document Path: \\sac-srv01\GIS\Projects\Seattle_City_Light\Skagit_FERC_Relicensing\7.2_Working\1_MXD_SkagStudyPlan\Recreation\MAPBOOK_ProfDevelopment_RefFacils_11x17_L.mxd

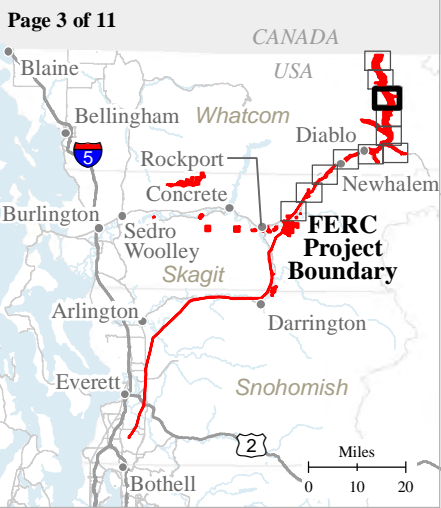
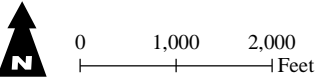


RECREATION USE AND FACILITY ASSESSMENT STUDY SITES (RA-01)

- FERC Project Boundary
- Mitigation Parcel
- Project River Miles (PRM)
- National Park Service
- National Recreation Area (NPS)
- U.S. Forest Service
- Trail (NPS, non-Project)
- Recreation Facility (NPS/non-Project)
- RA-01 Study Sites

Specific RA-01 Study Elements (see study for details)

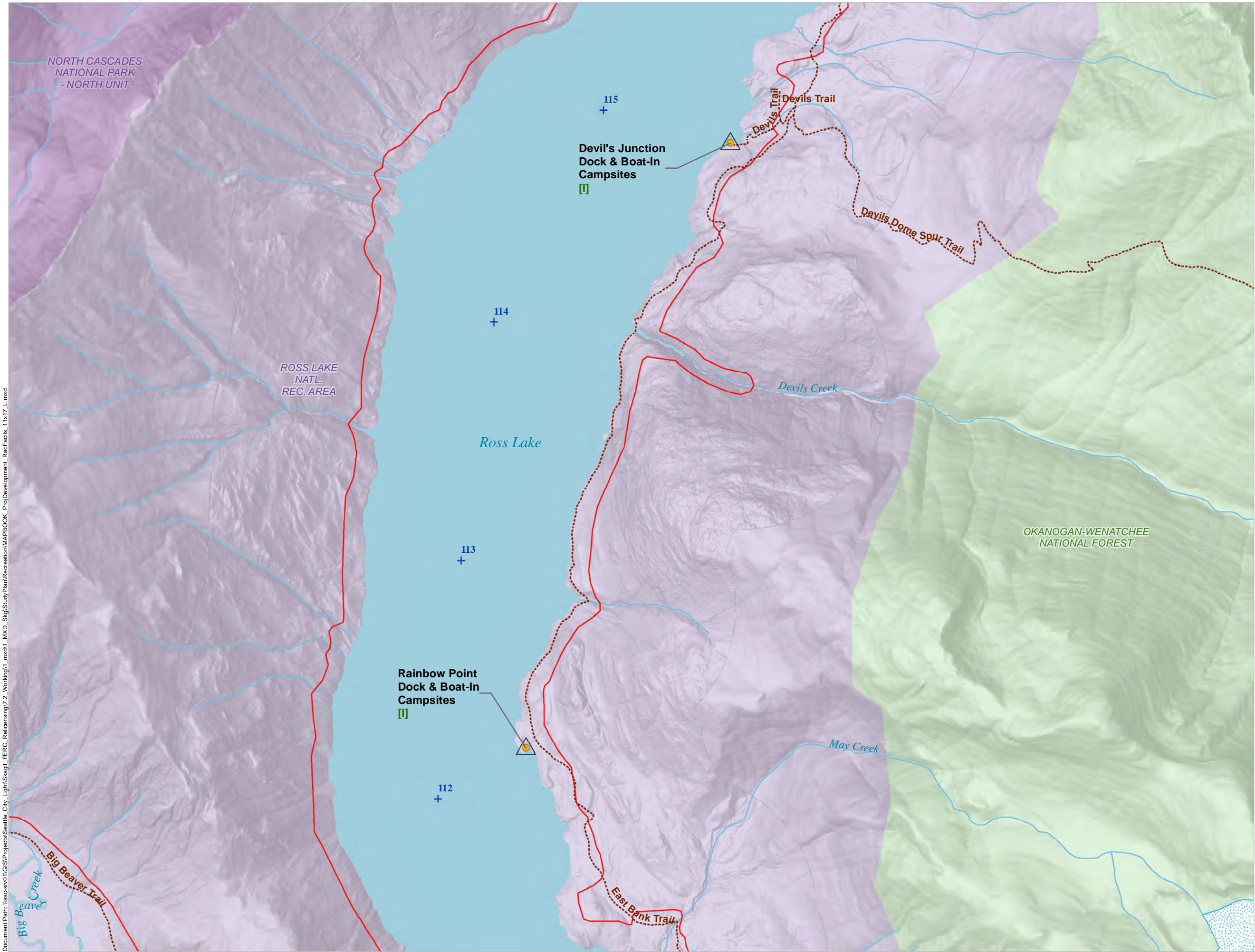
- [I] Inventory, Condition, Accessibility, and Use Impact Evaluations
- [S] Visitor and Observation Surveys
- [A] Trail Accessibility Evaluations
- [C] Trail Counter



SKAGIT RIVER HYDROELECTRIC PROJECT (FERC NO. 553)

Created on 3/25/2021 by HDR for Seattle City Light. City Light provides no warranty, expressed or implied, as to the accuracy, reliability or completeness of this data. Data Source: Recreation Sites, Campsites - Seattle City Light. Campsites, Trails - NPS.

Document Path: \\sac-srv01\GIS\Projects\Seattle_City_Light\Skagit_FERC_Relicensing\7.2_Working\1_MXD_SkagitStudyPlan\Recreation\MAPBOOK_ProDevelopment_RefFacils_11x17_L.mxd

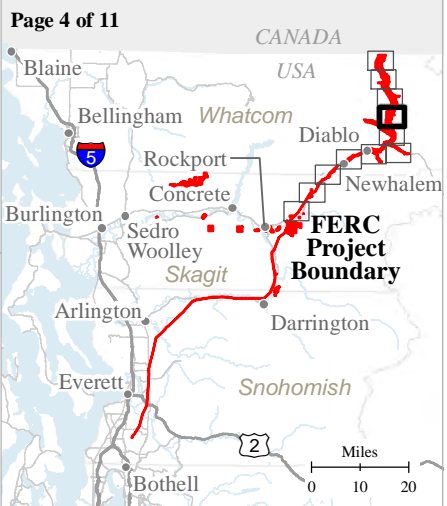
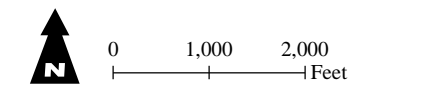


RECREATION USE AND FACILITY ASSESSMENT STUDY SITES (RA-01)

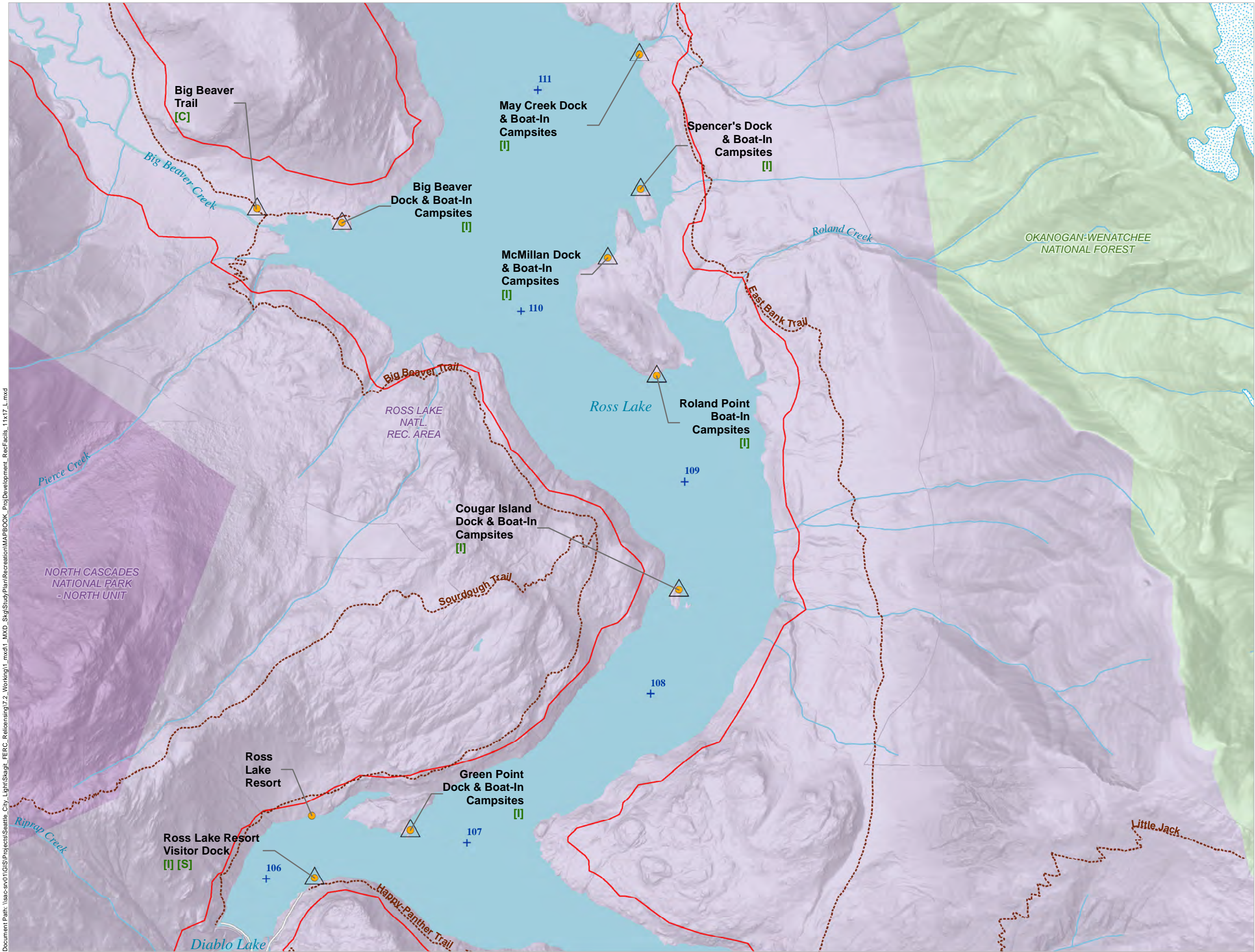
- FERC Project Boundary
- Mitigation Parcel
- + Project River Miles (PRM)
- National Park Service
- National Recreation Area (NPS)
- U.S. Forest Service
- Trail (NPS, non-Project)
- Recreation Facility (NPS/non-Project)
- RA-01 Study Sites

Specific RA-01 Study Elements (see study for details)

- [I] Inventory, Condition, Accessibility, and Use Impact Evaluations
- [S] Visitor and Observation Surveys
- [A] Trail Accessibility Evaluations
- [C] Trail Counter



Document Path: \\sac-srv01\GIS\Projects\Seattle_City_Light\Skagit_FERC_Reliensing\7.2_Working\1_MXD_SkagitStudyPlan\Recreation\MAPBOOK_ProfDevelopment_RefFacils_11x17_L.mxd

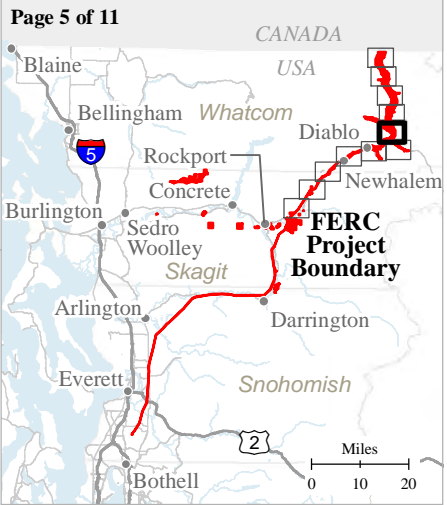
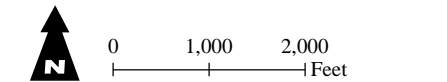


RECREATION USE AND FACILITY ASSESSMENT STUDY SITES (RA-01)

- FERC Project Boundary
- Mitigation Parcel
- Project River Miles (PRM)
- National Park Service
- National Recreation Area (NPS)
- U.S. Forest Service
- Trail (NPS, non-Project)
- Recreation Facility (NPS/non-Project)
- RA-01 Study Sites

Specific RA-01 Study Elements (see study for details)

- Inventory, Condition, Accessibility, and Use Impact Evaluations
- Visitor and Observation Surveys
- Trail Accessibility Evaluations
- Trail Counter



Seattle City Light

SKAGIT RIVER HYDROELECTRIC PROJECT (FERC NO. 553)

Created on 3/25/2021 by HDR for Seattle City Light.
City Light provides no warranty, expressed or implied, as to the accuracy, reliability or completeness of this data.
Data Source: Recreation Sites, Campsites - Seattle City Light.
Campsites, Trails - NPS.

Document Path: \\sac-srv01\GIS\Projects\Seattle_City_Light\Skagit_FERC_Reliensing\7.2_Working\1_MXD_SkagitStudyPlan\Recreation\MAPBOOK_ProfDevelopment_RefFacils_11x17_L.mxd

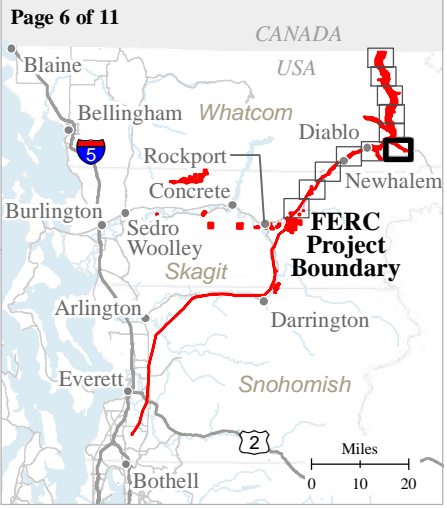
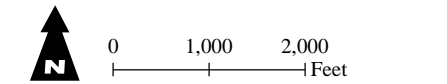


RECREATION USE AND
FACILITY ASSESSMENT
STUDY SITES (RA-01)

- FERC Project Boundary
- Mitigation Parcel
- Project River Miles (PRM)
- National Park Service
- National Recreation Area (NPS)
- U.S. Forest Service
- Trail (NPS, non-Project)
- Recreation Facility (NPS/non-Project)
- RA-01 Study Sites

Specific RA-01 Study Elements
(see study for details)

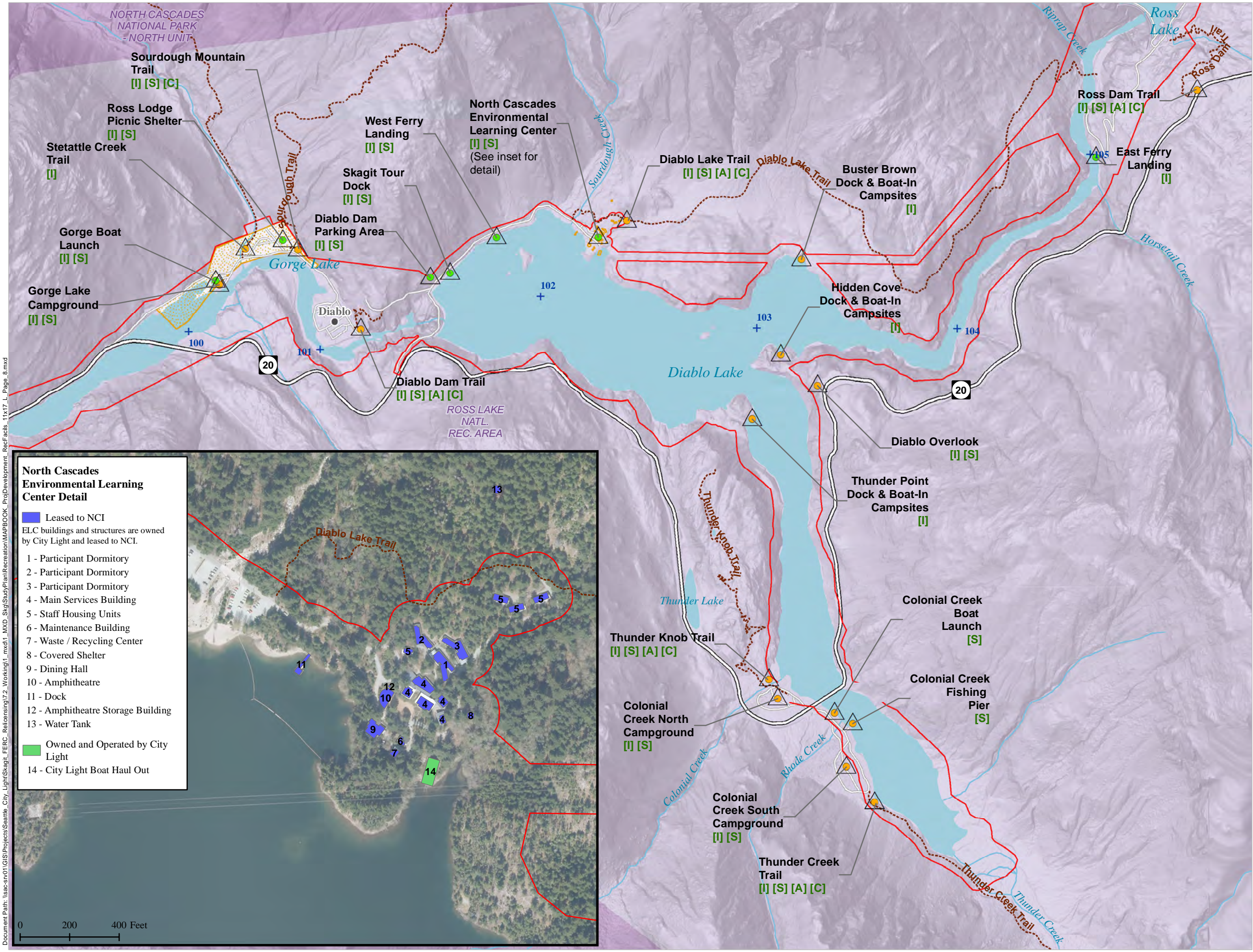
- [I] Inventory, Condition, Accessibility, and Use Impact Evaluations
- [S] Visitor and Observation Surveys
- [A] Trail Accessibility Evaluations
- [C] Trail Counter



Seattle City Light
SKAGIT RIVER HYDROELECTRIC
PROJECT (FERC NO. 553)

Created on 3/25/2021 by HDR for Seattle City Light.
City Light provides no warranty, expressed or implied, as to the accuracy, reliability or completeness of this data.
Data Source: Recreation Sites, Campsites - Seattle City Light.
Campsites, Trails - NPS.

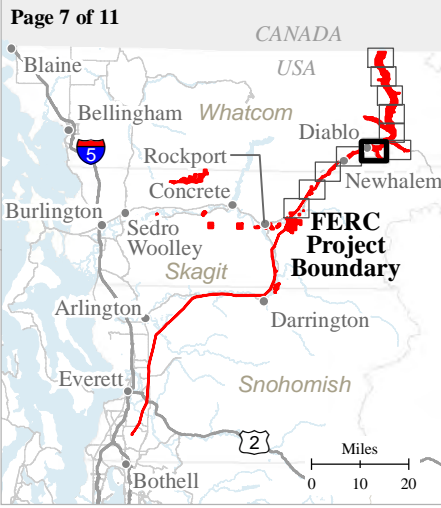
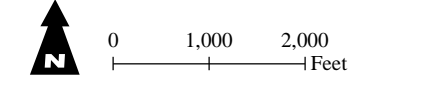
Document Path: \\sac-srv01\GIS\Projects\Seattle_City_Light\Skagit_FERC_Releensing7.2_Working1.mxd1_MXD_SkagitPlan\Recreation\MAPBOOK_ProjDevelopment_RefFacts_11x17_L_Page_8.mxd



RECREATION USE AND FACILITY ASSESSMENT STUDY SITES (RA-01)

- FERC Project Boundary
- Project River Miles (PRM)
- National Park Service
- National Recreation Area (NPS)
- Seattle City Light (Fee Owned Property)
- Trail (NPS, non-Project)
- Recreation Facility (NPS/non-Project)
- Recreation Facility (Project/FERC Approved)
- RA-01 Study Sites

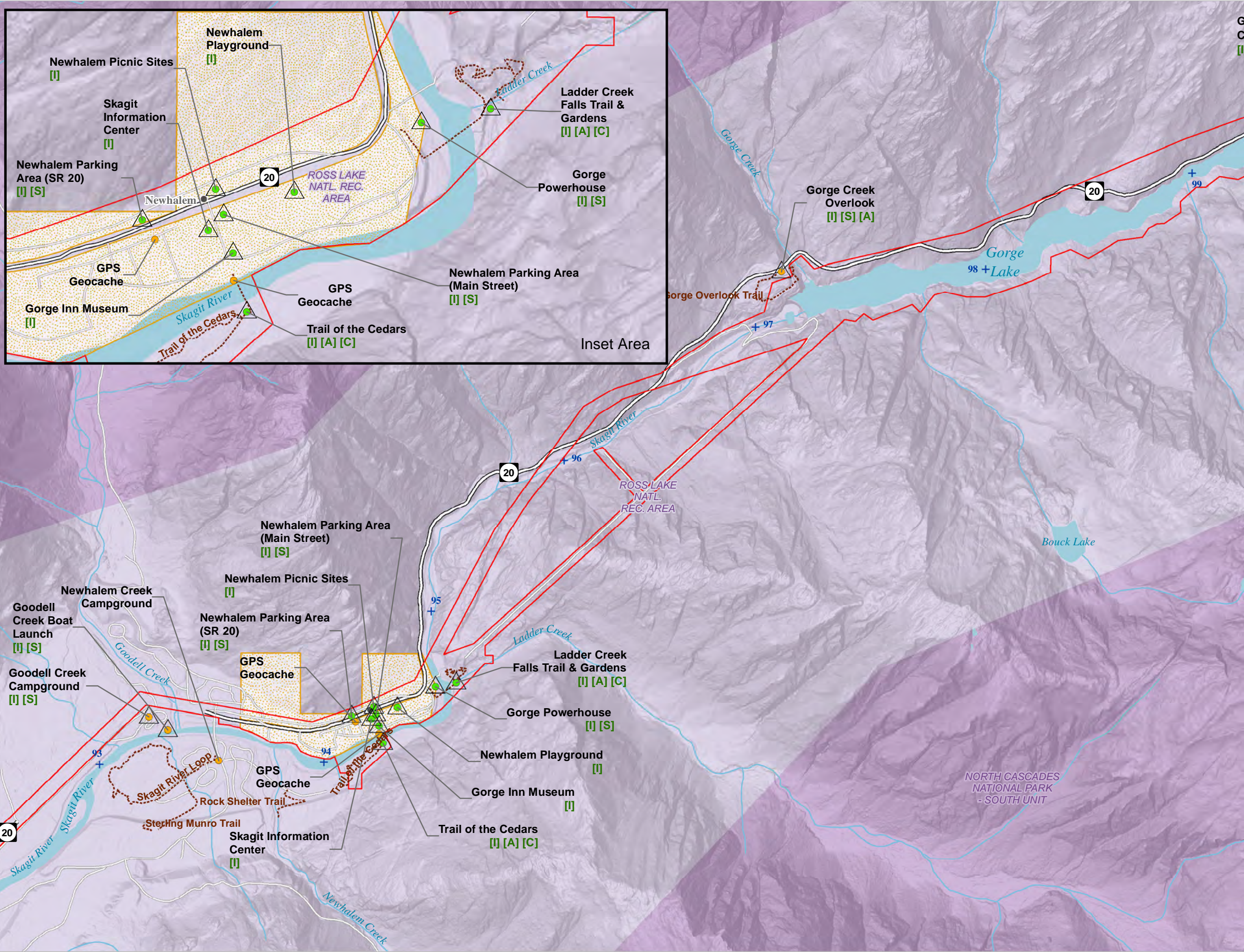
- Specific RA-01 Study Elements (see study for details)**
- [I]** Inventory, Condition, Accessibility, and Use Impact Evaluations
 - [S]** Visitor and Observation Surveys
 - [A]** Trail Accessibility Evaluations
 - [C]** Trail Counter



SKAGIT RIVER HYDROELECTRIC PROJECT (FERC NO. 553)

Created on 3/27/2021 by HDR for Seattle City Light.
City Light provides no warranty, expressed or implied, as to the accuracy, reliability or completeness of this data.
Data Source: Recreation Sites, Campsites - Seattle City Light.
Campsites, Trails - NPS.

Document Path: \\sac-srv01\GIS\Projects\Seattle_City_Light\Skagit_FERC_Reliensing\7.2_Working\1_mxd\1_MXD_SkagitStudyPlan\Recreation\MAPBOOK_ProfDevelopment\RecFacils_11x17_L_Page_9.mxd

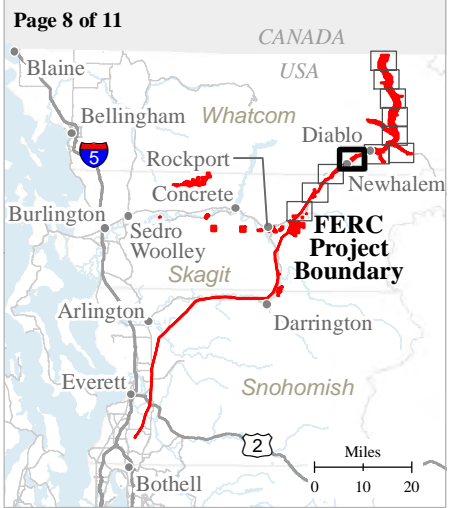
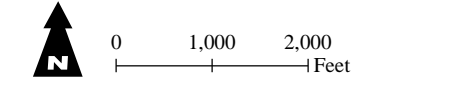


RECREATION USE AND FACILITY ASSESSMENT STUDY SITES (RA-01)

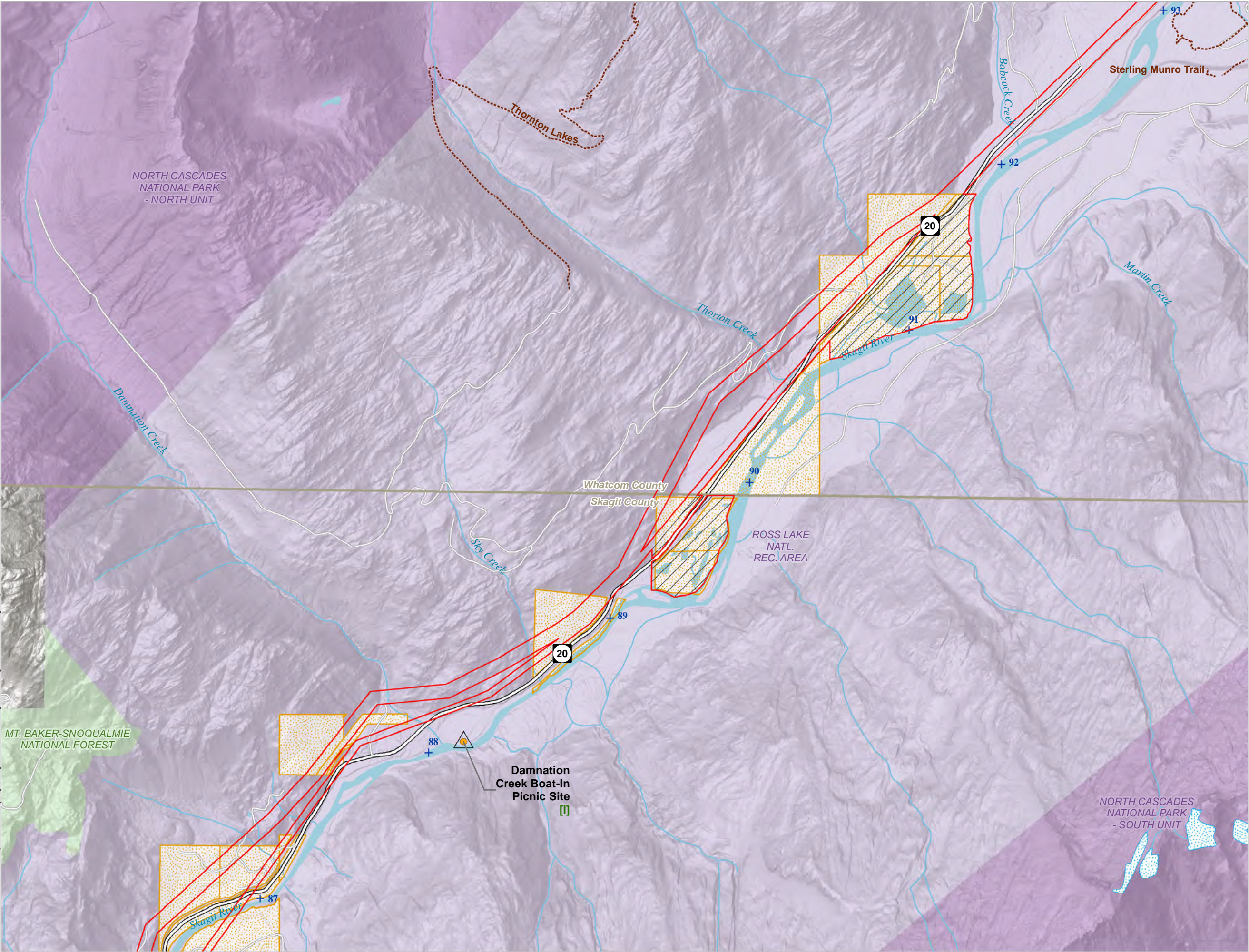
- FERC Project Boundary
- Mitigation Parcel
- Project River Miles (PRM)
- National Park Service
- National Recreation Area (NPS)
- Seattle City Light (Fee Owned Property)
- Trail (NPS, non-Project)
- Recreation Facility (NPS/non-Project)
- Recreation Facility (Project/FERC Approved)
- RA-01 Study Sites

Specific RA-01 Study Elements (see study for details)

- Inventory, Condition, Accessibility, and Use Impact Evaluations
- Visitor and Observation Surveys
- Trail Accessibility Evaluations
- Trail Counter



Document Path: \\sac-sv01\GIS\Projects\Seattle_City_Light\Skagit_FERC_Relicensing\7.2_Working\1_mxd\1_MXD_SkagitStudyPlan\Recreation\MAPBOOK_ProfDevelopment_RefFacils_1x17_L.mxd

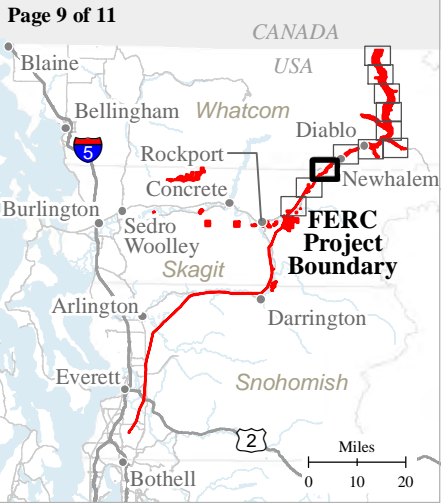
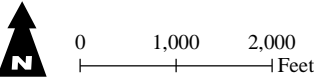


RECREATION USE AND FACILITY ASSESSMENT STUDY SITES (RA-01)

- FERC Project Boundary
- Mitigation Parcel
- Project River Miles (PRM)
- National Park Service
- National Recreation Area (NPS)
- U.S. Forest Service
- Seattle City Light
- Trail (NPS, non-Project)
- Recreation Facility (NPS/non-Project)
- RA-01 Study Sites

Specific RA-01 Study Elements (see study for details)

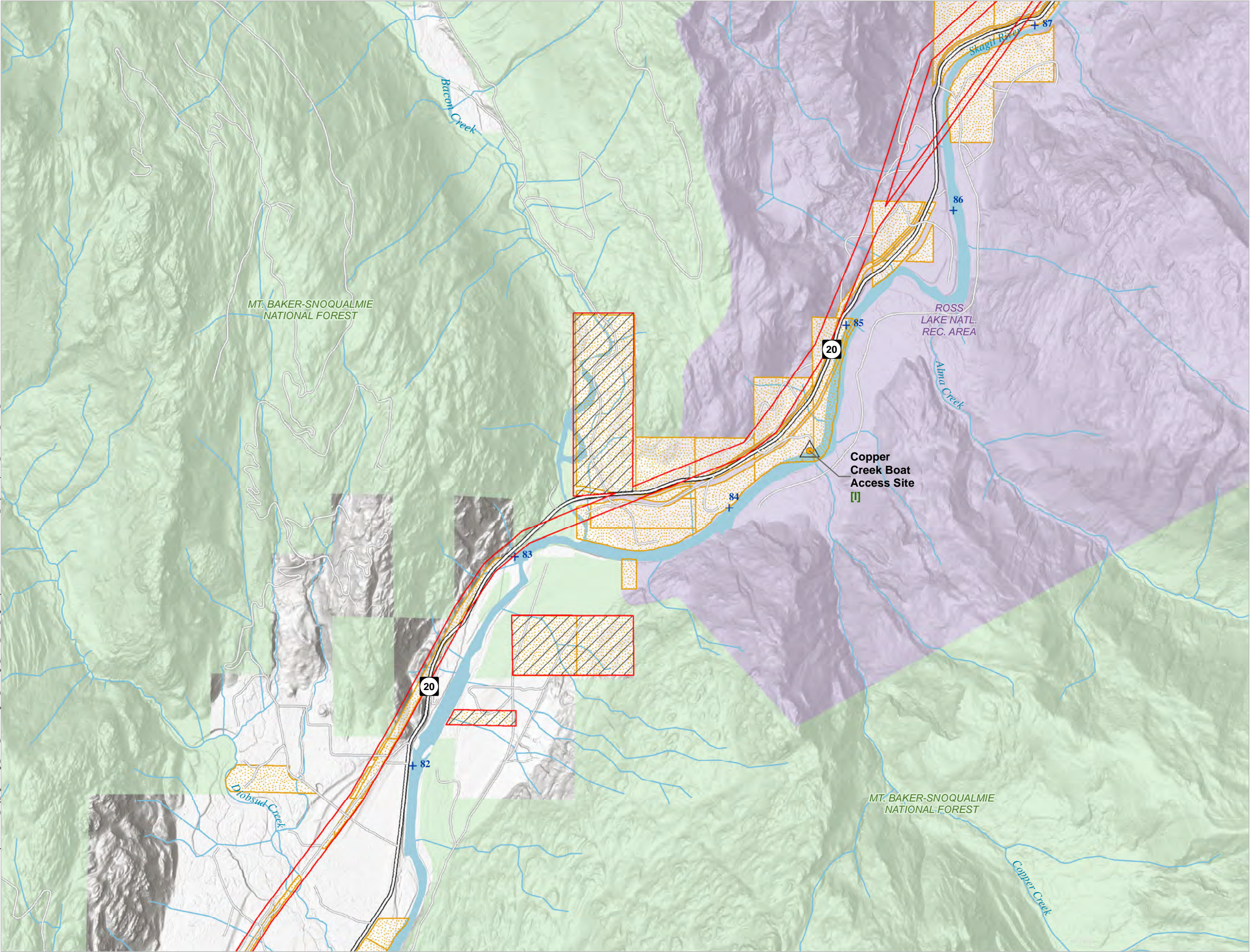
- Inventory, Condition, Accessibility, and Use Impact Evaluations
- Visitor and Observation Surveys
- Trail Accessibility Evaluations
- Trail Counter



SKAGIT RIVER HYDROELECTRIC PROJECT (FERC NO. 553)

Created on 3/25/2021 by HDR for Seattle City Light.
City Light provides no warranty, expressed or implied, as to the accuracy, reliability or completeness of this data.
Data Source: Recreation Sites, Campsites - Seattle City Light.
Campsites, Trails - NPS.

Document Path: \\sac-srv01\GIS\Projects\Seattle_City_Light\Skagit_FERC_Reliensing\7.2_Working\1_MXD_SkagitStudyPlan\Recreation\MAPBOOK_ProDevelopment_RefFacils_1x17_L.mxd

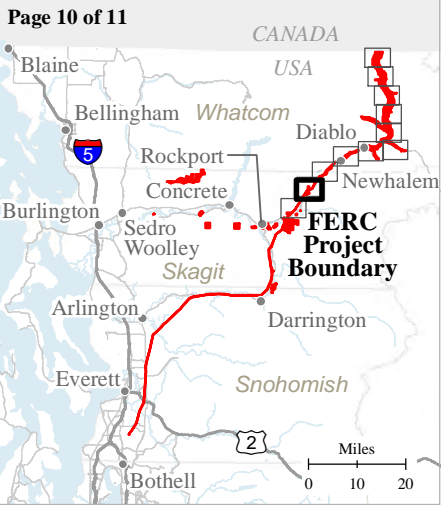
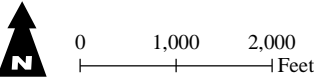


RECREATION USE AND FACILITY ASSESSMENT STUDY SITES (RA-01)

- FERC Project Boundary
- Mitigation Parcel
- Project River Miles (PRM)
- National Recreation Area (NPS)
- U.S. Forest Service
- Seattle City Light
- Recreation Facility (NPS/non-Project)
- RA-01 Study Sites

Specific RA-01 Study Elements (see study for details)

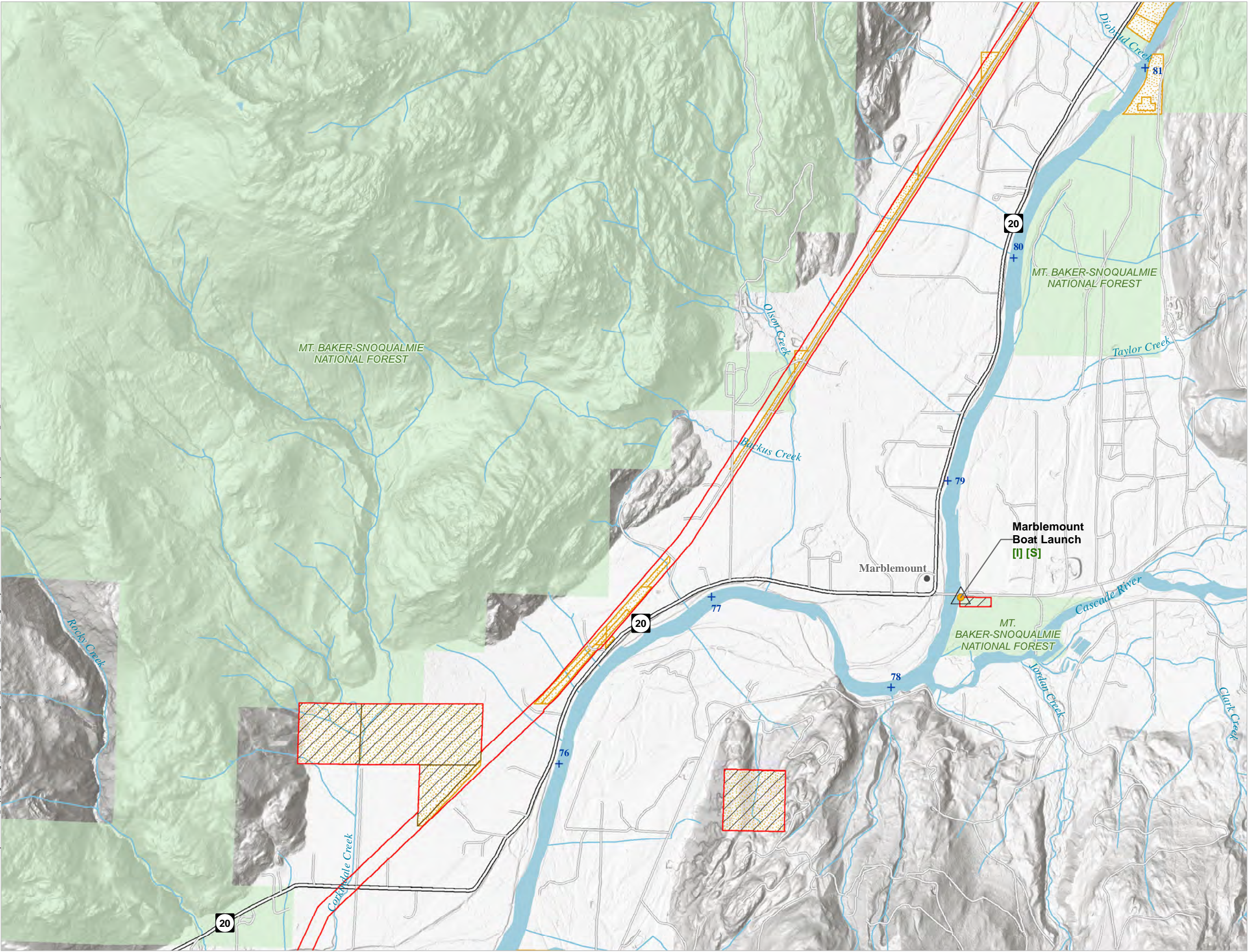
- Inventory, Condition, Accessibility, and Use Impact Evaluations
- Visitor and Observation Surveys
- Trail Accessibility Evaluations
- Trail Counter



SKAGIT RIVER HYDROELECTRIC PROJECT (FERC NO. 553)

Created on 3/25/2021 by HDR for Seattle City Light.
City Light provides no warranty, expressed or implied, as to the accuracy, reliability or completeness of this data.
Data Source: Recreation Sites, Campsites - Seattle City Light.
Campsites, Trails - NPS.

Document Path: \\sac-srv01\GIS\Projects\Seattle City Light\Skagit FERC Relicensing\7.2 Working\1 mxd\1 MXD_SkagitStudyPlan\Recreation\MAPBOOK_ProfDevelopment_RefFacils_11x17_L.mxd

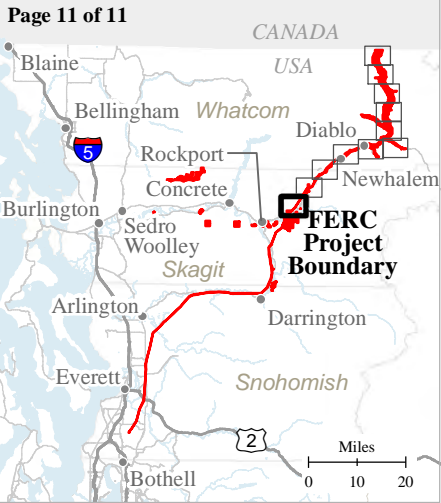
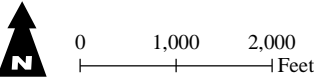


RECREATION USE AND FACILITY ASSESSMENT STUDY SITES (RA-01)

- FERC Project Boundary
- Mitigation Parcel
- Project River Miles (PRM)
- U.S. Forest Service
- Seattle City Light
- Recreation Facility (NPS/non-Project)
- RA-01 Study Sites

Specific RA-01 Study Elements (see study for details)

- [I] Inventory, Condition, Accessibility, and Use Impact Evaluations
- [S] Visitor and Observation Surveys
- [A] Trail Accessibility Evaluations
- [C] Trail Counter



SKAGIT RIVER HYDROELECTRIC PROJECT (FERC NO. 553)

Created on 3/25/2021 by HDR for Seattle City Light.
City Light provides no warranty, expressed or implied, as to the accuracy, reliability or completeness of this data.
Data Source: Recreation Sites, Campsites - Seattle City Light.
Campsites, Trails - NPS.

**RECREATION USE AND FACILITY ASSESSMENT
REVISED STUDY PLAN**

ATTACHMENT C

**FACILITY ASSESSMENT FORMS
(INVENTORY, CONDITION, ACCESSIBILITY, AND USE IMPACT)**

INVENTORY FORM - RECREATION FACILITIES

Facility:			Date:		Surveyor:	
Feature	Variables	Response Options				
Entrance Sign	Material	wood	synthetic	plastic	other	
	Condition	1-poor	2-fair	3-good	4-excellent	
	Comment	<manual input>				
Sign	Type	informational	directional	interpretive	regulatory	other
	Panels, number	<input number>				
	Material	metal	wood	plastic	other	
	Condition	1-poor	2-fair	3-good	4-excellent	
	Comment	<manual input>				
Information Board	Material	metal	wood	plastic	other	
	Panels, number	<input number>				
	Condition	1-poor	2-fair	3-good	4-excellent	
	Accessibility	0-inaccessible	1-partial	2-accessible		
	Comment	<manual input>				
Site Marker	Material	wood	synthetic	plastic	other	
	Condition	1-poor	2-fair	3-good	4-excellent	
	Comment	<manual input>				
Picnic Site	Type	single	group			
	Accessible	0-inaccessible	1-partial	2-accessible		
	Table, material	wood	concrete	wood/metal	none	
	Table, number	<input number>				
	Table, condition	1-poor	2-fair	3-good	4-excellent	
	Table, accessibility	0-inaccessible	1-partial	2-accessible	4	
	Grill, number	<input number>				
	Grill, condition	1-poor	2-fair	3-good	4-excellent	
	Grill, accessibility	0-inaccessible	1-partial	2-accessible	4	
	Comment	<manual input>				
Pathway	Surfacing	concrete	asphalt	gravel	dirt	other
	Condition	1-poor	2-fair	3-good	4-excellent	
	Width (ft)	<input number>				
	Resting Intervals	yes	no			
	Accessible	0-inaccessible	1-partial	2-accessible		
	Comment	<manual input>				
Restroom	Type	vault	flush	pit	portable	other
	Construction	CXT	concrete block	wood	other	
	Exterior, condition	1-poor	2-fair	3-good	4-excellent	
	Roof, construction	concrete	wood shingle	metal	other	
	Roof, condition	1-poor	2-fair	3-good	4-excellent	
	Stalls, number	<input number>				
	Sinks, number	<input number>				
	Interior, condition	1-poor	2-fair	3-good	4-excellent	
	Accessibility	0-inaccessible	1-partial	2-accessible	4	
	Comment	<manual input>				
Potable Water	Type	hydrant	fountain	other		
	Lever Type	paddle	twist/knob	lever	other	
	Condition	1-poor	2-fair	3-good	4-excellent	
	Accessibility	0-inaccessible	1-partial	2-accessible	4	
	Comment	<manual input>				

INVENTORY FORM - RECREATION FACILITIES

Facility:			Date:			Surveyor:		
Feature	Variables	Response Options						
Parking Area	Surfacing	asphalt	gravel	dirt	concrete	other		
	Condition	1-poor	2-fair	3-good	4-excellent			
	Type	striped	wheel stop	unmarked				
	Space, single (std)	<input number>						
	Space, single (ADA)	<input number>						
	Space, double (std)	<input number>						
	Space, double (ADA)	<input number>						
	Unmarked, length (ft)	<input number>						
	Unmarked, width (ft)	<input number>						
	Barriers	curb	post	boulder	guardrail	other		
	Comment	<manual input>						
	Trash, Receptacle	Number	<manual input>					
Recycling		yes	no					
Wildlife-resistant		yes	no					
Condition		1-poor	2-fair	3-good	4-excellent			
Accessibility		0-inaccessible	1-partial	2-accessible	4			
Comment		<manual input>						
Trash, Dumpster	Number	<input number>						
	Size (cu. yds)	<input number>						
	Wildlife-resistant	yes	no					
	Condition	1-poor	2-fair	3-good	4-excellent			
	Accessibility	0-inaccessible	1-partial	2-accessible	4			
	Comment	<manual input>						
Boat Ramp	Material	concrete	gravel	dirt	other			
	Ramp Size, lanes	<input number>						
	Width, ft	<input number>						
	Condition	1-poor	2-fair	3-good	4-excellent			
Boat Dock	Type	floating	pier	other				
	Width, ft.	<input number>						
	Length, ft.	<input number>						
	Condition	1-poor	2-fair	3-good	4-excellent			
	Comment	<manual input>						
Trail	Surface Type	dirt	asphalt	gravel	concrete			
	Width, ft	<manual input>						
	Condition	1-poor	2-fair	3-good	4-excellent			
	Comment	<manual input>						
Building, Misc.	Type	public	maintenance	other				
	Access Means	pathway	stairs					
	Condition	1-poor	2-fair	3-good	4-excellent			
	Stories	<input number>						
	Accessible	0-inaccessible	1-partial	2-accessible				
	Comment	<manual input>						

INVENTORY FORM - SIGNS

Facility:				Date:	Surveyor:
#	Type	Material	Condition	Location	Description
1	ent / dir / inf / int	w / m / s	1 2 3 4		
2	ent / dir / inf / int	w / m / s	1 2 3 4		
3	ent / dir / inf / int	w / m / s	1 2 3 4		
4	ent / dir / inf / int	w / m / s	1 2 3 4		
5	ent / dir / inf / int	w / m / s	1 2 3 4		
6	ent / dir / inf / int	w / m / s	1 2 3 4		
7	ent / dir / inf / int	w / m / s	1 2 3 4		
8	ent / dir / inf / int	w / m / s	1 2 3 4		
9	ent / dir / inf / int	w / m / s	1 2 3 4		
10	ent / dir / inf / int	w / m / s	1 2 3 4		
11	ent / dir / inf / int	w / m / s	1 2 3 4		
12	ent / dir / inf / int	w / m / s	1 2 3 4		
13	ent / dir / inf / int	w / m / s	1 2 3 4		
14	ent / dir / inf / int	w / m / s	1 2 3 4		
15	ent / dir / inf / int	w / m / s	1 2 3 4		
16	ent / dir / inf / int	w / m / s	1 2 3 4		
17	ent / dir / inf / int	w / m / s	1 2 3 4		
18	ent / dir / inf / int	w / m / s	1 2 3 4		
19	ent / dir / inf / int	w / m / s	1 2 3 4		
20	ent / dir / inf / int	w / m / s	1 2 3 4		
21	ent / dir / inf / int	w / m / s	1 2 3 4		
22	ent / dir / inf / int	w / m / s	1 2 3 4		
23	ent / dir / inf / int	w / m / s	1 2 3 4		
24	ent / dir / inf / int	w / m / s	1 2 3 4		
25	ent / dir / inf / int	w / m / s	1 2 3 4		
26	ent / dir / inf / int	w / m / s	1 2 3 4		
27	ent / dir / inf / int	w / m / s	1 2 3 4		
28	ent / dir / inf / int	w / m / s	1 2 3 4		
29	ent / dir / inf / int	w / m / s	1 2 3 4		
30	ent / dir / inf / int	w / m / s	1 2 3 4		

Legend: TYPE: ent=entrance sign; dir=directional; inf=information; int=interpretive. MATERIAL: w=wood; m=metal; s=synthetic

USE IMPACT FORM (adapted from Whittaker & Shelby, 2001)		Surveyor:	Date:
Variable	Question	Response Choices	
Facility Name	Name of the facility		
Resource Area	Which reservoir/resource area is the facility at?		
Litter	In general, how much litter is found at this facility?	1. Trace amounts: less than a handful or none 2. Small: about a handful 3. Medium: about a bucketful 4. Large: about a 33 gallon garbage bag full 5. Excessive: over one garbage bag full	
Dump	Does this facility get used as a dump (not just litter from camping)?	1. No, rarely 2. Yes, sometimes (large items such as cars, beds, etc. in evidence)	
Tree cutting	Does the facility show signs of tree cutting for firewood or other tree damage from human use?	1. Low: few signs 2. Medium: some signs, especially lower branches of live trees 3. High: many signs, including excessive cutting of live trees	
	Number of trees over 6" DBH felled		
Access Barriers	Are there management-placed barriers to prevent vehicle access to parts of the facility & have people moved the barriers?	1. No barriers placed there 2. Barriers there & have not been moved 3. Barriers have been moved	
Fire rings/ vegetation clearances	How many fires rings do not have appropriate vegetation clearing?	Report # of fire rings that do not have 8 to 10 feet vertical & 5 feet horizontal vegetation clearance:	
Campsites	Is there evidence of dispersed campsites at the designated site?	1. No 2. Yes	
Vegetation	What is dominant vegetation type at facility?	Report % vegetation types: Forest____ Meadow____ Riparian____ Other____	
Soil	What is the dominant soil type at the facility?	Report the % of soil type: Sandy____ Clay____ Rock____ Other____ Comment on drainage:	
Shade	Does the facility have good shade from rocks or trees?	1. Low: few trees or rocks with shade 2. Medium: some shade trees/rocks for some parts of the day 3. High: many trees/rocks that offer shade through entire day.	
Screening	Does the facility screen groups from each other?	0. Not applicable: single site (not cluster) 1. Low: virtually no screening between sites 2. Medium: some screening 3. High: extensive screening	
Reservoir views	Does the facility have views of the reservoir?	1. Poor or no views. 2. Some views, but not high quality 3. High quality views.	

USE IMPACT FORM (adapted from Whittaker & Shelby, 2001)		Surveyor:	Date:
Variable	Question	Response Choices	
Landscape views	Does the facility offer views of the surrounding landscape?	1. Poor or no views. 2. Some views, but not high quality 3. High quality views.	
Reservoir proximity	Is the facility on or off the reservoir?	1. < 100 feet 2. 100 to 200 feet 3. > 200 feet	
Reservoir accessibility	Is the reservoir easy to access from the facility?	1. Easy: <20' above reservoir, obvious trail/shorter trail (<100'), not steep. 2. Medium difficulty: over 20' above reservoir less obvious trail, narrower trail, some switchbacks, some scrambling over talus, some poison oak. 3. Hard: >200' above reservoir; less obvious trail; extensive scrambling.	
Creeks	Is the facility close to other creeks or springs?	1. < 100 feet 2. 100 to 200 feet 3. > 200 feet	
	Does the facility show signs of ORVs crossing streams nearby?	1. No 2. Yes	
Trail Type	Is the trail developed or user-created?	1. Developed trail 2. User-created trail	
Trail Length	Length of trail (feet)?		
ORV	Does the facility show signs of nearby ORV use?	1. No 2. Yes	
Bare ground	Does the facility show signs of extensive use & loss of ground vegetation outside the designated site?	1. Low: small areas around fire rings & tent sites 2. Medium: large areas around fire rings & tent sites 3. Large: large contiguous areas & multiple trails to satellite use areas	
White Flowers	# "White Flowers" present (toilet paper)?		
Illegal Fish & Wildlife Take	Is there evidence of illegal fish or wildlife take at the site?	1. No 2. Yes	

**RECREATION USE AND FACILITY ASSESSMENT
REVISED STUDY PLAN**

ATTACHMENT D

VISITOR SURVEY INSTRUMENT

The following survey will help Seattle City Light understand the needs of users of the recreational facilities and opportunities in the Ross Lake, Diablo Lake, Gorge Lake, the towns of Newhalem and Diablo, and in the Skagit River downstream of Newhalem. The survey is 6 pages long and takes approximately 15 minutes to complete. Most questions are about the **specific recreation facility and reservoir/area** you are visiting on your current trip.

SECTION 1 - YOUR TRIP CHARACTERISTICS

1. Name of the recreation facility and reservoir where you received this survey:

NOTE: City Light's survey staff will complete 1A/1B for respondents for naming consistency. City Light survey staff will also have a large-scale map available to help familiarize the respondent with the study site and areas.

(A) **Recreation facility:** _____.

(B) **Reservoir/area:** ☐ Ross Lake ☐ Diablo Lake ☐ Gorge Lake ☐ Town of Newhalem ☐ Skagit River

2. On your current trip, have you already or do you plan to visit any of the other following reservoirs or areas?
[Please check all that apply]

☐ Ross Lake ☐ Town of Diablo ☐ Okanogan-Wenatchee National Forest
☐ Diablo Lake ☐ Ross Lake National Recreation Area ☐ Mt. Baker-Snoqualmie National Forest
☐ Gorge Lake ☐ North Cascades National Park ☐ Skagit River downstream of Newhalem
☐ Town of Newhalem ☐ Lake Chelan National Recreation Area

3. (A) Are you staying overnight in the area or is this a day trip? [Check only one] ☐ Overnight ☐ Day Trip

(B) If you are staying overnight, what is the name of the campground or accommodation? [Refer to map]

(C) If you stayed at a campground on the map, was it your preferred campground? ☐ YES ☐ NO (Go to 3D)

(D) If NO, were you unable to use your preferred campground because it was full? ☐ YES ☐ NO

4. When did you arrive and plan to depart this recreation facility? (Please specify AM or PM)

Arrival: _____ AM / PM **Departure:** _____ AM / PM
 Date Time (estimated) Date Time

5. How did your visit to this recreation facility/reservoir fit into your travel plans? [Please check only one]

☐ This recreation facility/reservoir **is my primary destination**
☐ This recreation facility/reservoir is **one of several destinations**
☐ I am **passing through** the recreation facility to my primary destination, which is (specify): _____
☐ I **did not plan to visit** this recreation facility/reservoir

6. Regarding your visitation to this recreation facility/reservoir...

(A) Are you a first-time visitor to this recreation facility/reservoir? ☐ YES ☐ NO

(B) In which year did you make your first visit to this recreation facility/reservoir? _____ **Year**

(C) Over the past 12 months, how many visits have you made to this recreation facility/reservoir? _____ **Visits**

7. (A) How many people (including yourself) travelled here in the same vehicle as you on this visit?

_____ **Number of people** ☐ Not Applicable (did not arrive by vehicle)

(B) How many of those people are under the age of 16? _____ **Number of people**

8. By what means did you enter this recreation facility/reservoir? [Please check only one]

- ☐ Personal vehicle ☐ RV/motorhome ☐ Bicycling ☐ Watercraft ☐ Aircraft
☐ Vehicle with camper trailer ☐ Walk/hike ☐ Motorcycle ☐ Public Transportation /shuttle ☐ Other: _____

9. Below is a list of activities available. Please indicate:

(A) Which of these activities have you participated in on your current visit to the recreation facility/reservoir?

(B) Which **ONE** of these activities is your PRIMARY ACTIVITY on this visit to the recreation facility/reservoir?

(A) Participated in <u>ON THIS TRIP?</u> (Check <u>all</u> that apply)	(B) <u>PRIMARY ACTIVITY</u> (Check <u>only</u> one)
<input type="checkbox"/> Day hiking or walking	<input type="checkbox"/> Day hiking or walking
<input type="checkbox"/> Backcountry hiking	<input type="checkbox"/> Backcountry hiking
<input type="checkbox"/> Bicycling	<input type="checkbox"/> Bicycling
<input type="checkbox"/> Developed drive-in camping	<input type="checkbox"/> Developed drive-in camping
<input type="checkbox"/> Dispersed drive-in camping	<input type="checkbox"/> Dispersed drive-in camping
<input type="checkbox"/> Backcountry camping	<input type="checkbox"/> Backcountry camping
<input type="checkbox"/> Boat-in camping	<input type="checkbox"/> Boat-in camping
<input type="checkbox"/> Picnicking	<input type="checkbox"/> Picnicking
<input type="checkbox"/> Angling	<input type="checkbox"/> Angling
<input type="checkbox"/> Motorized boating on lakes	<input type="checkbox"/> Motorized boating on lakes
<input type="checkbox"/> Non-motorized boating on lakes	<input type="checkbox"/> Non-motorized boating on lakes
<input type="checkbox"/> River boating	<input type="checkbox"/> River boating
<input type="checkbox"/> Climbing	<input type="checkbox"/> Climbing
<input type="checkbox"/> Horseback riding	<input type="checkbox"/> Horseback riding
<input type="checkbox"/> Historic or interpretive tour	<input type="checkbox"/> Historic or interpretive tour
<input type="checkbox"/> Environmental education program	<input type="checkbox"/> Environmental education program
<input type="checkbox"/> Nature or wildlife viewing	<input type="checkbox"/> Nature or wildlife viewing
<input type="checkbox"/> Driving for pleasure	<input type="checkbox"/> Driving for pleasure
<input type="checkbox"/> Swimming	<input type="checkbox"/> Swimming
<input type="checkbox"/> Outdoor photography	<input type="checkbox"/> Outdoor photography
<input type="checkbox"/> Other: _____	<input type="checkbox"/> Other: _____
<input type="checkbox"/> Other: _____	<input type="checkbox"/> Other: _____

10. Please list up to three (3) other areas in the region where you participate in the **PRIMARY ACTIVITY on this trip** identified in Question 9 above.

1. _____ 2. _____ 3. _____

11. (A) Were there any activities that you and your group wanted to do on this visit to (area name) that you were not able to? ☐ YES ☐ NO

(B) If YES: What was the activity? _____

(C) Which of the following reasons, if any, explain why you did not engage in the activity?

- | | |
|--|--|
| <input type="checkbox"/> Rules or regulations did not allow for activity | <input type="checkbox"/> No road or trail access |
| <input type="checkbox"/> Area was temporarily closed to the public | <input type="checkbox"/> Unsatisfactory conditions of facilities |
| <input type="checkbox"/> Not enough time | <input type="checkbox"/> Resource damage due to overuse |
| <input type="checkbox"/> Safety concerns | <input type="checkbox"/> No facilities or services |
| <input type="checkbox"/> Not enough information about the activity | <input type="checkbox"/> Bad weather |
| <input type="checkbox"/> Too crowded | <input type="checkbox"/> Wildfire/other natural hazard |
| <input type="checkbox"/> Could not get a reservation | <input type="checkbox"/> Other (specify): _____ |
| <input type="checkbox"/> Difficult road or trail access | <input type="checkbox"/> None of the above reasons |

12. (A) Does anyone in your personal group have a physical condition or personal limitation that made it difficult to access or participate in [site] activities or services? ☐ YES ☐ NO

(B) If YES, on this visit what activities or services did the person(s) have difficulty accessing or participating in? (Please describe): _____

(C) Because of the physical condition, which specific difficulties did the person(s) have? (Check all that apply)

- ☐ Hearing (difficulty hearing ranger programs, bus drivers, audio-visual exhibits or programs, or information desk staff even with hearing aid)
- ☐ Visual (difficulty in seeing exhibits, directional signs, visual aids that are part of programs even with prescribed glasses or due to blindness)
- ☐ Mobility (difficult in accessing facilities, services, or programs even with walking aid and/or wheelchairs)
- ☐ Other (Please specify): _____

13. (A) Please rate the relative uniqueness of the **recreation opportunities** at this recreation facility/reservoir relative to the opportunities at the above three (3) areas you identified:

Extremely Common Opportunity				Extremely Unique	
1	2	3	4	5	

(B) Please explain what, if anything, is **special** or **unique** about this recreation facility/reservoir relative to other areas in the region. _____

SECTION 2 - EXISTING CONDITIONS

14. (A) Please indicate if **level of the reservoir or river** was a problem for your recreation activities at the recreation facility/reservoir you are currently visiting.

Not a Problem	Small Problem	Neither	Moderate Problem	Large Problem	No Opinion/Don't Know
1	2	3	4	5	<input type="checkbox"/>

(B) If you indicated it was a problem, please explain: _____

15. Has anything impacted your ability to participate in any recreation activities at this recreation facility/reservoir?

☐ NO ☐ YES. If **YES**, specify the: (A) **activity**: _____; and (B) **reason**: _____

16. Did you experience or see any unsafe conditions or behaviors while recreating at this recreation facility/reservoir? ☐ NO ☐ YES. If **YES**, please specify those conditions: _____

17. (A) How crowded did you feel while recreating at these locations today at this recreation facility/reservoir? **[Select one number for each or indicate it was not applicable to your visit.]**

LOCATION/AREA	Not at all crowded	Slightly crowded	Moderately crowded	Very crowded	Extremely crowded	Not applicable
On trails	1	2	3	4	5	<input type="checkbox"/>
At the parking area	1	2	3	4	5	<input type="checkbox"/>
At the picnic area	1	2	3	4	5	<input type="checkbox"/>
At a developed campsite	1	2	3	4	5	<input type="checkbox"/>
At a boat-in campsite	1	2	3	4	5	<input type="checkbox"/>
Fishing from the shoreline	1	2	3	4	5	<input type="checkbox"/>
While motorized boating/fishing	1	2	3	4	5	<input type="checkbox"/>
While non-motorized boating/fishing	1	2	3	4	5	<input type="checkbox"/>

(B) **If you felt crowded**, did you modify your recreation plans because you felt crowded? ☐ YES ☐ NO

(C) **If YES**, what did you do? ☐ Moved to a new location ☐ Changed your activity ☐ Continued with current plans
☐ Changed the time of day ☐ Chose not to recreate ☐ Other: _____

18. Did the actions or behavior of any other group or individual interfere with your enjoyment on this trip?

☐ NO ☐ YES. If **YES**, what type of group or person interfered with your enjoyment on this trip?

Group/Person	Reason(s)		
	Proximity	Loudness	Other (specify)
Hikers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> _____
Bicyclists	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> _____
Motorized boaters	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> _____
Non-motorized boaters	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> _____
Vehicles	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> _____
Campers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> _____
Stock use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> _____
Other: _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> _____

19. Are there any additional recreation amenities or other changes you would like to see at this recreation facility/reservoir? _____

20. How satisfied were you with the following **amenities** at this recreation facility/reservoir today.

Important: Please only circle a number for the items **you used during your current visit** to this recreation facility/reservoir. Also, please **check** the "Did Not Use" box if you did not use the item or it does not exist at the facility.

		Very Satisfied	Satisfied	Neither	Dissatisfied	Very Dissatisfied	Did Not Use	If you were dissatisfied, please explain why:
FACILITIES	Campsites	1	2	3	4	5	<input type="checkbox"/>	
	Privacy screening at campsites	1	2	3	4	5	<input type="checkbox"/>	
	Picnic sites	1	2	3	4	5	<input type="checkbox"/>	
	Restroom	1	2	3	4	5	<input type="checkbox"/>	
	Trash receptacles	1	2	3	4	5	<input type="checkbox"/>	
	Vehicle parking areas	1	2	3	4	5	<input type="checkbox"/>	
	Boat ramp parking area	1	2	3	4	5	<input type="checkbox"/>	
	Boat ramp	1	2	3	4	5	<input type="checkbox"/>	
	Boat dock	1	2	3	4	5	<input type="checkbox"/>	
	Ferry dock	1	2	3	4	5	<input type="checkbox"/>	
	Tour dock	1	2	3	4	5	<input type="checkbox"/>	
	Visitor center/museum	1	2	3	4	5	<input type="checkbox"/>	
	Playground equipment	1	2	3	4	5	<input type="checkbox"/>	
	Environmental Learning Center	1	2	3	4	5	<input type="checkbox"/>	
	Other: _____	1	2	3	4	5	<input type="checkbox"/>	
	ACCESS	Roads within the facility	1	2	3	4	5	<input type="checkbox"/>
Trails		1	2	3	4	5	<input type="checkbox"/>	
Signage to the facility		1	2	3	4	5	<input type="checkbox"/>	
Signage within the facility		1	2	3	4	5	<input type="checkbox"/>	
Other: _____		1	2	3	4	5	<input type="checkbox"/>	
INFORMATION	Interpretive/educational information	1	2	3	4	5	<input type="checkbox"/>	
	Recreation visitor information	1	2	3	4	5	<input type="checkbox"/>	
	Reservoir elevation information	1	2	3	4	5	<input type="checkbox"/>	
	River flow information	1	2	3	4	5	<input type="checkbox"/>	
	Other: _____	1	2	3	4	5	<input type="checkbox"/>	

21. How did you obtain information to plan your current trip? (Please select all that apply)

- | | | |
|---|---|---|
| <input type="checkbox"/> Federal or State website | <input type="checkbox"/> City Light mailers | <input type="checkbox"/> Social media (Facebook, Twitter, etc.) |
| <input type="checkbox"/> City/local/municipal website | <input type="checkbox"/> Visitor bureaus/centers | <input type="checkbox"/> Travel guides and tour books |
| <input type="checkbox"/> City Light website | <input type="checkbox"/> Maps/brochures/pamphlets | <input type="checkbox"/> Newspaper/magazine article |
| <input type="checkbox"/> Other websites | <input type="checkbox"/> Previous visits | <input type="checkbox"/> Radio/TV broadcasts |
| <input type="checkbox"/> Package tour companies | <input type="checkbox"/> Word of mouth | <input type="checkbox"/> Other: _____ |

SECTION 3 - ABOUT YOU

22. What is the zip code where you live or country if not in the United States?

Zip code: _____ or, country (if not the United States): _____

23. What is your Age: _____.

24. What is your Gender? ☐ Male ☐ Female ☐ Non-binary

25. Which of these categories best indicates your race? Answer only for yourself. Please select **one or more**.

- | | | |
|---|---|---|
| <input type="checkbox"/> American Indian/Alaskan Native | <input type="checkbox"/> Asian | <input type="checkbox"/> White |
| <input type="checkbox"/> Native Hawaiian/other Pacific Islander | <input type="checkbox"/> Hispanic or Latino | <input type="checkbox"/> Other (specify): _____ |
| <input type="checkbox"/> Black/African-American | <input type="checkbox"/> Not Hispanic or Latino | <input type="checkbox"/> Don't know |

26. What is your primary spoken language? ☐ English ☐ Other (specify): _____

27. Please let us know if you have any additional comments regarding your recreation experience during your visit:

Seattle City Light thanks you for taking the time to participate in this survey!

**RA-02 GORGE BYPASS REACH SAFETY
AND WHITEWATER BOATING
REVISED STUDY PLAN**

**SKAGIT RIVER HYDROELECTRIC PROJECT
FERC NO. 553**

Seattle City Light

**April 2021
RSP**

TABLE OF CONTENTS

Section No.	Description	Page No.
1.0	Introduction.....	1-1
1.1	General Description of the Project.....	1-1
1.2	Relicensing Process	1-1
1.3	Study Plan Development.....	1-2
2.0	Study Plan Elements	2-1
2.1	Study Goals and Objectives	2-1
2.2	Resource Management Goals	2-1
2.3	Background and Existing Information.....	2-2
2.4	Project Operations and Effects on Resources	2-2
2.5	Study Area	2-2
2.6	Methodology	2-4
2.6.1	Level 1: Desktop Analysis	2-4
2.6.2	Level 2: Field Reconnaissance.....	2-5
2.6.3	Level 3: Multiple Flow Evaluation	2-6
2.6.4	Reporting.....	2-7
2.7	Consistency with Generally Accepted Scientific Practice.....	2-7
2.8	Schedule.....	2-7
2.9	Level of Effort and Cost	2-8
3.0	References	3-1

List of Figures

Figure No.	Description	Page No.
Figure 2.5-1.	Proposed Gorge bypass reach study area.....	2-3

List of Attachments

Attachment A	City Light Responses to LP Comments on the Study Plan Prior to PSP
--------------	--

List of Acronyms and Abbreviations

City Light.....	Seattle City Light
Ecology	Washington State Department of Ecology
ELC	Environmental Learning Center
FARWG	Fish and Aquatics Resource Work Group
FERC.....	Federal Energy Regulatory Commission
ISR	Initial Study Report
LP	licensing participant
NPS	National Park Service
PAD.....	Pre-Application Document
PRM	Project River Mile
Project	Skagit River Hydroelectric Project
PSP	Proposed Study Plan
RARWG.....	Recreation and Aesthetics Resource Work Group
RLNRA.....	Ross Lake National Recreation Area
RM	river mile
RSP	Revised Study Plan
RWG	Resource Work Group
U.S.C.....	United States Code
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USR.....	Updated Study Report
Ecology	Washington Department of Ecology
WDFW	Washington Department of Fish and Wildlife

This page intentionally left blank.

1.0 INTRODUCTION

1.1 General Description of the Project

The Skagit River Hydroelectric Project (Project), licensed to The City of Seattle, Washington, and operated through its publicly-owned electric power utility Seattle City Light (City Light), is located in northern Washington State and consists of three power generating developments on the Skagit River – Ross, Diablo, and Gorge – and associated lands and facilities. The Project generating facilities are in the Cascade Mountains of the upper Skagit River watershed, between Project River Miles (PRM) 94.7 and 127.9 (U.S. Geological Survey [USGS] RMs 94.2 and 127).¹ Power from the Project is transmitted via two 230-kilovolt 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, an Environmental Learning Center (ELC), several recreation facilities, and several parcels of fish and wildlife mitigation lands.

Project generating facilities are all located in Whatcom County, although Ross Lake, the most upstream reservoir, crosses the U.S.-Canada border and extends for about one mile into British Columbia at normal maximum water surface elevation. Gorge Powerhouse, the most downstream facility, is approximately 120 miles northeast of Seattle and 60 miles east of Sedro-Woolley, the nearest large town. The closest town is Newhalem, which is part of the Project and just downstream of Gorge Powerhouse. The primary transmission lines cross Whatcom, Skagit, and Snohomish counties; the fish and wildlife mitigation lands are in the same counties.

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, Diablo, and Gorge lakes.” The legislation maintains the Federal Energy Regulatory Commission’s (FERC) 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).

1.2 Relicensing Process

The current FERC license for the Project expires on April 30, 2025, and City Light will apply for a new license no later than April 30, 2023. City Light formally initiated the relicensing process by filing a Notice of Intent and Pre-Application Document (PAD) with FERC on April 27, 2020 (City Light 2020a). The PAD includes descriptions of the Project facilities, operations, license

¹ 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 Project River Mile (PRM) system are provided throughout this document. For further details see Section 7.0 of the main body RSP.

requirements, and Project lands as well as a summary of the extensive existing information available on Project area resources and early consultation on potential resource issues to be addressed during the relicensing. The PAD also includes an outline of the goals and objectives of this study.

In 2019-2020, City Light convened a series of Resource Work Groups (RWG) to engage agencies and other licensing participants (LP) in the Study Plan Development Process. Discussions with LPs continued in early 2021 with a series of topic-based discussions following filing of the Proposed Study Plan (PSP) on December 8, 2020 (City Light 2020b). This study plan reflects RWG and LP discussion and study requests and comments submitted by LPs.

1.3 Study Plan Development

Issues to be addressed in this study were identified during the Study Plan Development Process and in the RA04 Whitewater Recreation issue form.

Gorge Dam diverts water to Gorge Powerhouse downstream, bypassing 2.5 miles of the Skagit River. The reach is referred to as “the Gorge bypass reach.” Under the current Project license, City Light is not required to release any flow into the Gorge bypass reach, and public access is restricted in the bypass reach for safety. Flows in the bypass reach are limited to accretion flow, spill-gate seepage, tributary input, and precipitation runoff, except when water is being spilled at Gorge Dam. Evaluating whitewater opportunities in the Gorge bypass reach during spill events is of interest to LPs. The study will evaluate the feasibility of recreational whitewater boating in the Gorge bypass reach, including public access, safety concerns, potential effects of recreational whitewater boating on other resources including archaeological sites, and operational constraints.

On March 13, 2020, City Light released the RA-02 Gorge Bypass Reach Safety and Whitewater Boating Draft Study Plan for LP review and comment. On March 24, 2020, the draft study plan was discussed at a Recreation and Aesthetics Resource Work Group (RARWG) meeting. City Light reviewed all comments received and released a revised version of the draft study plan on April 30, 2020. The revised draft was discussed on May 7, 2020 at a RARWG meeting. The revised draft study plan was also provided to the Fish and Aquatics Resource Work Group (FARWG) on June 19, 2020 for review. Written comments were received from Upper Skagit Indian Tribe, Washington Department of Fish and Wildlife (WDFW), American Whitewater, NPS, and U.S. Fish and Wildlife Service (USFWS) and responded to in an attachment to this study plan. A Status Draft of the study plan was provided to LPs on August 6, 2020.

City Light is filing this study plan with FERC as part of its Revised Study Plan (RSP), an update to the version that was filed with the PSP and incorporating additional consultation with LPs prior to the filing date. No formal study requests specific to this study in the Gorge bypass reach were filed with FERC. However, the Washington State Department of Ecology (Ecology) provided a study request (Ecology-02 Instream/Recreation Flow Study) related to instream flow that included recreation flow components downstream of the Gorge bypass reach. In response to this request, City Light proposes a new study, RA-05 Lower Skagit River Recreation Flow Study (Recreation Flow Study) to address river segments on the Skagit River downstream of the Project related to recreation flows. The study is summarized in Section 5.22 of this RSP and the Recreation Flow Study Plan with further details on overall study and methodology is included in an appendix to this RSP.

PSP comments to this study plan were submitted by American Whitewater and NPS. No modifications were made to this study plan in response to comments.

2.0 STUDY PLAN ELEMENTS

2.1 Study Goals and Objectives

The goal of this study is to evaluate the suitability of the Skagit River in the Gorge bypass reach for whitewater boating under current conditions, inform future operational scenarios that include the range of instream flow measures that may be included in a future license, and assess potential constraints such as Project operations and safety concerns. This study will include identifying any river access needs and potential effects of access on other Project resources. Information obtained from other studies examining resources in the Gorge bypass reach, such as FA-05 Skagit River Gorge Bypass Reach Hydraulic and Instream Flow Model Development Study (Bypass Instream Flow Model Development Study), will be considered in the Gorge Bypass Reach Safety and Whitewater Boating Study analysis. Due to the physical characteristics of the Gorge bypass reach, e.g., channel shape, substrate and gradient, the study is designed to investigate whitewater suitability for expert paddlers only. The study is not intended to investigate commercial whitewater boating opportunities in the Gorge bypass reach.

The study has the following objectives:

- Describe the whitewater boating opportunity in the Gorge bypass reach including the whitewater difficulty, character of rapids, number of portages, suitability for expert paddlers, and uniqueness of opportunity;
- Determine the range of flows that would provide whitewater boating opportunities in the Gorge bypass reach;
- Quantify the frequency, timing, duration, magnitude, and rate of change of spill events from Gorge Dam annually within the whitewater boating flow range;
- Assess the feasibility of expert whitewater boating, including public safety, effects on generation, and cost of providing whitewater boating in the bypass reach;
- If boating is determined feasible, compare the results of this assessment with an estimate of potential whitewater boating use; and
- If boating is determined feasible, identify existing and potential river access needs and routes, challenges with utilizing those routes, including potential effects to natural, cultural, and other Project resources from increased public access.

2.2 Resource Management Goals

City Light's goal is to evaluate the suitability of the Skagit River in the Gorge bypass reach for expert whitewater boating under current operating conditions, and assess potential constraints and opportunities for these boating opportunities, such as potential effects to natural, cultural, and other Project resources from increased public access as well as Project operations and safety concerns.

The study will provide information for resource agencies and Indian tribes with jurisdiction in the Project vicinity to address their respective goals and objectives for resource management. Ecology's resource management goals were provided in their study request identified in Section 1.3 of this study plan. NPS manages recreation within RLNRA, including the Gorge bypass reach, following the guidance provided in the 2012 RLNRA General Management Plan (NPS 2012).

Management of the North Cascades National Park north and south units is guided by the General Management Plan for the North Cascades National Park Complex (NPS 1988).

2.3 Background and Existing Information

The 2.5-mile-long reach of the Skagit River extending from Gorge Dam to Gorge Powerhouse (Gorge bypass reach) flows through a steep, confined canyon that is characterized by bedrock and large boulder substrate. American Whitewater has identified the Gorge bypass reach as a potential whitewater boating opportunity. No published information is available on the whitewater difficulty of the Gorge bypass reach from past trip reports or attempted trips. Public access is restricted in the Gorge bypass reach for safety. Flows in the bypass reach are limited to accretion flow, spill-gate seepage, tributary input, and precipitation runoff, except when water is being spilled at Gorge Dam (City Light 2020). As a result, the existence of a whitewater boating opportunity in the Gorge bypass reach, river access needs associated with whitewater boating, public safety concerns associated with whitewater flows, and effects on other resources including Project operations is unknown at this time.

2.4 Project Operations and Effects on Resources

Gorge Dam diverts water to Gorge Powerhouse downstream, bypassing 2.5 miles of the Skagit River. Project operations at the Gorge Development affect flows in the Gorge bypass reach. Under the current and previous licenses, public access is restricted in the bypass reach for safety. Under normal operations, flow in the bypass reach is limited to accretion and tributary inputs during rainfall events and spring snowmelt. Bypass flows also increase when Gorge Dam is spilling. This occurs on an annual basis during maintenance outages as well as when inflow to Gorge Lake exceeds the generation capacity of Gorge Powerhouse. LPs have expressed an interest in investigating the potential for whitewater boating opportunities and public access in the Gorge bypass reach.

2.5 Study Area

The study area is the 2.5-mile Gorge bypass reach from Gorge Dam to Gorge Powerhouse. The reach is a relatively steep, confined canyon characterized by bedrock and large boulder substrate. The suitability of this reach for expert whitewater boating has not been investigated. Public access to the Gorge bypass reach is restricted for safety. There are no established locations to access the river. Access to the river requires crossing over large boulders on steep slopes.

A map of the study area is provided in Figure 2.5-1.

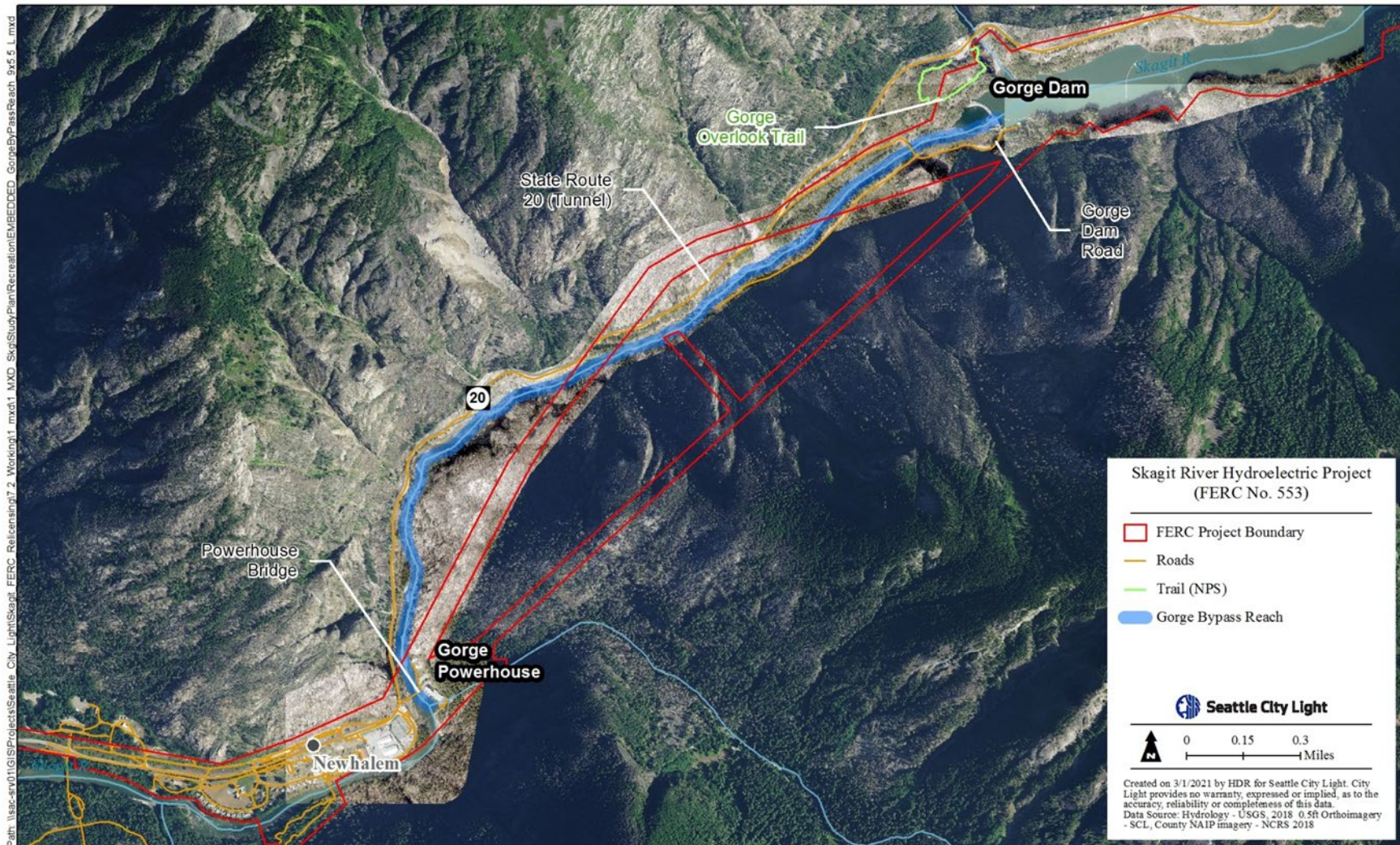


Figure 2.5-1. Proposed Gorge bypass reach study area.

2.6 Methodology

The Gorge Bypass Reach Safety and Whitewater Boating Study will consist of a three-phased sequential investigation referred to as Levels 1, 2, and 3 (Whittaker et al. 2005). The phased sequential approach is designed to increase study resolution as investigations progress from one level to the next, as well as share interim results earlier in the relicensing process across resource disciplines. Advancing to more intensive study levels is dependent on results and recommendations in the prior study level.

Each investigation level contains distinct study objectives, methods, and products captured in interim reports. The respective interim reports will include the following information where known: a description of the current understanding of the suitability of whitewater boating opportunity in the Gorge bypass reach, public safety issues, Project operational constraints, competing resources, and explicit decision criteria whether to proceed to the next level of study or suspend further investigation. Progression to the next level of investigation will be terminated if results from the current level indicate the Gorge bypass reach is not a suitable whitewater opportunity due to overly difficult rapids, safety concerns associated with public river access, Project operational constraints, or if agency regulations prohibit further investigation due to concerns for effects on competing resources.

The three levels of investigation are described in this study plan, including objectives, potential data sources, methods, anticipated products in interim report for each level, and potential criteria for advancement to the next level of investigation.

Field investigations in Levels 2 and 3, if warranted from previous levels, will be limited to opportunistic flows in the Gorge bypass reach and to the extent practicable, will also take advantage of controlled spills as part of the Bypass Instream Flow Model Development Study. Spill events will not be scheduled specifically for this study. Opportunistic flows may be caused by storm events, or by dam safety tests or other operational requirements in the Project system. Field investigations may be scheduled on short notice based on anticipation of opportunistic flow events.

2.6.1 Level 1: Desktop Analysis

Level 1 investigation will include literature reviews, structured interviews, summary of hydrology in the bypass reach, Gorge Dam spill gate operation, physical description of the river channel in the bypass, description of existing river access, and summary of regulatory agency resource management goals in the bypass reach and tribal interests.

Literature review will include whitewater guidebooks, magazine publications with a focus on whitewater recreation, electronic whitewater guidebooks available online, and Internet searches for trip reports. A table summarizing whitewater opportunities in the Skagit River basin to the confluence with the Sauk River will be compiled. The table will include the name of the whitewater run, river name, put-in and take-out location, length, gradient (feet per mile), and whitewater difficulty. Detailed information on the Gorge bypass reach will be included in the table where information is available. This will include length, gradient, whitewater difficulty, and potential access points. Cells where information is unknown will remain blank.

Structured interviews will be conducted with individuals in the whitewater boating community with knowledge of the Gorge bypass reach. The interviews will focus on individuals' knowledge of Gorge bypass reach, any dates with direct observations of Gorge bypass reach, opinion on whitewater difficulty, estimated range of preferred flows for whitewater boating, and other individuals with knowledge on whitewater boating in the bypass reach.

The recent hydrology of the Gorge bypass reach will be analyzed. Analysis will include the annual frequency and timing of spill events, duration, magnitude, and rate of change. The hydrology section of the Level 1 interim report will include a description of Gorge Dam spill gate operations, including the predictability, timing, and reason for planned spill events.

The Level 1 investigation will summarize regulatory agency resource goals and tribal interests for the Gorge bypass reach. The Level 1 interim report will include a matrix of relicensing studies being conducted in the Gorge bypass reach for respective resource areas.

The Level 1 interim report will include explicit decision criteria whether to proceed to Level 2. Progression to a Level 2 field reconnaissance will be evaluated based on results from the Level 1 interim report. Evaluation criteria will include at a minimum the criteria listed below:

- (1) Level 1 investigation determines Gorge bypass reach contains rapids suitable / not suitable for whitewater boating;
- (2) Access to the river is / is not feasible;
- (3) Potential effects on natural and cultural resources can / cannot be resolved for next level of proposed study;
- (4) Agency regulations and/or tribal concerns do / do not prohibit further investigation; and
- (5) Project operations are / are not able to provide opportunistic spills in range suitable for whitewater boating; and
- (6) Opportunities for coordination with other studies.

2.6.2 Level 2: Field Reconnaissance

Level 2 investigations involve opportunistic shore-based observation of flow in the bypass reach during a spill event or controlled spill as part of other relicensing studies. The objective is to observe flow in the bypass reach to evaluate navigability and whitewater difficulty and estimate a suitable range of flows for Level 3 investigation if warranted. River access and safety concerns will also be evaluated during the field reconnaissance.

Participants in the field reconnaissance will receive a brief overview of the relicensing process, the study plan process within the broader relicensing, objectives of the field reconnaissance, and specific criteria to evaluate. The study plan lead will identify areas of interest for the field reconnaissance tour. City Light will coordinate transportation during the field reconnaissance. The field reconnaissance will conclude with a structured focus group in Newhalem. Focus group questions will prompt discussion on navigability, whitewater difficulty, suitable range of flows for whitewater boating, river access needs, safety, other areas of concern, and uniqueness of the Gorge bypass reach compared to other opportunities in the region.

Participants in the Level 2 reconnaissance will be identified in advance of the field reconnaissance. Participants will be nominated collaboratively with the whitewater community. Selection will be based in part on knowledge of whitewater boating opportunities in the Skagit River basin, high level of whitewater boating skills, and experience to evaluate potential safety and whitewater difficulty for the Gorge bypass reach as well as familiarity with the Project relicensing process. The field reconnaissance will be limited to six or fewer participants from the whitewater community for tour logistics and to facilitate focus group discussion.

The Level 2 interim report will summarize findings from the field reconnaissance. The report will include notes from group discussions at individual field locations during the tour, opinions expressed in focus groups, river access needs, potential resource issues identified and summary of findings reported in the Level 1 desktop analysis. Decision criteria identified in the Level 1 desktop analysis will be refined in the Level 2 assessment to determine if the study should progress to Level 3. Progression to a Level 3 multiple flow evaluation will be based on results from the Level 2 interim report.

2.6.3 Level 3: Multiple Flow Evaluation

The Level 3 multiple flow evaluation will consist of a team of six or fewer boaters paddling two to four flows. The range of flows will be based on volumes previously identified in the Level 2 field reconnaissance. Participants will complete a single flow evaluation form after each flow event and participate in a structured focus group. Boaters will complete a comparative flow evaluation form and final structured focus group upon completion of all flow events. The single flow and comparative flow evaluation forms will be developed upon determination that a Level 3 multiple flow evaluation is warranted. The multiple flow reconnaissance will be limited to spill events as described in the Level 2 field reconnaissance.

Similar to the Level 2 field reconnaissance, boaters will be identified in advance collaboratively with representatives of the whitewater community. Participants will need to commit to each flow evaluation for comparison purposes. Participants may elect not to boat if they perceive conditions in the channel are unsafe. Representatives of the whitewater community will be responsible for determining if individuals possess the necessary skills to participate in the Level 3 evaluation. All study participants will be required to sign a liability waiver. City Light will aim to have a consistent team of boaters between Level 2 and Level 3 reconnaissance efforts, but unforeseen events or conflicts beyond City Light's control may influence the final Level 3 reconnaissance team representatives.

The Level 3 multiple flow evaluation will analyze the boaters' single flow and comparative flow evaluation forms as well as opinions expressed in focus group discussions. The analysis will identify the range of flows identified for whitewater boating including the minimum acceptable flow and the optimum flow, if applicable. The report will also identify the overall whitewater difficulty and list of significant rapids. For safety reasons, non-boater access into the Gorge bypass reach will be limited during Level 3 flow events. Flow conditions and boating opportunities will be documented with photographs and video at key observation points in the Gorge bypass reach for LP review in the reporting phase.

2.6.4 Reporting

The Gorge Bypass Reach Safety and Whitewater Boating Study final report will synthesize information and analysis for the respective levels of study warranted for investigation. For Levels 1 and 2, the report will include the following: (1) description of the whitewater boating opportunity observed in the Gorge bypass reach; (2) description of the existing access to the Gorge bypass reach; (3) public safety concerns; and (4) summary of natural and cultural resources and operations that could be affected by providing whitewater opportunities. Level 3 reporting, if warranted, will include analysis of multiple flow comparisons as described by Whittaker et al. (2005).

2.7 Consistency with Generally Accepted Scientific Practice

The sequential study approach proposed for the Gorge Bypass Reach Safety and Whitewater Boating Study is based on the publication “Flows and Recreation: A Guide to Studies for River Professionals” by Whittaker, et al. (2005). This approach has been successfully applied in other FERC relicensing proceedings.

2.8 Schedule

The Gorge Bypass Reach Safety and Whitewater Boating Study relies on a sequential framework with progression to subsequent levels of study dependent on results from previous levels. Furthermore, the field component is dependent on observation of flows in the Gorge bypass reach, which may include unscheduled spill events from Gorge Dam and controlled releases as part of other relicensing studies. As such, the schedule for completion of specific stages is dynamic.

A tentative schedule is provided below. The Level 1 desktop analysis will be completed in the spring/summer of 2021 allowing sufficient time for Level 2 study planning if warranted by Level 1 results. Level 2 field reconnaissance would then be positioned to take place in the summer or fall of 2021 when anticipated tributary inputs increase flows in the Gorge bypass reach or unscheduled spill events occur at Gorge Dam. If warranted by Level 2 results, Level 3 multiple flow evaluation timing would be based on opportunistic flows from tributary inputs and unscheduled spill from Gorge Dam as well as safety considerations. Interim reports will be provided upon completion of each level of study. Details of the proposed schedule for respective levels of study in the sequential framework are listed below.

Level 1: Desktop Analysis

- Data Collection and Analysis – Spring 2021
- Draft Interim Report – Spring/Summer 2021

Level 2: Field Reconnaissance

- Identify Team of Boaters and Agency Representatives for Field Reconnaissance – Summer 2021
- Develop Participant Liability Forms – Spring 2021
- Develop Focus Group Questions – Spring 2021

- Single Flow On-shore Reconnaissance – Summer/Fall 2021 (dependent on when opportunistic or controlled flows occur)
- Draft Report (Initial Study Report [ISR]) – March 2022

Level 3: Multiple Flow Evaluation

- Develop Single Flow and Comparative Flow Evaluation Forms – Winter 2022
- Develop Focus Group Questions – Winter 2022
- Identify Team of Boaters and Agency Representatives for Level 3 Multiple Flow Evaluation – Winter 2022
- Multiple Flow On-water Evaluation – Summer/Fall 2022 (dependent on when opportunistic or controlled flows occur)
- Final Report (Updated Study Report [USR]) – March 2023

2.9 Level of Effort and Cost

The initial estimate for implementation and reporting associated with this study is approximately \$75,000.

3.0 REFERENCES

- Corbett, R. 1990. A Method for Determining Minimum Instream Flow for Recreation Boating. SAIC Special Report 1-239-91-01. McLean, VA: Science Applications International Corporation.
- National Park Service (NPS). 1988. General management plan: North Cascades National Park, Ross Lake National Recreation Area, Lake Chelan National Recreation Area. [Denver, Colo.]: U.S. Dept. of the Interior, National Park Service.
- _____. 2012. Ross Lake National Recreation Area General Management Plan. North Cascades National Park Complex. March 2012.
- 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.
- Whittaker, D., B. Shelby, and J. Gangemi. 2005. Flows and Recreation: A Guide to Studies for River Professionals. Hydropower Reform Coalition, Washington, DC.
- Whittaker, D., B. Shelby, W. Jackson, and R. Beschta. 1993. Instream Flows for Recreation: A Handbook on Concepts and Research Methods. U.S. Department of Interior, National Park Service, Anchorage, AK.

This page intentionally left blank.

**GORGE BYPASS REACH SAFETY AND WHITEWATER BOATING
REVISED STUDY PLAN**

ATTACHMENT A

**CITY LIGHT RESPONSES TO LP COMMENTS ON THE STUDY PLAN
PRIOR TO PSP**

Table 1. City Light responses to LP comments on the study plan prior to PSP.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
1.	Rick Hartson (Upper Skagit Indian Tribe)	04/11/2020	Title	As worded, implies a general safety assessment for the bypass reach. Remove “safety” or reword title to better describe the focus of the study on “whitewater boating safety.”	Thank you for your comment. Safety is identified as a study objective in terms of safe access to the river, evaluation of the whitewater difficulty and assessment of potential increased public access to the bypass reach in general. No edits made.
2.	Brock Applegate (WDFW)	04/13/2020	Section 1.2 Relicensing Process	In-Text Edit: “This study plan reflects the RWG consultation effort , and City Light will continue to engage the RWG structure in the preparation of the Proposed and Revised Study Plans...”	Thank you for your comment. Edits to text made to better reflect the RWG and consultation process.
3.	Rick Hartson (Upper Skagit Indian Tribe)	04/11/2020	Section 1.3 Study Plan Development	This study could inform a number of fisheries-related information requests. Study development and implementation should be coordinated with fish & aquatics group.	Thank you for your comment. Licensing participants from other work groups including the F&A RWG are encouraged to review and comment on this study plan. In addition, the implementation schedule will be shared with the other work group participants. No edits made.
4.	Jon-Paul Shannahan (Upper Skagit Indian Tribe)	04/12/2020	Section 1.3 Study Plan Development	Given the different lengths reported in the many different reports one goal would be measure the length of the Skagit Mainstem that is currently dewatered available for whitewater rafting.	Thank you for your comments. An objective of the study is to describe the physical characteristics of the reach being studied for whitewater boating suitability. The length of the reach will be included in the physical description. No edits made.
5.	Jon-Paul Shannahan (Upper Skagit Indian Tribe)	04/12/2020	Section 1.3 Study Plan Development	Is there an interest in evaluating flows in this section other than the spill event? Understanding what mechanisms exist for different flows in the reach and then evaluating a range of flows that might be proposed under new license operations would be an interest to a broader range of paddlers than extreme spill events.	Thank you for your comments. The Level 1 Desktop Analysis will include an analysis of spill events in terms of frequency, timing, duration, magnitude of spill volume (cfs) and rate of change. The spill hydrology analysis will be combined with other information gathered in the Level 1 Desktop Analysis in the interim report. The Level 1 interim report

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				<p>New comment Brock Applegate (WDFW) provided 05/7/2020: I support Jon-Paul's comment. We should evaluate the flows at many levels, not just extreme spill.</p>	<p>will make a determination whether Level 2 study is warranted based on the information collected. The determination to proceed to Level 2 or Level 3 will not be limited to the hydrology of extreme spill events only. Field implementation of Levels 2 and 3, if warranted, are limited to opportunistic spill events. No edits made.</p> <p>Response to comment provided on 05/7/2020: Thank you for your comment. Comment noted.</p>
6.	Brian Lanouette (Upper Skagit Indian Tribe)	04/7/2020	Section 1.3 Study Plan Development	<p>As well as fishery resources</p> <p>New comment Brock Applegate (WDFW) provided 05/7/2020: WDFW considers fishery resources very important. I would wager all the Co-Managers do. WDFW also recommends that you add fishery resources for consideration.</p>	<p>Thank you for your comment. Fishery resources are included in the phrase “other resources...” in the sentence. No edit made.</p> <p>Response to comment provided on 05/7/2020: Thank you for your comment. Comment noted.</p>
7.	Jon-Paul Shannahan (Upper Skagit Indian Tribe)	04/12/2020	Section 2.1 Study Goals and Objectives	<p>Current conditions there is no water, goal should be a range of flows as identified in the re-license process.</p> <p>New comment Brock Applegate (WDFW) provided 05/7/2020: I would think that SCL would want to spill less than more, so WDFW recommends that the Fish and Aquatic WG coordinate with the Recreation WG do gather data at opportunistic flows. Let's work together on this relicensing.</p>	<p>Thank you for your comments. Current conditions include spill events in the Gorge bypass reach. No edits made.</p> <p>Response to comment provided on 05/7/2020: Thank you for your comment. Comment noted. Please see response to comment #39.</p>
8.	Thomas O’Keefe (American Whitewater)	04/16/2020	Section 2.1 Study Goals and Objectives	<p>In-Text Edit: “The goal of this study is to evaluate the suitability of the Skagit River in the Gorge bypass reach for whitewater boating under</p>	<p>Thank you for the suggested edit. Accepted with minor amendment. In the study phase, the goal is limited to current conditions in the Gorge Bypass. Future operational scenarios in</p>

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				current conditions and future operational scenarios that include the range of instream flow measures that may be included in a future license, and assess potential constraints such as Project operations and safety concerns.”	the Gorge Bypass will be evaluated in the development of the Draft License Application (DLA).
9.	Rick Hartson (Upper Skagit Indian Tribe)	04/11/2020	Section 2.1 Study Goals and Objectives	And cultural and fisheries.	Thank you for your comment. A comprehensive resource effects analysis will be developed and integrated during the preparation of the DLA. License participants will have an opportunity to consider effects of whitewater boating, if warranted, on other resources in their review of the DLA in the National Environmental Policy Act (NEPA) process. No edits made.
10.	Brian Lanouette (Upper Skagit Indian Tribe)	04/7/2020	Section 2.1 Study Goals and Objectives	<p>Include in objectives:</p> <p>If boating is determined feasible, identify the impacts of boating and necessary bypass reach flows on fishery and other natural resources downstream.</p> <p>If boating is determined feasible, identify the impacts of the flow regimes on the George reservoir’s aquatic community.</p>	Thank you for your comments. Evaluation of flow regimes at the Project may be part of the comprehensive resource effects analysis that will be developed and integrated during the preparation of the DLA. License participants will have an opportunity to consider the potential effects of modified flow regimes on respective resources in their review of the DLA in the NEPA process. No edits made.
11.	Thomas O’Keefe (American Whitewater)	04/15/2020	Section 2.1 Study Goals and Objectives	<p>In-Text Edit:</p> <p>Add: “Assess the recreational potential of the river corridor for recreational boating if portions of the project are removed;”</p> <p>Comment:</p> <p>We can wordsmith this and coordinate with other resource groups. If agencies or tribes are considering studies to evaluate project removal alternatives, we would like to see a basic recreational assessment. This could be a</p>	Thank you for your comments. The study does not consider project removal scenarios. No edits made.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				narrative based on historical information, photos, and gradient profiles.	
12.	Thomas O’Keefe (American Whitewater)	03/26/2020	Section 2.1 Study Goals and Objectives	In-text edit: “Quantify the frequency, timing, duration, and magnitude, and rate of change of spill events from Gorge Dam annually within the whitewater boating flow range;”	Thank you for your comments. Edit accepted. Rate of change will be included in the hydrologic analysis of spill events.
13.	Thomas O’Keefe (American Whitewater)	04/16/2020	Section 2.2 Resource Management Goals	In-text edit: “City Light’s goal is to evaluate the suitability of the Skagit River in the Gorge bypass reach for expert whitewater boating under current operating conditions, and assess potential constraints and opportunities for these boating opportunities, such as potential effects or benefits to natural, cultural, and other Project resources from increased public access as well as Project operations and modified flow regimes and safety concerns.” Comment: You may need to wordsmith this but as written it all assumes negative impact. As in the Jackson Hydropower licensing, often we can find opportunities and positive benefits of flushing flows or ecological process flows that also provide a recreational experience. The goal of the study should be to identify or highlight any of these opportunities.	Thank you for your comments. City Light agrees with the proposed edits to this sentence expanding the assessment of the potential constraints and “opportunities” as suggested by the respondent. However, it is premature for the study to assess modified flow regimes at this stage in the licensing process. Edits made to the text to reflect this. Evaluation of flow regimes at the Project may be part of the comprehensive resource effects analysis that will be developed and integrated during the preparation of the DLA. License participants will have an opportunity to consider the potential effects of modified flow regimes on respective resources in their review of the DLA in the NEPA process.
14.	Rick Hartson (Upper Skagit Indian Tribe)	04/11/2020	Section 2.2 Resource Management Goals	Why limit assessment of constraints to those caused by public access? If whitewater boating will be seeking spills over Gorge, the study should seek to identify potential conflicts with natural resources needs. Conversely, how might whitewater boating needs coincide with natural resources needs?	Thank you for your comment. The assessment of potential effects is not limited to public access alone. The potential effects associated with public access were provided in this section as examples. In addition, the study goals and objectives do not include a recommendation for scheduled spills for

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					whitewater boating purposes as the comment suggests. No edits made.
15.	Rick Hartson (Upper Skagit Indian Tribe)	04/11/2020	Section 2.2 Resource Management Goals	Does SCL have specific management goals in mind? If so, it would help to see that described here.	Thank you for your comment. Paragraph 1 in Section 2.2 describes City Light's goals as they relate to this study. The study plan follows FERC's seven criteria for study requests. One of those criteria is to explain the relevant resource management goals (5.9(b)(2)). City Light provided their goals for the study. Resource agencies and other license participants are encouraged to provide resource management goals specific to the proposed study as well. No edits made.
16.	Brian Lanouette (Upper Skagit Indian Tribe)	04/11/2020	Section 2.3 Background and Existing Information	Add "cultural, and fishery and aquatic resources" to this list. New comment Brock Applegate (WDFW) provided 05/7/2020: WDFW highly recommends that you give details and examples. Details help the reader understand the meaning of your statement.	Thank you for your comments. The phrase "other resources..." in this sentence includes cultural, fishery and aquatic resources. No edits made. Response to comment provided on 05/7/2020: Thank you for your comment. Comment noted.
17.	Thomas O'Keefe (American Whitewater)	04/16/2020	Section 2.4 Project Operations and Effects on Resources	A holistic treatment of the resource should also include benefits of dynamic flow regime. New comment Brock Applegate (WDFW) provided 05/7/2020: I would assume that SCL will do an effects analysis when they implement the operations model, a current study plan. The LPs will need to know the effects of different flow regimes before the submittal of the DLA. WDFW recommends that SCL coordinate with other staff in the Fish and Aquatic WG.	Thank you for your comments. It is beyond the scope of this study to evaluate the effects on other resources resulting from various flow scenarios. Evaluation of flow regimes at the Project may be part of the comprehensive resource effects analysis that will be developed and integrated during the preparation of the DLA. License participants will have an opportunity to consider the potential effects of modified flow regimes on respective resources in their review of the DLA in the NEPA process. No edits made.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					Response to comment provided on 05/7/2020: Thank you for your comment. Comment noted. Please see response to comment #21.
18.	Bob Mierendorf (Upper Skagit Indian Tribe)	04/11/2020	Section 2.4 Project Operations and Effects on Resources	I don't see any discussion of effects on resources here, only a statement on operations.	Thank you for your comment. The intent of this section is to discuss the potential effects on resources in order to inform the study goals and objectives. No edits made.
19.	Jon-Paul Shannahan (Upper Skagit Indian Tribe)	04/12/2020	Section 2.4 Project Operations and Effects on Resources	Frequency, magnitude and duration of spills should be noted in PAD over the term of last license, and used in this document to address study goals.	Thank you for your comment. The Desktop Analysis in Level 1 will include a detailed hydrologic analysis of spill events including frequency, timing, duration, magnitude of spill volume (cfs) and rate of change. No edits made.
20.	Rick Hartson (Upper Skagit Indian Tribe)	04/13/2020	Section 2.4 Project Operations and Effects on Resources	Would "irregular basis" be a better description? If spill events are predictable, explain the reason, time of year, and how far in advance it is known that a spill will occur.	Thank you for your comments. Spill events occur on a near annual basis but cannot be predicted with accuracy because they are dependent on annual snowpack and snowmelt run-off patterns combined with short term weather events. You are correct in referring to them as "irregular" but data also indicates spill events occur in most years. The Desktop Analysis in Level 1 will include a detailed hydrologic analysis of spill events. No edits made.
21.	Rick Hartson (Upper Skagit Indian Tribe)	04/13/2020	Section 2.4 Project Operations and Effects on Resources	LPs have expressed an interest in investigating instream flows, woody debris, and sediment transport for fisheries & aquatics, and this study should consider potential conflicts with these other resource needs.	Thank you for your comments. It is beyond the scope of this study to evaluate the effects on other resources resulting from various flow scenarios. A comprehensive resource effects analysis will be developed and integrated during the preparation of the DLA. License participants will have an opportunity to consider effects of

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				<p>New comment Brock Applegate (WDFW) provided 05/7/2020:</p> <p>SCL will do evaluate the effects of different flows when they implement the Operation Model Study Plan and to some degree, during the Instream Flow Model implementation, which informs the Operations Model.</p>	<p>whitewater boating, if warranted, on other resources in their review of the DLA in the NEPA process. No edits made.</p> <p>Response to comment provided on 05/7/2020:</p> <p>Thank you for your comment. City Light agrees that the Operations Model and the Instream Flow Model will inform evaluation of effects that will occur during preparation of the DLA.</p>
22.	Rick Hartson (Upper Skagit Indian Tribe)	04/11/2020	Section 2.5 Study Area	This study should consider how other resource interests may impact the study area. For example, fisheries and aquatics have expressed the need to understand how interruption of wood and gravel transport have affected the geomorphology of the bypass reach.	Thank you for your comments. A comprehensive resource effects analysis will be developed and integrated during the preparation of the DLA. License participants will have an opportunity to consider effects of whitewater boating, if warranted, on other resources in their review of the DLA in the NEPA process. No edits made.
23.	Bob Mierendorf (Upper Skagit Indian Tribe)	04/13/2020	Section 2.5 Study Area	Regarding cultural resources, Upper Skagit Indian Tribe will propose the By-pass reach be included in the project boundary and in the APE.	Thank you for your comments. Comment Noted.
24.	Rick Hartson (Upper Skagit Indian Tribe)	04/13/2020	Section 2.6 Methodology	“Competing or coincident resource needs”	Thank you for your comments. The interim reports for respective levels in the study are designed, in part, for license participants to evaluate the suitability for whitewater boating in the Gorge Bypass reach based on information collected at the current level of study and make a determination if progression to the next level of study is warranted. Potential competing and/or complimentary resources, if any, will be identified as part of the decision process but detailed analysis will not be completed on the other resource areas as part of this study.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					A comprehensive resource effects analysis will be developed and integrated during the preparation of the DLA. License participants will have an opportunity to consider effects of whitewater boating, if warranted, on other resources in their review of the DLA in the NEPA process. No edits made.
25.	Brock Applegate (WDFW)	04/13/2020	Section 2.6 Methodology	In-text edit: “Progression to the next level of investigation will be terminated if results from the current level indicate the Gorge bypass reach is not a suitable whitewater opportunity due to overly difficult rapids, overly dangerous concerns with public river access...”	Thank you for your comments. The study plan is referring to concerns for public safety. Edits made to the text to reflect the safety concerns associated with public river access.
26.	Thomas O’Keefe (American Whitewater)	04/15/2020	Section 2.6 Methodology	My one concern here is "overly dangerous" can mean different things to different people based on their skill and experience.	Thank you for your comments. The phrase “overly dangerous” was proposed by a comment respondent. The study plan is referring to concerns for public safety. Edits made to the text to reflect the safety concerns associated with public river access. Assessment of the whitewater boating difficulty will be objective using the International Scale of Whitewater Difficulty. This reference will be added to the text.
27.	Thomas O’Keefe (American Whitewater)	03/26/2020	Section 2.6 Methodology	I am not sure what this means. Just having "concerns" does not seem like the appropriate threshold.	Thank you for your comments. Edits made to the text to reflect the safety concerns associated with public river access.
28.	Thomas O’Keefe (American Whitewater)	03/26/2020	Section 2.6 Methodology	What type of "agency regulations" are we talking about here?	Thank you for your comments. The Gorge Bypass reach is located on NPS lands. As such, NPS has oversight on managing natural resources, recreation and access. The interim reports for each level of study will need to consider NPS regulations prior to progressing

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					to the next level of study, if warranted. No edits made.
29.	Brian Lanouette (Upper Skagit Indian Tribe)	04/8/2020	Section 2.6 Methodology	, for example, the impacts that the use or any changes in flow may have on fishery resources.	Thank you for your comments. Fishery resources are included in the term “resources”. No edits made.
30.	Thomas O’Keefe (American Whitewater) Brock Applegate (WDFW)	03/26/2020	Section 2.6 Methodology	In-text edits by Multiple Authors: “Spill events will not be scheduled specifically for this study,—but may be coordinated with other instream flow studies designed to address other instream flow issues for fisheries or geomorphic processes. Opportunistic flows may be caused by storm events, or by dam safety tests or other operational requirements in the Project system. Field investigations will —may be scheduled on short notice based on anticipation of opportunistic flow events,—but every attempt will be made to provide enough lead time. SCL will give best effort to and coordinate with interested LPs, when future spills look possible. ”	Thank you for your comments. The suggested edits were incorporated (in part) into the revised version.
31.	Thomas O’Keefe (American Whitewater)	03/26/2020	Section 2.6 Methodology	You can wordsmith this. I am fine with not scheduling solely for whitewater but if we are doing other flow studies, let's document a commitment to coordinating. I heard that sentiment expressed in our recent webinar, but it needs to be reflected in the document.	Thank you for your comments. See response to Comment 30 above.
32.	Susan Rosebrough-Jones (NPS)	04/14/2020	Section 2.6 Methodology	NPS supports American Whitewater’s comments and also recommends the study be coordinated with other studies vs. solely making use of unscheduled spill events as it allows more time for planning and addressing a safe study.	Thank you for your comments. City Light has accepted (in part) the edits recommended by American Whitewater and WDFW in comment No. 30 above. City Light will certainly attempt to coordinate resource studies taking place in the Gorge Bypass reach where co-location of study efforts is permissible and safety measures are in place.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					At this point in time, there is no planned spill events specific for resource studies in the Gorge Bypass reach. Should that change during the licensing process then City Light will communicate across resource areas to coordinate field investigation efforts where permissible and safe.
33.	Thomas O'Keefe (American Whitewater)	04/15/2020	Section 2.6 Methodology	I would not assume they all "will" be scheduled on short notice. If for example we have a good snowpack we should be able to have some heads up on likelihood of spill events and opportunities we can take advantage of.	Thank you for your comments. The predictability of spill events is contingent, in part, on run-off forecasts. In years with higher snowpack longer range forecasts can be made. In years with shallower snowpack spill events can occur with less predictability and are typically associated with individual storm events with heavy precipitation. No edits made.
34.	Thomas O'Keefe (American Whitewater)	04/16/2020	Section 2.6.1 Level 1: Desktop Analysis	Let's also include timing and not just physical attributes of the gate operation. What do we know about when gates are opened or adjusted for spills, maintenance, etc.	Thank you for your comments. Analysis of "Gorge Dam spill gate operation" includes physical capabilities of the gates as well as analysis of when and why spill gates are operated. This will include opening for maintenance purposes and safety tests. The volume of discharge spilled during maintenance and safety tests will be reported. No edits made.
35.	Rick Hartson (Upper Skagit Indian Tribe)	04/11/2020	Section 2.6.1 Level 1: Desktop Analysis	And how conditions might change under various PMEs, such as restored transport of woody debris and sediment.	Thank you for your comments. The intent is to describe the current physical conditions of the Gorge Bypass reach in the Level 1 Desktop Analysis. It is premature at this stage to predict what PM&E's might be included in the new license and how PM&E's may alter the physical description of the river channel in the Gorge Bypass reach. No edits made.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
36.	Thomas O'Keefe (American Whitewater)	03/26/2020	Section 2.6.1 Level 1: Desktop Analysis	I have had good luck on a couple of projects having people fill out a simple survey to identify a pool of people with interest and based on responses we can identify good candidates for interviews.	Thank you for your comments. Input appreciated. We look forward to working with you in this phase of the study. No edits made.
37.	Rick Hartson (Upper Skagit Indian Tribe)	04/11/2020	Section 2.6.1 Level 1: Desktop Analysis	And rate of change.	Thank you for your comments. Edit incorporated into the revised version.
38.	Rick Hartson (Upper Skagit Indian Tribe)	04/13/2020	Section 2.6.1 Level 1: Desktop Analysis	Including the predictability, timing, and reason for planned spill events.	Thank you for your comments. Edit made. Timing of spill events is included in the hydrology analysis as part of the Level 1 Desktop Analysis. The reasons for spill events will be added to the analysis using a categorized list. Predictability of spill will be an outcome of the hydrology analysis.
39.	Thomas O'Keefe (American Whitewater)	04/16/2020	Section 2.6.1 Level 1: Desktop Analysis	In-Text Edit: "The Level 1 interim report will include a matrix of relicensing studies being conducted in the bypass reach for respective resource areas— that includes relevant details on timing and flows. " Comment: This needs a bit more elaboration. At a minimum let's include information on timing and flows for any other studies in this reach. See my suggested edit.	Thank you for your comments. The Level 1 Desktop Analysis will be completed early in the study process most likely before any other studies have started field implementation. As such, the matrix will be limited to a list of other studies being conducted in the Gorge bypass reach, study objectives, and, where available, schedule for field work. At this point in time no resource studies include a schedule for spill. Results from other studies will not be available when the Level 1 Desktop Analysis is completed. No edits made.
40.	Rick Hartson (Upper Skagit Indian Tribe)	04/11/2020	Section 2.6.1 Level 1: Desktop Analysis	What information will be included in the matrix? Specific points of overlap with other studies, including information that will be shared across studies? Will specific agency and tribal interests be identified and listed? Explain how coordination across resource groups, agencies, and tribes will lead to a	Thank you for your comments. The Level 1 Desktop Analysis will be completed early in the study process most likely before any other studies have started field implementation. As such, the matrix will be limited to a list of other studies being conducted in the Gorge

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				complete matrix that adequately identifies information needs and interests.	bypass reach, study objectives, and, where available, schedule for field work. The matrix is not intended to coordinate all information related to the bypass reach. City Light welcomes further discussion with licensing participants on broader coordination issues and information needs. No edits made.
41.	Thomas O’Keefe (American Whitewater)	04/16/2020	Section 2.6.1 Level 1: Desktop Analysis	While this is part of desktop analysis, presumably these first two criteria will be based on site knowledge and involve a field trip. If consultants or SCL personnel will be in the field to evaluate these criteria, a representative from American Whitewater and NPS should be present.	Thank you for your comments. Comment noted. City Light will coordinate field investigation efforts with licensing participants where permissible and safe.
42.	Bob Mierendorf (Upper Skagit Indian Tribe)	04/13/2020	Section 2.6.1 Level 1: Desktop Analysis	Nowhere does this draft reference the Cultural Resources By-pass Survey plan, which clearly overlaps with this study. Somewhere this Methodology section needs to explicitly say it will coordinate with overlapping studies and identify them in more than just a “matrix”. The cross-resource coordination that we’ve been hearing much about at CRWG meetings needs to show up here.	Thank you for your comments. A comprehensive resource effects analysis will be developed and integrated during the preparation of the DLA. License participants will have an opportunity to consider effects of whitewater boating, if warranted, on other resources in their review of the DLA in the NEPA process. No edits made.
43.	Bob Mierendorf (Upper Skagit Indian Tribe)	04/11/2020	Section 2.6.1 Level 1: Desktop Analysis	Usage of “mitigation” here is premature, if it is referring to the term’s regulatory meaning in the Nat. Hist. Preserv. Act. You can’t mitigate without first knowing significance and effects.	Thank you for your comments. Edit made. The term “mitigation” will be replaced with the word “resolved” to avoid regulatory interpretations.
44.	Thomas O’Keefe (American Whitewater)	04/16/2020	Section 2.6.1 Level 1: Desktop Analysis	In-Text Edit: Add Bullet Point: “Opportunities for coordination with other studies” Comment: Not sure if this belongs here but somewhere in Level 1 it would be good to	Thank you for your comments. Edit made. City Light agrees with the additional criteria recommended by the respondent.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				identify opportunities for coordination with other studies (e.g. geomorphic studies of this reach).	
45.	Rick Hartson (Upper Skagit Indian Tribe)	04/11/2020	Section 2.6.2 Level 2: Field Reconnaissance	Is it possible that spill events will be shaped to attain the variety of flow conditions desired? If so, it will be imperative to coordinate with fisheries and aquatics interests.	Thank you for your comments. The Level 2 Field Reconnaissance is intended to observe spill without shaping. With that said, the Level 1 Desktop Analysis may recommend a target range of spill during which the Level 2 Field Reconnaissance might take place but the recommendation should be viewed as an estimate only and not involve shaping at this point in time. No edits made.
46.	Brian Lanouette (Upper Skagit Indian Tribe)	04/12/2020	Section 2.6.2 Level 2: Field Reconnaissance	Upper Skagit Indian Tribe again requests opportunity to observe spill events in the bypass reach. Additionally, Upper Skagit Indian Tribe requests notification in advance of all spill events, regardless of whether they will be observed as part of the whitewater boating study, as well as an understanding of how spill events are scheduled and the amount of lead time that can be expected.	<p>Thank you for your comments. Participation in levels 2 and 3 of the Gorge Bypass Safety and Whitewater Boating Study will be limited to minimize congestion and oversee safety measures. City Light will coordinate with LPs on opportunities to observe spill events.</p> <p>The Upper Skagit Indian Tribe's requests to observe spill events have been responded to directly at staff level outside of the relicensing process. Scheduling of spill events for planned maintenance is dynamic and dependent on market conditions and other factors. Other events are unscheduled in response to natural flows. The PAD describes the nature and frequency of spill operations post facto. City Light will coordinate field investigation efforts with licensing participants where permissible and safe. Additional follow up on this item is invited outside of this forum to improve understanding of City Lights operations. No edits made.</p>

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
47.	Susan Rosebrough-Jones (NPS)	04/14/2020	Section 2.6.2 Level 2: Field Reconnaissance	NPS would like to be present in the field for the Level 2 and Level 3 studies. The NPS recommends that the same boaters be utilized for each of the Level 2 and Level 3 flows.	Thank you, your request is noted. City Light will coordinate field investigation efforts with all licensing participants where permissible and safe. City Light agrees it will be ideal to have the same group of whitewater boaters participate in Level 2 and Level 3 of the investigation.
48.	Bob Mierendorf (Upper Skagit Indian Tribe)	04/13/2020	Section 2.6.2 Level 2: Field Reconnaissance	Presumably the cultural survey will be referenced in the Level 1 analysis and any cultural survey results should feed into the Level 2 assessment, as it's scheduled ahead of this study's completion. None of this is made clear in this plan.	Thank you for your comments. The Level 1 Desktop Analysis will be completed early in the study process most likely before the cultural resource study in the Gorge Bypass has started field implementation. As such, it is not anticipated the results of the cultural resources study will be available for the Level 2 Field Reconnaissance. Nonetheless, the interim report from the Level 1 Desktop Assessment will be publicly available for members of the cultural resources work group to review and provide input. No edits made.
49.	Jon-Paul Shannahan (Upper Skagit Indian Tribe)	04/13/2020	Section 2.6.3 Level 3: Multiple Flow Evaluation	Prior to setting flows, assessing existing mechanisms for adding a range of flows into the by-passed reach should be evaluated. Maybe a difference of 20 CFS provides greater boater experience and safety but cannot be obtained from spill, but valves and other water ways may exist in the dam already. However, water quality assessments should be addressed from different release points through the dam.	Thank you for your comments. The Level 3 Multiple Flow Evaluation will utilize opportunistic spill events using the spill gates. There is no plan to use other infrastructure to alter the volume of spill flows. Furthermore, 20 cfs differences in flow volume are likely not detectable by whitewater boaters given the channel width, depth and structure in the Gorge Bypass. No edits made.
50.	Rick Hartson (Upper Skagit Indian Tribe)	04/11/2020	Section 2.6.3 Level 3: Multiple Flow Evaluation	Is it possible that spill events will be shaped to attain the variety of flow conditions desired? If so, it will be imperative to coordinate with fisheries and aquatics interests.	Thank you for your comments. The Level 3 Multiple Flow Evaluation will utilize opportunistic spill events using the spill gates. There is currently no plan to shape opportunistic spill events at this point in time. No edits made.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
51.	Brian Lanouette (Upper Skagit Indian Tribe)	04/8/2020	Section 2.6.3 Level 3: Multiple Flow Evaluation	Again, Upper Skagit Indian Tribe requests notification of spill events and flow evaluations. Upper Skagit Indian Tribe would like to observe the flow evaluations for analysis of potential impacts to fishery resources.	Thank you for your comments. See Comment #46.
52.	Brian Lanouette (Upper Skagit Indian Tribe)	04/8/2020	Section 2.6.3 Level 3: Multiple Flow Evaluation	Upper Skagit Indian Tribe requests that the report evaluate the impacts of the flow ranges proposed on cultural and fishery resources.	No edits made. It is beyond the scope of this study to evaluate the effects on other resources resulting from various flow scenarios. Evaluation of flow regimes at the Project may be part of the comprehensive resource effects analysis that will be developed and integrated during the preparation of the DLA. License participants will have an opportunity to consider the potential effects of modified flow regimes on respective resources in their review of the DLA in the NEPA process.
53.	Brian Lanouette (Upper Skagit Indian Tribe)	04/12/2020	Section 2.6.4 Reporting	Add natural or fishery resources and cultural resources here for clarity	Thank you for your comments. Edits incorporated into revised version.
54.	Jon-Paul Shannahan (Upper Skagit Indian Tribe)	04/13/2020	Section 2.8 Schedule	Recommend to specifically share and request comments on these interim reports with ALL other RWGs.	Thank you for your comments. Comment noted.
55.	Thomas O'Keefe (American Whitewater)	04/16/2020	Section 2.8 Schedule	I assume you believe opportunistic flows will be available during this time and maybe you could comment on when spills occur. Driving up the highway I think I have seen water in the channel more often during the spring and would have thought spring 2021 would be the time to do this. Please include some justification for timing and any information you have on when spills occur to validate this timing. Alternatively, if this information will	Your observations are appreciated, but no edit made. Our preliminary analysis presented in the PAD suggests that during the current license term, spill events occur most frequently in June and July followed by October and November. Flow forecasting and operational scheduling will be taken into account when planning the field components.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				be collected as part of Level 1 analysis, please build in some flexibility on timing based on that analysis and knowledge of when opportunistic flows are likely to occur.	
56.	Brian Lanouette (Upper Skagit Indian Tribe)	04/8/2020	Section 2.8 Schedule	Consultation with co-managers regarding the impacts of the field reconnaissance.	Thank you for your comments. Interim reports will be provided to all LPs to review and provide input. No edit made.
57.	Thomas O'Keefe (American Whitewater)	04/16/2020	Section 2.8 Schedule	Same comment as above? Is summer/fall likely to work? Or do we need to build in flexibility to include spring?	Thank you for your comments. During the current license term, spill events occur most frequently in June and July followed by October and November. No edit made.
58.	Judy Neibauer (USFWS)	05/13/2020	General Comments	In terms of looking at recreation in the Gorge bypass reach, you should plan at looking at where recreation will be in terms of access facilities, parking, trails, use of riverine habitat and water for rafting, and how they may overlap with key salmonid habitat. Should that reach become important and watered up for anadromous fish to use, there could be key areas (thermal, gravels, forage, spawning, rearing, cover, etc.) that should be protected from degradation at certain times of the year. When finalizing recreational study plans, drawing upon and linking to information collected in the geomorphology study, erosion study, etc., may help determine other key survey sites or types of data collection to assist in effects analysis.	Thank you for the comments. The study includes an evaluation of ingress and egress to the river. A comprehensive resource effects analysis will be developed and integrated during the preparation of the DLA. License participants will have an opportunity to consider effects of whitewater boating, if warranted, on other resources in their review of the DLA in the NEPA process. No edits made.
59.	Susan Rosebrough-Jones (NPS)	05/19/2020	General Comments	The NPS needs to be part of the team assessing access, safety, and other resource issues at all 3 phases of study. All LPs should be given the opportunity to observe the study. Advance notice of 14 days would be optimal, but it is understandable that SCL may not be able to accommodate this. However, we	Thank you for the comments. LPs will have an opportunity to provide input for the Level 1, 2 and 3 reports. City Light will make every effort to provide advance notification to LPs where possible. Scheduling of spill events for planned maintenance is dynamic and dependent on market conditions and other

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				need agree on what (# days) the advance notification will be prior to the study.	factors. Other events are unscheduled in response to natural flows. The PAD describes the nature and frequency of spill operations post facto. City Light will coordinate field investigation efforts with licensing participants where permissible and safe. No edits made.
60.	Susan Rosebrough-Jones (NPS)	05/19/2020	General Comments	Geologic hazards need to be considered in the assessment (rock falls, snow avalanche, etc.)	Thank you for the comment. The study will examine the structure of the river channel from a paddler's perspective, e.g., interaction between river flow and the channel bed surface resulting in hydraulic features. Geologic hazards are part of that evaluation of river hydraulics. Rockfall and avalanche paths will also be considered in the safety evaluation of river ingress and egress. No edits made.
61.	Susan Rosebrough-Jones (NPS)	05/19/2020	General Comments	It would be helpful to know what the discharge is for typical operational spill events. The study should look at hydraulics (depth, velocity, etc.), as well as hydrology of flows. It is our understanding that these are covered in Phase I of the study.	<p>Thank you for the comments. Level 1 will include an analysis of spill events including discharge volume. The PAD describes the nature and frequency of spill operations post facto.</p> <p>Depth and velocity will not be measured at river cross-sections as part of this study. The Corbett method (Corbett 1990) utilized depth and velocity measures to estimate minimum flows for recreation boating but this method does not serve as good predictor of boatability (Whittaker et al 1993). No edits made.</p>
62.	Susan Rosebrough-Jones (NPS)	05/19/2020	General Comments	The WW Study should also address and link to fish and aquatic resource issues and the Instream Flow Study. SCL should coordinate this study with the FAWG by including updates as part of the FAWG agenda.	Thank you for the comments. The Gorge Bypass Safety and Whitewater Boating Study will be provided to the FARWG for their review. All LPs, including members of the FARWG have the opportunity to review and comment on the Level 1, 2, and 3 reports. City Light will inform all RWGs when Level 1, 2,

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					<p>and 3 reports are available for review and comment.</p> <p>A comprehensive resource effects analysis will be developed and integrated during the preparation of the DLA. License participants will have an opportunity to consider effects of whitewater boating, if warranted, on other resources in their review of the DLA in the NEPA process. No edits made. It is beyond the scope of the Gorge Bypass Safety and Whitewater Boating Study to address fish and aquatic issues directly in the study report.</p> <p>No edits made.</p>
63.	Susan Rosebrough-Jones (NPS)	05/19/2020	General Comments	The NPS is concerned about the potential for fish stranding depending on how this study is implemented and the NPS would like to be part of this assessment.	<p>Thank you for your comment. Per requirements of the current license, ramping rates associated with any spill event must follow established operating rules which account for salmon and steelhead protection measures, including spawning flows and associated minimum flows, fry outmigration flows, juvenile rearing flows, downramp amplitudes, and ramping rates. City Light will make every effort to provide advance notification of spill events to LPs where possible. No edits made.</p>

**RA-03 PROJECT FACILITY LIGHTING INVENTORY
REVISED STUDY PLAN**

**SKAGIT RIVER HYDROELECTRIC PROJECT
FERC NO. 553**

Seattle City Light

**April 2021
RSP**

TABLE OF CONTENTS

Section No.	Description	Page No.
1.0	Introduction.....	1-1
1.1	General Description of the Project.....	1-1
1.2	Relicensing Process	1-1
1.3	Study Plan Development.....	1-2
2.0	Study Plan Elements	2-1
2.1	Study Goals and Objectives	2-1
2.2	Resource Management Goals	2-1
2.3	Background and Existing Information.....	2-1
2.4	Project Operations and Effects on Resources	2-2
2.5	Study Area	2-2
2.6	Methodology	2-3
2.7	Consistency with Generally Accepted Scientific Practice.....	2-4
2.8	Schedule.....	2-5
2.9	Level of Effort and Cost	2-5
3.0	References	3-1

List of Attachments

Attachment A	City Light Responses to LP Comments on the Study Plan Prior to PSP
Attachment B	Study Area Map

List of Acronyms and Abbreviations

BMP	best management practice
CCT.....	Correlated Color Temperature
City Light.....	Seattle City Light
ELC	Environmental Learning Center
fc	footcandles
FERC.....	Federal Energy Regulatory Commission
IDSA	International Dark Sky Association
IES.....	Illuminating Engineering Society
IESNA.....	Illuminating Engineering Society of North America
ISR	Initial Study Report
lm	lumens
LP.....	licensing participant
mLux	milli-Lux
NEC.....	National Electrical Code
NPS	National Park Service
PAD.....	Pre-Application Document
PRM	Project River Mile
Project	Skagit River Hydroelectric Project
PSP.....	Proposed Study Plan
RARWG.....	Recreation and Aesthetic Resources Work Group
RLNRA.....	Ross Lake National Recreation Area
RM	river mile
RSP	Revised Study Plan
RWG	Resource Work Group
SR.....	State Route
U.S.C.....	United States Code
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WDFW	Washington Department of Fish and Wildlife

This page intentionally left blank.

1.0 INTRODUCTION

1.1 General Description of the Project

The Skagit River Hydroelectric Project (Project), licensed to The City of Seattle, Washington, and operated through its publicly-owned electric power utility Seattle City Light (City Light), is located in northern Washington State and consists of three power generating developments on the Skagit River – Ross, Diablo, and Gorge – and associated lands and facilities. The Project generating facilities are in the Cascade Mountains of the upper Skagit River watershed, between Project River Miles (PRM) 94.7 and 127.9 (U.S. Geological Survey [USGS] RMs 94.2 and 127).¹ Power from the Project is transmitted via two 230-kilovolt 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, an Environmental Learning Center (ELC), several recreation facilities, and several parcels of fish and wildlife mitigation lands.

Project generating facilities are all located in Whatcom County, although Ross Lake, the most upstream reservoir, crosses the U.S.-Canada border and extends for about one mile into British Columbia at normal maximum water surface elevation. Gorge Powerhouse, the most downstream facility, is approximately 120 miles northeast of Seattle and 60 miles east of Sedro-Woolley, the nearest large town. The closest town is Newhalem, which is part of the Project and just downstream of Gorge Powerhouse. The primary transmission lines cross Whatcom, Skagit, and Snohomish counties; the fish and wildlife mitigation lands are in the same counties.

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, Diablo, and Gorge lakes.” The legislation maintains the Federal Energy Regulatory Commission’s (FERC) 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).

1.2 Relicensing Process

The current FERC license for the Project expires on April 30, 2025, and City Light will apply for a new license no later than April 30, 2023. City Light formally initiated the relicensing process by filing a Notice of Intent and Pre-Application Document (PAD) with FERC on April 27, 2020 (City Light 2020a). The PAD includes descriptions of the Project facilities, operations, license

¹ 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 Project River Mile (PRM) system are provided throughout this document. For further details see Section 7.0 of the main body RSP.

requirements, and Project lands as well as a summary of the extensive existing information available on Project area resources and early consultation on potential resource issues to be addressed during the relicensing. The PAD also includes an outline of the goals and objectives of this study.

In 2019-2020, City Light convened a series of Resource Work Groups (RWG) to engage agencies and other licensing participants (LP) in the Study Plan Development Process. Discussions with LPs continued in early 2021 with a series of topic-based discussions following filing of the Proposed Study Plan (PSP) on December 8, 2020 (City Light 2020b). This study plan reflects RWG and LP discussion and study requests and comments submitted by LPs.

1.3 Study Plan Development

A study will be undertaken to conduct an inventory and map the locations of outdoor lighting equipment installed at Project facilities and identify the current use and need for lighting at Project facilities. This study addresses issues raised in Issue Form RA05 – Night Sky submitted by the NPS. Washington Department of Fish and Wildlife (WDFW) also raised that dark skies protect migrating passerines which can become confused by lights at night. WDFW recommends downward pointing lights; red-flashing lights at the least amount per minute as required by the Federal Aviation Administration for all towers and airspace obstacles; to reduce light pollution by specifying lighting only where it is needed and when it is needed; when light is needed to use less light; specifying energy efficient lighting that is shielded and directed downward; and to specify light with a warmer color.

On April 24, 2020, City Light released the RA-03 Project Facility Lighting Inventory Draft Study Plan for LP review and comment. On May 7, 2020, the draft study plan was discussed at a Recreation and Aesthetics Resource Work Group (RARWG) meeting. City Light reviewed all comments received and released a revised version of the draft study plan on June 18, 2020. The revised draft was discussed on June 25, 2020 at a RARWG meeting. Written comments were received from NPS, WDFW, and U.S. Fish and Wildlife Service (USFWS) and responded to in an attachment to this study plan. A Status Draft of the study plan was provided to LPs on August 6, 2020.

City Light is filing this study plan with FERC as part of its Revised Study Plan (RSP), an update to the version that was filed with the PSP and incorporating additional consultation with LPs prior to the filing date. No formal study requests related to this study were filed with FERC.

PSP comments to this study plan were submitted by the NPS and Upper Skagit Indian Tribe. City Light has addressed the specific comments and suggested edits in this study plan and responded to comments in the PSP comment/response table appended to the main body of the RSP. Modifications made to the study plan in response to comments include edits for additional field data collection/documentation related to the “As Found” lighting documentation.

2.0 STUDY PLAN ELEMENTS

2.1 Study Goals and Objectives

The goal of this study is to inventory Project facilities located within the Project Boundary and within the RLNRA that utilize lighting at night. The objectives are as follows:

- Identify Project facilities within RLNRA that utilize outdoor nighttime lighting and describe characteristics of the luminaires.²
- Describe outdoor lighting needs at each Project facility and the operating periodicity, design, and intensity of lights being used.

2.2 Resource Management Goals

City Light maintains lighting at Project facilities for safety reasons, and to protect historic character, and other Project purposes.

The study will provide information for resource agencies and Indian tribes with jurisdiction in the Project vicinity to address their respective goals and objectives for resource management. NPS has resource management goals related to artificial lighting that may apply in the vicinity of the Project. The National Park Service Organic Act of 1916 states that the purpose of national parks is "... to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." Night sky resources are considered a part of the "scenery and the natural and historic objects" that are conserved under this act. NPS management policy 4.10 states that NPS "will preserve, to the greatest extent possible, the natural lightscapes of parks, which are natural resources and values that exist in the absence of human-caused light" (NPS 2006). Additionally, NPS "will minimize light that emanates from park facilities, and also seek the cooperation of park visitors, neighbors, and local government agencies to prevent or minimize the intrusion of artificial light into the night scene of the ecosystems of parks" (NPS 2006).

The natural cycles of light and dark have ecological value to park system resources, recreational and aesthetic importance to park visitors, and are part of the natural and cultural aesthetic of the parks. NPS outlines the policy for protecting night skies in Management Policies (NPS 2006) and as identified by the RLNRA General Management Plan (NPS 2012): "The NPS will complete an inventory of night sky conditions and will work with partners and adjacent land managers to protect night sky by reducing light pollution within RLNRA and on adjacent lands. For example, the NPS will work with Seattle City Light to reduce light pollution in Diablo and Newhalem."

2.3 Background and Existing Information

Details about Project lighting and the night sky can be found in the PAD (City Light 2020). Because of the Project's location within the North Cascades National Park Complex, development

² Luminaire definition: "A complete lighting unit consisting of a light source such as a lamp or lamps, together with the parts designed to position the light source and connect it to the power supply. It may also include parts to protect the light source or the ballast or to distribute the light" (Illuminating Engineering Society [IES] 1947; National Electrical Code (NEC), Article 100 [NEC 2017]).

is generally limited to City Light, NPS facilities, and State Route (SR) 20 (Washington State Department of Transportation facility). The existing nighttime environment in the Project is dark, with very limited introduced nighttime lighting. The Stephen Mather Wilderness, designated in 1988, borders much of the Project Boundary in the RLNRA. NPS manages the nighttime photic environment as a resource. Stray light at night has the potential to affect wilderness character qualities and wildlife habitat.

NPS conducted ground-based photometric measurements in North Cascades National Park and RLNRA and identified the Project to be a source of light pollution (Hoffman et al. 2015). Light sources are currently being used at Project hydroelectric facilities, housing and security structures, and City Light visitor service facilities. NPS identified Diablo Dam as having no shielding or other modifications to direct the light to where it is needed and reduce light disbursement and glare (Hoffman et al. 2015). An analysis of the light emitted from the post lamps on top of the dam showed a vertical illuminance value of 0.1 milli-Lux (mLux) at a distance of 5.3 km. Light is also introduced by vehicle traffic on SR 20.

2.4 Project Operations and Effects on Resources

Safe environments require adequate illumination levels as recommended by the Illumination Engineering Society of North America (IESNA) and documented in the IESNA Lighting Handbook (Rea and IESNA 2000). Recommended lighting levels vary by the task to be performed, such as walking along a path or working on machinery.

However, lighting also can obscure views of the stars and have negative effects on night sky resource management goals. The illumination levels recommended by the IESNA to create a safe environment may conflict with an area's night sky goals. This study will collect information on the safety benefits and use requirements of existing lighting as well as characteristics of the lighting.

2.5 Study Area

The study area includes all Project facilities within the Project Boundary within the RLNRA that utilize lighting at night. A map of the study area is attached to this study plan. The Project facilities include:

- Generating facilities (powerhouses and dams):
 - Ross Dam and Powerhouse
 - Diablo Dam and Powerhouse
 - Gorge Dam and Powerhouse
- Operations and maintenance support areas
- Townsites, including housing:
 - Diablo
 - Newhalem
- Transmission, transportation (vehicle and boat) and communications infrastructure, including:

- High tension transmission towers
- Diablo and Ross Lake Boathouses
- Radio antennae and microwave repeaters
- Visitor service and recreation areas:
 - ELC
 - Ladder Creek Falls Trail and Gardens

2.6 Methodology

The study consists of inventorying outdoor Project-related luminaires installed within the study area.

The study will consist of a daytime and nighttime site visit to catalog the physical characteristics of existing lighting for lights that do not have existing documented information (e.g., building lighting plans). All outdoor luminaires in the study area will be cataloged for the purpose of creating an “As-Found” lighting document to serve as a record of existing luminaires. Representative luminaires will be photographed and data will be recorded as described below, including field notes with supplemental observations. In addition to the cataloging process, City Light Project operations staff will document purpose of lighting for the study report.

The “As-Found” documents will include information on all outdoor lighting within the study area, including:

- Quantity (number of lamps [bulbs]);
- Locations (including estimated height of luminaire to the ground);
- Condition of existing luminaires (qualitative description of condition of structure [broken, corrosion, requiring replacement, etc.], age of luminaire [if available]);
- Voltage;
- Lamp type (e.g., LED, metal halide, incandescent, high pressure sodium, etc.);
- Color temperature of lamp (i.e., Correlated Color Temperature or CCT);
- Source wattage (information on lamp or luminaire);
- Lighting distribution (e.g., directional floodlight, light focused below luminaire, etc.);
- Nighttime lighting documentation;
- Shielding (is the lamp housed in a full cutoff luminaire or does the light produce direct glare and/or trespass outside the task area);
- Illuminance (in footcandles [fc]; a footcandle is the measure of density of lumens (lm) falling onto a square foot surface [1 fc = 1 lm/ft²]; a measure of total amount of visible light to the human eye from a light source);
- Ballast information (electrical information, condition, part number); and

- Luminaire control method (e.g., switch, individual photocell, central astronomical time clock, centralized photocell, dimmer, timer, motion sensor, etc.).

Information on use to be incorporated into the “As-Found” documents will include the:

- Hours of operation of the luminaire;
- Safety and security concerns and activities in the lit area;
- Purpose of the luminaire; and
- Historic values of the luminaire.

Data on luminaires will be collected using a digital data collection tool (i.e., ESRI Collector for ArcGIS).

A report will be generated containing the data recorded during the site visit and information on use of the luminaire and lamp characteristics. The report will identify potential opportunities for reducing light pollution while maintaining adequate illumination levels required for safe operations, visitor use, and Project activities.

Electric light illumination reduction measures recommended by the study shall address five considerations and/or methods of minimizing the effect of light: assessing the purpose, lowering intensity, controlling direction of illumination, changing the spectrum of emitted light, and limiting duration of emitted light as defined by the International Dark Sky Association (IDSA) (2020). Possible strategies for light reduction that could be identified include:

- Assess if the light is required at a location.
- Lowering Intensity – When less light is emitted into the environment there is less potential for that light to become light pollution.
- Controlling Direction – When all light is directed down, light must interact with a surface where its intensity is reduced before it goes into the sky and becomes light pollution. Directing illumination down also creates a more efficient design.
- Limiting or changing the lighting spectrum emitted by electric lighting to a narrow band that is smaller than the full range visible spectrum (380-740nm) can be used to create a lighting specification that provides functional lighting for humans while limiting other visual effects.
- Limiting Duration of Emitted Light – Light cannot become light pollution when it is not emitted. By limiting the duration of emitted illumination to only the times when lighting is necessary the effect of night lighting can be reduced. Possible measures include motion sensors to turn lights off and on as needed, or timers for lights that are needed only at certain times.

2.7 Consistency with Generally Accepted Scientific Practice

Field methods and reporting are consistent with the design and application standards specified in the Illuminating Engineering Society Lighting Handbook (Rea and IESNA 2000). The study will follow those standards and will be overseen by a professional electrical or architectural engineer who meets the National Council on Qualifications for the Lighting Professions Professional Qualification Standards for Lighting Certification.

2.8 Schedule

- Site Survey – May – September 2021
- Analysis and Creation of “As Found” Lighting Inventory – Fall 2021
- Final Report (Initial Study Report [ISR]) – March 2022

2.9 Level of Effort and Cost

The initial estimate for implementation and reporting associated with this study is approximately \$55,000.

3.0 REFERENCES

- Hoffman, R.L., A. Woodward, P. Haggerty, K. Jenkins, P. Griffin, M.J. Adams, J. Hagar, T. Cummings, D. Duriscoe, K. Kopper, J. Riedel, L. Marin, G.S. Mauger, K. Bumbaco, and J.S. Littell. 2015. North Cascades National Park Service Complex: Natural resource condition assessment. Natural Resource Report NPS/NOCA/NRR—20105/901. National Park Service, Fort Collins, CO.
- Illuminating Engineering Society (IES). 1947. IES lighting handbook: The standard lighting guide. New York.
- International Dark Sky Association (IDSA). 2020. Outdoor Lighting Basics. Tucson, Arizona. [Online] URL: www.darksky.org/lighting/lighting-basics. Accessed April 21, 2020.
- National Electrical Code (NEC). 2017. National Electrical Code Handbook. 29th Edition.
- National Park Service (NPS). 2006. NPS Management Policies 2006. U.S. Department of Interior, National Park Service. 180p. [Online] URL: https://www.nps.gov/policy/MP_2006.pdf. Accessed April 21, 2020.
- _____. 2012. Ross Lake National Recreation Area. General Management Plan. National Park Service, U.S. Department of the Interior. July 2012.
- Rea, M.S. and Illuminating Engineering Society of North America (IESNA). 2000. The IESNA lighting handbook: Reference & application. New York, NY: Illuminating Engineering Society of North America.
- 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. April 2020.

This page intentionally left blank.

**PROJECT FACILITY LIGHTING INVENTORY
REVISED STUDY PLAN**

ATTACHMENT A

**CITY LIGHT RESPONSES TO LP COMMENTS ON THE STUDY PLAN
PRIOR TO PSP**

Table 1. City Light responses to LP comments on the study plan prior to PSP.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
1.	Jack Oelfke (NPS)	05/19/2020	List of Acronyms and Abbreviations	Can be deleted. Is not in the Study Plan and is not a required metric in the lighting inventory	Thank you for your comment. The abbreviations list has been revised.
2.	Jack Oelfke (NPS)	05/19/2020	Section 1.0 Introduction	Note: all the comments attributed to Jack are actually from Bob Meadows, an NPS employee within the Natural Sounds and Night Skies Division in Ft. Collins, CO	Thank you. Comment noted.
3.	Brock Applegate (WDFW)	05/07/2020	Section 1.2 Relicensing Process	In-Text Edit: This study plan reflects the RWG consultation effort , and City Light will continue to engage the RWG structure in the preparation of the Proposed and Revised Study Plans (18 Code of Federal Regulations [CFR] §§ 5.11-5.13), and through the relicensing process generally.	Thank you for your comment. Edits to text made to better reflect the RWG and consultation process.
4.	Brock Applegate (WDFW)	05/26/2020	Section 2.1 Study Goals and Objectives	WDFW recommends that SCL evaluate any towers or other structures with great height, as well. I am not sure if this description includes these structures.	Thank you for your comment. The study area includes transmission infrastructure within the RLNRA, including towers. No edits made.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
5.	Judy Neibauer (USFWS)	05/22/2020	Section 2.2 Resource Management Goals	<p>I have similar comments as I submitted for the sound study plan. Please consider aquatic species in the assessments. Bull trout typically travel at night and light may interrupt passage during key migrations. For example, when work occurs in key habitat, DOT is using conservation measures to change lighting or to limit work at night so bull trout and other salmonids can pass the project site. An assessment of areas that might be an issue would be good information for the ESA Section 7 consultation.</p> <p>The USFS and other land owners may have requirements in other project areas like the transmission corridors and other purchased, managed lands, including restoration projects if operations occur at night.</p>	<p>Thank you for your comment. This study plan is an inventory; it does not propose to evaluate effects to aquatic species or any other resource. Lighting effects will be analyzed during the preparation of the Draft License Application (DLA).</p> <p>City Light appreciates any information on resource agency goals or requirements in the transmission line right-of-way with regards to lighting.</p>
6.	Jack Oelfke (NPS)	05/19/2020	Section 2.2 Resource Management Goals	<p>In-Text Edit: The National Park Service Organic Act of 1916 states that the purpose of national parks is "... to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." Night sky resources are considered a part of the "scenery and the natural and historic objects" that are conserved under this act.</p> <p>Comment: National Park Service Organic Act, 54 U.S.C. §§ 100101 et seq. (1970).</p>	<p>Thank you for providing this agency resource management goal. Edit accepted.</p>

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
7.	Jack Oelfke (NPS)	05/19/2020	Section 2.2 Resource Management Goals	In-Text Edit: National Park Service (NPS) management policy 4.10 states that NPS “will preserve, to the greatest extent possible, the natural lightscapes of parks, which are natural resources and values that exist in the absence of human-caused light” (NPS 2006).	Thank you. Edits accepted.
8.	Jack Oelfke (NPS)	05/19/2020	Section 2.3 Background and Existing Information	In-Text Edit: The Stephen Mather Wilderness, designated in 1988, borders much of the Project Boundary in the RLNRA. The nighttime photic environment is a resource that NPS manages, and stray light at night has the potential to affect wilderness character qualities and wildlife habitat therein.	Thank you. Edits accepted.
9.	Jack Oelfke (NPS)	05/19/2020	Section 2.3 Background and Existing Information	In-Text Edit: Light sources are currently being used at Project hydroelectric facilities, housing and security structures, and City Light visitor service facilities. NPS identified Diablo Dam as having no shielding or other modifications to direct the light to where it is needed and reduce light disbursement trespass and glare (Hoffman et al. 2015). An analysis of the light emitted from the post lamps on top of the dam showed a vertical illuminance value of .1 mLux at a distance of 5.3k. This is significant important as this is the brightness of Venus, which is the brightest single object in the night sky, absent the moon. As you move closer to the dam, the brightness values increase above desired natural conditions while still within the Stephen Mather Wilderness of North Cascades NP. Light is also introduced by vehicle traffic on SR 20.	Thank you for your comment. City Light will include information on all outdoor lighting within the study area in the “As-Found” documents. City Light will add the light metrics for the Diablo Dam to the Existing Information section. Edits partially accepted.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
10.	Jack Oelfke (NPS)	05/19/2020	Section 2.4 Project Operations and Effects on Resources	There is acknowledgment that lights are necessary at the installations, but there are numerous luminaires that are purely decorative and currently most of the luminaires cause light trespass into the adjoining Wilderness	Thank you for the comment. Numerous luminaires serve a decorative or historic purpose.
11.	Jack Oelfke (NPS)	05/19/2020	Section 2.4 Project Operations and Effects on Resources	In-Text Edit: However, lighting also can obscure views of the stars and have negative impacts on dark-night sky resource management goals. The illumination levels recommended by the IESNA to create a safe environment may conflict with an area's dark-night sky goals.	Thank you for your comments. Edits accepted.
12.	Jack Oelfke (NPS)	05/19/2020	Section 2.4 Project Operations and Effects on Resources	NPS notes that it may be appropriate to apply more protective measures in areas near national parks, and particularly in those that are proximal to designated Wilderness	Thank you for your comment. City Light looks forward to working with NPS at the conclusion of the lighting inventory to identify potential actions to reduce light where applicable to reduce infringements to night sky goals while still meeting the safety and operations needs of the Project.
13.	Jack Oelfke (NPS)	05/19/2020	Section 2.4 Project Operations and Effects on Resources	In-Text Edit: This study will collect information on the safety benefits and use requirements of existing lighting as well as characteristics of the lighting, to determine how best to minimize light trespass into sensitive areas adjacent to the project boundary.	Thank you for your comment. The goal of the study is to conduct an inventory of Project lighting. No edits made.
14.	Judy Neibauer (USFWS)	05/22/2020	Section 2.4 Project Operations and Effects on Resources	Please include aquatic species in the study, they have effects from light, including but not limited to...issues with migration and foraging	Thank you for your comment. Please see response to #5.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
15.	Brock Applegate (WDFW)	05/26/2020	Section 2.4 Project Operations and Effects on Resources	In-Text Edit: Project lighting can also have effects on species that migrate such as bull trout and passerines. Lighting can confuse these species during migration, may not allow aquatic species to forage, and may cause mortality when passerines become confused and collide with towers, wires, and other structures near the lights.	Thank you for your comment. Please see response to comment #5. No edits made.
16.	Judy Neibauer (USFWS)	05/22/2020	Section 2.5 Study Area	You should add in any areas you may have maintenance where you might do work at night, stream crossings, restoration areas, transmission corridors, etc...	Thank you for your comment. An inventory of lighting related to possible maintenance activities performed at night is beyond the scope of this study. Night related maintenance is a non-routine activity. Also, please see response to comment #17 and #18.
17.	Brock Applegate (WDFW)	05/26/2020	Section 2.5 Study Area	I agree with Judy. SCL should consider possible projects that may happen over the next 50 years. SCL should develop a set of BMPs for possible future projects that will occur at night.	Thank you for your comment. City Light appreciates the suggestion and looks forward to discussing the development of best management practices (BMP) for nighttime illumination of maintenance activities and other projects.
18.	Brock Applegate (WDFW)	05/26/2020	Section 2.5 Study Area	WDFW recommends that you add any night construction projects as well, such as new structure or road construction.	Thank you for your comment. City Light looks forward to discussing the development of BMPs for lighting for night construction projects. Please note also that City Light currently develops environmental plans for each construction project and will continue to do so.
19.	Brock Applegate (WDFW)	05/26/2020	Section 2.5 Study Area	SCL should evaluate all electrical infrastructure with lights, particularly with the danger of collision.	Thank you for the comment. The intention of this study plan is to include electrical infrastructure with lights within the RLNRA described in the Study Area (Section 2.5). Additional detail added to the text.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
20.	Jack Oelfke (NPS)	05/19/2020	Section 2.6 Methodology	Recommend that a site visit is made both during the day and night. It is usually not possible to capture all the required info during one or the other.	Thank you for your comment. As stated in the methods, City Light will conduct an additional night visit if necessary to assess the distribution of the lighting. No edits made.
21.	Jack Oelfke (NPS)	05/19/2020	Section 2.6 Methodology	<p>In-Text Edit:</p> <ul style="list-style-type: none"> ■ Quantity (number of lamps [bulbs]); ■ Locations (including estimated height of luminaire to the ground); ■ Condition of existing luminaires (qualitative description of condition of structure [broken, corrosion, requiring replacement, etc.], age of luminaire [if available]); ■ Voltage; ■ Lamp type (e.g., LED, metal halide, incandescent, high pressure sodium, etc.); ■ Source wattage (information on lamp or luminaire); ■ Lighting distribution (e.g., directional floodlight, light focused below luminaire, etc.; may require additional night visit); ■ Ballast information (electrical information, condition, part number); and ■ Luminaire control method (e.g., switch, individual photocell, central astronomical time clock, centralized photocell, etc.). 	<p>Thank you for the list of information. City Light has included most of these elements of this information in the methods.</p> <p>Text revised to add shielding and illuminance to data collected.</p> <p>Data on color temperature will be included when information is available from the lamp manufacturer. City Light appreciates the guidance on lamp CCT preference.</p>
22.	Jack Oelfke (NPS)	05/19/2020	Section 2.6 Methodology	Instead of the above list, I would recommend these items be collected during the field inventory. Some appear above and others do not. We have found through numerous lighting inventories in other protected areas that these items will provide the needed information to make improvements in the lit environment at night. The goal should be to improve lighting efficiency and effectivenessI	See response to Comment #21.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
23.	Jack Oelfke (NPS)	05/19/2020	Section 2.6 Methodology	<p>In-Text Edit: Location & height above ground</p> <p>Task (what is the purpose of the lamp)</p> <p>Historical (is the luminaire potentially historically or architecturally significant)</p> <p>Quantity (number of lamps on single luminaire)</p> <p>Lamp type (LED, CFL, incandescent, HPS, LPS, metal halide, etc.)</p> <p>Shielding (is the lamp housed in a full cutoff luminaire or does the light produce direct glare and/or trespass outside the task area)</p> <p>CCT (color temperature of lamp) The use of lamps with a CCT =<3000k are preferred</p> <p>Lumens (a measure of total amount of visible light to the human eye from a light source)</p> <p>Source wattage (information from lamp or luminaire)</p> <p>Controls (dimmer, timer, motion sensor, etc.)</p> <p>Is the light on at night (requires night site visit)</p> <p>Functional (is the lamp or luminaire damaged or missing)</p> <p>Notes (any helpful information, possible)</p>	

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
24.	Brock Applegate (WDFW)	05/26/2020	Section 2.6 Methodology	In-Text Edit: Notes (any helpful information, possible) including possible effects to all resources	Thank you for your comment. The analysis of potential effects will occur as part of the DLA. No edits made.
25.	Jack Oelfke (NPS)	05/19/2020	Section 2.6 Methodology	Collected as “task” above	Thank you for your comment. See response to Comment #21. No edits made.
26.	Jack Oelfke (NPS)	05/19/2020	Section 2.6 Methodology	In-Text Edit: ■ Historic and cultural values of the luminaire. Comment: Can this be identified in the field? Who needs to make this determination? The fact that a luminaire is historic should not preclude a retrofit that maintains the same appearance while improving efficiency and reducing the unwanted impacts.	Thank you for your comment. No edit made. City Light will use existing documented information and/or consult with Cultural Resources staff to determine the historic values of the luminaire. City Light will take historic values and lighting needs into consideration of illumination reduction measures to minimize the impact of light.
27.	Brock Applegate (WDFW)	05/26/2020	Section 2.6 Methodology	In-Text Edit: The report will identify potential opportunities for reducing light pollution and reduction off effects on resources listed, while maintaining adequate illumination levels required for safe operations, visitor use, and Project activities. New comment provided 06/25/2020: I would think that you would this as the goal of the study. Why not have someone write some thoughts on effects reduction while out there doing the inventory?	Thank you for your comment. The proposed edit is outside the scope of this inventory. While the study will provide an inventory of lighting with potential actions to reduce light pollution where applicable, it does not propose to include an analysis of how those actions may potentially reduce effects on resources. No edit made. Response to comment provided on 06/25/2020: Thank you for the comment. Please see earlier response to comment # 27 and comment #5.

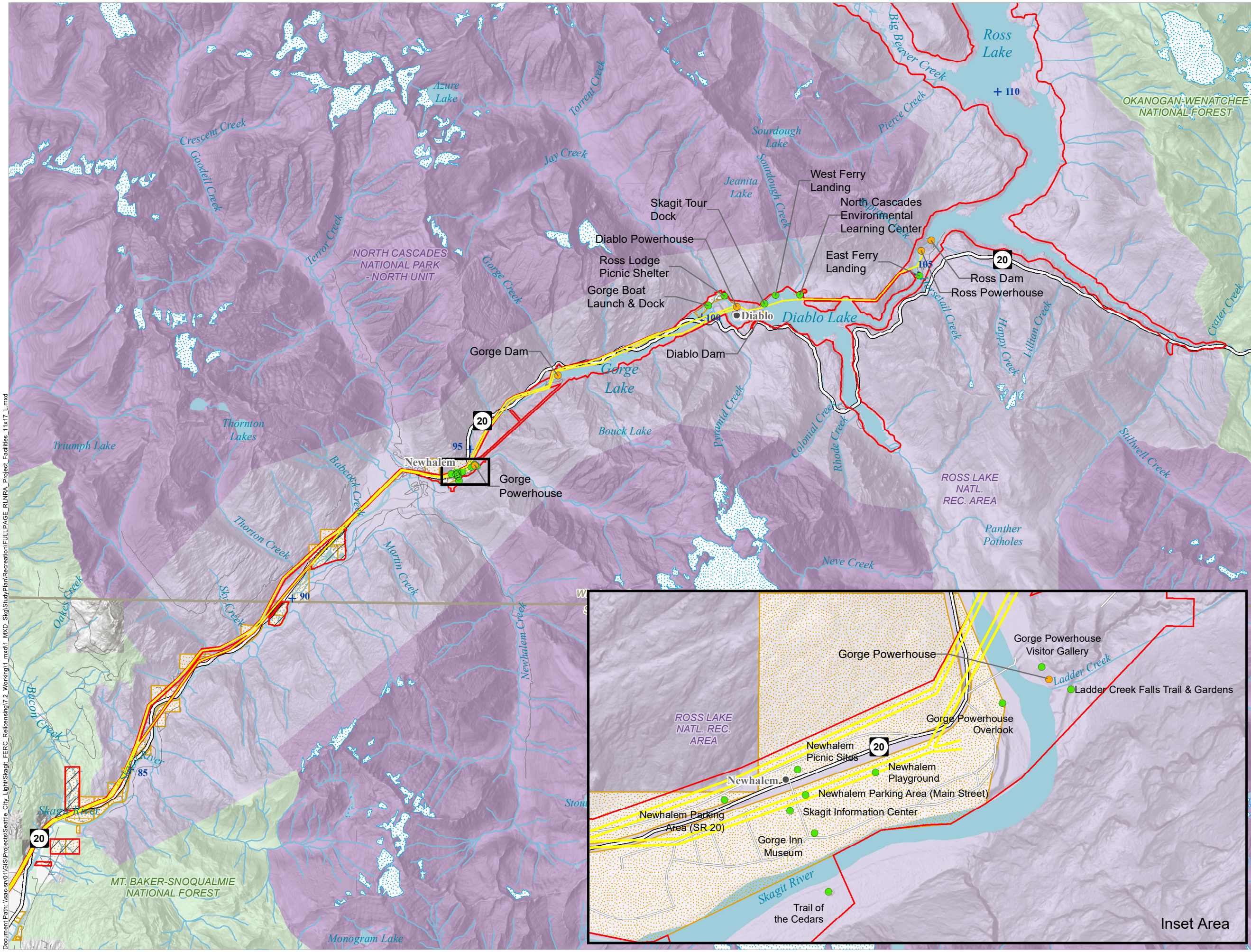
No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
28.	Jack Oelfke (NPS)	05/19/2020	Section 2.6 Methodology	In-Text Edit: Electric light illumination reduction measures recommended by the study shall address five considerations and/or methods of minimizing the impact of light: assessing the purpose, lowering intensity, controlling direction of illumination, minimizing changing the spectrum of emitted light, and limiting duration of emitted light as defined by the International Dark Sky Association (IDSA) 2020).	Thank you for the comment. Edit accepted.
29.	Jack Oelfke (NPS)	05/19/2020	Section 2.6 Methodology	In Text Edit: <ul style="list-style-type: none"> Limiting Changing the lighting spectrum emitted by electric lighting to a narrow band that is smaller than the full range visible spectrum (380–740nm) can be used to create a lighting specification that provides functional lighting for humans while limiting other visual impacts. <p>Comment: you are not actually “limiting” the spectrum, you would be changing it to warmer colors in the 500- 600nm range.</p>	City Light appreciates the input. Text revised.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
30.	Brock Applegate (WDFW)	05/07/2020	Section 2.6 Methodology	<p>In-Text Edit:</p> <ul style="list-style-type: none"> ■ Final Initial Study Report – March 2022 ■ Initial Study Report Meeting -- 2022 <p>New comment provided 06/25/2020: I think that the LPs decide whether you will modify the study plan at the study meeting, which includes a recommendation of another year or not.</p>	<p>Thank you for your comment. City Light acknowledges the ILP milestones provided. The ILP will provide the opportunity for comment on the final report submitted in the ISR and discussed at the ISR meeting. No changes were made to the schedule in the draft study plan as City Light intends to complete the study in one year and wants to be clear with FERC and LPs on the proposed schedule. City Light believes it will be beneficial to all parties to have complete information from the studies as soon as possible to inform development of management proposals and cross resource analysis.</p> <p>Response to comment provided on 06/25/2020: Thank you for your comment. Any potential modifications to the FERC-approved study must be approved by FERC. For more information, please see 18 CFR § 5.15.</p>
31.	Brock Applegate (WDFW)	05/26/2020	Attachment B Study Area Map	WDFW recommends that SCL include towers for electrical transmission and communication in the study area map. WDFW would assume that some of those towers reside on top of hills, higher areas, and rights-of-ways.	Thank you for your comment. The study area map shows the study area described in Section 2.5 of this study plan which consists of the portions of the Project Boundary within the RLNRA. The map resolution does not identify the individual locations of towers for electrical transmission and communication. The Study Area section (Section 2.5) has been edited to make it clear that it includes high tension transmission towers, radio antennae, microwave repeaters and structures, that will be individually assessed.

**PROJECT FACILITY LIGHTING INVENTORY
REVISED STUDY PLAN**

ATTACHMENT B

STUDY AREA MAP



PROJECT FACILITY LIGHTING INVENTORY STUDY AREA (RA-03)

FERC Project Boundary

Mitigation Parcel

Project River Miles (PRM)

National Park Service

National Recreation Area

U.S. Forest Service

Seattle City Light

Transmission Lines

Project Facilities

Recreation Facility

Non-Recreation Facility

0

4,500

9,000

Feet

0

10

20

Miles

Seattle City Light

SKAGIT RIVER HYDROELECTRIC PROJECT (FERC NO. 553)

Created on 3/4/2021 by HDR for Seattle City Light. City Light provides no warranty, expressed or implied, as to the accuracy, reliability or completeness of this data. Data Source: Recreation Sites, Campsites, Transmission Lines, other Facilities - Seattle City Light.

Document Path: \\sccc-srv01\GIS\Projects\Seattle City Light\Skagit FERC Relicensing\7.2 Working\1 mxd\1 MXD_SkoStudyPlan\Recreation\FULLPAGE_RLNRA_Project_Facilities_11x17_L.mxd

**RA-04 PROJECT SOUND ASSESSMENT
REVISED STUDY PLAN**

**SKAGIT RIVER HYDROELECTRIC PROJECT
FERC NO. 553**

Seattle City Light

**April 2021
RSP**

TABLE OF CONTENTS

Section No.	Description	Page No.
1.0	Introduction.....	1-1
1.1	General Description of the Project.....	1-1
1.2	Relicensing Process	1-1
1.3	Study Plan Development.....	1-2
2.0	Study Plan Elements	2-1
2.1	Study Goals and Objectives	2-1
2.2	Resource Management Goals	2-1
2.3	Background and Existing Information.....	2-2
2.4	Project Operations and Effects on Resources	2-2
2.5	Study Area	2-3
2.6	Methodology	2-4
2.6.1	Inventory and Assess Noise-Emitting Project Facilities and Activities ..	2-4
2.6.2	Assess Land Use	2-4
2.6.3	Select Sites and Perform Field Noise Measurements	2-5
2.6.3.1	Ambient Noise Measurements (Long-term)	2-5
2.6.3.2	Project-related Noise Measurements (Short-term)	2-5
2.6.4	Process and Analyze 7-Day Noise Measurement Results	2-5
2.6.5	Noise Modeling.....	2-6
2.6.5.1	Corona Noise	2-6
2.6.5.2	Project-related Noise.....	2-7
2.7	Consistency with Generally Accepted Scientific Practice.....	2-7
2.8	Schedule.....	2-7
2.9	Level of Effort and Cost	2-7
3.0	References	3-1

List of Attachments

Attachment A	City Light Responses to LP Comments on the Study Plan Prior to PSP
Attachment B	Study Area Map

List of Acronyms and Abbreviations

ANSI	American National Standards Institute
City Light	Seattle City Light
ELC	Environmental Learning Center
FERC	Federal Energy Regulatory Commission
GIS	Geographic Information System
GMP	General Management Plan
ISR	Initial Study Report
LP	licensing participant
NPS	National Park Service
PAD	Pre-Application Document
PRM	Project River Mile
Project	Skagit River Hydroelectric Project
PSP	Proposed Study Plan
RARWG	Recreation and Aesthetics Resource Work Group
RLNRA	Ross Lake National Recreation Area
RM	river mile
RSP	Revised Study Plan
RWG	Resource Work Group
SR	State Route
U.S.C.	United States Code
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USR	Updated Study Report
WDFW	Washington Department of Fish and Wildlife

This page intentionally left blank.

1.0 INTRODUCTION

1.1 General Description of the Project

The Skagit River Hydroelectric Project (Project), licensed to The City of Seattle, Washington, and operated through its publicly-owned electric power utility Seattle City Light (City Light), is located in northern Washington State and consists of three power generating developments on the Skagit River – Ross, Diablo, and Gorge – and associated lands and facilities. The Project generating facilities are in the Cascade Mountains of the upper Skagit River watershed, between Project River Miles (PRM) 94.7 and 127.9 (U.S. Geological Survey [USGS] RMs 94.2 and 127).¹ Power from the Project is transmitted via two 230-kilovolt 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, an Environmental Learning Center (ELC), several recreation facilities, and several parcels of fish and wildlife mitigation lands.

Project generating facilities are all located in Whatcom County, although Ross Lake, the most upstream reservoir, crosses the U.S.-Canada border and extends for about one mile into British Columbia at normal maximum water surface elevation. Gorge Powerhouse, the most downstream facility, is approximately 120 miles northeast of Seattle and 60 miles east of Sedro-Woolley, the nearest large town. The closest town is Newhalem, which is part of the Project and just downstream of Gorge Powerhouse. The primary transmission lines cross Whatcom, Skagit, and Snohomish counties; the fish and wildlife mitigation lands are in the same counties.

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, Diablo, and Gorge lakes.” The legislation maintains the Federal Energy Regulatory Commission’s (FERC) 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).

1.2 Relicensing Process

The current FERC license for the Project expires on April 30, 2025, and City Light will apply for a new license no later than April 30, 2023. City Light formally initiated the relicensing process by filing a Notice of Intent and Pre-Application Document (PAD) with FERC on April 27, 2020 (City

¹ 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 Project River Mile (PRM) system are provided throughout this document. For further details see Section 7.0 of the main body RSP.

Light 2020a). The PAD includes descriptions of the Project facilities, operations, license requirements, and Project lands as well as a summary of the extensive existing information available on Project area resources and early consultation on potential resource issues to be addressed during the relicensing. The PAD also includes an outline of the goals and objectives of this study.

In 2019-2020, City Light convened a series of Resource Work Groups (RWG) to engage agencies and other licensing participants (LP) in the Study Plan Development Process. Discussions with LPs continued in early 2021 with a series of topic-based discussions following filing of the Proposed Study Plan (PSP) on December 8, 2020 (City Light 2020b). This study plan reflects RWG and LP discussion and study requests and comments submitted by LPs.

1.3 Study Plan Development

This study plan discusses how City Light will characterize the existing outdoor soundscape near City Light facilities and define the extent of Project-related noise emitting from Project facilities, equipment, or activities within the Project Boundary. The study plan addresses elements of the RA06 (Soundscapes), RA07 (Noise), CR09 (Transmission Line Auditory Effects), TE16 (Northern Goshawk), and TE17 (Marbled Murrelet) issue forms provided during the 2019 Study Plan Development Process.

On April 24, 2020, City Light released the RA-04 Project Sound Assessment Draft Study Plan for LP review and comment. On May 7, 2020, the draft study plan was discussed at a Recreation and Aesthetics Resource Work Group (RARWG) meeting. City Light reviewed all comments received and released a revised version of the draft study plan on June 23, 2020. The revised draft was discussed on June 25, 2020 at a RARWG meeting. Written comments were received from NPS, Washington Department of Fish and Wildlife (WDFW), and U.S. Fish and Wildlife Service (USFWS) and responded to in an attachment to this study plan. A Status Draft of the study plan was provided to LPs on August 6, 2020.

City Light is filing this study plan with FERC as part of its Revised Study Plan (RSP), an update to the version that was filed with the PSP and incorporating additional consultation with LPs prior to the filing date. No formal study requests related to this study were filed with FERC.

PSP comments to this study plan were submitted by NPS and Upper Skagit Indian Tribe. City Light has addressed the specific comments and suggested edits in this study plan and responded to comments in the PSP comment/response table appended to the main body of the RSP. Modifications made to the study plan in response to comments include the addition of a spring long-term measurement period, and modeling springtime and summertime Project-related noise levels to the point at which they attenuate to the noise level exceeded 90 percent of the time (L90) which is considered inaudible.

2.0 STUDY PLAN ELEMENTS

2.1 Study Goals and Objectives

The goal of this study is to: develop estimates of Project-related noise to facilitate analysis of how Project-related noise may affect other resources (e.g., wildlife, cultural resources, recreation resources, etc.). The objectives of the study include:

- Inventory and assess the Project facilities, equipment, and activities that emit noise throughout the Project Boundary, and measure or otherwise identify the spectral noise emissions characteristics of those Project features.
- Identify when those Project-related features, maintenance, and operations produce noise (i.e., day/night, what seasons).
- Identify and delineate noise-sensitive land uses that are also representative of other noise-sensitive land uses in the study area. Delineate those areas in Geographic Information System (GIS) for later use in the noise assessment.
- Perform unattended noise measurements for a continuous seven-day period during two seasons (i.e., spring and summer) to describe and document existing noise levels at those noise-sensitive locations. Measured noise levels are assumed to be representative of comparable land uses.
- Model Project-related noise. Develop noise contour maps that show how Project-related noise propagates and attenuates throughout the noise study area.

2.2 Resource Management Goals

A goal of the Sound Assessment study is to inventory and assess the extent to which Project facilities, equipment, and activities emit noise. This information will provide baseline information for other studies and assessments of potential ongoing Project effects on wildlife, recreation, cultural, and other resources within the Project Boundary.

The study will provide information for resource agencies and Indian tribes with jurisdiction in the Project vicinity to address their respective goals and objectives for resource management. At this time, one participating agency, NPS, is known to have noise management goals.

- The National Park Service Organic Act of 1916 states that the purpose of national parks is "... to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." Acoustic resources are considered a part of the "scenery and the natural and historic objects" that are conserved under this act.
- NPS has soundscape management goals for National Park resources including both units of the North Cascades National Park. These goals are stated in the NPS Director's Order 47, Soundscape Preservation and Noise Management (NPS 2000). The stated goal of this order is "to articulate National Park Service operational policies that will require, to the fullest extent practicable, the protection, maintenance, or restoration of the natural soundscape resource in a condition unimpaired by inappropriate or excessive noise source" (NPS 2000).

- Direction for the management of NPS soundscapes is represented in NPS Management Policy 4.9 (NPS 2006). It states the NPS will “preserve, to the greatest extent possible, the natural soundscapes of parks.” Furthermore, this document states that the National Park Service will “restore to the natural condition wherever possible those park soundscapes that have become degraded by unnatural sounds (noise), and will protect natural soundscapes from unacceptable impacts.” Further guidance for soundscape management is also provided in 2006 Management Policies 4.1.4 Partnerships, 4.1.5 Restoration of Natural Systems, 8.2 Visitor Use, 8.2.2 Recreational Activities, 8.2.3 Use of Motorized Equipment, and 8.4 Overflights and Aviation Uses (NPS 2006).
- NPS also published the Ross Lake National Recreation Area General Management Plan (GMP) (NPS 2012), which contains measurable indicators used to evaluate if NPS needs to take action to preserve key aspects of the RLNRA including the soundscape. The GMP includes noise indicators or standards which NPS monitors, such as the percent of time boating noise is audible in various management zones in the RLNRA. These indicators are not regulatory noise effect thresholds; they are soundscape management goals.

2.3 Background and Existing Information

The generating facilities and reservoirs associated with the Skagit River Project are located in a remote area, within the RLNRA, and much of the surrounding soundscape is natural, punctuated by noise from traffic on roadways (primarily State Route [SR] 20), boat traffic on the reservoirs, occasional helicopter use, hydroelectric operations, and general recreational activity. The northern portions of the Project Boundary are undeveloped, mountainous, heavily wooded lands with trails and roadways in some areas. The Stephen Mather Wilderness, designated in 1988, borders much of the Project Boundary in the RLNRA. Environmental noise is a resource that NPS manages, as explained in Section 2.2 of this study plan. The southern portions of the Project Boundary, especially outside the RLNRA, are flatter and more developed and populated; in those areas the Project facilities primarily include transmission lines that deliver electricity to the Seattle metropolitan area.

The NPS has conducted acoustic monitoring throughout the RLNRA, including areas within the Project Boundary, since at least 2006. Monitoring comprised of collecting acoustic data at several locations that represented acoustic zones.

2.4 Project Operations and Effects on Resources

Noise measurements have been requested by the NPS and Sauk-Suiattle Indian Tribe to characterize Project-related noise near City Light facilities within the RLNRA and define the extent of that noise. City Light has agreed to propose this study as the information is of shared interest to assess the potential of ongoing effects of noise on marbled murrelet; northern goshawk, northern spotted owls, and other raptor species; cultural resources; and recreation and other resources, including wilderness character qualities such as opportunities for solitude in designated Wilderness areas adjacent to the Project Boundary.

Project-related noise (detailed in the PAD [City Light 2020]), including the operation of heavy equipment and tools (i.e., chainsaws) used for maintenance of structures, utilities, and roads, and vegetation management activities, has the potential to disturb avian species, cultural, and recreational resources.

Boat traffic, such as the tugboat and barge used to shuttle equipment and supplies across Diablo Lake to Ross Powerhouse and/or Ross Dam several times per week for operations and maintenance, generates short-term noise that might affect noise-sensitive resources. There are multiple daily powerboat trips to shuttle crews to and from the Ross Powerhouse and/or Ross Dam, which generate noise that have the potential to affect visitor experience on and around Diablo Lake and at the ELC. Some Project-related boat noise also occurs on Ross Lake from research boats and seasonal work boats collecting floating driftwood or transporting employees to maintain the Hozomeen facilities. However, the majority of boat use on Ross Lake is related to recreation and NPS management activities.

City Light uses helicopters to visually inspect the transmission line towers. During these infrequent inspections the helicopter flies quickly along the lines and only hovers if potential structural problems are noted, which is rare. Through coordination with the NPS, the Natural Resources Conservation Service conducts snow surveys by helicopter for two days each month from the end of December through early May (and more often if SR 20 is closed between Newhalem and Gorge). City Light participates in these snow surveys. Helicopter noise is most noticeable at take-off and landing in Newhalem and Diablo, at the snow course stations, and during ascents and descents in the Gorge bypass reach area. Noise from helicopters has the potential to affect noise-sensitive resources, but the frequency of occurrence is low and intermittent. Snow surveys occur at a time of year when sensitive avian species use in these areas is relatively low, and is largely outside of the nesting season. This period of helicopter use also coincides with the period of lowest recreational use in the area. Helicopter activity is also associated with firefighting and other specific projects year-round. City Light consults with the NPS and USFWS, as necessary, to determine potential noise effects on listed species if helicopter use is needed for maintenance projects. If possible, helicopter use for maintenance projects is scheduled to avoid the nesting season for most birds (April through August).

2.5 Study Area

The study area includes an area covering 0.6 mile from noise-generating facilities, activities, and ongoing/known maintenance and construction projects within the Project Boundary, and a 500-foot buffer on either side of Project transmission lines for corona noise assessment. A map showing the study area is attached to this study plan. The noise propagation equations in the international acoustical standard that will be used in the noise modeling task (ISO 9613) are considered accurate to distances of 0.6 mile. Beyond that distance, calculated noise levels are considered less accurate, particularly in areas where the terrain in the propagation path is not flat. In response to requests from LPs, City Light agreed to extend the noise modeling study area within the RLNRA and North Cascades National Park to the point at which modeled noise levels attenuate to the L90 value measured at the nearest long-term unattended noise measurement location (i.e., L90 is the sound level exceeded 90 percent of the time; generally considered to represent the background level of noise of an environment). City Light recognizes that the point at which project-related noise attenuates to the measured L90 may be beyond 0.6 miles. Modeling project-related noise to the measured L90 will be limited to portions of the noise study area within the RLNRA and North Cascades National Park.

2.6 Methodology

The noise study consists of two measurement tasks and a modeling task. The first noise measurement task, measuring ambient noise (see Section 2.6.3.1 of this study plan) will produce a record that shows existing noise levels and how they vary in certain portions of the study area. Those measurement locations will be selected based on the extent to which they are representative of other locations. In this manner, a limited number of existing noise measurement results can be used to quantify existing noise levels at a larger number of areas. These measurements will have a duration of a continuous 7-day period, and the measurements will be unattended. These 7-day measurements will occur during a spring and summer season which correlate to the off-peak and peak recreation seasons, respectively.

The second noise measurement task, measuring Project-related noise (see Section 2.6.3.2 of this study plan) will produce detailed measurements of noise emissions from activities and features of the Project that emit noise into the outdoor environment. Some of this type of information may also be obtained from publicly available and reasonably obtainable literature (i.e., construction equipment noise levels). Results of this task will also identify where and when those Project-related noise emissions occur. Results of this task will be used in the noise models.

The noise modeling task (see Section 2.6.5 of this study plan) will estimate how Project-related noise travels and attenuates throughout the study area. It will also estimate how much Project-related noise reaches certain areas of concern. That will be achieved by modeling Project-related noise and creating colored noise contours that are overlaid upon digital aerial photographs. The modeling task also includes an inventory of noise-sensitive land uses and locations. Modeling results will provide information about Project-related noise to assess potential effects on noise-sensitive land uses and locations. Those noise contour images also allow resource-specific assessments of the effects of Project-related noise on certain areas or other Project resources. Those resource-specific assessments will be presented in the Draft License Application.

The noise study methods include the following steps.

2.6.1 Inventory and Assess Noise-Emitting Project Facilities and Activities

Information gathered in this task will be used in the noise modeling task, to simulate Project-related noise. City Light will perform an inventory of activities and equipment that emit noise into the outdoors environment. Through measurements and/or literature searches, the sound pressure level and spectrums of each activity and equipment will be quantified for use in the modeling task. Project-related facilities, equipment, and outdoor maintenance activities that produce noise with distinct tonal characteristics (e.g., dominated by high or low frequencies) are particularly important because those types of sounds are more distinctly perceivable in the outdoor noise environment, and therefore, should be included in the noise modeling task.

2.6.2 Assess Land Use

Information gathered in this task will be used in the noise modeling task, to identify areas where Project-related noise may have a potential adverse effect on Project resources. City Light will review and assess available noise-sensitive land uses (areas or specific locations) within 0.6-mile of each Project dam and powerhouse, the townsite of Newhalem, and one additional site on Diablo Lake and within 500 feet of the transmission line. These areas and locations will be categorized

into different representative land uses based on activities with respect to noise-activity, noise-sensitivity, and the overall noise environment (e.g., within 100-200 feet of a road corridor; areas surrounding campgrounds; trails away from development; etc.). Areas will be delineated into polygons based on land use so that representative noise environments can be identified. City Light will also review these land uses to inform the noise measurement site selection process.

2.6.3 Select Sites and Perform Field Noise Measurements

2.6.3.1 Ambient Noise Measurements (Long-term)

City Light will select three to six locations where continuous 7-day unattended outdoor noise measurements will occur. At each location City Light will measure wind speed, store spectral noise measurements, and record a digital audio file for a continuous 7-day period. Measurements will occur during two separate periods, including a 7-day period in the spring when visitor use is lower and again in the summer to coincide with the highest recreation levels and minimize the adverse effects of meteorological conditions (rain, wind) which can adversely affect noise measurements.

The 7-day measurement system consists of Larson Davis Model 831 (LD 831) real-time sound level analyzers connected to a Larson Davis 831-INT (LD 831-INT) docking station. An Edirol R-09 digital audio recorder is used to continuously store a digital audio record of the entire measurement duration. The analyzer and recorder systems are stored in a weather-resistant Pelican case during deployment. A microphone attached to a self-calibrating preamplifier, and a R. M. Young anemometer (or similar) are also connected to the LD 831-INT. The microphone is covered by a large windscreen, which is installed inside a cage-like device to keep the wind screen in place and discourage birds from sitting on the windscreen (it has spikes on the top of it).

In this configuration, a digital audio file is stored in the Edirol R-09, and sound pressure level measurement results and wind speeds are stored in the LD 831. The power supply often consists of external batteries stored in a Pelican case, sometimes supplemented by a passive photovoltaic solar panel(s).

2.6.3.2 Project-related Noise Measurements (Short-term)

For Project-related equipment or activities where noise emissions data are unavailable or insufficiently described in the public domain, City Light will also perform additional short-term attended measurements of noise from select Project-related activities and equipment (e.g., corona noise emitted from transmission lines, chainsaws, etc.). This information will be used to simulate Project-related noise emissions in the noise modeling task. Equipment noise measurements will utilize a LD 831 or LD 824 real-time analyzer.

2.6.4 Process and Analyze 7-Day Noise Measurement Results

Each hour's worth of the 7-day noise measurement results will be processed to produce the following characterizations of hourly ambient noise:

- Minimum noise level (L_{min});
- Maximum noise level (L_{max});
- Energy-equivalent noise level (L_{eq}), a mean average noise level; and

- Statistical descriptors (L_n) that characterize noise levels exceeded n percent of the hour (i.e., L_{10} , L_{33} , L_{50} , and L_{90}). L_n descriptors help explain how much sound levels vary (or how consistent they are) during each hour. The L_{50} descriptor is a median average, and a comparison of the mean (L_{eq}) and median (L_{50}) is another way to evaluate the amount of variation in sound levels during an hour.

A modest amount of selective audio review will be performed on the digital audio files to identify anthropogenic noises that occurred during the measurement periods. Often this involves identifying peaks or spikes in the measurement data, locating the timestamp associated with those spikes, locating that timestamp in the digital audio file, and listening to the audio in an attempt to identify the source or cause of the data spike.

2.6.5 Noise Modeling

City Light will perform noise modeling to evaluate transmission line noise (corona noise), and noise from other Project features and activities. The noise modeling will utilize three basic tools: GIS, Cadna-A (3D noise modeling software), and CFI8X (a corona noise model; Bonneville Power Administration Corona and Fields Interactive 1989 Experimental model) to produce noise contours figures.

The process of creating noise contours consists of assembling a GIS mapbook that includes features of the study area (locations of Project features, digital terrain files, location of noise-sensitive areas, polygons of similar ground cover types, etc.). These spatial attributes are imported into the Cadna-A environmental noise modeling software. Cadna-A is a 3D environmental noise modeling tool that incorporates international acoustical standards for outdoor sound propagation (ISO 9613). A database of noise sources and activities will be developed in Cadna-A which includes noise emissions from field measurements. Cadna-A will be configured to calculate overall noise levels from the defined noise sources at specific locations (receptors) in the study area. Cadna-A is also configured to calculate noise levels at points throughout a user-defined Cartesian coordinate grid. These results are converted into noise contours, which can be exported into GIS and overlaid upon digital aerial photographs to create noise contour figures.

Noise contour figures will be developed for both corona noise and Project-related noise models representing spring and summer conditions, as explained below.

2.6.5.1 Corona Noise

City Light will use CFI8X or a functionally similar model to develop estimates of corona noise versus the distance from the conductors out to a maximum distance of 500-feet from the centerline of the transmission lines. The Cadna-A model may also be used in the corona noise modeling to incorporate digital terrain information, areas where dense vegetation exists (“tree zones”), and other information about the acoustical characteristics of the ground cover that have been delineated using GIS. The entire transmission line right-of-way may be subdivided into smaller segments to facilitate the Cadna-A analysis. Cadna-A will produce color noise contours which will be overlaid upon digital aerial photos in GIS to create noise contour figures. CFI8X and Cadna-A model results will also be presented in text and tables. CFI8X will simulate corona noise during damp, humid springtime conditions and drier summertime conditions.

2.6.5.2 Project-related Noise

City Light will also use Cadna-A to calculate sound propagation from other Project-related activities. The Project-related noise measurement results will be input into Cadna-A and used as noise source terms (telling the model how loud a noise source is at a fixed distance so it can calculate sound propagation from that source). Those Cadna-A models will also incorporate digital terrain data, tree zones, and other information about the acoustical characteristics of the ground cover that have been delineated using GIS. Cadna-A will be configured to calculate noise contours from the noise source to the point at which they attenuate to the measured L90 noise levels (as determined by ambient 7-day measurements) in portions of the noise study area that are within RLNRA and North Cascades National Park. Cadna-A will produce color noise contours which will be overlaid upon digital aerial photos in GIS to create noise contour figures. Cadna-A results will also be presented in text and tables. Specific modeling scenarios will be selected once City Light completes data collection tasks described earlier in this study plan. The Cadna-A models will be configured to represent spring and summer conditions.

2.7 Consistency with Generally Accepted Scientific Practice

The unattended 7-day noise measurement is based on American National Standards Institute (ANSI) ANSI-ASA_S3-SC1.100_S12.100-2014, Methods to Define and Measure the Residual Sound in Protected Natural and Quiet Residential Areas. Short-term attended measurements of noise from select equipment and activities, and use of those measurement results to model Project-related noise is a standard technique used by environmental acousticians to explain how Project-related noise propagates throughout a study area.

2.8 Schedule

- Field Work – June to September 2021, May to June 2022
- Analysis – October 2021 to November 2022
- Draft Report (Initial Study Report [ISR]) – March 2022
- Final Report (Updated Study Report [USR]) – March 2023

2.9 Level of Effort and Cost

The initial estimate for implementation and reporting associated with this study is approximately \$475,000.

3.0 REFERENCES

- ANSI. 2014. ANSI-ASA_S3-SC1.100_S12.100-2014, Methods to Define and Measure the Residual Sound in Protected Natural and Quiet Residential Areas.
- National Park Service (NPS). 2000. Director's Order #47: Soundscape Preservation and Noise Management. [Online] URL: <https://www.nps.gov/policy/dorders/dorder47.html>. Accessed April 6, 2020.
- _____. 2006. NPS Management Policies 2006. U.S. Department of Interior, National Park Service. 180p. [Online] URL: https://www.nps.gov/policy/MP_2006.pdf. Accessed April 21, 2020.
- _____. 2012. Ross Lake National Recreation Area. General Management Plan. National Park Service, U.S. Department of the Interior. July 2012.
- 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.

This page intentionally left blank.

**PROJECT SOUND ASSESSMENT
REVISED STUDY PLAN**

ATTACHMENT A

**CITY LIGHT RESPONSES TO LP COMMENTS ON THE STUDY PLAN
PRIOR TO PSP**

Table 1. City Light responses to LP comments on the study plan prior to PSP.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
1.	Jack Oelfke (NPS)	05/19/2020	Section 1.0 Introduction	All comments attributed to Jack are from Emma Brown, of the NPS Natural Sounds and Night Skies Division in Ft. Collins, CO	Thank you, comment noted.
2.	Brock Applegate (WDFW)	05/06/2020	Section 1.2 Relicensing Process	In-Text Edit: This study plan reflects the RWG consultation effort , and City Light will continue to engage the RWG structure in the preparation of the Proposed and Revised Study Plans (18 Code of Federal Regulations [CFR] §§ 5.11-5.13), and through the relicensing process generally.	Thank you for your comment. Edits to text made to better reflect the RWG and consultation process.
3.	Judy Neibauer (USFWS)	05/22/2020	Section 1.3 Study Plan Development	I am wondering about the Northern Spotted Owl (NSO) and noise effects to them. Please include them in the sound study. Typically in forested environments we have conservation measures that deal with timing of noise generation and have conservation measures associated with timing windows. It was confusing in meeting notes as to how NSO would be addressed. I did not see this in an issue paper. You will need to be looking at locations of NSO nesting, roosting, foraging locations in relation to project operations. Please adjust this study or develop other studies to understand how project operations could impact nesting roosting and foraging of NSO.	Thank you for your comment. A comprehensive resource effects analysis will be developed and integrated during the preparation of the Draft License Application (DLA). LPs will have an opportunity to consider effects of Project recreation, if warranted, on wildlife and other resources in their review of the DLA in the National Environmental Policy Act (NEPA) process. With respect specifically to the Northern Spotted Owl, the results of the sound assessment will be used to determine any effects of Project-related noise on NSO nesting, roosting, and foraging locations. Information on these locations is sufficiently provided in the existing literature.
4.	Brock Applegate (WDFW)	05/26/2020	Section 1.3 Study Plan Development	I agree with Judy. WDFW would assume that SCL could easily map the results of this study and NSO habitat.	See response to comment #3.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
5.	Judy Neibauer (USFWS)	05/22/2020	Section 1.3 Study Plan Development	<p>There are also noise effects associated with aquatic species. Depending on the type of noise it can travel distances through water. Please include an assessment of types of activities that could impact aquatic species from project elements including maintenance...across the project area including but not limited to... things such as dam operations and maintenance, recreation areas, work along transmission corridors on lands owned, managed, restored.</p> <p>New comment Brock Applegate (WDFW) provided 06/25/2020: Please add the BMPs to this study report to address concerns to aquatic species.</p>	<p>Thank you for your comment. This study addresses a data gap associated with routine Project operations and the type of noise created. City Light anticipates proposing specific measures for specific, non-routine noise-causing activities with known effects on a case by case basis, and currently employs BMPs to limit effects of in-water work on aquatic species. No edits made to the draft study plan at this time.</p> <p>Regarding routine Project operations, City Light is not aware of any regulatory thresholds for continuous noise as related to freshwater aquatic species. City Light is aware of the 2008 interim fish injury thresholds for impact pile-driving established by the Fisheries Hydroacoustic Work Group, which included Regions 1 and 8 of the USFWS. However, to date, no other injury or behavioral underwater noise thresholds have been established for salmonids, including bull trout. City Light would appreciate receiving any specific documentation of noise effects on aquatic species related to routine Project operations or the activities listed in the comment. If changes in operations are proposed that may introduce additional in-water sources of noise, City Light anticipates that these could be reviewed with USFWS during development of the Biological Assessment.</p> <p>Response to comment provided on 06/25/2020: Thank you for your comment. The identification of potential BMPs may discussed as part of the DLA or in development of management plans.</p>

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
6.	Brock Applegate (WDFW)	05/26/2020	Section 1.3 Study Plan Development	I agree with Judy. SCL should include aquatic species in the analysis.	Thank you for your comment. Please see response to Comment #5. No edits made.
7.	Brock Applegate (WDFW)	05/26/2020	Section 2.1 Study Goals and Objectives	In-Text Edit: The goal of this study is to: develop estimates of Project-related noise to facilitate analysis of how Project-related noise may affect other resources (e.g., wildlife, aquatic species , cultural resources, recreation resources, etc.).	Thank you for your comment. Please see response to Comment #5. No edits made.
8.	Brock Applegate (WDFW)	05/26/2020	Section 2.1 Study Goals and Objectives	In-Text Edit: ■ Identify when those Project-related features, maintenance, and operations produce noise (i.e., day/night, what seasons).	Thank you. Edits accepted.
9.	Brock Applegate (WDFW)	05/06/2020	Section 2.2 Resource Management Goals	SCL has not even conducted the study yet and has already told us about mitigation that they will not do. Could SCL find that dampening sound with a filter or a muffler might reduce their noise in a sensitive area to an acceptable level? WDFW recommends that SCL complete the study before they take any mitigation possibilities off the table.	Thank you for your comment. This sentence has been removed from the study plan.
10.	Judy Neibauer (USFWS)	05/22/2020	Section 2.2 Resource Management Goals	Agreed, this is probably not the right place for this statement.	See response to Comment #9.
11.	Brock Applegate (WDFW)	05/26/2020	Section 2.2 Resource Management Goals	In-Text Edit: This information will provide baseline information for other studies and assessments of potential ongoing Project effects on wildlife, aquatic species , recreation, cultural, and other resources in the Project Boundary.	Thank you for your comment. Please see response to Comment #5. No edits made.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
12.	Judy Neibauer (USFWS)	05/22/2020	Section 2.2 Resource Management Goals	<p>You could probably put in species specific goals to minimize noise around NSO, MM, Norther Goshawk, aquatics...there is guidance in some of the USFWS critical habitat documents. There is a some management guidelines about timing in the USFS LRMPs and NWFP standards and guidelines as well.</p> <p>New comment Brock Applegate (WDFW) provided 06/25/2020: WDFW recommends that you put this request on the integrated effects analysis list. SCL should mark on a map known marbled murrelet and raptor nests on a nest with your sound map from project maintenance, construction, and any other project-related discontinuous noise. As SCL pointed out, most of this information should accompany BMPs and a map.</p>	<p>Thank you for your comment. This study addresses the data gap associated with sound emanating from Project operations. An integrated effects analysis will probably consider species specific goals, as will any actions or BMPs subsequently deemed necessary to prevent, mitigate, or eliminate potential effects. Please also see responses to Comment #5.</p> <p>Response to comment provided on 06/25/2020: Thank you for your comment. Comment noted.</p>
13.	Brock Applegate (WDFW)	05/26/2020	Section 2.2 Resource Management Goals	I agree with Judy. SCL could also include noise guidelines for most raptors, which includes bald and golden eagles, peregrine falcons, and ospreys.	Thank you for your comment. Please see response to Comment #12.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
14.	Jack Oelfke (NPS)	05/19/2020	Section 2.2 Resource Management Goals	<p>In-Text Edit:</p> <p>■ The National Park Service Organic Act of 1916 states that the purpose of national parks is "... to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." Acoustic resources are considered a part of the "scenery and the natural and historic objects" that are conserved under this act</p> <p>Comment: National Park Service Organic Act, 54 U.S.C. §§ 100101 et seq. (1970).</p>	Thank you for providing this resource management goal. Edit accepted.
15.	Jack Oelfke (NPS)	05/19/2020	Section 2.2 Resource Management Goals	<p>In-Text Edit:</p> <p>■ Direction for the management of NPS soundscapes is represented in NPS Management Policy 4.9 (NPS 2006). It states the NPS will "preserve, to the greatest extent possible, the natural soundscapes of parks." Furthermore, this document states that the National Park Service will "restore to the natural condition wherever possible those park soundscapes that have become degraded by unnatural sounds (noise), and will protect natural soundscapes from unacceptable impacts." Further guidance for soundscape management is also provided in 2006 Management Policies 4.1.4 Partnerships, 4.1.5 Restoration of Natural Systems, 8.2 Visitor Use, 8.2.2 Recreational Activities, 8.2.3 Use of Motorized Equipment, and 8.4 Overflights and Aviation Uses (NPS 2006).</p> <p>Comment: National Park Service. 2006. Management Policies 4.9: Soundscape Management.</p>	Thank you for providing this resource management goal. Edit accepted.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
16.	Jack Oelfke (NPS)	05/19/2020	Section 2.3 Background and Existing Information	In-Text Edit: Environmental noise is a resource that NPS manages, as explained above in Section 2.2 of this study plan, and noise has the potential to affect wilderness character qualities such as opportunities for solitude..	Thank you for the suggested edit. Section 2.3 discusses background and existing information, whereas the suggested edit discusses potential Project effects. The suggested edit was therefore inserted in Section 2.4, Project Operations and Effects on Resources.
17.	Brock Applegate (WDFW)	05/06/2020	Section 2.3 Background and Existing Information	In-Text Edit: The NPS has conducted acoustic monitoring throughout the RLNRA, including areas within the Project Boundary, since at least 2006. Monitoring comprised of collecting acoustic data at several locations that represented acoustic zones.	Thank you. Edit accepted.
18.	Judy Neibauer (USFWS)	05/22/2020	Section 2.3 Background and Existing Information	Mention here what kind of information you already have from monitoring with your existing permit, where you have data gaps...as well....link to existing studies about noise for the species.	Thank you for your comment. City Light has not conducted acoustic monitoring within the Project Boundary to date. No edits made.
19.	Brock Applegate (WDFW)	05/26/2020	Section 2.3 Background and Existing Information	I agree with Judy. SCL could list or map the areas that SCL conducted the acoustic monitoring as well.	Please see response to Comment #18.
20.	Brock Applegate (WDFW)	05/26/2020	Section 2.4 Project Operations and Effects on Resources	In-Text Edit: City Light has agreed to propose this study as the information is of shared interest to assess the potential of ongoing effects of noise on northern goshawk, marbled murrelet, northern spotted owls, other raptor species , aquatic species, cultural, recreation, and other resources.	Thank you for your comment. Please see responses to Comment #3 and 5. Edits accepted with exception of “aquatic species.”

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
21.	Judy Neibauer (USFWS)	05/22/2020	Section 2.4 Project Operations and Effects on Resources	Please think about adding aquatic and underwater noise into this study as well. We know today that bull trout seem to avoid structure, noise and light, and may be why they don't like to enter traps. In literature there are examples of noise and light affecting fish species. In the Wenatchee radio tag study, some bull trout would not enter fish traps while the hydraulic weir was up, some did enter at night as well. Some would wait until it was down to pass (Kelly Ringel et al 2012). I have read other studies where salmonids react to noise. Dept of Transportation, and Corp of Engineers have some conservation measures for noise for fish in their current programmatic ESA Sec 7 Biological Opinion that may be useful...I can provide those if you would like to see them.	Please see response to Comment #5.
22.	Brock Applegate (WDFW)	05/26/2020	Section 2.4 Project Operations and Effects on Resources	WDFW considers aquatic species important in consideration of noise impacts as well.	Thank you for your comment. Please see response to Comment #5.
23.	Brock Applegate (WDFW)	05/06/2020	Section 2.4 Project Operations and Effects on Resources	Can SCL define "occasional?" WDFW would recommend a unit of time and frequency. New comment provided 06/25/2020: How about something more definitive like a couple times a decade? I find occasional and infrequent very subjective.	Thank you for your comment. Text changed to "infrequent." The most recent helicopter surveys of the transmission line towers occurred in 2010 and 2018. Each inspection lasted fewer than four hours. Response to comment provided on 06/25/2020: Thank you for this comment. City light believes "infrequent" is the appropriate term to describe the intermittent and irregular pattern of helicopter surveys.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
24.	Jack Oelfke (NPS)	05/19/2020	Section 2.5 Study Area	NPS recommends carrying modeling propagation out to the point of inaudibility, considering established natural sound levels at measurement sites in RLNRA	Thank you for this comment. Calculating the distance to where Project-related noise is inaudible is beyond the scope of this study. A National Recreation Area surrounds many of the Project features, and noise from recreation activities such as boat motors, traffic on State Route (SR) 20, etc. are common components of the existing soundscape. No edits made.
25.	Brock Applegate (WDFW)	05/26/2020	Section 2.5 Study Area	I agree with the NPS. Although less accurate beyond 0.6 miles, SCL should consider the greatest possible impact to resources by noise. SCL should extend the noise out until attenuation with natural sound levels.	Thank you for your comment. Please see response to Comment #24.
26.	Brock Applegate (WDFW)	05/26/2020	Section 2.5 Study Area	In-Text Edit: The study area includes an area covering 0.6 mile from noise-generating facilities and ongoing/known maintenance and construction projects within the Project Boundary, and a 500-foot buffer on either side of Project transmission lines.	Thank you. Edits accepted.
27.	Judy Neibauer (USFWS)	05/22/2020	Section 2.5 Study Area	500 feet may not be enough, depends on the type of noise, geology, locations	Thank you for your comment. Corona noise in the transmission line right-of-way will be evaluated from the centerline of the transmission line to a distance of 500 feet on either side of the transmission line centerline, as per BPA corona noise model (CFI8X). Project-related activities (including the operation of heavy equipment and tools [i.e., chainsaws] used for maintenance of structures, utilities, and roads, and vegetation management activities will be evaluated from the source of the noise to a distance of 0.6 miles. No edits made.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
28.	Brock Applegate (WDFW)	05/26/2020	Section 2.5 Study Area	I agree with Judy. SCL will want to consider greater than 500 feet, particularly if we consider pole driving in the rights-of- ways.	City Light currently follows BMPs to reduce or restrict timing of noise from activities such as pole driving. Activities such as pole driving will be evaluated from the source of the noise to a distance of 0.6 miles. Also, see response to Comment #27.
29.	Judy Neibauer (USFWS)	05/22/2020	Section 2.5 Study Area	Please use most recent science developed in looking at noise for NSO, MM, goshawk, and underwater noise for aquatic species to help determine the study areas. Need to include underwater areas in the study.	Thank you for your comment. Please see responses to Comments #3, #5, #12, and #21.
30.	Brock Applegate (WDFW)	05/26/2020	Section 2.5 Study Area	I agree with Judy. Please include other raptor species as well.	Thank you for your comment. Please see responses to Comments #3, #5, #12, and #21.
31.	Jack Oelfke (NPS)	05/19/2020	Section 2.6 Methodology	NPS suggests use of ANSI-ASA_S3-SC1.100_S12.100-2014, Methods to Define and Measure the Residual Sound in Protected Natural and Quiet Residential Areas. This standard calls for continuous measurements over a period of at least 7 days. NPS protocol (established in Lynch, E., Joyce, D., & Fristrup, K. (2011). An assessment of noise audibility and sound levels in US National Parks. Landscape ecology, 26(9), 1297.), recommends a measurement period of at least 25 days.	City Light proposes to measure existing noise levels for a continuous 7-day period using a methodology that is based on ANSI-ASA_S3-SC1.100_S12.100-2014, Methods to Define and Measure the Residual Sound in Protected Natural and Quiet Residential Areas.
32.	Brock Applegate (WDFW)	05/26/2020	Section 2.6 Methodology Page 2-4	I agree with NPS. When SCL measures the sound will affect the results. SCL will get a different measurement of sound for weekends, holiday weeks after weekends, and during different types of weather.	See response to Comment #31.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
33.	Judy Neibauer (USFWS)	05/22/2020	Section 2.6.1 Inventory and Assess Noise-Emitting Project Facilities and Activities	There are methods to measure aquatic noise, it would be good to establish a baseline and or use existing noise measurements to compare to. Our Lacey office has a document with some guidelines. Let me know if you would like that.	Thank you for your comment. See responses to Comments #5 and #21.
34.	Judy Neibauer (USFWS)	05/22/2020	Section 2.6.3 Select Sites and Perform Field Noise Measurements	Add some underwater locations near operation sites and during maintenance activities. It may have to be studied at different flow levels to determine how far noise may travel underwater during typical activities and unusual activities (operation of the dams, turbines/spill; maintenance activities; restoration and road work where pounding occurs, etc.)	Thank you for your comment. See responses to Comments #5 and #21.
35.	Jack Oelfke (NPS)	05/19/2020	Section 2.6.4 Process and Analyze 24-hour Noise Measurement Results	<p>This is close, but not exactly right. For a given hour (or other specified time period), L_{Anat} is calculated to be the sound level exceeded x percent of the time, where x is defined as</p> $x = (100 - PH/2) + PH$ <p>and PH is the percentage of the hour that contained noise. In summary, L_{Anat} is a percentile sound level that corresponds to the percentage of an hour where noise occurred.</p>	Thank you for your comment. City Light does not propose to calculate the L _{Anat} , therefore the reference to it was deleted.
36.	Jack Oelfke (NPS)	05/19/2020	Section 2.6.4 Process and Analyze 24-hour Noise Measurement Results	NPS recommends that hourly sound source audibility be a component of the analysis, as well as calculation of LA ₅₀ , as it will clarify the likely sources (including those that are loud, but also encompassing those that may be less loud but are nevertheless persistently audible) of sound measured during the study period.	Thank you for your comment. Evaluating audibility of Project-related noise is beyond the scope of this study. Also please see response to Comment #24.

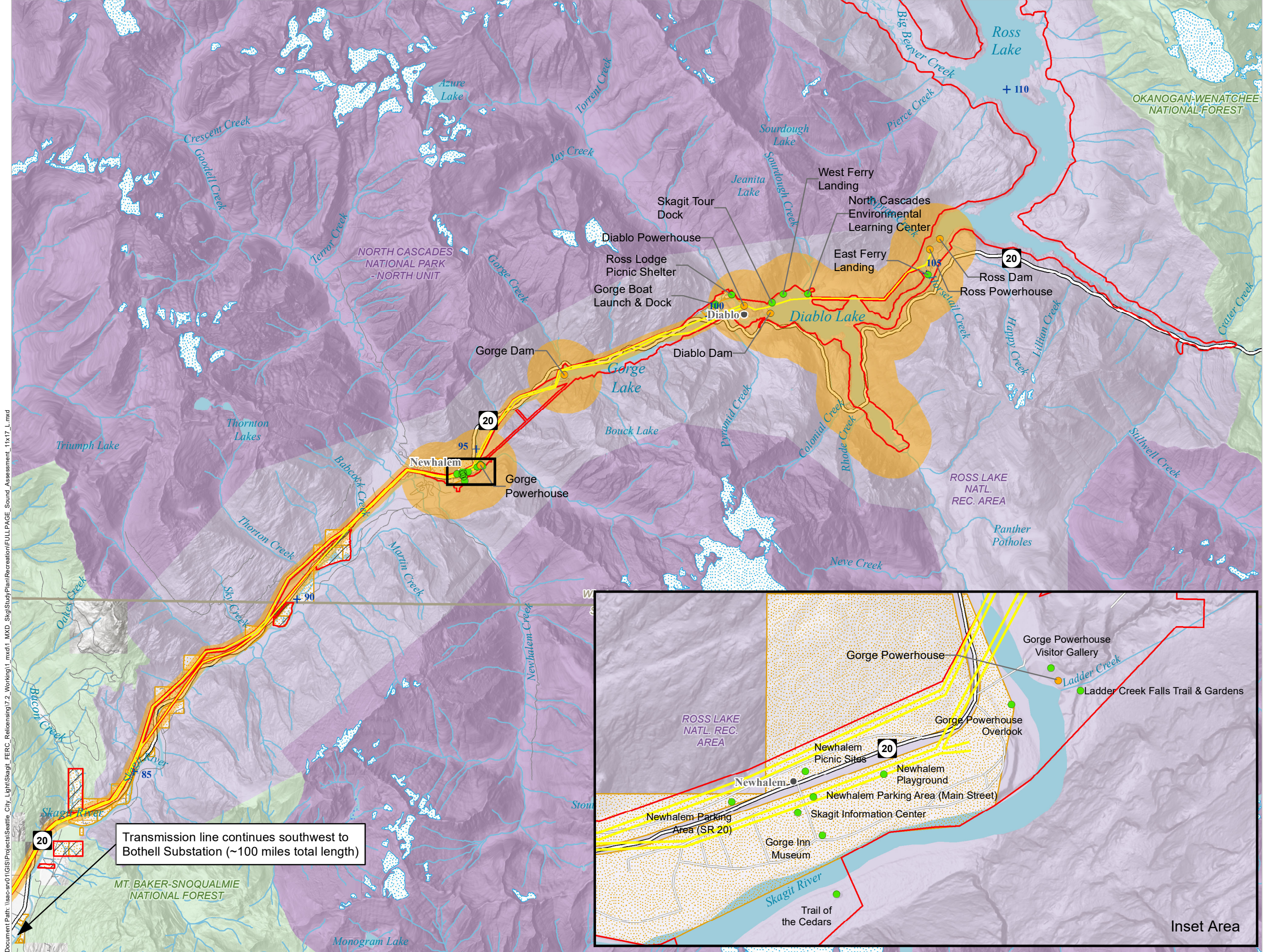
No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
37.	Jack Oelfke (NPS)	05/19/2020	Section 2.6.5 Noise Modeling	Please clarify which metric will be used to represent existing noise levels. Also, NPS suggests it may be more informative to carry noise contours out to the point at which they attenuate to natural sound levels (as established in previous measurements near the project boundary), or at the least, to the LA90 percentile level. This will provide a clearer picture of the effects of project-related noise emissions on the acoustic environment of surrounding park lands.	Refer to Section 2.6.4 for a discussion of acoustical metrics used to express existing (measured) noise levels. Modeled Project-related noise will be expressed as an Leq, with an intended duration equal to the duration during which the noise source produces noise. The calculation area is proposed to be 0.6 miles from the noise source.
38.	Brock Applegate (WDFW)	05/26/2020	Section 2.6.5 Noise Modeling	I agree with the NPS. SCL should attenuate noise to the point of natural sound levels.	Thank you for your comment. Please see response to Comments #24 and #37.
39.	Jack Oelfke (NPS)	05/19/2020	Section 2.7 Consistency with Generally Accepted Scientific Practice	As stated above, NPS recommends instead the use of ANSI-ASA_S3-SC1.100_S12.100-2014, Methods to Define and Measure the Residual Sound in Protected Natural and Quiet Residential Areas.	Thank you for your comment. Text revised. Also, please see response to Comments #24 and #31.
40.	Judy Neibauer (USFWS)	05/22/2020	Section 2.8 Schedule	To measure aquatic noise may take a different schedule, please account for studying aquatic noise in the schedule.	Thank you for your comment. Please see responses to Comments #5 and #21.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
41.	Brock Applegate (WDFW)	05/07/2020	Section 2.8 Schedule	<p>In-Text Edit:</p> <ul style="list-style-type: none"> ■ Final Initial Study Report – March 2022 ■ Initial Study Report Meeting-- 2022 <p>New comment provided 06/25/2020: The requested edit has no bearing on whether SCL finishes the study in one year or two.</p>	<p>Thank you for your comment. City Light acknowledges the ILP milestones provided. The ILP will provide the opportunity for comment on the final report submitted in the Initial Study Report (ISR) and discussed at the ISR meeting. No changes were made to the schedule in the draft study plan as City Light intends to complete the study in one year and wants to be clear with FERC and LPs on the proposed schedule. City Light believes it will be beneficial to all parties to have complete information from the studies as soon as possible to inform development of management proposals and cross resource analysis.</p> <p>Response to comment provided on 06/25/2020: Thank you for your comment. The schedule reflects the timeline for this study only, not the larger ILP process.</p>
42.	Jack Oelfke (NPS)	05/19/2020	Section 3.0 References	<p>In-Text Edit:</p> <p>_____. 2012. Ross Lake National Recreation Area. General Management Plan. National Park Service, U.S. Department of the Interior. July 2012. https://parkplanning.nps.gov/document.cfm?parkID=327&projectID=16940&documentID=47962</p>	Thank you, reference added.

**PROJECT SOUND ASSESSMENT
REVISED STUDY PLAN**

ATTACHMENT B

STUDY AREA MAP

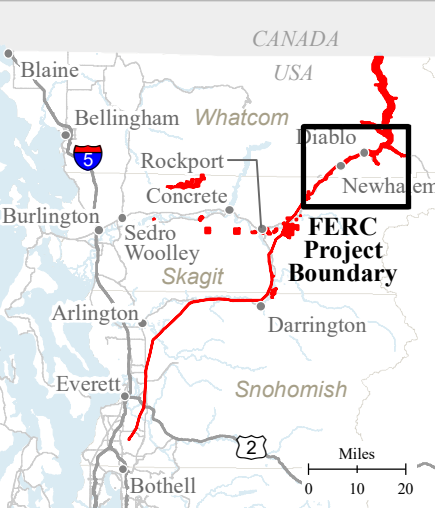
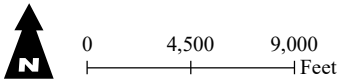


**PROJECT SOUND
ASSESSMENT STUDY AREA
(RA-04)**

- FERC Project Boundary
- Mitigation Parcel
- Project River Miles (PRM)
- National Park Service
- National Recreation Area (NPS)
- U.S. Forest Service
- Seattle City Light
- Transmission Lines
- Sound Assessment Area

Project Facilities

- Recreation Facility
- Non-Recreation Facility



Seattle City Light

**SKAGIT RIVER HYDROELECTRIC
PROJECT (FERC NO. 553)**

Created on 3/4/2021 by HDR for Seattle City Light.
City Light provides no warranty, expressed or implied, as to the accuracy, reliability or completeness of this data.
Data Source: Recreation Sites, Campsites, Transmission Lines, other Facilities - Seattle City Light.

**RA-05 LOWER SKAGIT RIVER RECREATION FLOW
REVISED STUDY PLAN**

**SKAGIT RIVER HYDROELECTRIC PROJECT
FERC NO. 553**

Seattle City Light

**April 2021
RSP**

TABLE OF CONTENTS

Section No.	Description	Page No.
1.0	Introduction.....	1-1
1.1	General Description of the Project.....	1-1
1.2	Relicensing Process	1-1
1.3	Study Plan Development.....	1-2
2.0	Study Plan Elements	2-1
2.1	Study Goals and Objectives	2-1
2.2	Resource Management Goals	2-1
2.3	Background and Existing Information.....	2-1
2.4	Project Operations and Effects on Resources	2-2
2.5	Study Area	2-2
2.6	Methodology	2-5
2.6.1	Literature Review.....	2-5
2.6.2	Boat Survey and Structured Interviews	2-5
2.6.3	Hydrology Analysis	2-5
2.6.4	S-Bends Portage Assessment.....	2-6
2.7	Reporting.....	2-6
2.8	Consistency with Generally Accepted Scientific Practice.....	2-6
2.9	Schedule.....	2-6
2.10	Level of Effort and Cost	2-6
3.0	References	3-1

List of Figures

Figure No.	Description	Page No.
Figure 2.5-1.	Proposed river segments for study.....	2-4

List of Acronyms and Abbreviations

City Light.....	Seattle City Light
DLA	Draft License Application
Ecology	Washington State Department of Ecology
ELC	Environmental Learning Center
FERC.....	Federal Energy Regulatory Commission
ISR	Initial Study Report
LP	licensing participant
NPS	National Park Service
PAD.....	Pre-Application Document
PRM	Project River Mile
Project	Skagit River Hydroelectric Project
PSP	Proposed Study Plan
RLNRA	Ross Lake National Recreation Area
RM	river mile
RSP	Revised Study Plan
RWG	Resource Work Group
U.S.C.....	United States Code
USGS	U.S. Geological Survey
Ecology	Washington Department of Ecology

This page intentionally left blank.

1.0 INTRODUCTION

1.1 General Description of the Project

The Skagit River Hydroelectric Project (Project), licensed to The City of Seattle, Washington, and operated through its publicly-owned electric power utility Seattle City Light (City Light), is located in northern Washington State and consists of three power generating developments on the Skagit River – Ross, Diablo, and Gorge – and associated lands and facilities. The Project generating facilities are in the Cascade Mountains of the upper Skagit River watershed, between Project River Miles (PRM) 94.7 and 127.9 (U.S. Geological Survey [USGS] RMs 94.2 and 127).¹ Power from the Project is transmitted via two 230-kilovolt 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, an Environmental Learning Center (ELC), several recreation facilities, and several parcels of fish and wildlife mitigation lands.

Project generating facilities are all located in Whatcom County, although Ross Lake, the most upstream reservoir, crosses the U.S.-Canada border and extends for about one mile into British Columbia at normal maximum water surface elevation. Gorge Powerhouse, the most downstream facility, is approximately 120 miles northeast of Seattle and 60 miles east of Sedro-Woolley, the nearest large town. The closest town is Newhalem, which is part of the Project and just downstream of Gorge Powerhouse. The primary transmission lines cross Whatcom, Skagit, and Snohomish counties; the fish and wildlife mitigation lands are in the same counties.

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, Diablo, and Gorge lakes.” The legislation maintains the Federal Energy Regulatory Commission’s (FERC) 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).

1.2 Relicensing Process

The current FERC license for the Project expires on April 30, 2025, and City Light will apply for a new license no later than April 30, 2023. City Light formally initiated the relicensing process by filing a Notice of Intent and Pre-Application Document (PAD) with FERC on April 27, 2020 (City Light 2020a). The PAD includes descriptions of the Project facilities, operations, license

¹ 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 Project River Mile (PRM) system are provided throughout this document. For further details see Section 7.0 of the main body RSP.

requirements, and Project lands as well as a summary of the extensive existing information available on Project area resources and early consultation on potential resource issues to be addressed during the relicensing. The PAD also includes an outline of the goals and objectives of this study.

In 2019-2020, City Light convened a series of Resource Work Groups (RWGs) to engage agencies and other licensing participants (LPs) in the Study Plan Development Process. Discussions with LPs continued in early 2021 with a series of topic-based discussions following filing of the Proposed Study Plan (PSP) on December 8, 2020 (City Light 2020b). This study plan reflects discussions during RWGs and with LPs and study requests and comments submitted by LPs.

1.3 Study Plan Development

City Light is filing this RA-05 Lower Skagit River Recreation Flow Study Plan with FERC as part of its Revised Study Plan (RSP), incorporating comments and consultation prior to the filing date. The Washington State Department of Ecology (Ecology) provided a study request (Ecology-02 Instream/Recreation Flow Study) related to instream flow that included recreation flow components downstream of the Gorge Powerhouse. This study plan addresses the elements identified in the study request, as explained in Section 6 of the RSP.

American Whitewater filed PSP comments to include this new study plan in the RSP. By proposing this new study, City Light has addressed American Whitewater's comments.

2.0 STUDY PLAN ELEMENTS

2.1 Study Goals and Objectives

The goal of this study is to document the recreation flow needs in the Skagit River from Goodell Creek Boat Launch to the Howard Miller Steelhead Park near Rockport to understand how current Project conditions may influence recreation flow opportunities, to inform future operational scenarios that may include a range of instream flow measures in a future license, and to assess potential constraints such as fish and aquatic resource protection measures, Project operations, or safety concerns. The study is not intended to estimate commercial or non-commercial use numbers on the Skagit River.

The study has the following objectives:

- Describe the recreation boating opportunity in the Skagit River from Goodell Creek Boat Launch to the Howard Miller Steelhead Park near Rockport, including delineating the respective recreation segments, access locations, whitewater difficulty, character of rapids, number of portages, watercraft types, and uniqueness of opportunity;
- Determine the range of boatable flows for watercraft types for the distinct recreation segments; and
- Quantify the frequency, timing, duration, magnitude, and rate of change of flows downstream of the Gorge Powerhouse within the boating flow range.

2.2 Resource Management Goals

City Light's goal is to evaluate instream flow needs for recreation under current operating conditions to better inform potential future operational scenarios and to assess potential constraints and opportunities for recreation instream flows, such as potential effects to natural, cultural, and other Project resources from increased public access, as well as Project operations and safety concerns.

The study will provide information for resource agencies and Indian tribes with jurisdiction in the Project vicinity to address their respective goals and objectives for resource management. Ecology's and American Whitewater's resource management goals were provided by in their study requests and PSP comments identified in Section 1.3 of this study plan. NPS manages recreation within RLNRA, including access to the Skagit River, following the guidance provided in the 2012 RLNRA General Management Plan (NPS 2012). The General Management Plan for the North Cascades National Park Complex (NPS 1988) guides management of the North Cascades National Park north and south units. The Skagit River downstream of the RLNRA boundary located at the confluence with Bacon Creek is managed by the Mt. Baker-Snoqualmie National Forest. Management for the river segments downstream of RLNRA are guided by the Land and Resources Management Plan (USFS 1990b) and the Skagit River Wild and Scenic River Management Plan (USFS 1983).

2.3 Background and Existing Information

The 25.4-mile-length of the Skagit River extending from Goodell Creek Boat Launch to Howard Miller Steelhead Park contains three distinct recreation segments: Goodell Creek to Copper Creek,

Copper Creek to Marblemount Boat Launch; and Marblemount Boat Launch to Howard Miller Steelhead Park. Recreation boaters may combine segments or further divide segments using both formal and informal access points along the river.

The mainstem Skagit River directly downstream of Newhalem provides a scenic Class II – III boating opportunity. The Guide to Whitewater Rivers of Washington (Bennett and Bennett, n.d.) lists the 9-mile river segment from Goodell Creek to Copper Creek as runnable year-round with flows ranging from 1,500 to 5,000 cubic feet per second (cfs). At flows greater than 5,000 cfs the difficulty increases to Class IV (Bennett and Bennett, n.d.). Much of the Goodell to Copper Creek river segment is described as scenic Class I – II difficulty with two rapids along the 9-mile length. S bends is a Class III rapid located 6-miles from the Goodell Creek put-in, and a Class II wave train is located at mile 7 (Bennett and Bennett, n.d.). Otherwise, the shallow gradient of 15 ft per mile keeps much of this river segment a peaceful scenic float.

The NPS manages the Goodell Creek Boat Launch on the mainstem Skagit downstream of the Project. Commercial and non-commercial boaters utilize this put-in location for the 9-mile float to Copper Creek. Rafting companies with clients must have a permit with the NPS for commercial use of the river from Goodell Creek Boat Launch to the boundary with RLNRA. Commercial river use downstream of the RLNRA boundary requires a permit with the Mt. Baker-Snoqualmie National Forest. Permits are not required for non-commercial boaters on the segments from Goodell Creek Boat Launch to Howard Miller Steelhead Park. American Whitewater describes the Skagit starting at Goodell Creek Boat Launch as a popular river segment available throughout the year for rafts, beginner to intermediate boaters in kayaks and open boats, and for advanced beginners to practice skills (American Whitewater 2020).

The Skagit River from Marblemount to Rockport is rated Class I-II (Bennett and Bennett, n.d.). American Whitewater combines the river segments from Copper Creek to Marblemount and from Marblemount to Howard Miller Steelhead Park as a single river segment on their interactive map for the Skagit River (American Whitewater 2021). American Whitewater points out that most boaters start at Marblemount for the lower river segment but explains that launching from Copper Creek extends the length of the trip.

Ecology and American Whitewater have expressed a need to document flows useable for recreation for the Skagit River from Goodell Creek Boat Launch to Howard Miller Steelhead Park. This study is designed to document boatable recreation flows for watercraft used in this reach of the Skagit River. For the period 1991 through 2018, monthly minimum discharge (Table 4.4.3 in the PAD [City Light 2020a]) has never dropped below the 1,500 cfs recommended minimum whitewater flow listed by Bennett and Bennett as well as by American Whitewater.

2.4 Project Operations and Effects on Resources

Project operations release flows into the Skagit River downstream of Gorge Powerhouse.

2.5 Study Area

The study area is the 25.4-mile Skagit River from Goodell Creek Boat Launch to Howard Miller Steelhead Park. The reach contains three distinct recreation segments: Goodell Creek to Copper Creek, Copper Creek to Marblemount Boat Launch; and Marblemount Boat Launch to Howard

Miller Steelhead Park. Recreation boaters may combine segments or further divide segments using both formal and informal access points along the river.

A map of the study area is provided in Figure 2.5-1.

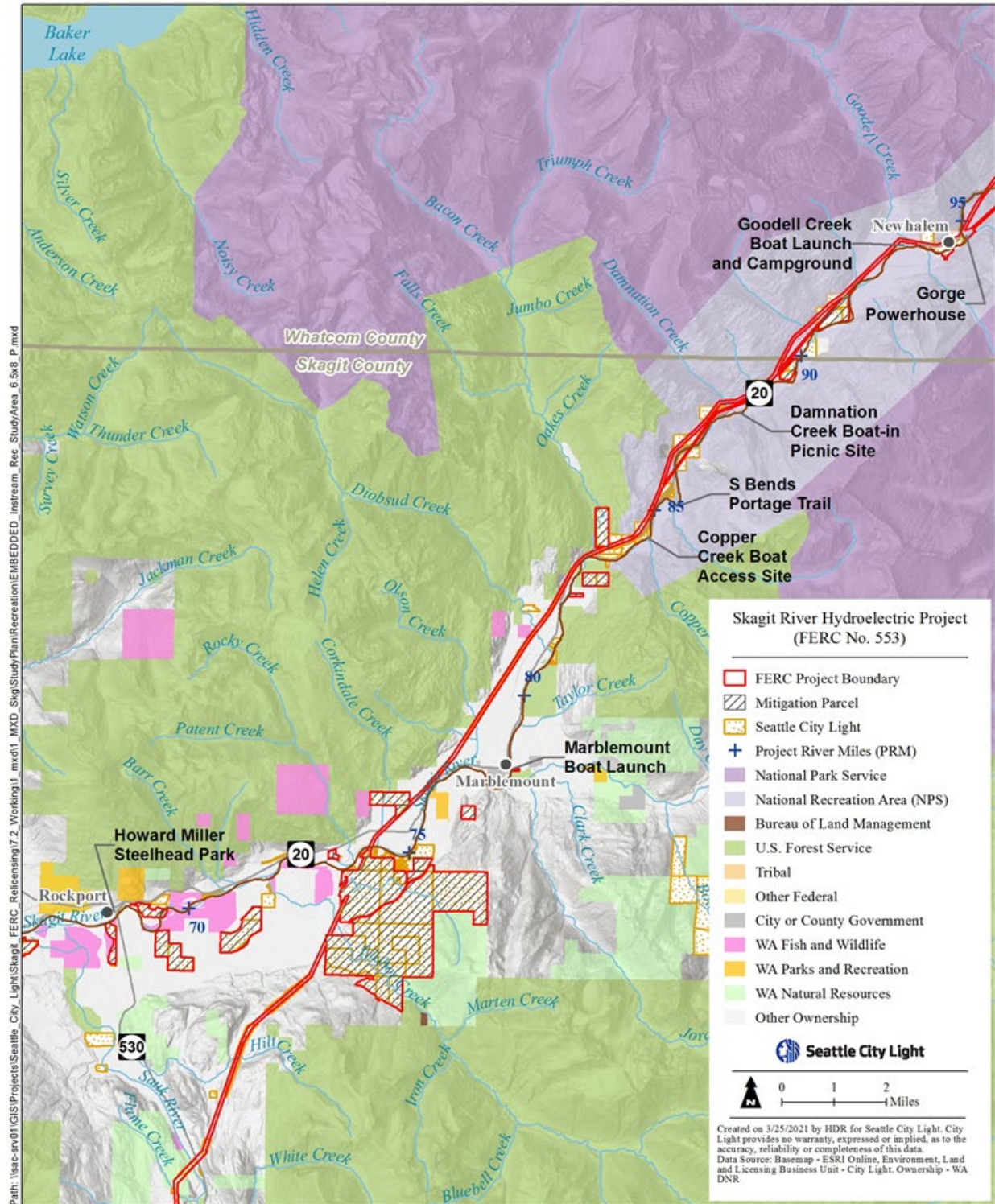


Figure 2.5-1. Proposed river segments for study.

2.6 Methodology

The study will consist of four tasks, including a: (1) literature review; (2) boater survey and structured interviews; (3) hydrology analysis; and (4) portage trail assessment at S-Bends. Each of these tasks is described below.

2.6.1 Literature Review

The study will include a review of existing information sources describing the river recreation opportunities and boatable recreation flows on this reach of the Skagit River. A literature review will include whitewater guidebooks, magazine publications, electronic guidebooks available online, and Internet searches for trip reports. A table summarizing the recreation segments on this reach of the Skagit River will be compiled. The table will include the name of the recreation segment, put-in and take-out location, length, gradient (feet per mile), typical watercraft, whitewater difficulty and season(s) of use.

2.6.2 Boat Survey and Structured Interviews

This study will include an Internet-based survey focused on recreation flows as recommended by American Whitewater. The survey questions and format will be similar to surveys applied for other FERC relicense proceedings and described in Whittaker et al. 1993 and Whittaker et al. 2005. The survey will be designed to obtain boatable recreation flows for respective watercraft types for the three distinct river segments. Links to the survey will be published on the Skagit River Hydroelectric Project website and forwarded to all LPs as well as recreation user groups. Information will be posted at river access locations and other key locations. The information will include a link to the electronic survey and a QR code for smart phones users to access the survey. In addition, the survey will include questions specific to the designated river access sites and facilities, including Goodell Creek Boat Launch, Copper Creek Boat Access Site, Damnation Creek Boat-in Picnic Site, and Marblemount Boat Launch. The questions will focus on visitor preferences and uses related to these river access sites and will be consistent with similar questions in City Light's RA-01 Recreation Use and Facility Assessment Study instrument.

Structured interviews will be conducted with individuals in the recreation boating community with knowledge of the river segments on this reach of the Skagit River. The interviews will focus on watercraft types, opinions on whitewater difficulty, estimated range of boatable flows for respective watercraft types, commercial and non-commercial use patterns, and on identifying other individuals with knowledge on whitewater boating on these river segments. The boating community will assist City Light in the selection of individuals for the structured interviews.

2.6.3 Hydrology Analysis

Analysis of the hydrology of the Skagit River downstream of Gorge Powerhouse will be conducted using the range of boatable recreation flows for respective watercraft documented through the internet survey and structured interviews. Analysis will include the annual frequency, timing, duration, magnitude, and rate of change. Tributary inputs will be considered in the analysis for respective recreation segments where discharge data is available.

2.6.4 S-Bends Portage Assessment

City Light will evaluate the portage trail at the S Bends in the river segment from the Goodell Creek Boat Launch to Copper Creek as requested by American Whitewater. The evaluation will include an assessment of current conditions of the portage trail, including trail width relative to watercraft being portaged, tread surface, and access to the portage trail from the river. Trail features will be documented with photographs, including of areas of potential resource degradation.

2.7 Reporting

The study report will include the recreation literature review, recreation flow survey, structured interviews, hydrology analysis, and portage trail assessment. The report will include the following: (1) description of the recreation boating opportunities observed in each of the three river recreation segments; (2) description of the known river access points to each river segment; (3) summary of visitor uses and preferences at key river access sites and facilities; (4) hydrology analysis of annual frequency, timing, duration, magnitude, and rate of change for the range of recreation flows in each recreation segment; and (5) an evaluation of current conditions at of the S-Bends portage trail and potential resource protection needs.

2.8 Consistency with Generally Accepted Scientific Practice

The study approach proposed for the Skagit River Instream Flow Needs for Recreation is based on recommendations from American Whitewater and on the publication, *Flows and Recreation: A Guide to Studies for River Professionals* by Whittaker et al. (2005). This approach has been successfully applied in other FERC relicensing proceedings.

2.9 Schedule

This study will be initiated in the summer of 2021. The proposed study schedule is provided below.

- River recreation literature review June - August 2021
- Develop recreation flow survey June 2021
- S-Bends portage trail evaluation July 2021
- Internet-based recreation flow survey July – October 2021
- Identify individuals for structured interviews August 2021
- Conduct structured interviews Fall 2021
- Data analysis Fall 2021
- Final Report (Initial Study Report [ISR]) March 2022

2.10 Level of Effort and Cost

The initial estimate for implementation and reporting associated with this study is approximately \$75,000.

3.0 REFERENCES

- American Whitewater. 2020. River Info: Skagit River – Goodell Creek to Copper Creek. [Online] URL: <https://www.americanwhitewater.org/content/River/view/?#/riverdetail/2206/main>. Accessed Nov 6, 2020.
- American Whitewater. 2021. River Info: Skagit River –Copper Creek to Rockport. [Online] URL: <https://www.americanwhitewater.org/content/River/view/river-detail/2205/main>. Accessed March 19, 2021.
- Bennett, Jeff and Tonya Bennett. n.d. A Guide to the Whitewater Rivers of Washington. 2nd Edition. Swiftwater Publishing Company, Portland, OR.
- National Park Service (NPS). 1988. General management plan: North Cascades National Park, Ross Lake National Recreation Area, Lake Chelan National Recreation Area. [Denver, Colo.]: U.S. Dept. of the Interior, National Park Service.
- _____. 2012. Ross Lake National Recreation Area General Management Plan. North Cascades National Park Complex. March 2012.
- 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.
- United States Forest Service (USFS). 1983. Skagit Wild and Scenic River Management Plan (Volumes I and II). Mount Baker-Snoqualmie National Forest, Pacific Northwest Region. Seattle, Washington.
- _____. 1990b. Mt. Baker-Snoqualmie National Forest Land and Resources Management Plan. Pacific Northwest Region. Everett, Washington.
- Whittaker, D., B. Shelby, and J. Gangemi. 2005. Flows and Recreation: A Guide to Studies for River Professionals. Hydropower Reform Coalition, Washington, DC.
- Whittaker, D., B. Shelby, W. Jackson, and R. Beschta. 1993. Instream Flows for Recreation: A Handbook on Concepts and Research Methods. U.S. Department of Interior, National Park Service, Anchorage, AK.

This page intentionally left blank.

**SY-01 SYNTHESIS AND INTEGRATION OF
AVAILABLE INFORMATION ON RESOURCES IN THE
LOWER SKAGIT RIVER
REVISED STUDY PLAN**

**SKAGIT RIVER HYDROELECTRIC PROJECT
FERC NO. 553**

Seattle City Light

**April 2021
RSP**

TABLE OF CONTENTS

Section No.	Description	Page No.
1.0	Introduction.....	1-1
1.1	General Description of the Project.....	1-1
1.2	Relicensing Process	1-1
1.3	Study Plan Development.....	1-2
2.0	Study Plan Elements	2-1
2.1	Study Goals and Objectives	2-1
	Step 1: Data Compilation.....	2-2
	Step 2: Data Analysis.....	2-2
	Step 3: Life Stage Factors Affecting Target Species	2-2
	Step 4: Identification of Key Uncertainties	2-2
2.2	Resource Management Goals	2-2
2.3	Existing Information and Need for Additional Information	2-3
2.4	Project Operations and Effects on Resources	2-6
2.5	Study Area	2-7
2.6	Methodology	2-9
2.7	Study Execution.....	2-11
2.8	Schedule and Integration with Ongoing Studies.....	2-11
2.9	Level of Effort and Cost	2-12
3.0	References	3-1

List of Figures

Figure No.	Description	Page No.
Figure 2.5-1.	Overview of study area.	2-8
Figure 2.5-2.	General depiction of Skagit River anadromous salmonid life cycle. The Synthesis Study will focus on key in-river, delta, and estuary life stages and habitat conditions.	2-10

List of Tables

Table No.	Description	Page No.
Table 2.3-1.	Example list of data resources and key publications for the lower Skagit River.....	2-4

List of Attachments

Attachment A	Example Summary of Factors Potentially Affecting Lower Skagit River Anadromous Fish Resources
--------------	---

List of Acronyms and Abbreviations

City Light.....	Seattle City Light
CFR.....	Code of Federal Regulations
Ecology	Washington Department of Ecology
ELC	Environmental Learning Center
FERC.....	Federal Energy Regulatory Commission
ILP.....	Integrated Licensing Process
ISR	Initial Study Report
LP	licensing participant
mi ²	square miles
NMFS.....	National Marine Fisheries Service
NPS	National Park Service
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
RSP	Revised Study Plan
RWG	Resource Work Group
U.S.C.....	United States Code
USIT.....	Upper Skagit Indian Tribe
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WDFW	Washington Department of Fish and Wildlife

1.0 INTRODUCTION

1.1 General Description of the Project

The Skagit River Hydroelectric Project (Project), licensed to The City of Seattle, Washington, and operated through its publicly-owned electric power utility Seattle City Light (City Light), is located in northern Washington State and consists of three power generating developments on the Skagit River – Ross, Diablo, and Gorge – and associated lands and facilities. The Project generating facilities are in the Cascade Mountains of the upper Skagit River watershed, between Project River Miles (PRM) 94.7 and 127.9 (U.S. Geological Survey [USGS] river miles (RM) 94.2 and 127)¹. Power from the Project is transmitted via two 230-kilovolt 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, an Environmental Learning Center (ELC), several recreation facilities, and several parcels of fish and wildlife mitigation lands in Whatcom, Skagit, and Snohomish counties.

Project generating facilities are all located in Whatcom County, although Ross Lake, the most upstream reservoir, crosses the U.S.-Canada border and extends for about one mile into British Columbia at normal maximum water surface elevation. Gorge Powerhouse, the most downstream facility, is approximately 120 miles northeast of Seattle and 60 miles east of Sedro-Woolley, the nearest large town. The closest town is Newhalem, which is part of the Project and just downstream of Gorge Powerhouse. The primary transmission lines cross Whatcom, Skagit, and Snohomish counties; the fish and wildlife mitigation lands are in the same counties.

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, Diablo, and Gorge lakes.” The legislation maintains the Federal Energy Regulatory Commission’s (FERC) 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).

1.2 Relicensing Process

The current FERC license for the Project expires on April 30, 2025, and City Light will apply for a new license no later than April 30, 2023. City Light formally initiated the relicensing process by filing a Notice of Intent and Pre-Application Document (PAD) with FERC on April 27, 2020 (City

¹ 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 7.0 of the main body RSP.

Light 2020a). The PAD includes descriptions of the Project facilities, operations, license requirements, and Project lands as well as a summary of the extensive existing information available on Project area resources and early consultation on potential resource issues to be addressed during the relicensing.

In 2019-2020, City Light convened a series of Resource Work Groups (RWG) to engage agencies and other licensing participants (LP) in the Study Plan Development Process. Discussions with LPs continued in early 2021 with a series of topic-based discussions following filing of the Proposed Study Plan (PSP) on December 8, 2020 (City Light 2020b). The addition of this study plan to the Revised Study Plan (RSP) reflects RWG and LP discussion and study requests and comments submitted by LPs.

1.3 Study Plan Development

Five LPs (National Marine Fisheries Service [NMFS], NPS, U.S. Fish and Wildlife Service [USFWS], Upper Skagit Indian Tribe [USIT], Washington Department of Ecology [Ecology], and Washington Department of Fish and Wildlife [WDFW]) submitted a total of 16 study requests to extend the geographic scope of resource studies downstream of the Sauk River confluence: NMFS-01 Water Quality; NPS-11 Impact of the Operations of Project on Sediment Capture within Reservoirs and Sediment Recovery Below Gorge Dam and Its Influence on Endangered Species Habitat, NPS-13 Impact of Operations of Project on Process Flows of Water, Wood, and Sediment Below Gorge Dam; USFWS-03 Skagit Project Water Quality Assessment and Modeling, USFWS-11 Impact of the Operations of Skagit Hydroelectric Project (#553) on Sediment Capture within Reservoirs and Sediment Recovery below Gorge Dam and its Influence on Endangered Species Habitat, USFWS-13 Impact of Operations of Skagit Hydroelectric Project (#553) on Process Flows of Water, Wood, and Sediment below Gorge Dam, USFWS-16 The impacts of Project Operations on Aquatic and Riparian Biological Productivity Downstream of Gorge Dam; USIT-07 Water Quality Impacts Above and Below SCL Project Infrastructure (Water Quality), USIT-09 The Impacts of Project Operations on Aquatic & Riparian Biological Productivity Downstream of Gorge Dam (Littoral and Riparian Productivity), USIT-10 Efficiency of Engineered Spawning Channels as Mitigation to Loss of Off Channel Habitats Downstream of the Skagit Project (#553); Ecology-01 Water Quality Study; WDFW-06 The Impacts of Project Operations on Aquatic & Riparian Biological Productivity Downstream of Gorge Dam (Littoral and Riparian Productivity); WDFW-07 Efficiency of Engineered Spawning Channels as Mitigation to Loss of Off Channel Habitats Downstream of the Skagit Project (#553), WDFW-09 Wood Budget Inventory and Assessment, WDFW-10 Impact of the Operations of Skagit Hydroelectric Project (#553) on Sediment Capture Within Reservoirs and Sediment Recovery Below Gorge Dam and Its Influence on Endangered Species Habitat, and WDFW-17 Water Quality Impacts Above and Below SCL Project Infrastructure (Water Quality).

A number of study requests and comments on City Light's PSP concern the potential for the Project to affect salmonid resources, and the habitats they rely on, downstream of the Sauk River confluence. In general, these study requests seek to more fully understand the extent of downstream influence of Project operations on resources below the Sauk River confluence and the potential for Project operations to affect anadromous fish species that may use the reach of the Skagit River extending from the Sauk River to the Skagit River delta and estuary. As appropriate to any scientific investigation, compiling and analyzing all relevant and available data and

information is a first step. City Light is proposing to first undertake an information synthesis and integration study focused on identifying the influence of Project operations on anadromous fish resources in the lower Skagit River extending from about PRM 66.7 (USGS RM 66.6; Sauk River confluence) to the delta and estuary.

Several study requestors cite prior studies which identify changes that have occurred over time to the Skagit River delta and estuary and the potential effect of these changes on rearing habitat and capacity to support juvenile salmonid rearing in the lower river, delta, and estuary. While a number of hypotheses have been put forward by LPs, the causal role of City Light's Skagit River Project as one of the watershed's contributors to the current conditions of the habitats and anadromous fish populations that use the lower river and Skagit delta is largely unknown. A first reasonable step towards attempting to determine the extent of the Project's impact on anadromous fish resources in the lower river, delta, and estuary is to understand the current watershed-scale factors affecting the species and their habitat. Based on the numerous citations and literature references provided in the LPs' study requests, it is apparent that a large body of information exists on the factors potentially affecting anadromous fish resources at the watershed level. However, this body of information has not been fully compiled, researched, analyzed, or integrated as a whole. In any comprehensive science-based assessment, a necessary first step is the compilation, synthesis, and integration of the available, relevant information.

Therefore, in consideration of the numerous study requests to extend the geographic scope of studies to below the Sauk River confluence, and City Light's interests in watershed-level influences on anadromous fish resources, City Light is adding the SY-01 Synthesis and Integration of Available Information on Resources in the Lower Skagit River (Synthesis) Study Plan as part of its RSP to develop a comprehensive data synthesis of existing information focused on the reach downstream of the Sauk River confluence to the estuary.

To build a shared understanding of the available information that will be used for this analysis, City Light will include a technical memorandum in the Initial Study Report (ISR) that: (1) compiles, analyzes, and summarizes relevant available information about the condition of and primary factors affecting life stages of anadromous fish resources in the reach of river extending from the Sauk River confluence to the Skagit River delta and estuary; (2) identifies the Project's potential contribution to those factors affecting life stages of anadromous fish resources and identifies data gaps related to the evaluation of the Project's effects; and (3) proposes studies to be conducted during the second year of study to address those data gaps, if necessary. Upon Commission approval, City Light will implement such studies during the second year of study.

2.0 STUDY PLAN ELEMENTS

2.1 Study Goals and Objectives

The goal of the study is to compile, analyze, and summarize available data and studies on anadromous fish resources using the Skagit River watershed, characterize factors affecting these populations, develop conceptual life history models of each population, and develop hypotheses to understand potential impacts of the Project and other contributing factors in the watershed. Existing information on watershed-wide contributing factors will then be updated and integrated with the results of studies being conducted as part of the Integrated Licensing Process (ILP) to determine the major factors affecting each target species, which may further inform preferred watershed-based measures and/or longer-term adaptive management processes for protecting and enhancing target anadromous salmonid populations in the Skagit River. The recommended target species are Chinook, Coho, Sockeye, Chum, and Pink salmon, Bull Trout, and steelhead.

While no study request demonstrates with reasonable scientific certainty a connection between Project operations and a specific resource impact, study requests raise hypotheses that Project operations may detrimentally affect conditions in the lower Skagit River downstream of the Sauk River and in the estuary related to water quality, habitat availability, wood and sediment transport, riparian and floodplain conditions, and other factors that may impact the life stages of anadromous fish resources using the lower river, delta, and estuary. This study is intended to summarize and synthesize available data and existing analyses by others (e.g., recovery plans, peer-reviewed and gray literature) that have investigated the conditions of these resources in the study area to date to inform potential studies and analysis during the second year of study. A list of some of these factors are listed as potential topics of interest below.

Topics of Interest for the Synthesis Study

- Geomorphology (e.g., geomorphic change, channel migration and incision; aquatic habitat; side channel/off channel connection; floodplain connectivity; substrate and sediment; wetlands; sediment transport; and large wood inventories)
- Landforms
- Water quality
- Aquatic primary and secondary productivity
- Fish and aquatic habitat (e.g., species limiting factors; habitat quality and quantity; salmonid population trends)
- Riparian vegetation and wetlands
- Available modeling tools (e.g., hydraulic, biological, geomorphologic)
- Other watershed and regional activities and land uses (e.g., forestry/logging, agriculture, commercial/industrial, shoreline development, levees, shoreline hardening, floodplain development and encroachment, irrigation/diking, urban landscapes)

The proposed Synthesis Study would be subdivided into four steps: (1) data compilation; (2) data analysis; (3) identification of factors affecting the target species by reach and life stage; and (4)

identification of key uncertainties for each of these factors and the data/information needed to address/reduce the uncertainties. Each step is briefly described below and expanded upon in the Methodologies section of this Study Plan. Significant efforts will be undertaken to attempt to complete these four steps in the first year of the ILP study program. The review and synthesis of existing information conducted in Year 1, and findings from other studies being undertaken under the ILP, will be used to identify any additional field data collection needs related to investigating the Project's effects on anadromous salmonids in the reach below the Sauk River for the 2022 field season. The results of this study will help establish a broader understanding of potential preferred protection, mitigation, and enhancement (PME) measures to protect and improve the target species and/or initiate consensus-based studies to increase the understanding of specific key factors.

Step 1: Data Compilation

The first step of the Synthesis Study is to assemble and review relevant and available information to characterize the status of each target species and physical and ecological attributes of important habitats for individual salmonid life stages of these target species in the lower Skagit River system.

Step 2: Data Analysis

Relevant information collected during data compilation would be analyzed to develop life-history-based conceptual models of each of the Skagit River target anadromous fish species using the lower river, delta, and estuary.

Step 3: Life Stage Factors Affecting Target Species

Using a life-history framework, hypotheses about key in-river and delta/estuary factors thought to be of greatest importance to each of the target anadromous fish populations in the Skagit River watershed would be derived based on the work conducted in the data compilation and data analysis steps. Factors considered would include those identified above in the Topics of Interest. Potential relationships between these key factors affecting anadromous fish resources in the Skagit River below the Sauk River confluence and Project operations will be identified and verified based on the work conducted in Steps 1 and 2.

Step 4: Identification of Key Uncertainties

Based on the information and data developed and analyzed in the first three steps, identify areas where further data are necessary to understand the key mechanisms and Project operations affecting species and their respective in-river, delta, and estuary life stages. Where large uncertainties and/or data gaps exist related to analyzing Project effects on key factors affecting anadromous fish resources, identify specific studies to reduce uncertainties and/or fill data gaps.

2.2 Resource Management Goals

The Synthesis Study will provide resource agencies and Indian tribes with an integrated summary of the large body of information available for the area of the Skagit River below the Sauk River confluence through an examination of the available peer-reviewed and gray literature derived from studies of the Skagit River and potentially other nearby rivers draining to Puget Sound.

The study will provide information for resource agencies and Indian tribes with jurisdiction in the Project vicinity to address their respective goals and objectives for resource management.

Resource management goals were provided by LPs in their study requests identified in Section 1.3 of this study plan.

2.3 Existing Information and Need for Additional Information

Studies have shown that the Skagit River is a complex river system owing in part to its geologic and geomorphologic history. A recent initial draft study of the geomorphology of the Skagit River (Riedel et al. 2020) identified 13 distinct reaches from Gorge Dam to the Skagit Bay estuary based on geomorphic characteristics and as further reported:

“The reaches have striking differences in flood-prone width, slope, sinuosity of the main channel, and the suite of landforms they contain. For example, R1 (Skagit Gorge) is narrow, has a steep slope and contains little stored sediment in the form of alluvial terraces or gravel bars, while R13 (Skagit Delta) has a shallow slope and is built of fine-grained sediment shed from the mountains and deposited at the edge of the Salish Sea. Each reach is defined by a set of geologic process or events that shaped its development over varying amounts of time that continue today. The main natural land forming processes are glaciation, mass movement, volcanism, and fluvial. River erosion and deposition are still active in all-of the reaches.”

As an example of this complex geologic history, reaches of the river have experienced large landslides which reached the valley floor, one of which – Damnation Creek – formed an over 100-foot tall dam blocking the Skagit River for centuries. The draft goes on to report:

“Debris flows from Glacier Peak and Mount Baker volcanoes influence all reaches below R5 [below Marblemount]. Deposits from large debris flows about 5,800-5,000 ybp and 1,800 ybp left massive sand deposits in lower Sauk and Skagit valleys that form high terraces in R8-12 (Dragovitch et al. 2000). The Sauk River alluvial fan has terraces built from the lahar deposits that split the alluvial fan into two lobes that push the Skagit River to the north edge of its floodplain. Lahar deposits extend above the mouth of the Sauk River into R6 [above Rockport]. Thicker deposits downstream near the Sauk River mouth undoubtedly created a backwater effect on the Skagit River and the creation of landforms in R6.”

As the draft report shows, the Skagit River traverses multiple valley configurations on its pathway from headwaters to the Skagit delta and estuary. Changes in gradient, sinuosity, sediment and wood availability, and hydrology all add to the unique character of the different river reaches. Understanding these changes integrated with the life history trajectories of the target anadromous fish species will aid in developing an understanding of the in-river, delta, and estuary (i.e., watershed level) factors involved by reach and by life stage.

The anadromous fish resources of the Skagit River watershed have been studied extensively for decades. There are numerous studies that document the natural resources of the watershed, and many of these efforts include or are focused on the area downstream of Sauk River confluence. Table 2.3-1 provides a partial list of data resources, key publications, and websites that include some of the comprehensive studies that have been carried out in the study area. This is an initial list and will be expanded upon during study development. As stated, City Light will conduct a literature and information search related to the list of topics summarized in Section 2.1 of this study plan and will also review prior submissions from LPs for potential information to be included in this study. City Light welcomes additional input and references from LPs during the compilation

process. Several of the proposed studies in this RSP include work scopes that extend to reaches below the Sauk River (e.g., FA-01 Water Quality Monitoring Study; GE-04 Skagit River Geomorphology Between Gorge Dam and the Sauk River Study Plan). Information from these studies will also contribute to the Synthesis Study.

Table 2.3-1. Example list of data resources and key publications for the lower Skagit River.

Title	Citation
Barnaby Reach Project Documents	Barnaby Reach Project 2021
Linking Watershed Conditions to Egg-to-Fry Survival of Skagit Chinook Salmon	Beamer et al. 2005
Freshwater Habitat Rearing Preferences for Stream Type Juvenile Chinook Salmon (<i>Oncorhynchus tshawytscha</i>) And Steelhead (<i>O. mykiss</i>) In The Skagit River Basin: Phase 1 Study Report.	Beamer et al. 2010
Monitoring Salmon Habitat Status and Trends in Puget Sound: Development of Sample Designs, Monitoring Metrics, and Sampling Protocols for Large River, Floodplain, Delta, and Nearshore Environments	Beechie et al. 2017
Bennett, S., G. Pess, N. Bouwes, P. Roni, R. Bilby, S. Gallagher, J. Ruzycki, T. Buehrens, K. Krueger, W. Ehinger, J. Anderson, C. Jordan, B. Bowersox, and C. Greene. 2016. Progress and challenges of testing the effectiveness of stream restoration in the Pacific Northwest using intensively monitored watersheds. <i>Fisheries</i> 41: 92–103.	Bennett et al. 2016
Assessment of resident rainbow trout contribution to returning adult steelhead in the Skagit River, WA	Bodensteiner 2020
Distribution of Salmon-habitat Potential Relative to Landscape Characteristics and Implications for Conservation	Burnett et al. 2007
Sediment load and distribution in the lower Skagit River, Skagit County, Washington	Curran et al. 2016
Variable prey consumption leads to distinct regional differences in Chinook salmon growth during the early marine critical period	Davis et al. 2020
Study of Skagit Dams Original Impacts on Wildlife and Fish Habitats and Populations	Envirosphere 1988
Skagit Watershed Council Riparian Assessment	ESA 2017
Size, Growth, and Size-Selective Mortality of Subyearling Chinook Salmon during Early Marine Residence in Puget Sound	Gamble et al. 2018
Skagit River Estuary Intensively Monitored Watershed Annual Report	Greene et al. 2016
Landscape, density-dependent, and bioenergetic influences upon Chinook salmon in tidal delta habitats: comparison of four Puget Sound estuaries	Greene et al. 2021
Monitoring Population Responses to Estuary restoration by Skagit River Chinook Salmon	Greene and Beamer 2011
Sediment Export and Impacts Associated with River Delta Channelization Compound Estuary Vulnerability to Sea-level Rise, Skagit River Delta, Washington, USA	Grossman et al. 2020
Large river habitat complexity and productivity of Puget Sound Chinook salmon	Hall et al. 2018
Inventory and Assessment of Hydromodified Bank Structures in the Skagit River Basin: Chinook Bearing Streams	Hartson and Shannahan 2015

Title	Citation
Evaluating Watershed Response to Land Management and Restoration Actions: Intensively Monitored Watersheds (IMW) 2006 Progress Report	IMW Scientific Oversight Committee 2006
Suspended sediment, turbidity, and stream water temperature in the Sauk River Basin, Washington	Jaeger et al. 2017
Genetic Stock Structure of Skagit River Basin winter steelhead	Kassler and Warheit 2012
Puget Sound Chinook Salmon Vital Sign Reporting	Kendall et al. 2020
Krall, M., C. Clark, P. Roni, and K. Ross. 2019. Lessons learned from Long-Term Effectiveness Monitoring of Instream Habitat Projects. North American Journal of Fisheries Management 39:1395-1411.	Krall et al. 2019
Lower Skagit River Tributaries Temperature Total Maximum Daily Load Water Quality Improvement Report	Lawrence 2008
Skagit River Basin Climate Science Report	Lee and Hamlet 2011
Seasonal distribution and habitat associations of salmonids with extended juvenile freshwater rearing in different precipitation zones of the Skagit River, WA	Lowery et al. 2020
Trophic Ontogeny of Fluvial bull Trout and Seasonal Predation on Pacific Salmon in a Riverine Food Web	Lowery and Beauchamp 2015
Water Temperature Conditioning Report Reach 3 of the Sultan River Henry M. Jackson Hydroelectric Project	Meridian 2015
Juvenile salmonid (<i>Oncorhynchus</i> spp.) use of constructed and natural side channels in Pacific Northwest rivers	Morley et al. 2005
Salmon Habitat Status and Trend Monitoring Program Data for Puget Sound	NOAA 2021
ESA Recovery Plan for the Puget Sound Steelhead Distinct Population Segment (<i>Oncorhynchus mykiss</i>)	NMFS 2019
Recovery Plan for Puget Sound Chinook Salmon	NMFS 2007
Skagit River Large Woody Debris Assessment: Connecting LWD to the 2005 Skagit Chinook Recovery Plan	NSD 2017
Estimating Changes in Sediment Supply due to Forest Practices: A Sediment Budget Approach Applied to the Skagit River Basin in Northwestern Washington	Paulson 1997
Skagit River Salmon and Steelhead Fry Stranding Studies	Pflug and Mobrand 1989
Ecological, genetic, and productivity consequences of interactions between hatchery and natural origin steelhead of the Skagit Watershed	Pflug et al. 2013
Comprehensive Management Plan for Puget Sound Chinook: Harvest Management Component (Appendix A: Skagit River Management Unit Status Profile)	Puget Sound Indian Tribes and WDFW 2017
Sediment Budget of the Middle Skagit River, Washington 1937-2015 Reveals Decadal Variations in Sediment Export and Storage	Rothleutner 2017
Juvenile Chinook Salmon and Forage Fish use of Eelgrass Habitats in a Diked and Channelized Puget Sound River Delta	Rubin et al. 2018
Retrospective analysis of Skagit River Chum productivity	Ruff 2019
Skagit Bull Trout Monitoring Program: 2002-2005 report.	Seattle City Light 2006
Seattle City Light Historical Climate Trends	Seattle City Light 2021
Skagit Climate Science Consortium: Northwest Science Special Issue	Skagit Climate Science Consortium 2016

Title	Citation
Skagit County Habitat Improvement Plan	Skagit County 2012
Skagit County Lidar Page	Skagit County 2021
Skagit County Monitoring Program Annual Report Database	Skagit County Public Works 2021
Plan for Habitat Protection and Restoration in the Middle Reach of the Skagit River	Skagit Watershed Council 2011
Application of the Skagit Watershed Council's Strategy, River Basin Analysis of the Skagit and Samish Basins: Tools for Salmon Habitat Restoration and Protection	Skagit Watershed Council 2000
Skagit Watershed Council	Skagit Watershed Council 2021
Salmon and Steelhead Habitat Limiting Factors; Water Resource Inventory Areas 3 and 4, the Skagit and Samish Basins	Smith 2003
Final report, population structure and genetic assignment of bull trout (<i>Salvelinus confluentus</i>) in the Skagit River Basin	Smith 2010
A Preliminary Biological Survey of the Skagit and Stillaguamish Rivers	Smith and Anderson 1921
Reach Level Analysis for the Middle Skagit River Assessment Report Prepared for The Skagit Watershed Council	Smith et al. 2011
Skagit River Basin Habitat Status and Trends for Freshwater Rearing Targets	SRSC 2018
Skagit River System Cooperative Document Database	SRSC 2021
Skagit Chinook Recovery Plan	SRSC and WDFW 2005
Size-Selective Mortality of Steelhead during Freshwater and Marine Life Stages Related to Freshwater Growth in the Skagit River, Washington	Thompson and Beauchamp 2014
Growth of juvenile steelhead <i>Oncorhynchus mykiss</i> under size-selective pressure limited by seasonal bioenergetic and environmental constraints	Thompson and Beauchamp 2016
Reconnaissance (1:20,000) fish and fish habitat inventory of the Skagit River Watershed	Triton 2008
Skagit River Flood Damage Reduction Feasibility Study Skagit River Basin Sediment Budget and Fluvial Geomorphology	USACE 2008
Skagit River Basin, Skagit River flood risk management feasibility study	USACE 2013
Lower Skagit River tributaries Temperature Total Maximum Daily Load Water Quality Improvement Report	WDE 2008
WDFW Data Hub	WDFW 2018
WDNR Lidar Portal	WDNR 2021a
WDNR Lidar Information	WDNR 2021b
Abundance, Survival, and Life History Strategies of Juvenile Chinook Salmon in the Skagit River	Zimmerman et al. 2015

2.4 Project Operations and Effects on Resources

The effects of Project operations become less discernible with distance from the Project due to geologic, geomorphic, hydrologic, and hydraulic factors. This is especially the case in the reach extending from the Sauk River confluence to the Skagit estuary. Significant changes in historical

geologic influences, river gradient, substrates, sinuosity, and floodplain character all contribute to the unique aspects of the lower Skagit River, not to mention the significant urban, rural and floodplain development that has occurred along the lower river. Meaningful quantification of the effects of Project operations on anadromous fish resources using this reach of river presents a serious scientific challenge.

The Skagit River watershed at its mouth covers an area of approximately 3,100 square miles (mi²) (USACE 2013). The watershed above Gorge Dam is approximately 1,160 mi². The Sauk River watershed drains an area of 730 mi². The influences of the approximately 2,000 mi² contributing watershed below the Project on the target anadromous fish species, due to size alone, is likely to be significant. The Sauk River is a large and unique watershed, as is the Baker River. The Sauk River enters the Skagit River at PRM 66.7 (USGS RM 66.6). The *individual* effects of the Sauk River and the upper Skagit River on anadromous fish resources in the lower river, delta, and estuary have not been rigorously studied. All watersheds are dynamic systems with numerous natural and anthropogenic inputs that can change the way a resource responds to a stressor; assigning an impact to an individual stressor is difficult in a large watershed. Given the large body of independent study that has already been completed on anadromous fish resources and the habitats they depend on in the lower Skagit River, it is essential to first undertake a synthesis and analysis of this body of available information to determine, to the extent allowed by the information, the conditions and factors most likely to affect anadromous fish use of the lower river, delta, and estuary. City Light and LPs have an interest in understanding the Project-related and watershed-based factors affecting the target anadromous fish resources. The findings of the Synthesis Study may reveal data gaps that, if addressed through additional study, could improve the understanding of effects, including Project-related effects, on anadromous fish resources or be used to identify measures that could improve their habitat in the lower river, delta, and estuary.

2.5 Study Area

The study area for the Synthesis Study is the Skagit River from the Sauk River confluence to the Skagit delta and estuary (Figure 2.5-1). The lower section of the river has several large tributaries below the Sauk River confluence (e.g., Baker River, Jackman Creek, Day Creek, Gilligan Creek, Loretta Creek, Hansen Creek, Wiseman Creek, Nookachamps Creek).

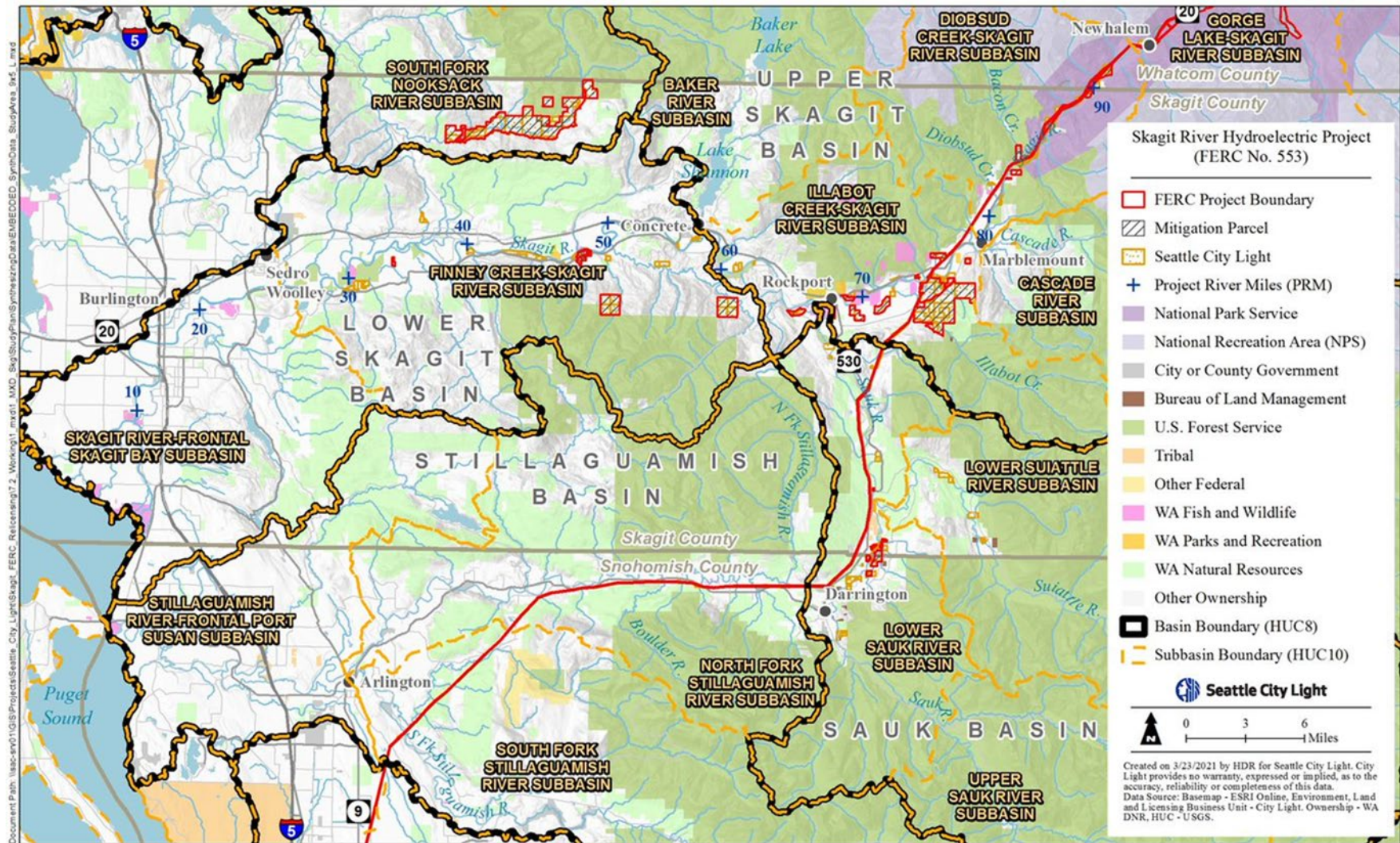


Figure 2.5-1. Overview of study area.

2.6 Methodology

Because of the large amount of information available from previously conducted studies, existing information concerning the study area will be gathered using steps to compile, synthesize, disseminate, analyze, and summarize findings using available information as outlined in the steps below.

Step 1: Data Compilation

Literature and data sources providing quantitative information on linkages between habitat conditions and biological responses of Skagit River anadromous fish resources will be identified and reviewed for relevancy, species-specific information, findings, uncertainties, and any recommended additional data needs. Sources would be prioritized using a process that assigns highest priority to data and scientific reports specific to the Skagit River and Skagit Delta and estuary. Salmonid life-history information for Skagit River salmonids would be developed, and, if needed, supplemented from other Puget Sound river systems. Seasonal life history by month of the year (i.e., adult upmigration, spawning, incubation, rearing, outmigration) would be developed for each target species (see example depicted on Figure 2.5-2). Temporal and geographic (i.e., reach) use by species will also be identified.

Step 2: Data Analysis

To the extent possible, linkages will be explored between species abundance/productivity and land and water uses, physical and ecological watershed processes, habitat conditions in the lower Skagit River and delta/estuary, hatchery operations, ocean conditions, and the effects of these factors on anadromous fish resources. Biological responses of steelhead and salmon species would be separated into factors potentially affecting reproduction, rearing and growth, movement, direct mortality (e.g., water quality, predation) and indirect mortality (e.g., disease and parasites). Major areas of biological uncertainty would be identified related to each of the species' life stages based on the findings and results of the available scientific studies and literature.

Step 3: Life Factors Affecting Target Species

Factors affecting survival from one-life stage to the next would be identified and discussed with LPs in an open forum where differing opinions would be sought out and welcomed, as this would aid in the identification of needed additional information. Physical and biological mechanisms affecting the target populations would be selected based on whether the mechanisms addressed were likely to be relevant and whether Skagit River basin-specific data provided a demonstrable linkage to the identified mechanisms. The Skagit River Project's potential for contributing to the key factors affecting anadromous fish resources in the reach extending from the Sauk River to the estuary will be identified. This analysis would be organized by life stage and include factors contributing to steelhead and salmon homing, straying, and timing of arrival at spawning grounds, spawning success, egg viability, fry and juvenile growth and smoltification, and potential examples of direct and indirect mortality of each life stage. An example of a possible result of the analysis for each species is shown in a table attached to this study plan.

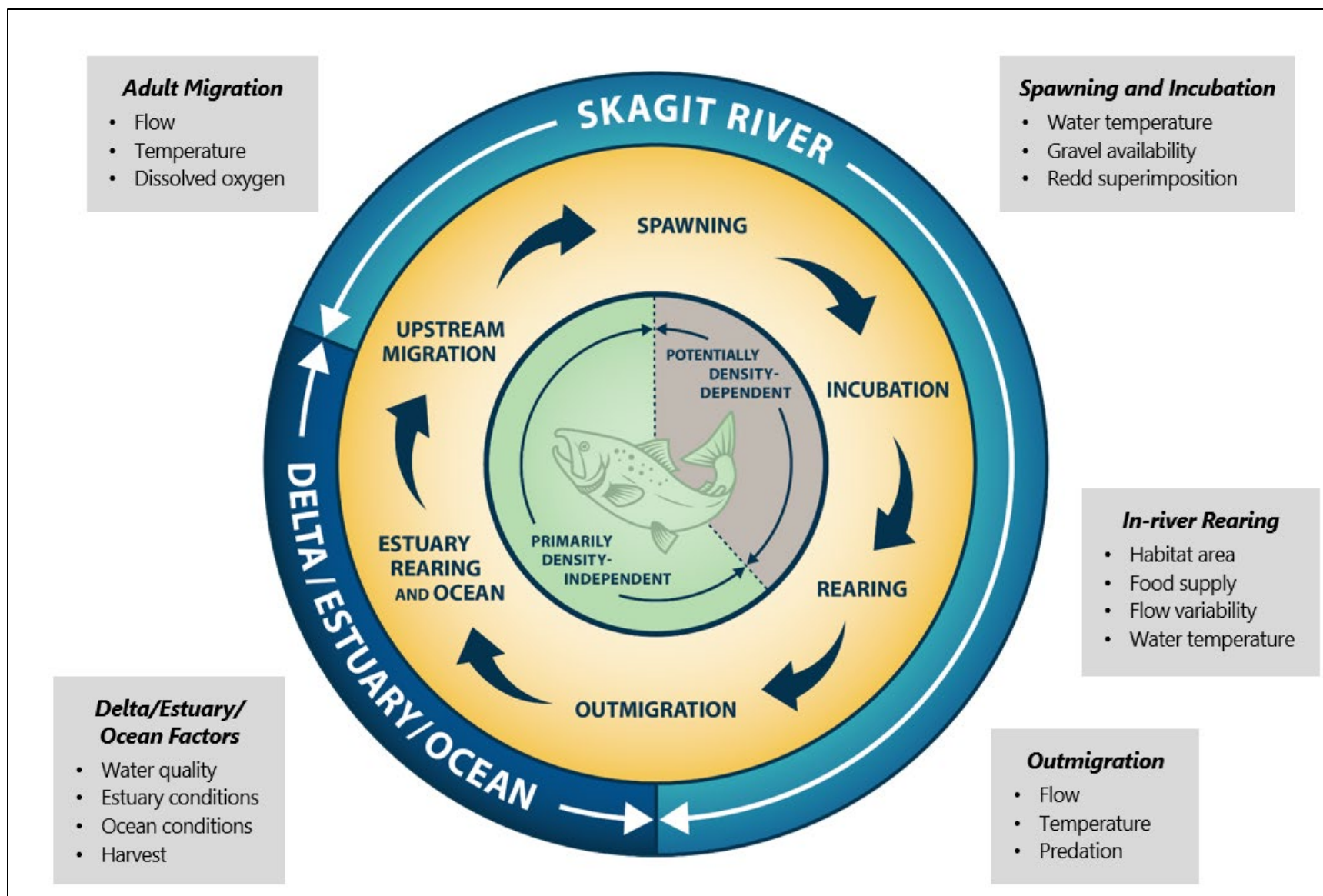


Figure 2.5-2. General depiction of Skagit River anadromous salmonid life cycle. The Synthesis Study will focus on key in-river, delta, and estuary life stages and habitat conditions.

In the event that no basin-specific information exists for a particular linkage/mechanism, professional judgment of LPs, prior population assessments, and findings from similar studies in the region could be used to construct mechanistic linkages between habitat conditions and salmonid population levels.

Step 4: Identification of Key Uncertainties

High priority areas of uncertainty would be identified and organized by species, seasonality and life-history stage, uncertainty regarding population-scale effects, and direct relevancy of source information. Recommendations for near-term and/or longer-term data collection activities to quantify the Project's effects would be developed. The information developed as part of this and other proposed studies regarding factors affecting specific life stages may lay the foundation for the future development of quantitative population models, if believed to be informative, once additional data are collected. The identification of key uncertainties may also be useful in the development of adaptive management programs to test hypotheses, protocols, and procedures as suggested in Bennett et al. (2016).

2.7 Study Execution

The Synthesis Study is a proposed new study not previously included in the PSP; therefore, LPs have not had the opportunity to provide input or comment. To maximize the value of the information developed, the Synthesis Study is proposed to be a collaborative effort. City Light proposes that the study be led by a team of experienced fisheries biologists as a Synthesis Study Group. City Light will provide a project manager, facilitation services, and fisheries biologists with Skagit River experience to author the Synthesis Study. Upon request from LPs, City Light will convene an Independent Review Panel to review and validate any findings and/or recommendations and reports produced by the Synthesis Study Group. When any work product is referred to the Independent Review Panel, differing or dissenting opinions on any findings of the Synthesis Study Group, may also be submitted to the Panel for consideration to ensure a robust exploration of the available data, analyses, and conclusions.

The Study Group will be organized in May/June 2021 and, upon LPs' request the Independent Review Panel could be formed in July/August. Regular progress meetings via conference call will be held monthly or bi-monthly led by the Synthesis Study Group. Additional research personnel would be provided by or retained by City Light, as needed. The Data Compilation efforts outlined under Step 1 above would begin in May 2021. The various literature citations provided in the PSP and in LPs' study requests will be the starting point for identification and compilation of relevant data.

2.8 Schedule and Integration with Ongoing Studies

The goal is to complete the Synthesis Study described above in the first year of the ILP study season extending from May 2021 through March 2022. The review and synthesis of existing information conducted in Year 1 will be used to identify any additional field data collection needs related to investigating the Project's effects on anadromous fish resources in the reach below the Sauk River for the 2022 field season.

The summary of findings of the Synthesis Study will be considered with the results of other relicensing studies being conducted in 2021-2022. The results of other studies may serve to address information needs identified by the Synthesis Study or simply supplement the findings of the Synthesis Study with detailed data and information applicable to the Project vicinity, Project effects, and the specific reaches included in the other relicensing studies.

Reviewing the results of the Synthesis Study and the suite of other relicensing studies will lead to a more comprehensive, watershed-based understanding of the key factors influencing the target anadromous fish resources, Project effects on resources, identification of areas of scientific and biological uncertainty, potential enhancement measures by species and life stage, and development of science-based adaptive management procedures to be included in City Light's license application. The integration of studies and development of paths forward will occur from April 2022 to December 2022.

A tentative schedule for this study is outlined below:

- May/June 2021 – Study organization meeting to review/add to potential literature to be addressed as part of the Synthesis Study
- June 2021 – February 2022 – Periodic conference call updates and coordination meetings, as needed
- September 2021 – Workshop to report progress and provide partial results/work in progress reviews
- January 2022 – Workshop to review in progress draft work products and discussion of potential data needs
- March 2022 – Initial Study Report
- April – December 2022 – Field data collection on data gaps and continued review/discussion of Synthesis Study and suite of other relicensing study program results
- March 2023 – Updated Study Report

2.9 Level of Effort and Cost

The initial estimate for implementation and reporting associated with this study is approximately \$450,000.

3.0 REFERENCES

- Barnaby Reach Project Documents. [Online] URL: <https://barnabystudy.wordpress.com/documents/>. Accessed March 22, 2021.
- Beamer, E., B. Hayman, and S. Hinton. 2005. Linking Watershed Conditions to Egg-to-Fry Survival of Skagit Chinook Salmon. Appendix B to Skagit River System Cooperative and Washington Department of Fish and Wildlife. Skagit River Chinook Recovery Plan.
- Beamer, E., Shannahan, J-P., Wolf, K., Lowery, E. and D. Pflug. Freshwater Habitat Rearing Preferences for Stream Type Juvenile Chinook Salmon (*Oncorhynchus tshawytscha*) And Steelhead (*O. mykiss*) In The Skagit River Basin: Phase 1 Study Report. [Online] URL: <http://skagitcoop.org/wp-content/uploads/Yearling-Phase-I-Final-12-4-10.pdf>
- Beechie, T. J. Stefankiv, O., Timpane-Padgham, B.L., Hall, J., Pess, G.R., Rowse, M.L., Liermann, M.C., Fresh, K.L., Ford, M.D. 2017. Monitoring Salmon Habitat Status and Trends in Puget Sound: Development of Sample Designs, Monitoring Metrics, and Sampling Protocols for Large River, Floodplain, Delta, and Nearshore Environments. National Oceanic and Atmospheric Administration technical memorandum NMFS-NWFSC 137. Washington, DC. [Online] URL: <https://repository.library.noaa.gov/view/noaa/14918>. Accessed March 5, 2021.
- Bodensteiner, L. 2020. Assessment of resident rainbow trout contribution to returning adult steelhead in the Skagit River, WA. Final Report to the Upper Skagit Indian Tribe. WWU Project #54130. Western Washington University, Bellingham, WA.
- Bennett, S., G. Pess, N. Bouwes, P. Roni, R. Bilby, S. Gallagher, J. Ruzicky, T. Buehrens, K. Krueger, W. Ehinger, J. Anderson, C. Jordan, B. Bowersox, and C. Greene. 2016. Progress and challenges of testing the effectiveness of stream restoration in the Pacific Northwest using intensively monitored watersheds. *Fisheries* 41: 92–103. Curran, C.A., Grossman, E.E., Mastin, M.C., and Huffman, R.L. 2016. Sediment load and distribution in the lower Skagit River, Skagit County, Washington: U.S. Geological Survey Scientific Investigations Report 2016–5106, 24 p. [Online] URL: <https://pubs.er.usgs.gov/publication/sir20165106>
- Burnett, K.W., Reeves, G.H., Miller, D.J., Clarke, S., Vance-Borland, K. and K. Christiansen. 2007. Distribution of Salmon-habitat Potential Relative to Landscape Characteristics and Implications for Conservation. *Ecological Applications*, v. 17:66-80.
- Davis, M.J., Chamberlin, J.W., Gardner, J.R., Connelly, K.A., Gamble, M.M., Beckman, B.R., and Beauchamp, D.A. 2020. Variable prey consumption leads to distinct regional differences in Chinook salmon growth during the early marine critical period. *Marine Ecology Progress Series*. V. 640: 147-169. April 20, 2020.
- Dragovich, Joe D.; McKay, Donald T., Jr.; Dethier, David P.; Beget, James E., 2000. Holocene Glacier Peak lahar deposits in the lower Skagit River Valley, Washington: *Washington Geology*, v. 28, no. 1/2, p. 19-21, 59.
- Envirosphere. 1988. Study of Skagit Dams Original Impacts on Wildlife and fish Habitats and Populations. Final report prepared for Seattle city Light by Envirosphere Company, Bellevue, Washington.

- Environmental Science Associates (ESA). 2017. Riparian Assessment. Prepared for the Skagit Watershed Council. December 2017.
- Gamble, M.M, Connelly, K.A., Gardner, J.R., Chamberin, J.W., Warheit, K.I., and Beauchamp, D.A. 2018. Size, Growth, and Size-Selective Mortality of Subyearling Chinook Salmon during Early Marine Residence in Puget Sound. *Transactions of the American Fisheries Society*. V. 147: 370-389.
- Greene, C., Beamer, E., and J. Anderson. 2016. Skagit River Estuary Intensively Monitored Watershed Annual Report. April 2016.
- Greene, C. and E. Beamer. 2011. Monitoring Population Responses to Estuary restoration by Skagit River Chinook Salmon. Intensively Monitored Watershed Project Annual Report.
- Grossman, E., Stevens, A.W., Dartnall, P., George, D.A., and D. Finlayson. 2020. Sediment Export and Impacts Associated with River Delta Channelization Compound Estuary Vulnerability to Sea-level Rise, Skagit River Delta, Washington, USA. *Marine Geology* v. 430.
- Hall, J.E., Greene, C.M., Stefankiv, O., Anderson, J.H., Timpane-Padgham, B., Beechie, T.J., and Pess, G.R. 2018. Large river habitat complexity and productivity of Puget Sound Chinook salmon. *PLoS One* 13(11): e0205127 [Online] URL: <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0205127>
- Hartson, R. and Shannahan, J. 2015. Inventory and Assessment of Hydromodified Bank Structures in the Skagit River Basin: Chinook Bearing Streams. Upper Skagit Indian Tribe, Sedro-Woolley, Washington.
- IMW Scientific Oversight Committee (IMW). 2006. Evaluating Watershed Response to Land Management and Restoration Actions: Intensively Monitored Watersheds (IMW) 2006 Progress Report. Submitted to Washington Salmon Recovery Funding Board, June 2006.
- Jaeger, K.L., C.A. Curran, S.W. Anderson, S.T. Morris, P.W. Moran, and K.A. Reams. 2017. Suspended Sediment, Turbidity, and Stream Water Temperature in the Sauk River Basin, Western Washington, Water Years 2012–16. U.S. Geological Survey Scientific Investigations Report 2017-5113, 47 p. <https://doi.org/10.3133/sir20175113>.
- Kassler, T.W. and K.I. Warheit. 2012. Genetic Stock Structure of Skagit River Basin Winter Steelhead. Washing Department of Fish and Wildlife. March 2012 Powerpoint Presentation [Online] URL: <https://www.slideserve.com/thu/genetic-stock-structure-of-skagit-river-basin-winter-steelhead>. Accessed March 22, 2021.
- Kendall, N., Ramirez, M., and Hamel, N. 2020. Puget Sound Chinook Salmon Vital Sign Reporting. Presentation. October 2020.
- Krall, M., C. Clark, P. Roni, and K. Ross. 2019. Lessons learned from Long-Term Effectiveness Monitoring of Instream Habitat Projects. *North American Journal of Fisheries Management* 39:1395-1411.
- Lawrence, S. 2008. Lower Skagit River Tributaries Temperature Total Maximum Daily Load Water Quality Improvement Report. Water Quality Program. Washington State Department of Ecology Northwest Regional Office Washington. Publication No. 08-10-020. July 2008.

- Lee, Se-Yeun, and A.F. Hamlet. 2011. Skagit River Basin Climate Science Report, a summary report prepared for Skagit County and the Envision Skagit Project by the Department of Civil and Environmental Engineering and The Climate Impacts Group at the University of Washington.
- Lowery, E.D., Thompson, J.N., Conor, E., Pflug, D., Donahue, B., and J. Shannahan. 2020. Seasonal distribution and habitat associations of salmonids with extended juvenile freshwater rearing in different precipitation zones of the Skagit River, WA. Online [URL]: <https://www.seattle.gov/light/skagit/docs/Skagit%20Stream-Type%20Juvenile%20Distribution%20and%20Habitat%20Use.pdf>. Accessed March 23, 2021.
- Lowery, E.D. and Beauchamp, D.A. 2015. Trophic Ontogeny of Fluvial bull Trout and Seasonal Predation on Pacific Salmon in a Riverine Food Web. Transactions of the American Fisheries Society. Vol 144:4, 724-741.
- Meridian Environmental, Inc. (Meridian). 2015. Water Temperature Conditioning Report reach 3 of the Sultan River Henry M. Jackson Hydroelectric Project FERC No. 2157. Prepared for Snohomish County Public utility District No. 1. October 2015.
- Morley, S.A., Garcia, P.S., Bennett, T.R. and P. Roni. 2005. Juvenile salmonid (*Oncorhynchus* spp.) use of constructed and natural side channels in Pacific Northwest rivers. Can. J. fish. Aquat. Sci. v. 62: 2811-2821.
- Natural Systems Design (NSD). 2017. Skagit River large Woody Debris assessment: connecting LWD to the 2005 Skagit Chinook Recovery Plan. Prepared for Skagit Watershed Council. November 13, 2017.
- National Marine Fisheries Service (NMFS). 2007. Puget Sound Salmon Recovery Plan, Volume 1: Plan Adopted by the National Marine Fisheries Service. Submitted by the Shared Strategy Development Committee. [Online] URL: <https://www.fisheries.noaa.gov/resource/document/recovery-plan-puget-sound-chinook-salmon>. Accessed March 5, 2021
- _____. 2019. ESA Recovery Plan for the Puget Sound Steelhead Distinct Population Segment (*Oncorhynchus mykiss*). National marine Fisheries Service. Seattle, WA.
- _____. 2021. Salmon Habitat Status and Trend Monitoring Program Data for Puget Sound. NOAA Fisheries. [Online] URL: <https://www.fisheries.noaa.gov/resource/map/salmon-habitat-status-and-trend-monitoring-program-data>. Accessed March 5, 2021.
- National Oceanic and Atmospheric Administration (NOAA). 2021. Salmon Habitat Status and Trend Monitoring Program Data for Puget Sound. Habitat data sets for habitat status and trend monitoring in Puget Sound and the Oregon Coast Coho Regions. [Online] URL: <https://www.fisheries.noaa.gov/resource/map/salmon-habitat-status-and-trend-monitoring-program-data>
- Paulson, K. 1997. Estimating Changes in Sediment Supply due to Forest Practices: A Sediment Budget Approach Applied to the Skagit River Basin in Northwestern Washington. Unpublished Master's Thesis, University of Washington, Seattle, Washington.

- Pflug, D. and L. Mobrand. 1989. Skagit River Salmon and Steelhead Fry Stranding Studies. Prepared by R.W. Beck Associates for the Seattle City Light Environmental Affairs Division, March 1989. Seattle, Washington. 300 pp.
- Pflug, D.E. Connor, B. Hayman, T., Kassler, K., Warheit, B. McMillan, and E. Beamer. 2013. Ecological, genetic, and productivity consequences of interactions between hatchery and natural origin steelhead of the Skagit Watershed. Report prepared for the Skagit River System Cooperative. Funding No. NMFS-FHQ-2008-2001011.
- Puget Sound Indian Tribes and Washington Department of Fish and Wildlife. 2017. Comprehensive Management Plan for Puget Sound Chinook: Harvest Management Component (Appendix A: Skagit River Management Unit Status Profile). December 1, 2017.
- Riedel, J., S. Sarrantonio, K. Ladig, and M. Larrabee, 2020. DRAFT Skagit River Geomorphology Inventory Report: Part I – Gorge Dam to Sauk River. Report prepared by the National Park Service for Seattle City Light. December 2020
- Rothleutner, A.D. 2017. Sediment Budget of the Middle Skagit River, Washington 1937-2015 Reveals Decadal Variations in Sediment Export and Storage. WWU Graduate School Collection. 624. [Online] URL: <https://cedar.wwu.edu/cgi/viewcontent.cgi?article=1641&context=wwuet>
- Rubin, S.P., Hayes, M.C. and E.E. Grossman. 2018. Juvenile Chinook Salmon and Forage Fish use of Eelgrass Habitats in a Diked and Channelized Puget Sound River Delta. Marine and Coastal fisheries: Dynamics, Management, and Ecosystem Science. Vol 10:435-451.
- Ruff, C. 2019. Retrospective Analysis of Skagit River Chum productivity. Presentation to the NCC October, 31 2019.
- Seattle City Light. 2006. Skagit Bull Trout Monitoring Program: 2002-2005 report. Report prepared for Seattle City Light. WDFW, La Conner, Washington.
- _____. 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. Historical Climate Trends. [Online] URL: <https://cig.uw.edu/resources/analysis-tools/seattle-city-light-trends/>. Accessed March 30, 2021.
- Skagit Climate Science Consortium. 2016. Northwest Science Special Issue. [Online] URL: <http://www.skagitclimatescience.org/research/2016-skagit-climate-science-consortium-northwest-science-special-issue/>. Access March 30, 2021.
- Skagit County. 2021. Skagit County LIDAR Information Page. [Online] URL: <https://www.skagitcounty.net/Departments/GIS/lidar.htm>. Accessed March 5, 2021.
- Skagit County Public Works. 2021. Skagit County Monitoring Program Annual Report database. [Online] URL: <https://www.skagitcounty.net/Departments/publicworkssurfacewatermanagement/wq.htm>. Accessed March 22, 2021.

- Skagit River System Cooperative (SRSC). 2018. Skagit River Basin Habitat Status & Trends for Freshwater Rearing Targets. [Online] URL: http://skagitcoop.org/wp-content/uploads/2017-Freshwater-Indicator-Report_Final_.pdf. Accessed March 5, 2021.
- _____. 2018. Skagit River Basin Habitat Status and Trends for Freshwater Rearing Targets. March 28, 2018. [Online] URL: http://skagitcoop.org/wp-content/uploads/2017-Freshwater-Indicator-Report_Final_.pdf. Accessed March 22, 2021.
- _____. 2021. Skagit River System Cooperative Documents. [Online]: URL: <http://skagitcoop.org/documents/>. Accessed March 5, 2021.
- Skagit River System Cooperative and Washington Department of Fish and Wildlife (SRSC and WDFW). 2005. Skagit Chinook Recovery Plan. [Online] URL: <https://www.skagitwatershed.org/wp-content/uploads/SkagitChinookRecoveryPlan13.pdf>. Accessed March 5, 2021.
- Skagit Watershed Council (SWC). 2011. Plan for Habitat Protection and Restoration in the Middle Reach of the Skagit River. July 13, 2011.
- _____. 2021. Skagit Watershed Resource Documents. [Online] URL: <https://www.skagitwatershed.org/resources/documents-archives/>. Accessed March 5, 2021.
- _____. 2000. Application of the Skagit Watershed Council's Strategy, River Basin Analysis of the Skagit and Samish Basins: Tools for Salmon Habitat Restoration and Protection. Prepared by the Habitat Restoration and Protection Committee of the Skagit Watershed Council.
- Smith, C.J. 2003. Salmon and Steelhead Habitat Limiting Factors; Water Resource Areas 3 and 4, the Skagit and Samish Basins. Washington State Conservation Commission, Lacey, Washington.
- Smith, M. 2010. Final report, population structure and genetic assignment of bull trout (*Salvelinus confluentus*) in the Skagit River Basin. December 2010. School of Aquatic and Fishery Sciences, University of Washington, Seattle, WA.
- Smith, E.V., and M.G. Anderson. 1921. A Preliminary Biological Survey of the Skagit and Stillaguamish Rivers. University of Washington.
- Smith, D., K. Ramsden, S. Hinton. 2011. Reach Level Analysis for the Middle Skagit River Assessment Report. Skagit River System Cooperative. Prepared for The Skagit Watershed Council. [Online] URL: http://skagitcoop.org/wp-content/uploads/MiddleSkagit_Reach_Analysis_Final_Report_and_Appendices_.pdf. Accessed March 5, 2021.
- Thompson, J.N. and Beauchamp, D.A. 2014. Size-Selective Mortality of Steelhead during Freshwater and marine Life Stages Related to Freshwater Growth in the Skagit River, Washington. Transactions of the American Fisheries Society. Vol 143:4, 910-925.
- Thompson, J.N. and Beauchamp, D.A. 2016. Growth of juvenile steelhead *Oncorhynchus mykiss* under size-selective pressure limited by seasonal bioenergetic and environmental constraints. Journal of Fish Biology. Vol. 89: 1720-1739.
- Triton. 2008. Reconnaissance (1:20,000) fish and fish habitat inventory of the Skagit River watershed, watershed code: 970-110000, dated March 2008. Prepared by Triton

- Environmental Consulting Ltd., Vancouver, British Columbia Canada, prepared for Ministry of Environment, Lower Mainland Region, Surrey, British Columbia, Canada.
- U.S. Army Corp of Engineers (USACE). 2008. Skagit River Flood Damage Reduction Feasibility Study Skagit River Basin Sediment Budget and Fluvial Geomorphology. Report prepared by the USACOE Seattle District. June 2008.
- _____. 2013. Skagit River Basin, Skagit River Flood Risk Management Feasibility Study. Final Report. Hydrology Technical Documentation. August 2013.
- Washington Department of Ecology (WDE). 2008. Lower Skagit River Tributaries Temperature Total Maximum Daily Load Water Quality Improvement Report. Water Quality Program, Publication No. 08-10-020. Bellevue, WA.
- Washington Department of Fish and Wildlife (WDFW). 2018. Salmon Data Hub. Governor's Salmon Recovery Office. [Online] URL: <https://salmon-wa-rco.opendata.arcgis.com/>. Accessed March 5, 2021.
- Washington State Department of Natural Resources (WDNR). 2021a. Washington Lidar Portal. Division of Geology and Earth Science. [Online] URL: <https://lidarportal.dnr.wa.gov/>. Accessed March 5, 2021.
- _____. 2021b. Lidar. [Online] URL: <https://www.dnr.wa.gov/lidar>. Accessed March 5, 2021.
- Zimmerman, M.S., Kinsel, E. Beamer, E.J. Connor, and D.E. Pflug. 2015. Abundance Survival and Life History Strategies of Juvenile Chinook Salmon in the Skagit River, Washington. Transactions of the American Fisheries Society, vol 144:3, 627-641.

**SYNTHESIS AND INTEGRATION OF AVAILABLE INFORMATION ON
RESOURCES IN THE LOWER SKAGIT RIVER
REVISED STUDY PLAN**

ATTACHMENT A

**EXAMPLE SUMMARY OF FACTORS POTENTIALLY AFFECTING
LOWER SKAGIT RIVER ANADROMOUS FISH RESOURCES**

Table 1. Example table of summary of factors potentially affecting lower Skagit River anadromous fish resources.

Life Stage	Process/Mechanism	Initial Assessment of Relative Importance	Lower Skagit River	Skagit Delta or Estuary	General	Notes/Primary Citations
Upmigration	<i>Factors Contributing to Chinook salmon Homing, Straying and Timing of Arrival at Spawning Grounds</i>					
	Flow effects					
	Water quality					
	Water temperature					
	Straying of hatchery-origin salmon					
	<i>Factors Contributing to Direct Mortality of In-river Upmigrant Adults</i>					
	Water quality					
	Water temperature					
	<i>Factors Contributing to Indirect Mortality of Upmigrant Adults</i>					
	Disease and parasites					

Life Stage	Process/Mechanism	Initial Assessment of Relative Importance	Lower Skagit River	Skagit Delta or Estuary	General	Notes/Primary Citations
Spawning	<i>Factors Contributing to Chinook Salmon Spawning Success</i>					
	Habitat availability					
	Gravel quality					
	Hydraulic conditions					
	Water temperature					
	Straying of hatchery origin salmon					
	<i>Factors Contributing to Direct Mortality of Pre-Spawning Chinook Salmon Adults</i>					
	Water temperature					
	<i>Factors Contributing to Indirect Mortality of Pre-Spawning Chinook Salmon Adults</i>					
	Disease and parasites					

Life Stage	Process/Mechanism	Initial Assessment of Relative Importance	Lower Skagit River	Skagit Delta or Estuary	General	Notes/Primary Citations
Egg Incubation through Fry Emergence	<i>Factors Contributing to Egg/Alevin Growth and Fry Emergence of Chinook Salmon</i>					
	Water temperature					
	Water quality					
	<i>Factors Contributing to Direct Mortality of Chinook Salmon Eggs/Alevins</i>					
	Antecedent water temperature					
	Intragravel water temperature					
	Intragravel water quality					
	Redd superimposition					
	Straying of hatchery origin salmon					
	Redd scour					
	Redd dewatering					
	Entombment					
	<i>Factors Contributing to Indirect Mortality of Chinook Salmon Eggs/Alevins</i>					
	Bacterial and fungal infections					

Life Stage	Process/Mechanism	Initial Assessment of Relative Importance	Lower Skagit River	Skagit Delta or Estuary	General	Notes/Primary Citations
Rearing / Outmigration	<i>Factors Contributing to Juvenile Growth and Smoltification of Chinook Salmon</i>					
	Habitat availability					
	Water temperature					
	Food availability					
	<i>Factors Contributing to Direct Mortality of Juvenile Chinook Salmon</i>					
	Water temperature					
	Predation					
	Habitat availability for predators					
	Flow and water temperature effects on predation					
	Water quality effects on predation					
	Stranding and entrapment					
	Entrainment					
	<i>Factors Contributing to Indirect Mortality of Juvenile Chinook Salmon</i>					
	Disease and parasites					

Life Stage	Process/Mechanism	Initial Assessment of Relative Importance	Lower Skagit River	Skagit Delta or Estuary	General	Notes/Primary Citations
Delta Rearing / Outmigration	Factors Contributing to Juvenile Growth and Smoltification					
	Habitat availability					
	Water temperature					
	Food availability					
	Factors Contributing to Direct Mortality of Juvenile Chinook Salmon					
	Water temperature					
	Predation					
	Habitat availability for predators					
	Water temperature effects on predation					
	Entrainment					
	Water quality					
	Factors Contributing to Indirect Mortality of Juvenile Chinook Salmon					
	Disease and parasites					

**TR-01 VEGETATION MAPPING
REVISED STUDY PLAN**

**SKAGIT RIVER HYDROELECTRIC PROJECT
FERC NO. 553**

Seattle City Light

**April 2021
RSP**

TABLE OF CONTENTS

Section No.	Description	Page No.
1.0	Introduction.....	1-1
1.1	General Description of the Project.....	1-1
1.2	Relicensing Process	1-1
1.3	Study Plan Development.....	1-2
2.0	Study Plan Elements	2-1
2.1	Study Goals and Objectives	2-1
2.2	Resource Management Goals	2-1
2.3	Background and Existing Information.....	2-2
2.4	Study Area	2-3
2.5	Methodology	2-5
2.5.1	Compile and Review Existing Information	2-5
2.5.2	Validate Field and Remote Sensing Methods.....	2-5
2.5.3	Pre-process Geospatial Resources (Imagery, LiDAR, etc.).....	2-5
2.5.4	Assess NPS Vegetation Mapping and Classification.....	2-5
2.5.5	Apply Field and Remote Sensing Methodology	2-5
2.5.6	Input Datasets.....	2-6
2.5.7	Preliminary Model	2-6
2.5.8	Collection of Model Training and Verification Data.....	2-7
2.5.9	Develop Draft and Final Vegetation Map.....	2-7
2.5.10	Accuracy Assessment	2-9
2.6	Consistency with Generally Accepted Scientific Practice.....	2-9
2.7	Schedule.....	2-9
2.8	Level of Effort and Cost	2-9
3.0	References	3-1

List of Figures

Figure No.	Description	Page No.
Figure 2.4-1.	Location map of the Skagit River Project.....	2-4

List of Attachments

Attachment A	City Light Responses to LP Comments on Study Plan Prior to PSP
--------------	--

List of Acronyms and Abbreviations

City Light.....	Seattle City Light
ELC.....	Environmental Learning Center
FERC.....	Federal Energy Regulatory Commission
GIS	geographic information system
LiDAR.....	Light Detection and Ranging
LP	licensing participant
NCNP	North Cascades National Park
NPS	National Park Service
NVC	National Vegetation Classification
OBIA.....	Object-based Image Analysis
PAD.....	Pre-Application Document
PHS	Priority Habitat and Species
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
RWG	Resource Work Group
SGCN.....	Species of Greatest Conservation Needs
SRSC.....	Skagit River System Cooperative
SSIT	Sauk-Suiattle Indian Tribe
STI.....	Stillaguamish Tribe of Indians
SWAP	State Wildlife Action Plan
TRREWG.....	Terrestrial Resources and Reservoir Erosion Work Group
U.S.C.....	United States Code
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WDFW	Washington Department of Fish and Wildlife

This page intentionally left blank.

1.0 INTRODUCTION

1.1 General Description of the Project

The Skagit River Hydroelectric Project (Project), licensed to The City of Seattle, Washington, and operated through its publicly-owned electric power utility Seattle City Light (City Light), is located in northern Washington State and consists of three power generating developments on the Skagit River – Ross, Diablo, and Gorge – and associated lands and facilities. The Project generating facilities are in the Cascade Mountains of the upper Skagit River watershed, between Project River Miles (PRM) 94.7 and 127.9 (U.S. Geological Survey [USGS] RMs 94.2 and 127).¹ Power from the Project is transmitted via two 230-kilovolt 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, an Environmental Learning Center (ELC), several recreation facilities, and several parcels of fish and wildlife mitigation lands.

Project generating facilities are all located in Whatcom County, although Ross Lake, the most upstream reservoir, crosses the U.S.-Canada border and extends for about one mile into British Columbia at normal maximum water surface elevation. Gorge Powerhouse, the most downstream facility, is approximately 120 miles northeast of Seattle and 60 miles east of Sedro-Woolley, the nearest large town. The closest town is Newhalem, which is part of the Project and just downstream of Gorge Powerhouse. The primary transmission lines cross Whatcom, Skagit, and Snohomish counties; the fish and wildlife mitigation lands are in the same counties.

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, Diablo, and Gorge lakes.” The legislation maintains the Federal Energy Regulatory Commission’s (FERC) 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).

1.2 Relicensing Process

The current FERC license for the Project expires on April 30, 2025, and City Light will apply for a new license no later than April 30, 2023. City Light formally initiated the relicensing process by filing a Notice of Intent and Pre-Application Document (PAD) with FERC on April 27, 2020 (City Light 2020a). The PAD includes descriptions of the Project facilities, operations, license

¹ 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 Project River Mile (PRM) system are provided throughout this document. For further details see Section 7.0 of the main body RSP.

requirements, and Project lands as well as a summary of the extensive existing information available on Project area resources and early consultation on potential resource issues to be addressed during the relicensing. The PAD also includes an outline of the goals and objectives of this study.

In 2019-2020, City Light convened a series of Resource Work Groups (RWG) to engage agencies and other licensing participants (LP) in the Study Plan Development Process. Discussions with LPs continued in early 2021 with a series of topic-based discussions following filing of the Proposed Study Plan (PSP) on December 8, 2020 (City Light 2020b). This study plan reflects RWG and LP discussion and study requests and comments submitted by LPs.

1.3 Study Plan Development

A baseline characterization of vegetation resources within the Project Boundary and vicinity was identified as an early study need during 2019 discussions with the Terrestrial Resources and Reservoir Erosion Work Group (TRREWG).

On October 10, 2019, City Light released the TR-01 Vegetation Mapping Draft Study Plan for LP review and comment. On October 15, 2019, the draft study plan was discussed at a TRREWG meeting. City Light reviewed all comments received and released a revised version of the draft study plan on March 3, 2020. The revised draft was discussed on March 17, 2020 at a TRREWG meeting. City Light reviewed additional comments received and released a second revised version of the draft study plan on March 31, 2020. Written comments were received from Washington Department of Fish and Wildlife (WDFW), NPS, Skagit River Systems Cooperative, Upper Skagit Indian Tribe, and U.S. Forest Service (USFS) and responded to in an attachment to this study plan. A Status Draft of the study plan was provided to LPs on August 6, 2020.

City Light is filing this study plan with FERC as part of its Revised Study Plan (RSP), an update to the version that was filed with the PSP and incorporating additional consultation with LPs prior to the filing date. No formal study requests related to this study were filed with FERC. However, this study will provide information requested as part of the following study requests: SSIT-03 Impacts of Transmission Line Right of Way (ROW) on Aquatic Habitat and Riparian Zone for the Skagit River Hydroelectric Project, STI-06 Spotted Owl Habitat Map, and USFWS-19 Impact of the Operations of Skagit Hydroelectric Project (#553) on Northern Spotted Owl, as explained in Section 6 of the RSP.

PSP comments to this study plan were submitted by Stillaguamish Tribe of Indians, Upper Skagit Indian Tribe, and USFWS. City Light has addressed the specific comments and suggested edits in this study plan and responded to comments in the PSP comment/response table appended to the main body of the RSP. Modifications were made to the study plan in response to comments and include revising objectives to include relevance of study results to fish and aquatic resources and clarifying field surveys prioritization based on accessible transitional habitats.

2.0 STUDY PLAN ELEMENTS

2.1 Study Goals and Objectives

The goal of the Vegetation Mapping Study is to develop a complete and systematic vegetation mapping geographic information system (GIS) database to describe existing conditions, assess potential Project-related habitat effects, and inform development of terrestrial resource management plans and, as needed, protection, mitigation and enhancement measures. Specific objectives of this study are as follows:

- Compile existing data and use remote sensing to describe and map vegetation to the “Group” level within the study area using the National Vegetation Classification (NVC) Standard.² The Group level is defined as a combination of relatively narrow sets of diagnostic plant species (including dominants and co-dominants), with broadly similar composition and diagnostic growth forms reflecting biogeographic differences in mesoclimate, geology, substrates, hydrology, and disturbance regimes. For highly modified areas such as the transmission line, a custom set of cover types will be used during mapping based on field observations and aerial photograph interpretation.
- Prioritize field surveys, including model verification surveys, to accessible areas of transitional habitats (e.g., riparian areas and areas of Group transitions).
- Describe baseline vegetation resources and environmental conditions within the study area.
- Provide information on wetland communities within the study area (see Wetland Assessment Study).
- To the extent possible, provide information for assessing fish and wildlife habitat (e.g., salmonids, marbled murrelet, golden eagle, northern goshawk, beaver, and select Priority Habitat and Species [PHS] wildlife [<https://wdfw.wa.gov/species-habitats/at-risk/phs/list>] and WDFW Species of Greatest Conservation Needs [SGCN]) within the study area [<https://wdfw.wa.gov/species-habitats/at-risk/swap>]), as well as species of concern for NPS.
- To the extent possible, provide information for assessing important tribal resources including forage for important wildlife and culturally important plants (information will be considered confidential and not included in materials distributed to general public).

2.2 Resource Management Goals

City Light’s goal is to compile and update existing information to provide a comprehensive vegetation type database to describe existing conditions, inform analysis of potential effects of Project operations and maintenance on vegetation and wildlife, and to inform natural resource management actions in the study area.

The study will provide information for resource agencies and Indian tribes with jurisdiction in the Project vicinity to address their respective goals and objectives for resource management.

² For more information on the NVC Standard and categories including definitions for Group, Association, and Alliance levels, see: <http://usnvc.org/data-standard/natural-vegetation-classification/>.

Management goals related to vegetation are described below.

- Ross Lake National Recreation Area General Management Plan and Environmental Impact Statement – Published by the NPS in 2012. The General Management Plan states that a Vegetation Management Plan will be developed to guide the vegetation management program. The Vegetation Management Plan will have priorities for restoration based on threats to high-quality habitats.
- U.S. Forest Service Mt. Baker-Snoqualmie National Forest Land and Resource Management Plan – Published by the U.S. Forest Service in June 1990. The Land and Resource Management Plan was developed to guide resource management and establish standards for the management of resources, including vegetation, throughout the Mt. Baker-Snoqualmie National Forest.

2.3 Background and Existing Information

NPS, in partnership with the Washington Natural Heritage Program and the Institute for Natural Resources (based at Portland State University), is in the final stage of developing a vegetation map at the Association level for the North Cascades National Park (NCNP) using the NVC Standards. The Association level is a more refined unit below the Group level that classifies vegetation based on a characteristic range of species composition, with diagnostic species occurrence, habitat conditions, and physiognomy reflecting topo-edaphic conditions, climate, substrates, hydrology, and disturbance regimes. This is part of an eight-year-long effort to map the three National Parks in Washington State – NCNP, Mt. Rainier National Park, and Olympic National Park. City Light will use mapping provided by NPS by the end of 2019 to cover the NPS portion of the study area. With this vegetation mapping effort, the target is an overall accuracy of 80 percent.

City Light owns approximately 10,800 acres of land in scattered tracts within the Sauk, Skagit, and South Fork Nooksack basins that have been acquired for wildlife and fish mitigation under the current Project license. These lands, known as the fish and wildlife mitigation lands, were purchased in accordance with the Wildlife Settlement Agreement and Fisheries Settlement Agreement. City Light has mapped vegetation cover types of most of these lands but has used a different vegetation classification scheme than the NPS. The transmission line right-of-way (ROW) within the Project Boundary has not been mapped, except for the portion that is within the RLNRA or that cross fish and wildlife mitigation lands.

In this study, the NPS vegetation mapping (Group level) results for the NPS areas will be adopted within the study area. The existing Alliance-level mapping completed by the NPS will be retained and would be available. The NPS detailed field vegetation plots database will be leveraged along with a limited number of additional training plots and remote sensing methods to map vegetation at the Group level for all other vegetated areas in the study area. Vegetation mapping at the Group level was chosen because it provides the appropriate level of floristic detail and composition when combined with structural data from Light Detection and Ranging (LiDAR) to assess wildlife issues and inform vegetation management planning efforts. The Group level focuses on the dominant overstory species and does not include understory species. As needed for effect assessment and management planning, specific sites may be further refined to Alliance or finer levels. Along the transmission line and other highly altered vegetation types, field surveys and traditional air-photo interpretation techniques will be used to map areas using custom cover types.

Existing resources include the following:

- Vegetation Classification of Mount Rainier, North Cascades, and Olympic National Parks. NRTR – NPS/NCCN/NRTR – 2009/211.
 - Mapping of vegetation cover types surrounding Project reservoirs for the 1995 FERC relicensing.
 - The EcoVeg approach in the Americas: U.S., Canadian, and International Vegetation Classifications. Faber-Langendoen, et al. Phytocoenologia. December 2017.
 - Skagit Mitigation Lands Management Plan. Seattle City Light. 2006.
 - Skagit Watershed Council Riparian Assessment. ESA. 2017.
 - Skagit Watershed Council Reach Level Analysis – Middle Skagit River. Skagit River System Cooperative. 2011.
- Washington Department of Fish and Wildlife High Resolution Land Cover Mapping. https://wdfw.wa.gov/conservation/research/projects/aerial_imagery/.
- Mapping Riparian Land Use within Agricultural Zones. A case study in Skagit County. Whitefield, E. 2010. <https://www.skagitcounty.net/SalmonStrategy/Documents/White%20Paper%20v23%20booklet-style.pdf>.
 - Seattle City Light Skagit River LiDAR – 2018.
 - USGS Western Washington 3DEP LiDAR. 2016/2017. <http://lidarportal.dnr.wa.gov/>.
 - High Spatial Res: 2018 4”/6” Pictometry, 1m 4band NAIP (normalized difference vegetation index).
 - Spectral/Temporal: Sentinel 2 – 12-bands (10m, 20m), coverage every 5 days.
 - National Park Service – SRI Soil Survey (SSURGO) for North Cascades National Park Complex. https://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/washington/NorthCascadesWA2012/NOCA_WA.pdf.
 - Conservation Biology Institute forest age mapping <https://databasin.org/galleries/90e11cbab3724db2aa801e67643d9151#expand=13863>.

2.4 Study Area

The study area will consist of land within the Project Boundary, the area within 0.5 mile of the Project Boundary, and the channel migration zone from Gorge Powerhouse to the confluence of the Sauk and Skagit Rivers. A location map of the Project Boundary and fish and wildlife mitigation lands is shown in Figure 2.4-1.

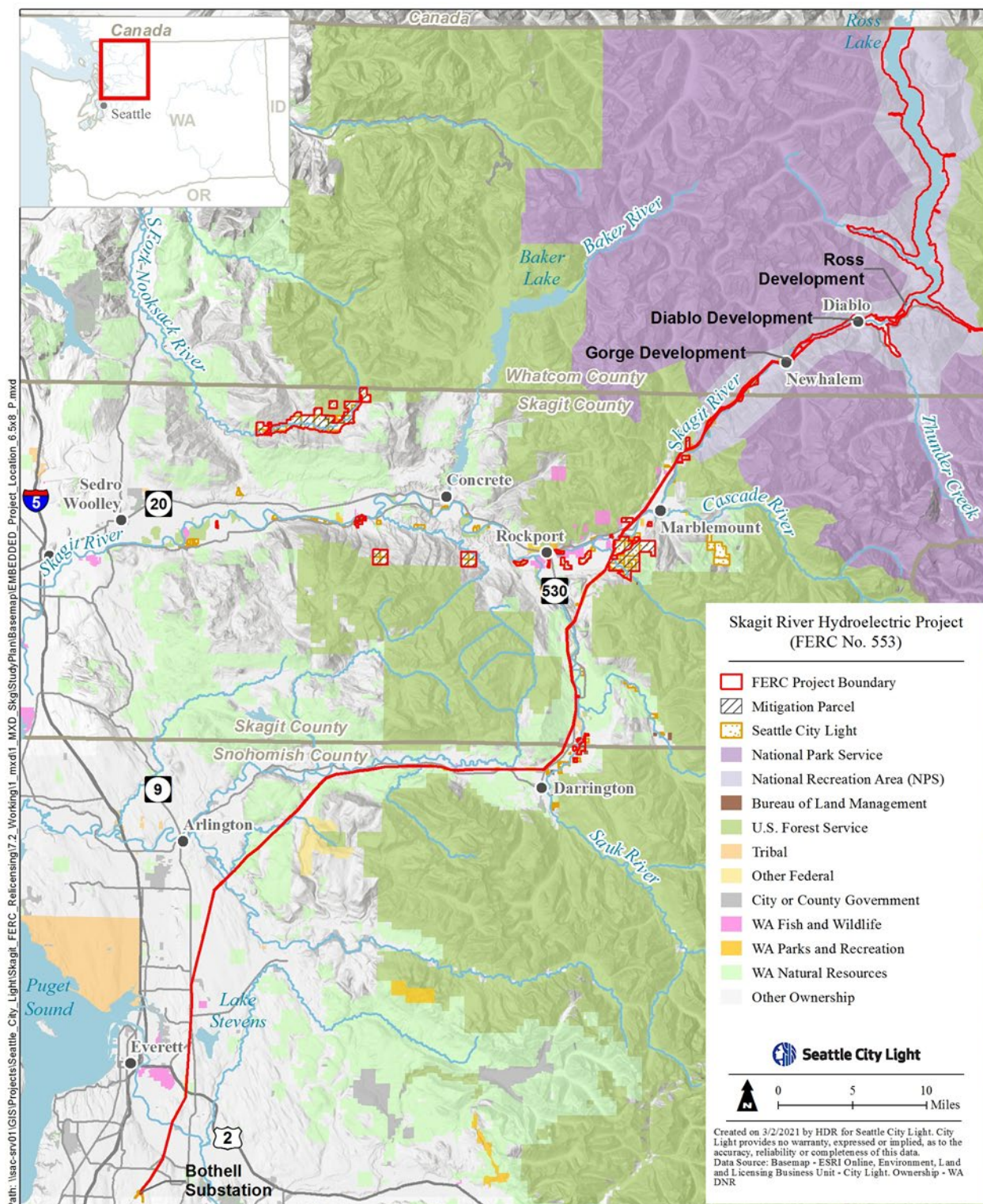


Figure 2.4-1. Location map of the Skagit River Project.

2.5 Methodology

2.5.1 Compile and Review Existing Information

City Light will work with the TRREWG to compile and summarize existing information including reports, documents, existing geospatial data, and similar studies relevant to the study area (see above existing resources list).

2.5.2 Validate Field and Remote Sensing Methods

The NPS has developed and applied a set of methods for their vegetation mapping inventory for NCNP based on a hierarchical classification of vegetation using the NVC Standard system. This approach uses a combination of random forest modeling and Object-based Image Analysis (OBIA) techniques. Random forest modeling is the most commonly used non-parametric classification method, which allows for the use of multiple, correlated input variables that are not normally distributed. Random forest is an ensemble, decision tree method, which uses a different random subset of training data (bootstrap) to build a multitude of decision trees and uses the mode of all decision trees to classify objects (Breiman 2001).

OBIA is a remote sensing technique used to identify patterns in raster imagery. For high-resolution mapping (<1 meter), OBIA improves classification accuracy, especially when the objects being resolved are larger than the pixel resolution of the imagery used (Blaschke et al. 2014). For efficiency purposes, the completed field and map products from NPS will be used as a basis, and the NPS field and remote sensing (random forest modeling and OBIA) framework will be applied to complete mapping vegetation in the study area outside of NCNP. The TRREWG will be informed of this approach, and intermediate products (maps, data summaries) will be shared as the study progresses.

2.5.3 Pre-process Geospatial Resources (Imagery, LiDAR, etc.)

Input and ancillary datasets will be compiled and pre-processed for incorporation into the analysis. Pre-processing includes re-projecting datasets into a common geographic projection and clipping data to the study extent.

2.5.4 Assess NPS Vegetation Mapping and Classification

The NPS vegetation mapping and classification output will be integrated into the final mapping product. In order to align results with the NPS classification, the NPS results will first be clipped to the study extent. Secondly, the NPS classification results mapped at the Group level will be spot checked based on limited field verifications and focus on areas where there is the greatest potential for Project effects (e.g., reservoir fluctuation zone and adjacent to Project facilities, buildings, and infrastructure).

2.5.5 Apply Field and Remote Sensing Methodology

A Group level vegetation map will be created based on a random forest model using multiple sources of remotely sensed (i.e., imagery, LiDAR-derived datasets) and ancillary (e.g., soils data) input variables identified as a first step in this analysis. A preliminary classification map will be produced for the portion of the study area not covered by NPS to interpret the initial model results, help identify areas to review in the field to inform the model, and to assist with field data collection

efforts. The classification will be refined and the classification accuracy will be validated using the collected field data.

2.5.6 Input Datasets

As stated above, any existing datasets that could be used in the random forest model will first be compiled and reviewed. The following input datasets will be tested for the preliminary model:

- Imagery
- High-resolution aerial imagery
- Sentinel-2 satellite imagery
- Landsat satellite imagery
- LiDAR-derived datasets
- Digital terrain model
- Canopy height model
- Slope index
- Topographic wetness index
- Topographic indices (plan curvature, grad curvature, profile curvature)
- Ancillary datasets
- Geology
- Soils

In addition, the potential of other LiDAR-derived vegetation metrics will be evaluated such as canopy bulk density, sub-canopy metrics (i.e., number of LiDAR points at different height stratifications), and rumple (i.e., canopy complexity). Only input variables that show model significance will be used for the preliminary random forest model that is run over the part of the study area not covered by NPS.

2.5.7 Preliminary Model

As a first step, a preliminary random forest model will be developed using training data taken from the NPS classification that falls within the study extent and run the model across the study area. The training data will be maximized by using existing data from as many of the NPS vegetation plots within proximity of the study area as possible.

This preliminary modeling effort will serve two purposes. First, it will provide an early look at the random forest model, which will help to identify which remote sensing data inputs are the most significant in the vegetation classification and if additional datasets are needed. Second, the preliminary classification can be used to stratify sampling for the field data collection effort. Outside of the NPS-mapped area, field assessment will prioritize areas with the greatest mapping uncertainty and representative sampling of Groups. Some field assessment will occur within the areas already mapped by NPS focusing on areas where there are obvious errors such as along transmission line ROWs or near towns. Preliminary maps will be output in raster format with each

pixel containing information on probability of vegetation group class membership. The pixel will be classified by the class with the highest probability of class membership. The prediction error output and input variable performance will be used, and two metrics will be provided through the Random Forest package in R (Liaw and Wiener 2002), to assess overall model performance and the significance of each of the input variables. In addition, the accuracy of the preliminary classification will be assessed using field data points collected by the NPS in NCNP.

2.5.8 Collection of Model Training and Verification Data

A stratified sampling approach will be used to collect vegetation information at representative sites not well covered by NPS data. These data will be used to develop an initial training and validation dataset to verify areas within the potential effects overlay and where model interpretation is less certain. Stratification will be based on a combination of vegetation mapping units and a combination of topography, soils, and other key components.

In order to increase efficiency in field data collection, the training and validation dataset will be refined by constraining the sampling sites to areas that are both safe and easily accessible to field ecologists. Areas with a steep slope, non-easement private property, and areas greater than a half-mile from a road will not be sampled for safety and field efficiency. The training dataset will be supplemented with opportunistic sampling by collecting additional data points for every group class encountered during travel to a sample point. These points can help boost the number of training data points needed for the random forest model. A proportion of sample points will be reserved for validation of the model to assess the accuracy of the classification. Accuracy assessment methods are described below. Validation data points will not include opportunistic collection of data. Resource leads will coordinate and will determine what data should be collected opportunistically during a specific study that would help inform another study's sampling scheme.

While not required for mapping at the Group level, additional vegetation data will be collected during field verification efforts to supplement the mapping effort at certain locations. These metrics include the following:

- Cover estimates of co-dominants of each strata – tree, shrub, and groundcover.
- Diameter-at-breast-height for co-dominant trees.
- List of common species of each strata.
- Incidental observations of special features such as high snag density, beaver activity, wildlife sightings, and associated items.

During fieldwork, biologists will document plant species that Indian tribes or First Nations listed as culturally-important for the relicensing studies.

2.5.9 Develop Draft and Final Vegetation Map

An OBIA approach will be used for a draft and final model instead of a pixel-based approach as was used in the preliminary modeling effort. While OBIA can produce more accurate results than pixel-based approaches, it is more computationally intensive. Therefore, only OBIA will be run for the final modeling effort. Object statistics (e.g., mean, min, max elevation) will be calculated, which is unique to OBIA, and will be integrated into the final random forest model.

The preliminary random forest model will be refined by using the training data collected within the study area and selecting the input variables that have the highest overall model importance. While random forest models can handle highly correlated input datasets, reducing the number of input variables will improve computing performance. Input variables will be checked for multi-collinearity and any datasets with a correlation greater than 0.8 will be removed.

Running filters will be evaluated on the final habitat classification to remove patches below a minimum mapping unit of 5 square meters. This is commonly done to remove the “popcorn” effect that can make maps illegible. In addition, manual refinements will be applied using very high spatial resolution imagery to address clear visual errors.

OBIA segmentation and calculation of object statistics will occur using Orpheo toolbox as part of QGIS. Random forest modeling will occur in R using the statistical package randomForest (Liaw and Wiener 2002). Post-processing, clean-up, and final map products including FGDC-compliant metadata will be done using ESRI ArcGIS desktop software.

The townsites and transmission line right-of-way are heavily altered habitats that require a modified mapping approach. Similarly, vegetation types likely modified through modern agriculture and traditional ecological management practices may not fit into natural vegetation categories. As such, separate cultural classifications will be developed for these areas because these vegetation communities are not included in typical vegetation classifications. Aerial photography will aid in determining the classifications of these sites and LiDAR will inform vegetation height determination on the transmission line ROW. Field verification will be conducted in the townsites and along the transmission line at representative sites where vegetation management occurs.

Specific study products include:

- GIS-based map of vegetation at group or cultural group level within the study area. Acreage of each type will be summarized by geographic areas of the study area (e.g., within the RLNRA, along the Skagit River, etc.). The database will include information on dominant plant species composition and field- and LiDAR-derived structural data (e.g. tree size and canopy closure, riparian/wetland deciduous tree and shrub cover, etc.) that will inform assessment of wildlife habitat for marbled murrelet, golden eagle, northern goshawk, and beaver studies, and the large woody debris component of the geomorphology study.
- A description of vegetation resources and environmental conditions within the study area.
- Cross-walk table that translates mapped vegetation groups (alliances in area covered by NPS mapping) to PHS habitats and State Wildlife Action Plan (SWAP) habitats and separate GIS layer of obvious snag-rich areas in the study area.
- Initial data on wetland communities to inform the Wetland Assessment Study.

Draft and final maps will be reviewed by the TRREWG and manual refinements to the vegetation map will be made based on expert input.

2.5.10 Accuracy Assessment

Accuracy of the final habitat classification will be assessed using standard accuracy assessment procedures as outlined in Congalton and Green (2010). The overall accuracy will be calculated as well as the individual class accuracy using the validation sample data collected in the field. An alternative approach is to use a bootstrap method of the entire sample dataset; a method that relies on random sampling to estimate the measure of accuracy. Consistent with the NPS vegetation mapping inventory, 80 percent overall accuracy will be targeted.

2.6 Consistency with Generally Accepted Scientific Practice

Random forest classification is a widely accepted approach for land cover classification. OBIA is commonly used for high spatial resolution remote sensing where spectral resolution is confined to 3 or 4 bands (red, blue, green, infrared). OBIA has been shown to increase overall accuracy of high spatial resolution classifications and overall map aesthetics. The standard accuracy assessment outlined by Congalton and Green (2010) will be implemented.

2.7 Schedule

- Draft Study Plan – October 2019 for TRREWG review
- Revised Draft Study Plan – March 2020
- Initial Model Run – Spring 2020
- Fieldwork – Summer 2020
- Data Analysis and Map Development – Autumn 2020
- Draft Maps – Summer 2021
- Draft Report – Summer 2021

2.8 Level of Effort and Cost

The initial estimate for implementation and reporting associated with this study is approximately \$300,000.

3.0 REFERENCES

- Blaschke, T., G.J. Hay, M. Kelly, S. Lang, P. Hoffman, E. Addink, R. Queiroz Feitosa, F. van der Meer, H. van der Werff, F. Coillie, and D. Tiede. 2014. Geographic Object-Based Image Analysis - Towards a new paradigm. *ISPRS J. Photogramm. Remote Sens.* 87, 180–191. [Online] URL: <https://doi.org/10.1016/j.isprsjprs.2013.09.014>. Accessed October 4, 2019.
- Breiman, L. 2001. Random forests. *Mach. Learn.* 45, 5–32. [Online] URL: <https://doi.org/10.1023/A:1010933404324>. Accessed October 4, 2019.
- Congalton, R.G. and K. Green. 2010. Assessing the Accuracy of Remotely Sensed Data: Principles and Practices, *The Photogrammetric Record*. Volume 25, Issue 130, 204-205.
- Liaw, A. and M. Wiener. 2002. Classification and Regression by randomForest. *R news* 2, 18–22. [Online] URL: <http://cogns.northwestern.edu/cbm/LiawAndWiener2002.pdf>. Accessed October 4, 2019.
- 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.

This page intentionally left blank.

VEGETATION MAPPING REVISED STUDY PLAN

ATTACHMENT A

**CITY LIGHT RESPONSES TO LP COMMENTS ON THE STUDY PLAN
PRIOR TO PSP**

Table 1. City Light responses to LP comments on the study plan prior to PSP.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
1.	Brock Applegate (WDFW)	10/31/202019	Section 2.1 Study Goals and Objectives	<p>Hi Ron, I am sorry it took this long to get to your request at the meeting. I just remembered. Please see PHS List : https://wdfw.wa.gov/publications/00165</p> <p>Additional Habitat Parameters: https://wdfw.wa.gov/species-habitats/at-risk/phs/recommendations</p> <p>Species of Greatest Conservation Need and Habitats of Greatest Conservation Need: https://wdfw.wa.gov/species-habitats/at-risk/swap</p>	WDFW noted at the October 10, 2019 TRREWG meeting that this information would be provided as a resource. Comment noted.
2.	Brock Applegate (WDFW)	10/31/202019	Section 2.1 Study Goals and Objectives	<p>As stated in the past comments, SCL should include all important habitat parameters for Washington State Priority Species and Habitat and Species of Greatest Conservation Need Lists, which have much overlap</p> <p>I like the bullet that SCL has in the Wetland Assessment Draft Study because it captures my thought on this study as well. "Additional habitat-related data to inform other efforts, such as the rare, threatened, and endangered (RTE) plant, invasive plant, beaver, and amphibian studies."</p>	<p>City Light will use high resolution imagery, LiDAR, and other existing sources to develop the Group Level Vegetation Map and make generalized assessments based on these data for select PHS and SGCN species. The expansion of the species list is not necessary to inform relicensing.</p> <p>Information from the Wetland Assessment Study and other planned studies will feed into this effort. This mapping effort is a baseline data effort that will be used for later impact assessments and management recommendations.</p>
3.	Brock Applegate (WDFW)	10/31/202019	Section 2.3 Background and Existing Information	WDFW finds transmission line corridors important, including those near the project lands for sensitive species, especially ones that migrate substantial distance between habitats, (IE raptors, waterfowl, etc.)	See the above response to Comment #2.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
4.	Brock Applegate (WDFW)	10/31/2019	Section 2.3 Background and Existing Information	I like the continuation of other mapping projects, but we may need more information beyond this particular effort. Let's look at all the habitat parameter needs for each species and habitat and make sure that we have it covered in the mapping project before we start.	The Vegetation Mapping Study is one piece of foundational information. Other data such as wetlands, weeds, rare plants, and other studies will provide supplemental information that will be used to make a high level assessment of important wildlife species.
5.	Brock Applegate (WDFW)	10/31/2019	Section 2.4 Study Area	Since SCL has lands in the South Fork of the Nooksack and on the Skagit River downstream, SCL should consider extending the boundaries to Concrete.	City Light is mapping the wildlife mitigation lands plus a 0.5-mile buffer that will provide context for general discussion of habitat connections.
6.	Brock Applegate (WDFW)	10/31/2019	Section 2.4 Study Area	SCL should consider the quality of migration corridors between their wildlife mitigation lands. Do we have enough foraging and staging trees and snags for eagles? Should we focus on the quality of habitat in riparian areas for migration corridors? Riparian zones have some of the best quality habitat. SCL should consider the connection between the mitigation lands as trespass, dumping, and noxious weeds degrade habitat on and off mitigation lands. SCL should consider species entire home range, which often includes these riparian corridors. I see a connection with fish and aquatics resources group as they consider the quality of riparian zones on wildlife and fish resources. What does the surrounding habitat near the river look like? How should we focus or management of the mitigation lands? New comment Shauna Hee (USFS) provided 3/23/2020: Can I please get a copy of the current Management Plan? When does City Light anticipate updating the plan?	The Vegetation Mapping Study concentrates on the wildlife mitigation lands where City Light has management control. An updated Wildlife Habitat Protection and Management Plan will address specific goals and objectives for each parcel. No data will be collected outside of the mitigation lands and a 0.5-mile buffer. Habitat connections among the parcels may be assessed on a high-level scale using government and other protected lands data; such an assessment will not be done as a part of this study. Response to comment provided on 3/23/2020: A copy of this document is posted on the LP SharePoint site under the TRREWG / Background Documents folder.
7.	Mignonne Bivin (NPS)	10/31/2019	Section 2.1	In reference to adding spotted owl to the example species list.	The U.S. Fish and Wildlife Service (USFWS) said they have the information they need for

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
			Study Goals and Objectives	<p>New comment Shauna Hee (USFS) provided 3/23/2020: How will forest/stand age be determined?</p>	<p>spotted owl. Forest age will be part of the mapping data and will be available to LPs.</p> <p>Response to comment provided on 3/23/2020: The NPS vegetation map and the map that will be developed for portions of the study area outside of the national park use the NVC system, which does not include an age component. Forest age will be developed for two other studies – the marbled murrelet and goshawk nesting habitat studies. Forest stand age will be determined using Conservation Biology Institute data for the North Cascades, adjusting as needed. See: https://databasin.org/galleries/90e11cbab3724db2aa801e67643d9151#expand=13863</p>
8.	Mignonne Bivin (NPS)	10/31/2019	Section 2.3 Background and Existing Information	National Park Service - SRI - Soil Survey Geographic (SSURGO) for North Cascades National Park Complex, Washington	Reference added to bulleted list.
9.	Mignonne Bivin (NPS)	10/31/2019	Section 2.5 Methodology	Define, how steep, major river crossing?	<p>Safety is of paramount importance for all field work. No technical rope-work will be allowed. Steepness of terrain and any water crossings will be reviewed once we have a draft map and have identified areas that need to be surveyed.</p> <p>City Light and all team members will adhere to the comprehensive safety plan for all field work.</p>
10.	Mignonne Bivin (NPS)	10/31/2019	Section 2.5 Methodology	Spotted owl?	The USFWS has indicated that they have all the data they need to develop an effects assessment for spotted owl. No further work is planned for this species.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					City Light will work with USFWS and NPS to consolidate their spotted owl data and provide the vegetation mapping data for consolidation with USFWS existing information.
11.	Stacy McDonough (NPS)	03/23/2020	Section 2.1 Study Goals and Objectives	How will this help to prioritized field surveys? Seems like the priority should be ensuring all potential vegetation types in the project area are identified, sampled and mapped. This seems more like a method for determining where the field work and remote sensing will be completed.	There will be two steps in field assessment. The first will be to inform and refine the model. The second step is further verification that will concentrate on areas that may be affected by the Project (as outlined) where more precise information is needed.
12.	Ashley Rawhouser (NPS)	03/17/2020	Section 2.1 Study Goals and Objectives	It seems like we should cast a broad net at this stage for the baseline. Species that are abundant today may be at risk in the future depending on changes in temps, precip and fire regime	This study is a broad vegetation mapping effort, not a broad scale habitat assessment. However, results of the study may be used along with other environmental parameters (topographic, LiDAR, etc.) to assess high-level habitat for many wildlife species. Additional studies have been developed to respond to specific resource concerns brought forth to the TRREWG – for instance, for the goshawk, amphibian, marbled murrelet, and golden eagle studies.
13.	Brock Applegate (WDFW)	03/17/2020	Section 2.1 Study Goals and Objectives	Would we describe these species for the study plan? We might want to include Priority Habitats as well.	The link provided includes both Priority Habitats and Priority Species.
14.	Brock Applegate (WDFW)	03/17/2020	Section 2.1 Study Goals and Objectives	We might solve the difference between Priority Species and Priority Habitats (two different lists in the same document) and keep the list updated by adding a link.	The provided link is WDFW's current document that covers both Priority Habitats and Priority Species. The list of PHS habitats likely in study area: <ul style="list-style-type: none"> ▪ Herbaceous balds ▪ Old-growth/mature forest ▪ Freshwater wetlands and fresh deepwater ▪ Instream ▪ Cliffs (larger ones) ▪ Snag-rich areas ▪ Talus

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					<p>City Light will develop a cross-walk matrix that will allow anyone to see which plant groups correspond to each PHS habitat (see added text in Section 2.5.9). One exception is snag-rich areas. For that City Light will map obvious stand-level areas with high snag density on a separate GIS layer, using combination of remote sensing and field observations.</p> <p>List of PHS wildlife species is extensive. Providing the URL in the study plan is adequate.</p>
15.	Brock Applegate (WDFW)	03/17/2020	Section 2.1 Study Goals and Objectives	Although the Priority and Greatest Conservation lists overlap immensely, I would say we might have the same issues with the Species of Greatest Conservation Need list, one section of species and one section of habitats. A link also keeps the list updated.	The link provided is WDFW's current document for PHS and the SWAP.
16.	Stan Walsh (SRSC)	03/17/2020	Section 2.1 Study Goals and Objectives	This needs to be coordinate with tribal staff on the cultural committee, some plants may be considered non-public information	Text added.
17.	Stacy McDonough (NPS)	03/23/2020	Section 2.3 Background and Existing Information	Does this mean that the data collected and mapped by NPS at the alliance and association level will be mapped for this project at the Group level? If so won't a lot of information be lost?	The baseline maps will be presented at the Group level; NPS mapped at the alliance and association level and that information will still be available for parties to review if desired. It will also be available if more detailed analyses are needed at specific locations covered by NPS mapping. Text edited.
18.	Rick Hartson (Upper Skagit Indian Tribe)	03/23/2020	Section 2.4 Study Area	<p>The Study Area should extend downstream to the mouth of the Skagit, including the Skagit delta and/or estuary.</p> <p>Issue/concern: The Study Area should extend downstream to the mouth of the Skagit, including the Skagit</p>	The study area extends downstream of the Gorge powerhouse to the confluence of the Skagit and Sauk rivers in order to first address the area with potential direct, attributable effects of the Project. Beyond this point, and further downstream, it is not possible with reasonable scientific certainty (and within the time frames

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				<p>delta and/or estuary.</p> <p>Resource Impact: Salmonid habitats, including for ESA-listed populations, encompassing the area within the 100-year floodplain or geomorphic floodplain, whichever is larger. Also, the natural and free-flowing state of the Skagit Wild & Scenic River system.</p> <p>Relevant Project Operations: Instream flow manipulations, including those associated with flood control and power generation. For example, the combination of two hydropower projects in the Skagit River basin (Seattle City Light and Puget Sound Energy) reduces peak flow at the USGS gage near Concrete, WA by nearly 50,000 cfs during the 1% annual chance exceedance (ACE), or 100-year event. Operations also impact floods more common than the 1% ACE, as well as the timing and duration of peak flows (see Skagit River General Investigation). Of the two hydro projects, the Skagit project has the greater flood storage capacity, providing ample reason to suspect that SCL's project-related impacts are significant throughout the entire Skagit River.</p> <p>Relevance of Vegetation Mapping: Alterations to the hydrograph may disrupt natural geomorphic processes that create and sustain ESA critical habitats, including priority juvenile Chinook rearing habitats such as river banks with large woody debris, low-angle gravel bars, log jams, backwaters, and floodplain channels. These habitats are important for other salmonid species, including</p>	<p>of the ILP) to determine whether, or to what extent, Skagit River Project operations or maintenance is affecting a resource.</p> <p>The potential for, and the degree to which, Project operations might affect resources below the Sauk River requires (1) a determination that a resource is actually being impacted, (2) if it is, the formation of various hypotheses as to the cause(s), and (3) either detailed studies, modeling, or large scale experimentation to investigate the hypotheses. It is reasonable to expect such efforts to require time frames well beyond what is available under the ILP. Seattle City Light may have an interest in participating in such longer-term studies if such studies can be reasonably scoped to have useful study results. Such efforts could be part of a settlement agreement or an agreed-upon long term study outside of relicensing.</p>

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				<p>Steelhead and Coho. A component of these geomorphic processes is the interaction of flow with forested channel banks and floodplains. Another important service of forested floodplains is terrestrial subsidies to the aquatic food web, for instance when high flow connects floodplain terraces to river channels (see Skagit Chinook Recovery Plan for discussion of geomorphic process and terrestrial subsidies to productivity).</p> <p>Specific Information Need: A remaining uncertainty is the extent to which instream flow manipulations have interrupted the geomorphic processes that create and sustain salmonid habitats, including for ESA-listed populations. Also, it is uncertain to what extent terrestrial subsidies have been impacted. To answer these questions a number of interrelated studies will be required, including the mapping of forest cover and stand age or tree size, as well as understory composition, throughout the area impacted by project-related flow manipulations. The size of trees is relevant for determining the geomorphic response. Understory composition and presence of non-native species may impact terrestrial subsidies.</p>	
19.	Rick Hartson (Upper Skagit Indian Tribe)	03/23/2020	Section 2.4 Study Area	To account for ESA critical habitat, the study area should encompass the FERC 100-year floodplain (see FEMA NFIP BiOp for Puget Sound, 2008). The FERC 100-year floodplain should be determined in the absence of project-related flood control (see Upper Skagit Indian Tribe's Regulatory Floodplain Issue Form).	<p>The CMZ data developed by the NPS will be used for this vegetation study. The CMZ expands the study area well beyond the existing 100-year floodplain.</p> <p>Any data needs regarding effects on salmonids (FEMA NFIP BiOp reference) will be determined by studies discussed within the Fish and Aquatics Workgroup.</p>

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
20.	Rick Hartson (Upper Skagit Indian Tribe)	03/23/2020	Section 2.4 Study Area	It is not clear how the channel migration zone will be defined. Rather than rely on this ambiguous term, SCL should ensure the study area encompasses the needs of the relevant regulatory authorities and affected tribes. For example, see our previous comment regarding importance of understanding impacts to ESA-listed populations. To account for ESA critical habitat, the study area should encompass the FERC 100-year floodplain (see FEMA NFIP BiOp for Puget Sound, 2008). The FERC 100-year floodplain should be determined in the absence of project-related flood control (see Upper Skagit Indian Tribe's Regulatory Floodplain Issue Form). This approach for mapping the floodplain attempts to directly relate information requests to ongoing project operations. The study area should be expanded beyond the 100-year floodplain where geomorphic assessment suggests a possibility for bank erosion and channel meandering over the course of the relicense period.	The study will use the CMZ developed and mapped by NPS. The CMZ encompasses the existing floodplain. Additional data needs to address salmonids (FEMA NFIP BiOp reference) will be determined by studies discussed in the Fish and Aquatics Resource Work Group.
21.	Shauna Hee (USFS)	03/23/2020	Section 2.5 Methodology	Can I get examples of what areas may have the "greatest potential" for project effects?	Text added.
22.	Stacy McDonough (NPS)	03/23/2020	Section 2.5 Methodology	How will the study ensure all vegetation groups within the study area including in the training data for the maps. What is the plan for addressing vegetation groups/alliances which may only occur at sizes smaller than the mapping unit size? ie wetlands, riparian corridors, conifer swamps etc	Study will review training data to ensure major groups have sufficient data. Some groups may need to be directly mapped. The WIT output will be aligned to the coarsest data input. If LiDAR is a 1 sq meter pixel and weather data is at a 10 m pixel, the WIT output will be at 10 m. There is a separate wetland mapping study that is using a specific wetland model. This study will note where particular vegetation groups are

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					associated with riparian areas.
23.	Stacy McDonough (NPS)	03/23/2020	Section 2.5 Methodology	Can you clarify how limited the field data collection will be? Will this be based on the accuracy for the first mapping effort? How will you determine now much additional data will need to be collected?	There will be an initial field effort to help inform the model. After the second generation map field efforts will concentrate on sites where there is a potential project effect, where more precise information will help inform an overall effects analysis. Limited field verification will be conducted on an as-needed basis for specific areas where a Project-related effect has been identified around City Light facilities and errors will be corrected.
24.	Shauna Hee (USFS)	03/23/2020	Section 2.5 Methodology	How is “steep gradient” being defined?	A field safety plan will be developed with guidelines for parameters such as steepness, terrain, water crossings, etc.
25.	Shauna Hee (USFS)	03/23/2020	Section 2.5 Methodology	Why are areas greater than a half-mile from a road omitted from field data collection? Why were sites that could be accessed by boat, kayak or trail omitted? Would this mean that only the southern end of Ross Lake near Hwy 20, if it's not too steep, may receive field review?	Potential effects from project roads into natural vegetation are less than one half mile. Keeping to these field guidelines will improve study efficiency. Areas along the reservoirs will be accessed by boat and then by foot, if necessary. NPS has already mapped the portion of the study area within the NCNP.
26.	Stacy McDonough (NPS)	03/23/2020	Section 2.5 Methodology	Will there be a standardized protocol and size for the collection of opportunistic data points? How will field crews determine what qualifies as an opportunistic site?	See text edits. Resource leads will coordinate to determine what opportunistic data should be collected to inform other studies prior to field work commencing.
27.	Stan Walsh (SRSC)	3/23/2020	Section 2.5 Methodology	Study products should also include species level vegetation for wildlife forage (specifically elk) on SCL Fish and Wildlife Lands. The purpose of this information is the development of Management Plans for the Fish and Wildlife Lands	Co-dominant species of the dominant cover class will be identified. An updated Wildlife Habitat Protection and Management Plan will be developed during this relicensing period. Additional information needed to inform management goals will be developed during the new license period.
28.	Shauna Hee (USFS)	03/23/2020	Section 2.5 Methodology	Why was the LWD geomorph. component dropped from the study plan?	Editing mistake – text added back.

**TR-02 WETLAND ASSESSMENT
REVISED STUDY PLAN**

**SKAGIT RIVER HYDROELECTRIC PROJECT
FERC NO. 553**

Seattle City Light

**April 2021
RSP**

TABLE OF CONTENTS

Section No.	Description	Page No.
1.0	Introduction.....	1-1
1.1	General Description of the Project.....	1-1
1.2	Relicensing Process	1-1
1.3	Study Plan Development.....	1-2
2.0	Study Plan Elements	2-1
2.1	Study Goals and Objectives	2-1
2.2	Resource Management Goals	2-1
2.3	Background and Existing Information.....	2-2
2.4	Study Area	2-4
2.5	Methodology	2-6
2.5.1	Compile and Review Existing Information	2-6
2.5.2	Collect Model Training Data	2-6
2.5.3	Wetland Remote Sensing Analysis.....	2-6
2.5.4	Identify Potential Disturbance Areas in Study Area.....	2-7
2.5.5	Conduct Field Data Collection of Wetlands Potentially Affected by the Project in the Study Area	2-7
2.5.6	Data Analysis and Reporting	2-7
2.6	Consistency with Generally Accepted Scientific Practice.....	2-8
2.7	Schedule.....	2-8
2.8	Level of Effort and Cost	2-8
3.0	References	3-1

List of Figures

Figure No.	Description	Page No.
Figure 2.4-1.	Location map of the Skagit River Project.....	2-5

List of Attachments

Attachment A	City Light Responses to LP Comments on Study Plan
--------------	---

List of Acronyms and Abbreviations

City Light.....	Seattle City Light
DO.....	Director’s Order
ELC	Environmental Learning Center
EO	Executive Order
FERC.....	Federal Energy Regulatory Commission
GIS	geographic information system
LiDAR.....	Light Detection and Ranging
LP	licensing participant
m	meters
NMFS.....	National Marine Fisheries Service
NPS	National Park Service
NWI.....	National Wetlands Inventory
PAD.....	Pre-Application Document
PRM	Project River Mile
Project	Skagit River Hydroelectric Project
PSP	Proposed Study Plan
RLNRA	Ross Lake National Recreation Area
RM	river mile
RSP	Revised Study Plan
RTE	rare, threatened, and endangered
RWG	Resource Work Group
SSIT	Sauk-Suiattle Indian Trive
TRREWG.....	Terrestrial Resources and Reservoir Erosion Working Group
USACE	U.S. Army Corps of Engineers
U.S.C.....	Unites States Code
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USIT.....	Upper Skagit Indian Tribe
WDFW	Washington Department of Fish and Wildlife
WIP	Wetland Intrinsic Potential

This page intentionally left blank.

1.0 INTRODUCTION

1.1 General Description of the Project

The Skagit River Hydroelectric Project (Project), licensed to The City of Seattle, Washington, and operated through its publicly-owned electric power utility Seattle City Light (City Light), is located in northern Washington State and consists of three power generating developments on the Skagit River – Ross, Diablo, and Gorge – and associated lands and facilities. The Project generating facilities are in the Cascade Mountains of the upper Skagit River watershed, between Project River Miles (PRM) 94.7 and 127.9 (U.S. Geological Survey [USGS] RMs 94.2 and 127).¹ Power from the Project is transmitted via two 230-kilovolt 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, an Environmental Learning Center (ELC) several recreation facilities, and several parcels of fish and wildlife mitigation lands.

Project generating facilities are all located in Whatcom County, although Ross Lake, the most upstream reservoir, crosses the U.S.-Canada border and extends for about one mile into British Columbia at normal maximum water surface elevation. Gorge Powerhouse, the most downstream facility, is approximately 120 miles northeast of Seattle and 60 miles east of Sedro-Woolley, the nearest large town. The closest town is Newhalem, which is part of the Project and just downstream of Gorge Powerhouse. The primary transmission lines cross Whatcom, Skagit, and Snohomish counties; the fish and wildlife mitigation lands are in the same counties.

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, Diablo, and Gorge lakes.” The legislation maintains the Federal Energy Regulatory Commission’s (FERC) 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).

1.2 Relicensing Process

The current FERC license for the Project expires on April 30, 2025, and City Light will apply for a new license no later than April 30, 2023. City Light formally initiated the relicensing process by filing a Notice of Intent and Pre-Application Document (PAD) with FERC on April 27, 2020 (City Light 2020). The PAD includes descriptions of the Project facilities, operations, license

¹ 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 Project River Mile (PRM) system are provided throughout this document. For further details see Section 7.0 of the main body RSP.

requirements, and Project lands as well as a summary of the extensive existing information available on Project area resources and early consultation on potential resource issues to be addressed during the relicensing. The PAD also includes an outline of the goals and objectives of this study.

In 2019-2020, City Light convened a series of Resource Work Groups (RWG) to engage agencies and other licensing participants (LP) in the Study Plan Development Process. Discussions with LPs continued in early 2021 with a series of topic-based discussions following filing of the Proposed Study Plan (PSP) on December 8, 2020 (City Light 2020b). This study plan reflects RWG and LP discussion and study requests and comments submitted by LPs.

1.3 Study Plan Development

A baseline characterization of wetlands within the Project Boundary and vicinity was identified as an early study need during 2019 discussions with the Terrestrial Resources and Reservoir Erosion Work Group (TRREWG). On October 10, 2019, City Light released the TR-02 Wetland Assessment Draft Study Plan for LP review and comment. On October 15, 2019, the draft study plan was discussed at a TRREWG meeting. City Light reviewed all comments received and released a revised version of the draft study plan on March 3, 2020. The revised draft was discussed on March 17, 2020 at a TRREWG meeting. City Light reviewed additional comments received and released a second revised version of the draft study plan on March 31, 2020. Written comments were received from Washington Department of Fish and Wildlife (WDFW), NPS, Upper Skagit Indian Tribe, and U.S. Forest Service (USFS) and responded to in an attachment to this study plan. A Status Draft of the study plan was provided to LPs on August 6, 2020.

City Light is filing this study plan with FERC as part of its Revised Study Plan (RSP), an update to the version that was filed with the PSP and incorporating additional consultation with LPs prior to the filing date. No formal study requests related to this study were filed with FERC. However, this study will provide information requested as part of the following study requests: NMFS-02 Geomorphology and Aquatic Habitat, SSIT-03 Impacts of Transmission Line Right of Way (ROW) on Aquatic Habitat and Riparian Zone for the Skagit River Hydroelectric Project, USFWS-15 Geomorphology and Aquatic Habitat Complexity Study, USIT-08 Geomorphology and Anadromous Salmonid Habitat, and WDFW-05 Geomorphology and Anadromous Salmonid Habitat, as explained in Section 6 of the RSP.

PSP comments to this study plan were submitted by Stillaguamish Tribe of Indians, Upper Skagit Indian Tribe, and U.S. Fish and Wildlife Service (USFWS). City Light has addressed the specific comments and suggested edits in this study plan and responded to comments in the PSP comment/response table appended to the main body of the RSP. Modifications were made to the study plan in response to comments and include clarification of criteria for potential Project-related disturbances and revisions to the schedule.

2.0 STUDY PLAN ELEMENTS

2.1 Study Goals and Objectives

The goal of the Wetland Assessment Study is to map and describe wetlands within the study area that may be affected by Project operations and to rate the capability of these wetlands to provide water quality, hydrologic, and habitat functions. Overall condition and existing sources of impairment will also be evaluated. Specific objectives of this study are as follows:

- Gather information on wetlands currently mapped within the study area and downstream to the Sauk River confluence.
- Refine existing maps derived from remote sensing and map wetlands in a uniform manner based on the USFWS Classification of Wetlands and Deepwater Habitat of the United States (Cowardin et al. 1979) classification system.
- Identify potential Project-related disturbances to prioritize field survey efforts.
- Document plant species in sampled wetlands.
- Use the Washington State Wetland Rating System for Western Washington (Hruby 2014) to assess wetland functions and values.
- Identify possible sources of any observed impairments.
- Provide basic habitat-related data to inform other efforts, such as the rare, threatened, and endangered (RTE) plant, invasive plant, beaver habitat, and amphibian studies, as well as the geomorphology study and other Fish and Aquatics studies.
- To the extent possible, provide basic habitat mapping for select Priority Habitat and Species wildlife (<https://wdfw.wa.gov/species-habitats/at-risk/phs/list>) and WDFW Species of Greatest Conservation Needs within the study area (<https://wdfw.wa.gov/species-habitats/at-risk/swap>), as well as species of concern for NPS.
- To the extent possible, provide information for assessing important tribal resources including forage for important wildlife and culturally important plants.

2.2 Resource Management Goals

City Light's goal is to have accurate wetland mapping and functional analysis data for assessing wetlands in the study area and will provide information for resource agencies and Indian tribes with jurisdiction in the Project vicinity to address their respective goals and objectives for resource management.

Management goals related to wetlands are described below.

- Protection of Wetlands, Executive Order (EO) 11990 of May 24, 1977 – This order requires federal agencies to consider alternatives to wetland sites and limit potential damage to minimize the destruction, loss, or degradation of wetlands to preserve and enhance the natural and beneficial values of wetlands.
- NPS Director's Order (DO) 77-1: Wetland Protection, effective October 30, 2002, establishes the policies, requirements, and standards for implementing EO 11990. Included in DO 77-1

are: (1) adoption of a “no net loss of wetlands” goal; and (2) adoption of the Cowardin et al. (1979) wetland classification system as the NPS standard for defining, classifying, and inventorying wetlands.

- Ross Lake National Recreation Area General Management Plan and Environmental Impact Statement – Published by the NPS in 2012, this management plan includes several management strategies for the protection of wetlands within the RLNRA based on EO 11990 and DO 77-1.
- The National Forest Management Act includes provisions applicable to all projects and requires the following: (a) resource plans and permits, contracts, and other instruments shall be consistent with the forest land management plan; (b) ensure consideration of the economic and environmental aspects of management, to provide for outdoor recreation, range, timber, watershed, wildlife, and fish; and (c) provide for diversity of plant and animal communities.

2.3 Background and Existing Information

Since 1975, the USFWS National Wetlands Inventory (NWI) has been mapping wetlands throughout the United States. Wetlands mapped by NWI are classified according to the USFWS classification system (Cowardin et al. 1979). However, these mapping exercises are performed on a large scale and based on aerial imagery, frequently resulting in the exclusion of smaller-scale wetlands. Additionally, once NWI maps a wetland, these areas are rarely revisited or revised and natural or anthropogenic changes are not captured. Due to the variations of accuracy and precision of NWI maps, these resources are only used during high-level planning phases and a wetland reconnaissance or delineation is necessary where Project effects may occur. Skagit, Whatcom, and Snohomish counties have all based their county wetland inventories on NWI mapping. NWI currently maps approximately 820 acres of wetland within the Project Boundary.

Additionally, the NPS’ Vegetation Classification of Mount Rainier, North Cascades, and Olympic National Parks study (Crawford et al. 2009) has mapped 1,647 acres of plant communities that may include wetlands within the Project Boundary within North Cascades National Park. Classification of vegetation has been performed according to the National Vegetation Classification System to the Association level. However, the data are mapped at the Alliance level, which is the mapping standard for NPS projects. Thus, some vegetation categories may include both wetland and non-wetland areas.

City Light owns approximately 10,850 acres of land in scattered tracts within the Sauk, Skagit, and South Fork Nooksack basins that they have acquired for natural resource protection over the course of the current Project license. These lands, known as the fish and wildlife mitigation lands, were purchased in according to the Wildlife Settlement Agreement and the Fisheries Settlement Agreement. City Light has mapped habitat cover types of most of these lands. Approximately 164 acres of wetlands have been mapped on the fish and wildlife mitigation lands. However, the evaluation of conditions was done between 2001 and 2003 and focused on seral stage and structures. Site conditions will likely change over time and require further site evaluation (City Light 2006). In addition, City Light did not apply the same vegetation mapping classifications as used by NPS and one of the goals of the relicensing studies is to develop a uniform set of terrestrial resource data. The goal of this study is to map wetland areas within the study area in a uniform way based on the USFWS Cowardin classification system.

Existing resources include the following:

- USFWS National Wetlands Inventory. <https://www.fws.gov/wetlands/data/Mapper.html>
- Vegetation Classification of Mount Rainier, North Cascades, and Olympic National Parks. Crawford et al., 2009. <https://irma.nps.gov/DataStore/Reference/Profile/661669>
- NPS Alliance-Level mapping within North Cascades National Park Service Complex.
- Washington Department of Fish and Wildlife Priority Habitats and Species Mapping. WDFW, 2019. <http://apps.wdfw.wa.gov/phsontheweb/>
- Washington Department of Natural Heritage Wetlands of High Conservation Value. WDNR 2019. <https://www.dnr.wa.gov/NHPwetlandviewer>
- Plant Life of Washington State: Big Beaver Valley and the Kettle Range. Washington Native Plant Society. 1988. Seattle, Washington. Douglasia Occasional Papers. Volume 3.
- Wetlands inventory in the North Cascades National Park Service Complex. Holmes RE and Kuntz RC, 1994. North Cascades National Park Service Complex, Resource Management Division.
- Skagit Mitigation Lands Management Plan and internal vegetation cover type mapping. City Light, 2006.
- Skagit River System Cooperative mapping of the “Barnaby Reach” portion of the Skagit River floodplain between Illabot Creek and SR530 bridge, 2017.
- Skagit Watershed Council Riparian Assessment. ESA, 2017. <https://www.skagitwatershed.org/our-work/riparian/>
- Skagit Watershed Council Reach Level Analysis – Middle Skagit River. Skagit River System Cooperative. 2011. https://www.skagitwatershed.org/wp-content/uploads/MiddleSkagit_Reach_Analysis_Final_Report_and_Appendices.pdf
- Mapping Riparian Land Use within Agricultural Zones. A case study in Skagit County. Whitefield, E. 2010. <https://www.skagitcounty.net/SalmonStrategy/Documents/White%20Paper%20v23%20booklet-style.pdf>
- Skagit County Wetland Map. Skagit County, 2004. https://www.skagitcounty.net/GIS/Documents/HydricSoils/t36r11_12.pdf
- Whatcom County Wetland Map. Whatcom County, 2006. <https://www.whatcomcounty.us/DocumentCenter/View/1838/Wetlands-PDF?bidId=>
- Snohomish County Wetland Maps. Snohomish County, 2016. http://www.snoco.org/docs/scd/PDF/PDS_CAR/Critical_Areas_Wetlands_ALLCounty_20160201.pdf
- Seattle City Light Skagit River Light Detection and Ranging (LiDAR) – 2018.
- USGS Western Washington 3DEP LiDAR. 2016/2017. <http://lidarportal.dnr.wa.gov/>

2.4 Study Area

This study area will consist of the area within the Project Boundary and the channel migration zone (mapped by NPS) from Gorge Powerhouse to the confluence of the Sauk and Skagit rivers. Field sampling will emphasize wetlands where there is the greatest potential for Project effects (e.g., reservoir fluctuation zone and adjacent to Project facilities, buildings, and infrastructure) or Project-related recreational activities, whereas wetlands not affected by the Project will not be field assessed (i.e., desktop analysis)

The study area includes the Big Beaver Valley as designated by the Project Boundary, but because there are no City Light activities that affect this portion of the Project vicinity and NPS reed canarygrass mapping in Big Beaver Valley is adequate for use in rating the wetland complex, no wetland fieldwork will be conducted here. Wetlands will be mapped here, however.

A draft map of the affected areas will be developed and overlain on the preliminary wetland map for LPs review.

A location map of the Project Boundary is provided in Figure 2.4-1.

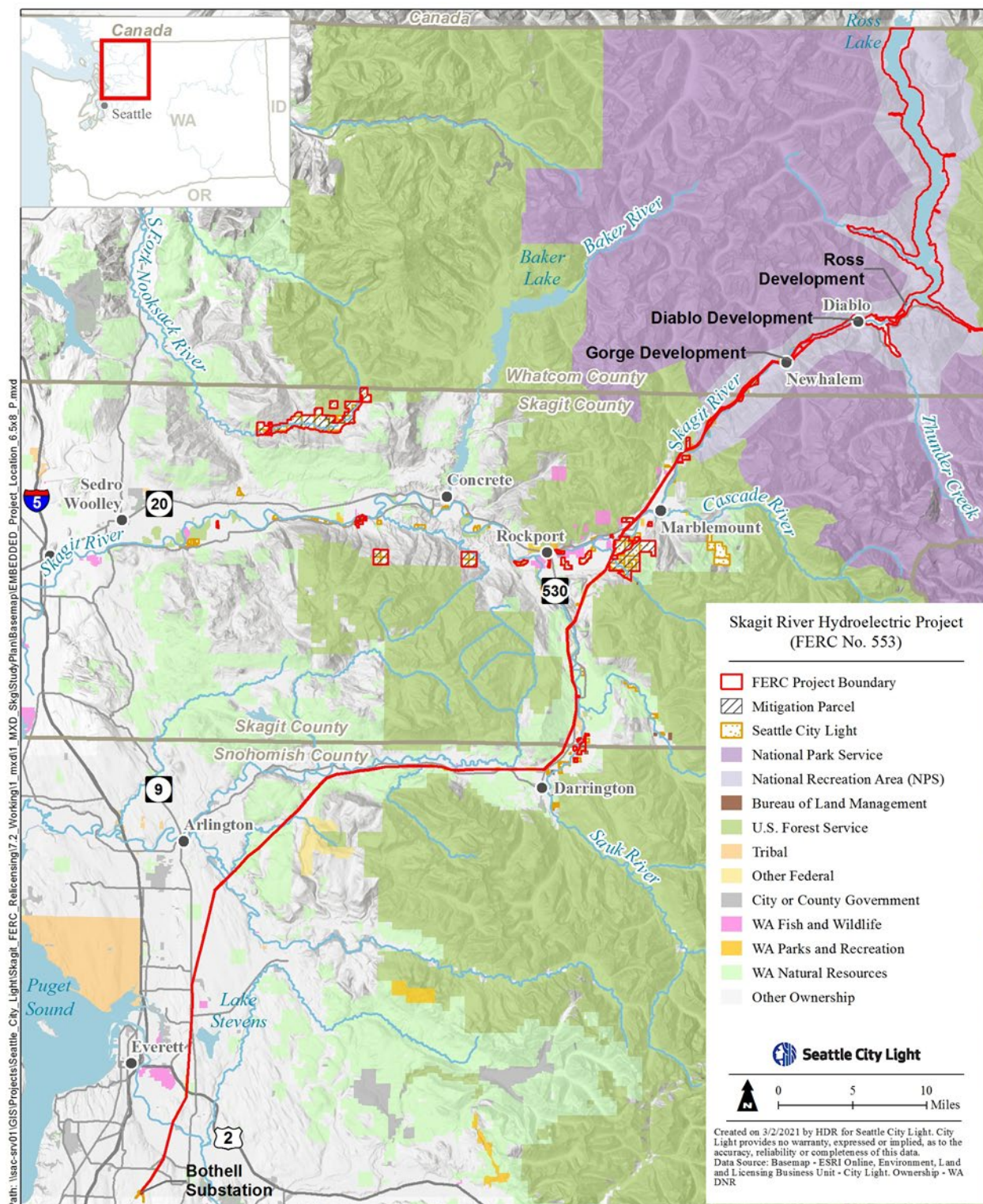


Figure 2.4-1. Location map of the Skagit River Project.

2.5 Methodology

2.5.1 Compile and Review Existing Information

The study team will prepare a preliminary map using existing NWI mapping as well as an interpretation of the most current high-resolution aerial photography (2018, 6-inch resolution color digital orthophotography). Working closely with City Light staff and the TRREWG, additional information on other wetland studies and inventories will be compiled. Results of the NPS's Vegetation Classification of Mount Rainier, North Cascades, and Olympic National Parks study (Crawford et al. 2009) will be analyzed to determine locations of water-related plant associations and added to the preliminary map. The team will assess the NPS mapping and flag those plant associations and areas where the presence of wetlands is not clear. The analysis will also draw upon the results of the separate Vegetation Mapping Study.

2.5.2 Collect Model Training Data

To improve the precision and accuracy of the model results, the team will conduct a field sampling of representative wetlands to verify existing wetland mapping (City Light, NPS, NWI, etc.). A field crew will visit a sample of wetland sites that cover the range of wetland types to assess the accuracy of the mapped data and wetland classifications and provide related information on plant species occurrence and cover. The location, extent, vegetation cover, and wetland class will be reviewed in the field. These data will be used to adjust the existing wetland data map that will be used by the remote sensing wetland model.

Accuracy of the final habitat classification will be assessed using standard accuracy assessment procedures as outlined in Congalton and Green (2010). The overall accuracy will be calculated as well as the individual class accuracy using the validation sample data collected in the field. An alternative approach is to use a bootstrap method of the entire sample dataset; a method that relies on random sampling to estimate the measure of accuracy.

2.5.3 Wetland Remote Sensing Analysis

As a preliminary step, the Washington State Department of Natural Resources' newly developed wetland mapping tool, the Wetland Intrinsic Potential (WIP) tool, will be used to identify wetlands that are not included in existing wetland mapping inventories. The WIP tool was designed to identify wetlands that are hard to detect in aerial imagery because they are ephemeral in nature or under tree canopy. The WIP tool uses LiDAR-derived datasets (available for lands within and adjacent to the Project Boundary) and aerial imagery to identify the likelihood any given area is a wetland or not using a random forest model. Several topographic indices, such as plan curvature and profile, are created as an intermediate step of the WIP tool and used as inputs in the random forest model. Topographic indices are calculated at multiple scales (30 meters [m], 150 m, 300 m), and improve errors of omission created by hummocky wetlands under forest canopy.

In addition to this study, these topographic indices are integral inputs into the remote sensing modeling effort to classify vegetation habitat classes that will be conducted under the Vegetation Mapping Study. Therefore, running the WIP tool in the beginning of this study will benefit both of these efforts.

The Random Forest model (Beiman 2001; Liaw and Wiener 2002) will be trained using sample points derived from the NWI polygons and any other wetlands identified during early wetland inventory compilation efforts. The WIP tool outputs a raster where each pixel provides a probability that an area is a wetland or upland. Areas with a higher probability of being a wetland than upland will be assessed through visual interpretation of aerial imagery.

2.5.4 Identify Potential Disturbance Areas in Study Area

Portions of the Project Boundary that are potentially affected by the Project's operations and maintenance and Project-related recreational activities will be identified and will be the focus of the field and analytical portion of the study. Specific sources of potential disturbance identified include: areas of hydraulic modifications and influence; vegetation management; Project-related recreation sites; soil excavation/compaction; and study roads. These sources of potential disturbance will be used to prioritize field verification areas.

2.5.5 Conduct Field Data Collection of Wetlands Potentially Affected by the Project in the Study Area

Plant species present at each site will be documented. Indicators of hydric vegetation, hydric soils, and wetland hydrology per the Regional Supplement to the U.S. Army Corps of Engineers (USACE) Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (USACE 2010) will be recorded when observed. Jurisdictional wetland delineations will not be completed and official wetland data plots will not be established.

Analytical methods will be developed for an appropriate level of assessment. Wetlands in areas of potential Project-related disturbance will undergo a functional analysis using the Wetland Rating System for Western Washington (Hruby 2014). Additionally, a supplemental rating form will be developed to capture information important to the relicensing process. These data will include sources of wetland hydrology, observed impairments and possible sources, and habitat information relevant to other studies such as the RTE Plant Study, Invasive Plant Study, Beaver Study, and Amphibian Study. The wetland data will also be available for fisheries investigations, as appropriate.

The estimated boundaries of sampled wetlands will be recorded using iPads fitted with global positioning system capability and aerial imagery and data will be collected on electronic forms using the iPads to increase the efficiency of data collection. Wetland polygons will be drawn onto the maps using vegetation and topography as guides. Electronic forms lead to a more efficient field effort that requires less time transcribing data forms post-survey, as well as providing a means of backing up data while in the field.

Prior to fieldwork, study leads will coordinate with other resource leads to determine what opportunistic data may be collected during the fieldwork phase to inform other studies (e.g., amphibian, beaver, RTE plant, invasive species, fisheries studies).

2.5.6 Data Analysis and Reporting

The wetland assessment will calculate the acreage of each wetland type within the study area based on the Cowardin classification system. General descriptions of wetland classifications, functions, and impairments will be included in a technical report. Potential Project effects to wetlands will

also be discussed. Results of the assessments of individual wetlands will be included in tabular form in the report. Spatial data will be presented as a kmz file that can be viewed on Google Earth. The attribute table will reflect the tabular data in the report.

Specific study products include:

- Geographic information system (GIS)-based map and Google Earth kmz of wetlands within the study area.
- An overlay of potential Project-related disturbances.
- List of plant species in each sampled wetland.
- An analysis of mapped wetland functions and values.
- Description of possible sources of any observed functional impairments.
- Additional habitat-related data to inform other efforts, such as the RTE plant, invasive plant, beaver, and amphibian studies.

2.6 Consistency with Generally Accepted Scientific Practice

The study methods (Section 2.5 of this study plan) are consistent with guidance generally accepted by the USACE and the Washington State Department of Ecology, and other entities of the scientific community regarding procedures for conducting wetland reconnaissance and functional analyses.

2.7 Schedule

- Draft Study Plan – October 2019 TRREWG review
- Revised Draft Study Plan – March 2020
- Initial Model Run – Spring 2020
- Field Verification and Collection – Spring-Summer 2020 (during vegetation growing period)
- Draft Technical Report and Map – Summer 2021
- Supplemental Data Collection – As needed in 2021 in conjunction with other terrestrial studies

2.8 Level of Effort and Cost

The initial estimate for implementation and reporting associated with this study is approximately \$240,000.

3.0 REFERENCES

- Beiman, L. 2001. Random Forests. Machine Learning, Vol. 45:1. Pp 5-32.
- Congalton, R.G. and K. Green. 2010. Assessing the Accuracy of Remotely Sensed Data: Principles and Practices, The Photogrammetric Record. Volume 25, Issue 130, 204-205.
- Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. FWS/OBS-79/31. U.S. Fish and Wildlife Service.
- Crawford, R.C., C.B. Chappell, C.C. Thompson, and F.J. Rocchio. 2009. Vegetation classification of Mount Rainier, North Cascades, and Olympic National Parks. Natural Resource Technical Report NPS/NCCN/NRTR – 2009/211. National Park Service, Fort Collins, Colorado.
- Hruby, T. 2014. Washington State Wetland Rating System for Western Washington: 2014 Update. (Publication #14-06-029). Olympia, WA: Washington Department of Ecology.
- Liaw, A. and M. Wiener. 2002. Classification and Regression by Random Forest. R News 2(3), 18-22.
- Seattle City Light (City Light). 2006. Skagit Wildlife Mitigation Lands Management Plan. Seattle City Light Environmental Affairs Division with oversight provided by the Wildlife Management Review Committee. June 2006.
- _____. 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.
- United States Army Corps of Engineers (USACE). 2010. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region. Version 2. Wetlands Regulatory Assistance Program. May 2010. ERDC/EL TR-10-3.

This page intentionally left blank.

WETLAND ASSESSMENT REVISED STUDY PLAN

ATTACHMENT A

**CITY LIGHT RESPONSES TO LP COMMENTS ON STUDY PLAN PRIOR
TO PSP**

Table 1. City Light responses to LP Comments on study plan prior to PSP.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
1.	Brock Applegate (WDFW)	10/31/2019	Section 2.1 Study Goals and Objectives	<p>I think that we talked about a special effort around Big Beaver Creek and associated wetlands as well, because of the habitat value.</p> <p>New comment Shauna Hee (USFS) provided 3/17/2020: SCL has data to support that the project has no effects to the Big Beaver area? Please provide justification within the comment table.</p> <p>New comments Brock Applegate (WDFW), and Ashley Rawhouser and Jack Oelfke (NPS) provided 3/17/2020: Did you consider the reservoir as a source of reed canarygrass into the wetland?</p> <p>Agree with Brock the bathtub ring is a disturbed area that facilitates colonization and spread of RCG.</p> <p>And we have basic inventory informatin that includes RCG within the Big Beaver wetlands.</p>	<p>City Light agreed to run the wetland model for the Big Beaver Valley that is within the FERC Boundary, but no field work will be conducted here. These wetlands are well above the influence of the reservoir and there are no other project-associated effects.</p> <p>Response to comments provided on 3/17/2020: The Big Beaver wetlands are well above the influence of the reservoir fluctuations – the wetlands are about 0.8 miles away from the reservoir and over 100 feet above the maximum water surface elevation. City Light agreed to run the wetland model for the Big Beaver Valley that is within the Project Boundary, but no field work will be conducted.</p> <p>A separate Invasive Plants Inventory is in development. The LPs will have the opportunity to comment on the draft study plan</p>
2.	Brock Applegate (WDFW)	10/31/2019	Section 2.1 Study Goals and Objectives	<p>For around the reservoirs, I would focus on Columbia spotted frogs, Western toad, evidence of bull frogs, and cavity-nesting ducks (snags). We might think about Oregon spotted frogs if SCL will look at wetlands further down the Skagit River.</p>	<p>A separate Amphibian Study will be developed. The field wetland work also will serve as a reconnaissance level survey to determine the suitability of habitat for amphibians. General notes of the wetland habitat will be recorded. Additionally, a Washington State Department of Ecology wetland rating form will be completed, which captures the presence of snags, as part of a general wildlife habitat assessment.</p>

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
3.	Brock Applegate (WDFW)	10/31/2019	Section 2.4 Study Area	SCL will want to map reed canarygrass in these disturbance areas, particularly in or near wetlands.	Wetland assessments will include notes on invasive species. A more detailed Invasive Plant Study Plan is under development and will provide more precise information on weeds.
4.	Mignonne Bevin (NPS)	10/31/2019	Section 2.4 Study Area	You mean wetland right? Not riparian or is that included in this study?	No – the term here is correct. A specific NPS vegetation classification sometimes includes both wetland and non-wetland zones. This information will be obtained using a more refined wetland mapping model.
5.	Brock Applegate (WDFW)	10/31/2019	Section 2.5 Methodology	<p>WDFW assumes the study area includes all the mitigation lands as well.</p> <p>New comment Brock Applegate (WDFW) provided 3/17/2020: We have human access as a possible disturbance vector. Do we have bull frogs, fish, permanent water, or non-native fish? We have interest in the creation of management plans for these lands and think this information could prove useful.</p>	<p>Wetlands will be mapped on the mitigation lands but since there are no disturbance vectors here they will not be rated according to the Washington State Department of Ecology methods. Weed information will be collected, however.</p> <p>Preliminary wetland ratings will be completed as a desktop exercise to inform long-term management planning on the mitigation lands. Follow-up work will be completed post-licensing as needed.</p> <p>Response to comments provided on 3/17/2020: The fish and wildlife mitigation lands were purchased by City Light and are managed following the Wildlife Habitat Protection and Management Plan that was developed with the Wildlife Management Review Committee (signatories to the Wildlife Settlement Agreement) for preservation of natural resource values. Public access is permitted on the lands, and therefore, City Light agrees that it needs to be considered in management planning. To City Light's knowledge, none of the wildlife mitigation lands have bullfrogs. Fish</p>

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					information is available for a few of the properties but not universally. An updated Wildlife Habitat Protection and Management Plan will be developed as part of the relicensing effort. Any specific studies needed to inform long-term management goals will be identified in the plan and information for which will be collected as part of implementation during the term of the new FERC license.
6.	Ashley Rawhouser (NPS)	03/17/2020	Section 2.1 Study Goals and Objectives	Provide a description of other studies this study will support/inform. For example, if this study is going to be used to ID and map off channel slough habitat for salmonids describe it's relationship to	This study is a wetland inventory and assessment. Geomorphology, fish and aquatics, amphibian, beaver, RTE plant, and invasive species studies may use information generated by this study to inform fish habitat analysis. Edits made to bullet #7 of the list of objectives in Section 2.1.
7.	Ashley Rawhouser (NPS)	03/17/2020	Section 2.1 Study Goals and Objectives	After reading below it would be more accurate to say "constrain field sampling"	Prioritize is an appropriate phrase here.
8.	Ashley Rawhouser (NPS)	03/17/2020	Section 2.1 Study Goals and Objectives	Additional information I would like collected: habitat associated with beaver use/dams; migratory bird observations; and, whether or not fish-bearing and/or surface water connected to a fish-bearing water body.	Text has been edited to indicate that resource leads will coordinate with one another to determine what opportunistic information should be collected that would help inform other technical studies.
9.	Ashley Rawhouser (NPS)	03/17/2020	Section 2.1 Study Goals and Objectives	This should include bryophytes and lichens. Is that the case?	This is a wetland assessment study not a plant inventory. A separate RTE Plant Study is in development. The LPs will have the opportunity to comment on the draft study plan.
10.	Rick Hartson (Upper Skagit Indian Tribe)	03/17/2020	Section 2.4 Study Area	The Study Area should extend downstream to the mouth of the Skagit, including the Skagit delta and/or estuary Resource Impact: Salmonid habitats, including for ESA-listed populations, encompassing the area within the	The study area extends downstream of the Gorge powerhouse to the confluence of the Skagit and Sauk rivers in order to first address the area with potential direct, attributable effects of the Project. Beyond this point, and further downstream, it is not possible with reasonable scientific certainty (and within the time frames

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				<p>100-year floodplain or geomorphic floodplain, whichever is larger. Also, the natural and free-flowing state of the Skagit Wild & Scenic River system.</p> <p>Relevant Project Operations: Instream flow manipulations, including those associated with flood control and power generation. For example, the combination of two hydropower projects in the Skagit River basin (Seattle City Light and Puget Sound Energy) reduces peak flow at the USGS gage near Concrete, WA by nearly 50,000 cfs during the 1% annual chance exceedance (ACE), or 100-year event. Operations also impact floods more common than the 1% ACE, as well as the timing and duration of peak flows (see Skagit River General Investigation). Of the two hydro projects, the Skagit project has the greater flood storage capacity, providing ample reason to suspect that SCL's project-related impacts are significant throughout the entire Skagit River.</p> <p>Relevance of Wetland Mapping: Alterations to the hydrograph may disrupt connectivity to and quality of existing ESA critical habitats, including priority juvenile Chinook rearing habitats such as relic floodplain channels and wetlands. These habitats are important for other salmonid species, including Steelhead and Coho. Project-related flow manipulations may isolate habitats previously accessible to fish, or may reduce the duration or frequency of fish-accessible connections. There may be a decoupling of seasonal flow events from evolved or</p>	<p>of the ILP) to determine whether, or to what extent, Skagit River Project operations or maintenance is affecting a resource.</p> <p>The potential for, and the degree to which, Project operations might affect resources below the Sauk River requires (1) a determination that a resource is actually being impacted, (2) if it is, the formation of various hypotheses as to the cause(s), and (3) either detailed studies, modeling, or large scale experimentation to investigate the hypotheses. It is reasonable to expect such efforts to require time frames well beyond what is available under the ILP. Seattle City Light may have an interest in participating in such longer-term studies if such studies can be reasonably scoped to have useful study results. Such efforts could be part of a settlement agreement or an agreed-upon long term study outside of relicensing.</p>

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				<p>environmentally-driven fish behaviors, such as juvenile migrations timed to access productive floodplain habitats. Temperature or wetted area of floodplain habitats may be impacted by surface or groundwater connectivity to mainstem channel flows (see Skagit Chinook Recovery Plan for discussions of many of these topics).</p> <p>Specific Information Need: A remaining uncertainty is the extent to which instream flow manipulations have impacted the connectivity or quality of floodplain salmonid habitats, including for ESA-listed populations. To answer these questions a number of interrelated studies will be required, including the mapping of floodplain habitats throughout the area impacted by project-related flow manipulations. This may include areas that are only wetted during periods of connection to the mainstem channel. Such habitats may be dry throughout much of the year and potentially difficult to capture by formal wetland surveys. For example, an area may go several years without being inundated, and terrestrial vegetation may obscure signs of aquatic habitat potential. Hydraulic modeling may be necessary to support field identification of such habitats.</p>	
11.	Shauna Hee (USFS)	03/17/2020	Section 2.4 Study Area	I have in my notes the study area included a buffer around the project area (0.5 mile – similar to the veg map study area), yet I see no mention of this buffer. The intent of the buffer was to gather data on those wetlands that may have connectivity to the respective reservoir via groundwater, and thus are affected by project-related actions such as reservoir fluctuation.	No buffer to the FERC Project Boundary is proposed for this study – there is such a buffer for the Vegetation Mapping Study. Around Ross Lake, as an example, the Project Boundary is from 0.05-0.1 miles from the shoreline of the reservoir, affording sufficient space to capture wetlands potentially influenced by the reservoir.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				Please explain why the buffer was dropped.	
12.	Rick Hartson (Upper Skagit Indian Tribe)	03/17/2020	Section 2.4 Study Area	It is not clear how the channel migration zone will be defined. Rather than rely on this ambiguous term, SCL should clarify how the study area will encompass the needs of the relevant regulatory authorities and affected tribes. For example, see our previous comment regarding importance of understanding impacts to ESA-listed populations. To account for ESA critical habitat, the study area should encompass the FERC 100-year floodplain (see FEMA NFIP BiOp for Puget Sound, 2008). The FERC 100-year floodplain should be determined in the absence of project-related flood control (see Upper Skagit Indian Tribe's Regulatory Floodplain Issue Form). This approach for mapping the floodplain attempts to directly relate information requests to ongoing project operations. The study area should be expanded beyond the 100-year floodplain where geomorphic assessment suggests a possibility for bank erosion and channel meandering	NPS modeled and mapped the channel migration zone downstream of the Project – these data will be used for the extent of the study area. The channel migration zone was mapped to encompass the 100-year floodplain as well as higher surfaces prone to bank erosion and channel meandering. Information needed to address salmonids (FEMA NFIP BiOp reference) determined by studies discussed in the Fish and Aquatics Resource Work Group.
13.	Ashley Rawhouser (NPS)	03/17/2020	Section 2.4 Study Area	The map below stops at the BC border. What are the plans for including BC? The area around the mouth of the Skagit Rv contains a large amount of wetland habitat.	The Project Boundary and FERC's jurisdiction ends at the U.S.-Canada border. There are currently no plans to conduct field work in Canada.
14.	Ashley Rawhouser (NPS)	03/17/2020	Section 2.4 Study Area	More detail needed. How are you determining what "wetlands farther from potentially affected areas" are?	Text edited. Wetlands not affected by the Project will not be visited.
15.	Ashley Rawhouser (NPS)	03/17/2020	Section 2.5 Methodology	More detail needed. Ensure adequate sample size for each relevant wetland type. How will you determine which aspects of the model need ground-truthing? That is, how do you determine which wetlands to visit?	The wetland model was developed at the University of Washington for specific application in western Washington and has been field verified on several landscape-level projects. The initial mapping verification will include briefly visiting a representative sample

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					<p>of previously mapped wetlands across the range of types and locations to inform wetland intrinsic potential model.</p> <p>Edits added to indicate that a sample of sites representing the range of wetland types will be visited to assess accuracy. Primary attributes that will be verified at this stage are location, size, and vegetative cover. The full wetland assessment will be conducted for all wetlands that are potentially affected by the Project.</p>
16.	Ashley Rawhouser (NPS)	03/17/2020	Section 2.5 Methodology	What metrics will be used to assess precision and accuracy?	Text added to clarify.
17.	Ashley Rawhouser (NPS)	03/17/2020	Section 2.5 Methodology	Please be specific about what “limited” means.	Verification surveys will be tailored to the outcome of the model mapping and the occurrence and distribution of wetlands over the study area. Text has been edited for clarity.
18.	Ashley Rawhouser (NPS)	03/17/2020	Section 2.5 Methodology	What criteria will be applied to make this decision	Location, size, and vegetative cover (Cowardin wetland class) will be verified.
19.	Ashley Rawhouser (NPS)	03/17/2020	Section 2.5 Methodology	What is the extent of existing LiDAR for the project area?	LiDAR is available for the lands within the Project Boundary and the Wetland Assessment study area.
20.	Ashley Rawhouser (NPS)	03/17/2020	Section 2.5 Methodology	These should undergo field verification and model improvement.	The WIP model has undergone extensive field testing during development and for several projects in western Washington. The model will be applied according to its developed standards and conduct field assessment to refine our results. Initial mapping will be sampled in the field to document wetland locations to be used in the wetland model.
21.	Ashley Rawhouser (NPS)	03/17/2020	Section 2.5 Methodology	Citations needed for the model, R code (assume using R), and application to wetland or veg classification.	Beiman, L 2001. Random Forests. Machine Learning, Vol. 45:1. Pp 5-32.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					Liaw, A. and M. Wiener. 2002. Classification and Regression by Random Forest. R News 2(3), 18-22.
22.	Shauna Hee (USFS)	03/17/2020	Section 2.5 Methodology	I'm confused by the use of the word "factor". Please define within the document	Text edited for clarity.
23.	Shauna Hee (USFS)	03/17/2020	Section 2.5 Methodology	Why is the overlay a product before field data collection?	Wetlands potentially affected by the Project will be included in field surveys to gather additional information and ratings. Additional information has been added about the development of the disturbance overlay.
24.	Ashley Rawhouser (NPS)	03/17/2020	Section 2.5 Methodology	How will this be determined. Specific criteria need to be stated. This could have a large IMPACT on the extent of the study area.	See above #23 comment response. Text edited.
25.	Ashley Rawhouser (NPS)	03/17/2020	Section 2.5 Methodology	Assume all vascular plants but bryophytes and lichens should also be included.	This is a wetland assessment study not a plant inventory. A separate Rare, Threatened, and Endangered Plant Study is in development and will be available for comment. For this wetlands assessment the dominant vegetation types will be noted as will significant occurrences of moss (sphagnum). Non-vascular plants will not be documented.
26.	Rick Hartson (Upper Skagit Indian Tribe)	03/17/2020	Section 2.5 Methodology	Whether in this study or another, assess potential for connectivity to mainstem channels. Relevant to a variety of F&A issue forms, including those that address salmonid habitat in floodplains. 2-D hydraulic modeling would be appropriate to answer this, with a refined topographic mesh for potential connectivity pathways between wetlands and mainstem.	This study will map and rate wetlands. Other studies will draw on this information as needed. Text added.
27.	Ashley Rawhouser (NPS)	03/17/2020	Section 2.5 Methodology	Scale? (of mapping)	In addition to the map that will be provided in the report, a kmz file of wetlands will be made available. Data sources: High Resolution Spatial 2018 – 4'/6" Pictometry, 1m 4 band NAIP (2017, 2015), Spectral/Temporal:

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					Sentinel 2 – 12 bands (10m, 20m) coverage every 5 days.
28.	Ashley Rawhouser (NPS)	03/17/2020	Section 2.5 Methodology	Is this described in Hruby 2014? If not, more detail needed. What are the sources of impairment that will be evaluated and what are the function impairments?	Yes – according to the Western Washington Wetland Rating System (Hruby 2014).
29.	Ashley Rawhouser (NPS)	03/17/2020	Section 2.5 Methodology	What specifically will this consist of? More detail needed.	We will coordinate with team resource leads to ensure we are collecting opportunistic data that is valuable.

**TR-03 RARE, THREATENED, AND ENDANGERED
PLANTS REVISED STUDY PLAN**

**SKAGIT RIVER HYDROELECTRIC PROJECT
FERC NO. 553**

Seattle City Light

**April 2021
RSP**

TABLE OF CONTENTS

Section No.	Description	Page No.
1.0	Introduction.....	1-1
1.1	General Description of the Project.....	1-1
1.2	Relicensing Process	1-1
1.3	Study Plan Development.....	1-2
2.0	Study Plan Elements	2-1
2.1	Study Goals and Objectives	2-1
2.2	Resource Management Goals	2-1
2.3	Background and Existing Information.....	2-2
2.4	Project Operations and Effects on Resources	2-7
2.5	Study Area	2-7
	2.5.1 Study Area	2-7
	2.5.2 General Concepts	2-8
2.6	Methodology	2-12
	2.6.1 Step 1 – Develop Target RTE Plant Species List	2-12
	2.6.2 Step 2 – Determine Survey Locations	2-12
	2.6.3 Step 3 – Prepare for Field Effort.....	2-12
	2.6.4 Step 4 – Conduct Field Surveys.....	2-12
	2.6.5 Step 5 – Compile Data and Provide Data QA/QC	2-14
	2.6.6 Step 6 – Threats Assessment.....	2-14
	2.6.7 Step 7 – Prepare Report	2-14
2.7	Consistency with Generally Accepted Scientific Practice.....	2-14
2.8	Schedule.....	2-14
2.9	Level of Effort and Cost	2-15
3.0	References	3-1

List of Figures

Figure No.	Description	Page No.
Figure 2.5-1.	Study area overview.....	2-9
Figure 2.5-2.	Study area associated with recreation facilities at and around Diablo and Gorge lakes.	2-10
Figure 2.5-3.	Study area associated with recreation facilities at and around Newhalem.	2-11

List of Tables

Table No.	Description	Page No.
Table 2.3-1.	RTE vascular species or species identified by agencies as species of interest potentially occurring in the study area based on existing information.	2-4

List of Attachments

Attachment A	Washington Natural Heritage Program Rare Plant Sighting Form
Attachment B	City Light Responses to LP Comments on the Study Plan Prior to PSP

List of Acronyms and Abbreviations

BLM.....	Bureau of Land Management
City Light.....	Seattle City Light
DNR.....	(Washington) Department of Natural Resources
ESA.....	Endangered Species Act
ELC.....	Environmental Learning Center
FERC.....	Federal Energy Regulatory Commission
GIS.....	geographic information system
GPS.....	Global Positioning System
ISR.....	Initial Study Report
LP.....	licensing participant
NPS.....	National Park Service
O&M.....	operations and maintenance
PAD.....	Pre-Application Document
PRM.....	Project River Mile
Project.....	Skagit River Hydroelectric Project
PSP.....	Proposed Study Plan
QA/QC.....	quality assurance/quality control
RLNRA.....	Ross Lake National Recreation Area
RM.....	river mile
ROW.....	right-of-way
RSP.....	Revised Study Plan
RTE.....	rare, threatened, and endangered
RWG.....	Resource Work Group
TRREWG.....	Terrestrial Resources and Reservoir Erosion Work Group
U.S.C.....	United States Code
USFS.....	U.S. Forest Service
USFWS.....	U.S. Fish and Wildlife Service
USGS.....	U.S. Geological Survey
UW.....	University of Washington
WNHP.....	Washington Natural Heritage Program

1.0 INTRODUCTION

1.1 General Description of the Project

The Skagit River Hydroelectric Project (Project), licensed to The City of Seattle, Washington, and operated through its publicly-owned electric power utility Seattle City Light (City Light), is located in northern Washington State and consists of three power generating developments on the Skagit River – Ross, Diablo, and Gorge – and associated lands and facilities. The Project generating facilities are in the Cascade Mountains of the upper Skagit River watershed, between Project River Miles (PRM) 94.7 and 127.9 (U.S. Geological Survey [USGS] RMs 94.2 and 127).¹ Power from the Project is transmitted via two 230-kilovolt 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, an Environmental Learning Center (ELC), several recreation facilities, and several parcels of fish and wildlife mitigation lands.

Project generating facilities are all located in Whatcom County, although Ross Lake, the most upstream reservoir, crosses the U.S.-Canada border and extends for about one mile into British Columbia at normal maximum water surface elevation. Gorge Powerhouse, the most downstream facility, is approximately 120 miles northeast of Seattle and 60 miles east of Sedro-Woolley, the nearest large town. The closest town is Newhalem, which is part of the Project and just downstream of Gorge Powerhouse. The primary transmission lines cross Whatcom, Skagit, and Snohomish counties; the fish and wildlife mitigation lands are in the same counties.

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, Diablo, and Gorge lakes.” The legislation maintains the Federal Energy Regulatory Commission’s (FERC) 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).

1.2 Relicensing Process

The current FERC license for the Project expires on April 30, 2025, and City Light will apply for a new license no later than April 30, 2023. City Light formally initiated the relicensing process by filing a Notice of Intent and Pre-Application Document (PAD) with FERC on April 27, 2020 (City Light 2020a). The PAD includes descriptions of the Project facilities, operations, license

¹ 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 Project River Mile (PRM) system are provided throughout this document. For further details see Section 7.0 of the main body RSP.

requirements, and Project lands as well as a summary of the extensive existing information available on Project area resources and early consultation on potential resource issues to be addressed during the relicensing. The PAD also includes an outline of the goals and objectives of this study.

In 2019-2020, City Light convened a series of Resource Work Groups (RWG) to engage agencies and other licensing participants (LP) in the Study Plan Development Process. Discussions with LPs continued in early 2021 with a series of topic-based discussions following filing of the Proposed Study Plan (PSP) on December 8, 2020 (City Light 2020b). This study plan reflects RWG and LP discussions and study requests and comments submitted by LPs.

1.3 Study Plan Development

Information on rare, threatened, and endangered (RTE) plant occurrence is needed to identify existing species and populations in areas potentially affected by ongoing Project activities. The TR-03 Rare, Threatened, and Endangered Plants Study (RTE Plants Study) will document occurrence of special-status plant species at sites which may be affected by ongoing Project operations or Project-related activities. This study plan was developed to map and summarize the occurrence of RTE plants within the Project Boundary where there is a potential for a Project-related effect. A target list of RTE plant species was identified in the PAD (City Light 2020). This study is designed to address Terrestrial Issue 11 (TE11: Rare Plant Study).

On April 17, 2020, City Light released the RTE Plants Draft Study Plan for LP review and comment. On May 6, 2020, the draft study plan was discussed at a Terrestrial Resources and Reservoir Erosion Work Group (TRREWG) meeting. City Light reviewed all comments received and released a revised version of the draft study plan on June 12, 2020. The revised draft was discussed on June 23, 2020 at a TRREWG meeting. Written comments were received from U.S. Forest Service (USFS), NPS, and U.S. Fish and Wildlife Service (USFWS) and responded to in an attachment to this study plan. A Status Draft of the study plan was provided to LPs on August 6, 2020.

City Light is filing this study plan with FERC as part of its Revised Study Plan (RSP), an update to the version that was filed with the PSP and incorporating additional consultation prior to the filing date. No formal study requests related to this study were filed with FERC.

No PSP comments to this study plan were filed with FERC. No modifications were made to the study plan since the PSP.

2.0 STUDY PLAN ELEMENTS

2.1 Study Goals and Objectives

The goal of this study is to provide information to determine whether and the extent to which certain Project operations and maintenance (O&M) activities may have the potential to adversely affect RTE plant species. This study will document occurrences of RTE plants within the study area as defined in Section 2.5 of this study plan which could potentially be affected by Project-related O&M activities. Specific objectives of this study are as follows:

- Identify list of RTE plant species that require protection based on federal or State regulation that have reasonable likelihood of occurring within the study area.
- Identify habitats with highest potential for RTE plant species occurrence and determine where Project-related activities could have an effect on such habitats.
- Develop a map depicting RTE plant species locations (locations will be kept confidential consistent with and to the extent provided by law).

2.2 Resource Management Goals

City Light's goal is to collect information about RTE plant occurrence in the Project vicinity to support Indian tribes, First Nations, and agency information requests.

The study will provide information to help resource agencies and Indian tribes with jurisdiction in the Project vicinity identify appropriate recommendations and conditions for the new Project license pursuant to their respective goals and authorities for resource management.

Agencies with an interest in these issues in the context of FERC relicensing of the Skagit River Project include but are not limited to:

USFWS has jurisdiction over federally protected species and critical habitats under the Endangered Species Act (ESA). Section 4 of the ESA requires USFWS to develop recovery plans for the purpose of recovering listed species and removing them from the list of Threatened and Endangered species. Section 7 of the ESA requires federal agencies to consult with USFWS prior to taking an action that "may affect" a threatened or endangered plant.

USFS plant species on the Region 6 Forest Service list of sensitive plants must be managed to maintain a viable population and avoid the need for listing them under the ESA (USFS 1990).

The NPS's General Management Plan for RLNRA includes a goal of enhancing habitat where sensitive species occur (NPS 2012).

Washington Department of Natural Resources (DNR), through the Washington Natural Heritage Program (WNHP), is responsible for mapping, monitoring, and conserving RTE plant species in Washington (DNR 2017).

2.3 Background and Existing Information

Information about RTE plant species is covered in Section 4.6.6 of the PAD (City Light 2020). For the purpose of this study plan, RTE plant species are defined in the same manner as the PAD which includes vascular plant species that fall into one of the following categories:

- **ESA Federally Listed or Proposed** – Species that are listed and protected under the ESA of 1973, as Endangered, Threatened, or Proposed for listing.
- **ESA Federal Candidates** – Species for which USFWS has sufficient information on the biological vulnerability and threats to support a proposal to list as Endangered or Threatened under the ESA, but the development of listing regulations has not occurred because of other higher priority listing activities.
- **ESA Federal Species of Concern** – Species, usually thought to be in decline, which may be considered for federal candidate status in the future.
- **State Listed Species** – Species listed by the WNHP on an advisory basis as Endangered, Threatened, or Sensitive.
- **USFS Sensitive Species** – Species on the Regional Forester’s List of Sensitive Species for the Mount Baker – Snoqualmie National Forest (USFS 2019).

Available information compiled for the PAD (City Light 2020) showed there are no known ESA-listed, proposed, or candidate species that have potential to occur within the Project Boundary. NPS has identified the following WNHP state-listed species (also indicated in bold in Table 2.3-1) as known or likely to occur in the Project vicinity (Bivin 2019a):

- western moonwort (*Botrychium hesperium*)
- two-spiked moonwort (*B. paradoxum*)
- different-veined sedge (*Carex heteroneura*)
- Alaska long-awn sedge (*C. macrochaeta*)
- Montana sedge (*C. media*)
- black bog sedge (*C. pluriflora*)
- bulblet-bearing water-hemlock (*Cicuta bulbifera*)
- prickly tree clubmoss (*Dendrolycopodium dendroideum*; synonymous with tree ground-pine [*Lycopodium dendroideum*])
- tassel cottongrass (*Eriophorum viridicarinatum*)
- greater Canadian St. John’s-wort (*Hypericum majus*)
- bog clubmoss (*Lycopodiella inundata*)
- western ladies’-tresses (*Spiranthes porrifolia*)

NPS also provided a list of plant species that it believes are known or likely to occur in the Project vicinity (Bivin 2019b) which included, in addition, the following species:

- stalked moonwort (*B. pedunculosum*)
- Buxbaum's sedge (*Carex buxbaumii*; not state-listed)
- bristly sedge (*Carex comosa*; not state-listed)
- yellow sedge (*Carex flava*; not state-listed)
- varied jewelweed (*Impatiens aurella*; not state-listed)

Of the above-mentioned species, Washington DNR has location data on stalked moonwort, prickly tree clubmoss, and bog clubmoss in Big Beaver Creek. No other Washington DNR records indicate state-listed species within three miles of the Project Boundary (City Light 2020).

Table 4.6-19 of the PAD (City Light 2020) includes a list of USFS Sensitive plant species for Mt. Baker-Snoqualmie National Forest which occurs intermittently within the Project Boundary southwest of RLNRA.

Table 2.3-1. RTE vascular species or species identified by agencies as species of interest potentially occurring in the study area based on existing information.

Species Name ¹	Common Name ¹	Last Documented ²	State Status (Rank) 2019 ³	USFS Sensitive Species ⁴	NPS Identified	Habitat Requirements ⁵
<i>Botrychium hesperium</i>	western moonwort		S(S2)	X	X	Moist open areas in meadows and forests. ⁶
<i>Botrychium paradoxum</i>	two-spiked moonwort	Suspected	T(S2)	X	X	Late-seral western redcedar forests on floodplains, perennial or intermittent stream terraces, wet or dry meadows, compacted old rockbeds, rocky subalpine slopes, and early-seral lodgepole pine communities.
<i>Botrychium pedunculatum</i>	stalked moonwort	2010	S(S2)	D	X	Moist or dry meadows, springs, stream terraces, coniferous forests, and forest edges.
<i>Carex buxbaumii</i>	Buxbaum's sedge				X	Bogs, marshes, wet meadows.
<i>Carex capillaris</i>	hair sedge	2010	T(S1)	X		Streambanks, wet meadows, bogs, and marshy lake lakeshores.
<i>Carex comosa</i>	bristly sedge				X	Marshes, lake edges, wet meadows.
<i>Carex flava</i>	yellow sedge				X	Wet meadows, forested wetlands, bogs, shores of streams, and lakes.
<i>Carex heteroneura</i>	different-veined sedge		S(S2S3)	X (var. <i>epapillosa</i>)	X	Wet meadows to dry slopes. ⁶
<i>Carex macrochaeta</i>	Alaska long-awn sedge	2010	T(S1)	S	X	Moist open spaces, including seeps and wet meadows, and around streams, lakes, and waterfalls.
<i>Carex media</i>	Montana sedge		S(S2)	X	X	Moist meadows and perennial streams and ponds. ⁶
<i>Carex pluriflora</i>	black bog sedge	1988	S(S2)		X	Wetlands, boggy lake margins, prairies, streambanks, and coastal inland areas.
<i>Carex rostrata</i>	northern beaked sedge	2010	S(S2)	S		Fens, bogs, quaking or floating peat, lake and stream shores, wet meadows; often in shallow water or on floating mats.
<i>Cicuta bulbifera</i>	bulblet-bearing water-hemlock		S(S2S3)	S	X	Edges of marshes, lakes, bogs, meadows, shallow standing or slow moving water. ⁶
<i>Coptis asplenifolia</i>	fern-leaf goldthread		S(S2)	D		Moist, cool, old forests with a well-developed litter layer (30-930 meter elevation).

Species Name ¹	Common Name ¹	Last Documented ²	State Status (Rank) 2019 ³	USFS Sensitive Species ⁴	NPS Identified	Habitat Requirements ⁵
<i>Dendrolycopodium dendroideum</i> (<i>Lycopodium dendroideum</i>)	prickly tree clubmoss/tree ground-pine		S(S2)	D	X	Rock outcrops, talus fields, moss, and significant debris layers. ⁶
<i>Draba aurea</i>	golden draba whitlow-grass	Suspected	S(S1)	X		Forested slopes, alpine meadows, and dry, relatively open, sunny areas at high elevations.
<i>Erigeron salishii</i>	Salish daisy	2010	S(S2)	D		Alpine zone on dry, rocky, or scree slopes and ridge tops with granite, rock, talus, sand, or loess soils; 2,000 to 2,800 meters.
<i>Eriophorum viridicarinatum</i>	tassel cottongrass	2010	S(S2)	X	X	Obligate wetland species of cold, usually calcareous swamps, bogs, fens, ponds, and wet meadows.
<i>Gentiana glauca</i>	glaucous gentian	Suspected	S(S2)	D		On hummocks and in seepage areas in moist alpine and subalpine meadows.
<i>Githopsis speculariodes</i>	common bluecup	1970	S(S2S3)	X		Dry, open places at lower elevations, such as thin soils over bedrock outcrops, grassy balds, talus slopes, and gravelly prairies.
<i>Hypericum majus</i>	greater Canadian St. John's-wort		S(S2)		X	Along ponds and lakeshores, riparian areas. ⁶
<i>Impatiens aurella</i>	varied jewelweed				X	Moist shaded areas at low elevations.
<i>Kalmia procumbens</i> (<i>Loiseleuria procumbens</i>)	alpine azalea	1963	T(S1)	D		Alpine slopes and cold, dry areas at high elevations (1,800-2,000 meters).
<i>Luzula arcuata</i>	curved woodrush	2010	T(S1)	D		Alpine to subalpine glacial moraines, mountain meadows, rocky and gravelly areas, rocky ridges, talus, bare patches of sandy soil; often adjacent to snow fields.
<i>Lycopodiella inundata</i>	bog clubmoss	2010	S(S2)	D	X	Sphagnum bogs, wet sandy places, and wetlands adjacent to lakes, marshes, and swampy grounds.
<i>Montia diffusa</i>	branching montia	Suspected	S(S1S2)	S		Moist forests and open fir woodlands in the lowland and lower montane zones; occasionally in xeric soils or disturbed sites.

Species Name ¹	Common Name ¹	Last Documented ²	State Status (Rank) 2019 ³	USFS Sensitive Species ⁴	NPS Identified	Habitat Requirements ⁵
<i>Oxytropis campestris</i> var. <i>gracilis</i>	Slender crazyweed	Suspected	S(S2)	D		Montane sites on glacial outwash terraces in sandy loam soil, scree, and alpine tundra.
<i>Parnassia kotzebuei</i>	Kotzebue's Grass-of-Parnassus	2010	T(S1)	X		Damp mossy ledges at the base of granitic cliffs, and adjacent to lakes, in moist seepage at the base of talus slopes.
<i>Platanthera chorisiana</i>	choriso bog orchid	1991	T(S2)	D		Wettest regions of sphagnum bogs, streams, seeps, wet meadows, gravel outwashes, and moist areas with fine soils; often just above the water table (774-1,300 meters).
<i>Polemonium viscosum</i>	sticky polemonium		S(S2)	X		At high altitudes, commonly above timberline, in open rocky places, talus slopes, rock outcrops, glacial cirques, and alpine fellfields.
<i>Saxifraga hyperborea</i>	pygmy saxifrage	2010	S(S3)			Damp, shaded cliffs, rock crevices, and talus in alpine and subalpine areas; commonly as single plants.
<i>Silene seelyi</i>	Seely's silene	2000	S(S3)	X		Shaded crevices in ultramafic, granitic, or basaltic cliffs and rock outcrops, and occasionally among boulders in talus; restricted to sites with poor nutrient and water availability.
<i>Spiranthes porrifolia</i>	western ladies'-tresses		S(S2)	X	X	Meadows, seeps, streams. ⁶

Source: Bivin and Rochefort (2010) unless otherwise noted.

1 Species names in bold are identified as known or likely to occur within the Project vicinity by NPS. Source: Bivin 2019a.

2 Last documented in North Cascades National Park Complex.

3 WDNR (2019a); S=Sensitive; T=Threatened. (More detail on state status codes see WDNR 2019b).

4 D=documented occurrence; S=suspected occurrence: in Mt. Baker-Snoqualmie National Forest; X=Region 6 Regional Forester Special Status Species Sensitive Species in Washington State (no occurrence status for Mt. Baker-Snoqualmie National Forest) (USFS 2019).

5 Source: Camp and Gamon (2011) unless otherwise noted.

6 Source: Bivin 2019a.

2.4 Project Operations and Effects on Resources

Certain Project O&M activities may have the potential to adversely affect RTE plant species. O&M activities may have direct effects, (e.g., ground disturbing activities associated with vegetation management; reservoir fluctuation; and maintenance of study roads), indirect effects (e.g., recreation activity at City Light-owned facilities), or cumulative (e.g., activities associated with non-Project activity such as loss of habitat due to the introduction of invasive plants from a non-Project vector). Activities that could have an effect on RTE plants are described in more detail in Section 4.6.7 of the PAD (City Light 2020).

2.5 Study Area

2.5.1 Study Area

The study area consists of the area within the Project Boundary that is subject to Project-related O&M and/or Project-related recreation. The study area is shown in Figures 2.5-1 through 3, and includes the following specific areas within the Project Boundary:

- Project reservoirs
 - Upper portion of the reservoir fluctuation zone (e.g., between 10 feet below and 10 feet above normal maximum water surface elevation, including immediate banks affected by reservoir)
 - Tributary inlets
 - Known Project-related reservoir shoreline erosion treatment sites
- Transmission line right-of-way (ROW): portions of the ROW where City Light activities (vegetation management and patrol and access road maintenance) has potential to affect RTE plant habitats
- Study roads (50-foot buffer)
- Project facilities (50-foot buffer) includes dams, powerhouses, penstocks, surge tanks, boathouses/docks/landings
- Project recreation facilities (details in Table 2.6-1 of the Recreation Use and Facility Assessment study plan; detail of study area associated with recreation facilities shown in Figures 2.5-2 through 3), including:
 - Skagit Tour Dock
 - West Ferry Landing (parking and dock)
 - East Ferry Landing
 - North Cascades ELC
 - Ross Lodge Picnic Shelter
 - Gorge Lake Boat Launch
 - Ladder Creek Falls Trail and Gardens
 - Trail of the Cedars

- Gorge Powerhouse Overlook
- Gorge Powerhouse Visitor Gallery
- Skagit Information Center
- Gorge Inn Museum
- Newhalem Facilities:
 - Picnic Sites
 - Parking Area (Main Street)
 - Parking Area (State Route 20)
 - Interpretive Displays (standalone)
 - Playground

2.5.2 General Concepts

These general concepts apply to the study:

- Personal safety is an important consideration of each fieldwork team. City Light and their consultants will perform the study in a safe manner.
- Field crews may make minor modifications in the field to adjust to and to accommodate actual field conditions and unforeseeable events. Any modifications made will be documented and reported in the study report.

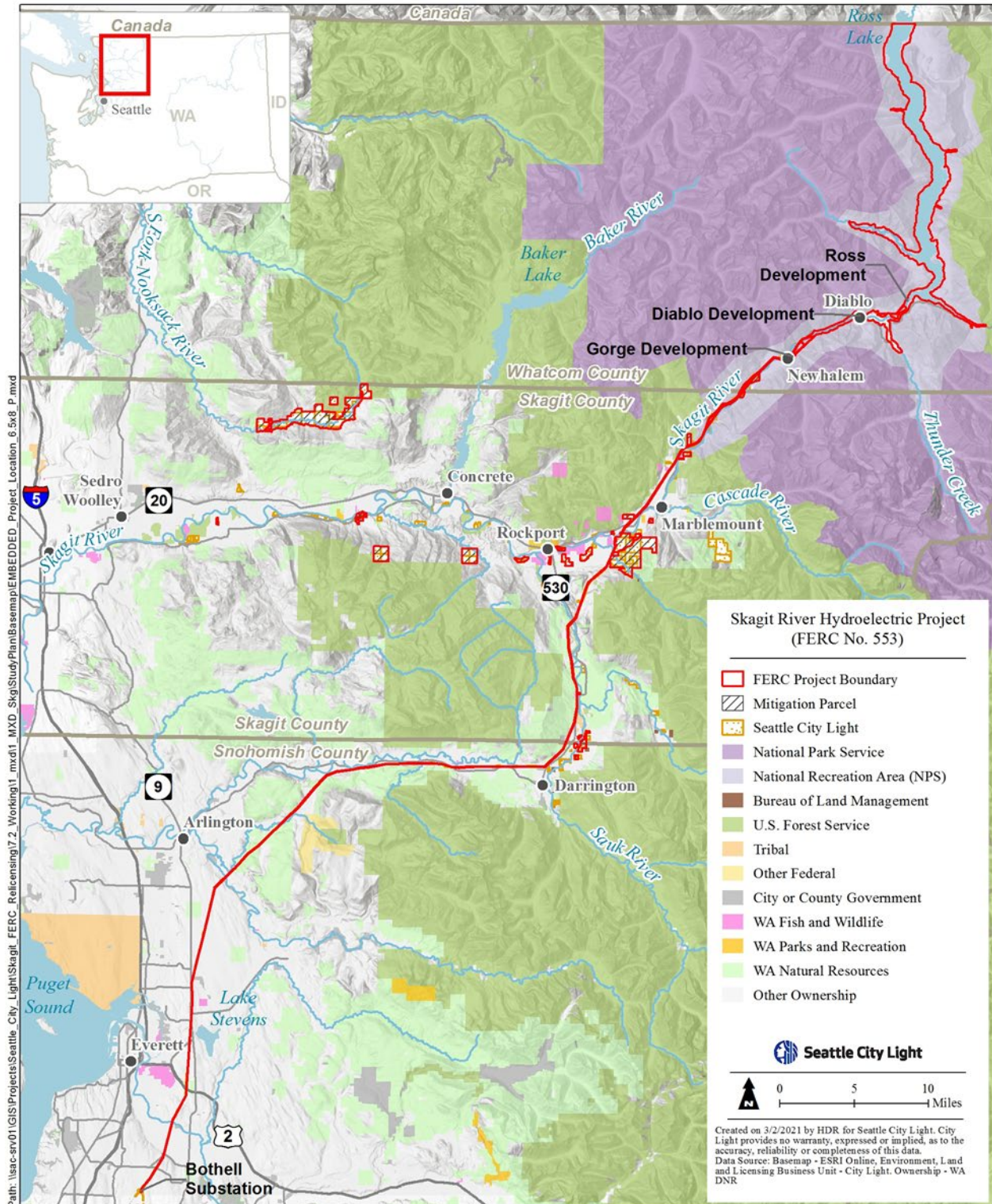


Figure 2.5-1. Study area overview.

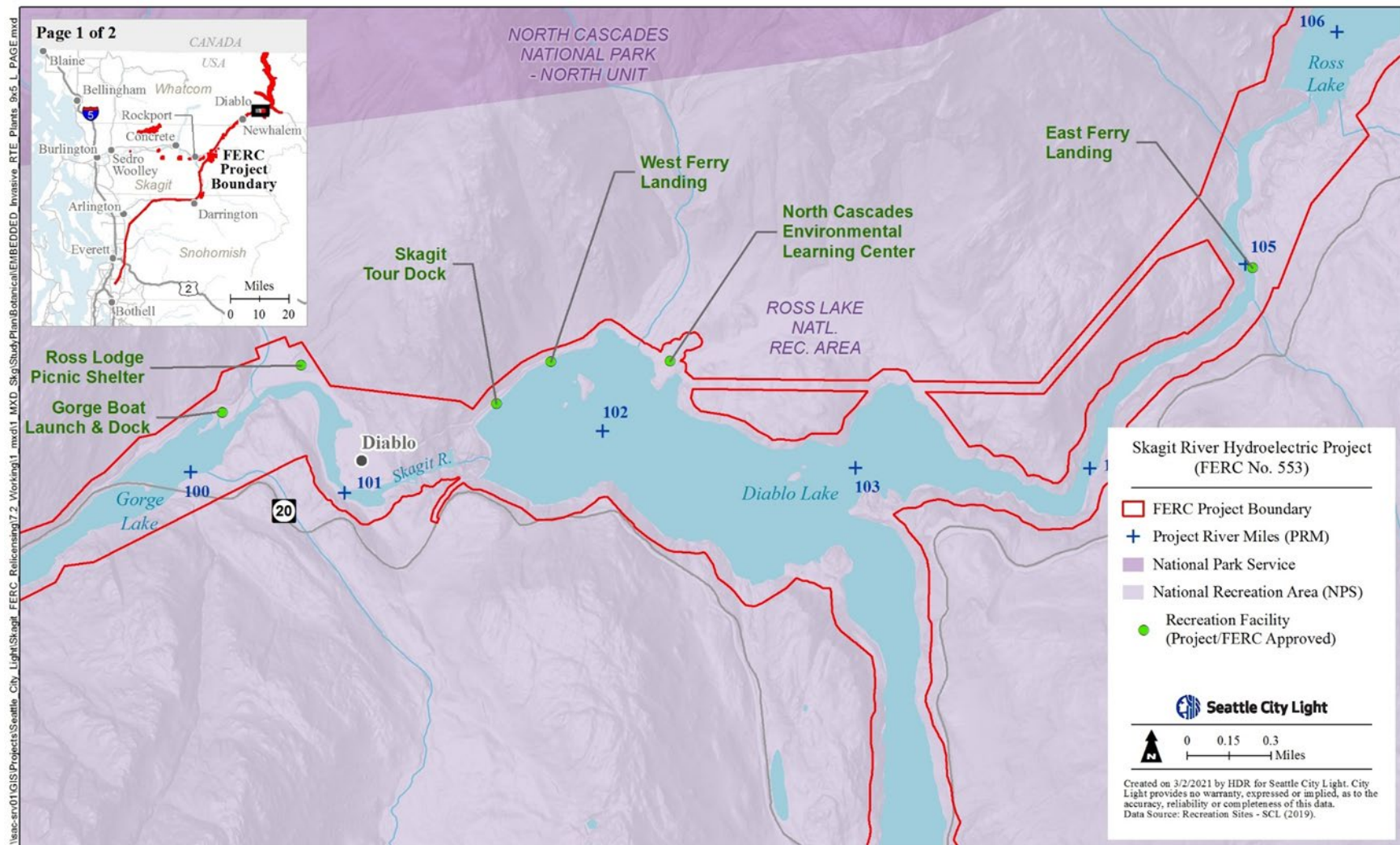


Figure 2.5-2. Study area associated with recreation facilities at and around Diablo and Gorge lakes.

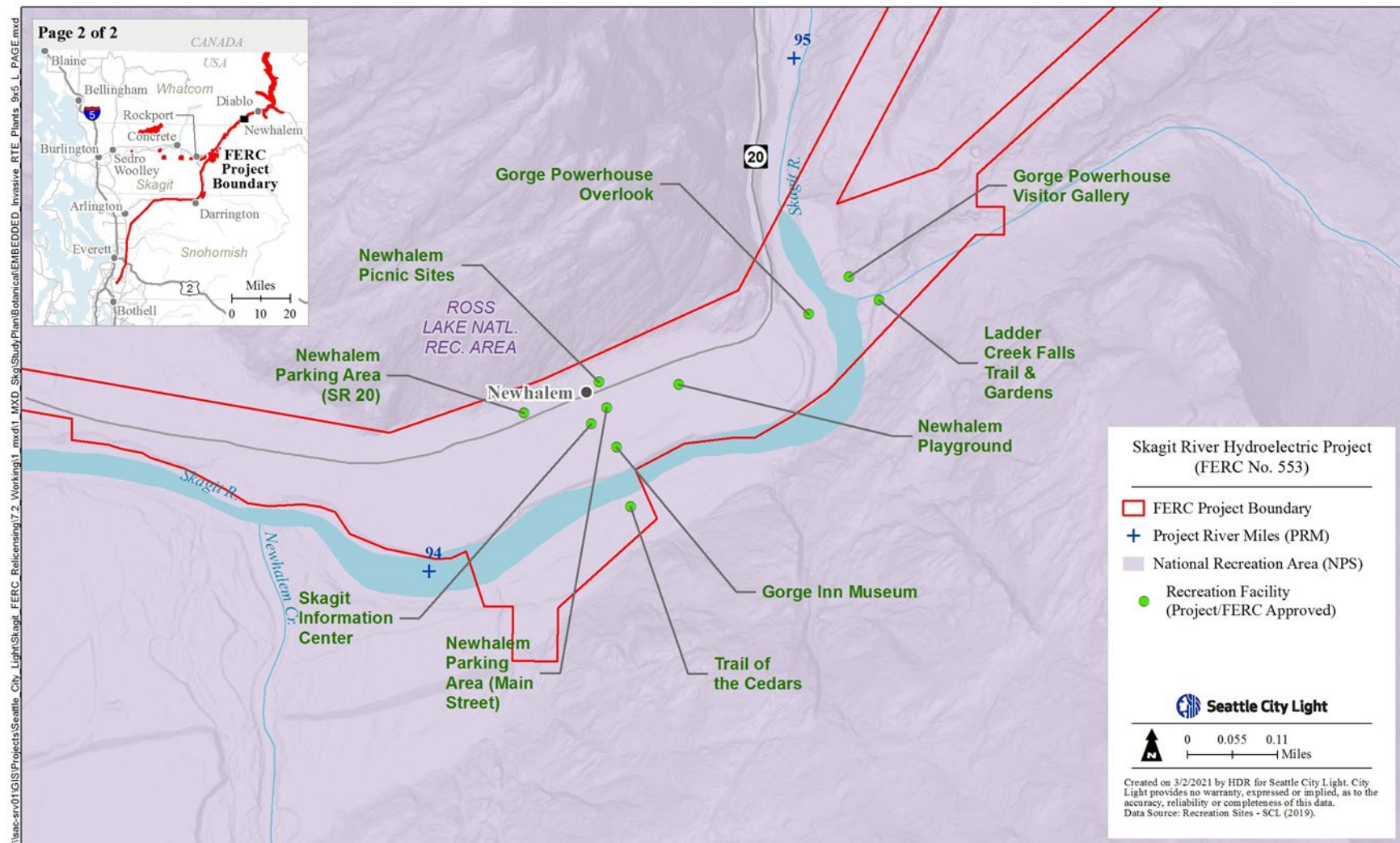


Figure 2.5-3. Study area associated with recreation facilities at and around Newhalem.

2.6 Methodology

Study methods will consist of the following steps: (1) develop list of species reasonably likely to occur in the Project vicinity; (2) determine survey locations; (3) gather data and prepare for field effort; (4) conduct field surveys; (5) compile field collected data and provide quality assurance/quality control (QA/QC) of the data; and (6) prepare report. Each step is described below. It is expected that this study will be conducted concurrently with the Invasive Plants study. Both studies will likely require permits for field work in RLNRA. If it is not possible to obtain permits, then City Light may need to forgo work in the RLNRA.

2.6.1 Step 1 – Develop Target RTE Plant Species List

RTE species with potential to occur within the Project Boundary are listed in Table 2.3-1. A refined target species list will be developed based on (1) known RTE species occurrences; and (2) presence of suitable habitat for RTE species with potential to occur in the study area. The list will include status categories, potential habitats (include suitable types from Vegetation Mapping and Wetlands Assessment studies), and identification periods. Known RTE species occurrences will be identified and mapped. The results of the Vegetation Mapping and Wetland Assessment studies will be used along with published information on species habitat associations to identify and map general habitats in the study area that are potentially suitable for each RTE species. The refined target list will be shared with the TRREWG for comment, before surveys begin.

2.6.2 Step 2 – Determine Survey Locations

Surveys for RTE plants will be conducted where Project activities occur in locations with known RTE occurrences or with potentially suitable habitat for RTE plants. Habitats for the target species list will be overlaid with the study area to determine these survey locations. Specific habitat requirements of each species will be used to prioritize field survey locations within each general habitat. Again, the habitats and locations to be surveyed for RTE species will be shared with the TRREWG before surveys begin.

2.6.3 Step 3 – Prepare for Field Effort

City Light will map known occurrences of RTE plants within the study area and prepare field maps for use by survey teams. Field maps will include aerial imagery, Project facilities, known RTE plant occurrences, and potentially suitable habitats for target species. A flowering matrix will be developed for the target species list, and survey timing will be planned based on when the species will be detectable and identifiable, typically during their flowering or fruiting phases, and based on herbarium collection dates.

Prior to the start of field surveys, the surveyor(s) will visit the University of Washington (UW) Herbarium and/or other local collections, as needed (e.g., NPS collection in Marblemount) to review specimens to help develop a key characteristics search image and also review the habitat conditions of the voucher specimens.

2.6.4 Step 4 – Conduct Field Surveys

The surveyors will conduct target RTE plant surveys in a manner that conforms to the Survey Protocols for Survey and Manage Strategy 2 Vascular Plants (Whiteaker et al. 1998) and Rare

Plant Surveys: Techniques for Impact Assessment (Nelson 1985), which are accepted methods for conducting a botanical survey in Washington. Species guides will include Hitchcock and Cronquist (2018), Camp and Gamon (2011), online guides including Washington DNR Rare Plant Field Guide (2020) and Oregon Flora Project Rare Plant Guide (Oregon State University 2020), and consultation with agency and UW taxonomic experts.

Field surveyors will visit survey locations as defined in Step 2 and verify the occurrence of the known RTE species and/or the extent of the potential habitat. Field staff will implement the Intuitive Controlled Survey method used by the Bureau of Land Management (BLM 2017) where more intense survey will occur in areas of highly suitable habitat and less intense cover will occur everywhere else. A team of two will cover the entire potential habitat area, wandering through the site guided by habitat parameters most likely to support RTE plant species. Survey areas and routes will be documented with Global Positioning System (GPS). The initial identification of RTE plant potential habitat will be guided by the results of the Vegetation Mapping and Wetland Assessment studies desktop and fieldwork efforts, which will determine where the areas of highly suitable habitat occur.

All vascular RTE plant species observed will be identified and recorded in a species list. Scientific and common names for all species will conform to the nomenclature found in the *Flora of the Pacific Northwest 2nd Edition* (Hitchcock and Cronquist 2018).

Due to safety considerations, population attributes may be difficult to assess for some species. Species that occur on rock outcrops or cliffs, such as Seely's silene (*Silene seelyi*), may be inaccessible. High quality, powerful binoculars or a spotting scope will be used to accurately estimate population extent and size for some occurrences of RTE plants, for sites with steep slopes.

When target RTE plants are documented in the study area, the following information will be collected to the edge of the occurrence, within the study area:

- General habitat type (i.e., mixed conifer forest, wet meadow, etc.), slope, soil features (i.e., mesic, clay, etc.), most common surrounding species, potential threats (including Project effects), and the level of existing ground disturbance.
- Photographs of the species, its habitat, and any potential threats (one set per species with other photographs to document potential threats, or as needed).
- Population extent (approximate length and width).
- Estimation of the number of individual plants in the population. If the population is estimated to cover an area greater than 0.1 acre, surveyors will delineate the occurrence boundary using a polygon (as safety and accessibility allow). For occurrences estimated less than 0.1 acre in size, the location of the approximate center of the occurrence will be taken as point data using GPS.
- Estimated phenology and descriptions of reproductive state.
- Relative population location and estimated distance to nearest Project facility, feature, or Project-related activity (reservoir fluctuation zone, recreation area, erosion site, active vegetation management area, etc.).

Additional details will be collected as described in the WNHP Rare Plant Sighting Form (example form is attached to this study plan). Due to the likely phenology of the mix of target species, it is expected that two full passes of the portions of the study area with highly suitable habitat will be needed to identify and map all the target RTE plant species.

All data will be collected using weatherproof iPads that are loaded with high resolution aerial photographs, the results of the Vegetation Mapping and Wetlands Assessment studies, and preliminary identification of habitat potentially supporting RTE plants. Digital data forms will be developed to eliminate the use of paper forms. Data will automatically backup to the hard drive and to a dedicated web-sever when phone service is detected.

2.6.5 Step 5 – Compile Data and Provide Data QA/QC

Following field surveys, maps will be developed depicting all target RTE plant occurrences and Project facilities in the study area. Field data will then be subject to QA/QC procedures, including either spot-checks of transcription or a *digital* application with integrated QA/QC review and comparison of geographic information system (GIS) maps with field notes to verify locations of mapped occurrences.

2.6.6 Step 6 – Threats Assessment

Once the locations of RTE plants in the study area are determined, City Light will assess all potential threats to these species, including invasive plant species, O&M, and Project-related recreation. In addition to field notation of potential threats to document RTE occurrences, City Light operations staff will be consulted to identify Project activities that occur in the area of the plant occurrences that have a potential to affect RTE plants.

2.6.7 Step 7 – Prepare Report

A report will be prepared to include the following information: (1) study goals and objectives; (2) methods; (3) results, including GIS-based maps of RTE plant occurrences; (4) discussion, including threats assessment; and (5) description of variances from the FERC-approved study plan, if any.

The results of the RTE Plants Study may include confidential location information regarding rare plant populations. Confidential information will be marked “confidential” and sharing will be restricted to distribution to agencies and Indian tribes and First Nations. Documents shared with the public will have confidential rare plant population information removed.

2.7 Consistency with Generally Accepted Scientific Practice

The methodology for this study plan conforms to the Survey Protocols for Survey and Manage Strategy 2 Vascular Plants (Whiteaker et al. 1998) and Rare Plant Surveys: Techniques for Impact Assessment (Nelson 1985), and conforms to BLM survey guidelines (BLM 2017) which are used in many parts of the country.

2.8 Schedule

- Field Work – April to November 2021
- Analysis – June to December 2021

- Final Report (Initial Study Report) – March 2022

Depending on logistics and the need to access more remote areas of the Project to match RTE plant flowering times, some field work may extend into a second field season and an addendum report would be issued in 2022.

2.9 Level of Effort and Cost

The initial estimate for implementation and reporting associated with this study is approximately \$200,000.

3.0 REFERENCES

- Bivin, M. 2019a. Personal communication between Mignonne Bivin, National Park Service, and Rory Denovan, Seattle City Light. October 2, 2019.
- _____. 2019b. Personal communication between Mignonne Bivin, National Park Service, and Rory Denovan, Seattle City Light. November 13, 2019.
- Bivin, M. and R. Rochefort. 2010. Vascular plant inventory of North Cascades National Park Service Complex. Natural Resource Technical Report NPS/NCCN/NRTR–2010/369. National Park Service, Fort Collins, Colorado.
- Bureau of Land Management (BLM). 2017. Idaho BLM Special Status Plant Survey and Clearance Protocols. [Online] URL: <https://www.blm.gov/policy/im-id-2017-011>. Accessed April 2020. Boise District. BLM Idaho District. Boise, Idaho.
- Camp, P. and J.G. Gamon (Editors.). 2011. Field Guide to the Rare Plants of Washington. University of Washington Press, Seattle, Washington.
- Hitchcock, A.S. 1971. Manual of the Grasses of the United States, Volume One. Dover Publications, Inc. New York, New York.
- Hitchcock, C.L. and A. Cronquist. 2018. Flora of the Pacific Northwest: An Illustrated Manual, 2nd Edition. Edited by D.E. Giblin, B.S. Legler, P.F. Zika, and R.G. Olmstead. University of Washington Press, Seattle, WA. 882 pp.
- National Park Service (NPS). 2012. Ross Lake National Recreation Area. General Management Plan. National Park Service, U.S. Department of the Interior. July 2012.
- Nelson, J.R. 1985. Rare Plant Surveys: Techniques for Impact Assessment. Natural Areas Journal 5: 18–30.
- Oregon State University. 2020. Oregon Flora Project; Rare Plant Guide. [Online] URL: <http://www.oregonflora.org/rareplants.php>. Accessed March 26, 2020. Corvallis, OR.
- Seattle City Light (City Light). 2020a. Pre-Application Document (PAD) Skagit River Hydroelectric Project (FERC No. 553). April 2020.
- _____. 2020b. Proposed Study Plan (PSP) Skagit River Hydroelectric Project (FERC No. 553). December 2020.
- United States Forest Service (USFS). 1990. Land and Resource Management Plan. Mt. Baker-Snoqualmie National Forest. Pacific Northwest Region. Seattle, Washington. June 1990.
- _____. 2019. Enclosure 1 - Federal Threatened, Endangered & Proposed Species and Sensitive Species Lists; FINAL Region 6 Regional Forester Special Status Species List, February 25, 2019. [Online] URL: <https://www.fs.fed.us/r6/sfpnw/issssp/agency-policy/>. Accessed April 13, 2020.
- Washington Department of Natural Resources (WDNR). 2017. Natural Heritage Program Flyer. [Online] URL: https://www.dnr.wa.gov/publications/amp_nat_heritage_mission_goals.pdf?q13dxhm. Accessed February 11, 2020. Olympia, Washington. November 2017.

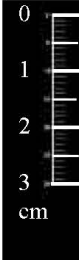
-
- _____. 2019a. 2019 Washington Vascular Plant Species of Special Concern List. [Online] URL: <https://www.dnr.wa.gov/NHPlists>. Accessed April 14, 2020.
- _____. 2019b. 2019 Washington Vascular Plant Species of Special Concern. Natural Heritage Report 2019-04. https://www.dnr.wa.gov/publications/amp_nh_vascular_ets.pdf?nyhopj. Accessed April 14, 2020.
- _____. 2020. Rare Plant Field Guide. [Online] URL: <https://www.dnr.wa.gov/NHPfieldguide>. Accessed March 26, 2020.
- Whiteaker, L., J. Henderson, R. Holmes, L. Hoover, R. Leshner, J. Lippert, E. Olson, L. Potash, J. Seevers, M. Stein, and N. Wogen. 1998. Survey protocols for survey & manage strategy 2 vascular plants. V 2.0. Bureau of Land Management. [Online] URL: <http://www.blm.gov/or/plans/surveyandmanage/SP/VascularPlants/cover.htm>. Accessed April 2020.

**RARE, THREATENED, AND ENDANGERED PLANTS
REVISED STUDY PLAN**

ATTACHMENT A

**WASHINGTON NATURAL HERITAGE PROGRAM RARE PLANT
SIGHTING FORM**

Washington Natural Heritage Program Rare Plant Sighting Form



Please read instructions page. Shaded boxes are for Natural Heritage Staff use only.

Taxon Name: _____ EO # _____
Are you confident of the identification? ☐ yes ☐ no Explain: _____

Survey Site Name: _____

Surveyor's Name/Phone/Email: _____

Survey Date: _____ (yr-mo-day) County: _____

Quad Name: _____ Quad Code: _____

Township: _____ N Range: _____ Section(s): _____ 1/4 of 1/4: _____
(e.g. NW of NE)

Directions to site: _____

Mapping (see instructions): Attach a copy of the USGS 7.5 minute quad with the location and extent of the rare plant population clearly drawn. Do not reduce or enlarge the photocopy or printout of the map. If your map is a different scale (not recommended) please write the scale on the map.

Please answer the following:

1. I used GPS to map the population: ☐ No (skip to #2) ☐ Yes (complete #1 & #3)
☐ Coordinates are in electronic file on diskette (preferred) ☐ Coordinates written below or attached
Description of what coordinates represent: _____

GPS accuracy: ☐ Uncorrected ☐ Corrected to <5m

GPS datum: _____

GPS coordinates: _____

2. I used a topographic map to map the population:
☐ yes (complete #2) ☐ no (provide detailed directions & description above, and skip to #3)

I am confident I have accurately located and mapped the population at map scale: ☐ yes (skip to #3)
☐ no, but I am confident the population is within the general area indicated on the map as follows:
On the same map, use a highlighter to identify the outer boundary of the area where the population could be, given the uncertainties about your exact location.

3. I used the following features on the map to identify my location (stream, shoreline, bridge, road, cliff, etc.):

To the best of my knowledge, I mapped the entire extent of this population
☐ yes ☐ no ☐ unknown If no or unknown, explain: _____

Is a revisit needed? ☐ no ☐ yes - if yes, why?: _____

Ownership (if known): _____

Page 2 - Washington Natural Heritage Program Rare Plant Sighting Form

Population Size (# of individuals or ramets) or estimate: _____

Population (EO) Data (include population vigor, microhabitat, phenology, etc.): _____

Plant Association (include author, citation, or classification, e.g. Daubenmire): _____

Associated Species (include % cover by layer and by individual species for dominants in each layer):

Lichen/moss layer: _____

Herb layer: _____

Shrub layer(s): _____

Tree layer: _____

General Description (include description of landscape, surrounding plant communities, land forms, land use, etc.):

Minimum elevation (ft.): _____ Maximum elevation (ft.): _____

Size (acres): _____ Aspect: _____ Slope: _____

Photo taken? ☐ yes ☐ no

Management Comments (exotics, roads, shape/size, position in landscape, hydrology, adjacent land use, cumulative effects, etc.):

Protection Comments (legal actions/steps/strategies needed to secure protection for the site): _____

Additional Comments (discrepancies, general observations, etc.): _____

Please mail completed form with map to:

Washington Natural Heritage Program
Department of Natural Resources
PO Box 47014, Olympia WA 98504-7014



WASHINGTON STATE DEPT OF
**NATURAL
RESOURCES**

Instructions for Washington Natural Heritage Program Rare Plant Survey Form
(Form for external data contributors)

Please complete all sections except for the shaded areas. Those will be completed by WNHP staff.

Taxon Name: Please enter a complete scientific name.

Are you confident of the identification? If you had trouble with the identification, please explain why (e.g. immature or senescent plants, similarity to other species, etc.). If a specimen was verified by an expert on the taxon, please indicate, such as "verified by".

Survey Site Name: This should be a place name near the population, preferably something that appears on the USGS quad map. It should help someone, not intimately familiar with the area, locate this population.

Surveyor's Name: Enter the name(s) of the person who located the plant. Include their contact information so that they can be contacted if more information is need.

Survey Date: When was the plant located? Please use year-month-day format (e.g. 2001-07-05)

County: In what county is the site located?

Quad Name: Please enter name of the USGS 1:24,000 scale quad map where the site is located.

Township, Range, Section, and _ of _: Enter the legal description of this site. Quarter sections should be entered in the form "NW of SE", which indicates that the site is within the northwest quarter of the southeast quarter-section.

Directions to site: Please explain how someone else could relocate the site, starting from a named paved road.

Mapping: Attach a copy of the USGS 7.5 minute quadrangle map with the location and extent of the rare plant population clearly drawn. Do not reduce or enlarge the photocopy or printout of the map. If you're using a map at a different scale (not recommended) please write the scale on the map. Follow the three steps listed in describing your location. Include detailed comments here; these are useful to us.

1. GPS: When mapping with GPS, the best way to submit data to us is to export this data to a floppy disk and mail with your survey form. Submitting a short list of GPS coordinate values is also acceptable. Whether you submit a disk or a list, please provide the accuracy and datum used by your GPS. Also, write a description of what these coordinates represent. For instance, do your GPS points represent the centers of individual patches, each with an estimated size?

2. Topographic Map: Submitting this is helpful to interpreting your survey, even if you are submitting data collected via GPS. If neither a map nor GPS was used to collect the information you are reporting, we will rely on written comments in 'directions to site' and mapping question #3.

I am confident I have accurately located and mapped the population at map scale: The most common answer is 'no'. When surveying away from roads or mapped streams, one usually cannot reference their position accurately to map scale. Use this rule of thumb: to map at 1:24,000 scale, your marks must be within one pencil line's width of their correct location. Often the field biologist can estimate location to within a small area visible on the map (i.e., 'I know I'm between these two streams and between 1000 and 1400 ft. elevation'). If you can estimate your location, draw this area surrounding your mapped feature.

3. I used the following features on the map to identify my location: Please include comments that will help us map the site accurately. If the population is located near or within some feature on the map, please describe. For instance, we want to know if the plants are located within a wetland, at the base of a cliff, on the west bank of a river, or within the littoral zone of a lake.

I mapped the entire extent of the population? Might there be more of these plants in this general area? For instance, did you do an exhaustive survey of all surrounding appropriate habitat, or did you stop at a fence line or ownership boundary.

Is a revisit needed? Check yes if, for instance, identification should be verified at another time, the population should be mapped more accurately, if you did not survey all of the potential habitat, if you think there is some imminent threat, etc.

Ownership: If you know who owns the property, please enter that here.

Population Size: Your count or estimate of the number of individuals or ramets.

Population Data: Describe the population quality and phenology. For example: "45 plants scattered in a wet depression with an area of 10 by 45 meters. Vigorous plants with 30% flowering and 70% vegetative."

Plant Association: If you have access to a vegetation key, please include the plant association of the immediate area along with the author of the key.

Associated Species: Please enter the scientific names of the other plant species that are found in the immediate area and their percent cover, if determined. These should be described by layer as listed on the form.

General Description: Describe the local landscape, including physical land forms, vegetation, and land use.

Minimum & Maximum Elevation: Enter values in feet and a maximum elevation only if this is a large population with a range of elevations.

Size: How many acres does the population cover? If less than 0.1 acre, you can leave this blank.

Aspect: Enter the direction of slope as degrees or as a compass direction such as SW.

Slope: Enter as degrees or percent.

Photo taken? Check yes if you took a photograph of the population, otherwise, check no.

Management Comments: Enter information about land use and threats (exotic species, recreation, road maintenance, grazing, etc.) here as well as recommended changes in site use that will help ensure continued existence of the population.

Protection Comments: Enter any legal steps that you think should be taken to protect the population.

Additional Comments: Enter anything that you think is important about this population that did not fit in any other space on the form.

**RARE, THREATENED, AND ENDANGERED PLANTS
REVISED STUDY PLAN**

ATTACHMENT B

**CITY LIGHT RESPONSES TO LP COMMENTS ON THE STUDY PLAN
PRIOR TO PSP**

Table 1. City Light responses to LP comments on the study plan prior to PSP.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
1.	Shauna Hee (USFS)	05/15/2020	Section 2.1 Study Goals and Objectives	The list of RTE species does not address nonvascular plants or fungi that require federal or state regulation. Either include these species or provide justification as to why project related actions has no effect to these species. The list of RTE species also does not address lichenized fungi or macro-fungi. Either include these species or provide justification as to why project related actions has no effect to these species. Species lists can be found: https://www.dnr.wa.gov/NHPlists	<p>Please refer to the criteria used to define RTE species in Section 2.3 of the Rare, Threatened, and Endangered Plants Draft Study Plan. Information on nonvascular plants were cross-referenced with the USFS Region 6 Forester's List of Sensitive Species. Species that were not documented or suspected within the Mt. Baker-Snoqualmie National Forest (MBSNF) were excluded.</p> <p>The next step was to review the habitat information in the species accounts provided by the USFS/BLM Interagency Special Status/Sensitive Species Program to review the habitat requirements and typical landscape occurrence of the species.</p> <p>No Washington National Heritage Program (NHP) fungi are included in the MBSNF Sensitive Species List. The series of nonvascular plants that do or may occur in the MBSNF were reviewed for their habitat type and cross-referenced with what is available in the study area. Habitats not included in the study area, such as alpine, were not included.</p> <p>Two non-vascular species will be added to the RTE target species list based on this review: <i>Leptogium cyanescens</i> and <i>Ramalina thausta</i> on USFS land. NPS provided an RTE target species list that included no non-vascular species. If USFS has additional species they are required to survey for under similar circumstances, City Light would be glad to consider these.</p>

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
2.	Stacy McDonough (NPS)	05/20/2020	Section 2.3 Background and Existing Information	Per M Bivin this species [<i>Carex flava</i>] occurs at Hozomeen lake	Thank you for your comment. City Light appreciates the information.
3.	Stacy McDonough (NPS)	05/20/2020	Section 2.3 Background and Existing Information	Per M Bivin this species [<i>Coptis asplenifolia</i>] is unlikely to occur in NOCA	Thank you for your comment. City Light appreciates the information.
4.	Stacy McDonough (NPS)	05/20/2020	Section 2.3 Background and Existing Information	This [<i>Coptis asplenifolia</i>] occurs on McAlester mountains	Thank you for your comment. City Light appreciates the information.
5.	Stacy McDonough (NPS)	05/20/2020	Section 2.3 Background and Existing Information	Per M Bivin this species [<i>Githopsis specuarioides</i>] does not occur in NOCA	Thank you for your comment. City Light appreciates the information.
6.	Stacy McDonough (NPS)	05/20/2020	Section 2.3 Background and Existing Information	Per M Bivin - this species [<i>Saxifraga hyperborea</i>] occurs at boulder butte	Thank you for your comment. City Light appreciates the information.
7.	Stacy McDonough (NPS)	05/20/2020	Section 2.3 Background and Existing Information	Per M Bivin this species [<i>Spiranthes porrifolia</i>] occurs at coon lake	Thank you for your comment. City Light appreciates the information.
8.	Judy Niebauer (USFWS)	05/22/2020	Section 2.5 Study Area	<p>Please expand the scope to look at full areas of the project boundary, any nearby/adjacent areas with populations of RTE plants to be able to determine if adjacent populations could be expanded or connected to similar habitat types. Looking for connectivity between populations and potential for new populations should be a goal for such a long term project.</p> <p>Because Canada is within the boundary, please determine if populations exist in the areas</p>	<p>The study plan focuses efforts on areas where there is the potential for Project effects. City Light is interested in any existing data on RTE plant populations both within and outside of the Project Boundary as well as any incidental observations. Looking for connectivity potential is beyond the scope of this study.</p> <p>Canada is outside the Project Boundary as FERC has no jurisdiction in Canada.</p>

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				within the reservoir/river beds within the drawdown zones in Canada. This may require and MOU for sharing data.	
9.	Shauna Hee (USFS)	05/15/2020, 05/22/2020	Section 2.5.1 Study Area	<p>This is a great study area for invasive plants. I don't quite understand why it was determined that facilities have suitable habitat for RTE species (based on the above listed habitat requirements). Please provide justification as to why facilities are included in the study area.</p> <p>Comment edited on 5/22 to the following: Please provide an explanation why the same study area is being used for both the rare plant and invasive plant studies. I don't quite understand why it was determined that facilities have suitable habitat for RTE species (based on the above listed habitat requirements). Please provide justification as to why facilities are included in the study area.</p>	Surveys for RTE plants will be conducted where Project reservoir management and O&M activities have a reasonable potential to affect plant communities that could include RTE species. For built facilities a 50-ft buffer will be assessed for potentially suitable habitat for the RTE plant species. Areas beyond that distance would only be surveyed if field observations indicate high potential habitat occurs where the Project could reasonably affect them. City Light does not manage lands or many of the recreation facilities that happen to be within FERC Project Boundary.
10.	Shauna Hee (USFS)	05/15/2020	Section 2.5.1 Study Area	As the reservoir fluctuation zones likely have suitable habitat for RTE species, please provide a full description of the sites or areas that are included in the study area. If the example provided is indeed the study area - 10-ft above and below max water surface - then provide references and justification as to why impacts from reservoir water fluctuation to shoreline vegetation is restricted to 10-feet from full pool.	The elevational range 10 ft above and below the normal maximum water surface elevation was selected as a reasonable range for potential effects in the reservoir fluctuation zone. If effects from Project shoreline erosion treatment extend beyond 10 ft, that area would be included. In addition, it is unlikely that plants will be growing 10 ft below full pool. However, habitats and locations to be surveyed for RTE species will be shared with the TRREWG before surveys begin.
11.	Shauna Hee (USFS)	05/21/2020	Section 2.5.1 Study Area	Please include project trails plus a buffer.	Project-related trails including Ladder Creek Falls Trail and Gardens and Trail of the Cedars, as well as trails maintained by City Light for O&M purposes are included in the study area. These areas will be included, as applicable, with habitats and locations to be surveyed for

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					RTE species as described in response to Comments #9 and #10
12.	Shauna Hee (USFS)	05/21/2020	Section 2.5.1 Study Area	How did you come up with the 50-foot buffer? Please cite references and provide an explanation.	The 50-ft buffer distance is a reasonable assumption for the effects of Project facilities and roads for the purpose of a RTE Plants Study. USFS publication Backcountry Road Maintenance and Weed Management (Ferguson, Leslie; Duncan, Celestine Lacey; Snodgrass, Kathleen. 2003. Backcountry Road Maintenance and Weed Management. 0371 2811P. Missoula, MT: U.S. Department of Agriculture, Forest Service, Missoula Technology and Development Center. 22 p.) indicates a declining effect from roads and associated maintenance after 50 ft from the source.
13.	Shauna Hee (USFS)	05/15/2020	Section 2.5.1 Study Area	Please include dispersed recreation sites within the project area or provide justification as to how dispersed recreation is not considered a project related recreation use.	<p>Project-related recreation sites have been included in the study area.</p> <p>Dispersed recreation sites are administered by National Park Service. While these facilities are located within the FERC Project boundary, they are not Project recreation facilities and City Light does not operate or maintain these facilities.</p> <p>The Project provides a variety of Project recreation facilities and opportunities, primarily at Diablo Lake, Gorge Lake, and the town of Newhalem, where City Light has provided public access and recreation opportunities dating back prior to the development of the NCNP and RLNRA. The development of non-Project recreation facilities and the larger NCNP and RLNRA are not a result of demand for recreation related to the Project or a change in Project operations.</p>

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					Rather, the increased recreation demand of the non-Project NPS recreation sites and facilities is a result of the development of a much larger, broader NCNP and RLNRA that dwarf the FERC Project, which was in place at the time of the Park's establishment and exceed City Light's requirements related to the Project.
14.	Shauna Hee (USFS)	05/21/2020	Section 2.6.1 Step 1 – Develop Target RTE Species List	The Vegetation Mapping effort is too coarse a filter for suitable habitat. The NPS Association delineation should be used for a rough habitat suitability analysis.	City Light has access to the NPS Alliance-level mapping for the study area within the NCNP, including reservoirs and Project facilities, and part of the transmission line right-of-way. All other areas will be mapped at the Group level. Field data will be collected to train the vegetation model and to collect reconnaissance level data on the shrub layer. Supplemental information on typical vegetation associations will be derived from standard publications such as the NPS mapping effort, Franklin and Dyrness (1973. Natural vegetation of Oregon and Washington. Gen. Tech. Rep. PNW-GTR-008. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 427 p.), and other available documents. City Light is confident that these combined efforts will allow for accurate determination of potential RTE plant habitat as matched up with species descriptions and vegetation associations.
15.	Shauna Hee (USFS)	05/21/2020	Section 2.6.1 Step 1 – Develop Target RTE Species List	Describe methods that would be used to generate or delineate potential suitable habitat. Cite references.	Multiple data sources will be used to match RTE plant potential occurrence areas with the vegetation mapping effort. These include species accounts from the USFS available on the Interagency Special Status / Sensitive Species Program website, the Oregon Flora Project, Natural Heritage accounts, discussions with experts, and other available sources.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					Interagency Special Status / Sensitive Species Program. https://www.fs.fed.us/r6/sfpnw/issssp/ Oregon Flora Project. 2020. http://www.oregonflora.org/index.php https://www.dnr.wa.gov/NHPlists
16.	Shauna Hee (USFS)	05/15/2020	Section 2.6.2 Determine Survey Areas	How much of the study area will be surveyed for RTE species? 25% 50% 100%?	City Light will survey for RTE plants where Project activities occur in locations with known RTE occurrences or with potentially suitable habitat for RTE plants. Habitats for the target species list will be overlaid with the study area to determine these survey locations. Habitats and locations to be surveyed for RTE species will be shared with the TRREWG before surveys begin. There is no predetermined percent of the overall study area.
17.	Shauna Hee (USFS)	05/21/2020	Section 2.6.2 Determine Survey Areas	Why are locations in which project activities occur the only sites where surveys would occur? What are examples of project activities? Please provide justification.	Surveys for RTE plants will be conducted where Project reservoir management and O&M activities have a reasonable potential to affect plant communities that could include RTE species. For built facilities a 50-ft buffer will be assessed for potentially suitable habitat for the RTE plant species. Areas beyond that distance would only be surveyed if field observations indicate high potential habitat occurs where the Project could reasonably affect them. The goal of this study is to provide information to determine whether and the extent to which certain Project O&M activities adversely affect RTE plant species and define PME measures to protect the species. Examples of Project

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					activities are listed in Sections 2.4 and 2.5 of the Study Plan.
18.	Shauna Hee (USFS)	05/15/2020	Section 2.6.2 Determine Survey Areas	How will field sites be prioritized based on habitat requirements? Please cite references and provide justification on how this is an acceptable method. Why would field sites not be prioritized on the likelihood of greatest impact to suitable habitat and potential loss or RTE species?	Locations will be surveyed if specific habitat requirements of one or more RTE species are present. Habitat requirements will be used to select field locations for survey. Field sites initially will be determined based on potential for effects by Project activities – the intersection between potential effects and potential suitable habitat. Habitats and locations to be surveyed for RTE species will be shared with the TRREWG before surveys begin. If LPs have additional direction for selecting survey sites that are affected by Project City Light would appreciate the information. Also refer to the response to Comment #15.
19.	Judy Niebauer (USFWS)	05/22/2020	Section 2.6.4 Step 4 - Conduct Field Surveys	Please include a map of potential RTE areas outside of project boundary to be able to determine if there are key connectivity corridors for increasing populations on lands within the project boundary or on nearby adjacent lands.	Mapping potential RTE plants habitats outside of the Project Boundary or potential for connectivity is beyond the scope of this study.
20.	Shauna Hee (USFS)	05/21/2020	Section 2.6.4 Step 4 - Conduct Field Surveys	Why is an Oregon field guide proposed for use in NW WA State?	The Oregon Flora Project Rare Plant Guide would be used as a supplemental resource to facilitate proper plant identification and nomenclature. The intent is not to supplant Washington-oriented lists or resources.
21.	Shauna Hee (USFS)	05/15/2020	Section 2.6.4 Step 4 - Conduct Field Surveys	How much of the field site would receive an intense survey? At least 50%?	The extent of intensive survey would depend on the quality of the habitat based on professional judgment of the surveyors. This will vary with the specific conditions found in the field.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
22.	Stacy McDonough (NPS)	05/20/2020	Section 2.6.4 Step 4 - Conduct Field Surveys	We need to ensure the timing of surveys is ensures that identification is possible especially for plants for which identification is dependent upon characteristics they may be sort lived, or only occurring in specific phenological stage.	A flowering matrix will be developed for the target species list, and survey timing will be planned based on when the species will be detectable and identifiable, typically during their flowering or fruiting phases, and based on herbarium collection dates.
23.	Shauna Hee (USFS)	05/21/2020	Section 2.6.4 Step 4 - Conduct Field Surveys	How does general habitat type crosswalk with the Veg Mapping and wetland studies? Habitat type within the Park should conform to their Alliance or Association delineation as it is the best available science.	City Light will include a direct crosswalk from Vegetation Mapping and Wetland Assessment studies.
24.	Shauna Hee (USFS)	05/21/2020	Section 2.6.4 Step 4 - Conduct Field Surveys	A list of associated species should be recorded to help describe the microsite conditions that would be needed to maintain the population.	Such information will be collected and will be part of the electronic datasheet used for the study. In addition, a general incidental observation data form will be used during fieldwork for all studies to collect information on observations, including those not necessarily connected to this RTE Plants Study.
25.	Shauna Hee (USFS)	05/21/2020	Section 2.6.4 Step 4 - Conduct Field Surveys	Please include collection of voucher specimens per NPS collection and vouchering policy. The collection of voucher specimens would allow the verification of the proposed species ID. All identifications made in the field would need verification by an expert.	<p>City Light will collect voucher specimens for species that are unusual or unidentifiable in the field. Field staff will be trained in rare plant identification skill.</p> <p>On NPS land, City Light will follow NPS guidance on collecting any voucher specimens. City Light will defer to USFS guidance on their land. On all other land we will follow WA Natural Heritage and Native Plant Society guidance on voucher specimens.</p> <p>The RTE Plants Study will be led by a botanist experienced in plant taxonomy of rare species and with extensive Pacific Northwest survey experience. Prior to fieldwork one of the identified steps is visiting the University of</p>

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					Washington herbarium to review any problematic species.
26.	Shauna Hee (USFS)	05/21/2020	Section 2.6.4 Step 4 - Conduct Field Surveys	How is a population being defined? What about sub-populations? What is the minimum mapping distance?	<p>In general terms we are using a standard definition of a plant population for all individuals in one location that are close enough for genetic exchange. If there are “subpopulations” further from one another but still within the area of Project influence, they will be surveyed.</p> <p>If what is meant by “minimum mapping distance” is the minimum mapping unit for the RTE Plants Study, then the vegetation mapping minimal unit is about 18 sq. m. Minimum pixel size is 9 sq. m, so any plant occurrence polygons smaller than 9 sq. m will be indicated as a point. There is a longer technical explanation of why predictor models used for the vegetation mapping results in a minimum mapping unit larger than the minimum pixel size.</p>
27.	Stacy McDonough (NPS)	05/20/2020	Section 2.6.4 Step 4 - Conduct Field Surveys	need to determine how this data will be protected in accordance with NPS requirements	<p>City Light will follow guidelines to protect confidential information.</p> <p>As stated in the study plan, confidential information will be marked “confidential” and sharing will be restricted to distribution to agencies and tribes. Documents shared with the public will have confidential rare plant population information removed.</p>
28.	Shauna Hee (USFS)	05/21/2020	Section 2.6.4 Step 4 - Conduct Field Surveys	You could use imagery instead of photos. Also - I find bare ground lidar really helpful for delineating locations when GPS accuracy is very very low.	City Light appreciates the information.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
29.	Judy Niebauer (USFWS)	05/22/2020	Section 2.6.6 Step 6 – Threats Assessment	Provide a connectivity assessment to see if there are key locations adjacent to project boundary that could help develop conservation sites within the project boundary or visa versa. Understanding if the project intersects key connectivity areas will provide another level of effects analysis, as well as provide for understanding if there are opportunities for future conservation.	See response to Comment #19.
30.	Shauna Hee (USFS)	05/21/2020	Section 2.8 Schedule	I would expect most field work to occur from June-August. Please provide an explanation of why surveys may occur as early as April and as late as November.	The study area covers a large area, including the transmission line right-of-way (where vegetation management occurs); the extent of survey season includes surveys for the extent of the study area.
31.	Shauna Hee (USFS)	05/21/2020	Section 2.9 Level of Effort and Cost	Why is the cost for the RTE study higher than the Invasive Plant study? I would assume that it would be significantly lower since the likelihood of documenting sites is lower.	RTE plants, because of more specialized habitat requirements and sporadic occurrence over the landscape, will take more intensive field time than the weed survey. In addition, because of differences in blooming time across the season and the associated logistics, the RTE Plants Study may spill into a second year of survey.

**TR-04 INVASIVE PLANTS
REVISED STUDY PLAN**

**SKAGIT RIVER HYDROELECTRIC PROJECT
FERC NO. 553**

Seattle City Light

**April 2021
RSP**

TABLE OF CONTENTS

Section No.	Description	Page No.
1.0	Introduction.....	1-1
1.1	General Description of the Project.....	1-1
1.2	Relicensing Process	1-1
1.3	Study Plan Development.....	1-2
2.0	Study Plan Elements	2-1
2.1	Study Goals and Objectives	2-1
2.2	Resource Management Goals	2-1
2.3	Background and Existing Information.....	2-2
2.4	Project Operations and Effects on Resources	2-6
2.5	Study Area	2-7
2.5.1	Study Area	2-7
2.5.2	General Concepts	2-7
2.6	Methodology	2-12
2.6.1	Step 1 – Compile Information and Develop Target Species List	2-12
2.6.1.1	Compile and Review Existing Information	2-12
2.6.1.2	Develop Target Invasive Plant Species List	2-13
2.6.2	Step 2 – Prioritize Survey Locations	2-13
2.6.3	Step 3 – Gather Data and Prepare for Field Efforts	2-14
2.6.4	Step 4 – Conduct Field Surveys.....	2-14
2.6.5	Step 5 – Process Data and Provide Data QA/QC	2-16
2.6.6	Step 6 – Prepare Report	2-16
2.7	Consistency with Generally Accepted Scientific Practice.....	2-16
2.8	Schedule.....	2-16
2.9	Level of Effort and Cost	2-16
3.0	References	3-1

List of Figures

Figure No.	Description	Page No.
Figure 2.5-1.	Location map of the Skagit River Project, including study areas associated with transmission line right of way and fish and wildlife mitigation lands.....	2-8
Figure 2.5-2.	Study area associated with reservoir shorelines.....	2-9
Figure 2.5-3.	Study area associated with recreation facilities at and around Diablo and Gorge lakes.....	2-10
Figure 2.5-4.	Study area associated with recreation facilities at and around Newhalem.	2-11

List of Tables

Table No.	Description	Page No.
Table 2.3-1.	County-designated weed species in Whatcom, Skagit, and Snohomish counties known or suspected to occur within/near the Project vicinity.....	2-3
Table 2.3-2.	Highest Priority non-native plant species observed in RLNRA.	2-4
Table 2.3-3.	Invasive ¹ species documented in the portion of the Project Boundary within the RLNRA (2016-2018).	2-5

List of Attachments

Attachment A	City Light Responses to LP Comments on the Study Plan Prior to PSP
--------------	--

List of Acronyms and Abbreviations

Board.....	State of Washington Noxious Weed Control Board
City Light.....	Seattle City Light
EA	Environmental Assessment
ELC	Environmental Learning Center
FERC.....	Federal Energy Regulatory Commission
Forest Plan	Mt. Baker-Snoqualmie National Forest Land and Resource Management Plan
GIS	Geographic Information System
GPS	Global Positioning System
ISR	Initial Study Report
LP	licensing participant
NISIMS	National Invasive Species Information Management System
NPS	National Park Service
O&M.....	operations and maintenance
PAD.....	Pre-Application Document
PRM.....	Project River Mile
Project	Skagit River Hydroelectric Project
PSP	Proposed Study Plan
QA/QC	quality assurance/quality control
RLNRA	Ross Lake National Recreation Area
ROW	right-of-way
RSP	Revised Study Plan
RWG	Resource Work Group
SR.....	State Route
TRREWG.....	Terrestrial Resources and Reservoir Erosion Work Group
U.S.C.....	United States Code
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WDFW	Washington Department of Fish and Wildlife

1.0 INTRODUCTION

1.1 General Description of the Project

The Skagit River Hydroelectric Project (Project), licensed to The City of Seattle, Washington, and operated through its publicly-owned electric power utility Seattle City Light (City Light), is located in northern Washington State and consists of three power generating developments on the Skagit River – Ross, Diablo, and Gorge – and associated lands and facilities. The Project generating facilities are in the Cascade Mountains of the upper Skagit River watershed, between Project River Miles (PRM) 94.7 and 127.9 (U.S. Geological Survey [USGS] RMs 94.2 and 127).¹ Power from the Project is transmitted via two 230-kilovolt 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, an Environmental Learning Center (ELC), several recreation facilities, and several parcels of fish and wildlife mitigation lands.

Project generating facilities are all located in Whatcom County, although Ross Lake, the most upstream reservoir, crosses the U.S.-Canada border and extends for about one mile into British Columbia at normal maximum water surface elevation. Gorge Powerhouse, the most downstream facility, is approximately 120 miles northeast of Seattle and 60 miles east of Sedro-Woolley, the nearest large town. The closest town is Newhalem, which is part of the Project and just downstream of Gorge Powerhouse. The primary transmission lines cross Whatcom, Skagit, and Snohomish counties; the fish and wildlife mitigation lands are in the same counties.

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, Diablo, and Gorge lakes.” The legislation maintains the Federal Energy Regulatory Commission’s (FERC) 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).

1.2 Relicensing Process

The current FERC license for the Project expires on April 30, 2025, and City Light will apply for a new license no later than April 30, 2023. City Light formally initiated the relicensing process by filing a Notice of Intent and Pre-Application Document (PAD) with FERC by April 27, 2020 (City Light 2020a). The PAD includes descriptions of the Project facilities, operations, license

¹ 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 Project River Mile (PRM) system are provided throughout this document. For further details see Section 7.0 of the main body RSP.

requirements, and Project lands as well as a summary of the extensive existing information available on Project area resources and early consultation on potential resource issues to be addressed during the relicensing. The PAD also includes an outline of the goals and objectives of this study.

In 2019-2020, City Light convened a series of Resource Work Groups (RWG) to engage agencies and other licensing participants (LP) in the Study Plan Development Process. Discussions with LPs continued in early 2021 with a series of topic-based discussions following filing of the Proposed Study Plan (PSP) on December 8, 2020 (City Light 2020b). This study plan reflects RWG and LP discussion and study requests and comments submitted by LPs.

1.3 Study Plan Development

This study plan was developed for the purpose of mapping and summarizing the extent of occurrence of a target list of invasive plant species and likely vectors for their distribution within the study area. This study is designed to address Terrestrial Issue 10 (TE10: Invasive Plant Survey) that identifies that Project-related activities (operations and maintenance [O&M], and Project-related recreation) may contribute to the introduction and spread of invasive plants.

On April 24, 2020, City Light released the TR-04 Invasive Plants Draft Study Plan for LP review and comment. On May 6, 2020, the draft study plan was discussed at a Terrestrial Resources and Reservoir Erosion Work Group (TRREWG) meeting. City Light reviewed all comments received and released a revised version of the draft study plan on June 12, 2020. The revised draft was discussed on June 23, 2020 at a TRREWG meeting. Written comments were received from Washington Department of Fish and Wildlife (WDFW), U.S. Fish and Wildlife Service (USFWS), NPS, and U.S. Forest Service (USFS). A Status Draft of the study plan was provided to LPs on August 6, 2020.

City Light is filing this study plan with FERC as part of its Revised Study Plan (RSP), an update to the version that was filed with the PSP and incorporating additional consultation with LPs prior to the filing date. No formal study requests related to this study were filed with FERC. However, this study will provide information requested as part of the SSIT-03 Impacts of Transmission Line Right of Way (ROW) on Aquatic Habitat and Riparian Zone for the Skagit River Hydroelectric Project study request, as explained in Section 6 of the RSP.

PSP comments to this study plan were submitted by the Stillaguamish Tribe of Indians. City Light has responded to comments in the PSP comment/response table appended to the main body of the RSP. In response to comments, City Light added a dataset to the list of existing information to be reviewed and a clarifying bullet point to the list of survey locations.

2.0 STUDY PLAN ELEMENTS

2.1 Study Goals and Objectives

The goal of the invasive plants study is to document occurrences of a target list of plant species designated as invasive², which could potentially be spread by Project O&M and Project-related recreation activities, and to assess effects. Specific objectives of this study are as follows:

- Develop a target list of invasive species that have the potential to cause significant ecological or economic damage within the study area.
- Identify locations within the study area where there are Project-related disturbance and pathways for invasive species dispersal.
- Develop a map depicting invasive species locations, based on existing data and field verification.
- Describe the status, distribution, likely vectors, and limiting factors for target invasive plant species.

2.2 Resource Management Goals

City Light's goal is to have invasive plant mapping data and provide basic information to the LPs necessary to meet their regulatory mandates within the FERC relicensing process.

The study will provide information to help resource agencies and Indian tribes with jurisdiction in the Project vicinity identify appropriate recommendations and conditions for the new Project license pursuant to their respective goals and authorities for resource management.

Management goals related to invasive plants are described below.

- U.S. Forest Service (USFS)

USFS controls the spread of noxious weeds on National Forest System land in compliance with the objectives, standards, and guidelines of the Mt. Baker-Snoqualmie National Forest Land and Resource Management Plan (Forest Plan) (USFS 1990, as amended), as well as federal law and direction. In 2005, an Environmental Assessment (EA) and corresponding decision notice on invasive plant control were issued for the Mt. Baker-Snoqualmie National Forest. Region 6 provides guidance in the Pacific Northwest Region's Invasive Plant Program Record of Decision

Amendments include the 2016 ROD for Invasive Plant Treatment on the MBS, 2005 Determination of Non-significance (DN) for Treatment of Invasive Plants on the MBS, 2005 Record of Decision Preventing and Managing Invasive Plants, and the 1999 DN Forest-Wide Noxious Weed Management.

² Control is required for all Class A and Class B-designate species by the Washington State Noxious Weed Control Board and by County Noxious Weed Control Boards if their designation is different from the State designation.

- National Park Service (NPS)

The following goals were identified in the North Cascades National Park Service Complex Invasive Non-Native Plant Management Environmental Assessment (NPS 2011):

- Prevent new invasive species from entering the park and prevent the spread of existing invasive species;
- Conduct a comprehensive inventory of invasive plants in the park and monitor known populations;
- Create management priorities based on the invasive plant occurrences' ability to affect natural systems;
- Restore treated areas as quickly as possible; and
- Use outreach, education, and cooperation to increase understanding of the prevention and control of invasive plants.

- Washington State Noxious Weed Control Board (Board).

The Board is responsible for the designation and management of invasive plants, in cooperation with County Noxious Weed Control Boards (Board 2020).

- County Noxious Weed Control Boards.

Each County containing the Project has a Noxious Weed Control Board that designates rankings to manage invasive plants in conjunction with the Board (Skagit County 2020; Snohomish County 2020; Whatcom County 2020).

2.3 Background and Existing Information

Information about invasive plant species in the Project is covered in detail in Section 4.6.3 of the PAD (City Light 2020). For the purpose of this study plan, invasive plant species are those listed in the PAD which are:

- Washington State-designated noxious weeds (Washington State Noxious Weed Control Board 2020);
- County-designated noxious weeds (Skagit County 2020; Whatcom County 2020; Snohomish County 2020);
- NPS-designated highest priority species (NPS 2011); and
- Specific species identified as targeted concerns during the 2019 Study Plan Development Process, including traveler's joy (*Clematis vitalba*), reed canarygrass³ (*Phalaris arundinacea*), Japanese knotweed (*Polygonum cuspidatum*), and sycamore maple (*Acer pseudoplatanus*).

³ Note that reed canarygrass populations in the study area may be native, non-native, or intraspecific hybrid, based on herbarium records (Consortium of Pacific Northwest Herbaria Specimen Database 2020) and recent genetic studies (Merigliano and Lesica 1998, Jakubowski et al. 2013).

County-designated weed species are listed in Table 2.3-1.

Table 2.3-1. County-designated weed species in Whatcom, Skagit, and Snohomish counties known or suspected to occur within/near the Project vicinity.

Scientific Name	Common Name	Designation ¹			
		State	Skagit	Whatcom	Snohomish
<i>Artemisia absinthium</i>	absinthe	C	C	-	-
<i>Buddleja davidii</i>	orange-eye butterfly bush	B	B-no con.	B-sel.	-
<i>Centaurea stoebe</i>	knapweed, spotted	B	B-des.	B-sel.	B-des.
<i>Cirsium arvense</i>	thistle, Canada	C	C	C	-
<i>Cirsium vulgare</i>	thistle, bull	C	C	C	-
<i>Clematis orientalis</i>	Oriental clematis	A	A	A	A
<i>Clematis vitalba</i>	traveler's joy	C	C	C	-
<i>Convolvulus arvensis</i>	field bindweed	C	C	-	-
<i>Crataegus monogyna</i>	English hawthorn	C	C	C	C
<i>Cytisus scoparius</i>	Scot's broom	B	B-no con.	B-sel.	-
<i>Daucus carota</i>	wild carrot (except where commercially grown)	C	C	-	-
<i>Dipsacus fullonum</i>	common teasel	C	C	-	-
<i>Epilobium hirsutum</i>	fiddle grass	B	B-des.	B-sel.	B-des.
<i>Euphorbia oblongata</i>	balkan spurge	A	A	A	A
<i>Fallopia x bohemica</i>	knotweed, bohemian	B	B-sel.	B-sel.	B-sel.
<i>Fallopia japonica</i>	knotweed, Japanese	B	B-sel.	B-des.	B-sel.
<i>Fallopia sachalinensis</i>	knotweed, giant	B	B-des.	B-des.	B-sel.
<i>Geranium robertianum</i>	herbrobert	B	B-no con.	B-sel.	-
<i>Hedera helix</i> 'Baltica', 'Pittsburgh', and 'Star'; <i>H. hibernica</i> 'Hibernica'	English ivy (four cultivars only)	C	C	C	-
<i>Hypericum perforatum</i>	common St. Johnswort	C	C	C	-
<i>Impatiens glandulifera</i>	policeman's helmet	B	B-des.	B-sel.	B-des.
<i>Iris pseudacorus</i>	pale yellow iris	C	C	C	-
<i>Jacobaea vulgaris</i>	tansy ragwort	C	B-sel.	B-sel.	B-sel.
<i>Lamium galeobdolon</i>	yellow archangel	B	B-des.	B-des.	-
<i>Leucanthemum vulgare</i>	oxeye daisy	C	C	-	-
<i>Linaria dalmatica</i> ssp. <i>dalmatica</i>	Dalmatian toadflax	B	B-des.	B-des.	B-des.
<i>Persicaria wallichii</i>	knotweed, Himalayan	B	B-des.	B-des.	B
<i>Phalaris arundinacea</i>	reed canarygrass	C	C	C	-
<i>Potentilla recta</i>	sulphur cinquefoil	B	-	B-des.	B
<i>Rhaponticum repens</i>	knapweed, Russian	B	B-des.	B-des.	B-des.
<i>Rubus armeniacus</i>	Blackberry, Himalayan	C	C	C	-
<i>Rubus laciniatus</i>	Blackberry, evergreen	C	C	C	-
<i>Sonchus arvensis</i> ssp. <i>arvensis</i>	perennial sowthistle	C	C	-	-
<i>Tanacetum vulgare</i>	common tansy	C	C	C	-

Source: Board 2020; Skagit County 2020; Whatcom County 2020; Snohomish County 2020.

1 no con. = no control, des. = designated, sel. = selected.

Additionally, the NPS has designated species that have spread beyond historic cultivation in Newhalem and select other non-native species as “Highest Priority Species” (NPS 2011). A list of these species is included in Table 2.3-2.

Table 2.3-2. Highest Priority non-native plant species observed in RLNRA.

Scientific Name	Common Name
<i>Acer ginnala</i>	Amur maple
<i>Acer negundo</i>	Box elder
<i>Acer platanoides</i>	Norway maple
<i>Acer pseudoplatanus</i>	Sycamore maple
<i>Acer rubrum</i>	Red maple
<i>Acroptilon repens</i>	Russian knapweed
<i>Aesculus hippocastanum</i>	Horse chestnut
<i>Arctim lappa</i>	Greater burdock
<i>Cytisus scoparius</i>	Scot’s broom
<i>Ilex aquifolium</i>	English holly
<i>Juglans cinerea</i>	Butternut
<i>Juglans nigra</i>	Black walnut
<i>Linaria purpurea</i>	Purple toadflax
<i>Lunaria annua</i>	Annual honesty
<i>Prunus avium</i>	Wild cherry
<i>Prunus cerasifera</i>	Thundercloud plum
<i>Prunus domestica</i>	Domestic cherry
<i>Prunus laurocerasus</i>	Cherry laurel
<i>Robinia pseudoacacia</i>	Bristly locust
<i>Sorbus aucuparia</i>	European mountain ash
<i>Verbascum thapsus</i>	Common mullein
<i>Vinca minor</i>	Small-leave periwinkle

Source: NPS 2011.

Invasive species documented during surveys within the North Cascades National Park Complex, townsites, the State Route (SR) 20 corridor, and transmission line right-of-way (ROW) are included in Table 2.3-3.

Table 2.3-3. Invasive¹ species documented in the portion of the Project Boundary within the RLNRA (2016-2018).

Scientific Name ²	Common Name ²	Location Observed				
		Diablo	Newhalem	SR 20	Transmission Line	Ross Lake
<i>Acer negundo</i>	box elder		X			
<i>Acer pseudoplatanus</i>	sycamore maple	X	X			
<i>Aesculus hippocastanum</i>	horse chestnut		X			
<i>Aegopodium podagraria</i>	bishop's goutweed	X	X			
<i>Artemisia absinthium</i>	absinthe	X	X	X ⁵		
<i>Arctium lappa</i>	greater burdock	X				
<i>Bromus arvensis</i>	field brome		X			
<i>Brassica sp.</i>	mustard		X			
<i>Bromus inermis</i>	smooth brome	X				
<i>Campanula rapunculoides</i>	creeping bellflower		X			
<i>Centaurea stoebe</i>	spotted knapweed		X	X		
<i>Chenopodium album</i>	lambsquarters					
<i>Cirsium arvense</i>	Canada thistle	X		X		X ⁵
<i>Cirsium vulgare</i>	bull thistle		X	X ⁵		
<i>Clematis vitalba</i>	traveler's joy		X	X		
<i>Convolvulus arvensis</i>	field bindweed	X		X ⁵		
<i>Conium maculatum</i>	Poison-hemlock					
<i>Crataegus monogyna</i>	One-seed hawthorn	X	X			
<i>Cytisus scoparius</i>	Scot's broom		X	X ⁵	X	
<i>Dactylis glomerata</i>	Orchard grass					
<i>Digitalis purpurea</i>	purple foxglove	X	X	X		
<i>Erysimum cheiranthoides</i>	wormseed wallflower		X			
<i>Euphorbia oblongata</i> ³	spurge, balkan	X				
<i>Euphorbia peplus</i> ³	spurge, petty		X			
<i>Fagus sylvatica</i>	European beech		X			
<i>Fallopia japonica</i>	knotweed, Japanese			X		
<i>Geranium lucidum</i>	shining cranes-bill					
<i>Geranium robertianum</i>	herbrobert		X	X		
<i>Hedera helix</i>	English ivy	X ⁵	X			
<i>Hesperis matronalis</i>	Dame's rocket	X	X	X ⁵		
<i>Hieracium caespitosum</i>	hawkweed, meadow			X		
<i>Hieracium floribundum</i>	hawkweed, flowery			X		
<i>Hypericum perforatum</i>	common St. Johnswort	X	X	X ⁵	X	
<i>Ilex aquifolium</i>	English holly					
<i>Impatiens glandulifera</i>	policeman's helmet			X ⁵	X	
<i>Juglans nigra</i>	black walnut		X			
<i>Lapsana communis</i>	common nipplewort	X	X	X ⁵		
<i>Lathyrus latifolius</i>	everlasting-pea			X		

Scientific Name ²	Common Name ²	Location Observed				
		Diablo	Newhalem	SR 20	Transmission Line	Ross Lake
<i>Leucanthemum vulgare</i>	oxeye daisy	X	X	X		
<i>Linaria dalmatica</i> ssp. <i>dalmatica</i>	Dalmatian toadflax	X	X	X		
<i>Melilotus officinalis</i>	yellow sweet-clover	X	X ⁵	X ⁵		
<i>Mycelis muralis</i>	wall lettuce	X	X ⁵	X ⁵		X ⁵
<i>Phalaris arundinacea</i>	reed canarygrass				X	X ⁴
<i>Plantago lanceolata</i>	English plantain	X				
<i>Polygonum</i> sp.	knotweed	X				
<i>Potentilla recta</i>	sulphur cinquefoil			X		
<i>Prunus spinosa</i>	blackthorn	X				
<i>Robinia hispida</i>	bristly locust		X			
<i>Robinia pseudoacacia</i>	black locust	X	X		X ⁵	
<i>Rumex acetosella</i>	common sheep sorrel	X	X ⁵	X ⁵		X ⁵
<i>Rubus armeniacus</i>	blackberry, Himalayan	X	X	X	X	
<i>Rubus laciniatus</i>	blackberry, cutleaf		X		X	
<i>Rumex crispus</i>	curly dock	X	X	X ⁵		
<i>Silene vulgaris</i>	bladder campion		X			
<i>Sonchus arvensis</i>	field sow-thistle	X	X	X ⁵		
<i>Sonchus asper</i>	Spiny leaf sow thistle		X			
<i>Sorbus aucuparia</i>	European mountain ash		X			
<i>Tanacetum vulgare</i>	common tansy	X	X	X ⁵	X	X ⁵
<i>Verbascum thapsus</i>	great mullein	X	X	X		
<i>Vinca minor</i>	lesser periwinkle	X	X			

Source: NPS National Invasive Species Information Management System (NISIMS 2020) database unless otherwise noted.

- 1 This table includes species listed as “exotic” by the NPS which is defined as “those that occupy park lands as a result of deliberate or accidental human actions” (Rocheport et al. 2016).
- 2 Species names in bold are on the State NWCB list or listed as a “Priority Species” by NPS.
- 3 Source: Denovan 2019.
- 4 Source: McAvinchey et al. 2017; McAvinchey and Wilhoit 2019.
- 5 Source: Bivin 2020.

Additionally, traveler’s joy, reed canarygrass, Japanese knotweed, and sycamore maple were identified during the 2019 Study Plan Development Process as target species.

2.4 Project Operations and Effects on Resources

Certain aspects of Project-related recreation and O&M may increase the spread of invasive plant species. The spread could be the result of direct actions (i.e., ground disturbing activities such as vegetation management in the absence of best management practices) or indirect (i.e., caused by a Project activity in association with a non-Project activity, such as introduction of invasive species from a non-Project vector). Activities that could contribute to the spread of invasive plant species are described in more detail in Section 4.6.7 of the PAD (City Light 2020).

2.5 Study Area

2.5.1 Study Area

The study area consists of the land within the Project Boundary and the shorebanks of the Skagit River to the confluence with the Sauk River. The study area is shown in Figures 2.5-1 through 2.5-4. Field survey locations will be prioritized to include areas where specific Project-related disturbance and pathways are known to occur. A detailed list of these areas is included in Section 2.6.6 of this study plan. However, observations of invasive species throughout the study area will be recorded.

2.5.2 General Concepts

These general concepts apply to the study:

- Personal safety is an important consideration of each fieldwork team. City Light and their consultants will perform the study in a safe manner.
- Field crews may make minor modifications in the field to adjust to and to accommodate actual field conditions and unforeseeable events. Any modifications made will be documented and reported in the study report.

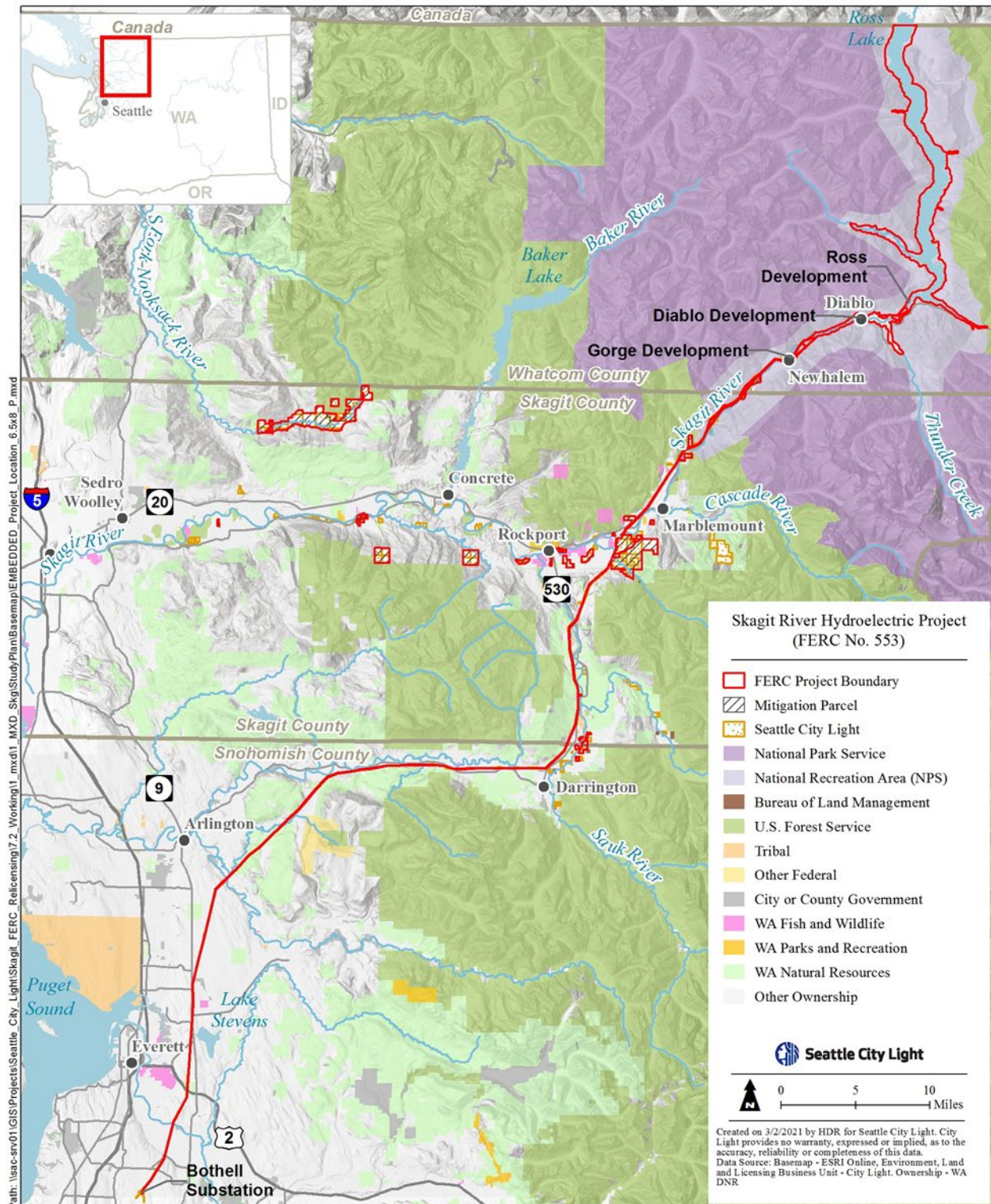


Figure 2.5-1. Location map of the Skagit River Project, including study areas associated with transmission line right of way and fish and wildlife mitigation lands.

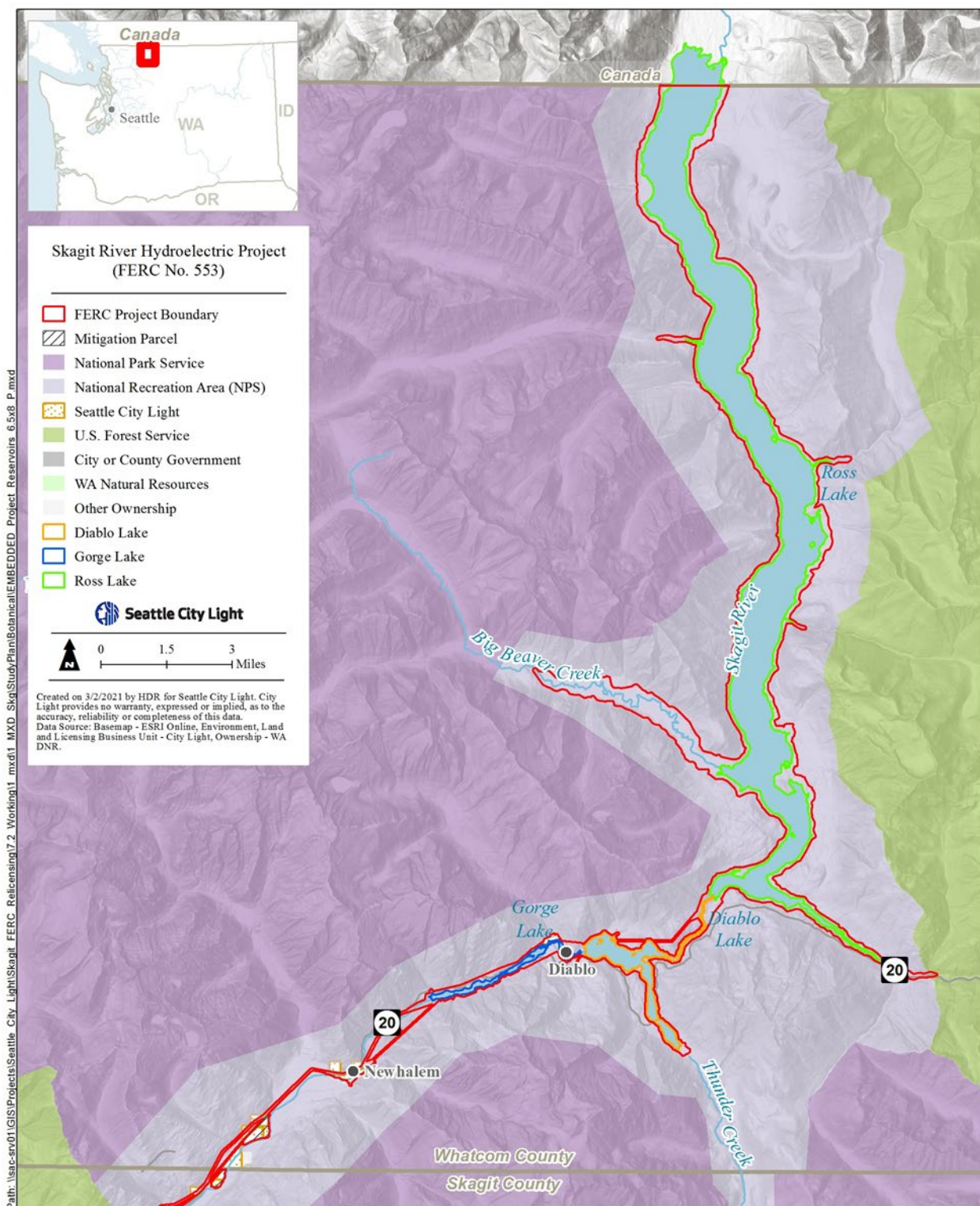


Figure 2.5-2. Study area associated with reservoir shorelines.

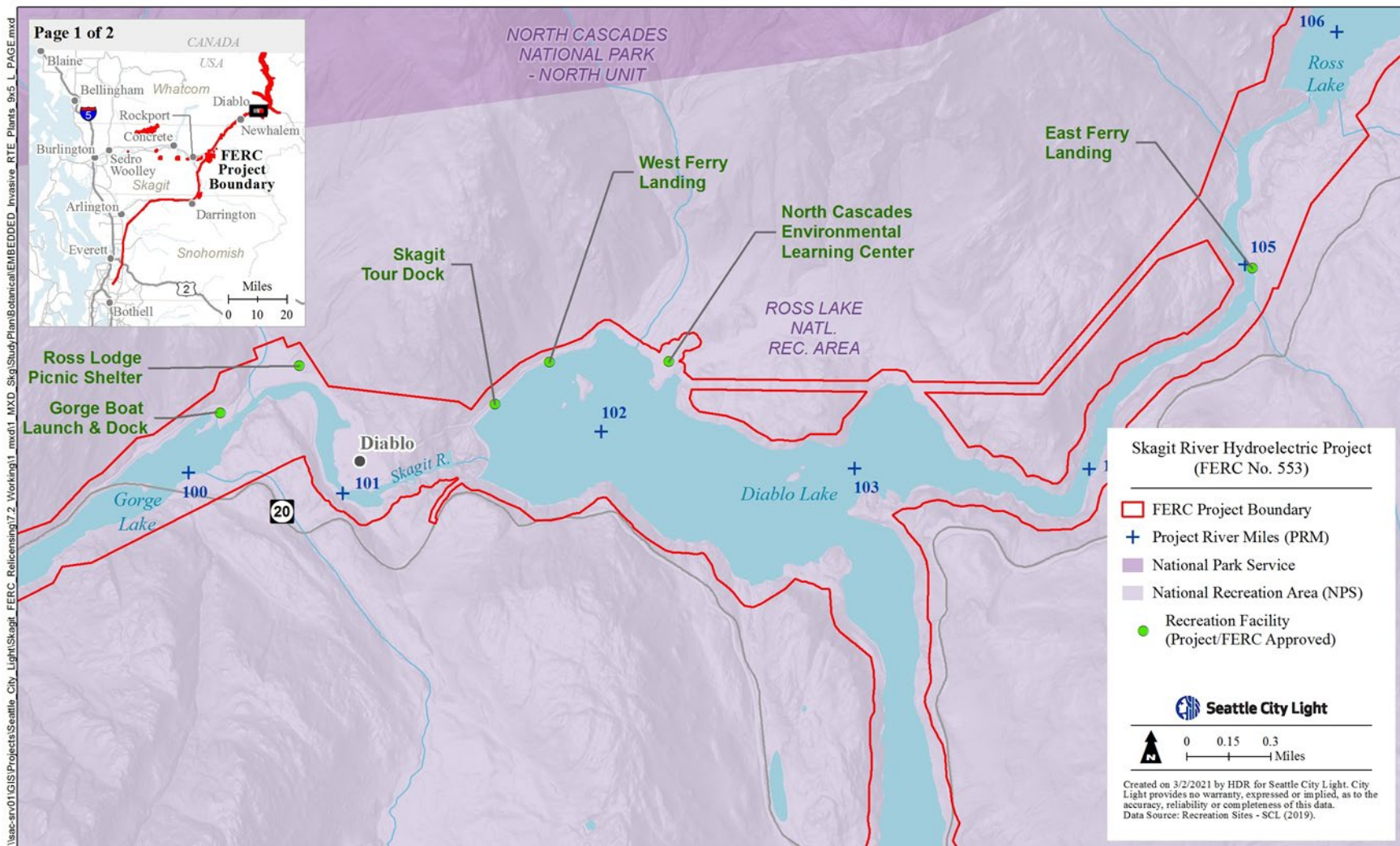


Figure 2.5-3. Study area associated with recreation facilities at and around Diablo and Diablo and Gorge lakes.

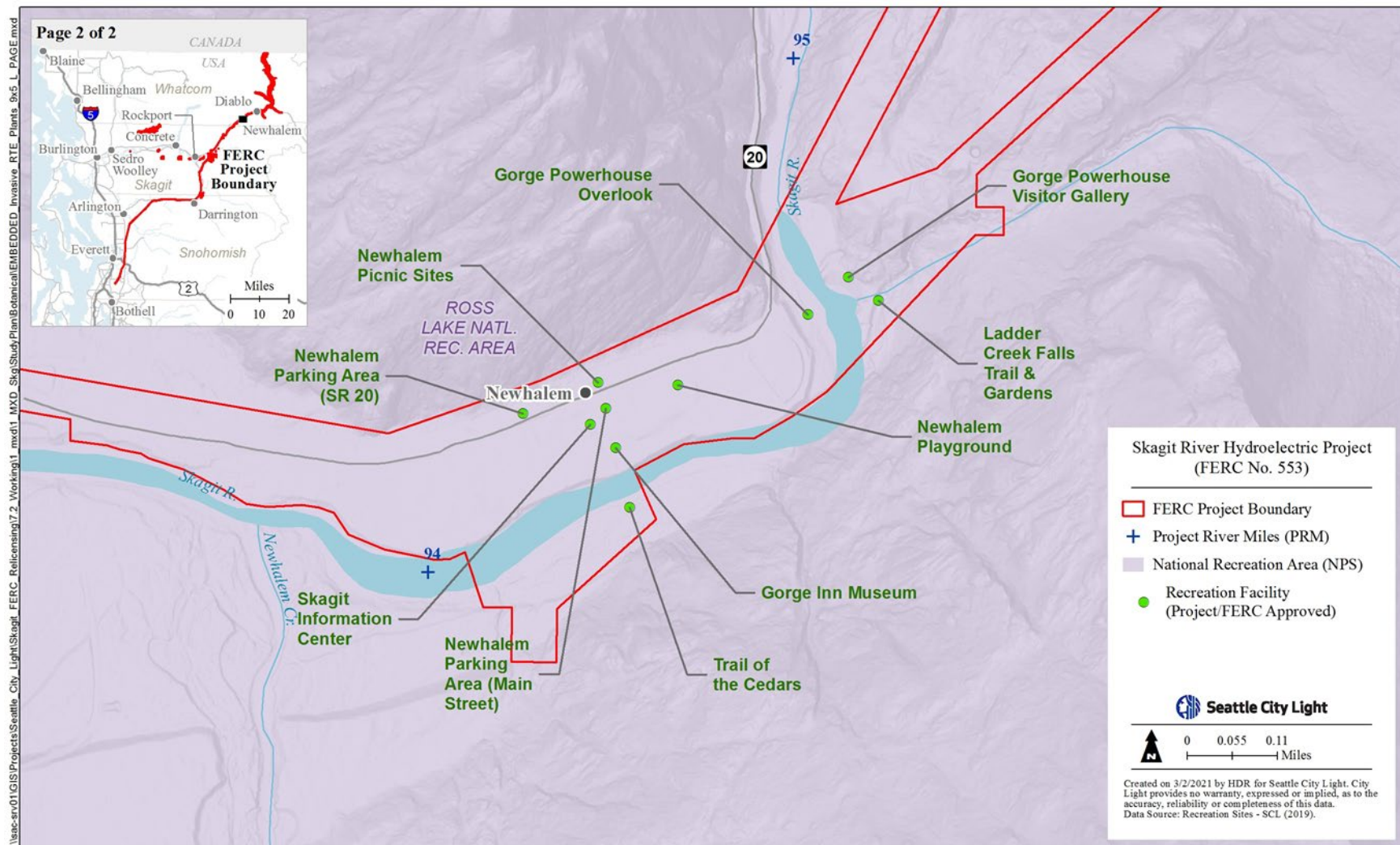


Figure 2.5-4. Study area associated with recreation facilities at and around Newhalem.

2.6 Methodology

The study will map target invasive plant species populations in the study area. Study methods will consist of the following steps: (1) compile and review existing information and develop target species list; (2) determine survey locations; (3) gather data and prepare for field effort; (4) conduct field surveys; (5) compile field collected data and provide quality assurance/quality control (QA/QC) of the data; and (6) prepare report. Each step is described below. It is expected that this study will be conducted concurrently with the Rare, Threatened, and Endangered Plant Study.

2.6.1 Step 1 – Compile Information and Develop Target Species List

Existing information regarding known and potentially occurring invasive plant species will be used to develop a target list of invasive plants.

2.6.1.1 Compile and Review Existing Information

Existing information on invasive plant occurrence in the study area will be compiled and reviewed including, but not limited to, the following:

- Aerial imagery of the study area;
- Information about potential invasive plant species occurrences from the Vegetation Mapping and Wetland Assessment studies;
- Skagit River Cooperative Weed Management Area – Upper Skagit Knotweed Control Program (Skagit Fisheries Enhancement Group 2019 Report; Miller 2020);
- Strategy for Invasive Plant Management and Habitat Restoration for Newhalem and Diablo 2016–2017 (City Light 2016a);
- Assessment of the Ecological Impacts of Non-Native Trees In and Around the Town of Newhalem, WA (City Light and Seattle University 2015);
- NPS reed canarygrass mapping in Big Beaver Valley (NPS unpublished data 2017–2020);
- Goodell Creek Fire, Weed Management Memo (City Light 2016b);
- Invasive Non-Native Plant Management, Environmental Assessment (NPS 2011);
- Exotic Plant Inventories in Mount Rainier, North Cascades, and Olympic National Parks (Rochefort 2016);
- Newhalem Riparian Restoration Project, Seattle City Light (Skagit Fisheries Enhancement Group 2015);
- North Cascades 2015 Fires Post-Fire Response Plan (NPS 2015);
- Ross Lake Invasive Weed Survey by Boat (NPS 2017) and treatment of targeted weeds using the Integrated Pest Management;
- Sycamore Maple Control Along the Skagit River Through Newhalem (City Light 2017);
- NISIMS weed mapping data for much of the Project Boundary (2020); and
- Available information on invasive plant species in Canada, as relevant to the Project.

2.6.1.2 Develop Target Invasive Plant Species List

Target invasive plant species will be defined in the following manner:

- Species listed as Class A or Class B weeds by the County Noxious Weed Boards of Skagit, Whatcom, and Snohomish counties;
- Highest Priority species identified by NPS as listed in the PAD (City Light 2020) in NPS managed lands; and
- Species identified as target species during the 2019 Study Plan Development Process (i.e., reed canarygrass, Japanese knotweed, traveler's joy, and sycamore maple).

If licensing participants recommend additional species, a valid assessment tool (e.g., Washington Invasive Species Council's (WISC) Invasive Species Impact and Prevention/Early Action Assessment Tool [WISC 2019] and Invasive Species Management Priorities grid [WISC 2017]) and existing information will be used to evaluate potential additions jointly with RWG to consider ecological and economic risks and control feasibility.

2.6.2 Step 2 – Prioritize Survey Locations

Surveys for invasive plant species will be conducted on lands within the study area identified as having potential Project-related disturbance or pathways due to Project O&M and Project-related recreational activities. Surveys will be conducted on City Light-owned lands and lands administered by federal, state, or local agencies.

Locations for surveys include (but are not limited to) the following areas of potential Project-related disturbance or pathways within the study area:

- Within and adjacent to the reservoir fluctuation zone and areas of known Project-related reservoir erosion management locations
- Tributary inlets and low gradient shorelines with wetlands along Project reservoirs
- Riparian margins of the Skagit River downstream of Gorge Dam to the Sauk River confluence
- Riparian areas within the transmission line ROW and 50-ft buffer
- Areas with active vegetation management in the transmission line ROW and within a 50-ft buffer
- Study roads and trails and within a 50-foot buffer
- Portions of fish and wildlife mitigation lands along riverbanks or affected by City Light, recreationists, or unauthorized activities
- Project facilities and within a 50-foot buffer
- Townsites and wildland interface
- Project recreation facilities and within a 50-foot buffer (details in Table 2.6-1 of the Recreation Use and Facility Assessment Study Plan), including:
 - Skagit Tour Dock

- West Ferry Landing (parking and dock)
- East Ferry Landing
- ELC
- Ross Lodge Picnic Shelter
- Gorge Lake Boat Launch
- Ladder Creek Falls Trail and Gardens
- Trail of the Cedars
- Gorge Powerhouse Overlook
- Gorge Powerhouse Visitor Gallery
- Skagit Information Center
- Gorge Inn Museum
- Newhalem Facilities:
 - Picnic Sites
 - Parking Area (Main Street)
 - Parking Area (SR 20)
 - Interpretive Displays (standalone)
 - Playground

If invasive plant occurrences are located, the survey area will be expanded to the full extent of the occurrence or the Project Boundary, whichever is less. General notes will be recorded to document infestations that extend significantly beyond the Project Boundary but the outer extent will not be mapped.

2.6.3 Step 3 – Gather Data and Prepare for Field Efforts

The study lead will identify and map known occurrences of target invasive species within the study area, and prepare field maps for use by survey teams. The maps will include aerial imagery, Project features (which are Project facilities associated with Project O&M and Project recreation facilities), known invasive plant occurrences, study area boundary, and study roads and trails. Survey timing will be planned based on suitable identification periods in the literature and herbaria records. Locations to be surveyed for invasive species will be shared with the TRREWG before surveys begin. City Light will develop a datasheet and review with TRREWG prior to initiation of fieldwork.

2.6.4 Step 4 – Conduct Field Surveys

The surveyors will conduct invasive plant surveys in a manner that conforms to Survey Protocols for Survey and Manage Strategy 2 Vascular Plants (Whiteaker et al. 1998) and Inventory and Survey Methods for Nonindigenous Plant Species (Rew and Pokorny 2006), which are accepted methods for conducting botanical surveys in Washington. Surveys will be conducted in

conjunction with Rare, Threatened, and Endangered Plants surveys, where practicable (i.e., coincidental detectable and identifiable timing). Surveys will be conducted following the qualitative “exploratory” method outlined and described by Rew and Pokorny (2006). Assessing populations using this method is ideal for large areas where relatively little is known about the location and extent of species populations, and existing knowledge is based on informal or casual observations from other field efforts (Rew and Pokorny 2006).

Field surveyors will observe target species and collect data to document the general distribution of species at survey locations accessible by land. For survey locations associated with Project reservoir shorelines and riparian margins of the Skagit River where land access is impractical or unsafe, surveys will be conducted visually via boat. Invasive plant species presence will also be noted incidentally during fieldwork for other studies. Scientific and common names for all species will conform to the nomenclature found in the Flora of the Pacific Northwest 2nd Edition (Hitchcock and Cronquist 2018).

The data collected will follow the minimum mapping standards for invasive plants, as established by the Mapping Standards Committee of the North American Invasive Species Management Association (NAISMA 2020). Specifically, when target invasive plants are observed in the study area the following information will be collected:

- Species
- Location
- Estimation of extent of area infested by the species:
 - A polygon of the general distribution of the species will be mapped using Geographic Information System (GIS) (desktop) or Global Positioning System (GPS) (in the field). For example, any large infestations of woody invasive species within the managed portions of the transmission line may be observed using aerial imagery.
 - Stem density and/or percent cover would be recorded, as appropriate. For example, an ocular estimate of percent cover for woody species while a stem count in a subset of the population may be more appropriate for herbaceous species.
 - Ubiquitous or widespread species (e.g., St. Johnswort [*Hypericum perforatum*]) will be noted as observed, and described more generally, with specific reference to nearby Project features, unless an occurrence is unusual or novel, where more detailed information will be gathered.
- General habitat type (i.e., mixed conifer forest, wet meadow, etc.), and the level of existing ground disturbance.
- Representative photographs of the species and its habitat (one set per species).
- Pathways or disturbance due to Project O&M and Project-related recreation activities observed in the vicinity of the occurrence that have a potential to spread invasive plant species (e.g., recreational trails and uses).
- Estimated phenology and descriptions of reproductive state of that invasive plant occurrence.

2.6.5 Step 5 – Process Data and Provide Data QA/QC

Following field surveys, maps will be developed depicting all target invasive plant occurrences and Project facilities. Field data will then be subject to QA/QC procedures, including spot-checks of transcription or a digital application with integrated QA/QC review and comparison of GIS maps with field notes to verify locations of mapped occurrences.

2.6.6 Step 6 – Prepare Report

A report will be developed and will include GIS maps that show each target invasive plant occurrence and all Project features. The report will also include a list of observed ubiquitous or widespread species which will include a population estimate observed in the Project. Finally, the report will include likely disturbance or pathways for the target invasive plant occurrences.

2.7 Consistency with Generally Accepted Scientific Practice

The methodology for this study plan conforms to the Survey Protocols for Survey and Manage Strategy 2 Vascular Plants (Whiteaker et al. 1998) and Inventory and Survey Methods for Nonindigenous Plant Species (Rew and Pokorny 2006), which is an approved scientific method used for conducting invasive plant surveys in Washington.

2.8 Schedule

- Field Work – April to November 2021
- Analysis – June to December 2021
- Final Report (Initial Study Report [ISR]) – March 2022

2.9 Level of Effort and Cost

The initial estimate for implementation and reporting associated with this study is approximately \$155,000.

3.0 REFERENCES

- Bivin, M. 2020. Personal communication between Mignonne Bivin, National Park Service, and Ron Tressler, City Light. May 2020.
- Consortium of Pacific Northwest Herbaria Specimen Database (CPNWH). 2020. [Online] URL: <http://www.pnwherbaria.org>. Accessed April 14, 2020.
- Denovan, R. 2019. Personal communication between Rory Denovan, City Light, and Jessica Redman, Environmental Science Associates. November 2019.
- Hitchcock, C.L. and A. Cronquist. 2018. Flora of the Pacific Northwest: An Illustrated Manual, 2nd Edition. Edited by D.E. Giblin, B.S. Legler, P.F. Zika, and R.G. Olmstead. University of Washington Press, Seattle, WA. 882 pp.
- Jakubowski, A. R., M. D. Casler, and R. D. Jackson. 2013. Genetic evidence suggests a widespread distribution of native North American populations of reed canarygrass. *Biological Invasions* 15:261–268.
- McAvinchey, C. and S. Wilhoit. 2019. National Park Service NCCN Invasive Plant Management Team Project Report. Ross Lake National Recreation Area. July 31st, 2019 – August 7th, 2019.
- McAvinchey, C., S. Wilhoit, and C. Decker. 2017. Project Report: Big Beaver Creek Drainage Reed Canary Grass Survey (August 24th through August 29th, 2017). Prepared for National Park Service.
- Merigliano, M.F. and Lesica, P. 1998. The native status of reed canarygrass (*Phalaris arundinacea* L.) in the inland northwest, USA. *Natural Areas Journal*, vol. 18, no. 3, pp. 223-230.
- Miller, B. 2020. Upper Skagit Knotweed Control Program: 2019 Season Ending Report. Skagit Cooperative Weed Management Area. Skagit Fisheries Enhancement Group. [Online] URL: <http://www.skagitfisheries.org/habitat-restoration/knotweed-program/>. Accessed April 23, 2020.
- National Invasive Species Information Management System (NISIMS). 2020. National Invasive Species Information Management System database. Online [URL] <<https://www.blm.gov/programs/natural-resources/weeds-and-invasives/nisims-database>>
- National Park Service (NPS). 2011. Invasive Non-Native Plant Management Environmental Assessment. November 2011. [Online] URL: <https://parkplanning.nps.gov/document.cfm?parkID=327&projectID=20396&documentID=44167>. Accessed April 14, 2020.
- _____. 2012. Ross Lake National Recreation Area. General Management Plan. National Park Service, U.S. Department of the Interior. July 2012.
- _____. 2015. North Cascades 2015 Fires Post-Fire Response Plan – North Cascades National Park Complex. Prepared by National Park Service North Cascades National Park Complex Fires BAER Team. September 18, 2015.
- _____. 2017. Ross Lake Invasive Weed Survey by Boat. Map. 1 pp. June 2017.

- North American Invasive Species Management Association (NAISMA). 2020. NAISMA's Minimum Mapping Standards. [Online] URL: <https://www.naisma.org/programs/mapping-standards/>. Accessed April 14, 2020.
- Potash, L.L. and C.A. Aubry. 1997. Mt. Baker-Snoqualmie National Forest native plant notebook. Second edition. U.S. Forest Service, Mt. Baker-Snoqualmie National Forest and North Cascades Institute, Sedro Woolley, WA. 413 pp.
- Rew, L. and M.L. Pokorny. 2006. Inventory and Survey Methods for Nonindigenous Plant Species. Editors. Bozeman (MT): Montana State University Extension. 75 p.
- Rocheftort, R.M., M.M. Bivin, L. Conquest, S.A. Acker, and L. Kurth. 2016. Exotic plant inventories in Mount Rainier, North Cascades, and Olympic National Parks. Natural Resource Report NPS/NCCN/NRR –2016/1279. National Park Service, Fort Collins, Colorado.
- Seattle City Light. 2006. Skagit Wildlife Mitigation Lands Management Plan. Seattle City Light Environmental Affairs Division with oversight provided by the Wildlife Management Review Committee. June 2006.
- _____. 2016a. Strategy for Invasive Management and Habitat Restoration for Newhalem and Diablo, 2016-2017. 9 pp.
- _____. 2016b. Goodell Creek Fire, Weed Management Memo. Prepared by Andy Pigg. 5 pp. August 18, 2016.
- _____. 2017. Sycamore Maple Control Along the Skagit River Through Newhalem. 15 pp.
- _____. 2020a. Pre-Application Document (PAD) Skagit River Hydroelectric Project (FERC No. 553). April 2020.
- _____. 2020b. Proposed Study Plan (PSP) Skagit River Hydroelectric Project (FERC No. 553). December 2020.
- Seattle City Light and Seattle University. 2015. Assessment of the Ecological Impacts of Non-Native Trees In and Around the Town of Newhalem, WA. Science and Engineering Project Center, College of Science Engineering. 57 pp. June 5, 2015.
- Skagit County. 2020. Skagit County Noxious Weed List. Region 2. [Online] URL: <https://www.skagitcounty.net/Departments/NoxiousWeeds/weedlist.htm>. Accessed April 14, 2020.
- Skagit Fisheries Enhancement Group. 2015. Newhalem Riparian Restoration Project, Seattle City Light. Prepared by Michelle Murphy. 24 pp. September 30, 2015.
- Snohomish County. 2020. Snohomish County Noxious Weed List. [Online] URL: <https://snohomishcountywa.gov/750/Noxious-Weeds-List>. Accessed April 14, 2020.
- United States Forest Service (USFS). 1990. Mt. Baker-Snoqualmie National Forest land and resource management plan, final environmental impact statement and appendices. U.S. Forest Service, Pacific Northwest Region, Mountlake Terrace, WA.
- _____. 2005. Decision notice and finding of no significant impact on proposed treatment of invasive plants and new invaders strategy (Forest Plan Amendment # 26). Mt. Baker-Snoqualmie National Forest, Pacific Northwest Region, Mountlake Terrace, WA. June 3,

- 2005.
- Washington Invasive Species Council. 2017. Invasive Species Management Priorities. [Online] URL: <https://invasivespecies.wa.gov/wp-content/uploads/2019/08/ManagementPriorities.pdf>. Accessed April 14, 2020.
- _____. 2019. Invasive Species Impact and Prevention/Early Action Assessment Tool. [Online] URL: https://invasivespecies.wa.gov/wp-content/uploads/2019/08/assessment_tool.pdf. Accessed April 14, 2020.
- Washington State Noxious Weed Control Board. 2020. List of invasive plant species considered noxious weeds. [Online] URL: <https://www.nwcb.wa.gov/printable-noxious-weed-list>. Accessed February 3, 2020.
- Whatcom County. 2019. Whatcom County Noxious Weed List. [Online] URL: <https://www.whatcomcounty.us/DocumentCenter/View/45998/CountyList20>. Accessed May 2019.
- Whiteaker, L., J. Henderson, R. Holmes, L. Hoover, R. Leshner, J. Lippert, E. Olson, L. Potash, J. Seevers, M. Stein, and N. Wogen. 1998. Survey protocols for survey & manage strategy 2 vascular plants. V 2.0. Bureau of Land Management. [Online] URL: <http://www.blm.gov/or/plans/surveyandmanage/SP/VascularPlants/cover.htm>. Accessed April 2020.

**INVASIVE PLANTS
REVISED STUDY PLAN**

ATTACHMENT A

**CITY LIGHT RESPONSES TO LP COMMENTS ON THE STUDY PLAN
PRIOR TO PSP**

Table 1. City Light responses to LP comments on the study plan prior to PSP.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
1.	Brock Applegate (WDFW)	05/26/2020	Section 1.2 Relicensing Process	1 st Paragraph – Add: consultation Delete: effort	Change made in different location of sentence and paragraph. Text modified to include discussion and consultation.
2.	Judy Neibauer (USFWS)	05/22/2020	Section 1.3 Study Plan Development	1 st Paragraph – Add: identifies that Delete: which suggests Delete: may	One edit made to add requested language. Other edit not incorporated.
3.	Judy Neibauer (USFWS)	05/22/2020	Section 1.3 Study Plan Development	You probably already know that your operations, roads worksites, etc contribute to invasive plants from your current operations. Mention that here.	City Light is conducting the Invasive Plant study to determine where Project operations may affect invasive species; the purpose of the study is to identify those sites.
4.	Brock Applegate (WDFW)	05/26/2020	Section 1.3 Study Plan Development	I agree with the good edits by Judy. At the very least, SCL's company trucks provide an invasive weed vector throughout the road system that they need to address. In addition, the ongoing operation of the project encourages reed canarygrass in the fluctuation zone. The fluctuation zone acts as a source population for the spread of invasive reed canarygrass throughout the waterways and wetlands, including the reservoir backflow up tributaries, and causes habitat degradation.	See response to Comment #3.
5.	Judy Neibauer (USFWS)	05/22/2020	Section 2.1 Study Goals and Objectives	I looked in the issue forms for other non-native species, but did not see any other studies...Is there a study for other invasive species...fish and wildlife? I know there are issues with fish, not sure about any wildlife...are there nutria in the project boundary? If so there should be a study plan to identify numbers, locations, etc. for at lease non-native fish. Share this comment or link to a study with the Fish & Aquatics work group.	Thank you for your comment. The Invasive Plants study plan focuses on terrestrial plant species; invasive aquatic and wildlife species are outside the scope of this study. As referenced and described in the PAD (Section 5.4.2; and agreed to by Steering Committee), City Light will address aquatic invasive species (AIS) in an AIS Management Plan (AISMP). The Special-Status Amphibian study and incidental sightings will document any American bullfrog detected by survey or

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					incidentally. City Light is not aware of any observations or documentation of invasive wildlife species in the Project Boundary. Bullfrogs have been documented in lower valley, but not in Project Boundary. City Light would appreciate any information on nutria, bullfrogs, and other invasive wildlife in the area.
6.	Brock Applegate (WDFW)	05/26/2020	Section 2.1 Study Goals and Objectives	I agree with Judy. LPs submitted invasive, non-native fish, brook trout, and invasive aquatic invertebrate study issue forms, so we should have a study plan somewhere.	See response to Comment #5.
7.	Stacy McDonough (NPS)	05/20/2020	Section 2.1 Study Goals and Objectives	MIG BIV - How will this be decided? Will they only use the state county weed list. This is not sufficient because some invasives are not listed by the state, we don't want any weeds in the park if possible. Are they accounting for climate change that may favor expansion of species that have an ecological advantage with a new climate	City Light will provide the LPs the opportunity to propose additional species to include on the target species list. City Light appreciates information regarding species of management concern to include that do not occur on the county weed lists. Results of the surveys will inform effects analysis in DLA and development of BMPs for the new license that could incorporate climate change.
8.	Shauna Hee (USFS)	05/21/2020	Section 2.1 Study Goals and Objectives	What are limiting factors for invasive plants? Do you mean actions that could be taken to limit introduction, establishment and spread?	"Limiting factors" refers to biotic and abiotic factors that limit populations or spread of invasive species.
9.	Brock Applegate (WDFW)	05/26/2020	Section 2.1 Study Goals and Objectives	I agree with Shauna. Please make this phrase clearer.	See response to Comment #8.
10.	Judy Neibauer (USFWS)	05/22/2020	Section 2.2 Resource Management Goals	When we do ESA consultations, for land management type activities, we typically have conservation measures for non-native species as well. I would say WDFW and the services have some resource management goals for the control of invasive. We have an invasive species plan for aquatic (i.e. mussels, snails, aquatic plants...)	Thank you for your comment. See response to Comment #5. In the interim, City Light follows BMPs to prevent boats and equipment from spreading invasive species.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				We would be concerned with boats and recreational gear transporting aquatic invasive species. Studying and or having some sort of a cleaning station would help with determining what species may be transported. Currently there is new guidelines for boat cleaning stations (see WDFW for regulations). This may soon become an issue in the water ways within the project boundary. FYI...western Montana geared up for invasive aquatic species invasions 5 years ago. More recently, Eastern WA and Idaho have within the Columbia Basin.	
11.	Brock Applegate (WDFW)	05/26/2020	Section 2.2 Resource Management Goals	WDFW recommends that SCL address the issue of aquatic invasive species here or in another study plan.	See responses to Comment #5 and #10.
12.	Shauna Hee (USFS)	05/21/2020	Section 2.2 Resource Management Goals	1 st Paragraph – Add: inventory Delete: mapping	While City Light intends to map locations of invasive species associated with the Project, it is not feasible to do an “inventory”, which would include a 100% coverage for all species.
13.	Shauna Hee (USFS)	05/21/2020	Section 2.2 Resource Management Goals	Amendments include the 2016 ROD for Invasive Plant Treatment on the MBS, 2005 DN for Treatment of Invasive Plants on the MBS, 2005 ROD Preventing and Managing Invasive Plants, and the 1999 DN Forest-Wide Noxious Weed Management.	Thank you, text has been updated.
14.	Shauna Hee (USFS)	05/21/2020	Section 2.2 Resource Management Goals	3 rd Paragraph – Delete: In 2005, an Environmental Assessment (EA) and corresponding decision notice on invasive plant control were issued for the Mt. Baker-Snoqualmie National Forest. Region 6 provides guidance in the Pacific Northwest Region’s Invasive Plant Program Record of Decision. Region 6 policy on the use of native	Thank you, last sentence has been deleted and the provided additional information has been added to the text.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				and non-native plants is provided in USFS (1994); Mt. Baker-Snoqualmie National Forest guidelines on plant movement are provided in Potash and Aubry (1997).	
15.	Judy Neibauer (USFWS)	05/22/2020	Section 2.3 Background and Existing Information	Include other aquatic species,	See response to Comment #5 and/or #10
16.	Shauna Hee (USFS)	05/21/2020	Section 2.3 Background and Existing Information	The most recent lists should be used at the time of field data collection.	City Light will use most up to date lists for fieldwork.
17.	Shauna Hee (USFS)	05/21/2020	Section 2.3 Background and Existing Information	<p>I'm not really sure what info. about nativeness you gleaned from the PNW Herbaria. I'm not aware of any herbarium records of native occurrences of PHAR3 in WA State. Please share information if you know otherwise.</p> <p>Although a native occurrence of PHAR3 was last collected in a remote location of Alaska in 1996, no native populations are known to exist in the lower 48. There is some evidence there were natives in Idaho, Wyoming, Montana and Minnesota pre-European settlement. I think it's a stretch to state there may be natives in the "study area". If there is question as to the native status of mapped occurrences within the study area, multiple samples can be taken from all of the sites and the study could include a genetic analysis. Or – the distribution and abundance of mapped occurrences could be used to infer "invasiveness". It is assumed that native populations did not have the same pernicious invasiveness as European cultivars (or they would be more widespread and common) or their hybrid progeny.</p>	City Light has reviewed herbaria records back to the 1870s, in Western BC and Western WA – noted as dominant at Hozomeen on BC side in early 70s, records not far from Hope, from the 30s. It is certainly a native species, although it is possible that populations within the Project Boundary are an intraspecific hybrid. The functional behavior of the hybrid in the Puget lowland appears to be more aggressive. City Light is interested in managing for diversity (richness and evenness), and also needs to consider ecosystem services provided by PHAR3 before attempting complete eradication. This question deserves nuanced consideration about what we want to accomplish and what are possibilities. City Light may have an interest in managing PHAR3, but not a jump to a blanket herbicide approach. Regardless of its origin, City Light will consider the species in the study and in management, effectiveness and impact of management or control. City Light would consider focus on management for biodiversity

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					and ecosystem services, but not an automatic commitment to eradication of a native species.
18.	Brock Applegate (WDFW)	05/26/2020	Section 2.3 Background and Existing Information	Thank you Shauna, Native or non-native, SCL needs to address the propagation of reed canarygrass by their ongoing project operation and the degradation of wetlands, aquatic, and riparian habitat.	See response to Comment #17.
19.	Shauna Hee (USFS)	05/21/2020	Section 2.3 Background and Existing Information	Based on what criteria? There are numerous species that I suspect occur within the project boundary - such as <i>Impatiens capensis</i> and <i>Myriophyllum spicatum</i> – that are not on the list. Please disclose the information used to determine whether the species is known or suspected within the project boundary, in addition to justification as to why the remaining County/State species were not.	The species list was developed using the combined weed list of Skagit, Whatcom, and Snohomish County Weed Control Boards supplanted by NPS information and data from City Light from their work on the fish and wildlife mitigation lands, transmission line work, and coordination with agencies, Tribes, and NGOs on weed control in the Skagit valley of the past several decades. The two species specifically mentioned - <i>Impatiens capensis</i> and <i>Myriophyllum spicatum</i> - are both Class C species that do not require control and were not included in the target species list.
20.	Brock Applegate (WDFW)	05/26/2020	Section 2.3 Background and Existing Information	SCL probably needs to update their invasive plant list.	See response to Comment #19.
21.	Shauna Hee (USFS)	05/21/2020	Section 2.3 Background and Existing Information	Please use the same reference for scientific name and common name. Some of the taxonomy and common names cited are not widely used.	The scientific and common names follow <i>Flora of the Pacific Northwest, 2nd Edition</i> as listed by the Univ. of Washington Herbarium, except where quoting or listing from a reference that uses a different name. (WTU Herbarium: Giblin, D.E. & B.S. Legler (eds.). 2003+. WTU Image Collection Web Site: Vascular Plants, MacroFungi, & Lichenized Fungi of Washington State.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					University of Washington Herbarium. http://biology.burke.washington.edu/herbarium/imagecollection.php)
22.	Stacy McDonough (NPS)	05/20/2020	Section 2.3 Background and Existing Information	Per M Bivin this work was done nine years ago but written up in 2011. Weeds are moving targets and all the weeds should be recorded and re-evaluated	City Light appreciates any information NPS can provide on this topic.
23.	Stacy McDonough (NPS)	05/20/2020	Section 2.3 Background and Existing Information	M Bivinn updates to table added for species she has observed but does not have documentation	Thank you, edits accepted.
24.	Judy Neibauer (USFWS)	05/22/2020	Section 2.4 Project Operations and Effects on Resources	Aquatic Species ?	See response to Comment #5 and/or #10
25.	Shauna Hee (USFS)	05/21/2020	Section 2.4 Project Operations and Effects on Resources	Does this mean that project has a set of BMPs for the prevention or introduction and spread of invasive plants? If so, please cite the reference.	City Light does not have existing BMPs for prevention of introduction or spread of terrestrial invasive plants.
26.	Brock Applegate (WDFW)	05/26/2020	Section 2.4 Project Operations and Effects on Resources	I agree with Shauna. If SCL does not have BMPs for invasive weeds, then they should produce BMPs from this study plan.	BMPs may be part of a settlement agreement. City Light anticipates using information from this study to inform BMP development. See response to Comment #25.
27.	Judy Neibauer (USFWS)	05/22/2020	Section 2.5.1 Study Area	Does this include the reservoirs...if not, please increase the scope to include reservoir areas. This may involve Canada, as weed seed float across the border. Maybe think about development of an MOU to share data with Canada. Reservoir drawdown zones can be a source area for invasives. Reservoirs can be source areas for aquatic invasive plants, fish, invertebrates, etc. Other areas like transmission corridors,	The reservoir fluctuation zone and lands within the transmission line right-of-way are included in the study area. City Light will address aquatic invasive species in a Management Plan (see response to Comment #5). City Light will consider involving Canada in management considerations, however land in Canada is outside of the FERC boundary.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				restoration areas etc. are likely sources of invasive weeds, if not include already, please include those areas.	
28.	Brock Applegate (WDFW)	05/26/2020	Section 2.5.1 Study Area	I agree with Judy. Please include the entire reservoir system, mitigation lands, and ROWs	See response to Comments #27 and #29.
29.	Shauna Hee (USFS)	05/21/2020	Section 2.5.1 Study Area	1. Please confirm even though they are shown on the map – does this include all of the wildlife acquisitions and associated roads within them? Please list the mitigation parcels here. 2. If FS managed lands are within the study area... such as along the transmission line, then the MBS Invasive Plant Target List should be included. 3. Please include non-system access roads to the transmission line that are outside of the project boundary.	City Light will include lands within the Project Boundary, which includes fish and wildlife mitigation lands. These lands are shown in the study area maps. Please see details on mitigation parcels in the PAD. City Light appreciates any information on an Invasive Plant Target List for Mt. Baker-Snoqualmie National Forest. Project-related roads will be included in the study area, non-Project-related roads are not.
30.	Shauna Hee (USFS)	05/21/2020	Section 2.5.1 Study Area	Please define a distance in which invasive plants will be inventoried along the shoreline.	City Light will survey the area influenced by Project O&M: immediate river banks, connected channels, hydrologically connected wetlands. Invasive species will also be noted during the Wetland Assessment study.
31.	Shauna Hee (USFS)	05/21/2020	Section 2.5.1 Study Area	For the wildlife parcels, I would like an inventory of all sites that may have had disturbance or modification prior to acquisition. These sites may have weeds that are continuing to spread and degrade wildlife habitat even though no ongoing or future on the ground actions by the project are proposed.	City Light will survey for invasive plants in the study area to determine current extent of infestation based on potential Project-related disturbance or pathways due to Project O&M and Project-related recreational activities. Activities or disturbances that occurred on these parcels prior to acquisition are not Project-related, however, the surveys will assess current invasive plant extent.
32.	Judy Neibauer (USFWS)	05/22/2020	Section 2.6 Methodology	May need different methods for aquatic species	See responses to Comment #5 and/or #10.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
33.	Shauna Hee (USFS)	05/21/2020	Section 2.6 Methodology	Will incidental species not included on the target list but present on the State & County lists be inventoried?	City Light will survey for species on the target list; incidental observations of other species not on this target list or in other study plans is outside the scope of this study plan. If licensing participants recommend additional species, a valid assessment tool (e.g., Washington Invasive Species Council's (WISC) Invasive Species Impact and Prevention/Early Action Assessment Tool [WISC 2019] and Invasive Species Management Priorities grid [WISC 2017]) and existing information will be used to evaluate potential additions jointly with RWG to consider ecological and economic risks and control feasibility.
34.	Shauna Hee (USFS)	05/21/2020	Section 2.6.1 Step 1 – Compile Information and Develop Target Species List	The FS also has existing info.	City Light would appreciate receiving any information related to this topic from LPs.
35.	Stacy McDonough (NPS)	05/20/2020	Section 2.6.1.1 Compile and Review Existing Information	Per M Bivin - These surveys were conducted in 2000 and 2001	City Light appreciates the information.
36.	Shauna Hee (USFS)	05/21/2020	Section 2.6.1.2 Develop Target Invasive Plant Species List	See comment above about FS Invasive Plant list inclusion.	See response to Comment #29.
37.	Shauna Hee (USFS)	05/21/2020	Section 2.6.1.2 Develop Target Invasive Plant Species List	Why are Class C species not included? Although these species may be more widespread in WA State, they are not necessarily common outside of agricultural or urban areas. Field data collection would provide information on abundance and distribution within the project area. This	City Light has included some Class-C species. If licensing participants recommend additional species, a valid assessment tool (e.g., Washington Invasive Species Council's (WISC) Invasive Species Impact and Prevention/Early Action Assessment Tool

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				information would then be used to prioritize treatments.	[WISC 2019] and Invasive Species Management Priorities grid [WISC 2017]) and existing information will be used to evaluate potential additions jointly with RWG to consider ecological and economic risks and control feasibility.
38.	Brock Applegate (WDFW)	05/26/2020	Section 2.6.1.2 Develop Target Invasive Plant Species List	I agree with Shauna's reasoning. SCL already has the large Class C species listed, reed canarygrass.	See response to Comment #37.
39.	Shauna Hee (USFS)	05/21/2020	Section 2.6.1.2 Develop Target Invasive Plant Species List	None of the examples are valid assessment tools for the project scale. Please provide a tool developed specifically for the project and add it as an attachment for review.	USFWS provides a commonly used construct for weed survey and management. See: https://www.fws.gov/invasives/staffTrainingModule/assessing/inventory.html The first step in the management program is a Reconnaissance Level Survey for areas that are large, where observations to date have been casual, and where basic weed occurrence data is needed. The result is a map of occurrences, relative densities, and priorities for follow-up work and control measures. City Light appreciates any information or proposed assessment methods to meet these needs.
40.	Shauna Hee (USFS)	05/21/2020	Section 2.6.1.2 Develop Target Invasive Plant Species List	This tool is to assess risk to WA state and not the appropriate scale for the project.	See response to Comment #39.
41.	Shauna Hee (USFS)	05/21/2020	Section 2.6.1.2 Develop Target Invasive Plant Species List	This requires a prioritization framework that has yet to be developed or proposed by SCL/RWG.	See response to Comment #39.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
42.	Shauna Hee (USFS)	05/21/2020	Section 2.6.1.2 Develop Target Invasive Plant Species List	If economic risk (is it really a risk?) is to be included in the evaluation, then please provide a weighted measure for each risk – and list all risks that would be considered. Will economic risk be 90% of the consideration vs. ecological risk 10%?	Economic risk refers to risk of potential impacts of invasive plant species to commercial recreational uses of resources (e.g., invasive plant is potentially toxic to livestock, not financial risk to City Light). Risk assessment will be conducted in a general manner.
43.	Stacy McDonough (NPS)	05/20/2020	Section 2.6.2 Step 2 – Prioritize Survey Locations	At a minimum I think this should include potential areas and areas with in the project where know populations exist to ensure we have a handle on how large those populations are.	City Light will review existing information on invasive plant occurrence in the study area in order to inform prioritization of survey locations based on occurrence.
44.	Shauna Hee (USFS)	05/21/2020	Section 2.6.2 Step 2 – Prioritize Survey Locations	Please elaborate on how this applies to the shoreline/banks of the Skagit River? Will lands under private ownership be excluded? Please define local agencies. Are these city and county?	City Light will include riparian margins of the Skagit River downstream of Gorge Dam to the Sauk River confluence in the study area. Surveys will be conducted on City Light-owned lands and lands administered by federal, state, or local agencies (including city, county, etc.), and lands not privately-owned. Surveys on privately-owned lands are outside the scope of this study plan. If surveys are conducted via boat, occurrence will be noted and indicated as on private land.
45.	Shauna Hee (USFS)	05/21/2020	Section 2.6.2 Step 2 – Prioritize Survey Locations	There's a 50-foot buffer for some locations. How was this buffer determined? Please cite a reference used to determine buffer length. Is the buffer based on the longest distance a specific species could disperse based on XX vector?	The 50-ft buffer distance is a reasonable assumption for the effects of Project facilities and roads for the purpose of an RTE Plant survey. Mean seed rain decreases 5 meters from roads (Betz, J. A. 2019. Fire and Road disturbance Impacts on Forest Plant Species and Seed Rain in Table Mountain Fire Area, Kittitas County, Washington. Masters Thesis, Central Washington University, Ellensburg, WA) and the road effect on differences in plant composition was less than 5 meters in forested stands (Avon, Catherine, Berges, L., Dumas, Y., Dupouey J.L. 2010. Does the effect of forest

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					roads extend a few meters or more into the adjacent forest? A study on understory plant diversity in managed oak stands. Forest Ecology and Management. V. 259:8, 1546-1555).
46.	Stacy McDonough (NPS)	05/20/2020	Section 2.6.2 Step 2 – Prioritize Survey Locations	<p>Per Cheryl Decke - Big Beaver Wetland? I can't tell from the map if this is included but it really should be, and so should inland lakes and tributaries near Hozameen. They are not directly in the reservoir fluctuation zone, but the reservoir is the reason reed canary grass has infested these areas</p> <p>New Comment from Brock Applegate (WDFW) provided on 06/23/2020: Study area should include Big Beaver Creek and Wetlands. The source population of reed canarygrass from the reservoir has expanded upstream of Big Beaver Creek by tributary backflow, wind, or beaver. The infestation continues upstream in the creek and up to the wetland. Big Beaver Wetland has habitat degradation due to reed canarygrass and possible additional predation of native amphibians by larger fish that have fish passage due to the elevation of the reservoir. In the past 20 years, red side shiners have turned resident trout and bull trout more piscivorous, which increases their size. The larger fish can navigate the partial fish passage barrier easier and cause greater mortality on all life stages of special status amphibians that could frequent the wetlands: Federal listed species, Oregon spotted frog, State Candidate Species, the Columbia spotted frog and western toad, and other native species.</p>	<p>City Light has not received any evidence or mechanism of how Project operations are foreseeably spreading reed canarygrass to wetlands upstream of the Project in the Big Beaver Valley. The Project has no effect on the hydrology of these wetlands, which are located between about 0.85 to 2 miles from Ross Lake and above the normal maximum water surface elevation (NMWSE). City Light would appreciate any information or evidence regarding the reservoir as a source for reed canarygrass in Big Beaver Valley.</p> <p>Response to comment provided on 06/23/2020: See previous response above.</p> <p>Potential effects on amphibians in Big Beaver Valley are addressed in the Special-Status Amphibian Study.</p>

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
47.	Brock Applegate (WDFW)	05/26/2020	Section 2.6.2 Step 2 – Prioritize Survey Locations	WDFW highly recommends that SCL include Big Beaver Wetland as the reed canarygrass population exists from reservoir, up the creek, and through the wetland.	See response to Comment #46.
48.	Stacy McDonough (NPS)	05/20/2020	Section 2.6.2 Step 2 – Prioritize Survey Locations	what is the reason for 50"?	See response to Comment #45.
49.	Shauna Hee (USFS)	05/21/2020	Section 2.6.2 Step 2 – Prioritize Survey Locations	I'd like to review a list of all roads and trails - and a map of the extent of each linear feature - in which surveys would occur listed in the plan. I would also like the opportunity to review and comment on the sites proposed.	City Light is currently reviewing information on roads in the Project Boundary and will add Project roads to the maps in an updated study plan. Locations to be surveyed for invasive species will be shared with the TRREWG before surveys begin.
50.	Shauna Hee (USFS)	05/21/2020	Section 2.6.2 Step 2 – Prioritize Survey Locations	Please provide a list and map of stated locations. Also - please see my comment above about including sites that were modified prior to SCL acquisition and about including roads. If there are dispersed recreation sites on the parcels, these should be included too.	For comment regarding sites modified prior to City Light acquisition, please see response to Comment #31. See PAD for description of extent of mitigation lands. Non-motorized, day-use recreation is permitted in these areas, but recreation use is not a primary use of the transmission line corridor and mitigation lands. City Light will include areas on fish and wildlife mitigation lands with potential vectors for dispersal of invasive plants.
51.	Brock Applegate (WDFW)	05/26/2020	Section 2.6.2 Step 2 – Prioritize Survey Locations	SCL should include all lands within the wildlife parcels. The presence of invasive weeds degrades habitat.	See responses to Comments #29 and #50.
52.	Shauna Hee (USFS)	05/21/2020	Section 2.6.2 Step 2 – Prioritize Survey Locations	What is the wildland interface? How is this area being defined? Is there a buffer/distance?	“Wildland interface” is the area where townsites, dams, powerhouses and other infrastructure meet or intermingle with

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					undeveloped wildland vegetation. The wildland interface effectively is the buffer and extends up to 50 feet.
53.	Shauna Hee (USFS)	05/21/2020	Section 2.6.2 Step 2 – Prioritize Survey Locations	Please include dispersed recreation sites within the project area. These are sites in which early introduction of invasives can occur.	See response to Comment #50.
54.	Shauna Hee (USFS)	05/21/2020	Section 2.6.2 Step 2 – Prioritize Survey Locations	Why not? Aerial imagery and spatial mapping apps can allow one to estimate infestation extent without field verification (trespassing), although the entire extent should be mapped if trespass is not an issue. Federal land is within and adjacent to a large portion of the project area. If O&M of the project lead to the introduction and spread of invasive plants outside of the project boundary, the project may be responsible for control of said infestation. Estimate of extent at the time of data collection would eliminate the need to revisit sites for additional information.	Where aerial photographs facilitate this, City Light will map extent of significant infestations.
55.	Brock Applegate (WDFW)	05/26/2020	Section 2.6.2 Step 2 – Prioritize Survey Locations	SCL should document the extent of the infestation if easy to accomplish or if the infestation came from SCL's lands.	See response to Comment #54.
56.	Shauna Hee (USFS)	05/21/2020	Section 2.6.3 Step 3 – Gather Data and Prepare for Field Efforts	Please include a draft data sheet as an attachment to the document. I would like the opportunity to review and comment on the datasheet.	City Light will develop a datasheet and review with TRREWG at a later date prior to initiation of fieldwork.
57.	Shauna Hee (USFS)	05/21/2020	Section 2.6.4 Step 4 – Conduct Field Surveys	The S&M Strategy 2 Survey Protocol is not a widely accepted method for surveying for invasive plants. This is not the appropriate survey method to use for invasives.	City Light will identify areas based on disturbance factors and habitat features where invasive plants are likely to occur, then will employ methods from Whiteaker et al. (1998), including random meander. The Survey and Manage Strategy 2 Survey Protocol is not the basis for this survey – see the above literature reference to the random

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					meander technique that will be used when visiting an area of invasive species interest. City Light appreciates any information on other methods or references to incorporate. Also see response to Comment #39.
58.	Shauna Hee (USFS)	05/21/2020	Section 2.6.4 Step 4 – Conduct Field Surveys	The study is not assessing a large area. Occurrences are known within the study area. Inventories have occurred in the past. The study has already identified specific sites and 100% of these sites should be surveyed. The exploratory method is very coarse. Either the extensive or intensive survey method should be implemented.	Please provide any additional information regarding locations of invasive plant species. City Light finds the exploratory method appropriate for the needs and goals of the study. See the response to Comment #39.
59.	Shauna Hee (USFS)	05/21/2020	Section 2.6.4 Step 4 – Conduct Field Surveys	How much of an area and how intensively will an area be surveyed?	Surveys will prioritize areas with Project-related effects and areas most likely to have invasive plant occurrence. Potential disturbance from Project facilities, recreation at City Light-owned facilities and operation, and vegetation management on the transmission line right-of-way will be used to define Project-related disturbances that can contribute to weed infestations.
60.	Shauna Hee (USFS)	05/21/2020	Section 2.6.4 Step 4 – Conduct Field Surveys	What about now target species that are WA State Class A, B, & C species that weren't suspected in the project area... but are present?	Please see response to Comment #37.
61.	Shauna Hee (USFS)	05/21/2020	Section 2.6.4 Step 4 – Conduct Field Surveys	Please update all species names within this study to conform to this nomenclature.	Please see response to Comment #21.
62.	Shauna Hee (USFS)	05/21/2020	Section 2.6.4 Step 4 – Conduct Field Surveys	The minimum standards basically describe the minimum amount of information one should collect when inventorying for invasive plants. So - the plan is proposing to collect the minimum amount of information. Although	Thank you for your comment.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				this may speed up field work, it may not provide enough information to assess whether or not there are values at risk/impacts to natural processes or the ecological conditions present to prescribe an integrated treatment method. There can always be a revisit/remeasurement if additional information is needed.	
63.	Shauna Hee (USFS)	05/21/2020	Section 2.6.4 Step 4 – Conduct Field Surveys	ArcPad is available for both GPS and tablets.	Thank you for your comment. City Light appreciates the information.
64.	Shauna Hee (USFS)	05/21/2020	Section 2.6.4 Step 4 – Conduct Field Surveys	What are examples of the transmission line corridor that would not receive management actions within the next 50 years?	Areas where line clearance is sufficient and does not require vegetation management.
65.	Brock Applegate (WDFW)	05/26/2020	Section 2.6.4 Step 4 – Conduct Field Surveys	WDFW would think that the transmission corridors receive mowing every 5 years or so.	See response to Comment #64. Not all areas on the transmission line right-of-way are mowed.
66.	Shauna Hee (USFS)	05/21/2020	Section 2.6.4 Step 4 – Conduct Field Surveys	This makes me think that not all sites will receive field visits. Is this a correct assumption? How much of the transmission line will be field surveyed?	Areas that undergo vegetation management, which will be indicated on the map provided for review in early phases of study.
67.	Shauna Hee (USFS)	05/21/2020	Section 2.6.4 Step 4 – Conduct Field Surveys	Aerial observations are not adequate for mapping forbs. The start and stop of infestations within the transmission line should be mapped in the field?	Text revised to refer to “Large infestations of woody invasive species.”
68.	Shauna Hee (USFS)	05/21/2020	Section 2.6.4 Step 4 – Conduct Field Surveys	What is the minimum mapping size for an infestation? What is the minimum percent infested mapping size for a polygon?	Minimum pixel size is 9 sq m, so any plant occurrence polygons smaller than 9 sq m will be indicated as a point. There is a longer technical explanation of why predictor models used for the vegetation mapping results in a minimum mapping unit larger than the minimum pixel size. Infestations density will be noted as a polygon or point as appropriate and the density, likely a

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					choice of 5 categories beginning with “trace” will be used.
69.	Shauna Hee (USFS)	05/21/2020	Section 2.6.4 Step 4 – Conduct Field Surveys	All invasives should follow the same inventory protocol. Allowing different protocol for “locally abundant” species assumes that those species are not having an ecological impact to the infestation site. Species though to be widespread, and it is infeasible to control and there is low ecological risk should not be included in the target list.	City Light has an interest in information of widespread species. Thank you for your comment.
70.	Shauna Hee (USFS)	05/21/2020	Section 2.6.4 Step 4 – Conduct Field Surveys	Please include observations of herbivory and try to get photos of any insects on plants. Would be valuable to know if any biocontrols are present within the infestation.	City Light appreciates the comment. This is outside the scope of the study.
71.	Shauna Hee (USFS)	05/21/2020	Section 2.6.4 Step 4 – Conduct Field Surveys	Please include soil type and soil moisture. Please include distance from standing water or potential standing water.	This is outside the scope of this study.
72.	Shauna Hee (USFS)	05/21/2020	Section 2.6.4 Step 4 – Conduct Field Surveys	I don’t understand how general habitat type crosswalks with the veg mapping study or the wetlands study Please provide an explanation. Also – how would the level of ground disturbance be measured and why is that important? Please include a list of associated species.	City Light will include a direct crosswalk from Vegetation Mapping and Wetland Assessment studies. Ground disturbance levels will be measured by estimate of percent bare soil in categories. Disturbance is important in relation to invasive species spread. Associated species will be addressed via general habitat type for vegetation and wetland studies.
73.	Shauna Hee (USFS)	05/21/2020	Section 2.6.4 Step 4 – Conduct Field Surveys	Where are voucher specimens not being collected? In some cases, species ID cannot be verified from photos.	City Light will collect voucher specimens for species that are unusual or unidentifiable in the field.
74.	Shauna Hee (USFS)	05/21/2020	Section 2.6.4 Step 4 – Conduct Field Surveys	Will a list of options be provided to surveyors? Will the surveyors have the knowledge for each	City Light will look for disturbance factors based on the observed O&M. Pathways refers to the Project-related feature that has potential

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				species reproductive/invasive biology to make this observation in the field?	to contribute to spread, not the biology of the species and how it propagates.
75.	Shauna Hee (USFS)	05/21/2020	Section 2.6.4 Step 4 – Conduct Field Surveys	Please provide an explanation has to why distance to the nearest project feature is important to record?	Deleted. Will list nearby Project features.
76.	Shauna Hee (USFS)	05/21/2020	Section 2.7 Consistency with Generally Accepted Scientific Practice	Please see my comments above.	See responses to comments as indicated above.
77.	Shauna Hee (USFS)	05/21/2020	Section 2.8 Schedule	Please use the State and Counties weed lists for 2021.	See response to Comment #16.
78.	Brock Applegate (WDFW)	05/26/2020	Section 2.8 Schedule	3 rd Bullet – Add: Initial Study 4 th Bullet – Add Initial Study Report Meeting - 2022	Thank you for the comment; City Light acknowledges the ILP milestones provided. The ILP will provide the opportunity for comment on the final report submitted in the ISR and discussed at the ISR meeting; if any components of the study goals and objectives are not met in the first year, or there are anomalous conditions, any party may propose additional work or request additional study per FERC ILP regulations. No changes were made to the schedule in the draft study plan as City Light intends to complete the study within one year and wants to be clear with FERC and LPs on the proposed schedule. City Light believes that it will be beneficial to all parties to have complete information from the studies as soon as possible to inform development of management proposals and cross resource analysis.
79.	Brock Applegate (WDFW)	06/23/2020	Section 2.5.1 Study Area	Study area should include Big Beaver Creek and Wetlands. The source population of reed canarygrass from the reservoir has expanded	Thank you for your comment. Please see response to Comment #46.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				upstream of Big Beaver Creek by tributary backflow, wind, or beaver. The infestation continues throughout the creek area up to the wetland. Big Beaver Wetland has habitat degradation by reed canarygrass and possible additional predation of native amphibians by larger fish that have fish passage due to the elevation of the reservoir. In the past 20 years, red side shiners have turned resident trout and bull trout more piscivorous, which increases their size. The larger fish can navigate the partial fish passage barrier easier and cause greater mortality on all life stages of special status amphibians that could frequent the wetlands: Federal listed species, Oregon spotted frog, State Candidate Species, the Columbia spotted frog and western toad, and other native species.	

**TR-05 MARBLED MURRELET
REVISED STUDY PLAN**

**SKAGIT RIVER HYDROELECTRIC PROJECT
FERC NO. 553**

Seattle City Light

**April 2021
RSP**

TABLE OF CONTENTS

Section No.	Description	Page No.
1.0	Introduction.....	1-1
1.1	General Description of the Project.....	1-1
1.2	Relicensing Process	1-1
1.3	Study Plan Development.....	1-2
2.0	Study Plan Elements	2-1
2.1	Study Goals and Objectives	2-1
2.2	Resource Management Goals	2-1
2.3	Background and Existing Information.....	2-2
2.4	Project Operations and Effects on Resources	2-4
2.5	Study Area	2-5
2.6	Methodology	2-7
2.6.1	Map Potential Marbled Murrelet Nesting Habitat	2-7
2.6.2	Conduct Limited Ground Surveys to Verify Accuracy of Habitat Mapping	2-7
2.6.3	Radar and Audio-Visual Surveys.....	2-7
2.6.3.1	Choosing Radar Survey Locations.....	2-7
2.6.3.2	Radar and Audio-Visual Survey Methods	2-8
2.6.3.3	Ground Clutter Reduction.....	2-10
2.6.3.4	Radar Equipment	2-11
2.6.3.5	Radar Tracking Software	2-11
2.6.3.6	Audio-visual Surveys.....	2-13
2.6.4	Data Analyses	2-14
2.6.4.1	Radar Counts and Passage Rates	2-14
2.6.4.2	Flight Directions and Locations.....	2-14
2.6.4.3	Flight Paths	2-14
2.6.4.4	Weather Data	2-14
2.7	Consistency with Generally Accepted Scientific Practice.....	2-14
2.8	Schedule.....	2-15
2.9	Level of Effort and Cost	2-15
3.0	References	3-1

List of Figures

Figure No.	Description	Page No.
Figure 2.5-1.	Location map of the Skagit River Project.....	2-6
Figure 2.6-1.	Preliminary proposed radar survey station locations (specific locations to be refined as described in Section 2.6.3.1 of this study plan).	2-9

List of Attachments

Attachment A	City Light Responses to LP Comments on the Study Plan Prior to PSP
--------------	--

List of Acronyms and Abbreviations

BMP	best management practice
City Light	Seattle City Light
DNR	(Washington) Department of Natural Resources
ELC	Environmental Learning Center
ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission
FR	Federal Register
HCP	habitat conservation plan
hr	hour
ISR	Initial Study Report
km	kilometer
LiDAR	Light Detection and Ranging
LP	licensing participant
m	meter
mph	miles per hour
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NVCS	National Vegetation Classification Standards
O&M	operation and maintenance
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
RWG	Resource Work Group
TRREWG	Terrestrial Resources and Reservoir Erosion Work Group
U.S.C.	United States Code

USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WDFW	Washington Department of Fish and Wildlife

This page intentionally left blank.

1.0 INTRODUCTION

1.1 General Description of the Project

The Skagit River Hydroelectric Project (Project), licensed to The City of Seattle, Washington, and operated through its publicly-owned electric power utility Seattle City Light (City Light), is located in northern Washington State and consists of three power generating developments on the Skagit River – Ross, Diablo, and Gorge – and associated lands and facilities. The Project generating facilities are in the Cascade Mountains of the upper Skagit River watershed, between Project River Miles (PRM) 94.7 and 127.9 (U.S. Geological Survey [USGS] RMs 94.2 and 127).¹ Power from the Project is transmitted via two 230-kilovolt 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, an Environmental Learning Center (ELC), several recreation facilities, and several parcels of fish and wildlife mitigation lands.

Project generating facilities are all located in Whatcom County, although Ross Lake, the most upstream reservoir, crosses the U.S.-Canada border and extends for about one mile into British Columbia at normal maximum water surface elevation. Gorge Powerhouse, the most downstream facility, is approximately 120 miles northeast of Seattle and 60 miles east of Sedro-Woolley, the nearest large town. The closest town is Newhalem, which is part of the Project and just downstream of Gorge Powerhouse. The primary transmission lines cross Whatcom, Skagit, and Snohomish counties; the fish and wildlife mitigation lands are in the same counties.

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, Diablo, and Gorge lakes.” The legislation maintains the Federal Energy Regulatory Commission’s (FERC) 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).

1.2 Relicensing Process

The current FERC license for the Project expires on April 30, 2025, and City Light will apply for a new license no later than April 30, 2023. City Light formally initiated the relicensing process by filing a Notice of Intent and Pre-Application Document (PAD) with FERC on April 27, 2020 (City Light 2020b). The PAD includes descriptions of the Project facilities, operations, license

¹ 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 Project River Mile (PRM) system are provided throughout this document. For further details see Section 7.0 of the main body RSP.

requirements, and Project lands as well as a summary of the extensive existing information available on Project area resources and early consultation on potential resource issues to be addressed during the relicensing. The PAD also includes an outline of the goals and objectives of this study.

In 2019-2020, City Light convened a series of Resource Work Groups (RWG) to engage agencies and other licensing participants (LP) in the Study Plan Development Process. Discussions with LPs continued in early 2021 with a series of topic-based discussions following filing of the Proposed Study Plan (PSP) on December 8, 2020 (City Light 2020b). This study plan reflects RWG and LP discussion and study requests and comments submitted by LPs.

1.3 Study Plan Development

The TR-05 Marbled Murrelet Study will be used to establish whether marbled murrelets are present within the Project Boundary, where Project-related activities potentially affect suitable habitat or where Project-generated noise could affect nesting murrelets. This likelihood of presence data, along with analysis of habitat data from the Vegetation Mapping and Project Sound Assessment studies and other sources such as Light Detection and Ranging (LiDAR) data, will inform consultation with LPs and, as needed, the development of best management practices (BMP). Murrelets are listed under the federal Endangered Species Act (ESA) as threatened in Washington State and are listed as an endangered species by the State of Washington. This study addresses the TE17 Marbled Murrelet issue form.

On March 12, 2020, City Light released the Marbled Murrelet Draft Study Plan for LP review and comment. On March 17, 2020, the draft study plan was discussed at a Terrestrial Resources and Reservoir Erosion Work Group (TRREWG) meeting. City Light reviewed all comments received and released a revised version of the draft study plan on April 29, 2020. The revised draft was discussed on May 6, 2020 at a TRREWG meeting. Written comments were received from Washington Department of Fish and Wildlife (WDFW), U.S. Forest Service (USFS), NPS, and U.S. Fish and Wildlife Service (USFWS) and responded to in an attachment to this study plan. By A Status Draft of the study plan was provided to LPs on August 6, 2020.

City Light is filing this study plan with FERC as part of its Revised Study Plan (RSP), an update to the version that was filed with the PSP and incorporating additional consultation with LPs prior to the filing date. No formal study requests related to this study were filed with FERC.

PSP comments to this study plan were submitted by USFWS. City Light has responded to comments in the PSP comment/response table appended to the main body of the RSP. No modifications were made to the study plan in response to comments.

2.0 STUDY PLAN ELEMENTS

2.1 Study Goals and Objectives

The goals of the study are to map potentially suitable marbled murrelet nesting habitat within the study area and assess likelihood of marbled murrelet nesting. There have been limited surveys that have documented murrelet flights at several sites between Newhalem and Marblemount but no surveys have been conducted within the Project Boundary to determine if the species occurs this far inland from their marine habitat. However, a pair of murrelets were observed in 2017 on Ross Lake near Roland Point, which is 2.9 miles northeast of the Ross Lake Dam.

The objectives of the study are to:

- Develop map of potentially suitable nesting habitat within the study area using existing vegetation mapping data from the National Park Service, data developed for the Vegetation Mapping study, and criteria identified in the scientific literature to determine areas of potentially suitable murrelet nesting habitat and select appropriate locations for radar-based surveys to document murrelet flight activity upriver of Thornton Creek and along Project reservoirs, focusing on areas near Project facilities and existing and likely future maintenance and construction noise sources.
- Conduct limited habitat assessments to verify the accuracy of the mapping of potentially suitable marbled murrelet nesting habitat.
- Conduct peak nesting season (May-July) simultaneous radar and audio-visual surveys at selected sites to assess the likelihood of presence of marbled murrelets. If present, determine the relative abundance of birds at each survey site within the Project Boundary.

2.2 Resource Management Goals

The study will provide information needed to characterize potential Project effects on the marbled murrelet. The study will also provide information to help resource agencies and Indian tribes with jurisdiction in the Project vicinity identify appropriate recommendations and conditions for the new Project license pursuant to their respective goals and authorities for resource management.

Management goals related to marbled murrelet are described below.

- **Seattle City Light**

The goal of Seattle City Light is to gather information to determine the occurrence of marbled murrelets within the Project Boundary, and if they occur, to develop any best management practices to offset any identified Project-related effects to ensure long-term coordinated management of marbled murrelets during the new license period.

- **U.S. Fish and Wildlife Service (USFWS)**

The USFWS Marbled Murrelet Recovery Plan of September 1997 (USFWS 1997) states that the interim objective of the recovery plan is to stabilize marbled murrelet population sizes at or near current levels by: (1) maintaining and/or increasing productivity of the population as reflected by changes in total population size, the adult:juvenile ratio, and nesting success by maintaining and/or

increasing marine and terrestrial habitat and by; and (2) removing and/or minimizing threats to survivorship, including mortality from gill-net fisheries and oil spills.

- U.S. Forest Service (USFS)

The stated objective of the Northwest Forest Plan is to maintain and restore nesting habitat conditions that would provide for viability of murrelet populations, well-distributed along their current range on federal lands (FEMAT 1993). The expectation was that the Plan “...would eventually provide substantially more suitable nesting habitat for murrelets than currently (in 1994) exists on federal lands” (USDA and USDI 1994).

- National Park Service (NPS)

The marbled murrelet is listed by NPS as an at-risk species in the North Cascades National Park Service Complex. All NPS management actions and projects are required to evaluate potential effects to murrelet habitat prior to implementation and follow applicable consultation with USFWS when appropriate. Preservation of murrelet habitat, such as old growth nesting trees around Ross, Diablo, and Gorge lakes, is resource management priority of the agency.

- Washington Department of Fish and Wildlife (WDFW)

The marbled murrelet was listed as threatened by the Washington State Fish and Wildlife Commission (Commission) in 1993 (Washington Administrative Code 232-12-001). “Without solutions that can effectively address the major threats in the short-term, it is likely the situation for Marbled Murrelets will only worsen and the species could be lost from some landscapes in the decades ahead. Therefore, our recommendation is to up-list the Marbled Murrelet to the status of a state endangered species in Washington” (Desimone 2016). The Commission upgraded the marbled murrelet on the list to “Endangered.”

- Washington Department of Natural Resources (Washington DNR)

The Board of Natural Resources adopted a long-term conservation strategy for the marbled murrelet at its meeting on December 3, 2019 and a Final Amendment to the 1997 State Trust Lands Habitat Conservation Plan (HCP; Washington DNR 2019). The goal of the HCP amendment is to provide forest conditions in strategic locations on forested state trust lands that minimize and mitigate incidental take of marbled murrelets resulting from Washington DNR’s forest management activities. In accomplishing this objective, Washington DNR expects to make a significant contribution to maintaining and protecting marbled murrelet populations. The intent of the Washington DNR’s Habitat Conservation Plan is to improve current population trends through conservation and recruitment of additional nesting habitat on Washington DNR-managed lands.

2.3 Background and Existing Information

The marbled murrelet (*Brachyramphus marmoratus*) is a small seabird that inhabits the nearshore marine environment in western North America where it forages for small fish and zooplankton. The distribution of murrelets in Washington State includes the southern Salish Sea and the outer coast. It is unique among seabirds in that it will fly considerable distances inland during the breeding season to nest in old growth and mature coniferous forests. In Washington, marbled murrelets usually nest in older forests dominated by western hemlock (*Tsuga heterophylla*), Sitka spruce (*Picea sitchensis*), Douglas-fir (*Pseudotsuga menziesii*) and western redcedar (*Thuja*

plicata) trees that have large branches that support substantial moss, epiphytes and debris to form platforms on which a single egg is laid (Hamer and Nelson 1995). Marbled murrelets exhibit strong site fidelity to nesting areas, appear to nest in alternate years, on average, and have a naturally low reproductive rate (Desimone 2016).

The species was listed as threatened under ESA in 1992 in Washington, Oregon and California, primarily due to loss of old-growth forest nesting habitat from commercial timber harvesting and mortality associated with net fisheries and oil spills. The USFWS designated critical habitat for the marbled murrelet in 1996 (61 Federal Register [FR] 26255). The Project vicinity does not contain any designated critical habitat for marbled murrelet. Critical habitat is mapped approximately one mile south of the Bacon Creek confluence with the Skagit River (Project transmission lines cross near this confluence) and the Illabot Creek fish and wildlife mitigation land property (USFWS 2019a).

The species was also subsequently listed by the Washington Fish and Wildlife Commission as threatened in 1993. In 1997, the Washington Forest Practices Board enacted State Forest Practices Rules to address effects to murrelets from timber management on non-federal lands. At-sea population monitoring from 2001 to 2015 indicated a 4.4 percent decline in the murrelet population annually, which represents a 44 percent reduction since 2001. The 2015 population estimate for Washington is about 7,500 birds (Desimone 2016). In a 2016 status review by the Washington Department of Fish and Wildlife (WDFW), it was recommended to list the marbled murrelet as a state endangered species in Washington State (Desimone 2016). A review of its status by USFWS found that the California/Oregon/Washington marbled murrelet population is a distinct population segment that continues to be subject to a broad range of threats, such as nesting habitat loss, habitat fragmentation, and predation (USFWS 2009; USFWS 2019b). Based on this assessment, USFWS concluded in January 2010 that removing the species from the list of threatened species was not warranted (75 FR 3424).

The distance inland that marbled murrelets breed is variable and is influenced by several factors, including the availability of suitable habitat, climate, topography, predation rates, and maximum forage range (McShane et al. 2004). In Washington, the primary nesting range extends 40 miles inland, but occupied nesting habitat has been documented 52 miles from the coast (Hamer 1995; Madsen et al. 1999), and the species has been detected up to 70 miles inland (57 FR 15328). However, 90 percent of all observations have been within 37 miles of the coast in the northern Washington Cascades (57 FR 15328). Marbled murrelets typically nest in old-growth forests and select large, old trees with branches that support mats of epiphytes (McShane et al. 2004). Nesting in Washington occurs over an extended period from late April through late August (McShane et al. 2004). Incubation lasts about 30 days and chick rearing takes another 28 days.

The most downstream Project facility, the Gorge Powerhouse, is 54 miles straight-line distance from Puget Sound, which is beyond the 50-mile zone generally considered to be the farthest distance from saltwater for murrelets in Washington (USFWS 1997). Nonetheless, the Project does contain some suitably large trees and could possibly be used by murrelets for nesting. Within the Project Boundary, the fish and wildlife mitigation lands at Illabot Creek, Bacon Creek, and South Fork Nooksack and forests adjacent to the transmission line also contain some patches of large conifer trees that could provide potential habitat. These parcels range 20-45 miles from Puget Sound. An assessment of a small portion of the Nooksack parcel found a patch of trees >32 inches

diameter at breast height with potentially suitable nest platforms based on Washington DNR survey methodology.

In May and June 2008, pre-dawn radar surveys recorded detections of possible marbled murrelets flying along the Skagit River near the mouths of Bacon, Thornton, and Damnation creeks (Hamer Environmental 2010). The Thornton Creek survey site is approximately 2 miles from the Gorge Powerhouse. Eleven of the flight path detections were very close to the Bacon Creek mitigation lands, but all were high-speed flights indicative of birds passing through as opposed to flights near nest sites. Follow-up ground-based surveys in 2009 detected murrelet-like audio-visual observations 1.5 miles up the Thornton Creek drainage but failed to detect any possible murrelet activity at survey stations 4.6 miles up the Bacon Creek drainage (Hamer Environmental 2010). Additional survey effort would be necessary to verify actual murrelet use in these drainages.

Surveys for marbled murrelets have not been conducted on Gorge, Diablo, or Ross lakes. NPS records show few visitor or staff sighting records of this species in the RLNRA. However, NPS staff observed a pair of murrelets on Ross Lake in 2017, near Roland Point (Ransom 2019). Roland Point is 2.9 miles northeast of the Ross Lake Dam. Murrelets have been documented foraging on inland freshwater lakes in Alaska, British Columbia, Washington, and Oregon. In Washington they have been documented using Lake Washington near Seattle and Lake Quinault on the Olympic Peninsula. In British Columbia, most freshwater lakes used by murrelets were within 12 miles of the coast, but use did extend to inland lakes up to 46 miles from the coast (Carter and Sealy 1986).

2.4 Project Operations and Effects on Resources

The USFWS has previously completed analyses of the potential for disturbance to murrelets (USFWS 2003; USFWS 2006) and has concluded that project noise or activities can disrupt normal murrelet nesting behaviors in some situations. The USFWS considered significant disturbance to occur when project noise or activity causes a murrelet to become so agitated that it flushes away from an active nest site or aborts a feeding attempt during incubation or brooding of nestlings (USFWS 2003). They defined a flush from a nest site as including movement out of an actual nest, off the nest branch, and away from a branch of a tree within suitable habitat during the nesting season. Such events were considered significant because they have the potential to result in reduced hatching success, fitness, or survival of juveniles and adults (USFWS 2003).

The USFWS (2006) analysis grouped potential exposures of nesting murrelets to noise and human activity into three categories: (1) aircraft noise (helicopters and planes); (2) ground-based continuous noise and human activity (e.g., chainsaws, heavy equipment) and; (3) impulsive noise (pile-driving and blasting). It concluded that under certain scenarios these activities could result in significant disruptions of normal behaviors that result in a likelihood of injury to marbled murrelets. Behavioral responses considered significant were: (1) an adult murrelet flushing from a nest or perch within the vicinity of a nest site, including delay or avoidance in nest establishment; and (2) an adult murrelet delaying or aborting one or more feedings of nestlings. The analysis found that these behaviors were likely to occur when: (1) aircraft noise exceeds 92 dBA SEL at a nest site, or aircraft approach within a distance of 100 meters (m)(110 yards), whichever is greater and; and (2) ground-based activity occurs during the nesting season within 100 m (110 yards) of a nest site (USFWS 2006).

Project operation and maintenance (O&M) activities and recreation may affect nesting murrelets if they occur in the vicinity of murrelet nests. Project-related noise disturbance could include the operation of heavy equipment and loud tools, such as chainsaws, used for maintenance of structures, utilities, and roads. In addition, vegetation management activities have the potential to disturb wildlife. For marbled murrelets, these noise effects would likely be greatest during the breeding season which is defined by the USFWS as April 1 to September 23 for Washington State (USFWS 2012). Boat traffic also generates short-term disturbances, which might affect wildlife. Some boat noise occurs on Diablo Lake from operating the barge and crew ferry and on Ross Lake from research boats and seasonal work boats collecting floating driftwood. However, the majority of boat use on Ross Lake is related to recreation and NPS management activities.

In addition, City Light uses helicopters to visually inspect the transmission line towers. During these occasional inspections the machine only hovers if potential structural problems are noted, which is rare. Project-related snow surveys, conducted by helicopter for two days each month from the end of December through early May, also generate noise, which is most noticeable at take-off and landing in Newhalem and at the snow course stations, and during ascents and descents in the Gorge bypass reach area. Noise from helicopters has the potential to affect wildlife in and around the Newhalem area and in the Gorge bypass reach but the frequency of occurrence is low and intermittent and mostly at a time of year when marbled murrelet use in these areas is relatively low, and is largely outside of the nesting season. City Light consults with the NPS and USFWS to determine potential noise effects on listed species if helicopter use is needed for maintenance projects outside the winter season. If possible, helicopter use for Project-related work is scheduled to avoid the breeding and rearing season for most birds (April through August).

2.5 Study Area

The study area will include lands within the Project Boundary (Figure 2.5-1) and a 0.5-mile buffer area with an emphasis on locations where potentially suitable marbled murrelet habitat and potential Project effects intersect. This will include the lands around the Project reservoirs (Ross, Diablo, and Gorge lakes) and facilities, the transmission line right-of-way (ROW), and fish and wildlife mitigation lands.

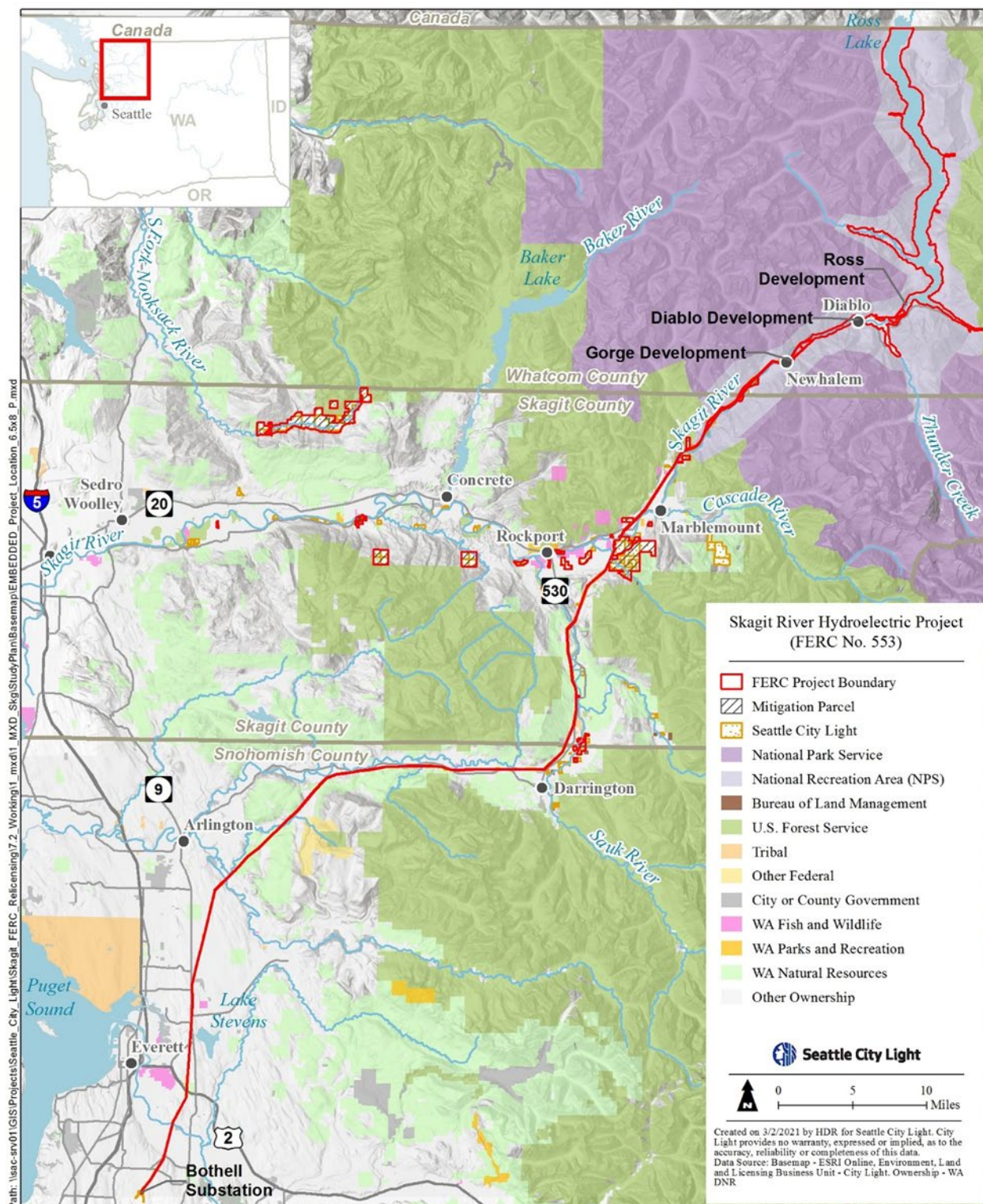


Figure 2.5-1. Location map of the Skagit River Project.

2.6 Methodology

2.6.1 Map Potential Marbled Murrelet Nesting Habitat

NPS has mapped vegetation associations within the North Cascades National Park using the National Vegetation Classification Standards (NVCS). These data will be reviewed to determine those mapped vegetation association units in the study area that meet potential marbled murrelet habitat criteria. Old growth forest will be the primary indicator used for this effort. LiDAR-derived variables (tree height) will be used to refine the extent of potential murrelet habitat. Vegetation within the study area outside of the North Cascades National Park will be mapped as part of the Vegetation Mapping Study. These areas will be mapped using NVCS to the association level. These data, along with LiDAR-derived tree height data will be used to map potential murrelet habitat. Limited field verification during the Vegetation Mapping and the Wetland Assessment studies will provide additional refinement of the initial murrelet habitat maps, providing information on the availability of suitable limb nesting platforms. These maps will assist in selecting radar survey stations that scan or are located near suitable nesting habitat in the vicinity of Project noise sources, thus increasing the likelihood of detecting nesting marbled murrelets.

2.6.2 Conduct Limited Ground Surveys to Verify Accuracy of Habitat Mapping

If deemed necessary, using some of the methods outlined in the Vegetation Mapping Study, we will also conduct limited habitat assessments to verify the accuracy of the mapping of suitable marbled murrelet nesting habitat in areas to be surveyed by radar for marbled murrelets. We will use two biologists to sample and conduct a rapid assessment of representative sites (up to 5 days field effort) to verify accuracy of the mapping of murrelet nesting habitat. A 25-m radius plot will be conducted in each stand and information collected on potential nest platform abundance. A platform is a relatively flat surface at least 10 centimeters (4 inches) in diameter and 10 m (33 feet) high in the live crown of a coniferous tree. Platforms can be created by a wide bare branch, moss or lichen covering a branch, dwarf mistletoe, witches' brooms, other deformities, or other structures (Evans Mack et al. 2003). We will also collect information on average percent moss cover on tree limbs, average moss depth on tree limbs, presence of dwarf mistletoe, tree species composition, tree diameters, and an assessment of flight access for murrelets to nest platforms. At least 5 stands could be sampled per day or a total of ~25 stands during the week.

2.6.3 Radar and Audio-Visual Surveys

2.6.3.1 Choosing Radar Survey Locations

Radar survey locations will be chosen using four criteria: (1) within the Project Boundary where O&M activities may have the highest likelihood of affecting nesting marbled murrelets if present; (2) presence of suitable marbled murrelet nesting habitat; (3) presence of a major river valley or reservoir which could be used as potential flight corridors; and (4) suitability to detect birds using ornithological radar. The radar survey locations will not include the wildlife mitigation lands as there are no disturbance sources on these parcels.

Using the criteria above, the radar study will include horizontal radar sampling at one location near Hozomeen Campground on Ross Lake (using radars mounted on a boat), one location near Roland Point on Ross Lake (by boat), one site on Ross Lake near Ross Lake Resort above Ross Lake Dam (by boat), two sites adjacent to Diablo Lake (using a radar utility trailer as a radar lab), one site 400 m west of Diablo Dam, two sites along Gorge Lake, and one site at Newhalem. Therefore, a

total of nine sites will be sampled. Preliminary radar sampling station locations have been proposed based on occurrence of suitable habitat, intersection with potential effect vectors, sampling efficiency, and logistics (Figure 2.6-1). These locations will be further refined as described in the methods. Final radar survey locations will be chosen in the field and will depend on site access, safety, logistics, and suitability in detecting birds.

2.6.3.2 Radar and Audio-Visual Survey Methods

In the first radar study of marbled murrelets in northern California, Hamer et al. (1995) determined that radar was a useful tool to detect and monitor marbled murrelets at inland sites as they transited to nest sites from the marine environment. Craig et al. (2016) conducted a study testing three different methods for monitoring *Brachyramphus* murrelets breeding in the Kodiak Archipelago, Alaska. These included standard audio-visual surveys, radar surveys, and autonomous acoustic recorders for monitoring vocal activity. They found that of the three methods, radar sampled the largest area and detected silently flying murrelets, thus providing the most reliable data on local populations. In addition, Cooper et al. (2008) conducted a 3-year study and chose to use a combination of ornithological radar and standard audio-visual surveys to collect baseline information on distribution and abundance of marbled murrelets in the Cedar River Municipal Watershed in Washington during 2005-2007. The monitoring of murrelets using radar methods is also described in the 2003 Pacific Seabird Group Marbled Murrelet Survey Protocol (Cooper and Hamer 2003).

Radar can supply information on the murrelets' flight path and flight behavior, flight direction of targets to the nearest degree, number of targets, and the distance from the radar to the target to the nearest meter (Hamer et al. 1995, Cooper and Hamer 2003). All of this information is critical in determining where birds are headed, which forest stands are likely being used, and the relative abundance of birds in the area. Thus, the quality and usefulness of the survey information collected by radar is much higher than data produced by the audio-visual ground survey protocol (Cooper and Hamer 2003). Radar also improves survey efficiency because it reliably samples a much larger area (up to a 1,500 m radius) than audio-visual observers (less than 100 m radius for visual detections) (Hamer et al. 1995). Maximal distances of detection of birds by the radar depends on body size of the birds, flock size, flight profile of the birds, distance between flying birds, atmospheric conditions, and, to some extent, the amount and location of ground clutter. Marbled murrelets are usually detectable to at least a 1.5-kilometer (km) radius, whereas single, small passerines are detectable to ~1 km (Cooper et al. 2001). However, if murrelets are detected by radar, audio-visual surveys would still be necessary to determine if a particular stand is 'occupied' by nesting murrelets. Because radar energy cannot penetrate forest vegetation, it generally cannot be used to determine whether a specific stand is being used by nesting marbled murrelets (Hamer et al. 1995; Cooper and Hamer 2003).

Murrelets are primarily identified on radar by their flight speed, which tends to be greater than most other species (Hamer et al. 1995). There are individual sites, however, that can have problematic species present, like band-tailed pigeons or waterfowl that can fly at speeds similar to those of murrelets. Therefore, it is important that concurrent audio-visual observations (at the radar lab) and radar observations be made to assess the relative abundance of potentially confounding species and to help filter out non-murrelets from the radar database (Hamer et al. 1995; Cooper et al. 2001; Burger 2001).

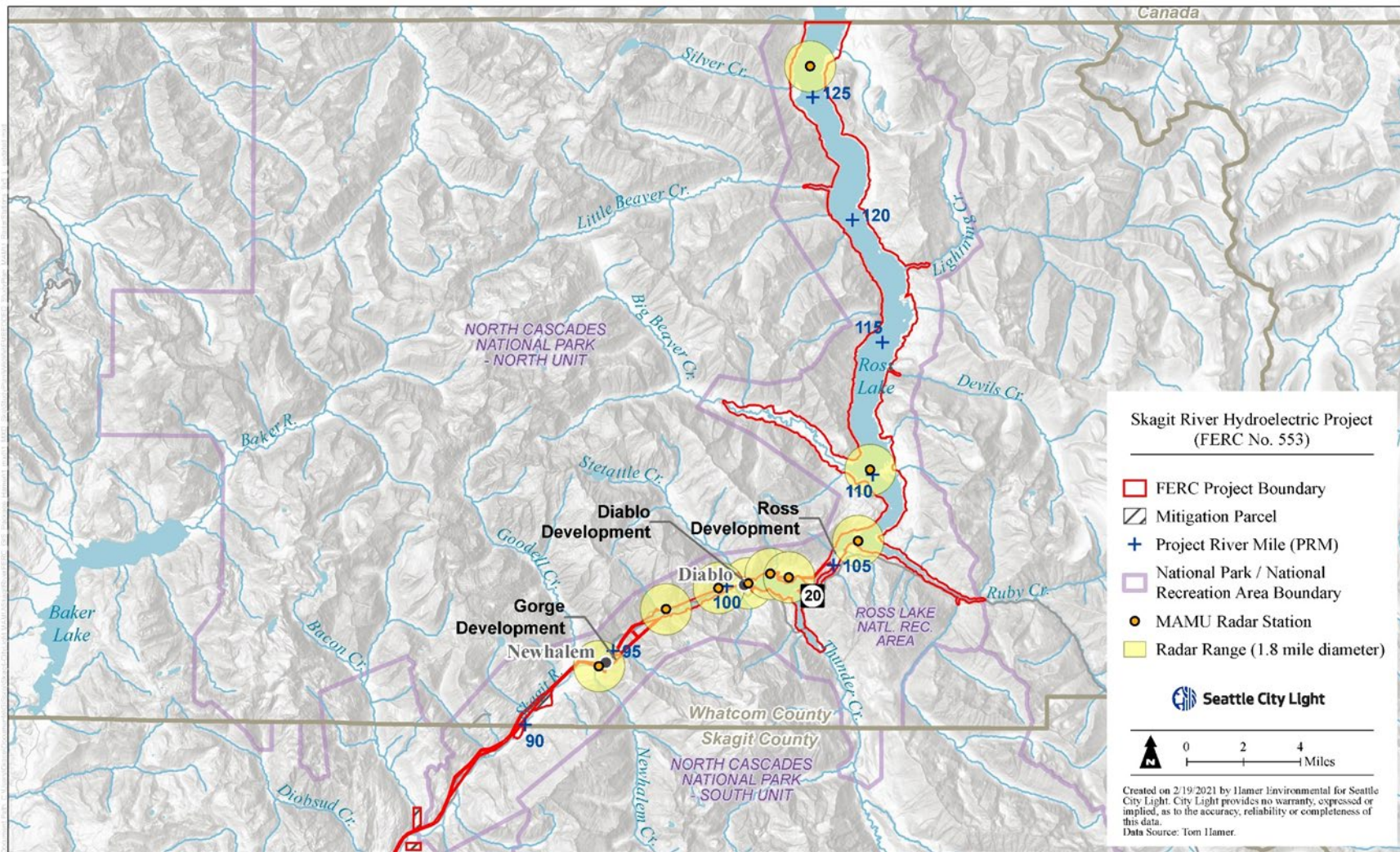


Figure 2.6-1. Preliminary proposed radar survey station locations (specific locations to be refined as described in Section 2.6.3.1 of this study plan).

Therefore, for this study, simultaneous radar and audio-visual surveys will be completed during the morning murrelet activity period beginning approximately 105 minutes before official sunrise and ending 75 minutes after sunrise for a total of 3 hours of sampling each day. This period encompasses the known peak of daily murrelet activity (Burger 1997). The audio-visual observer will be located just outside the radar unit and will attempt to verify the identification of each radar target. Sunset and sunrise times for each site will be obtained from the National Oceanic and Atmospheric Administration (NOAA) Sunrise/Sunset tables available for the nearest location.

Five radar and audio-visual surveys will be completed at each of nine sites for a total of 45 surveys. Surveys will be completed in May, June and July, the peak breeding season for marbled murrelets. One survey will be completed at each site in May, two in June, and two in July. The higher sampling intensity in June and July corresponds to higher probabilities of detecting marbled murrelets during the breeding season.

2.6.3.3 Ground Clutter Reduction

For terrestrial radar survey sites located near Ross Dam, Diablo Lake, and associated transmission lines, the ability to detect marbled murrelets with ornithological radar declines with increasing ground clutter. Ground clutter forms on the radar monitor when radar energy bounces off solid objects such as landforms, trees, buildings, etc. Ground clutter creates solid echoes on the radar monitor creating conditions where the echoes of individual flying birds cannot be seen. In order to reduce this ground clutter, radar station locations will be carefully selected and pre-tested with the radar system to ensure their suitability for detecting marbled murrelets. In areas where ground clutter may be an issue, many natural landforms (low berms) and surrounding vegetation (hedgerows or lines of low trees) will be used to create a “radar fence” that clips off the lowest portion of the radar beam and creates a ground clutter-free air space beyond where murrelet targets can then be accurately detected and tracked. Hamer Environmental horizontal radar systems have also been modified to significantly reduce ground clutter. In areas where a radar fence is not available, our radar units have a built-in ground clutter reduction screen that is adjustable in 5° increments and can be raised to clip off the lowest portion of the beam and create clutter-free air space beyond. In addition, our radar systems are built so that the radar antennas can be tilted upwards, and thus focus energy in the sky where birds are flying and lessen the amount of energy hitting or scanning the ground or surrounding landforms. Hamer Environmental radar antennas can be tilted in 5° increments from 0° to 60°. Radar survey station locations will be chosen that allow access for the radar lab and to maximize the surveillance area of the radar.

For the aquatic sites that will be surveyed by boat on Ross Lake, sites will be chosen on the lake where the boat and radars will be somewhat protected by wind and waves to minimize wave clutter on the radar monitors. Thus, areas protected from wind by ridges and other landforms, such as behind spits and in bays, will be chosen as radar survey locations. Standing waves created by wind reflect energy back to the radar causing “wave clutter” on the radar screen. Lake sites will also be chosen to maximize the area of wave and ground clutter-free air space beyond where murrelet targets can then be accurately detected and tracked. We will also use our ground clutter reduction screens and radar tilt modifications to further reduce any clutter at these survey stations. Radars were built to work on water so that the lake sites should experience much lower clutter issues than terrestrial sites. Both lake and terrestrial sites will be chosen so that the radars are scanning areas

that are likely to be flight corridors or areas with suitable marbled murrelet habitat to increase our chance of detecting marbled murrelets.

2.6.3.4 Radar Equipment

Radar tracking in horizontal (surveillance) mode will be performed using high-frequency marine radars (Furuno Model FR-1510 Mark 3 and Furuno Model 2117, Furuno Electric Company, Nishinomiya, Japan) transmitting at 9,410 megahertz (MHz) ± 30 MHz (i.e., X-band) with 2 m-long slotted wave guide antennas with peak power output of 12 kW. Target detection will be enhanced by sophisticated signal processing techniques Furuno employs, such as the radar interference rejecter, which reduces the amount of noise received by the radar, while not affecting the resolution of targets being detected.

The radar antennas have a beam width for the vertical span of 20° and a horizontal beam width of 1.23° . To enhance detection of small targets and discrimination between close targets, the pulse length will be set to 0.07 microsecond when operating the units within the 0.25 to 3 km (0.16 to 1.86-mile) ranges. The shorter pulse allows better definition of small targets and increased range resolution. Range resolution is a measure of the capability of the radar to detect separation between targets on the same bearing with small differences in range. Maximum detection range capability can be reduced when using the shorter pulse length, but better target definition and range accuracy allow for more accurate assessments of bird passage rates and behavior, justifying some reduction in range. Range accuracy was 1 percent of the maximum range of the scale in use, or 30 m (98 feet), whichever was greater.

The horizontal scanning radar will be operated at a range of 1.5 km (0.9-mile) radius. The unit will be mounted on a motorized boat that will be docked on Ross Lake at the Ross Lake Resort. A gasoline or propane powered generator will provide power to each radar unit and associated computers.

2.6.3.5 Radar Tracking Software

Horizontal (surveillance) radars will be operated each sampling morning. The horizontal (surveillance) radar antenna rotates and scans the horizon once every 2.5 seconds. With each rotation the radar monitor displays an echo of the targets being tracked. Echoes on the radar display will be retained for 30 seconds resulting in a trail of echoes as the targets moved, which will enable the flight paths of all birds to be plotted. Because the radar rotates at fixed time intervals, the distance between adjacent echoes is directly proportional to the ground speed of the targets. Therefore, the speed of the target can be calculated by measuring the distance between echoes. Echoes farther apart indicated faster moving targets. The horizontal radar will collect information on flight direction, flight behavior (straight, arcing or circling flight path), overall flight path, movement rates (targets/hour, targets/morning), relative body size, and the ground speed of birds (km/hour [hr]). To plot the flight paths of each bird, the x and y coordinate of each echo will be recorded by the software.

Raw output (video, trigger pulse, ships heading marker, and bearing pulse) from the radar will be collected using a dedicated computer. Each sweep of the radar and associated echoes will be stored as a single digital archive file. All the sweeps from a given survey period will be archived together

in a single folder on an external hard drive, which will be cloned to a separate hard drive at the end of each morning for data back-up.

Echoes on the radar screen will be recorded for the duration of each morning survey using digital radar technologies and automatic tracking software. Automated data collection and software analysis systems allow permanent digital storage of all radar data along with replay or re-analysis of the data from any morning at any time. After the removal of any clutter (non-moving objects) from the screen, detections of moving targets will be processed. As in other studies, the term “target” will be used to describe birds detected by radar because the species composition and size of a group of birds is usually unknown. For the horizontal radar, for each detection of a target, automated software will record the date, detection time, flight speed, echo size (targets can be filtered by several measures of size including radial span, angular span, perimeter and/or area), echo shape, number of echoes, echo locations, distance between each echo, flight direction and reflectivity (a measure of the strength of each echo).

All radars have a corona-effect, where radar signal interference creates clutter within a small area immediately surrounding the radar location, and effectively masking any target detections. The corona-effect for this study will include a 200 to 250 m radius area surrounding each radar site location. Thus, no targets will likely be detected with ranges <200 m from the radar.

Target Tracks and Filtering

Individual targets will be tracked over time using a complex multi-frame correspondence model. A minimum of four echoes will be needed before a target’s flight path will be tracked and recorded by the software to help eliminate non-murrelet targets and to achieve higher accuracy of speed and flight direction measurements. The resulting tracks will then be filtered based on flight speed and echo reflectivity to exclude insects and smaller avian targets. Under ideal conditions murrelet type targets can be detected up to 1,500 m away from the radar.

Murrelet type targets detected on radar will be distinguished from other avian species by the target timing of activity, flight speed, flight direction, and body size. The most important discriminating factor will be the timing of activity. For birds flying in an inbound-outbound direction from saltwater, the earlier the detection before sunrise, the higher the likelihood that the detection is a marbled murrelet. The one species usually confused with murrelets, band-tailed pigeons, usually do not become active until 20 minutes after sunrise (Colclazier et al. 2010) and no other shorebird or seabird would be as likely to be flying inland as early as a marbled murrelet.

An additional factor we will use in determining the likelihood of a target being a marbled murrelet will be flight speed. The faster the flight speeds of targets flying inbound or outbound towards the ocean over the threshold of 40 miles per hour (mph) the more likely the species is a marbled murrelet (Cooper and Hamer 2003). Murrelet flight speeds can range from 40 mph to over 70 mph. In a 2010 radar study in North Cascades National Park (Hamer Environmental 2010), murrelet-type targets had an average speed of 84.92 km/hr (50.85 mph) with the fastest targets recorded at 130.26 km/hr (78 mph). In general, the faster the flight speed the more likely the target could be a marbled murrelet. At inland sites, Hamer et al. (1995) found the only other common inland species of similar size and flight speed to the murrelet was the band-tailed pigeon (*Columba fasciata*), which overlapped at the lower end of murrelet flight speed. Only birds flying ≥ 40 mph (at the 1.5 km range) will be recorded as murrelets to minimize the number of non-murrelet targets recorded.

In addition, murrelet type targets will sometimes show a somewhat higher mean flight speed for outbound versus inbound flights. This discrepancy results from the murrelets losing altitude after visiting nest sites in the nearby hills and mountains as they descend back to sea level. Murrelets heading inland to nest sites usually have to gain some altitude to fly over nearby ridges and hills and this slows their flight speed. However, Craig et al. (2016) concluded that radar identification of murrelets was found to be more unreliable in winds exceeding 18 km/hr (11 mph). In a summary of radar methods, Cooper and Hamer (2003) recommended to only sample when average wind speeds were <25 km/hr (15 mph), so that slowly flying birds with tailwinds would not be counted as murrelet targets. Therefore, we will avoid sampling on days with higher wind speeds.

The more direct flight paths of murrelets along drainages and east-west flight directions on their way to and from marine waters will also help distinguish the murrelet from other species. Typically, detections are considered inbound if the target was headed inland within $\pm 45^\circ$ of an easterly direction (90°) and outbound if the target had a flight bearing within $\pm 45^\circ$ of a westerly direction (270°).

In addition to speed and flight direction, a marbled murrelet's compact body and relatively large muscle mass make comparatively large, round, echo sizes on the radar monitor. The timing of the detections will also be considered. Murrelets start flying inland as much as 105 minutes before sunrise when most other birds are not yet active (Cooper and Hamer 2003). Therefore, targets flying inland predawn are more likely to be murrelets. In addition, daily murrelet type detections will usually show a pulse of early inbound detections and then a pulse of outbound detections sometime later in the morning. The difference between the inbound and outbound flight times is due to the time it takes the birds to fly inland to exchange incubation duties and feed young along with the time it takes to return back to the ocean. These criteria, when considered together, assist in the identification of murrelet targets using radar and in the final assessment of whether a site has a likelihood of murrelet presence. Radar targets occurring before sunrise, with high flight speeds, showing roughly east-west flight patterns, large echo sizes and arriving in pulses of inbound and outbound detections have a much higher likelihood of being marbled murrelets than other similar radar targets (Hamer Environmental 2010).

2.6.3.6 Audio-visual Surveys

Simultaneous audio-visual surveys will be conducted adjacent to the radar unit to attempt to confirm the identification of radar targets. Since radar cannot absolutely determine species identification of targets detected, audio-visual surveys will assist in confirming radar detections as marbled murrelets. The Pacific Seabird Group Marbled Murrelet Survey Protocol (Evans Mack et al. 2003) methods for audio-visual surveys will be used to collect this data. All Hamer personnel working as audio-visual surveyors will be trained and certified to conduct marbled murrelet surveys at our week-long Prairie Creek Redwoods State Park training session in Northern California.

Data in the field will be recorded using hand-held digital recorders during surveys. On the digital files, the surveyors will note any murrelet detection and details of the observation, record survey start and end times, note any pertinent changes in weather conditions, and record detections of other species of concern. The audio-visual surveyor will be in radio contact with the radar technician. The radar technician will provide the surveyor with the distance and direction of radar targets to assist the observer with locating and identifying these avian targets. The data will be

transcribed onto standardized survey forms and if the target was also recorded by the radar, this will also be noted.

2.6.4 Data Analyses

2.6.4.1 Radar Counts and Passage Rates

Data will be analyzed by hour and by survey morning for the breeding season. Counts of murrelet type flight tracks during each sampling period will be summed. We will use these counts to calculate movement rates (targets/hr) based on the number of hours sampled in each period analyzed (per hour and per morning).

Radar passage rates are an index of the number of murrelet type targets flying over a location and can be used to assess the relative biological importance of sites being analyzed. Passage rates will be adjusted for minutes of lost data due to rain or other radar clutter during these time periods.

2.6.4.2 Flight Directions and Locations

Flight directions will be calculated for each radar target track by averaging the bearing of each echo within the track and then converting the final bearing to a cardinal direction based on the track echo x and y coordinates. Flight directions (degrees) for each track will then be summarized ORIANA 4.02 software (ORIANA 2013). Mean flight directions, 95 percent confidence intervals and standard error will also be calculated for all survey periods at each radar site.

2.6.4.3 Flight Paths

We will map all the target flight paths throughout each of the 1.5 km-radius survey areas for the entire breeding season sampling period. Flight tracks will be analyzed by plotting the average x and y coordinates of each track using ArcMap. All flight tracks will be plotted over maps of suitable habitat to help determine areas that could contain nesting murrelets.

2.6.4.4 Weather Data

Weather data will be collected by the radar operator each morning just before the start and end of each radar survey session. Weather variables collected will include wind speed (km/hr) using a hand-held wind meter, wind direction (degrees), cloud cover (percent), estimated ceiling height (m), minimum horizontal visibility (m), light condition (daylight, twilight, dark), precipitation, and air temperature (°C). It will not be possible to collect radar data during periods of heavy rain because the electronic filtering required to remove the echoes of the precipitation from the display screen also removes bird targets.

2.7 Consistency with Generally Accepted Scientific Practice

The study adheres to currently accepted scientific methods for evaluating marbled murrelet habitat suitability (Evans Mack et al. 2003), potential for noise disturbance, developing a radar and audio-visual sampling protocol (Burger 1997; Cooper et al. 2001; Hamer Environmental 2010; Evans Mack et al. 2003), analyzing potential Project effects (USFWS 2013), and developing appropriate PME (USFWS 2013).

2.8 Schedule

- Habitat Mapping, Ground-truthing, and Desktop Analysis – Spring 2021
- Field Work – April to July 31, 2021
- Analysis – September to November 30, 2021
- Final Report (Initial Study Report [ISR]) – March 2022

If 2021 is deemed a poor nesting season for marbled murrelets in Washington State, an additional year of radar and audio-visual surveys may be necessary in 2022. To help determine if a poor nesting year occurred, data will be reviewed from: (1) at-sea surveys of marbled murrelets off the coast of Oregon and Washington conducted by the USFS that collect data on the number of fledglings observed on the water; (2) data on frequency of nesting and nesting success from murrelet telemetry and nest monitoring study in Oregon by Oregon State University; (3) data on warm water events collected by NOAA (e.g., El Niño) and poor reproductive performance of related seabirds (common murres, etc.) off the coast of Washington (WDFW and USFWS) and; (4) results of inland audio-visual surveys being conducted at inland sites in Washington and Oregon (WDFW, Oregon Department of Forestry, and Oregon Department of Fish and Wildlife survey data).

2.9 Level of Effort and Cost

The initial estimate for implementation and reporting associated with this study is approximately \$207,000.

3.0 REFERENCES

- Burger, A.E. 1997. Behavior and numbers of marbled murrelets measured with radar. *Journal of Field Ornithology* 68:208-223.
- . Using radar to estimate populations and assess habitat associations of Marbled Murrelets. *Journal of Wildlife Management* 65: 696–715.
- Carter, H.R. and S.G. Sealy. 1986. Year-round use of coastal lakes by marbled murrelets. *Condor* 88: 473-477.
- Colclazier, E., J. Stump, and S. Singer. 2010. Long-Term Monitoring of Marbled Murrelet Populations at Inland Sites in the Santa Cruz Mountains of Central California, 1999-2009. Unpublished Report to the Command Trustee Council, State of California. 32 pp.
- Cooper, B.A., M.G. Raphael, and D. Evans Mack. 2001. Radar-based monitoring of Marbled Murrelets. *Condor* 103:219-229.
- Cooper, B.A. and T.E. Hamer. 2003. Use of radar for Marbled Murrelet surveys, Appendix H. In Evans, D. R., W. P. Ritchie, S. K. Nelson, E. Kuo-Harrison, P. Harrison, and T. E. Hamer (eds.). *Methods for surveying Marbled Murrelets in forests: a revised protocol for land management and research*. Pacific Seabird Group unpublished document, available at: <http://www.pacificseabirdgroup.org>.
- Cooper, B.A., C.M. Grinnell, and R.J. Blaha. 2008. Radar and audio-visual surveys for Marbled Murrelets in the Cedar River Municipal Watershed, Washington. Final Report. Prepared for City of Seattle Watershed Management Division, 19901 Cedar Falls Road S.E., North Bend, WA 98045. 161 pg.
- Cragg, J.L., A.E. Burger, and J.F. Piatt. 2016. Techniques for monitoring *Brachyramphus* murrelets: a comparison of radar, autonomous acoustic recording and audio-visual surveys. *Wildlife Society Bulletin* 40(1):130–139.
- Desimone, S.M. 2016. Periodic status review for the marbled murrelet in Washington. Washington Department of Fish and Wildlife, Olympia, Washington. 28 pp.
- Evans Mack, D., W.P. Ritchie, S.K. Nelson, E. Kuo-Harrison, P. Harrison, and T.E. Hamer. 2003. *Methods for surveying marbled murrelets in forests, a revised protocol for land management and research*, Marbled Murrelet Technical Committee, Pacific Seabird Group, 89 pp. Pacific Seabird Group unpublished document available at <http://www.pacificseabirdgroup.org>.
- Forest Ecosystem Management Assessment Team (FEMAT). 1993. *Forest ecosystem management: an ecological, economic, and social assessment*. Portland, OR: U.S. Department of Agriculture; U.S. Department of the Interior (and others).
- Hamer Environmental. 2010. Use of audio-visual surveys to determine the presence/probable absence of marbled murrelets in North Cascades National Park, Washington. Final Report. Prepared for North Cascades National Park. October 14, 2010.
- Hamer, T. E., B.A. Cooper, and C.J. Ralph. 1995. Use of radar to study the movements of marbled murrelets at inland sites. *Northwestern Naturalist* 76:73-78.

- Madsen, S., D. Evans, T. Hamer, P. Henson, S. Miller, S.K. Nelson, D. Roby, and M. Stapanian. 1999. Marbled murrelet effectiveness monitoring plan for the Northwest Forest Plan. USDA, U.S. Forest Service. PNW-GTR-439. 51 pp.
- McShane, C., T. Hamer, H. Carter, G. Swartzman, V. Friesen, D. Ainley, R. Tressler, K. Nelson, A. Burger, L. Spear, T. Mohagen, R. Martin, L. Henkel, K. Prindle, C. Strong, and J. Keany. 2004. Evaluation report for the 5-year status review of the marbled murrelet in Washington, Oregon, and California. Unpublished Report. EDAW, Inc., Seattle, Washington. Prepared for the U.S. Fish and Wildlife Service, Region 1, Portland, Oregon.
- National Park Service. 2009. Vegetation classification of Mount Rainier, North Cascades, and Olympic National Parks (final map is in progress).
- ORIANA. 2013. ORIANA for Windows, version 4.02. Kovach Computing Services, Wales, UK.
- Ransom, J. 2019. Personal communication between Jason Ransom, National Park Service, and Jim Keany, Environmental Science Associates. March 12, 2019.
- 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.
- United States Department of Agriculture, Forest Service; U.S. Department of the Interior, Bureau of Land Management (USDA and USDI). 1994. Final supplemental environmental impact statement on management of habitat for late-successional and old-growth forest related species within the range of the northern spotted owl. Portland, OR. 526 pp.
- United States Fish and Wildlife Service (USFWS). 1997. Recovery Plan for the Threatened Marbled Murrelet (*Brachyramphus marmoratus*) in Washington, Oregon, and California. Portland, Oregon. 203 pp.
- _____. 2003. Biological Opinion and letter of concurrence for effects to bald eagles, marbled murrelets, northern spotted owls, bull trout, and designated critical habitat for marbled murrelets and northern spotted owls from Olympic National Forest program of activities for August 5, 2003 to December 18, 2008. Service Reference 1-3-03-F-0833. U.S. Fish and Wildlife Service, Lacey, Washington.
- _____. 2006. Transmittal of guidance: estimating the effects of auditory and visual disturbance to northern spotted owls and marbled murrelets in Northwestern California. Arcata Fish and Wildlife Office, July 31, 2006.
- _____. 2009. Marbled Murrelet 5 Year Review. Washington Fish and Wildlife Office, Lacey, WA. June 12, 2009. Final Report.
- _____. 2012. Marbled murrelet nesting season and analytical framework for Section 7 Consultation in Washington. U. S. Fish and Wildlife Service, Washington Fish and Wildlife Office (WFWO), Lacey, Washington, June 20, 2012. 10 pp.
- _____. 2013. Biological opinion for effects to northern spotted owls, critical habitat for northern spotted owls, marbled murrelets, critical habitat for marbled murrelets, bull trout, and critical habitat for bull trout from selected programmatic forest management activities, March 25, 2013 to December 31, 2023, on the Olympic National Forest, Washington. U.S.

- Fish and Wildlife Service Reference: 13410-2009-F-0388. U.S. Department of the Interior U.S. Fish and Wildlife Service Washington Fish and Wildlife Office Lacey, Washington. 404 pp.
- _____. 2019a. ECOS Environmental Conservation Online System. [Online] URL: <http://criticalhabitat.fws.gov/flex/crithabMapper.jsp>. Accessed December 31, 2019.
- _____. 2019b. Marbled Murrelet 5-Year Status Review. Washington Fish and Wildlife Office. Lacey, Washington. May, 2019.
- Washington State Department of Natural Resources (Washington DNR). 2019. Washington State Department of Natural Resources Final State Trust Lands Habitat Conservation Plan AMENDMENT. [Online] URL: https://www.dnr.wa.gov/publications/lm_mm_hcp_amendment.pdf?ih8zxi. Accessed December 31, 2019.

This page intentionally left blank.

MARBLED MURRELET REVISED STUDY PLAN

ATTACHMENT A

**CITY LIGHT RESPONSES TO LP COMMENTS ON THE STUDY PLAN
PRIOR TO PSP**

Table 1. City Light responses to LP comments on the study plan prior to PSP.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
1.	Brock Applegate (WDFW)	04/17/2020	Section 1.2 Relicensing Process	1 st Paragraph Add: consultation Delete: effort	Change made in different location of sentence and paragraph. Text modified to include discussion and consultation.
2.	Brock Applegate (WDFW)	04/17/2020	Section 1.3 Study Plan Development	I am not sure that we can declare 100% absence of marbled murrelets. I would recommend that SCL remove the word or add a footnote with the error associated with a determination of absence, probably something more than 95% sure of absence.	Edit made: text changed to "This likelihood of presence data".
3.	Shauna Hee (USFS)	04/15/2020	Section 2.1 Study Goals and Objectives	What is the distance inland?	The distance from Roland point to the closest saltwater (Bellingham Bay) is 64.4 miles straight line distance.
4.	Brock Applegate (WDFW)	04/17/2020	Section 2.1 Study Goals and Objectives	I agree with Shauna. WDFW would recommend that SCL add a number of miles inland for this detection.	See response to Comment #3.
5.	Shauna Hee (USFS)	04/15/2020	Section 2.1 Study Goals and Objectives	Radar-based surveys seem appropriate for landscape investigation	City Light appreciates the input.
6.	Brock Applegate (WDFW)	04/17/2020	Section 2.1 Study Goals and Objectives	<p>I agree, but not able to pinpoint nest areas, which SCL may want to do to find project operations effects on murrelets. Where would SCL apply marbled murrelet BMPs for further project operations, maintenance, and construction? I don't think this study plan will answer this question.</p> <p>New comment provided on 05/05/2020: I am not sure that you can pinpoint a breeding spot surrounded by 0.5 miles with this survey. How do you determine the location of a nest when you use this method? Does the sighting or detection of a migrating murrelet mean the nest resides closeby? I am not sure</p>	<p>The purpose and intent of the Marbled Murrelet Study is to determine where murrelet activity and potential occupancy is located in the study area (i.e., likelihood of presence) and where potential nesting habitat exists within 0.5 miles of locations where most Project noise generation occurs; not to determine occupancy in specific stands.</p> <p>This is a phased approach: 1) Conduct study to determine if and where murrelet activity is located in the study area using Radar Surveys, as described in Pacific Seabird Group Marbled Murrelet Protocol Surveys (Evans Mack et al. 2003) to identify</p>

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				<p>you can say anything other than a murrelet has flown by this detection point on the route to somewhere. I am just trying to help meet the objective for this study plan. Does SCL set a BMP for a large swath of land and place a 0.5-mile buffer around it? I am confused on how most of the time, SCL will have the ability to pinpoint an area to consider for BMPs, unless you will consider many acres. Does SCL have limited areas of possible nesting habitat?</p> <p>Please note that presence behaviors and occupied behaviors do not mean the same thing. Occupied behaviors do indicate the nest resides close. What will you do with the presence behaviors (non-circling above canopy activities)? Can SCL determine how far away the nesting area resides with a radar presence detection?</p>	<p>where occupancy is a possibility. Results to be reported in Initial Study Report (ISR). If activity is detected, then next steps will be determined based on those results:</p> <p>A) If likelihood of murrelet presence is extremely low, then ground surveys are unlikely to be needed to locate specific occupied sites.</p> <p>B) If consistent murrelet activity is detected by radar surveys in some areas, then follow up Pacific Seabird Group Protocol Intensive Surveys (Evans Mack et al. 2003) to determine probable absence or presence and occupancy of murrelets at a specific stand may be conducted for one or two years to find occupied sites (likely nesting areas) depending on potential for Project effects. (City Light could also assume occupancy for these sites and determine if best management practices (BMP) can be applied to avoid effects.)</p> <p>Radar surveys are appropriate for this first phase, especially given the size of the Project, as radar surveys detect murrelets over a significantly larger area and during dark periods, which is more effective at detecting murrelets than a single observer.</p> <p>The Pacific Seabird Group Survey Protocol does not determine nest locations, it only determines if birds are present in the canopy or not (occupied behaviors). If present, then there is a likelihood that birds are nesting in that forest patch or nearby.</p>

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					<p>Response to comment provided on 05/05/2020:</p> <p>City Light appreciates your comments. Currently there is very little known about murrelet nesting activity in the upper portion of the Skagit watershed so this study is intended to be an initial assessment of likelihood of murrelet nesting activity in portions of the study area with potential Project noise but is not intended to pinpoint nest locations. Even audio/visual surveys do not locate nests. Each radar station will be located such that they cover the potentially suitable habitat out up to 1,500m from the radar so they will give good coverage. All of the detected flight paths will be assessed to determine if birds are preparing to fly into forest or if they are exhibiting directional flight which would mean they are likely nesting in a forest that is farther from the radar station.</p> <p>Given the great distance inland from marine foraging habitat, murrelet flight detections are a good indicator of nesting activity somewhere in the area. City Light will review the results of the study with the TRREWG to determine if any follow-up surveys beyond this study are warranted in certain areas to identify likely nesting stands, depending on potential for Project effects. (City Light could also assume occupancy for these sites and determine if BMPs can be applied to avoid effects.) The locations and characteristics of detections from this study and any follow-up surveys may be used to</p>

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					assess any potential Project-related effects and then develop and inform BMPs. In some cases, nest stand identification might be necessary, but for most City Light activities, general location of potential nesting habitats will be sufficient to implement BMPs. For future new construction or vegetation clearing activities within a certain distance of suitable habitat, we would have a working assumption that the habitat is occupied until a protocol survey is conducted to verify absence.
7.	Shauna Hee (USFS)	04/15/2020	Section 2.1 Study Goals and Objectives	What protocol will be used in the audio-visual surveys? Please cite references. Would it be advantageous to schedule the combined audio-visual surveys after confirming murrelet presence with the radar surveys in area.	The audio-visual surveyor (observer) will be following the Pacific Seabird Group (PSG) Survey Protocol (Evans Mack et al. 2003) methods for audio-visual surveys. For second question, see response to Comment #6.
8.	Brock Applegate (WDFW)	04/17/2020	Section 2.1 Study Goals and Objectives	I agree with Shauna. Do we want to find areas of occupation? Usually if a surveyor can see the murrelets below canopy or circling behavior above canopy, a surveyor can infer that a certain amount of acreage has a nest somewhere. If SCL stops at presence or the majority of these radar detections, especially on the reservoir tributaries, we will know that a murrelet passed by on its way to somewhere. SCL will not have the ability to determine if noise from the project affects nests with just a presence determination, because SCL will have less accuracy on the location of the nest. New comment provided on 05/05/2020:	See response to Comment #6. Response to comment provided on 05/05/2020: See response to Comment #6. We would consider additional surveys if they are important for developing PME's.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				<p>See my responses to your response in # six. If you don't get occupied behaviors, the murrelet has flown by going somewhere. Can you determine where to conduct an intensive survey with a just a radar presence detection? I am not sure, but wonder about the probability of finding the location of the occupied area.</p> <p>Continued from the comment above on "When SCL receives radar presence (not occupied) detections): Do you move the radar farther up the reservoir next time? Let me give an example of what I am trying to say: When on the Coast, you can get many detections from murrelets flying by, but the murrelets may fly many miles before they get to the nest (occupied) area. How do you find the nest area with radar presence (not occupied) behavior detections? Do you just protect (invoke a BMP over) a larger area?</p>	
9.	Brock Applegate (WDFW)	04/17/2020	Section 2.1 Study Goals and Objectives	In addition, SCL may need two years of surveys to better locate some murrelet nests, because a surveyor often finds presence, but cannot determine occupation.	See response to Comment #6.
10.	Brock Applegate (WDFW)	04/17/2020	Section 2.1 Study Goals and Objectives	1 st Bullet – Add: and potential future construction, operations, or maintenance areas that generate noise.	<p>Future construction locations are very likely to be at existing facilities.</p> <p>Edit made: sentence modified to "...near Project facilities and existing and likely future maintenance construction noise sources."</p>
11.	Brock Applegate (WDFW)	04/17/2020	Section 2.2 Resource Management Goals	SCL will need better locations of the nests, which more than likely will lead to two seasons of surveys or more. SCL could just assume occupation and develop management	See response to Comment #6.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				practices. I would assume that SCL will want to know the most precise and accurate information of the location of the nests for management purposes, hence the probability of two years or more of audio-visual surveys.	
12.	Brock Applegate (WDFW)	04/17/2020	Section 2.2 Resource Management Goals	After reading the methodology of the study plan, I don't think you will have the ability to answer this question because the radar study will basically detect the migration routes, not the actual nest areas. You would need audio-visual surveys for probably a few years to answer this question. Radar surveys will more than likely not provide specific enough information to identify project effects on murrelets, because SCL will not know the more specific locations of nesting areas.	See response to Comment #6.
13.	Brock Applegate (WDFW)	04/17/2020	Section 2.2 Resource Management Goals	See my comment above. How and how long you survey will depend on how accurate that you want the nest locations.	See response to Comment #6.
14.	Brock Applegate (WDFW)	04/17/2020	Section 2.2 Resource Management Goals	WDFW would expect that SCL would want more accurate nest locations to create BMPs for certain areas.	See response to Comment #6.
15.	Jason Ransom (NPS)	04/14/2020	Section 2.2 Resource Management Goals	2 nd Bullet – Add: The marbled murrelet is listed by NPS as an at-risk species in the North Cascades National Park Service Complex. All NPS management actions and projects are required to evaluate potential impacts to murrelet habitat prior to implementation, and follow applicable consultation with USFWS when appropriate. Preservation of murrelet habitat, such as old growth nesting trees around Ross, Diablo, and Gorge reservoirs, is resource management priority of the agency.	Thank you for the information. Text revised to include the supplied information.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
16.	Brock Applegate (WDFW)	04/17/2020	Section 2.2 Resource Management Goals	3 rd Bullet – Add: (Commission)_ Add: The Commission upgraded the marbled murrelet on the list to “Endangered.”	Thank you for the information. Text revised to include the supplied information.
17.	Brock Applegate (WDFW)	04/17/2020	Section 2.3 Background and Existing Information	The background information has shown why SCL should conduct more than one year of survey. The marbled murrelets, presumably individually, nest every other year.	<p>The adequacy of one year of radar surveys will be assessed at the end of Year 1 using the criteria outlined at the end of the study plan. If it was deemed a good breeding year, a second year of surveys are unlikely to shed additional light or change the results.</p> <p>Even non-breeding murrelets fly inland and not all murrelets are on the same alternating years schedule.</p> <p>Follow up Pacific Seabird Group Protocol Intensive Surveys (Evans Mack et al. 2003) to determine probable absence or presence and occupancy of murrelets at a specific stand may be conducted for one or two years to find occupied sites (likely nesting areas) depending on potential for Project effects. (City Light could also assume occupancy for these sites and determine if BMPs can be applied to avoid effects.)</p>
18.	Judy Neibauer (USFWS)	04/17/2020	Section 2.3 Background and Existing Information	I agree.	See response to Comment #17.
19.	Brock Applegate (WDFW)	04/17/2020	Section 2.3 Background and Existing Information	How do marble murrelets negotiate powerlines during flight? WDFW recommends that SCL investigate the probability of murrelet migration through their powerlines to the critical habitat.	The purpose and intent of the Marbled Murrelet Study is to determine where murrelet activity and potential occupancy is located in the study area (i.e., likelihood of presence) and where potential nesting habitat exists within 0.5 miles of locations where most Project noise generation occurs. The

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					<p>habitat mapping will encompass the entire transmission line corridor.</p> <p>City Light has reviewed a number of scientific studies that indicate, in specific circumstances, there may be potential collision risks for murrelets posed by transmission lines. Based on information collected in this study, City Light will develop a transmission line collision risk model for murrelets for review with the License Participants during effects analysis.</p>
20.	Brock Applegate (WDFW)	04/17/2020	Section 2.3 Background and Existing Information	Will SCL look at these areas for murrelets? Does SCL have concerns about powerline collisions? WDFW has noticed that SCL will conduct surveys, but do not see these areas listed on the map.	See response to Comment #19.
21.	Brock Applegate (WDFW)	04/17/2020	Section 2.3 Background and Existing Information	Could the murrelets migrate from hear up the Skagit River? Murrelets do fly over ridges sometimes.	Marbled murrelets could take many different flight paths to reach the study area, but murrelets are known to commonly follow drainages when transiting to and from nest sites, especially where topographic relief on each side of the drainage is high (>500 feet vertical).
22.	Judy Neibauer (USFWS)	04/17/2020	Section 2.3 Background and Existing Information	FYI...I there is historic info about a site just over the cascades I think near Cle Elum Reservoir...i.e., Snoqualmie Pass...	Thank you for your comment. We believe the WDFW database includes a detection of a murrelet just east of Snoqualmie Pass.
23.	Brock Applegate (WDFW)	04/17/2020	Section 2.3 Background and Existing Information	SCL will probably run into these same problems when they conduct their survey, especially just for one year.	See response to Comment #6.
24.	Brock Applegate (WDFW)	04/17/2020	Section 2.3 Background and Existing Information	These lakes reside much closer to the saltwater.	Thank you for your comment.
25.	Brock Applegate (WDFW)	04/17/2020	Section 2.5 Study Area	SCL should conduct surveys of their powerlines near suitable habitat.	See response to Comment #19.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
26.	Judy Neibauer (USFWS)	04/17/2020	Section 2.5 Study Area	I agree these areas should be included...Activities within and adjacent to powerline corridors and access roads can have effects.	See response to Comment #19.
27.	Shauna Hee (USFS)	04/15/2020	Section 2.5 Study Area	Are there any aquatic or other restoration projects planned for the mitigation lands (such as large woody debris placement in Illabot Creek per the 2006 Management Plan)? Why would actions identified in the Management Plan not be considered disturbances? Please provide justification.	<p>Potential actions on fish and wildlife mitigation lands are undetermined and best addressed with pre-Project assessments prior to their implementation. The updated Wildlife Mitigation Land Management Plan will identify management actions and procedures for assessing whether the action requires protocol surveys or other BMPs.</p> <p>Edits made as follows: Study area description modified to include all areas within the Project Boundary including the transmission line ROW, fish and wildlife mitigation lands, and 0.5-mile buffer for the purposes of mapping of potentially suitable nesting habitat. Methods for radar survey locations modified to indicate that mitigation lands will not be included as there are no disturbance sources on these parcels.</p>
28.	Judy Neibauer (USFWS)	04/17/2020	Section 2.5 Study Area	If there are any restoration or recreation on these lands, they may cause effects? You may need to include sites here...?	See response to Comment #27.
29.	Judy Neibauer (USFWS)	04/17/2020	Section 2.5 Study Area	Maybe include a map with the 50 mile buffer overlapping the project areas.	Tom Hamer recommends using a 55-mile minimum distance to determine where inland murrelet detections are expected to be low. As such, Gorge Powerhouse is very close to the 55 mile distance from saltwater (Bellingham Bay). All of the transmission line west and south of that point is less than 55 miles from saltwater. Ross Dam is ~63 miles and Hozomeen at the Canada border is ~66 miles from saltwater.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
30.	Shauna Hee (USFS)	04/15/2020	Section 2.6.1 Map Potential Marbled Murrelet Nesting Habitat	Are there any survey sites anticipated outside of the NPS lands? If no, then why not?	Potentially suitable nesting habitat will be mapped throughout the study area. Radar survey locations are located in areas where potential nesting habitat exists within 0.5 miles of locations where most Project noise generation occurs. The alignment with NPS-managed land is coincidental. Radar murrelet surveys by Hamer covered sites near the transmission line in the Thornton Creek and Bacon Creek watersheds, the latter of which has USFS land. Any need for additional surveys would be assessed in the ISR.
31.	Brock Applegate (WDFW)	04/17/2020	Section 2.6.1 Map Potential Marbled Murrelet Nesting Habitat	SCL should survey those lands within the project effects area, whether owned by SCL or not. I would appreciatively point to the Vegetation Mapping Study Plan as a great example how SCL has addressed the effects area before.	See response to Comment #30.
32.	Judy Neibauer (USFWS)	04/17/2020	Section 2.6.1 Map Potential Marbled Murrelet Nesting Habitat	Agreed	See response to Comment #30.
33.	Shauna Hee (USFS)	04/15/2020	Section 2.6.2 Conduct Limited Ground Surveys to Verify Accuracy of Habitat Mapping	How will representative sites for platform check/suitable nesting habitat be selected?	Sites to conduct rapid habitat assessments will be selected by reviewing: 1) areas with mapped suitable habitat within the 1.5 km diameter radar survey area; 2) reviews of aerial photo imagery of this habitat, and; 3) ease of access.
34.	Brock Applegate (WDFW)	04/17/2020	Section 2.6.1 Map Potential Marbled Murrelet Nesting Habitat	I would argue that it might not pinpoint nest locations better.	See response to Comment #6.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
35.	Brock Applegate (WDFW)	04/17/2020	Section 2.6.3.2 Radar and Audio-Visual Survey Methods	See comment above.	See response to Comment #6.
36.	Brock Applegate (WDFW)	04/17/2020	Section 2.6.1 Map Potential Marbled Murrelet Nesting Habitat	I will reiterate. If SCL wants to find nest areas that project noise may affect, then SCL should conduct more than one year of audio-visual surveys in the areas that the greatest radar detections occur. Many surveyors will use radar to focus their efforts for audio-visual surveys. If SCL wants to know how project noise and operation effect marbled murrelets, they will need to know where they breeding areas occur. With this current study plan, SCL will basically describe the migration areas of murrelets with this radar study.	See response to Comment #6.
37.	Brock Applegate (WDFW)	04/17/2020	Section 2.6.3.5 Radar Tracking Software	Wouldn't this make it difficult to find stand occupation behaviors?	Thank you for your question. No, the radar is also looking out and surveying the other 1,300 m diameter circle. In addition, if you were interested in a particular stand of habitat and it was within this 200 m range, you could move the radar further away and then scan this area on subsequent surveys.
38.	Brock Applegate (WDFW)	04/17/2020	Section 2.6.4.1 Radar Counts and Passage Rates	I don't think this information will help SCL find areas affected by the Project. This study will collect more general information about murrelet usage areas mostly through migration and less about areas where murrelets nest. I am not sure that SCL will have the information to make a project effects call or write BMPs on a specific area.	See response to Comment #6.
39.	Brock Applegate (WDFW)	04/17/2020	Section 2.6.4.3 Flight Paths	The information gained about nest location sounds very general.	See response to Comment #6.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
40.	Brock Applegate (WDFW)	04/17/2020	Section 2.8 Schedule	<p>Bulleted list – Add: Initial Study (ISR) Delete: Final Add: Study Plan Modification Requests (if needed) Add: or SCL needs additional audio-visual surveys to refine further nesting locations areas</p> <p>New comment provided on 05/05/2020: Didn't SCL say they may do two years of survey earlier in their comment # six? I am confused.</p>	<p>Thank you for the comment; City Light acknowledges the ILP milestones provided. The ILP will provide the opportunity for comment on the final report submitted in the ISR and discussed at the ISR meeting; if any components of the study goals and objectives are not met in the first year, or there are anomalous conditions (such as a poor breeding year), any party may propose additional work or request additional study per FERC ILP regulations.</p> <p>No changes were made to the schedule in the draft study plan as City Light intends to complete the study within one year and wants to be clear with FERC and LPs on the proposed schedule. City Light believes that it will be beneficial to all parties to have complete information from the studies as soon as possible to inform development of management proposals and cross resource analysis.</p> <p>Response to comment provided on 05/05/2020: See response to Comment #17.</p>
41.	Brock Applegate (WDFW)	04/17/2020	Section 2.8 Schedule	Murrelets nest in alternate years. SCL may need an additional year just to discover another high-use site.	See response to Comment #17.
42.	Brock Applegate (WDFW)	04/17/2020	Section 2.8 Schedule	<p>Bulleted list – Add: Second season of studies and surveys (if needed) 2022 Add: Study Report (if needed)</p>	See response to Comment #40.
43.	Brock Applegate (WDFW)	05/05/2020	Section 2.1 Study Goals and Objectives	First Bullet	Edit accepted.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				<p>“....and likely future maintenance construction noise sources.”</p> <p>and?</p>	

**TR-06 GOLDEN EAGLE HABITAT ANALYSIS
REVISED STUDY PLAN**

**SKAGIT RIVER HYDROELECTRIC PROJECT
FERC NO. 553**

Seattle City Light

**April 2021
RSP**

TABLE OF CONTENTS

Section No.	Description	Page No.
1.0	Introduction.....	1-1
1.1	General Description of the Project.....	1-1
1.2	Relicensing Process	1-1
1.3	Study Plan Development.....	1-2
2.0	Study Plan Elements	2-1
2.1	Study Goals and Objectives	2-1
2.2	Resource Management Goals	2-1
2.3	Background and Existing Information.....	2-3
2.3.1	Nesting Habitat Characteristics.....	2-4
2.3.2	Foraging Habitat Characteristics.....	2-4
2.3.3	Risk of Transmission Line Collision	2-5
2.4	Project Operations and Effects on Resources	2-5
2.5	Study Area	2-5
2.6	Methodology	2-7
2.6.1	Compile and Review Existing Information	2-7
2.6.2	Map Observations and Potential Nesting and Foraging Habitat.....	2-7
2.6.3	Develop Golden Eagle Geospatial Risk Assessment.....	2-7
2.6.3.1	Initial Geospatial Habitat Assessment	2-8
2.6.3.2	Eagle Use Assessment	2-9
2.7	Consistency with Generally Accepted Scientific Practice.....	2-9
2.8	Schedule.....	2-9
2.9	Level of Effort and Cost	2-9
3.0	References	3-1

List of Figures

Figure No.	Description	Page No.
Figure 2.5-1.	Overview of study area.	2-6

List of Attachments

Attachment A	City Light Responses to LP Comments on the Study Plan Prior to PSP
--------------	--

List of Acronyms and Abbreviations

APLIC	Avian Power Line Interaction Committee
APP	Avian Protection Plan
BGEPA	Bald and Golden Eagle Protection Act
BMP	best management practice
CFR	Code of Federal Regulations
City Light	Seattle City Light
ELC	Environmental Learning Center
EMU	eagle management unit
FERC	Federal Energy Regulatory Commission
GIS	geographic information system
GRA	geospatial risk assessment
IEUA	Important Eagle Use Area
ISR	Initial Study Report
km	kilometer
LAP	local area population
LiDAR	Light Detection and Ranging
LP	licensing participant
MBTA	Migratory Bird Treaty Act
MIS	Management Indicator Species
NPS	National Park Service
PAD	Pre-Application Document
PHS	Priority Habitats and Species
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
RWG	Resource Work Group
TRREWG	Terrestrial Resources and Reservoir Erosion Work Group

U.S.C.....	United States Code
USDOI	United States Department of the Interior
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WDFW	Washington Department of Fish and Wildlife

1.0 INTRODUCTION

1.1 General Description of the Project

The Skagit River Hydroelectric Project (Project), licensed to The City of Seattle, Washington, and operated through its publicly-owned electric power utility Seattle City Light (City Light), is located in northern Washington State and consists of three power generating developments on the Skagit River – Ross, Diablo, and Gorge – and associated lands and facilities. The Project generating facilities are in the Cascade Mountains of the upper Skagit River watershed, between Project River Miles (PRM) 94.7 and 127.9 (U.S. Geological Survey [USGS] RMs 94.2 and 127).¹ Power from the Project is transmitted via two 230-kilovolt 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, an Environmental Learning Center (ELC), several recreation facilities, and several parcels of fish and wildlife mitigation lands.

Project generating facilities are all located in Whatcom County, although Ross Lake, the most upstream reservoir, crosses the U.S.-Canada border and extends for about one mile into British Columbia at normal maximum water surface elevation. Gorge Powerhouse, the most downstream facility, is approximately 120 miles northeast of Seattle and 60 miles east of Sedro-Woolley, the nearest large town. The closest town is Newhalem, which is part of the Project and just downstream of Gorge Powerhouse. The primary transmission lines cross Whatcom, Skagit, and Snohomish counties; the fish and wildlife mitigation lands are in the same counties.

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, Diablo, and Gorge lakes.” The legislation maintains the Federal Energy Regulatory Commission’s (FERC) 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).

1.2 Relicensing Process

The current FERC license for the Project expires on April 30, 2025, and City Light will apply for a new license no later than April 30, 2023. City Light formally initiated the relicensing process by filing a Notice of Intent and Pre-Application Document (PAD) with FERC on April 27, 2020 (City Light 2020a). The PAD includes descriptions of the Project facilities, operations, license

¹ 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 Project River Mile (PRM) system are provided throughout this document. For further details see Section 7.0 of the main body RSP.

requirements, and Project lands as well as a summary of the extensive existing information available on Project area resources and early consultation on potential resource issues to be addressed during the relicensing. The PAD also includes an outline of the goals and objectives of this study.

In 2019-2020, City Light convened a series of Resource Work Groups (RWG) to engage agencies and other licensing participants (LP) in the Study Plan Development Process. Discussions with LPs continued in early 2021 with a series of topic-based discussions following filing of the Proposed Study Plan (PSP) on December 8, 2020 (City Light 2020b). This study plan reflects RWG and LP discussion and study requests and comments submitted by LPs.

1.3 Study Plan Development

NPS and the Washington Department of Fish and Wildlife (WDFW) have limited data on golden eagle (*Aquila chrysaetos*) nests within several miles of the Project, but as recently as 2019, NPS biologists have observed occasional individual golden eagles in the general vicinity of Marblemount in the winter and spring. However, habitat assessments or migratory studies specific to golden eagles have not been conducted within the Project Boundary. WDFW has raised concerns about the potential threat to the species from collisions with powerlines, although there have been no documented golden eagle collisions in the area. City Light has acknowledged a shared natural resource management interest in ensuring that golden eagles are protected to the extent possible and agreed to conduct a limited study to clarify the issue and any potential hazard posed by the Project transmission lines. This study plan addresses the TE19 Golden Eagle Breeding Area issue form and will inform best management practices (BMP) and potentially City Light's Avian Protection Plan (APP)(City Light 2014) that it implements for the entire transmission and distribution system. The study will use information from the Vegetation Mapping and Wetland Assessment studies to characterize areas of potentially suitable golden eagle habitat for nesting, foraging, and movement corridors near the Project.

On March 12, 2020, City Light released the TR-06 Golden Eagle Habitat Analysis Draft Study Plan for LP review and comment. On March 17, 2020, the draft study plan was discussed at a Terrestrial Resources and Reservoir Erosion Work Group (TRREWG) meeting. City Light reviewed all comments received and released a revised version of the draft study plan on April 29, 2020. The revised draft was discussed on May 6, 2020 at a TRREWG meeting. Written comments were received from WDFW, U.S. Forest Service (USFS), and NPS and responded to in an attachment to this study plan. A Status Draft of the study plan was provided to LPs on August 6, 2020.

City Light is filing this study plan with FERC as part of its Revised Study Plan (RSP), an update to the version that was filed with the PSP and incorporating additional consultation with LPs prior to the filing date. No formal study requests related to this study were filed with FERC.

PSP comments to this study plan were submitted by USFWS. City Light has responded to comments in the PSP comment/response table appended to the main body of the RSP. No modifications were made to the study plan in response to comments.

2.0 STUDY PLAN ELEMENTS

2.1 Study Goals and Objectives

The goal of this study is to use existing information to map habitat for golden eagle nesting, foraging, and movement corridors in the study area (Section 2.5 of this study plan) and conduct a geospatial risk assessment (GRA) to identify potential risk associated with collision with Project transmission lines. This information will be used to assess the potential effects of continued operation and maintenance of the Project with respect to collision risk of golden eagles with transmission lines and inform BMPs and elements of City Light's APP.

Specific objectives are to:

- Use existing information to characterize areas of potentially suitable golden eagle habitat for nesting, foraging, and movement corridors within the study area.
- Map historical golden eagle observations and habitats used for nesting, foraging, and movement corridors within the study area.
- Develop GRA to identify and map areas of potential golden eagle risk of collision with Project transmission lines within the study area.

2.2 Resource Management Goals

The Golden Eagle Habitat Analysis Study will provide information needed to characterize potential Project effects on golden eagles so the risks to eagles can be reduced consistent with the City Light APP.

The study will also provide information to help resource agencies and Indian tribes with jurisdiction in the Project vicinity identify appropriate recommendations and conditions for the new Project license pursuant to their respective goals and authorities for resource management.

The agencies with jurisdiction or interest in the species and habitat include: U.S. Fish and Wildlife Service (USFWS), USFS, NPS, and WDFW.

- U.S. Fish and Wildlife Service (USFWS)

USFWS is responsible for implementing 2016 regulations published under the Bald and Golden Eagle Protection Act (BGEPA) 50 Code of Federal Regulations [CFR] § 22 and the Migratory Bird Treaty Act (MBTA).

The BGEPA prohibits anyone without being permitted to do so to “take, possess, sell, purchase, barter, offer of sale, purchase, or barter, transport, export or import, at any time or in any manner of any bald or golden eagle, alive or dead, or any part, nest, or egg thereof.” See 16 United States Code (USC) § 668. The BGEPA also defines “take” to include “pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb.” See 16 USC § 668c. Prohibited actions result in criminal and civil penalties for violating the statute. See 16 USC § 668. Additionally, the term “disturb” is defined as agitating or bothering an eagle to a degree that causes, or is likely to cause, injury, or either a decrease in productivity or nest abandonment by substantially interfering with normal breeding, feeding, or sheltering behavior. See 50 CFR § 22.3. USFWS is authorized to

permit the take of eagles for certain purposes and under certain circumstances according to the BGEPA, including scientific or exhibition purposes, Indian tribe religious purposes, and wildlife, agricultural, or other interests' protection, so long as that take is compatible with the preservation of eagles.

In the 2009 regulations, the USFWS established that compatibility with mandates of the BGEPA are accomplished if permitting activities do not result in a net decrease in the number of breeding pairs of golden eagles (using 2009 as the baseline) within regional geographic management units, which in the case of the golden eagle are Bird Conservation Regions (U.S. North American Bird Conservation Initiative Monitoring Subcommittee 2007; USFWS 2009). In 2016, the USFWS revised the geographic management units from Bird Conservation Regions to use the Pacific flyway, Central flyway, and combine the Mississippi and Atlantic flyways for the golden eagle to better reflect regional populations and seasonal movement patterns (50 CFR § 22).

The USFWS manages eagle take at two geographic scales, regional eagle management units (EMU) and the local area population (LAP). The LAP is unique to each prospective permit and is defined as the area of the permitted activity bounded by the 90th quantile of natal dispersal distance for golden eagles. Eagle take at the EMU scale is governed by a take rate that is compatible with maintaining an equilibrium population size governed by the population objective which is to “maintain a stable or increasing eagle population” within regional geographic management units (USFWS 2016a, b). Take limits at the LAP-scale apply only to take permitted or authorized by the USFWS and are intended to prevent local extirpation of eagles.

In December 2016, the USFWS updated its regulation to allow for permits to be issued that address incidental take up to a maximum of 30 years (50 CFR § 22.26). Additionally, the USFWS addressed permits for removal of eagle nests (50 CFR §22.27). Additionally, the USFWS issued a Final Programmatic Environmental Impact Statement for the Eagle Rule Revision, December 2016 and the Record of Decision for the Final Programmatic Environmental Impact Statement for the Eagle Rule Revision, December 13, 2016.

Over 1,000 migratory bird species are protected under the MBTA, including bald and golden eagles. The USFWS administers the MBTA. The MBTA provides international migratory bird protections. In December 2017, the United States Department of the Interior's (USDOI) Office of the Solicitor issued a memorandum that found the prohibitions of take under the MBTA apply only to “affirmative actions that have as their purpose the taking or killing of migratory birds, their nest, or their eggs.” In April 2018, the USFWS issued clarifying guidance that the USDOI does not consider incidental take a violation of the MBTA if the purpose of the activity is not to take birds. Additionally, the USFWS has proposed a rule that would codify the current Solicitor's Opinion.

- U.S. Forest Service (USFS)

The bald eagle is listed as a Sensitive Species and a Management Indicator Species (MIS) under the Northwest Forest Plan by a 1990 Forest Plan management action that covers the Mt. Baker-Snoqualmie National Forest. USFS monitors MIS to assess the effects of forest management activities on native species, and manages sensitive species to ensure that actions do not contribute to a loss of viability or cause a significant trend toward listing under the Endangered Species Act. Because golden eagles are protected under the BGEPA, USFS includes these birds under “other species of concern” in developing management actions on its lands.

- National Park Service (NPS)

The golden eagle is listed as one of 73 species of management concern in the North Cascades National Park by NPS (Hoffman et al. 2015).

- Washington Department of Fish and Wildlife (WDFW)

Golden eagles are listed under WDFW's Priority Habitats and Species (PHS) program as a State Candidate species, which are those under review by WDFW for possible listing as endangered, threatened, or sensitive. WDFW manages these species, as needed, to ensure the long-term survival of populations in Washington. WDFW has raised concerns about the potential threat to the species from collisions with powerlines.

2.3 Background and Existing Information

Although habitat assessments or migratory studies specific to golden eagles have not been conducted within the Project Boundary, Section 4.7 (Wildlife Resources) of City Light's PAD (City Light 2020) describes the extensive amount of existing information on the life history of golden eagles. This information is summarized below.

Golden eagle populations in the region are part of the Pacific flyway EMU. In Washington, golden eagles nest throughout much of the state but are most common in the north-central highlands transitional area between montane and shrub-steppe landscapes. Its occurrence west of the Cascade crest is considered uncommon (Larrison and Sonnenberg 1968), yet up to 86 golden eagle breeding territories have been recorded in western Washington (Hayes 2013). One study indicated that all observed western Washington golden eagle nests were within 1,500 feet of large clearcuts or open fields, which support populations of medium-sized mammals such as mountain beaver (*Aplodontia rufa*), snowshoe hare (*Lepus americanus*), and European rabbit (*Oryctolagus cuniculus*) (Bruce et al. 1982). Servheen (1978, as cited in Hansen 2017) noted that mountain beaver made up a substantial portion of golden eagle prey in western Washington, and this was further confirmed in a study conducted on the breeding ecology of golden eagles in western Washington. Forest clearcuts and younger forest stands create favorable foraging areas for golden eagles in western Washington as these habitats offer peak abundance and availability of mountain beaver (Thomas 1977; Servheen 1978, as cited in Hansen 2017).

Data for the North Cascades National Park Complex include 55 incidental observations of golden eagles west of the Cascade crest within the park, ranging from the summit of Sourdough Mountain to along Ross Lake over 49 years (NPS 2019). However, the NPS has no records of golden eagle nests in the North Cascades National Park Complex. There are 35 observations of golden eagles in the vicinity of the Project during 1979-2020 (eBird 2020). Most of these observations demonstrate seasonal movement along river valleys crossed by the Project by immature birds that occur in spring (over 50 percent of the observations, March-May). There is limited use during the winter (December-February, five observations), and limited use during the summer (eBird 2020). According to WDFW PHS data, multiple historic golden eagle nest sites have been documented in the Baker River watershed, but none have been documented in the Project vicinity. One nest site, last documented in 2013, is approximately eight miles from the nearest fish and wildlife mitigation lands parcel and ten miles from the transmission line; while another nest site, as reported in 2000, is more than three miles east of the South Fork Nooksack wildlife mitigation lands parcel.

There is also a suspected golden eagle nest site in the upper elevations of the Cascade River watershed more than five miles from the transmission line and fish and wildlife mitigation lands.

2.3.1 Nesting Habitat Characteristics

Throughout much of their range, golden eagles usually nest on cliffs but also use large trees, artificial structures, or on the ground, depending in on availability (Dixon 1937; Bent 1961; McGahan 1968; Whitfield et al. 1969; Boeker and Ray 1971; Baglien 1975; Lish 1975; Seibert et al 1976; Olendorff et al. 1980; Bruce et al 1982; Smith and Murphy 1982; Houston 1985; Menkens and Anderson 1987; MacLaren et al. 1988; Phillips and Beske 1990; Phillips et al. 1990; Bates and Moretti 1994; Morneau et al. 1994). Cliff nests at northern latitudes generally avoid sites that accumulate large amounts of snow and prefer sites with a southern aspect (Kochert et al. 2002). Cliffs and rock outcrop sites are also chosen with topography sheer enough to provide protection from predators and then provide for clear take off (Watson 2010; Weber 2015).

In western Washington, golden eagles nested in Douglas fir, or relatively large trees in noncontiguous forest (Bruce et al. 1982). Tree nests occupied by golden eagles are typically built in the top one-third of large trees that are isolated, in small forest stands at or near the edge of clearcuts and open fields; large contiguous forest tracts are not used. A review of nesting territories of golden eagles in western Washington determined that high occupancy territories (repeated use) tended to have lower forest cover and higher open/shrub cover than low occupancy territories (Hansen 2017). In general, forest cover was negatively associated with occupancy of golden eagle territories in western Washington, likely related to prey accessibility. Clearcuts and open forests offer prime habitat for mountain beaver. These areas are strongly associated with golden eagle nesting in western Washington (Hansen 2017; Bruce et al. 1982).

Steenhof et al. (1983) found that human use may lead to high rates of golden eagle nest failure, mortality, or emigration. Human use such as roads, habitation and powerlines are a negative influence on golden eagles nesting habitat. Scott (1985) found more abandoned eagle territories in areas with residential dwellings within 1.6 kilometers (km) and in areas with higher human populations within 4.8 km than in territories that continued to be occupied.

2.3.2 Foraging Habitat Characteristics

Foraging habitat selection by resident eagles differ between breeding and non-breeding season (Marzluff et al. 1997). Golden eagles prey primarily on medium-sized mammals such as jackrabbits, beaver, ground squirrels, and snowshoe hare, although bird, reptiles, fish and carrion also are eaten (Bent 1961; Olendorff 1976; Bruce et al. 1982; Brown 1992; Watson et al. 1992; Kochert et al. 2002). Primary prey during the breeding season were more variable. In the Great Basin, golden eagles use shrubsteppe, native grassland, tame grassland, cropland, riparian habitats, open fields and clearcuts <500 meters from open areas or from clearcuts in which primary prey were found (Bruce et al. 1982). Golden eagles primarily inhabit arid regions east of the Cascade Mountains in Washington and there is limited information on their foraging habits on the west side of the Cascades (Bruce et al. 1982). In western Washington the primary prey item for nesting golden eagles was mountain beaver, followed by unidentified, general small mammals, and sooty grouse (Hansen 2017).

2.3.3 Risk of Transmission Line Collision

Golden eagles are aerial hunters with exceptional maneuverability and very good vision, as well as low wing loading and aspect ratio, making them less susceptible to collision (Avian Power Line Interaction Committee [APLIC] 2018). Golden eagles collide with transmission lines less commonly than bald eagles (APLIC 2018). A number of specific factors contribute to collision risk for eagles in western Washington. These include but are not limited to adjacent habitat type, topography, height of transmission line relative to the height of adjacent vegetation, spacing of parallel lines, and other factors (APLIC 2012).

The Project transmission line has two parallel sets of towers with two sets of three electrical conductors 18 feet apart, arranged vertically. The easterly towers also have a fibre-optic cable above the conductor cables; the fibre-optic cable is a smaller diameter than the electrical cables (Springwood Associates, Inc. 2001).

There is no evidence that the Project transmission lines pose a collision hazard for golden eagles. There has been no known golden eagle collision mortality and only one bald eagle collision mortality associated with Project transmission lines documented since 1973 (Springwood Associates, Inc. 2001). During intensive monitoring of wintering bald eagles at the Corkindale Skagit River crossing from 1996-2000, Springwood (2001) saw no collisions. Due to observations of eagles modifying their flight paths at this location, City Light installed bird flight diverters at six sites where the transmission lines cross the Skagit River or a tributary stream (City Light 2014).

2.4 Project Operations and Effects on Resources

Eagles and other raptor species that perch on utility and transmission poles are vulnerable to electrocution and collisions when avian-safe spacing, wire marking, and insulating hardware are absent. Numerous studies indicate that electrocution and collisions with power lines are the leading cause of death for golden eagles in the U.S. (Franson et al. 1995; Kochert et al. 2002, Wayland et al. 2003; Tetra Tech 2011). As part of its APP for the entire generation, transmission, and distribution network (City Light 2014), City Light implements a combination of proactive and reactive measures to minimize avian collision and electrocution mortalities. The transmission cables use avian-safe spacing (more than 60 inches apart horizontally, more than 40 inches apart vertically) as recommended to decrease likelihood of an electrocution (APLIC 2018); electrocution on Project transmission lines is not a risk for eagles. City Light staff are trained to follow the APP-outlined reporting for bird injury or mortality in case of discovery or confirmation of a bird electrocution or collision and City Light submits annual reports on avian mortalities to USFWS and WDFW (City Light 2014).

2.5 Study Area

This study area will include a subsection of land within the Project Boundary (Figure 2.5-1), which will be limited to the transmission line right-of-way (ROW) and a 1-mile buffer on either side.

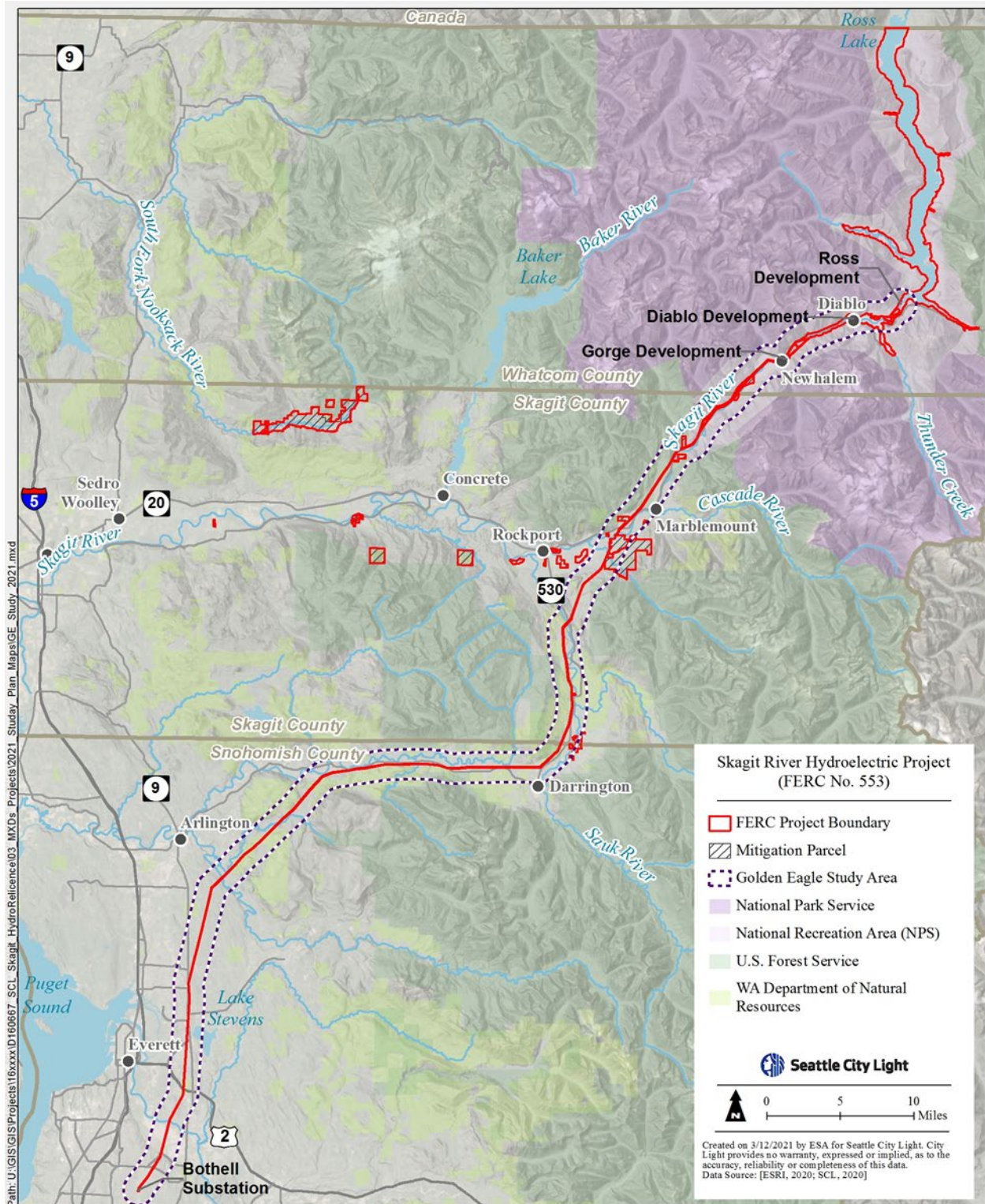


Figure 2.5-1. Overview of study area.

2.6 Methodology

The Golden Eagle Habitat Analysis Study will be a desktop review of habitat resources used by golden eagles for nesting, foraging, and movement corridors. The review will include identifying landscape level general cover types through the use of the Vegetation Mapping Study, U.S. Geologic Survey (USGS) National Land Cover Database, photo-interpretation, Light Detection and Ranging (LiDAR), National Hydrography Datasets, golden eagle observational plot data, known golden eagle nest data, and Washington Department of Transportation road data.

The habitat analysis will use GRA, or predictive relative abundance modeling, which can help to define the likelihood of eagle presence at any particular location or area of interest. GRA is geographic information system (GIS) exercise that overlays known resource occurrences with critical habitat parameters such as topography, land use, and habitat features to provide a quantifiable predictive relative abundance model. Habitat risk can incorporate local factors of known importance to the species. These GRAs involve associating golden eagle observation data with nesting, foraging, and movement corridor land features that strongly correlate with the presence of golden eagles.

2.6.1 Compile and Review Existing Information

Existing information on golden eagle nesting and foraging habitats in the region and golden eagle observations will be compiled and reviewed. Numerous citizen science-based databases document observations of golden eagle during the course of the year. Data sources including eBird, Washington Breeding Bird Atlas, and the USFWS Breeding Bird Survey among others provide spatial information on the distribution and timing of the presence of golden eagles.

2.6.2 Map Observations and Potential Nesting and Foraging Habitat

A map of golden eagle observations, and associated topography and land features will be developed from existing available data. Documented sightings of golden eagles within or adjacent to the study area will be plotted to analyze golden eagle use patterns and occurrences in the vicinity of the Project.

Potential nesting and foraging habitats will be identified within or adjacent to the study area using available geospatial information that maps land use, forest cover, topography and watercourses. Information will include regional golden eagle nest model data (Dunk et al. 2019) to inform nesting habitat.

Non-breeding foraging habitats include roads and open areas with an abundance of prey or carrion. Eagles scavenge on road-kill such as deer, elk, coyotes or other small mammals. Scavenging increases during the winter months when other food sources are less available. Landscape level map elements that identify grassland, open areas, or road features where carrion may be present and where observational data occurs will be used to identify potential non-breeding foraging sites.

2.6.3 Develop Golden Eagle Geospatial Risk Assessment

GRA objectives will include identifying golden eagle general use patterns (nesting, foraging, and movement corridors) within the study area. The GRA will summarize:

- Known golden eagle nest sites
- Golden eagle use areas
- Golden eagle observation locations
- Topography conducive to golden eagle movement

A key element to reducing eagle risk is to identify eagle foraging areas, nest sites, winter roosts, and movement corridors (Important Eagle Use Areas [IEUA]). An Important Eagle Use Area is defined as an “eagle nest, foraging area, or communal roost site that eagles rely on for breeding, sheltering, or feeding, and the landscape features surrounding such nest, foraging area, or roost site that are essential for the continued viability of the site for breeding, feeding, or sheltering eagles” in permit regulations under the BGEPA (USFWS 2016a). Each of these areas is defined as follows:

- Roost sites and Winter Roosts (each a “communal roost site”): “an area where eagles gather repeatedly in the course of a season and shelter overnight and sometimes during the day in the event of inclement weather”
- Foraging Areas: “an area where eagles regularly feed during one or more seasons”
- Nest Sites: “any readily identifiable structure built, maintained, or used by bald eagles or golden eagles for the purpose of reproduction” (USFWS 2016a).

Geospatial risk models are a first step to identifying where IEUA’s intersect with utility infrastructure. These models use GIS to incorporate spatial data, infrastructure system data, and knowledge of eagle ecology to complete an estimation of risk. The GIS analysis helps to identify all power lines within a set distance of eagle nests or IEUAs. These models provide an easily quantifiable estimate of risk zones by overlaying recorded eagle activity, foraging habitat, home range use, nest habitat and other identifiable habitat characteristics that are publicly available or can be derived from publicly available sources. Habitat risk assessments or predictive relative abundance modeling help to define the likelihood of golden eagle presence at a particular location or within a defined area of interest, specifically here, the transmission line ROW.

A list of correlative habitat influences will be created built on peer-reviewed studies about Washington golden eagle nesting characteristics, habitat use studies, species narratives, and a professional understanding of eagle nesting characteristics. Habitat characteristics known to be highly correlative to the presence of golden eagle nesting territories will be overlaid on other critical data layers using ArcGIS™ within the study area.

2.6.3.1 Initial Geospatial Habitat Assessment

The initial habitat assessment will utilize a GIS determination that examines existing land use and eagle use information. The following resources will be used to assemble data layers that identify areas having the highest probability to support nesting, foraging, concentrating, and migrating golden eagles:

- LiDAR
- National Land Cover Data

- Recent aerial photography
- Golden eagle observation location data (see Section 2.6.1 of this study plan)
- USGS quadrangle maps
- National Wetlands Inventory maps
- National Hydrography Dataset: Waterbodies
- National Hydrography Dataset: Area
- Washington Department of Transportation road data
- State, county, and local maps

2.6.3.2 Eagle Use Assessment

A second task will be to acquire official information held by the Washington State agencies, NPS, or USFWS regarding nest sites, winter roost sites, communal roosts, and foraging concentration sites all of which are regulated under the BGEPA. Biologists will ask WDFW, USFS, and USFWS for historic nest or eagle use information.

Information about important eagle use areas such as winter roost sites, communal roosts, and foraging concentration sites should also be obtained from WDFW, and reviewed to ensure compliance with the BGEPA and the MBTA. The additional agency information regarding important eagle use areas would provide information that could be used to identify high risk areas.

The resulting model will be used to identify golden eagle general use patterns within one mile of the Project transmission line centerline.

2.7 Consistency with Generally Accepted Scientific Practice

The study methods follow GRA standards outlined by APLIC's Eagle Risk Framework A Practical Approach to Power Lines (2018) and use standard scientific approaches by relying on documented occurrences of the species, a review of scientific literature and management guidelines, and a habitat assessment specific to western Washington using parameters for golden eagle use identified in the scientific literature.

2.8 Schedule

The anticipated schedule for the Golden Eagle Habitat Analysis Study is as follows:

- Compile and Map Existing Information – Spring 2021
- Develop Model – Summer 2021
- Final Report (Initial Study Report [ISR]) – March 2022

2.9 Level of Effort and Cost

The initial estimate for implementation and reporting associated with this study is approximately \$45,000.

3.0 REFERENCES

- Avian Power Line Interaction Committee (APLIC). 2018. Eagle Risk Framework: A Practical Approach for Power Lines. Edison Electric Institute and APLIC. Washington, DC.
- Baglien, J.W. 1975. Biology and habitat requirements of the nesting Golden Eagle in southwestern Montana. M.S. thesis. Montana State University, Bozeman, Montana. 63 pages.
- Bates, J.W. and M.O. Moretti. 1994. Golden Eagle (*Aquila chrysaetos*) population ecology in western Utah. *Great Basin Naturalist* 54:248-255.
- Benson, P.C. 1981. Large raptor electrocution and powerpole utilization: a study in six western states. PhD Thesis. Brigham Young Univ. Provo, UT.
- Bent, A.C. 1961. Life histories of North American birds of prey. Part 1. Dover Publications, Inc., New York, New York. 409 pages.
- Boeker, E.L. and T.D. Ray. 1971. Golden Eagle population studies in the Southwest. *Condor* 73:463-467.
- Brown, B.T. 1992. Golden Eagles feeding on fish. *J. Raptor Res.* 26:36-37.
- Bruce, A.M., R.J. Anderson, and G.T. Allen. 1982. Observations of Golden Eagles nesting in western Washington. *Raptor Research* 16:132-134.
- Dixon, J.B. 1937. The Golden Eagle in San Diego County, California. *Condor* 39:49-56.
- Dunk J.R., B. Woodbridge, T.M. Lickfett, G. Bedrosian, B.R. Noon, and D.W. LaPlante. 2019. Modeling spatial variation in density of golden eagle nest sites in the western United States. *PLoS ONE* 14(9): e0223143. [Online] URL: <https://doi.org/10.1371/journal.pone.0223143>. Accessed February 2020.
- eBird. 2020. An online database of bird distribution and abundance [web application]. eBird, Cornell Lab of Ornithology, Ithaca, New York. [Online] URL: <http://www.ebird.org>. Accessed March 9, 2020.
- Franson, J.C., L. Sileo, and N. Thomas. 1995. Causes of Eagle Deaths. *In* *Birds - Our Living Resources*, page 68.
- Hansen, L. 2017. Breeding Ecology of Golden eagles in Western Washington. University of Washington, Seattle, WA.
- Harness, R.E. and K.R. Wilson. 2001. Electric-utility structures associated with raptor electrocutions in rural areas. *Wildl. Soc. Bull.* 29:612-623.
- Hayes, G.E. 2013. Golden eagles nesting in Washington. Annual report, Washington Department of Fish and Wildlife, Olympia, WA. As cited in: Hansen, L. 2017. Breeding Ecology of Golden Eagles in Western Washington. M.S. Thesis, University of Washington, Seattle.
- Hoffman, R.L., A. Woodward, P. Haggerty, K. Jenkins, P. Griffin, M.J. Adams, J. Hagar, T. Cummings, D. Duriscoe, K. Kopper, J. Riedel, L. Marin, G.S. Mauger, K. Bumbaco, and J.S. Littell. 2015. North Cascades National Park Service Complex: Natural resource condition assessment. Natural Resource Report NPS/NOCA/NRR—2015/901.

- Houston, C.S. 1985. Golden Eagle banding in the South Saskatchewan River Valley. *North American Bird Bander* 10:110-114.
- Kochert, M.N., K. Steenhof, C.L. McIntyre and E.H. Craig. 2002. Golden Eagle (*Aquila chrysaetos*), *The Birds of North America Online* (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online. [Online] URL: <http://bna.birds.cornell.edu/bna/species/684>. Accessed February 28,2020.
- Larrison, E.J. and K.G. Sonnenberg. 1968. *Washington birds: their location and identification*. Seattle Audubon Society, Seattle, WA.
- Lish, J.W. 1975. Status and ecology of Bald Eagles and nesting of Golden Eagles in Oklahoma. M.S. thesis. Oklahoma State University, Stillwater, Oklahoma. 99 pages.
- MacLaren, P.A., S.H. Anderson, and D.E. Runde. 1988. Food habits and nest characteristics of breeding raptors in southwestern Wyoming *Great Basin Naturalist* 48:548-553.
- Marzluff, J.M., S.T. Knick, M.S. Vekasy, L.S. Schueck, and T.J. Zarriello. 1997. Spatial use and habitat selection of Golden Eagles in southwestern Idaho. *Auk* 114:673-687.
- McGahan, J. 1968. Ecology of the Golden Eagle. *Auk* 85:1-12.
- Menkens, G.E., Jr. and S.H. Anderson. 1987. Nest site characteristics of a predominantly tree-nesting population of Golden Eagles. *Journal of Field Ornithology* 58:22-25.
- Morneau, F., S. Brodeur, R. Decarie, S. Carriere, and D.M. Bird. 1994. Abundance and distribution of nesting Golden Eagles in Hudson Bay, Quebec. *Journal of Raptor Research* 28:220-225.
- National Park Service (NPS). 2019. NPS unpublished data.
- Olendorff, R.R. 1976. The food habits of North American Golden Eagles. *American Midland Naturalist* 95:231-236.
- Phillips, R.L. and A.E. Beske. 1990. Distribution and abundance of Golden Eagles and other raptors in Campbell and Converse counties, Wyoming. U.S. Fish and Wildlife Service, Fish and Wildlife Technical Report 27. Washington, D.C. 31 pages.
- Phillips, R.L., A.H. Wheeler, J.M. Lockhart, T.P. McEneaney, and N.C. Forrester. 1990. Nesting ecology of Golden Eagles and other raptors in southeastern Montana and Northern Wyoming. U.S. Fish and Wildlife Service Technical Report 26, Washington, D.C. 13 pages.
- Scott, T.A. 1985. Human impacts on the Golden Eagle population of San Diego County. Master's Thesis. San Diego State Univ. San Diego, CA.
- Seattle City Light (City Light). 2014. Avian Protection Plan, Version 1. [Online] URL: <http://www.seattle.gov/light/enviro/avian/docs/app%20final%20rs.pdf>. Accessed February 28, 2020.
- _____. 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.

- Seibert, D.J., R.J. Oakleaf, J.M. Laughlin, and J.L. Page. 1976. Nesting ecology of Golden Eagles in Elko County, Nevada. Technical Note. U.S. Department of the Interior, Bureau of Land Management. 17 pages.
- Servheen, C. 1978. Mountain beaver as a prey species of the golden eagle. *Murrelet* 59:77. As cited in: Hansen, L. 2017. Breeding Ecology of Golden Eagles in Western Washington. M.S. Thesis, University of Washington, Seattle.
- Smith, D.G. and J.R. Murphy. 1982. Spatial relationships of nesting Golden Eagles in central Utah. *Raptor Research* 16:127-132.
- Springwood Associates, Inc. 2001. Skagit River Bald Eagle - Seattle City Light Transmission Line Interaction Study: Final Report. Prepared for Seattle City Light. 29 pp. Steenhof, K., M.N. Kochert, and J.H. Doremus. 1983. Nesting of subadult Golden Eagles in southwestern Idaho. *Auk* 100:743-747.
- TetraTech. 2012. Mohave County Wind Farm Eagle Conservation Plan and Bird Conservation Strategy. Prepared for BP Wind Energy North America. December 2012.
- Thomas, C. 1977. Golden eagle nesting in the Willamette Valley. *Oregon Birds* 2:16-17.
- United States Fish and Wildlife Service (USFWS). 2016a. Title 50 – Wildlife and Fisheries. 39 FR 1183, Jan. 4, 1974, as amended at 48 FR 57300, Dec. 29, 1983; 64 FR 50472, Sept. 17, 1999; 72 FR 31139, June 5, 2007; 74 FR 46876, Sept. 11, 2009; 81 FR 91550, Dec. 16, 2016. [Online] URL: <https://www.govinfo.gov/content/pkg/CFR-2019-title50-vol9/pdf/CFR-2019-title50-vol9-sec22-3.pdf>. Accessed February 28, 2020.
- _____. 2016b. Bald and Golden Eagles: Population demographics and estimation of sustainable take in the United States, 2016 update. Division of Migratory Bird Management, Washington D.C., USA.
- United States North American Bird Conservation Initiative Monitoring Subcommittee. 2007. Opportunities for improving avian monitoring, U.S. North American Bird Conservation initiative report. Division of Migratory Bird Management, U. S. Fish and Wildlife Service, Arlington, Virginia, USA.
- Washington Department of Fish and Wildlife (WDFW). 2013. Threatened and Endangered Wildlife in Washington: 2012 Annual Report. Listing and Recovery Section, Wildlife Program, Washington Department of Fish and Wildlife, Olympia, WA. 251 pp.
- Watson, J. 2010. The Golden Eagle Second Edition. T&AD Poyser London, United Kingdom.
- Watson, J. and R.H. Dennis. 1992. Nest-site selection by Golden Eagles in Scotland. *Br. Birds* 85:469-481.
- Wayland, M., L. Wilson, J. Elliot, M. Miller, T. Bollinger, M. McAdie, K. Langelier, J. Keating, and J. Froese. 2003. Mortality, Morbidity, and Lead Poisoning of Eagles in Western Canada, 1986-98. *Journal of Raptor Research* 37(1):8-18. March 2003.
- Weber, S.A. 2015. Golden Eagle Nest Site Selection and Habitat Suitability Modeling Across Two Ecoregions in Southern Nevada. M.S. thesis. Texas State University, San Marcos, Texas. 73 pages.

Whitfield, D.W.A., D.W. Davis, J.M. Gerrard, and W.J. Maher. 1969. Golden Eagles in central Saskatchewan. *Blue Jay* 27:74-79.

**GOLDEN EAGLE HABITAT ANALYSIS
REVISED STUDY PLAN**

ATTACHMENT A

**CITY LIGHT RESPONSES TO LP COMMENTS ON THE STUDY PLAN
PRIOR TO PSP**

Table 1. City Light responses to LP comments on the study plan prior to PSP.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
1.	Brock Applegate (WDFW)	04/10/2020	List of Acronyms and Abbreviations	Acronyms list - Add: “(either Council or Committee)” after Avian Powerline Interaction	Edit made: “Avian Power Line Interaction Committee”
2.	Brock Applegate (WDFW)	04/10/2020	Section 1.3 Study Plan Development	Eagle carcasses don’t stay around for long with scavengers.	Thank you for your comment.
3.	Brock Applegate (WDFW)	04/10/2020	Section 1.3 Study Plan Development	<p>Since SCL limited the Vegetation Mapping and Wetland Assessment in geographic scope and golden eagles can fly many miles, WDFW recommends that you extend geographical scope to include nearby cliff type areas when the study identifies possible nesting areas. We might have nesting areas farther out than 0.5 mile from the project boundary and large home ranges that overlap project boundary, but span a greater distance than 0.5 miles, particularly near the Skagit River. WDFW recommends that you consider mapping nearby eagle habitat features outside of the mapping projects.</p> <p>New comment provided on 05/06/2020: I thank you for the comment. As SCL does a risk assessment, SCL would want to consider areas with higher possibility for eagle migration, those areas near eagle habitat. SCL might want to consider areas with possible, future nests, because eagles would make many migration trips between the nest and other habitat, while nearing powerlines and project structures and activity, which increases the chance of project impacts.</p>	<p>The Golden Eagle Study addresses the potential for golden eagle interactions with the transmission line with a tiered GIS risk assessment mapping nesting and foraging habitats up to one mile from transmission line ROW using available geospatial information that maps land use, forest cover, topography, and watercourses. Within 0.5 miles of the line, the vegetation mapping study will provide finer-scale habitat information. The Project has no effect on nest sites and no nest sites are known to occur within five miles of the Project Boundary. Any newly discovered golden eagle nest sites brought to our attention will be considered during the study and during development of best management practices in the license application.</p> <p>Response to comment provided on 05/06/2020: Comment noted. This study will produce a map of potentially suitable habitat to assess where golden eagles might forage near the transmission line right-of-way. Assessing areas that could have “possible, future nests” is beyond the scope of this study. If City Light is made aware of new nests in the Project vicinity during the new license, we would evaluate the</p>

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					need for additional assessment or management actions under an Avian Protection Plan.
4.	Brock Applegate (WDFW)	04/10/2020	Section 2.1 Study Goals and Objectives	1 st Bullet – Add: , including eagle habitat features (IE cliffs),	Thank you for your comment. See response to Comment #3.
5.	Brock Applegate (WDFW)	04/10/2020	Section 2.1 Study Goals and Objectives	As stated before, you will need to go beyond the 0.5- mile area to discover eagle habitat features. I remain unsure if you plan on examining anything outside of the 0.5 mile “effects area”.	This assessment focuses on the potential for interaction of golden eagles with the transmission line and towers, so habitats close to the transmission line are most important to include. The overall geospatial risk assessment extends one mile from the transmission line to include information on potential nesting and foraging habitat at a broader scale.
6.	Shauna Hee (USFS)	04/15/2020	Section 2.2 Resource Management Goals	Bald eagle as a MIS was a 1990 Forest plan management action, not a Northwest Forest Plan amendment. Please update the US Forest Service management direction.	Edit made: “Management Indicator Species (MIS) under the Northwest Forest Plan by a 1990 Forest Plan management action that covers the Mt. Baker-Snoqualmie National Forest.”
7.	Brock Applegate (WDFW)	04/10/2020	Section 2.2 Resource Management Goals	Does SCL have some evidence, information, or a study that they can base this statement on about collisions? I would caution against the assumption that the lack evidence equals no collisions. Many collisions over rivers lead to the carcasses floating down the river. Predators scavenge eagles killed or injured during collision and electrocution before surveyors or even a bystander passes by the carcass.	Edit made: deleted the phrase: “, although there is currently no evidence of such a threat.” Thank you for your comment.
8.	Brock Applegate (WDFW)	04/10/2020	Section 2.2 Resource Management Goals	2 nd Paragraph – Add: However, scavengers quickly remove carcasses and rivers can transport dead or injured eagles away from the collision or electrocution site.	Thank you for your comment. As this section of the study plan is summarizing agency policies this is not the proper location to include this sentence.
9.	Jason Ransom (NPS)	04/14/2020	Section 2.3 Background and Existing Information	I don't know where this statement comes from. (NPS 2019 is not a complete reference). We have a combination of reported observations, survey data from our landbirds long-term	Edit made: After email discussion with Jason Ransom, it was determined that the information in the draft study plan is acceptable. The reference will be changed to indicate that the

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				inventory and monitoring dataset, and broader public reporting sources such as eBird (confirmed datasets only...which run about 2 years behind the current calendar year). Our at-risk species Focused Condition Assessment that is in development is based on records since the last license, which total 31 records from 1995-2018. I haven't yet updated any 2019 records. That total includes all sources listed above. You could cite that as (NPS, unpublished data)	NPS (2019) is "NPS unpublished data".
10.	Brock Applegate (WDFW)	04/10/2020	Section 2.3 Background and Existing Information	I think that we have found the distance for the more likely boundary of the effects area for golden eagle in these statements. I am making the point that SCL may want to extend the search for habitat features beyond the 0.5 mile vegetation mapping boundary.	This background information was included in the study plan to indicate that golden eagles typically nest at sites farther from residential and major developed areas. As indicated in the Study Area and Methods sections, potential nesting and foraging habitat will be identified within the one-mile (1.6-km) buffer area based on existing data for use in the geospatial risk analysis along with detailed vegetation mapping information to assess where collision risk is greatest.
11.	Brock Applegate (WDFW)	04/10/2020	Section 2.3 Background and Existing Information	With this said, powerlines killed many golden eagles in Wyoming due to collision. New comment provided on 05/06/2020: I read a newspaper piece 5-10 years ago that talked about the golden eagle fatalities with powerlines in Wyoming. I can't remember if Puget Sound Energy owned the lands, but a raptor specialist mentioned that powerlines had for more eagle fatalities than Washington State wind power projects that I referred to during a conversation.	It would be greatly appreciated if WDFW can provide the reference(s) for collisions specifically with transmission lines. We are aware of some information on collisions (e.g., a North American Golden Eagle Science Meeting held in 2010 [https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=83970&inline] that conflated electrocution and collision numbers and other studies indicating that collisions with vehicles, powerlines and other structures account for the greatest percentage of mortality [Franson et.al. 1995]).

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					(Franson, J. C., L. Sileo, and N. J. Thomas. 1995. Causes of eagle deaths. Page 68 in E. T. LaRoe, G. S. Farris, C. E. Puckett, P. D. Doran, and M. J. Mac, editors. Our living resources: a report to the nation on the distribution, abundance, and health of U.S. plants, animals, and ecosystems. U.S. Department of the Interior, National Biological Service, Washington, D.C., USA.) Response to comment provided on 05/05/2020: Comment noted. Thank you for your comment.
12.	Brock Applegate (WDFW)	04/10/2020	Section 2.3 Background and Existing Information	Did the researcher adjust the number for the greater number of bald eagles? New comment provided on 05/06/2020: I appreciate the answer and the information.	The statement cites reference to “a recent survey of utility companies”. We are unaware of additional studies that support the statement. This statement is related to wing-loading and foraging behavior differences between the two species (golden eagles are more likely to forage on the wing and while using powered flight/bald eagles are perch or soaring hunters), i.e., golden eagles collide less often with transmission lines, not because there are fewer golden eagles than bald eagles, but rather due to physical and behavioral differences between the species. Response to comment provided on 05/05/2020: You are welcome.
13.	Brock Applegate (WDFW)	04/10/2020	Section 2.3 Background and Existing Information	Without marking the smaller diameter cable, eagles would less likely see it and collide with the fibre-optic cable.	Comment noted. Study is aimed at identifying where elevated risk potentially exists to determine where additional marking with bird flight diverters may be considered.
14.	Brock Applegate (WDFW)	04/10/2020	Section 2.3 Background and	Carcasses don’t necessarily stay around for someone to find.	Thank you for your comment.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
			Existing Information		
15.	Brock Applegate (WDFW)	04/10/2020	Section 2.3 Background and Existing Information	Thank you, WDFW appreciates that you installed diverters.	Thank you for your comment.
16.	Brock Applegate (WDFW)	04/10/2020	Section 2.5 Study Area	I like this buffer distance much better. Do we have vegetation mapping 1-mile from the project boundary or will you look more at other maps with eagle habitat features?	Thank you for your comment. We will use USGS data for the coarse review for lands further from the transmission line ROW, then revise using information gathered by the Vegetation Mapping study within 0.5 miles of the transmission line ROW.
17.	Brock Applegate (WDFW)	04/10/2020	Section 2.6 Methodology	Can we identify cliffs and clear-cuts with these sources? I know the mapping study will only extend 0.5 miles, so we will need other sources. Eagles will fly between habitats in their home range, for example they will fly from the foraging areas back to the nest. You will increase the likelihood of finding the potential spots for collision, if you can understand where these habitats could exist. Perhaps I have stated what SCL would plan to do.	We will use the USGS data and other existing geospatial data and aerial photographs to map potential golden eagle foraging and nesting habitat within one mile. The greatest collision risk would be in areas where foraging habitat occurs under or very close to the transmission line so the vegetation mapping results will be best information source for the area within 0.5 mile of the line.
18.	Shauna Hee (USFS)	04/15/2020	Section 2.6.2 Map Observations and Potential Nesting and Foraging Habitat	Potential for transmission lines maintained in low vegetation to be foraging habitat? Please provide references that support the classification of “map elements” as foraging sites, or are map elements to based on observation only?	Golden eagles have been observed foraging in transmission line corridors in Montana. We will search for other information in Kochert et al. (2002), Bruce (1982), and other peer-reviewed sources to make this determination.
19.	Shauna Hee (USFS)	04/15/2020	Section 2.6.3 Develop Golden Eagle Geospatial risk Assessment, Page 2-8	How frequently do golden eagles have communal roost sites? Please provide references and background information to support this as an important golden eagle use area.	The statement in the study plan was from definitions in the Bald and Golden Eagle Protection Act that covers both species. While roosting is common for bald eagles, it is not common for golden eagles. Kochert et al. (2002) states “golden eagles rarely roost communally” and “roosts communally in unique

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					<p>circumstances (rarely; e.g., extremely cold weather and abundant prey).”</p> <p>It has also been reported by Craig and Craig (1984).</p> <p>(Craig, T.H. and Craig, E.H. 1984. A Large Concentration of Roosting Golden Eagles in Southeastern Idaho. The Auk. Vol. 101. pp 610-613. [Online] URL: https://sora.unm.edu/sites/default/files/journals/auk/v101n03/p0610-p0613.pdf. Accessed April 24, 2020.)</p>
20.	Shauna Hee (USFS)	04/15/2020	Section 2.6.3.2 Eagle Use Assessment	Could check USFS database.	Edit made: added USFS to list of agencies to contact to search for existing information.
21.	Brock Applegate (WDFW)	04/10/2020	Section 2.6.3.2 Eagle Use Assessment	I am alright with this approach, if we understand that we may need to extend out beyond the powerline more than one mile to find these important eagle habitats. When the eagles fly between the habitats, the eagles run the risk of the collision when it passes through or near the powerlines.	<p>The intent of the GIS analysis is to find where habitat elements and eagle use areas overlap with the transmission line ROW and create the greatest risk, if any, along the right-of-way. City Light does not see a need to expand study area beyond the one mile.</p> <p>As stated in the Methods (Section 2.6) data will be gathered from the region (“Existing information on golden eagle nesting and foraging habitats in the region and golden eagle observations will be compiled and reviewed”) and habitat elements and eagle use areas will be identified within the study area (“Potential nesting and foraging habitats will be identified within or adjacent to the study area using available geospatial information that maps land use, forest cover, topography and watercourses”). Locations where eagle use areas (“eagle foraging areas, nest sites, winter roosts,</p>

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					and movement corridors”) intersect with the transmission line ROW and 1 mile buffer will be identified.
22.	Brock Applegate (WDFW)	04/17/2020	Section 2.8 Schedule	<p>Bulleted list - Add:</p> <ul style="list-style-type: none"> ▪ “Initial Study Report (ISR) – March 2022 ▪ ISR Meeting ▪ Study Plan Modification request (if needed) ▪ Additional activities through 2022 (if needed) ▪ Final Study Report (if needed)” <p>New comment provided on 05/06/2020:</p> <p>How about adding the ILP milestones to the schedule, since they will occur? How about: --The Final Initial Study Report (ISR) -- The ISR Meeting</p>	<p>Thank you for the comment; City Light acknowledges the ILP milestones provided. The ILP will provide the opportunity for comment on the final report submitted in the ISR and discussed at the ISR meeting; if any components of the study goals and objectives are not met in the first year, or there are anomalous conditions, any party may propose additional work or request additional study per FERC ILP regulations.</p> <p>No changes were made to the schedule in the draft study plan as City Light intends to complete the study within one year and wants to be clear with FERC and LPs on the proposed schedule. City Light believes that it will be beneficial to all parties to have complete information from the studies as soon as possible to inform development of management proposals and cross resource analysis.</p> <p>Response to comment provided on 05/06/2020: Thank you for your comment. The schedule reflects the timeline for this study only, not the larger ILP process.</p>

**TR-07 NORTHERN GOSHAWK HABITAT ANALYSIS
REVISED STUDY PLAN**

**SKAGIT RIVER HYDROELECTRIC PROJECT
FERC NO. 553**

Seattle City Light

**April 2021
RSP**

TABLE OF CONTENTS

Section No.	Description	Page No.
1.0	Introduction.....	1-1
1.1	General Description of the Project.....	1-1
1.2	Relicensing Process	1-1
1.3	Study Plan Development.....	1-2
2.0	Study Plan Elements	2-1
2.1	Study Goals and Objectives	2-1
2.2	Resource Management Goals	2-1
2.3	Background and Existing Information.....	2-2
2.4	Project Operations and Effects on Resources	2-2
2.5	Study Area	2-2
2.6	Methodology	2-4
	2.6.1 Review Scientific Literature	2-4
	2.6.2 Identify and Map Potentially Suitable Habitat.....	2-4
2.7	Consistency with Generally Accepted Scientific Practice.....	2-5
2.8	Schedule.....	2-5
2.9	Level of Effort and Cost	2-5
3.0	References	3-1

List of Figures

Figure No.	Description	Page No.
Figure 2.5-1.	Overview of study area.	2-3

List of Attachments

Attachment A	City Light Responses to LP Comments on the Study Plan Prior to PSP
--------------	--

List of Acronyms and Abbreviations

BMP	best management practice
CBI.....	Conservation Biology Institute
City Light.....	Seattle City Light
dbh.....	diameter at breast height
ELC	Environmental Learning Center
FERC.....	Federal Energy Regulatory Commission
GIS	geographic information system
ISR	Initial Study Report
LiDAR.....	Light Detection and Ranging
LP	licensing participant
MBTA.....	Migratory Bird Treaty Act
NPS	National Park Service
NVC	National Vegetation Classification
PAD.....	Pre-Application Document
PRM	Project River Mile
Project	Skagit River Hydroelectric Project
PSP	Proposed Study Plan
RLNRA.....	Ross Lake National Recreation Area
RM	river mile
RSP	Revised Study Plan
RWG	Resource Work Group
TRREWG.....	Terrestrial Resources and Reservoir Erosion Work Group
U.S.C.....	United States Code
USDOI	U.S. Department of the Interior
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WDFW	Washington Department of Fish and Wildlife

This page intentionally left blank.

1.0 INTRODUCTION

1.1 General Description of the Project

The Skagit River Hydroelectric Project (Project), licensed to The City of Seattle, Washington, and operated through its publicly-owned electric power utility Seattle City Light (City Light), is located in northern Washington State and consists of three power generating developments on the Skagit River – Ross, Diablo, and Gorge – and associated lands and facilities. The Project generating facilities are in the Cascade Mountains of the upper Skagit River watershed, between Project River Miles (PRM) 94.7 and 127.9 (U.S. Geological Survey [USGS] RMs 94.2 and 127).¹ Power from the Project is transmitted via two 230-kilovolt 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, an Environmental Learning Center (ELC), several recreation facilities, and several parcels of fish and wildlife mitigation lands.

Project generating facilities are all located in Whatcom County, although Ross Lake, the most upstream reservoir, crosses the U.S.-Canada border and extends for about one mile into British Columbia at normal maximum water surface elevation. Gorge Powerhouse, the most downstream facility, is approximately 120 miles northeast of Seattle and 60 miles east of Sedro-Woolley, the nearest large town. The closest town is Newhalem, which is part of the Project and just downstream of Gorge Powerhouse. The primary transmission lines cross Whatcom, Skagit, and Snohomish counties; the fish and wildlife mitigation lands are in the same counties.

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, Diablo, and Gorge lakes.” The legislation maintains the Federal Energy Regulatory Commission’s (FERC) 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).

1.2 Relicensing Process

The current FERC license for the Project expires on April 30, 2025, and City Light will apply for a new license no later than April 30, 2023. City Light formally initiated the relicensing process by filing a Notice of Intent and Pre-Application Document (PAD) with FERC on April 27, 2020 (City Light 2020a). The PAD includes descriptions of the Project facilities, operations, license

¹ 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 Project River Mile (PRM) system are provided throughout this document. For further details see Section 7.0 of the main body RSP.

requirements, and Project lands as well as a summary of the extensive existing information available on Project area resources and early consultation on potential resource issues to be addressed during the relicensing. The PAD also includes an outline of the goals and objectives of this study.

In 2019-2020, City Light convened a series of Resource Work Groups (RWG) to engage agencies and other licensing participants (LP) in the Study Plan Development Process. Discussions with LPs continued in early 2021 with a series of topic-based discussions following filing of the Proposed Study Plan (PSP) on December 8, 2020 (City Light 2020b). This study plan reflects RWG and LP discussion and study requests and comment submitted by LPs.

1.3 Study Plan Development

The northern goshawk (*Accipiter gentilis*) is considered a priority species by the Washington Department of Fish and Wildlife (WDFW) and is a Candidate species for state listing. Northern goshawks (hereafter, “goshawk”) use a range of habitats, but occupied nest sites tend to be in areas with a high proportion of late seral stage forest (Finn et al. 2002) and foraging habitat is typically in mature and old-growth forests where understory is somewhat open (Reynolds et al. 1992). Several recent goshawk sightings within the Project Boundary and general Project vicinity are noted on eBird (eBird 2020).

If goshawk habitat exists in an area near Project-induced noise or tree clearing, there is potential for disturbing nesting goshawks. This study plan addresses the TE16 Northern Goshawk issue form.

On March 12, 2020, City Light released the TR-07 Northern Goshawk Habitat Analysis Draft Study Plan for LP review and comment. On March 17, 2020, the draft study plan was discussed at a Terrestrial Resources and Reservoir Erosion Work Group (TRREWG) meeting. City Light reviewed all comments received and released a revised version of the draft study plan on April 29, 2020. The revised draft was discussed on May 6, 2020 at a TRREWG meeting. Written comments were received from WDFW, U.S. Forest Service (USFS), and NPS and responded to in an attachment to this study plan. A Status Draft of the study plan was provided to LPs on August 6, 2020.

City Light is filing this study plan with FERC as part of its Revised Study Plan (RSP), an update to the version that was filed with the PSP and incorporating additional consultation with LPs prior to the filing date. No formal study requests related to this study were filed with FERC.

No PSP comments to the study plan were filed with FERC. No modifications were made to the study plan since the PSP.

2.0 STUDY PLAN ELEMENTS

2.1 Study Goals and Objectives

The goal of this study is to identify suitable goshawk nesting habitat within and near (i.e., within 0.5 mile) the Project Boundary. WDFW has specifically requested this habitat analysis, and City Light has agreed to do so as it has a mutual natural resource management interest. Objective of the study is to develop a map of suitable goshawk nesting habitat within the study area.

2.2 Resource Management Goals

The study will provide information for resource agencies and Indian tribes with jurisdiction in the Project vicinity to address their respective goals and objectives for resource management. The study will provide information to the following agencies with jurisdiction or interest in the species and habitat.

- U.S. Fish and Wildlife Service (USFWS)

Over 1,000 migratory bird species are protected under the Migratory Bird Treaty Act (MBTA), including the goshawk. USFWS administers the MBTA. The MBTA provides international migratory bird protections. In December 2017, the U.S. Department of the Interior's (USDOI) Office of the Solicitor issued a memorandum that found the prohibitions of take under the MBTA apply only to "affirmative actions that have as their purpose the taking or killing of migratory birds, their nest, or their eggs." In April 2018, the USFWS issued clarifying guidance that the USDOI does not consider incidental take a violation of the MBTA if the purpose of the activity is not to take birds. Additionally, the USFWS has proposed a rule that would codify the current Solicitor's Opinion.

- U.S. Forest Service (USFS)

The goshawk is designated a "sensitive species" in Region 6 (Pacific Northwest Region), within its geographic range (Woodbridge and Hargis 2006). USFS manages Sensitive Species to ensure that actions do not contribute to a loss of viability or cause a significant trend toward listing under the Endangered Species Act. Additionally, USFS has an MBTA Memorandum of Understanding with USFWS that "further clarifies the USFS commitment to bird conservation during forest and project-level planning" (Brewer et al. 2009).

- National Park Service (NPS)

NPS includes goshawk as one of 73 bird species of management concern in the North Cascades National Park and notes that the status of many species within the park is difficult to determine because of rarity or a lack of data (Hoffman et al. 2015).

- Washington Department of Fish and Wildlife (WDFW)

The goshawk is listed under WDFW's Priority Habitat and Species as a Candidate Species for State listing as Threatened or Endangered (WDFW 2019). WDFW has raised concern about the potential threat to the species from Project-related noise disturbance, although there are no such documented effects in the study area. WDFW is also concerned about possible effects from future maintenance and construction projects.

2.3 Background and Existing Information

A preliminary review of the existing literature was conducted to determine the potential for goshawk to occur within the Project Boundary. Additional literature will be reviewed as part of the study. Section 4.7 (Wildlife Resources) of City Light's PAD (City Light 2020) includes existing life history information for goshawk. This information is summarized below.

The goshawk is an accipiter that uses a range of habitats, but nest sites are consistently correlated with mature forests. In Washington, occupied historical nest sites tend to have a high proportion of late seral stage forest (>70 percent canopy closure of conifer species with >10 percent of the canopy trees >53 centimeters diameter at breast height [dbh]) (Finn et al. 2002). Douglas squirrel (*Tamiasciurus douglasii*), grouse (*Dendragapus obscurus* and *Bonasa umbellus*), and snowshoe hare (*Lepus americanus*) are the most frequently represented prey items for goshawks in both eastern and western Washington (Watson et al. 1998).

Prior to 2014, goshawk nesting activity had been suspected in the general vicinity of the Sourdough Trailhead but never confirmed. In 2014, a juvenile goshawk died after it flew into a Diablo Powerhouse window. Following this incident, City Light conducted acoustic broadcast goshawk surveys in 2015 along the lower portions of the Stetattle Creek Trail and Sourdough Trail for evidence of nesting goshawk, but no goshawks were detected. Survey methods were based on a Washington Department of Natural Resources protocol and approved by NPS staff (Tressler 2019).

Goshawks were detected 12 times during the NPS landbird Inventory and Monitoring surveys in the North Cascades National Park Complex from 2008-2018 (Ray et al. 2018; NPS unpublished data), and twice during Northern Spotted Owl surveys in 1995 (NPS unpublished data). The NPS wildlife observation records document 32 observations of goshawk from 1995-2018 (NPS unpublished data), and several recent goshawk sightings within the Project Boundary and general Project vicinity are noted on eBird (eBird 2020).

2.4 Project Operations and Effects on Resources

There is no known link between Project operations and effects on goshawks outside of the one incidental collision mortality referenced above. There are no known effects at the population level. WDFW has raised concern about the potential threat to the species from Project-related noise from operations and maintenance. City Light has agreed to conduct a study to gather information that will inform long-term management actions and best management practices (BMP), if necessary.

The goshawk uses a variety of forest types for nesting and foraging (USFS 2006). Project-related maintenance activities can generate loud noises, having the potential to disturb goshawk nesting pairs during the breeding season (mid-February through mid-September) (McClaren et al. 2015). Noise disturbance could result in egg predation, nest failure, premature fledging of young, and abandonment of young and the nesting territory (McClaren et al. 2015). Information from this study will inform a later potential effects analysis.

2.5 Study Area

The study area will consist of a 0.5-mile buffer surrounding the Project Boundary (Figure 2.5-1).

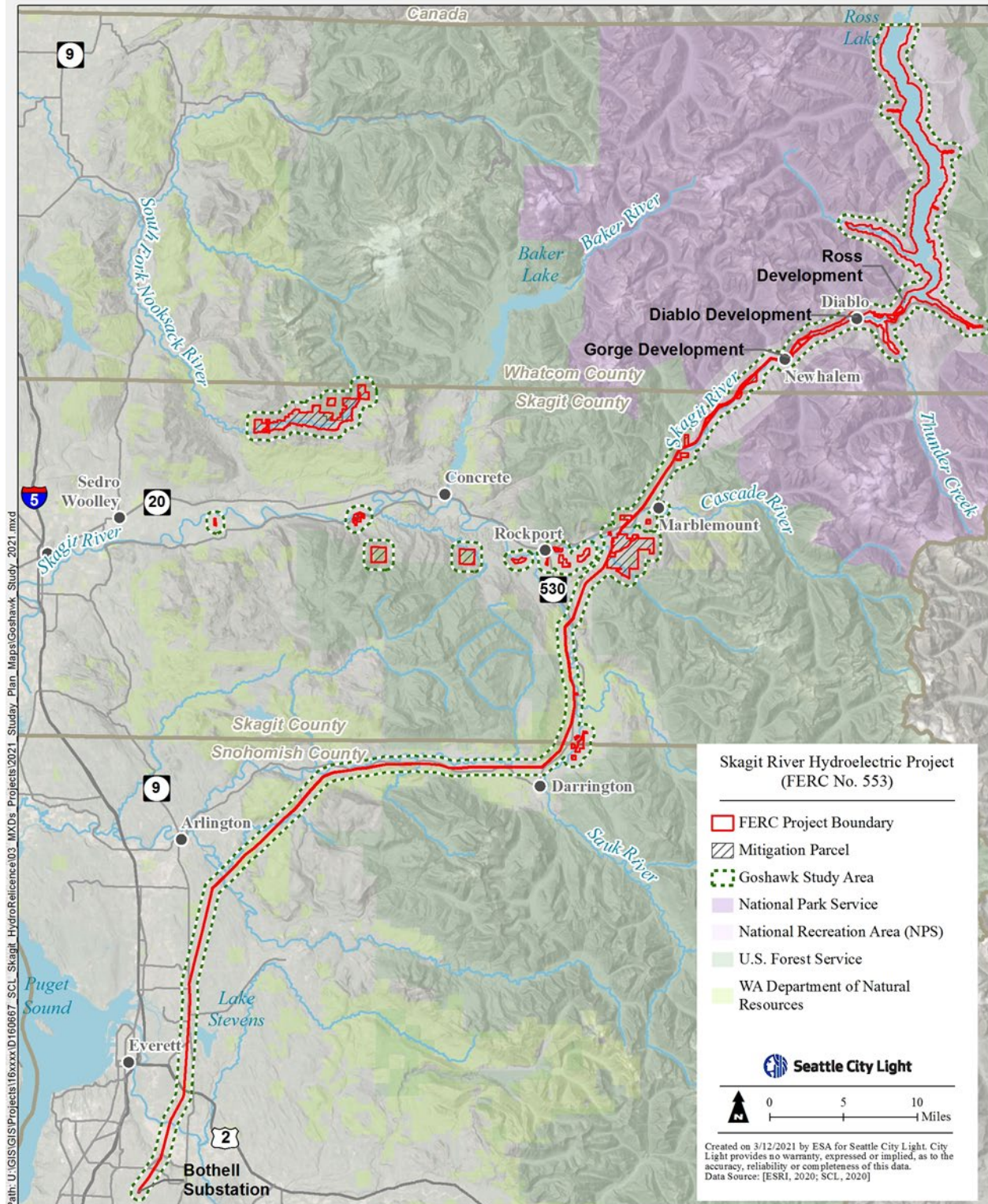


Figure 2.5-1. Overview of study area.

2.6 Methodology

The study will use available science to identify potentially suitable goshawk nesting habitat. The general steps for conducting the study are detailed below.

2.6.1 Review Scientific Literature

Habitat parameters identified in the literature will be reviewed and summarized in tabular and narrative format. The types of information that will be reviewed include state and federal agency reports and management plans, peer reviewed, published literature, NPS survey data, eBird records, and interviews with NPS, USFS, and WDFW knowledgeable staff and other species experts.

2.6.2 Identify and Map Potentially Suitable Habitat

Habitat parameters identified in the literature will be applied to the results from the Vegetation Mapping Study to map and quantify potentially suitable goshawk nesting habitat within the study area. A geographic information system (GIS) map of potential suitable habitat will be developed.

The NPS has mapped vegetation within the North Cascades National Park according to the National Vegetation Classification (NVC) system to the Association level, which includes co-dominant overstory species and primary understory species. The study area outside of the park will be mapped as part of the relicensing studies (see Vegetation Mapping Study including the transmission line, fish and wildlife mitigation lands, and Skagit River channel migration zone to the Sauk River confluence), but to the less precise Group level. The NVC does not use tree size as a classification element, thus a vegetation category – Western Hemlock/Red Cedar – may include portions of young, mature, and/or old-growth forest. Additional analysis using a combination of available Light Detection and Ranging (LiDAR)-derived Canopy Height Model and field data collection will be used to approximate age class from tree heights and canopy structure.

Existing data within the North Cascades National Park, data from the Vegetation Mapping Study, LiDAR analysis, and limited field review will be used to define the extent of potential goshawk nesting habitat in the study area. Based on the available information (as summarized in the PAD, City Light 2020) potential goshawk nesting habitat is defined as old-growth and mature conifer stands with >50 percent canopy, with tree dbh greater than 17 inches and a height of greater than 89 feet (Desimone and Hays 2003). These metrics will likely be refined once the North Cascades National Park NVC data has been analyzed and initial mapping of the study area outside of the North Cascades National Park has been completed as part of the Vegetation Mapping Study.

The Conservation Biology Institute (CBI) mapping of old growth and late seral stage forests of the North Cascades (CBI 2020) will be combined in GIS with the data layers described above to model goshawk nesting habitat within the 0.5-mile buffer. The CBI GIS data will be made available to interested LPs. The refined mapping within the study and the CBI data would be available to City Light to find potential goshawk breeding areas before construction, maintenance projects that produce noise, such as road maintenance, and herbicide/pesticide applications.

The data will be presented in map format and summarized in a narrative. The results of the study will be used in the license application to assess Project effects and to inform development of

goshawk protection BMPs for operation and maintenance activities and new construction in or near goshawk nesting habitat, if warranted.

2.7 Consistency with Generally Accepted Scientific Practice

The study methods use a standard scientific approach by relying on documented occurrences of the species, a review of scientific literature and management guidelines, and a habitat assessment specific to western Washington using parameters identified in the scientific literature. Noise disturbance thresholds will be summarized from the scientific literature and/or resource agency guidelines.

2.8 Schedule

- Literature Review – Spring 2021
- Habitat Mapping – Summer 2021
- Final Report (Initial Study Report [ISR]) – March 2022

2.9 Level of Effort and Cost

The initial estimate for implementation and reporting associated with this study is approximately \$38,000.

3.0 REFERENCES

- Brewer, L.T., R. Bush, J.E. Canfield, and A.R. Dohmen. 2009. Northern Goshawk Northern Region Overview: Key Findings and Project Considerations. Prepared by the Northern Goshawk Working Group.
- Conservation Biology Institute (CBI). 2020. Data Basin website. [Online] URL: <https://databasin.org/galleries/90e11cbab3724db2aa801e67643d9151#expand=13863>.
- Desimone, S.M. and D. W. Hays. 2003. Northern goshawk. Pages 6-1 – 6-16 *in* E. Larsen, J. M. Azerrad, N. Nordstrom, editors. Management Recommendations for Washington’s Priority Species, Volume IV: Birds. Washington Department of Fish and Wildlife, Olympia, Washington, USA.
- eBird. 2020. eBird database maintained by Cornell Lab of Ornithology. [Online] URL: <https://ebird.org/region/US-WA?yr=all>. Accessed January 2, 2020.
- Finn, S.P., J.M. Marzluff, and D.E. Varland. 2002. Effects of landscape and local habitat attributes on Northern Goshawk site occupancy in western Washington. *Forest Science* 48(2):427-436.
- Hoffman, R.L., A. Woodward, P. Haggerty, K. Jenkins, P. Griffin, M.J. Adams, J. Hagar, T. Cummings, D. Duriscoe, K. Kopper, J. Riedel, L. Marin, G.S. Mauger, K. Bumbaco, and J.S. Littell. 2015. North Cascades National Park Service Complex: Natural resource condition assessment. Natural Resource Report NPS/NOCA/NRR—2015/901.
- McClaren, E.L., T. Mahon, F.I. Doyle, and W.L. Harrower. 2015. Science-Based Guidelines for Managing Northern Goshawk Breeding Areas in Coastal British Columbia. *Journal of Ecosystems and Management* 15(2):1–91.
- National Park Service (NPS). 2020. Unpublished data on goshawk detections provided by Jason Ransom, NPS, April 14, 2020.
- Ray, C., J.F. Saracco, M.L. Holmgren, R.L. Wilkerson, R.B. Siegel, K.J. Jenkins, J.I. Ransom, P.J. Happe, J.R. Boetsch, and M.H. Huff. 2018. Landbird population trends in mountain and historical parks of the North Coast and Cascades Network 2005–2016 synthesis. Natural Resource Report NPS/PWR/NRR-2018/1673. National Park Service, Fort Collins, Colorado. 85 p
- Reynolds, R.T., R.T. Graham, M.H. Reiser, R.L. Bassett, P.L. Kennedy, D.A. Boyce Jr., G. Goodwin, R. Smith, and E.L. Fisher. 1992. Management recommendations for the northern goshawk in the southwestern United States. Gen. Tech. Rep. RM-217, Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 90 p.
- 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.

- Tressler, R. 2019. Personal communication between Ron Tressler, Seattle City Light, and Jim Keany, Environmental Science Associates. April 8, April 10, May 23, June 25, and August 13, 2019.
- United States Forest Service (USFS). 2006. Northern Goshawk Inventory and Monitoring Technical Guide. Gen. Tech. Report WO-71. July 2006.
- Washington Department of Fish and Wildlife (WDFW). 2019. State Listed Species, Revised June 2019. [Online] URL: <https://wdfw.wa.gov/sites/default/files/2019-06/threatened%20and%20endangered%20species%20list.pdf>. Accessed January 6, 2020.
- Watson, J.W., D.W. Hays, S.P. Finn, and P. Meehan-Martin. 1998. Prey of breeding Northern Goshawks in Washington. *J. Raptor Res.* 32(4):297-305.
- Woodbridge, B. and C.D. Hargis. 2006. Northern goshawk inventory and monitoring technical guide. Gen. Tech. Rep. WO-71. Washington, DC: U.S. Department of Agriculture, Forest Service. 80 p.

NORTHERN GOSHAWK HABITAT ANALYSIS REVISED STUDY PLAN

ATTACHMENT A

**CITY LIGHT RESPONSES TO LP COMMENTS ON THE STUDY PLAN
PRIOR TO PSP**

Table 1. City Light responses to LP comments on the study plan prior to PSP.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
1.	Brock Applegate (WDFW)	04/10/2020	Section 1.3 Study Plan Development	<p>Goshawks will use smaller trees for habitat than required by old-growth obligates like murrelets and spotted owls. I would recommend SCL considers areas with +50-year old coniferous stand with low amounts of deciduous trees.</p> <p>New comment provided on 05/22/2020:</p> <p>Thank you, WDFW prefers structural characteristics and height, instead of stand age. When I evaluated impacts to Northern Goshawk nesting on private timberland, Steve Desimone stated that they have found goshawks nesting in small trees than those in the management recommendations. He recommended the age class state in WDFW's comment, because we did not know heights and structures.</p>	<p>This study will map potential goshawk nesting habitat based on structural characteristics as stand ages are not available. Goshawks are known to use a variety of habitats for foraging but only later seral state stands for nesting. We are using the criteria for nesting habitat that is cited in WDFW's PHS Management Recommendations for the northern goshawk (Desimone and Hays 2003).</p> <p>City Light appreciates any specific criteria from the literature or WDFW policy – or from other LPs that they believe should help guide the mapping parameters.</p> <p>Response to comment provided on 05/22/2020: Comment noted. Thank you.</p>
2.	Brock Applegate (WDFW)	04/10/2020	Section 2.2 Resource Management Goals	<p>1st Paragraph – Add: State Add: as Threatened or Endangered Add: and possible impacts from future maintenance and construction projects.</p>	Text changed to add WDFW concern on maintenance and construction projects.
3.	Shauna Hee (USFS)	04/15/2020	Section 2.2 Resource Management Goals	Is the assumption that SCL operations will continue in the current footprint for future maintenance and construction? Is there a suspected distance of noise or human disturbance?	This study will address current configuration and operation of the Project. If changes or new elements are proposed during relicensing process, we would evaluate those at that time. In Section 2.7, we indicate that noise disturbance thresholds will be summarized from the scientific literature and/or resource agency guidelines. City Light would appreciate receiving any information related to this topic from LPs.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
4.	Jason Ransom (NPS)	04/14/2020	Section 2.3 Background and Existing Information	Paragraph #4 – Add: detected 12 times during Delete: not observed in Add Inventory and Monitoring Add: from 2008-2018 (Ray et al. 2018; NPS, unpublished data), and twice during Northern Spotted Owl surveys in 1995 (NPS, unpublished data). Add: The NPS wildlife observation records document 32 observations of goshawk from 1995 – 2018 (NPS, unpublished data), and	Thank you for the information. Text edited to include changes.
5.	Brock Applegate (WDFW)	04/10/2020	Section 2.4 Project Operations and Effects on Resources	Like many effects to fish and wildlife, they go undetected by us. A person will not usually see a pair abandoning their nest with or without chicks due to noise.	City Light appreciates the input.
6.	Brock Applegate (WDFW)	04/10/2020	Section 2.4 Project Operations and Effects on Resources	SCL would not know the complex dynamics and effects on populations unless they created a study. New comment provided on 05/22/2020: WDFW has them listed as Washington Priority and State Candidate Species so we have concerns about every part of the population and the population's habitat. The literature referenced allows SCL to understand the impacts vectors caused by the project.	City Light is currently unaware of any specific Project-related adverse effects that would have corresponding population-level effects. City Light welcomes specific information or literature from the LPs regarding such effects. Given the relatively small portion of the North Cascades Ecosystem occupied by the Project, it appears highly unlikely that the Project is affecting goshawks on a population-scale level. Response to comment provided on 05/22/2020: Comment noted. The study is focused on gathering information on location of potential nesting habitat as it is more limited than foraging habitat.
7.	Brock Applegate (WDFW)	04/10/2020	Section 2.4 Project Operations and Effects on Resources	1 st Paragraph – Remove: but has provided no documented link	Edit made.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
8.	Brock Applegate (WDFW)	04/10/2020	Section 2.4 Project Operations and Effects on Resources	Doesn't operations and maintenance create noise? I am confused by this statement.	The Project does cause noise from operation and maintenance, but it is currently unknown if there is any effect to nesting goshawks. A goal of this study is to provide information for such an analysis using results of the Sound Assessment study and other information in the License Application.
9.	Brock Applegate (WDFW)	04/10/2020	Section 2.4 Project Operations and Effects on resources	Please see the "link" for above.	See response to Comment #8.
10.	Brock Applegate (WDFW)	04/10/2020	Section 2.4 Project Operations and effects on resources	1 st Paragraph – Add: of nest and young	Edit made.
11.	Shauna Hee (USFS)	04/15/2020	Section 2.5 Study Area	What is the basis for the 0.5 mile buffer? The veg study? Please provide justification and references for the 0.5-mile buffer.	<p>This was discussed with the Terrestrial Resources and Reservoir Erosion Work Group (TRREWG) during the formation and editing of the Issue Form (TE16 Northern Goshawk) during the 7/30/2019 TRREWG meeting. The issue also was discussed during the 3/17/20 TRREWG meeting. Noise from typical Project operations and maintenance is expected to attenuate within 0.5 miles to below threshold levels for disturbance to nesting goshawks.</p> <p>See WDFW management recommendations for goshawk nest sites, which recommends a 0.5-mile buffer for active road building and timber operations.</p> <p>https://wdfw.wa.gov/sites/default/files/publications/00026/wdfw00026.pdf</p> <p>Noise generated from other, non-routine work, would be subject to individual project</p>

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					evaluations and will be accounted for in BMPs developed later in the relicensing process.
12.	Shauna Hee (USFS)	04/15/2020	Section 2.6 Methodology	Why does the development of the suitable habitat overlay not take into account historic and current goshawk nest sites and sightings? (Similar to golden eagle study – where have goshawks been located in the landscape?)	This information will be assembled and reviewed as noted in the methods under Section 2.6.1 (Review Scientific Literature) of this study plan.
13.	Brock Applegate (WDFW)	04/10/2020	Section 2.6.2 Identify and Map Potentially Suitable Habitat	<p>4th Paragraph – Add: SCL would create BMPs and guidelines in a Northern Goshawk Management Plan for areas in and near goshawk habitat found in the map format. Recommendations should include surveys, if SCL would conduct future projects, including construction and maintenance and could not avoid impacts.</p> <p>New comment provided on 05/22/2020: “During the RWG meeting, Ron asked me to leave a comment about the habitat area that may reside partially inside and outside the 0.5-mile vegetation mapping zone. WDFW made the comment that the vegetation mapping may only partially capture the suitable habitat, because the full breeding area may have small piece in the 0.5-mile vegetation mapping zone and extend beyond the vegetation map. WDFW recommends that SCL investigate and map any suitable habitat for goshawk breeding area described in WDFW PHS Management Recommendations that may have suitable habitat in <u>and</u> outside the 0.5-mile vegetation mapping zone.”</p>	<p>Thank you for your comment. Text has been revised to attempt to clarify that the purpose of the study plan is to gather habitat mapping to inform analysis of potential effects on Northern Goshawk and BMP development. The analysis and BMP development will occur in the License Application. We are not certain whether the goshawk BMPs will be in a stand-alone goshawk plan or part of a larger environmental protection and BMP plan for the new license. City Light will consider recommendations for minimizing effects to goshawk nesting habitat and a procedure for assessing potential effects of new construction projects.</p> <p>Response to comment provided on 05/22/2020: City Light will make available the GIS data from the Conservation Biology Institute (CBI) that shows old-growth and mature forests to supplement the study mapping. This mapping can be used to look at overall distribution of potential nesting habitat at a larger scale. City Light would use these map products to find potential goshawk breeding areas before construction, maintenance projects that produce noise, such as road maintenance, and herbicide/pesticide applications. This information is inserted into Section 2.6.2.</p>

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				<p>During the RWG meeting, Ron asked me to leave a comment about the habitat area that may reside partially inside and outside the 0.5-mile vegetation mapping zone. WDFW made the comment that the vegetation mapping may only partially capture the suitable habitat, because the full breeding area may have small piece in the 0.5-mile vegetation mapping zone and extend beyond the vegetation map. WDFW recommends that SCL investigate and map any suitable habitat for goshawk breeding area described in WDFW PHS Management Recommendations that may have suitable habitat in <u>and</u> outside the 0.5-mile vegetation mapping zone.</p> <p><i>Note: identical comment written twice.</i></p>	
14.	Brock Applegate (WDFW)	04/10/2020	Section 2.6.2 Identify and Map Potentially Suitable Habitat	I thought we talked about the creation of this kind of product for use by SCL later, when needed.	See response to Comment #13.
15.	Brock Applegate (WDFW)	04/17/2020	Section 2.8 Schedule	<p>Bulleted list - Add:</p> <ul style="list-style-type: none"> Initial Study Report (ISR) – March 2022 ISR Meeting Study Plan Modification request (if needed) Additional activities (if needed) Final Report (if needed) <p>New comment provided on 05/22/2020: Why not add these parts to the schedule then?</p>	<p>Thank you for the comment; City Light acknowledges the ILP milestones provided. The ILP will provide the opportunity for comment on the final report submitted in the ISR and discussed at the ISR meeting; if any components of the study goals and objectives are not met in the first year, or there are anomalous conditions, any party may propose additional work or request additional study per FERC ILP regulations.</p> <p>No changes were made to the schedule in the draft study plan as City Light intends to complete the study within one year and wants to</p>

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					<p>be clear with FERC and LPs on the proposed schedule. City Light believes that it will be beneficial to all parties to have complete information from the studies as soon as possible to inform development of management proposals and cross resource analysis.</p> <p>Response to comment provided on 05/22/2020: Thank you for your comment. The schedule reflects the timeline for this study only, not the larger ILP process.</p>
16.	Jason Ransom (NPS)	04/14/2020	Section 3.0 References	<p>Delete: Holmgren, A.L., R.L. Wilkerson, R.B. Siegel, and J.I. Ransom. 2017. North Coast and Cascades Network landbird monitoring: Report for the 2016 field season. Natural Resource Report NPS/NCCN/NRR—2017/1495. National Park Service, Fort Collins, CO.</p> <p>Add: Ray, C., Saracco, J.F., Holmgren, M.L., Wilkerson, R.L., Siegel, R.B., Jenkins, K.J., Ransom, J.I., Happe, P.J., Boetsch, J.R., and M.H. Huff. 2018. Landbird population trends in mountain and historical parks of the North Coast and Cascades Network 2005–2016 synthesis. Natural Resource Report NPS/PWR/NRR-2018/1673. National Park Service, Fort Collins, Colorado. 85 p.</p>	Thank you for the information, edits made.

**TR-08 SPECIAL-STATUS AMPHIBIAN
REVISED STUDY PLAN**

**SKAGIT RIVER HYDROELECTRIC PROJECT
FERC NO. 553**

Seattle City Light

**April 2021
RSP**

TABLE OF CONTENTS

Section No.	Description	Page No.
1.0	Introduction.....	1-1
1.1	General Description of the Project.....	1-1
1.2	Relicensing Process	1-1
1.3	Study Plan Development.....	1-2
2.0	Study Plan Elements	2-1
2.1	Study Goals and Objectives	2-1
2.2	Resource Management Goals	2-2
2.3	Background and Existing Information.....	2-2
2.3.1	Columbia Spotted Frog.....	2-2
2.3.2	Oregon Spotted Frog.....	2-3
2.3.3	Western Toad	2-5
2.4	Project Operations and Effects on Resources	2-6
2.5	Study Area	2-6
2.6	Methodology	2-8
2.6.1	Identify and Map Potentially Suitable Habitat.....	2-8
2.6.2	Reconnaissance and Incidental Observations	2-8
2.6.3	Amphibian Surveys.....	2-9
2.6.4	Identification and Handling of Amphibians	2-11
2.7	Consistency with Generally Accepted Scientific Practice.....	2-14
2.8	Schedule.....	2-14
2.9	Level of Effort and Cost	2-14
3.0	References	3-1

List of Figures

Figure No.	Description	Page No.
Figure 2.5-1.	Location map of the Skagit River Project.....	2-7

List of Tables

Table No.	Description	Page No.
Table 2.3-1.	Spotted frog species habitat requirements by life stage.....	2-5

List of Attachments

Attachment A	City Light Responses to LP Comments on the Study Plan Prior to PSP
--------------	--

List of Acronyms and Abbreviations

BMP	best management practice
City Light	Seattle City Light
DNA	deoxyribonucleic acid
eDNA	environmental DNA
ELC	Environmental Learning Center
ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission
GIS	Geographic Information System
ISR	Initial Study Report
LiDAR	Light Detection and Ranging
LP	licensing participant
NMWSE	Normal Maximum Water Surface Elevation
NPS	National Park Service
NWI	National Wetlands Inventory
O&M	operations and maintenance
PAD	Pre-Application Document
PBF	physical or biological features
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
RWG	Resource Work Group
SEEC	Skagit Environmental Endowment Commission
SGCN	Species of Greatest Conservation Need
TRREWG	Terrestrial Resources and Reservoir Erosion Work Group
U.S.C.	United States Code
USFWS	U.S. Fish and Wildlife Service

USGSU.S. Geological Survey

VESvisual encounter survey

WDFWWashington Department of Fish and Wildlife

1.0 INTRODUCTION

1.1 General Description of the Project

The Skagit River Hydroelectric Project (Project), licensed to The City of Seattle, Washington, and operated through its publicly-owned electric power utility Seattle City Light (City Light), is located in northern Washington State and consists of three power generating developments on the Skagit River – Ross, Diablo, and Gorge – and associated lands and facilities. The Project generating facilities are in the Cascade Mountains of the upper Skagit River watershed, between Project River Miles (PRM) 94.7 and 127.9 (U.S. Geological Survey [USGS] RMs 94.2 and 127).¹ Power from the Project is transmitted via two 230-kilovolt 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, an Environmental Learning Center (ELC), several recreation facilities, and several parcels of fish and wildlife mitigation lands.

Project generating facilities are all located in Whatcom County, although Ross Lake, the most upstream reservoir, crosses the U.S.-Canada border and extends for about one mile into British Columbia at normal maximum water surface elevation. Gorge Powerhouse, the most downstream facility, is approximately 120 miles northeast of Seattle and 60 miles east of Sedro-Woolley, the nearest large town. The closest town is Newhalem, which is part of the Project and just downstream of Gorge Powerhouse. The primary transmission lines cross Whatcom, Skagit, and Snohomish counties; the fish and wildlife mitigation lands are in the same counties.

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, Diablo, and Gorge lakes.” The legislation maintains the Federal Energy Regulatory Commission’s (FERC) 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).

1.2 Relicensing Process

The current FERC license for the Project expires on April 30, 2025, and City Light will apply for a new license no later than April 30, 2023. City Light formally initiated the relicensing process by filing a Notice of Intent and Pre-Application Document (PAD) with FERC on April 27, 2020 (City Light 2020a). The PAD includes descriptions of the Project facilities, operations, license

¹ 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 Project River Mile (PRM) system are provided throughout this document. For further details see Section 7.0 of the main body RSP.

requirements, and Project lands as well as a summary of the extensive existing information available on Project area resources and early consultation on potential resource issues to be addressed during the relicensing. The PAD also includes an outline of the goals and objectives of this study.

In 2019-2020, City Light convened a series of Resource Work Groups (RWG) to engage agencies and other licensing participants (LP) in the Study Plan Development Process. Discussions with LPs continued in early 2021 with a series of topic-based discussions following filing of the Proposed Study Plan (PSP) on December 8, 2020 (City Light 2020b). This study plan reflects RWG and LP discussion and study requests and comments submitted by LPs.

1.3 Study Plan Development

The study is designed to address Terrestrial Resources Issue 20 (TE20 Columbia Spotted Frog Survey), and aspects of TE03 (Littoral Riparian Habitat) and FA09 (Littoral and Riparian Habitat). TE20 as identified by Washington Department of Fish and Wildlife (WDFW) suggested that Project operations may affect Columbia spotted frog (*Rana luteiventris*), a WDFW candidate species, if this species occurs at the Project reservoirs and Project effects area. WDFW postulated that the Project may reduce or degrade aquatic, littoral, and emergent vegetation associated with potential spotted frog habitat through the fluctuations of the reservoirs. The study will also provide information on any other amphibians that are observed incidentally or during surveys, including western toad (or boreal toad *Anaxyrus boreas boreas*), a WDFW candidate species, and Oregon spotted frog (*Rana pretiosa*), a federal threatened and State endangered species, and native amphibians that do not have special status. As well, the study will report any detections (visual or auditory) of the non-native American bullfrog (*Lithobates catesbeianus*), a species which, while not documented in the Project area, is expanding its range and has been found in nearby waterbodies. The study partially overlaps and will use information derived from the Wetland Assessment study. The Reservoir Fish Stranding and Trapping Risk Assessment study will also identify potential habitats within drawdown zones on Ross, Diablo, and Gorge lakes that could be used by special-status amphibians. Because Oregon spotted frog is listed as a threatened species under the Endangered Species Act (ESA), information provided by this TR-08 Special-status Amphibian Study could be used by U.S. Fish and Wildlife Service (USFWS) to fulfill its requirement for ESA compliance for the Project.

On April 10, 2020, City Light released the Special-status Amphibian Draft Study Plan for LP review and comment. On May 6, 2020, the draft study plan was discussed at a Terrestrial Resources and Reservoir Erosion Work Group (TRREWG) meeting. City Light reviewed all comments received and released a revised version of the draft study plan on June 12, 2020. The revised draft was discussed on June 23, 2020 at a TRREWG meeting. Written comments were received from Washington Department of Fish and Wildlife (WDFW), NPS, Sauk-Suiattle Indian Tribe, U.S. Forest Service (USFS), and Upper Skagit Indian Tribe and responded to in an attachment to this study plan. A Status Draft of the study plan was provided to LPs on August 6, 2020.

City Light is filing this study plan with FERC as part of its Revised Study Plan (RSP), an update to the version that was filed with the PSP and incorporating additional consultation with LPs prior to the filing date. No formal study requests related to this study were filed with FERC.

PSP comments to this study plan were submitted by WDFW. City Light has responded to comments in the PSP comment/response table appended to the main body of the RSP. No modifications were made to the study plan in response to comments.

2.0 STUDY PLAN ELEMENTS

2.1 Study Goals and Objectives

The goals of this study are to: (1) identify areas of potentially suitable breeding habitat for the special-status amphibians, Columbia spotted frog and Oregon spotted frog, within the study area; (2) assess the likelihood that either species occurs in areas where there is activity related to Project operations and maintenance (O&M), including at Project recreation facilities; (3) document occurrences of a third special-status species, western toad, and the locations and types of habitats used around the study area; and (4) collect relevant information on populations where these species are found, including numbers, life stages, habitat, and locations. Study results will provide information on special-status and other amphibian species present that will be combined with results of other studies (e.g., Wetlands Assessment, Erosion and Geologic Hazards at Project Facilities and Transmission Line Right-Of-Way, Reservoir Shoreline Erosion, Sediment Deposition in Reservoirs Affecting Resource Areas of Concern, Reservoir Fish Stranding and Trapping Risk Assessment) to develop appropriate best management practices (BMP) to protect wetlands, streams, and other sensitive habitats, or other protection, mitigation, and enhancement (PME) measures, if warranted. Specific study objectives are listed below:

- Develop a preliminary, working map of potentially suitable breeding habitat (i.e., habitats used for oviposition [egg-laying] and larval rearing) for special-status amphibians within the study area using existing, publicly available aerial imagery, wetland and soil maps, and vegetation data. Potential habitat will also be identified by the results of the Vegetation Mapping and Wetland Assessment studies and analyses of Light Detection and Ranging (LiDAR) data by the Reservoir Fish Stranding and Trapping Risk Assessment study. The preliminary map will indicate discernible wetlands and topographic depressions, as well as general areas, such as gently sloping shorelines, that might support special-status amphibian breeding and could strand and trap amphibians in different life stages. For this preliminary map habitat suitability will be broadly defined by reference to literature accounts that describe habitats successfully used by each special-status species.
- Conduct field reconnaissance in areas where additional information is needed to verify or correct preliminary assumptions of habitat suitability.
- Catalog and map incidental observations of special-status amphibians and other amphibians (including non-native bullfrogs) recorded during the wetland study and other studies during the relicensing.
- Perform a special-status amphibian field survey in areas identified as potentially suitable habitat where there is activity related to Project O&M or at Project recreation facilities and where additional information is needed on species occurrence, relative abundance, and life history timing.
- Prepare a final report including narrative descriptions of field reconnaissance and survey areas and relevant habitat characteristics, information regarding potentially suitable areas that were not surveyed, and final maps. The final maps will show habitat categories mapped by the Vegetation Mapping and Wetland Assessment studies; locations of field reconnaissance and amphibian surveys; and amphibians by life stage detected during surveys, field reconnaissance and by incidental observation.

2.2 Resource Management Goals

The study will provide information for resource agencies and Indian tribes with jurisdiction in the Project vicinity to address their respective goals and objectives for resource management.

City Light will collect information on special-status amphibians in the study area which will be used for the Project relicensing process. Amphibian species with the potential to occur within the study area include Oregon spotted frog, which is a federal threatened and Washington State endangered species. Columbia spotted frog and western toad are State candidate species and also listed as Species of Greatest Conservation Need (SGCN; WDFW 2015), both because of regional declines (Columbia spotted frog in areas of shrub-steppe and western toad in lowlands of the Puget Trough and lower Columbia River Gorge). In general, federal and state management goals are aimed at protecting and achieving recovery of currently listed species, and preventing habitat removal, modification, or disturbance that would lead to future listing of any species.

WDFW's goals for priority habitats and species are to maintain or enhance the structural attributes and ecological functions of habitat needed to support healthy populations of fish and wildlife; maintain or enhance populations of priority species within their present and/or historical range in order to prevent future declines; and to restore species that have experienced significant declines. Amphibians are sensitive to degradation of essential habitats including wetlands, riparian habitat, seeps, and mature forests. Amphibian biomass is available to other trophic levels, which makes them important components of aquatic and terrestrial ecosystems. WDFW management recommendations specific to Oregon spotted frog and Columbia spotted frog were published in 1997 (Nordstrom and Milner 1997a, 1997b).

2.3 Background and Existing Information

As demonstrated in the PAD (City Light 2020) and summarized below, there is a great deal of existing information on the special-status amphibians—Columbia spotted frog, Oregon spotted frog, and western toad.

2.3.1 Columbia Spotted Frog

The Columbia spotted frog is a candidate species for state listing and regarded as a SGCN by WDFW on the basis of regional declines within areas of shrub-steppe habitat, especially in the Columbia basin, although the species reportedly remains common in many places elsewhere in Washington State (WDFW 2015). This aquatic species occurs over a large geographic area and in diverse biomes, including arid scrub and montane forests, with permanent ponds, lakes, or sluggish streams.

There are no confirmed records of Columbia spotted frog on any of the Project reservoirs. However, on May 5, 2012 City Light biologists incidentally observed and photographed two ranid (i.e., frogs of the family Ranidae) egg masses in wetlands associated with the north end of Ross Lake in British Columbia. The egg masses were in a low-gradient drainage channel within an extensive grass-, or sedge-dominated wetland (Tressler 2020). Based on known range of the species and the elevation of the site, these were probably Columbia spotted frog egg masses; although certain identification cannot be established without more information.

Columbia spotted frog is known to occur in the Big Beaver Valley west of Ross Lake, an area of extensive beaver-dammed wetlands. The frogs reportedly could not be reliably field-identified because they shared characteristics with northern red-legged frog (*Rana aurora*) and Cascades frog (*Rana cascadae*) (Holmes and Glesne 1997), but were later determined by genetic analyses to be Columbia spotted frog (Holmes and Glesne 2000). The results of these genetic analyses are consistent with other information that Columbia spotted frog was the most likely species to occur in this area, whereas Cascades frog is found at higher elevations (e.g., in the Illabot Creek watershed at over 4,900 feet) and rarely occurs below 2,000 feet, and northern red-legged frog typically occurs at lower elevations (Dvornich et al. 1997).

Columbia spotted frogs typically deposit egg masses in vegetated, shallow water locations, including the margins of permanent water bodies and separate seasonal sites, and after hatching larvae require aquatic habitats that persist until at least mid- to late summer to complete metamorphosis. All life stages of this species are typically aquatic, but eggs and larvae are the most sensitive to site drying and changes in water level. Adult and juvenile Columbia spotted frogs are usually found in or near water, except possibly during dispersal.

Habitat suitability for Columbia spotted frog is not precisely described in the literature, in part because this species is so wide-ranging. Movements between essential habitats of Columbia spotted frog populations often follow stream and wetland corridors (Reaser and Pilliod 2005). However, Pilliod et al. (2002) documented individual radio-tagged Columbia spotted frogs at a high montane site (7,620-8,640 feet elevation) in Idaho making direct overland movements of over 540 feet through dry habitats, although some of these frogs stopped at seeps, springs, and isolated pools along the way when these were available (Pilliod et al. 2002). Habitats of Columbia spotted frog may include forested wetlands, but typically only as a component of a larger wetland habitat complex with emergent class wetlands (Reaser and Pilliod 2005).

2.3.2 Oregon Spotted Frog

There are no known historical or extant occurrences of Oregon spotted frog within the study area. Oregon spotted frog has not been documented to occur (including known extirpated populations) at elevations above about 650 feet elevation in western Washington, although there are known populations at higher elevations at Trout Lake and Conboy Lake in the southern Cascades of Washington (i.e., up to about 2,080 feet), and in the Oregon Cascades (i.e., over 5,000 feet). Like Columbia spotted frog, Oregon spotted frog is highly aquatic and generally associated with large wetland complexes (i.e., >10 acres) with areas of permanent water, vegetated shallows, and aquatic connections. Oregon spotted frog has been described as a warmwater marsh specialist, associated with sites where water is warm (i.e., 20-35°C) during the late spring and summer season, when the frogs are active (Pearl and Hayes 2005).

Oregon spotted frog populations were first discovered in western Whatcom and adjacent Skagit counties in 2011 through 2013 at multiple sites in three lowland watersheds: the lower South Fork Nooksack River, Sumas River, and the upper Samish River (Bohannon et al. 2016). These and subsequent discoveries (unpublished WDFW data, 2015-2019) in the same watersheds resulted from one or more surveys per site within suitable habitat. Known historical occurrences of Oregon spotted frog in the Skagit River watershed near Mount Vernon, Sedro-Woolley, and Concrete are considered extirpated (Hallock 2013) and Oregon spotted frog was not detected by egg mass

surveys of other sites in the Skagit Valley, including City Light surveys of wildlife mitigation lands in 2011 and repeat surveys of some of these sites in 2012 (unpublished WDFW data).

Contrary to expectations, Ovaska et al. (2019) found genetic evidence of Oregon spotted frog at one of 16 sampled water bodies in the upper Skagit basin in Canada. The site was located less than 2 miles north of Ross Lake and 2.75 miles north of the international border in British Columbia. This genetic evidence consisted of detections of environmental deoxyribonucleic acid (DNA) (eDNA) positive for Oregon spotted frog in two of three years, which suggested the species may be present², and DNA from a swab of a captured frog. The site is a beaver-dammed wetland on a tributary of the Skagit River at about 1,640 feet elevation. Columbia spotted frog was also detected by DNA from swabs of 3 captured frogs at the same site, but was not detected by eDNA at the site. Ovaska et al. (2019) reported that eDNA tests for Columbia spotted frog exhibited a high level of false negatives, detecting Columbia spotted frog in only 37 percent of sites where the species was observed to occur. Oregon spotted frog is otherwise only known to occur in Canada in the lower Fraser Valley in extreme southwestern British Columbia and has not been found previously at any sites with Columbia spotted frog in Canada or the US. Possible contact between the species, including hybridization and genetic introgression, has not been studied.

The final critical habitat rule for Oregon spotted frog (81 FR 29335) identified three physical or biological features (PBF) essential to the conservation of the species that may require special management considerations or protection. Formerly called “primary constituent elements”, these PBFs include:

- Permanent or seasonal water bodies holding water continuously for a minimum of four months, which corresponds to the time of year required for eggs and larvae (generally, as early as February and as late as September) with:
 - Shallow water up to 12 inches deep (or up to 12 inches over vegetation in deeper water),
 - Gradual topographic gradient, and
 - If seasonal, hydrologic connection to deeper, more permanent water;
- Aquatic movement corridors up to 3.1 miles from breeding habitats and free of impassable impediments; and
- Habitat characteristics that provide refuge from predators.

Other considerations include vegetation conditions in potential oviposition habitats, which may limit or preclude egg-laying if the previous year’s emergent growth remains tall and dense, or, where bent-over, completely covers the water. Most known Oregon spotted frog populations in lowland western Washington occur at sites with a recent history of livestock grazing, hay production, or mowing, which reduce reed canary-grass (*Phalaris arundinacea*). However, at a few sites with no apparent management of reed canary-grass, oviposition habitat is associated with submerged, flattened grass floating near the surface in unusually deep water. Seasonal habitats of

² Ovaska et al, 2019 notes that eDNA cannot be used to detect Oregon spotted frog if Columbia spotted frog also occurs at a site.

Oregon spotted frog occasionally include forested wetlands within larger wetland complexes (Hallock 2013).

Habitat requirements of Oregon spotted frog and Columbia spotted frog are similar and are summarized in Table 2.3-1. Oviposition sites of both spotted frog species are typically located in shallow, still-water (occasionally in flowing streams), close to shore, gently sloped, where herbaceous vegetation is submerged or short-statured emergent when oviposition occurs, and where exposed to sunlight. Populations of both species typically use additional habitats during non-breeding periods and these habitats may be essential to the species.

Table 2.3-1. Spotted frog species habitat requirements by life stage.

Egg Masses¹	Larvae¹	Juveniles/Adults¹
Typically in clusters (i.e., piles of egg masses of multiple females) in unshaded, relatively shallow water, often 2-10 inches deep. May be found in deeper water because of water level changes, if egg masses drift, or where mats of submerged vegetation float near the surface. Egg mass substrate is usually submerged herbaceous vegetation (e.g., grasses or sedges). Associated with permanent or seasonally drying water bodies with still- or slowly-flowing water including lake or pond edges, marshes, streams, springs, and floodwater pools. Hatching occurs in about 8-24 days.	Early stages may remain in or near oviposition sites, but larvae may subsequently disperse distances of 100s of feet. May favor areas of shallow, warmer water, especially where there is hiding cover in the form of vegetation, detritus, or soft substrates. Columbia spotted frog larvae reportedly metamorphose 70-100 days after hatching and Oregon spotted frog larvae in 90-130 days. After metamorphosis, young-of-year may remain in the same habitat or emigrate as pools dry.	Occur in more varied habitats than other life stages but usually in or near water. In addition to use of breeding and larval rearing habitats, may be found in areas with taller emergent vegetation, especially where inter-mixed with wetland shrubs; in aquatic vegetation beds, and on fringes of deeper permanent water bodies. May bask for long periods or hide in dense vegetation. Both species may migrate long distances seasonally, but may be relatively sedentary in summer. Overwintering habitats include springs, streams, lakes, ponds, and shallow marshes that do not freeze completely.

¹ Sources: Watson et al. 2003; Reaser and Pilliod 2005; Pearl and Hayes 2005; Pearl et al. 2007; Pearl et al. 2009; Popescu et al. 2013.

2.3.3 Western Toad

Western toad presumably occurs at Ross Lake, based on a few images of post-metamorphic individuals from City Light biologists and publically posted and verified images on iNaturalist, and also occurs at sites in Big Beaver Valley (Holmes and Glesne 1997). The species has also been detected anecdotally elsewhere in the Project Area over the last 20 years. Western toad breeding habitats are diverse, including seasonal to permanent ponds, small to large lakes, low gradient streams, side channels and backwaters of large rivers, rain pools, and various anthropogenic habitats such as ditches, tire ruts, and stock ponds (COSEWIC 2002, Jones et al. 2005, Muths and Nanjappa 2005). Common features of these habitats are still- or very slowly flowing water, shallow edges, prolonged sun exposure, and water levels that do not rapidly fluctuate. On lakes and ponds surrounded by forests, north and east shores are typically favored because of longer sun exposure. Breeding habitats may contain submerged aquatic vegetation or lack vegetation entirely (Hawkes and Tuttle 2013). Barren sites far from hiding cover (e.g., dense vegetation, small mammal burrows, or rock slides) may not be suitable (Rombough 2012). Western toads often breed in successive years at the same sites, but may also quickly exploit newly constructed ponds (Pearl

and Bowerman 2006). Eggs are laid at sites where water temperatures are relatively warm and generally later than sympatric ranid frogs (Rombough 2012), with seasonal timing affected by latitude, elevation, and local conditions. For example, at lowland, stream-associated sites, breeding may be delayed until after springtime flows subside, but occur soon after spring thaw at some high elevation sites. As summarized by Muths and Nanjappa (2005): (1) egg laying is often communal; (2) depending on temperature, hatching occurs in 3-12 days; (3) the tadpoles, which exhibit distinctive schooling behavior, develop rapidly (30-45 days); and (4) the transformed toads often aggregate on the shores of the natal site before emigrating en masse. Western toads are largely terrestrial after metamorphosis.

2.4 Project Operations and Effects on Resources

It is unknown whether suitable habitats for either spotted frog species occur in the study area. However, if spotted frogs or western toads occur, depending on the location, operational changes in water level could strand or deeply flood egg masses, or strand larvae, depending on life history timing. Other potential Project-related effects include recreational activity at Project recreation facilities, vegetation management and routine O&M on the transmission line access roads if adjacent to breeding habitats.

2.5 Study Area

This study will occur within the Project Boundary with emphasis on locations where suitable habitat and potential Project effects may intersect (Figure 2.5-1). This may include areas on the fringes of the Project reservoirs (including depressions in drawdown zones and littoral zones), Project recreation facilities (as defined in the Recreation Use and Facility Assessment study), areas adjacent to Project facilities and study roads, within the transmission line right-of-way (ROW), wetlands affected by ongoing Project operations, and wetlands hydrologically connected to the Skagit River between Diablo Powerhouse and the Sauk River confluence. The wildlife mitigation lands are not included in the study area because no Project effects occur in these areas; in addition, previous surveys completed by City Light in 2011-2012 covered wetlands on the properties and found only one ranid species – northern red-legged frog. Field reconnaissance and survey locations will be determined based on the occurrence of suitable habitat, intersection with potential Project effects, and logistical constraints (e.g., safely accessible and permitted by the landowner, if located on private lands).

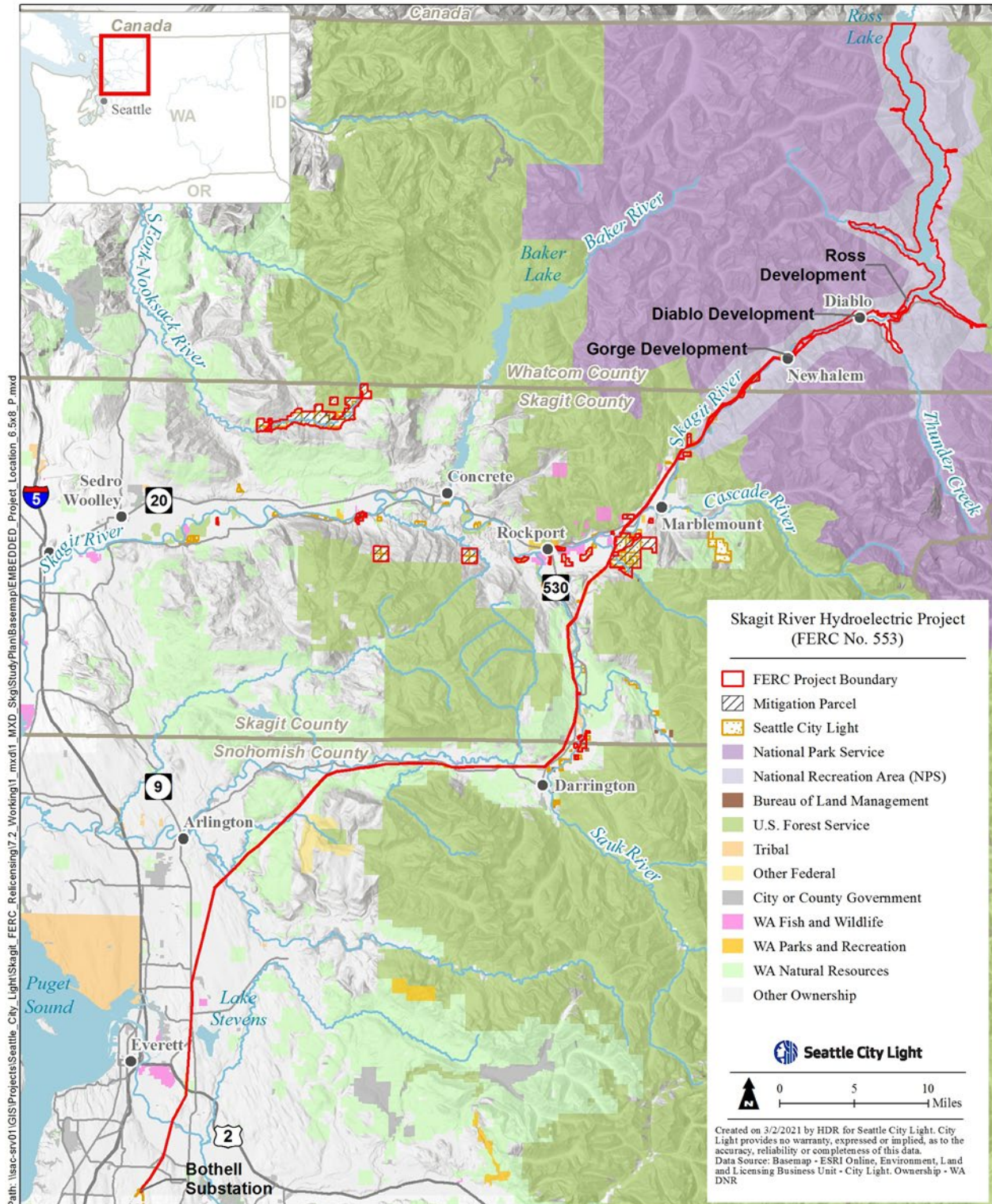


Figure 2.5-1. Location map of the Skagit River Project.

2.6 Methodology

The Special-status Amphibian Study will be performed in the following steps. Field data will be subject to quality assurance/quality control procedures, including spot-checks of transcription and comparison of Geographic Information System (GIS) maps with field notes to verify locations.

2.6.1 Identify and Map Potentially Suitable Habitat

Potentially suitable habitat for special-status amphibians will be identified and mapped within the Project Boundary beginning with a desktop GIS analysis of vegetation mapping and LiDAR, and historical reservoir pool level data. This analysis will use existing, publicly available information, including aerial imagery, vegetation data from the NPS, National Wetlands Inventory (NWI) maps, and soil survey maps, as well as information collected by the Vegetation Mapping and Wetlands Assessment studies to be performed in 2020. Mapping will include potentially suitable breeding habitats for the spotted frog species, for which mapping criteria are available, and more generally for western toad, for which mapping criteria are not as well defined and include characteristics and features that may not be detectable by remote source data. Around the Project reservoirs mapping will identify habitats that might support western toad breeding associated with broad, gradually sloped areas and depressions that hold water when reservoirs levels are below normal maximum water surface elevation. For other areas within the Project Boundary, including along the transmission line, mapping will note stream and wetland types that might be used by western toad. The purpose of the resulting maps is to guide the next steps of the study, beginning with field reconnaissance, and does not represent a final product of the study.

Work products of this step of the study will include GIS maps of wetlands with potentially suitable amphibian habitats indicated.

2.6.2 Reconnaissance and Incidental Observations

A field reconnaissance will be performed in areas where additional information is needed to verify habitat suitability. Field reconnaissance differs from formal surveys as it allows for a relatively quick assessment of site conditions and logistical considerations, prioritization of areas for sampling, and initial species observations. For example, field reconnaissance on a warm summer day may be more likely to document frogs than a spring egg mass survey. Field reconnaissance also provides an opportunity to detect tadpoles of various species because this life stage may be present at a site for a longer period than other stages. Western toad is later breeding than other species and has other features (see Section 2.3 of this study plan) that complicate survey timing and design, particularly at large sites, and may be as readily detected by reconnaissance (e.g., observations of schooling tadpoles) as by a survey.

Incidental observations of spotted frogs and other amphibians recorded during the Wetlands Assessment and other studies during the relicensing will also be catalogued and mapped by location, and summarized in the study report.

Work products of this step of the study will include GIS maps indicating areas that were examined during field reconnaissance and locations of amphibian observations, field photographs of amphibians and habitats, summary notes regarding site conditions and habitat suitability, and site conclusions regarding the need for any formal amphibian surveys and site-specific survey

methods. Prior to designating specific survey sites, maps and summary findings of field reconnaissance will be presented to the Terrestrial Resources and Reservoir Erosion Work Group (TRREWG) for review and discussion.

2.6.3 Amphibian Surveys

Suitable habitats or, if extensive, a representative sub-set of total habitat, will be sampled as needed to determine species occurrence, identify the target species, and to collect additional information on life history habitat use and relative abundance. All amphibians found during surveys, as well as incidental detections during other studies, will be recorded, along with location information. Although field methods are focused on the two spotted frog species, they are generally applicable to other species that may occur. Because western toad egg-laying within the Project reservoirs would be difficult to predict by time or location, surveys will emphasize detection of tadpoles, as well as opportunistic sightings during field reconnaissance and survey. As described in Section 2.6.4 of this study plan, documentation will include photographic vouchers if possible, as well as photographs of habitat. Field surveys will be conducted in appropriate seasons for the target species and under suitable temperature and weather conditions that allow for observations. Surveys on warm (20-30°C), sunny or partial sunny days with minimal wind generally provide the best opportunity to observe post-metamorphic spotted frogs of either species. Similarly surveys for egg masses will not be performed under conditions that obscure detections, such as heavy rain and wind. Multiple survey visits will be performed as needed to account for seasonal differences in detection and to describe timing of major life history events. It is anticipated that surveys will include two visits in summer (e.g., June and July) for detection of larvae, adults, and juveniles. Sites accessible earlier in the season when egg-laying may occur (i.e., late April or early May), may also be surveyed at that time. If surveys at a site do not detect spotted frogs, but the results are inconclusive (e.g., survey timing was compromised or there were possible sightings that could not be verified), additional visits may be conducted later in the season or a second year of surveys at the site (up to two visits) may be warranted. Visits may include the field reconnaissance or visits during the Wetland Assessment study if these visits provide sufficient information to meet the study objectives. In addition, a subsequent survey will not be performed if the first site visit indicates the site is not suitable.

Survey methods will include visual encounter surveys (VES) and dip-netting and may be supplemented by use of aquatic funnel traps for sampling larvae (Graeter et al. 2013). This approach is generally consistent with the presence survey methods described for Oregon spotted frog by Pearl et al. (2010) and for both species by Rombough (2012), and should be well suited for surveys at Ross Lake, where access during the period when egg-laying may occur is likely to be difficult to impossible. These sources recommend survey timing based on the length of time and ease with which each life stage is likely to be detected, especially in areas not previously surveyed. For spotted frogs, at least in the higher elevation and interior regions the sources discuss, adult and juvenile stage frogs are most easily detected and for a longer period; followed by larval stages, which may be localized, but can be detected for three months or more; and egg masses are most difficult to detect because they may be present at some sites for only two to four weeks, a period sometimes difficult to predict, and may be concentrated in one or just a few locations. Pearl et al. (2010) recommend two or more summer surveys and, if Oregon spotted frog is not detected in suitable habitat, one or more surveys the following year. VES will be performed in suitable habitats following procedures for Northwestern habitats and species by Olson et al. (1997).

Generally, a VES for amphibians provides data on the number of egg masses, larvae, and post-metamorphic stages (juveniles and adults) of each species observed *in situ* or captured by dip-net by searching for a prescribed period of time. Areas with limited habitat will be searched completely, whereas large areas of contiguous suitable habitat may require sub-sampling of representative habitat types (e.g., by depth and dominant vegetation) and geographic sub-division. Data may also be represented as the number found per unit time to allow comparison of sites.

In addition to visual detection, amphibians will be documented by auditory means. The three special-status species are not typically detected by calls: male western toads do not call and the spotted frog species have relatively weak calls that do not carry long distances and are generally not produced over a long period. However, Pacific chorus frog (*Pseudacris regilla*) and the non-native American bullfrog and green frog (*Lithobates clamitans*) have calls that can be heard at longer distances and over longer periods, aiding detection. Juvenile American bullfrogs also produce a high pitched “squawk” or “chirp” and leap into the water when alarmed, a behavior that can be elicited by walking along the shoreline of a site.

Because amphibian larvae are often under-detected by visual searches in dark, clouded, or vegetation-filled water, surveys for sampling larvae usually include rigorous dip-netting and may be supplemented by use of aquatic funnel traps. Aquatic funnel traps are an adjunct to active searches and can increase the number of sites that can be surveyed effectively, including surveying deeper water where dip-netting is ineffective. Trapping also sometimes reveals species or life stages (e.g., large larvae) that may escape detection by other means. Traps will be deployed in the afternoon or early evening, situated in a variety of suitable microhabitats, and secured to vegetation or sticks as needed to maintain an air pocket in the trap (a precaution to prevent mortality). After a night in place, traps will be pulled and the contents tabulated and released. Trapping for shorter periods during the day can also be effective for sampling spotted frog larvae and may be used at some locations instead of overnight trapping. Decisions regarding use of traps will be based on a determination that trapping could provide substantially more information on amphibian use of a site or do so more efficiently than other means.

In the event that spotted frog life stages are not found at sites associated with Project reservoirs with suitable breeding habitat, these sites or a representative sub-sample of these sites will be sampled for the presence of Columbia spotted frog and Oregon spotted frog eDNA. At each qualifying site, three replicate 1-liter water samples will be collected. Each sample will pass through filter membranes and will be analyzed for eDNA by a qualified genetics laboratory.

If surveys for Oregon spotted frog are warranted in lowland sites (e.g., associated with the transmission line), surveys will follow the WDFW (undated) “Survey Protocol for Detecting Presence of Oregon Spotted Frogs by Identifying Oviposition Sites.” This is the recommended method for Oregon spotted frog surveys of lowland, western Washington watersheds known or suspected to be occupied by the species, and the higher elevation known populations at Conboy Lake and Trout Lake. This methodology offers ease of use, can be performed with little or no handling and low risk of adversely affecting the species or its habitat. Results provide information on presence and an estimate of adult population size. Presence of Oregon spotted frog may be detected with a single, well-timed survey or may require multiple surveys. This protocol relies on

information that is shared among the Washington Oregon Spotted Frog Working Group³ to help determine when surveys should begin in an area. For example, Oregon spotted frog breeding typically begins at the earliest sites in western Whatcom County within about two to three weeks after the start of breeding in Thurston County, while other sites in Whatcom County may begin more than a week later. Over a nine-year period, the earliest recorded breeding in western Whatcom County occurred on February 26 or 27 (2015, 2016), March 4-6 (2012, 2020), March 11-13 (2013, 2014, 2017, 2018), and March 17 (2019). Pre-survey monitoring is frequently used to further “fine-tune” survey timing, including collection of water temperature data and observations of initial frog activity (e.g., detections of male Oregon spotted frogs gathering at breeding sites). Data to be recorded during amphibian surveys will include macrohabitat type description, survey method(s), weather (current and within past 24 hours), air temperature (start and end), water temperatures, and distance, area or percentage of site searched, as applicable. Search paths will be recorded as Tracks by a handheld consumer-grade GPS unit. Habitat data will include primary substrate, dominant vegetation, emergent vegetation cover (percentage), water color and turbidity (qualitative). Aquatic funnel trap data will be recorded by individual trap, including geographic coordinates, water depth, and trap contents.

Work products of this step of the study will include GIS maps indicating locations and results of amphibian surveys (i.e., survey locations, dates, and times, survey effort, locations and numbers of amphibian observations by species and life stage), field photographs of amphibians and habitats, and related field notes.

2.6.4 Identification and Handling of Amphibians

Amphibians will be identified in the field based on information contained in Jones et al. (2006), Altig et al. (undated), Rombough (2012), and authoritative on-line sources (e.g., <https://whatfrogs.wordpress.com>), as well as personal experience of the lead investigator. Identification of ranid tadpoles includes reference to labial tooth row formulae and other technical differences which may vary according to stages of development. To provide for vouchered identification and enumeration, samples of tadpoles will be photographed in a glass bowl or tray, including a view from above along with a ruler, from below, and from the side. Representative and unusual specimens of adult or juvenile amphibians (e.g., frogs displaying characters that may indicate hybrid forms) will also be photographed.

In practice, spotted frogs are typically field identified by differences in geographic range of the two spotted frog species, which are not known to overlap or be in contact, not by differences in morphology, coloration, or behavior. If Oregon spotted frog surveys are warranted at lowland sites outside of the range of Columbia spotted frog, photographs of ranid egg mass clusters are considered definitive evidence of Oregon spotted frog, especially if tracked to hatching (WDFW undated) (Oregon spotted frog is the only ranid species in lowland western Washington that lays eggs communally). An experienced surveyor will also be able to differentiate Oregon spotted frog egg masses from egg masses of the northern red-legged frog, the only similar egg masses at lowland sites. Because any finding of Oregon spotted frog would represent a “new” population, a

³ The Washington Oregon Spotted Working Group (or Work Group) is an informal information exchange and species recovery network organized and facilitated by USFWS (Teal Waterstrat) and WDFW (Lisa Hallock). Group members represent public agencies, non-governmental organizations, landowners, and researchers who work with Oregon spotted frog in Washington and British Columbia.

genetic sample (e.g., embryos from an egg mass) would be collected in coordination with WDFW and USFWS through the Washington Oregon Spotted Frog Working Group.

Green et al. (1997) state that Columbia spotted frog and Oregon spotted frog are morphologically indistinct. However, Hayes (1994) indicated that Oregon spotted frogs are characterized by mottling on at least some part of the ventral abdomen, whereas Columbia spotted frogs lack this mottling. The extent of mottling, which is not retained in preserved specimens, may vary individually, but generally increases with age; and may be faint in frogs under stress. The efficacy of this characteristic to differentiate the species in the field throughout Washington has not been tested. Amphibian field guides also do not provide distinguishing characteristics to separate the species. To address identification issues in areas within the range of Columbia spotted frog, ranid frogs that are found during the study will, when possible, be documented with photographic vouchers that include dorsal, ventral, and lateral views. For spotted frogs (adults, juveniles or young-of-the-year) found at sites associated with the Project reservoirs, the surveyors will also take a skin swab sample for DNA analysis.

Similarly, tissue samples will be collected from tadpoles (i.e., the tip of the tail removed with sterile dissecting scissors) and from egg masses (i.e., a small number of individual embryos removed from the egg mass jelly). These tissue samples or skin swabs will be collected in separate, labeled, sterile vials when spotted frog life stages are found and will be preserved for genetic analyses. Samples will be provided to a laboratory recommended by WDFW that is qualified to make identifications. If embryos are collected for genetic analysis, the number of embryos will include no more than five per egg mass.

The following protocols will apply to documenting survey results and incidental sightings, including proper handling of amphibians. Prior to possible capture and handling of amphibians, the surveyors' hands should be cleaned of any chemicals (e.g., insect repellent, perfumes, lotions, etc.) or residue of a previous amphibian capture, and rinsed with water, and must be kept moist during handling. Tadpoles are delicate and will be handled as little as possible (e.g., tadpoles captured by dip-net can typically be viewed within the net or a smaller aquarium net and transferred directly to a water-filled glass tray or clean zip-lock plastic bag).

Where possible, observations will be supported by photographs of the animal *in situ*. Oregon spotted frog and Columbia spotted frog are remarkably tolerant of a gradual, close approach for photographing and capture. A well-practiced surveyor will slowly approach and capture the frog by hand or dip-net (depending on the size of the frog, water depth, skill of the surveyor, etc.). Captured frogs may be temporarily held (ideally for 30 minutes or less) in separate, clean containers (e.g., zip-lock plastic bags) through which initial photographs may be taken. When handled for photographs, spotted frogs will be held gently, but securely around or slightly below the "waist" with the legs outstretched on the palm, so that the frog cannot kick or twist itself free and (for large frogs) using the other hand to support the upper part of the frog. Frogs will be photographed from multiple views.

For frogs being sampled for DNA, the surveyor will use a new pair of disposable gloves when handling frogs. Frogs will be swabbed 30 times on the underside with a sterile cotton swab to dislodge skin cells. Swabs will be air-dried and placed within individual, labeled, pre-sterilized

vials. Frogs will then be released at the original capture location. Samples will be held in a dark, cool place (e.g., a cooler) until analysis.

To enable reliable reporting of incidental sightings of amphibians by other field crews, an incidental field form and identification aids for all species will be provided. Procedures will also be specified for recording geographic coordinates, vouchering sightings with photographs, and regularly reporting sightings to the Special-status Amphibian study lead. All reported incidental sightings will be evaluated for accuracy by the study lead.

Prior to initiating field surveys, the lead investigator will obtain a NPS, USFWS, and Washington State Scientific Collection Permit (as required), which will also list other survey participants, and all of the surveyors will adhere to the guidelines stipulated in the permit. Qualifications will include prior amphibian survey experience, familiarity with the target species and other amphibian species that may occur, and identification of species by life stage. Field activities will adhere to accepted field-gear cleaning and disinfection procedures to prevent the spread of amphibian pathogens (e.g., Murray et al. 2011). Traps, dip-nets, boots, waders, and other field gear will be cleaned and disinfected prior to each field period. All gear will be cleaned and then treated prior to field use either with quaternary ammonium (Quat-128) disinfection solution or freshly-prepared 10 percent bleach. Gear used at multiple sites during a day will be cleaned and disinfected between sites unless the sites are associated with the same water body (e.g., the same reservoir or the same stream system). Specimens will be released alive at collection sites immediately after data collection, except for any embryos collected for genetic analyses.

Study products for this study include:

- A report summarizing results of the study including:
 - Narrative description of field reconnaissance and survey areas and relevant habitat characteristics; and
 - Survey effort, timing, weather conditions, and species documented.
- GIS maps of wetlands with the following indicated:
 - Wetland and stream classification categories;
 - Areas examined during field reconnaissance for potentially suitable amphibian habitats;
 - Locations of amphibian observations; and
 - Locations and results of amphibian surveys.
- Photographs of amphibians and habitats;
- Summary notes regarding site condition and habitat suitability assessments; and
- A list of incidental observations of wildlife.

2.7 Consistency with Generally Accepted Scientific Practice

The study approach described above is consistent with methods commonly employed for inventory surveys of amphibians and comparable to approaches adopted in other FERC relicensings, including the Baker River Hydroelectric Project (FERC No. 2150) and Henry M. Jackson Hydroelectric Project (FERC No. 2157), and methods for Oregon spotted frog surveys used during licensing of the proposed Calligan Creek Hydroelectric Project (FERC No. 13948) and Sunset Fish Passage and Energy Project (FERC No. 14295). The study also includes survey methods that are commonly used for scientific studies of Oregon spotted frog and Columbia spotted frog.

2.8 Schedule

- Desktop Analysis (Identify and map potentially suitable habitat) – Summer 2020 (coordinated with Wetland Assessment)
- Field Reconnaissance – Summer 2020 (coordinated with Wetland Assessment)
- Field Surveys (Oregon spotted frog egg mass surveys, where warranted) – March to April 2021
- Field Surveys (reservoir sites and any associated sites) – April to July 2021
- Analysis – September to December 2021
- Final Report (Initial Study Report [ISR]) – March 2022

2.9 Level of Effort and Cost

The initial estimate for implementation and reporting associated with this study is approximately \$125,000; the final cost will depend on the number of sites surveyed.

3.0 REFERENCES

- Altig, R., R.W. McDiarmid, K.A. Nichols, and P.C. Ustach. Undated. Tadpoles of the United States and Canada: a tutorial and key. [Online] URL: <http://www.pwrc.usgs.gov/tadpole/>.
- Bohannon, J.S., D.R. Gay, M.P. Hayes, C.D. Danilson, and K.I. Warheit. 2016. Discovery of the Oregon Spotted Frog in the Northern Puget Sound Basin, Washington State. *Northwest Naturalist*. 97:82-97.
- COSEWIC. 2002. COSEWIC assessment and status report on the western toad *Bufo boreas* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. 31 pp.
- Dvornich, K.M., K.R. McAllister, and K.B. Aubry. 1997. Amphibians and reptiles of Washington State: Location data and predicted distributions, Volume 2 in Washington State Gap Analysis - Final Report, (K.M. Cassidy, C.E. Grue, M.R. Smith, and K.M. Dvornich, editors), Washington Cooperative Fish and Wildlife Research Unit, University of Washington, Seattle, 146 pp.
- Graeter, G.J., K.A. Buhlmann, L.K. Wilkinson, and J.W. Gibbons (Editors). 2013. Inventory and Monitoring: Recommended Techniques for Reptiles and Amphibians. Partners in Amphibian and Reptile Conservation Technical Publication IM-1, Birmingham, Alabama.
- Green, D.M., H. Kaiser, T.F. Sharbel, J. Kearsley, and K.R. McAllister. 1997. Cryptic species of spotted frogs, *Rana pretiosa* complex, in western North America. *Copeia* 1997:1-8.
- Hallock, L. 2013. Draft State of Washington Oregon Spotted Frog Recovery Plan. Washington State Department of Fish and Wildlife, Olympia. 93+ v pp.
- Hawkes, V.C. and K.N. Tuttle. 2013. CLBMON-37. Kinbasket and Arrow Lakes Reservoirs: Amphibian and Reptile Life History and Habitat Use Assessment. Year 5 Annual Report – 2012. LGL Report EA3303. Unpublished report by LGL Limited Environmental Research Associates, Sidney, BC, for BC Hydro Generations, Water License Requirements, Burnaby, BC. 67 pp, and appendices.
- Hayes, M.P. 1994. The spotted frog in western Oregon. Oregon Department of Fish and Wildlife Technical Report #94-1-01.
- Holmes R.E. and R.S. Glesne. 1997. NOCA NRPP Amphibian Inventory Big Beaver Watershed 1996 – Progress Report. North Cascades National Park, Sedro-Woolley, WA.
- _____. 2000. Status report: Species identification and genetic differentiation among ranid frog populations in the Skagit River watershed, North Cascades National Park. November 6, 2000.
- Jones, L.L.C., W.P. Leonard, and D.H. Olson (Editors). 2006. Amphibians of the Pacific Northwest. Seattle Audubon Society, Seattle, WA. 227 pp.
- Murray, K., L. Skerratt, G. Marantelli, L. Berger, D. Hunter, M. Mahony, and H. Hines. 2011. Hygiene protocols for the control of diseases in Australian frogs. A report for the Australian Government Department of Sustainability, Environment, Water, Population and Communities.

- Muths, E. and P. Nanjappa. 2005. *Bufo boreas* Baird and Girard 1852(b), Western toad. Pp. 392-396. In: Lannoo, M. (Editor). Amphibian Declines: The Conservation Status of United States Species. University of California Press, June 2005.
- Nordstrom, N. and R. Milner. 1997a. Columbia Spotted Frog. Pp. 4-1-14. In E. M. Larsen (Editor). Management recommendations for Washington's Priority Species, Vol. III: Amphibians and Reptiles. Washington Department Fish and Wildlife, Olympia. Available at: <https://wdfw.wa.gov/sites/default/files/publications/00025/wdfw00025.pdf>.
- _____. 1997b. Oregon Spotted Frog. Pp. 6-1-12 in E. M. Larsen (Editor). Management recommendations for Washington's Priority Species, Vol. III: Amphibians and Reptiles. Washington Department Fish and Wildlife, Olympia. [Online] URL: <https://wdfw.wa.gov/sites/default/files/publications/00025/wdfw00025.pdf>.
- Olson, D.H., W.P. Leonard, and R.B. Bury (Editors). 1997. Sampling amphibians in lentic habitats. Society for Northwestern Vertebrate Biology, Northwest Fauna (4).
- Ovaska, K., L. Sopuck, and C. Engelstoft. 2019. Clarifying distributions of four species of *Rana* in southwestern British Columbia using eDNA methods. Final Report, 2016-2018. Habitat Conservation Trust Foundation.
- Pearl, C.A., M.J. Adams, and N. Leuthold. 2009. Breeding habitat and local population size of the Oregon Spotted Frog (*Rana pretiosa*) in Oregon. Northwest Naturalist 90:136-147.
- Pearl, C.A., M.J. Adams, and W.H. Wentz. 2007. Characteristics of Columbia spotted frog (*Rana luteiventris*) oviposition sites in northeastern Oregon, USA. Western North American Naturalist 67:86-91.
- Pearl, C.A. and J. Bowerman. 2006. Observations of rapid colonization of constructed ponds by western toads (*Bufo boreas*) in Oregon, USA. Western North American Naturalist 66: No. 3, Article 14. [Online] URL: <https://scholarsarchive.byu.edu/wnan/vol66/iss3/14>.
- Pearl, C.A., D. Clayton, and L. Turner. 2010. Surveys for presence of Oregon spotted frog (*Rana pretiosa*): background information and field methods. Interagency Special Status/Sensitive Species Program. US Forest Service, Forest and Rangeland Ecosystem Science Center, Washington DC. 48 pp. [Online] URL: <https://pubs.er.usgs.gov/publication/70004673>.
- Pearl, C.A. and M.P. Hayes. 2004. Habitat Assessment of the Oregon Spotted Frog (*Rana pretiosa*): A literature review. Unpublished report prepared for Washington State Department of Transportation, Environmental Affairs, Olympia. 43 pp.
- _____. 2005. *Rana pretiosa* Baird and Girard, 1953c. Oregon spotted frog. Pp. 577-580. In: Lannoo, M. (Editor). Amphibian Declines: The Conservation Status of United States Species. University of California Press, June 2005.
- Pilliod, D.S., C.R. Peterson, and P.I. Ritson. 2001. Seasonal migration of Columbia spotted frogs (*Rana luteiventris*) among complementary resources in a high mountain basin. Canadian Journal of Zoology 80:1849-1862.
- Popescu, V.D., A.M. Kissel, M. Pearson, W.J. Palen, P. Govindarajulu, and C.A. Bishop. 2013. Defining conservation-relevant habitat selection by the highly imperiled Oregon Spotted Frog, *Rana pretiosa*. Herpetological Conservation and Biology 8:688-706.

- Reaser, J.K. and D.S. Pilliod. 2005. *Rana luteiventris* Thomson, 1913. Columbia spotted frog. Pp. 559-563. In: Lannoo, M. (Editor). Amphibian Declines: The Conservation Status of United States Species. University of California Press, June 2005.
- Rombough, C. 2012. Instructional manual and frog survey protocols for Region 1 National Wildlife Refuges, East-side Zone (Great Basin and Great Northern LCCs). Report to the US Fish and Wildlife Service, Region 1 Inventory and Monitoring Program, Vancouver, Washington.
- 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.
- Tressler, R. 2020. Personal communication between Ron Tressler, Seattle City Light, and Susan Imholt, HDR, Inc. January 27, 2020.
- Washington Department of Fish and Wildlife. Undated. Survey protocol for detecting presence of Oregon spotted frogs by identifying oviposition sites.
- _____. 2015. Species of Greatest Conservation Need. Chapter 3 pp. 3-1-3:50, In: 2015 State Wildlife Action Plan.
- Watson, J.W., K.R. McAllister, and D.J. Pierce. 2003. Home ranges, movements, and habitat selection of Oregon spotted frogs (*Rana pretiosa*). Journal of Herpetology 37:292-300.

SPECIAL-STATUS AMPHIBIAN REVISED STUDY PLAN

ATTACHMENT A

**CITY LIGHT RESPONSES TO LP COMMENTS ON THE STUDY PLAN
PRIOR TO PSP**

Table 1. City Light responses to LP comments on the study plan prior to PSP.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
1.	Brock Applegate (WDFW)	05/10/2020	Section 1.2 Relicensing Process	1 st paragraph - Delete: effort Add: consultation	Change made in different location of sentence and paragraph. Text modified to include discussion and consultation.
2.	Ashley Rawhouser (NPS)	5/13/2020	Section 1.3 Study Plan Development	<p>As previously discussed throughout the collaborative process, NPS requests that habitat assessments and surveys be conducted for all amphibian species that could be affected by fluctuating reservoir levels, dewatering of the Bypass Reach, ramping in Skagit River, the floodplain and channel migration corridor of the Skagit River, and all roads and infrastructure associated with the Skagit Hydroproject including powerline corridors. These species should include those with a with a range that overlaps or is adjacent with the project boundary and the area inundated in BC by Ross Reservoir including those portions of the Skagit River that are influenced by reservoir elevations. Given SCLs desire for a 50 year license identifying potential range expansions of non-native species near the project boundary and changes in habitat use and range shifts of native species will be important for developing and implementing PME's. Not only will it be important to understand competition and predation between native and non-native species but also competition and predation among native species. We will also need to understand if the reservoirs and power line corridors are impacting connectivity for amphibian species and if these areas are functioning as a sink for the populations that occur near the project.</p> <p>These species should include: Ambystoma gracile Northwestern salamander Ambystoma macrodactylum Long-toed salamander Ascaphus truei Tailed frog Anaxyrus boreas Western toad Dicamptodon tenebrosus Pacific/Coastal giant</p>	The goal of the proposed study is to identify areas of potentially suitable breeding habitat for the special-status amphibians and provide information useful for assessing ongoing Project effects to those species. City Light does not believe there is justification for long-term ecological studies requested by the NPS given the lack of demonstrated Project effects. The requested far-reaching inventory of all amphibian species that may occur, regardless of conservation status or life history habitat association is unwarranted for hypothesized effects. However, surveys will document all amphibian species observed so there will be additional data for species that are not special-status. The amphibian study in combination with five other studies – Vegetation Mapping, Wetland Assessment, Reservoir Shoreline Erosion, Reservoir Fish Stranding and Trapping Risk Assessment, and Erosion and Geologic Hazards at Project Facilities and Transmission Line Right-Of-Way studies – will be used to characterize habitat conditions for amphibian species in the FERC Project Boundary as well as Skagit River floodplain wetlands downriver to the Sauk River and be used to assess effects in the DLA and develop appropriate protection, mitigation, and enhancement (PME) measures and best management practices (BMP). Future BMPs could include additional assessments where

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				<p>salamander Plethodon veniculum Western red-backed salamander Pseudacris regilla Pacific (Chorus) tree frog Rana aurora Red-legged frog Rana cascadae Cascade frog Rana pretiosa Oregon Spotted frog Rana luteiventris Columbia spotted frog Taricha granulosa Rough-skinned newt Ensatina eschscholzii Ensatina Rana catesbeiana Bull frog (introduced) Rana clamitans Green Frog (introduced)</p> <p>We agree with SCL and WDFW that <i>[Note: NPS comment ends here.]</i></p>	<p>proposed ground disturbing activities overlap important amphibian habitats.</p> <p>While areas north of the international border are outside of FERC or other U.S. agencies jurisdiction, City Light has already gathered existing reports on amphibians for the Skagit Valley Provincial Park to provide additional context. City Light cannot conduct field data collection in Canada but will explore options to obtain select information on wetlands and amphibians north of the international border through coordination with the Skagit Environmental Endowment Commission (SEEC) and BC Parks.</p> <p>The Project has existed for many decades and many amphibian species are persisting throughout the watershed. For example, a genetic study of tailed frogs in streams along and below Project dams by Grummer and Leache (2017) concluded that "...population connectivity is high throughout the North Cascades National Park Service Complex." City Light believes that the combination of studies will provide adequate information on the location of habitat for special-status amphibian species and habitat conditions for wetlands, shorelines, stream crossings along the transmission line and other sites in the Project Boundary for assessing effects of continued operation of the Project and to develop PMEs and BMPs. City Light would appreciate receiving any specific documentation of Project effects on amphibians that might be helpful for this study and analysis.</p>

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
3.	Emily Wirtz (Sauk-Suiattle Indian Tribe)	04/28/2020	Section 1.2 Relicensing Process	Why is the font different on this line?	SharePoint sometimes displays different fonts when viewing in browser. Recommend viewing in app.
4.	Brock Applegate (WDFW)	05/10/2020	Section 1.3 Study Plan Development	<p>1st paragraph – Add: and Project effects area. Add: due to the fluctuation of the reservoir and the spread of the very invasive reed canarygrass and may allow fish access to Big Beaver Wetland.</p> <p>New comment provided on 06/23/2020: Reservoir tributary back flow, wind, or beavers can spread reed canarygrass up the Big Beaver Creek. In addition, the back up of tributary water has allowed fish passage into Big Beaver Creek and the wetlands. Although SCL has noted that reports of Cutthroats and spotted frogs have lived together twenty years ago, red-side shiners have increased the size of the fish in the reservoir. Bigger resident trout and bull trout may cause additional mortality of all life stages of spotted frog, with an additional degradation of habitat by reed canarygrass.</p>	<p>Thank you for the comment. First edit accepted.</p> <p>City Light does not agree that Project reservoir fluctuation has a documented effect on spread of reed canarygrass. WDFW has not provided any evidence or mechanism of how Project operations are foreseeably spreading reed canarygrass to wetlands upstream of the Project in the Big Beaver Valley.</p> <p>City Light would appreciate any information on this topic.</p> <p>Response to comment provided on 06/23/2020: Most of the wetlands within Big Beaver Valley are not adjacent to Big Beaver Creek and are not discernibly connected by channels to the creek. As such these wetlands may not be accessible to fish from Ross Lake. City Light would appreciate any evidence that fish are now more widely distributed in the wetlands in Big Beaver Valley or that these fish are causing spotted frog mortality.</p> <p>For reed canarygrass, please see response to Comment #26.</p>
5.	Brock Applegate (WDFW)	05/10/2020	Section 1.3 Study Plan Development	WDFW listed western toad as State Priority and Candidate Species for listing. WDFW recommends that SCL map breeding habitat. SCL cannot know where to apply any PME or surveys unless they have	Around the Project reservoirs preliminary mapping from wetland characterization and fish stranding risk studies will identify potentially suitable habitats for special-status amphibians. This will include habitats that

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				breeding habitat mapped, especially when SCL has survey crews on the ground, who can verify habitat.	might support western toad breeding associated with broad, gradually sloped areas and depressions that hold water when reservoir levels are below normal maximum water surface elevation (NMWSE). These areas will be subsequently examined to verify suitability and to determine locations for surveys. (See also Response to Comment #42). Occurrences of western toad life stages will be mapped, which will likely indicate specific locations of breeding habitat as well as the types of habitats that are used. The study report maps will also show the National Wetlands Inventory (NWI) wetland and stream classification categories, or the categories as further refined or corrected during the Wetland Assessment study. As explained in the study plan, there are limited predictive criteria with which to identify where western toad breeding may occur.
6.	Shauna Hee (USFS)	05/10/2020	Section 1.3 Study Plan Development	<p>Target amphibian frog species - not much available information that would suggest they may have been common in project area, but given that there has not been comprehensive studies, this proposal may be advantageous to better define habitat use.</p> <p>While other amphibians would be tallied, added attention might be targeted to invasives such as the bullfrog which is predator of the focus frog species during different life stages.</p>	<p>The study and incidental sightings will document any amphibian detected by survey or incidentally, including American bullfrog.</p> <p>Separate from the relicensing studies and due to the concern of American bullfrog range expansion, City Light is initiating annual periodic monitoring of wetlands on its fish and wildlife mitigation lands, which may include visual/auditory surveys, the use of AudioMoths, and soliciting sightings from the public. AudioMoths, electronic, programmable acoustic monitoring devices (Hill et al. 2018, 2019), will be deployed at selected sites. This methodology will allow for prolonged periods of monitoring male</p>

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					territorial advertisement calls at sites where American bullfrog presence is suspected or where there is concern for invasion from adjacent areas outside of the Project Boundary. (Hill, A.P., P. Prince, E.P. Covarrubias, C.P Donaster, J.L. Snaddon, and A. Rogers. 2018. AudioMoth: evaluation of a smart open acoustic device for monitoring biodiversity and the environment. <i>Methods in Ecology and Evolution</i> 9:1199-1211. < https://doi.org/10.1111/2041-210X.12955 >; Hill, A.P., P. Prince, J.L. Snaddon, C.P. Doncaster, and A. Rogers. 2019. AudioMoth: a low cost method for monitoring biodiversity and the environment. <i>HardwareX</i> 6:1-19. https://doi.org/10.1016/j.ohx.2019.e00073).
					Monitoring for non-native amphibians at mitigation lands may be included in the updated Mitigation Lands Management Plan. City Light is also willing to coordinate with NPS and other entities to initiate monitoring in other portions of the Project Boundary.
7.	Brock Applegate (WDFW)	05/10/2020	Section 2.1 Study Goals and Objectives	1 st paragraph – Add: , western toad, Add: all three of the special-status	See response to Comment #5.
8.	Ashley Rawhouser (NPS)	5/13/2020	Section 2.1 Study Goals and Objectives	This is pretty vague. Can you define what relevant info is?	Thank you for your comment. Text has been revised as follows: “collect relevant information on populations where these species are found, including numbers, life stages, habitat, and locations.”
9.	Ashley Rawhouser (NPS)	5/13/2020	Section 2.1 Study Goals and Objectives	NPS prefers that objects state a measurable/quantifiable component.	The objectives of this study are comparable to those of amphibian survey studies on other FERC project relicensings aimed at obtaining baseline information on amphibian breeding sites. These objectives are, by their nature, not

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					quantifiable. The study report will present quantitative data on acreage of potential habitats surveyed, survey effort, and number of individuals by species/life stage.
10.	Ashley Rawhouser (NPS)	5/13/2020	Section 2.1 Study Goals and Objectives	What will the scale/resolution of this mapping be conducted at.	The resolution of the preliminary map will be limited by the data sources. The final maps will reflect field observations of habitat during this study and the Wetland Assessment study, which may include habitats not detected by preliminary mapping.
11.	Brock Applegate (WDFW)	05/10/2020	Section 2.1 Study Goals and Objectives	WDFW recommends that you document breeding habitat as well.	See response to Comment #5.
12.	Brian (uploaded by Jon-Paul Shannahan) (Upper Skagit Indian Tribe)	05/05/2020	Section 2.1 Study Goals and Objectives	Prior to moving to the next objectives, the data here should be “ground-truth” with randomized sub-sample field observations of the habitat identified in the desktop exercise	As noted, field reconnaissance will be performed in coordination with the Wetland Assessment study in areas where additional information is needed to verify habitat suitability. The Wetland Assessment study also includes field data collection which would function to “ground-truth” remote sensing data. If the number of sites with potentially suitable habitat for the target species with a Project effect nexus requires sub-sampling, this may include randomization, but will also include considerations of accessibility and habitat quality, based on professional judgment. Prior to designating survey sites, maps and summary findings of field reconnaissance will be presented to the TRREWG for review and discussion.
13.	Brian (uploaded by Jon-Paul Shannahan)	05/05/2020	Section 2.1 Study Goals and Objectives	Emphasis on impacts of drawdowns (all drawdowns not just normal ones) on littoral primary/secondary productivity AND habitat should be made	Assessing primary/secondary productivity in the littoral zone is outside the scope of this study. The study area includes suitable habitat in areas on the fringes of Project reservoirs

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
	(Upper Skagit Indian Tribe)				including depressions in drawdown zones and littoral zones. Amphibian breeding habitats that are documented in this study will be assessed in the Draft License Application (DLA) for operational effects, including the effects of drawdowns.
14.	Brock Applegate (WDFW)	05/10/2020	Section 2.1 Study Goals and Objectives	Does this include western toad? If it does not, WDFW recommends that SCL should include western toad suitable breeding habitat on the map.	See response to Comment #5.
15.	Brock Applegate (WDFW)	05/10/2020	Section 2.1 Study Goals and Objectives	4 th bullet – Add: , including western toad, Add: and western toad	See response to Comment #5.
16.	Brock Applegate (WDFW)	05/10/2020	Section 2.1 Study Goals and Objectives	Does this include weed spraying and road maintenance? Both activities will need special consideration for future impacts to amphibians. SCL should consider all effects from their project operations and maintenance, including ones from roads, powerline right-of-ways, and other impacts to waterbodies. New comment provided on 06/23/2020: I appreciate the explanation on herbicide use. Can I assume that future areas of road maintenance and construction projects will include BMPs or future surveys, if the map notes suitable habitat?	Vegetation management plans and BMPs developed for the new license will address protection of amphibian habitats from herbicides effects. Note that current City Light policy is to follow the City of Seattle pesticide reduction policy which includes strict limitations on types of pesticides that can be used. For example, in 2019, City of Seattle stopped using glyphosate herbicides on its properties. Response to comment provided on 06/23/2020: City Light will use the study results to develop appropriate BMP to protect wetlands, streams, and other sensitive habitats, or other PME measures, if warranted.
17.	Brock Applegate (WDFW)	05/10/2020	Section 2.2 Resource management Goals	Hence the reason that SCL should map the habitat of Western toad, as well.	See response to Comment #5.
18.	Ashley Rawhouser	5/13/2020	Section 2.2 Resource	Jointly developing a set of management questions for the study would help to provide clarity for SCL and	Thank you. City Light appreciates the input. The intent of this section is to refer to resource

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
	(NPS)		management Goals	LPs.	agency management plans, regulations, and policies pertaining to the subject matter. City Light would appreciate receiving specific information that should be incorporated into the study plan.
19.	Brock Applegate (WDFW)	05/10/2020	Section 2.2 Resource management Goals	Last paragraph – Add: WDFW also has created management recommendations for both spotted frogs. Please see: https://wdfw.wa.gov/sites/default/files/publications/00025/wdfw00025.pdf (Nordstrom, N., and R. Milner. 1997)	Thank you. Text and references have been added.
20.	Brock Applegate (WDFW)	05/10/2020	Section 2.3.1 Columbia Spotted Frog	I would underscore the possible impact by ongoing operations and a fluctuating reservoir by the Project.	This is noted in Section 2.4 (Project Operations and Effects on Resources).
21.	Emily Wirtz (Sauk-Suiattle Indian Tribe)	04/28/2020	Section 2.3.2 Oregon Spotted Frog	Sedro-Woolley	Thank you, change made.
22.	Ashley Rawhouser (NPS)	5/13/2020	Section 2.3.2 Oregon Spotted Frog	This isn't an entirely accurate description of Ovaska's findings. While the findings were surprising and getting more data would be beneficial, the FLNRO biologist considers the findings valid. Seems like SCL is trying a bit too hard to downplay this work. However, NPS is appreciative that SCL sees the need to survey for this species.	An error in the description of the study findings has been corrected (specifically, Columbia spotted frog was detected by DNA from skin swabs, but was not detected by eDNA). The text does not in any way downplay, disparage, or portray the findings as invalid. On the contrary, City Light has included DNA analysis of spotted frogs in the Special-status Amphibian Study precisely because of the findings of Ovaska et al. (2019), which challenge previous assumptions regarding the distribution of spotted frog species in the region. Nevertheless, all good science is subject to further scrutiny, often raises as many research questions as it answers, and may be reinterpreted as new information is collected. As noted by Ovaska et al. (2019), potential contact between spotted

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					frog species raises the possibility of genetic introgression. DNA sequences used to differentiate the species might not distinguish a hybridized spotted frog from a genetically pure Oregon spotted frog.
23.	Emily Wirtz (Sauk-Suiattle Indian Tribe)	04/28/2020	Section 2.3.3 Western Toad	This seems warm for western Washington aquatic habitats. Could this be verified through another reference? I'm having a hard time finding this to be a requirement in other literature. I'm fairly certain that toads lay eggs in cooler temperatures. I will try to check the temperatures for our amphibian surveys at the reservation.	Thank you for the comment. City Light has revised the text.
24.	Brian (uploaded by Jon-Paul Shannahan) (Upper Skagit Indian Tribe)	05/05/2020	Section 2.4 Project Operations and Effects on Resources	Changes in water level could also impact littoral productivity reducing food and quality habitat availability.	See response to Comment #13. Thank you for the comment. The focus of this study is to determine where special-status amphibian species and habitat occur (primarily for egg-laying and larval life stages). As part of the DLA, the effects of reservoir water level management on special-status amphibian species will be conducted by combining results of this study with the wetland assessment and operations model. However, collecting data on littoral productivity is outside the scope of this study.
25.	Brian (uploaded by Jon-Paul Shannahan) (Upper Skagit Indian Tribe)	05/05/2020	Section 2.4 Project Operations and Effects on Resources	And associated use impacts	Effects will be assessed in the DLA using the results of this and other studies.
26.	Brock Applegate (WDFW)	05/10/2020	Section 2.5 Study Area	Big Beaver Wetland lies within the Project boundary and effects area due to spread of reed canarygrass from reservoir, up Big Beaver Creek, and throughout the wetlands. Reed canarygrass has spread from the Ross Lake source population by water, wind, or beaver, but	Big Beaver Valley is included in the FERC Project Boundary only due to the High Ross Treaty; current Project operations have no effect on the hydrology of these wetlands, which are located between about 0.85 to 2

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				<p>exists along the entire banks of the creek to the wetland. Please include Big Beaver Wetland in your study area.</p> <p>New comment provided on 06/23/2020: The degraded habitat in the lowland wetlands has mostly extirpated Oregon Spotted Frog from Skagit and Whatcom County. I am not sure how SCL can use an example of a frog population's habitat that has barely survived as an example of habitat that works well. WDFW recommends that we don't have habitat like the lowlands at Big Beaver Wetland and aim for a healthier population.</p>	<p>miles from Ross Lake and 10 to 15 ft above the NMWSE of the lake. Further, the reported presence of reed canarygrass is not evidence that conditions for Columbia spotted frog or other amphibians have been degraded. Although reed canarygrass is widespread in lowland wetlands in Washington, general effects to most species of amphibians have not been reported. Specific effects of reed canarygrass on Oregon spotted frog are generally associated with limiting availability of suitable oviposition habitat where the previous year's plant growth has not been removed by grazing or mowing, or compressed and submerged; these effects may be reduced in areas where heavy snow cover occurs. At some sites with no apparent management of reed canarygrass, suitable oviposition habitat is associated with submerged, flattened grass floating near the surface in uncharacteristically deep water.</p> <p>City Light would appreciate receiving information describing how mechanisms caused by Project operations are spreading reed canarygrass to wetlands upstream in the Big Beaver Valley, and references being used to indicate that reed canarygrass occurs along "entire banks of the creek to the wetland".</p> <p>Response to comment provided on 06/23/2020: The apparent extirpation of Oregon spotted frog in the lower Skagit River drainage is likely attributable to multiple factors, of which reed canarygrass is probably not the leading cause. Important factors include extensive loss</p>

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					<p>of wetlands to urban and agricultural development, flood control and diking, introduction of fish to lakes and ponds, and introduction of American bullfrog. The historical distribution of Oregon spotted frog in other drainages in Whatcom and Skagit County is unknown, but there is no evidence to describe the species as “mostly extirpated” in the Samish or lower South Fork Nooksack River drainages where multiple populations occur, and new discoveries of populations on private properties have occurred as recently as 2019 and 2020. The fact that populations occur on the upper Samish River, but not the lower Samish River, both areas where reed canarygrass is dominant, suggests that other factors may be more important.</p> <p>The comment also misconstrues City Light’s response regarding the effects of reed canarygrass on amphibian habitat, the points of which included that spotted frog oviposition habitat may not be substantially degraded at sites with high snow cover or where reed canarygrass occurs on the edges of deep water. These conditions may apply to wetlands in Big Beaver Valley. Regardless of these considerations, the invasive form of reed canarygrass is unquestionably an undesirable plant species compared to the species it replaces. Separate from this issue is whether Project operations are responsible for the presence or abundance of reed canarygrass in Big Beaver Valley. Given the nearly ubiquitous nature of reed canarygrass in the Pacific Northwest, a Project effects nexus is not clear.</p>

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
27.	Brian (uploaded by Jon-Paul Shannahan) (Upper Skagit Indian Tribe)	05/05/2020	Section 2.5 Study Area	Wildlife mitigation lands should be included. Management of the mitigation lands should be considered an ongoing project effect.	Wetlands on wildlife mitigation lands were surveyed for Oregon spotted frogs in 2011-2012 as part of the WDFW-led Skagit/Whatcom County systematic surveys. The mitigation lands create and maintain many wetlands used by breeding amphibians. Management of the mitigation lands already focuses on protecting amphibian habitats and the updated Management Plan for the new license will further refine those protection measures. We do not believe that additional survey is necessary at this time or that surveys of these lands should be part of the relicensing studies.
28.	Ashley Rawhouser (NPS)	5/13/2020	Section 2.3.3 Western Toad	NPS has documented large numbers of WT (toadlets) dispersing into Ross Reservoir at the mouth of Big Beaver Creek. In fact, we stopped a Boy Scout Troop from wantonly spiking and smashing 100's of them in their canoe bottoms.	Existing information on amphibian occurrences is invaluable to study plan development and implementation. City Light requests such information, including locations and dates of observations. As requested earlier, City Light would also appreciate if NPS can provide a copy of the following report, as well as any more recent information: Holmes R. E. and R. S. Glesne. 1997. NOCA NRPP Amphibian Inventory Big Beaver Watershed 1996 – Progress Report. North Cascades National Park, Sedro-Woolley, WA.
29.	Ashley Rawhouser (NPS)	5/13/2020	Section 2.5 Study Area	The study area needs to be specifically described so that there is no ambiguity for LPs.	The comment confuses “study area”, which is unambiguously described in the study plan, with the identification of specific locations where amphibian field surveys will occur, which cannot be determined at this time. Prior to designating survey sites, maps and summary findings of field reconnaissance will be presented to the TRREWG for review and discussion.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
30.	Ashley Rawhouser (NPS)	5/13/2020	Section 2.5 Study Area	NPS requests that habitat assessments and surveys be conducted for all amphibian species that could be affected by fluctuating reservoir levels, dewatering of the Bypass Reach, ramping in the Skagit River, the floodplain and channel migration corridor of the Skagit River impacted by flow attenuation due to managed flows, and all roads and infrastructure associated with the Skagit Hydroproject including powerline corridors.	See response to Comment #2.
31.	Brock Applegate (WDFW)	05/10/2020	Section 2.5 Study Area	<p>In addition, Big Beaver Wetlands has Columbia spotted frogs and the introduction of fish that may not had the ability to migrate from the reservoir to the wetland may exist. The reservoir backs up the creek and allows access over the falls to fish. Project operation and the reservoir elevation may affect access to fish that may not have access at some reservoir levels or during some times of year. New fish or new timing of fish can highly impact the frogs as fish may cause predation on all life stages of the frogs. SCL should explore the access of fish species to Big Beaver Wetland, the season of the access, and the reservoir levels, including the historic access of fish to Big Beaver Wetland.</p> <p>New comment provided on 06/23/2020: The 20 year-old report does not consider the new variable, red side shiners. Adult resident trout and bull trout can obtain bigger sizes due to the explosion of red side shiner population. Larger fish can not only access and navigate the old fish barrier at the falls at Big Beaver Creek confluence easier, they can also increase predation on all life stages of frogs because of their large size. The reservoir has caused easier access by larger fish to the wetland and degraded the wetland habitat through the spread of reed canarygrass with the source population at the reservoir. Larger fish will bring different and possibly detrimental effects to</p>	<p>Bull trout have been documented in Big Beaver Creek, however it is unclear if these fish are occupying the same habitats as amphibians. Columbia spotted frog have been documented in Big Beaver Valley in extensive beaver-dammed wetlands as recently as the 90s which indicates continued presence of the species post construction of Ross Lake. There is no documentation of an effect of bull trout predation on Columbia spotted frog in these habitats.</p> <p>Regarding the documented presence of Westslope Cutthroat Trout (WCT) in Big Beaver Creek, WDFW has provided no evidence that amphibian populations using wetlands separate from the stream channel are affected. Holmes and Glesne (1999) reported a diverse amphibian community associated with the streams and wetlands in Big Beaver Valley.</p> <p>WDFW has also not established a Project effect. Smith and Anderson (1921) reported the presence of Cutthroat Trout during a reconnaissance of the Upper Skagit in 1920, decades prior to Ross Dam construction. The authors attributed the presence of this species</p>

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				ecosystem and natural habitats upstream in Big Beaver Creek. WDFW recommends that you include Big Beaver Wetland in the study area.	<p>to intentional stocking for sport fishing. Further, the presence of this fish species in Big Beaver Valley is not necessarily attributable to Project operations. WCT are infrequently caught in Ross Lake during gillnet surveys due to their relative scarcity in the Lake. Initial eDNA analysis of Ross Lake tributaries found WCT in Big Beaver, Ruby, and Lightning creeks. The majority of Ross Lake tributaries are either closed to fishing or managed as catch-and-release. The presence of WCT in those streams and their relatively low abundance in Ross Lake suggests that the tributaries, including Big Beaver Creek, are the likely sources of WCT and not immigration from Ross Lake. WDFW manages this population of WCT with a catch-and-release fishery, which indicates that WDFW, in coordination with the NPS, is actively managing WCT to ensure their persistence in the Big Beaver Valley.</p> <p>City Light would appreciate receiving information describing how City Light's operations have contributed to amphibian predation and WCT occurring in Big Beaver Creek wetlands.</p> <p>City Light is open to discussions about potential interactions between Ross Lake and Big Beaver Valley flora and fauna.</p> <p>Response to comment provided on 06/23/2020:</p> <p>The term "Big Beaver Wetland" does not accurately represent the complex of wetlands in Big Beaver Valley, which are not uniform,</p>

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					and most are separated from Big Beaver Creek by 400-900 ft. The statement, “the reservoir has caused easier access by larger fish to the wetland and degraded the wetland habitat through the spread of reed canarygrass with the source population at the reservoir” is entirely speculative. It should also be noted that larger fish are not necessarily a greater threat to native amphibians than smaller fish and that the risk is only increased if fish are using the wetland sites where frogs occur.
32.	Ashley Rawhouser (NPS)	5/13/2020	Section 2.5 Study Area	Concur	See response to Comment #31.
33.	Ashley Rawhouser (NPS)	5/13/2020	Section 2.5 Study Area	More specifics on how this is being defined is needed.	See response to Comment #29. Types of areas to be evaluated are listed in the study plan and survey locations will be mapped and shared with TRREWG prior to fieldwork.
34.	Brock Applegate (WDFW)	05/10/2020	Section 2.5 Study Area	The locations should include Big Beaver Wetland for the effects above.	See response to Comment #26.
35.	Ashley Rawhouser (NPS)	5/13/2020	Section 2.5 Study Area	Concur	See response to Comment #26.
36.	Ashley Rawhouser (NPS)	5/13/2020	Section 2.5 Study Area	This is vague and leaves lots of wiggle room for misunderstanding.	Prior to designating survey sites, maps and summary findings of field reconnaissance will be presented to the TRREWG for review and discussion.
37.	Ashley Rawhouser (NPS)	5/13/2020	Section 2.5 Study Area	If these areas are within the flood plain and channel migration corridor of the Skagit River they should be included.	See response to Comment #2
38.	Brock Applegate (WDFW)	05/10/2020	Section 2.5 Study Area	1 st paragraph – Add: wetlands affected by ongoing Project operations,	Text revised to include information.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
39.	Emily Wirtz (Sauk-Suiattle Indian Tribe)	04/28/2020	Section 2.5 Study Area	SSIT has updated Tribal lands, more than what is shown on the map. We also have property along the southside of 530. Also, I believe Swinomish and Upper Skagit have more lands along Highway 20 than what is represented. Let me know if you would like updated properties from SSIT for future maps.	Thank you. City Light would appreciate receiving information on tribal lands within or adjacent to the FERC Project.
40.	Brian (uploaded by Jon-Paul Shannahan) (Upper Skagit Indian Tribe)	05/05/2020	Section 2.6 Methodology	Include randomized sub-sample field observations of the habitat identified in the desktop exercise	See response to Comment #12.
41.	Brock Applegate (WDFW)	05/10/2020	Section 2.6.1 Identify and Map Potentially Suitable Habitat	<p>SCL should include western toad.</p> <p>New comment provided on 06/23/2020: Please map western toad breeding habitat throughout the project area, which includes transmission lines.</p>	<p>See response to Comment #5.</p> <p>Mapping will emphasize potentially suitable habitat for the spotted frog species, for which mapping criteria are available. Around the Project reservoirs mapping will also identify habitats that might support western toad breeding associated with broad, gradually sloped areas and depressions that hold water when reservoirs levels are below NMWSE (linkage to fish stranding study plan). The study will also create a final map showing locations of surveys, amphibians detected during surveys and by incidental observation, and associated habitats.</p> <p>Response to comment provided on 06/23/2020: Sites where evidence of western toad breeding is detected by surveys or incidental observations, and any current or historical records provided by WDFW or other verified sources will be mapped. As indicated, mapping along the transmission line ROW will note stream and wetland categories, which</p>

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					can be used to indicate potential western toad breeding habitat and development of BMPs protective of these locations. City Light is not aware of mapping criteria with which to accurately predict “western toad breeding habitat” from aerial imagery or other remote sources. As illustrated by the terminology in the comments, City Light is justifiably concerned that maps of broadly defined <u>potential</u> habitat would be misrepresented as “western toad breeding habitat.”
42.	Ashley Rawhouser (NPS)	5/13/2020	Section 2.6 Methodology	<p>The Methods need more detail. NPS requests that Methods be detailed enough that a uniformed party could replicate the study. You propose a number of different protocols below (VES, egg mass, dipnets, traps, and WDFW Oviposition) and it is unclear when and where each will be utilized. Additionally, it is uncertain what the level of effort will be.</p> <p>The proposed study lacks a description of analysis methods. How will occupancy be estimated and modeled? How will imperfect detection be accounted for?</p>	The study report will fully document surveys methods performed at each site, as well as other details pertinent to interpreting results (e.g., site and weather conditions, total search time, and number of traps). The use of multiple methods closely follows the “toolbox” approach described by Olson and Leonard (1997), which is appropriate for sampling sites where multiple species and multiple life stages may occur. As indicated in the study plan, survey methods at lowland sites will be limited to the WDFW egg mass survey protocol for Oregon spotted frog, if warranted by potential for Project effects and the presence of suitable habitat. Decisions regarding choice of aquatic funnel trapping versus intensive dip-netting is often governed by site conditions, including water depths, and both methods may be appropriate at some sites. Presentation of summary findings of the field reconnaissance prior to designating survey sites will include details on expected survey methods at each site.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					This is not a modeling study. The study uses methods that are consistent with existing protocols for the objectives of the study. The results <u>might</u> inform development of PME that could incorporate statistically rigorous sampling and analyses (if warranted).
43.	Ashley Rawhouser (NPS)	5/13/2020	Section 2.6.1 Identify and Map Potentially Suitable Habitat	How is potentially suitable habitat going to be identified? What constitutes PSH? If this is going to be a GIS analysis there must be a quantitative component.	<p>Section 2.3 describes features of suitable habitat for each species. Potentially suitable habitat consists of areas that have these features. GIS provides a platform to combine multiple data layers for visualization. As evident from most of data layers listed here, the intent is not to quantify habitat but to identify locations where the data, including aerial imagery and LiDAR, suggest habitat for target species occurs. For example, NWI data consists of polygons of wetland types and is not quantitative except if used to calculate acreages and distances between connected wetlands, which are considerations that may be pertinent to identifying potential suitable spotted frog habitat.</p> <p>The study will also create a final map showing locations of surveys, amphibians detected during surveys and by incidental observation, and associated habitats.</p>
44.	Ashley Rawhouser (NPS)	5/13/2020	Section 2.6.3 Amphibian Surveys	Consider including a table of species, habitat, and timing on when you would expect of encounter them.	Survey timing will be influenced by elevation, weather conditions, and seasonal accessibility. Presentation of summary findings prior to designating survey sites will include details on expected survey methods and timing at each site, to the extent possible.
45.	Ashley Rawhouser (NPS)	5/13/2020	Section 2.6.3 Amphibian Surveys	Surveys should also include eDNA.	eDNA may not be effective for detecting Columbia spotted frog and has limitations where both spotted frog species occur (Ovaska

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
					et al. 2019). However, City Light had added the use of eDNA to the study plan as follows: “In the event that spotted frog life stages are not found at sites associated with Project reservoirs with suitable breeding habitat, these sites or a representative sub-sample of these sites will be sampled for the presence of Columbia spotted frog and Oregon spotted frog eDNA.”
46.	Ashley Rawhouser (NPS)	5/13/2020	Section 2.6.3 Amphibian Surveys	How will this [use of aquatic funnel traps] be determined?	As detailed in the same paragraph: “Decisions regarding use of traps will be based on a determination that trapping could provide substantially more information on amphibian use of a site or do so more efficiently than other means.”
47.	Ashley Rawhouser (NPS)	5/13/2020	Section 2.6.4 Identification and Handling of Amphibians	Cool site! Thanks.	Comment noted. Thank you.
48.	Brian (uploaded by Jon-Paul Shannahan) (Upper Skagit Indian Tribe)	05/05/2020	Section 2.6.4 Identification and Handling of Amphibians	eDNA could be used, BUT strict sample methodology should be developed to determine if enough replicates/samples are taken to ensure a sufficient detection rate/possibility.	Sampling methods for use of eDNA will follow those described by Ovaska et al. (2019), which provides guidance for the number of samples/site. See also response to Comment #45.
49.	Brian (uploaded by Jon-Paul Shannahan) (Upper Skagit Indian Tribe)	05/05/2020	Section 2.6.4 Identification and Handling of Amphibians	Changes in water level due to Project operations and associated impacts on habitat availability/productivity should be included as a product.	See response to Comment #13. The Study will present results of surveys and habitat assessment. Project effects will be assessed in the DLA by combining results of this study along with the Wetlands Assessment, Reservoir Fish Stranding and Trapping Risk Assessment, Reservoir Shoreline Erosion, and operations.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
50.	Brock Applegate (WDFW)	05/10/2020	Section 2.8 Schedule	6 th bullet – Add: Initial Study (ISR) Add ISR Meeting 2022	<p>Thank you for the comment; City Light acknowledges the ILP milestones provided. The ILP will provide the opportunity for comment on the final report submitted in the ISR and discussed at the ISR meeting; if any components of the study goals and objectives are not met in the first year, or there are anomalous conditions, any party may propose additional work or request additional study per FERC ILP regulations.</p> <p>No changes were made to the schedule in the draft study plan as City Light intends to complete the study within one year and wants to be clear with FERC and LPs on the proposed schedule. City Light believes that it will be beneficial to all parties to have complete information from the studies as soon as possible to inform development of management proposals and cross resource analysis.</p>
51.	Emily Wirtz (Sauk-Suiattle Indian Tribe)	04/28/2020	Section 2.6.4 Identification and Handling of Amphibians	I'm curious whether eDNA could also be a method used at the wetland sites. Also, I think testing for the Chytrid fungus and making sure to follow protocols to ensure surveyors are not spreading Chytrid from site to site should be considered and potentially mentioned in the plan.	<p>Thank you for your comment.</p> <p>We are proposing multiple standard methods to document amphibians. Depending on specific site conditions, the methods may include repeated visit visual encounter surveys, funnel traps, and DNA samples collected via swabs or eDNA analysis of water samples. See response to Comment #45.</p> <p>City Light has added text describing cleaning and disinfection protocols to prevent spread of chytrid.</p>
52.	Ashley Rawhouser	5/13/2020	Section 2.8 Schedule	Concur	See response to Comment #51.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
	(NPS)				
53.	Ashley Rawhouser (NPS)	5/13/2020	Section 2.8 Schedule	One year of survey effort will not be sufficient and will bias the results towards non-detection.	The ILP will provide the opportunity for comment on the final report submitted in the ISR and discussed at the ISR meeting; if any components of the study goals and objectives are not met in the first year, or there are anomalous conditions, any party may propose additional work or request additional study per FERC ILP regulations.
54.	Brock Applegate (WDFW)	05/10/2020	Section 3.1 References	<p>Add: Nordstrom, N., and R. Milner. 1997. Columbia Spotted Frog. Pages 4-1 to 4-14 in E. M. Larsen, ed. Management recommendations for Washington's Priority Species, Volume III: Amphibians and Reptiles. Wash. Dept. Fish and Wildl., Olympia.</p> <p>Add: 1997. Oregon Spotted Frog. Pages 6-1 to 6-12 in E. M. Larsen, ed. Management recommendations for Washington's Priority Species, Volume III: Amphibians and Reptiles. Wash. Dept. Fish and Wildl., Olympia.</p>	Thank you. These references have been added as well as noting them in the text in Section.2.2.
55.	Brock Applegate (WDFW)	06/22/2020	Section 1.3 Study Plan Development	<p>Comment on: "The study is designed to address Terrestrial Resources Issue 20 (TE20 Columbia Spotted Frog Survey), and aspects of TE03 (Littoral Riparian Habitat) and FA09 (Littoral and Riparian Habitat)."</p> <p>Should we include Invasive Plants as well?</p>	No. The sentence is referring to linkages from the original issue forms discussed in the 2019 process. It is true that information from multiple other studies, including invasive species, will be used along with amphibian survey results to assess habitat conditions for special-status species.
56.	Brock Applegate (WDFW)	06/22/2020	Section 1.3 Study Plan Development	<p>Comment on: "WDFW postulated that the Project may reduce or degrade aquatic, littoral, and emergent vegetation associated with potential spotted frog habitat."</p> <p>Please add "... through the fluctuations of the reservoirs."</p>	Edit made.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
57.	Brock Applegate (WDFW)	06/22/2020	Section 1.3 Study Plan Development	<p>Comment on: “The study will also provide information on any other amphibians that are observed incidentally or during surveys, including western toad (or boreal toad <i>Anaxyrus boreas boreas</i>), a WDFW candidate species, and Oregon spotted frog (<i>Rana pretiosa</i>), a federal threatened and State endangered species, and native amphibians that do not have special status. As well, the study will report any detections (visual or auditory) of the non-native American bullfrog (<i>Lithobates catesbeianus</i>), a species which, while not documented in the Project Area yet, is expanding its range and has been found in nearby waterbodies.”</p> <p>WDFW recommends that SCL document presence of all non-native amphibians. Possibilities of additional non-native amphibians increase as the surveys continue south along the transmission lines to Bothell.</p>	<p>We will document all native and non-native amphibians detected during the surveys or by incidental observations during other field work, which will include work along the transmission line ROW. A large portion of the transmission line ROW is located on private property and is surrounded by private property over which City Light has no authority or means of preventing the spread of non-native amphibians.</p> <p>Also, see response to Comment #6.</p>
58.	Brock Applegate (WDFW)	06/22/2020	Section 1.3 Study Plan Development	<p>Comment on: “The Reservoir Fish Stranding and Trapping Risk Assessment study will also identify potential habitats within drawdown zones on Ross, Diablo, and Gorge lakes that could be used by special-status amphibians.”</p> <p>Please add “...and could strand and trap amphibians in different life stages.”</p>	Edit made.
59.	Brock Applegate (WDFW)	06/22/2020	Section 2.1 Study Goals and Objectives	<p>Comment on: “The goals of this study are to: (1) identify areas of potentially suitable breeding habitat for the special-status amphibians, Columbia spotted frog and Oregon spotted frog, within the study area;...”</p> <p>Please add western toad to the list. If SCL wants to identify special status breeding habitats so that SCL can mitigate effects from the ongoing operations, the map must contain the breeding habitats for all special-status amphibians.</p>	See our responses to Comments #5 and 41. Maps will depict locations with evidence of western toad breeding and sightings of post-metamorphic life stages, as well as wetland and stream classifications. All sites examined in the field will also be described in text. Based on the types of habitats that are shown to be used by western toads in the study area, reasonable conclusions regarding potential effects of Project operations can be deduced.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
60.	Brock Applegate (WDFW)	06/22/2020	Section 2.1 Study Goals and Objectives	<p>Comment on: "... (3) document occurrences of a third special-status species, western toad, and the locations and types of habitats used around the Project reservoirs;..."</p> <p>How does this differ from the first goal? I don't understand why we can't just add western toad to the first goal.</p>	<p>See our responses to Comments #5 and 41.</p> <p>The species are treated differently in the study goals for several reasons. (1) Oregon spotted frog is federally listed, whereas the other species are not. (2) The spotted frog species are highly aquatic and associated with relatively large wetlands or wetland complexes with areas of permanent water, vegetated shallows, and aquatic connections, features usually detectable from aerial imagery and other remote sources. As such, identifying and mapping potential habitats is a realistic goal. In contrast, the western toad is largely terrestrial and may breed long distances from where found terrestrially. Potential breeding habitats include common and widespread aquatic features (e.g., ponds, lakes, and slow-moving streams), as well as common features that may be too small to be detected on aerial photographs (e.g., rain pools, small ditches, and tire ruts). However, most of this potential habitat, particularly in lowlands of western Washington, is not actually used, and even at sites where western toad occurs, only a small part of potential habitat may be used. (3) The potential for Project operations to affect amphibians associated with Project reservoirs differs greatly from potential effects elsewhere such as along the transmission line ROW where the Project has no effect on water levels and where development of BMPs protective of aquatic and wetland habitats does not require documenting amphibian species.</p>

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
61.	Brock Applegate (WDFW)	06/22/2020	Section 2.1 Study Goals and Objectives	<p>Comment on: "... (3) document occurrences of a third special-status species, western toad, and the locations and types of habitats used around the Project reservoirs;..."</p> <p>We should replace "project reservoirs" with "project area."</p>	<p>No edit made. See our responses to Comments #41 and 60.</p> <p>As indicated, mapping in other areas within the Project Boundary, including along the transmission line ROW, will note stream and wetland categories, which can be used along with amphibian observation locations to indicate potential western toad breeding habitat and development of BMPs protective of these habitats. The potential for Project operations to affect amphibians associated with Project reservoirs differs greatly from potential effects elsewhere such as along the transmission line ROW.</p>
62.	Brock Applegate (WDFW)	06/22/2020	Section 2.1 Study Goals and Objectives	<p>Comment on: "Study results will provide information on special-status and other amphibian species use and habitats that will be combined with results of other studies (e.g., Wetlands Assessment, Erosion and Geologic Hazards at Project Facilities and Transmission Line Right-Of-Way, Reservoir Shoreline Erosion, Sediment Deposition in Reservoirs Affecting Resource Areas of Concern)..."</p> <p>Please include Fish stranding and Trapping Study Plan.</p>	Edit made.
63.	Brock Applegate (WDFW)	06/22/2020	Section 2.1 Study Goals and Objectives	<p>Comment on: "Develop a preliminary, working map of potentially suitable breeding habitat (i.e., habitats used for oviposition [egg-laying] and larval rearing) for special-status amphibians within the study area using existing, publicly available aerial imagery, wetland and soil maps, and vegetation data. Potential habitat will also be identified by the results of the Vegetation Mapping and Wetland Assessment studies and analyses of Light Detection and Ranging (LiDAR) data by the Reservoir Fish Stranding and Trapping Risk Assessment study. The preliminary map will indicate</p>	See our responses to Comments #5, 41, 59, and 60.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				discernible wetlands and topographic depressions, as well as general areas, such as gently sloping shorelines, that might support special-status amphibian breeding. For this preliminary map habitat suitability will be broadly defined by reference to literature accounts that describe habitats successfully used by each special-status species.” Will SCL include western toad on this map? I assume so, since WDFW has listed western toad as a State Candidate Species for listing. WDFW would like western toad breeding habitats included on the maps to warn of risks from project operations effects.	
64.	Brock Applegate (WDFW)	06/22/2020	Section 2.1 Study Goals and Objectives	Comment on: “Develop a preliminary, working map of potentially suitable breeding habitat (i.e., habitats used for oviposition [egg-laying] and larval rearing) for special-status amphibians within the study area using existing, publicly available aerial imagery, wetland and soil maps, and vegetation data. Potential habitat will also be identified by the results of the Vegetation Mapping and Wetland Assessment studies and analyses of Light Detection and Ranging (LiDAR) data by the Reservoir Fish Stranding and Trapping Risk Assessment study. The preliminary map will indicate discernible wetlands and topographic depressions, as well as general areas, such as gently sloping shorelines, that might support special-status amphibian breeding. For this preliminary map habitat suitability will be broadly defined by reference to literature accounts that describe habitats successfully used by each special-status species.” I would envision that SCL would use this map to implement BMPs or future surveys, when maintenance projects, road construction, or herbicide/pesticides application would occur in the future. In addition, SCL	Thank you for your comment. City Light will use the study results to develop appropriate BMPs to protect wetlands, streams, and other sensitive habitats, or other PME measures, if warranted.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				should address any effects to amphibians due to ongoing operations, currently or in the future.	
65.	Brock Applegate (WDFW)	06/22/2020	Section 2.1 Study Goals and Objectives	<p>Comment on: “Perform a special-status amphibian field survey in areas identified as potentially suitable habitat where there is activity related to Project O&M or at Project recreation facilities and where additional information is needed on species occurrence, relative abundance, and life history timing.”</p> <p>Would this include western toad?</p>	See our responses to Comments #5 and 41.
66.	Brock Applegate (WDFW)	06/22/2020	Section 2.5 Study Area	<p>Comment on: “The wildlife mitigation lands are not included in the study area because no Project effects occur in these areas; in addition, previous surveys completed by City Light in 2011–2012 covered wetlands on the properties and found only one ranid species – northern red-legged frog.”</p> <p>Although not caused by the Project directly, ownership of the project may cause the public to visit the mitigation lands. Bullfrogs and people, to some degree, come together. WDFW would recommend that SCL have these mitigation lands surveyed for bullfrogs so that we can manage for containment or eradication of them. WDFW would like this request for bull frog surveys recorded here so that they may accompany these surveys, when SCL has biologists mobilized around the project, or future surveys. SCL should address the possibility of bullfrogs because of their impact on other native amphibian species.</p>	See response to Comment #27.
67.	Brock Applegate (WDFW)	06/22/2020	Section 2.5 Study Area	<p>Comment on: “The wildlife mitigation lands are not included in the study area because no Project effects occur in these areas; in addition, previous surveys completed by City Light in 2011–2012 covered wetlands on the properties and found only one ranid species – northern red-legged frog.”</p>	See response to Comment #27.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				WDFW would prefer the same findings, which includes mitigation lands with only native amphibians. We appreciate the 2011/12 surveys, but the surveys happened 8-9 years ago. Conditions can change on the mitigation lands over the course of one season.	
68.	Brock Applegate (WDFW)	06/22/2020	Section 2.6.4 Identification and Handling of Amphibians	<p>Comment on: “Areas examined during field reconnaissance for potentially suitable amphibian habitats;”</p> <p>WDFW recommends that SCL include suitable habitat for all special status frogs on the map, whether examined during field reconnaissance or not.</p>	See our responses to Comments #5, 41, 59, and 60. Study report maps will show stream and wetland categories, which can be used to indicate potential habitats for special-status amphibians and development of BMPs protective of these habitats. It may not be appropriate to categorize habitats as “suitable” basely solely on remote data sources.
69.	Brock Applegate (WDFW)	06/23/2020	Section 2.8 Schedule	<p>Comment on: “Final Report – March 2022”</p> <p>Please include the Final Initial Study Report (ISR) and the ISR Meeting. SCL will complete these activities in the schedule, so please include them.</p>	Thank you for your comment. The schedule reflects the timeline for this study only, not the larger ILP process.

**TR-09 BEAVER HABITAT ASSESSMENT
REVISED STUDY PLAN**

**SKAGIT RIVER HYDROELECTRIC PROJECT
FERC NO. 553**

Seattle City Light

**April 2021
RSP**

TABLE OF CONTENTS

Section No.	Description	Page No.
1.0	Introduction.....	1-1
1.1	General Description of the Project.....	1-1
1.2	Relicensing Process	1-1
1.3	Study Plan Development.....	1-2
2.0	Study Plan Elements	2-1
2.1	Study Goals and Objectives	2-1
2.2	Resource Management Goals	2-1
2.3	Background and Existing Information.....	2-2
2.4	Project Operations and Effects on Resources	2-3
2.5	Study Area	2-4
2.6	Methodology	2-9
	2.6.1 Evaluate Existing Conditions and Management Activities at Constructed Off-Channel Habitat Areas	2-9
	2.6.2 Map Beaver Occurrence within the Project Boundary	2-9
	2.6.3 Beaver Habitat Assessment.....	2-9
2.7	Consistency with Generally Accepted Scientific Practice.....	2-13
2.8	Schedule.....	2-13
2.9	Level of Effort and Cost	2-13
3.0	References	3-1

List of Figures

Figure No.	Description	Page No.
Figure 2.5-1.	Location map of the Skagit River Project.....	2-5
Figure 2.5-2.	Chum Salmon spawning channels: Newhalem and County Line Ponds and Park Slough.	2-6
Figure 2.5-3.	Chum Salmon spawning channels: Taylor spawning channel.....	2-7
Figure 2.5-4.	Chum Salmon spawning channels: Powerline and Illabot spawning channels.....	2-8
Figure 2.6-1.	Beaver Intrinsic Potential between Bacon Creek and Marblemount.	2-11
Figure 2.6-2.	Beaver Intrinsic Potential near Taylor, Powerline, and Illabot spawning channels.....	2-12

List of Attachments

Attachment A	RCW 77.32.585. Release of Wild Beavers
Attachment B	Skagit River Hydroelectric Project Beaver Sighting and Habitat Form
Attachment C	City Light Responses to LP Comments on the Study Plan Prior to PSP

List of Acronyms and Abbreviations

BDA	beaver dam analog
BIP	Beaver Intrinsic Potential
City Light.....	Seattle City Light
CMZ.....	channel migration zone
ELC	Environmental Learning Center
FCC	Flow Coordinating Committee
FERC.....	Federal Energy Regulatory Commission
ft	feet/foot
GIS	Geographic Information System
GPS	Global Positioning System
HEP	Habitat Evaluation Procedure
HPA.....	Hydraulic Project Approval
ISR	Initial Study Report
LiDAR.....	Light Detection and Ranging
LP	licensing participant
LWD	large woody debris
NCC	Non-flow Coordinating Committee
NOAA.....	National Oceanic and Atmospheric Administration
NPS	National Park Service
O&M.....	operations and maintenance
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
RWG	Resource Work Group
STI.....	Stillaguamish Tribe of Indians

TRREWG.....	Terrestrial Resources and Reservoir Erosion Work Group
U.S.C.....	United States Code
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WDFW	Washington Department of Fish and Wildlife

1.0 INTRODUCTION

1.1 General Description of the Project

The Skagit River Hydroelectric Project (Project), licensed to The City of Seattle, Washington, and operated through its publicly-owned electric power utility Seattle City Light (City Light), is located in northern Washington State and consists of three power generating developments on the Skagit River – Ross, Diablo, and Gorge – and associated lands and facilities. The Project generating facilities are in the Cascade Mountains of the upper Skagit River watershed, between Project River Miles (PRM) 94.7 and 127.9 (U.S. Geological Survey [USGS] RMs 94.2 and 127).¹ Power from the Project is transmitted via two 230-kilovolt 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, an Environmental Learning Center (ELC), several recreation facilities, and several parcels of fish and wildlife mitigation lands.

Project generating facilities are all located in Whatcom County, although Ross Lake, the most upstream reservoir, crosses the U.S.-Canada border and extends for about one mile into British Columbia at normal maximum water surface elevation. Gorge Powerhouse, the most downstream facility, is approximately 120 miles northeast of Seattle and 60 miles east of Sedro-Woolley, the nearest large town. The closest town is Newhalem, which is part of the Project and just downstream of Gorge Powerhouse. The primary transmission lines cross Whatcom, Skagit, and Snohomish counties; the fish and wildlife mitigation lands are in the same counties.

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, Diablo, and Gorge lakes.” The legislation maintains the Federal Energy Regulatory Commission’s (FERC) 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).

1.2 Relicensing Process

The current FERC license for the Project expires on April 30, 2025, and City Light will apply for a new license no later than April 30, 2023. City Light formally initiated the relicensing process by filing a Notice of Intent and Pre-Application Document (PAD) with FERC on April 27, 2020 (City Light 2020a). The PAD includes descriptions of the Project facilities, operations, license

¹ 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 Project River Mile (PRM) system are provided throughout this document. For further details see Section 7.0 of the main body RSP.

requirements, and Project lands as well as a summary of the extensive existing information available on Project area resources and early consultation on potential resource issues to be addressed during the relicensing. The PAD also includes an outline of the goals and objectives of this study.

In 2019-2020, City Light convened a series of Resource Work Groups (RWG) to engage agencies and other licensing participants (LP) in the Study Plan Development Process. Discussions with LPs continued in early 2021 with a series of topic-based discussions following filing of the Proposed Study Plan (PSP) on December 8, 2020 (City Light 2020b). This study plan reflects RWG and LPs discussion and study requests and comments submitted by LPs.

1.3 Study Plan Development

This Study Plan addresses Issue Form TE22 – Beaver Floodplains and Dams brought forward to the Terrestrial Resources and Reservoir Erosion Work Group (TRREWG) on July 8, 2019 by the Upper Skagit Indian Tribe. The Upper Skagit Indian Tribe conducts annual maintenance, as needed, of the Newhalem and County Line Ponds, and Taylor, Powerline, and Illabot spawning channels. A sixth spawning channel, Park Slough, is maintained by NPS. All six of these off-channel Chum habitat sites were constructed as part of the City Light fisheries mitigation program under the current license. Upper Skagit Indian Tribe biologists have indicated that beaver (*Castor canadensis*) dams constructed near the outlets and at other locations of several of the artificial channels and ponds are causing episodic but sometimes significant impediments to Chum access and impediments for other aquatic organisms. The issue form submitted by the Upper Skagit Indian Tribe included three topics: (1) Project operations may continue to affect beaver distribution in the study area; (2) beaver dams built at several of the constructed off-channel Chum Salmon habitat areas are adversely affecting fish access; and (3) an evaluation and feasibility study for a beaver relocation project through the Project vicinity. The TRREWG discussed the form at the July 30, 2019 RWG meeting where City Light agreed to assess beaver conflicts at spawning channels, to collect information on current location and condition of beaver habitat in the study area, and to provide information useful for planning beaver relocations. The Steering Committee approved study of the issue at their September 4, 2019 meeting.

On April 10, 2020, City Light released the TR-09 Beaver Habitat Assessment Draft Study Plan for review and commenting by the LPs. On May 6, 2020, the draft study plan was discussed at a Terrestrial Resources and Reservoir Erosion Work Group (TRREWG) meeting. City Light reviewed all comments received and released a revised version of the draft study plan on June 12, 2020. The revised draft was discussed on June 23, 2020 at a TRREWG meeting. Written comments were received from Washington Department of Fish and Wildlife (WDFW), Upper Skagit Indian Tribe, Sauk-Suiattle Indian Tribe, and U.S. Forest Service (USFS) and responded to in an attachment to this study plan. A Status Draft of the study plan was provided to LPs on August 6, 2020.

City Light is filing this study plan with FERC as part of its Revised Study Plan (RSP), an update to the version that was filed with the PSP and incorporating additional consultation with LPs prior to the filing date. The Stillaguamish Tribe of Indians submitted a study request pertaining to beaver (STI-04 Beaver Project). This study plan addresses some of the elements identified in this study request, as explained in Section 6 of the RSP. Some elements of the study request involve management actions that will take place after the relicensing; information gathered in the study

will be used to assess potential management actions, including beaver relocation, at the Chum channels during the next Project license.

PSP comments to this study plan were submitted by the Stillaguamish Tribe of Indians and Upper Skagit Indian Tribe. City Light has addressed the specific comments and suggested edits in this study plan and responded to comments in the PSP comment/response table appended to the main body of the RSP. Modifications made to the study plan in response to comments include: clarifications to the study area, clarifications on the locations and studies where beaver observations will be documented, updated resource management goals, clarifying available historic data from Indian tribes, adding information about beaver dam analogs (BDA), adding discussion of potential operations and maintenance (O&M) effects on beaver habitat, clarifying that other relicensing studies' results will be included in assessment of beaver habitat, updating goals and objectives and related methods, and adding reference to previous habitat evaluation procedure study.

Though City Light knows of no data supporting the contention that the Project affects overall beaver distribution along the Skagit River, City Light has a shared interest to work with LPs to collect information on beaver habitat in areas where flow, fisheries mitigation, vegetation, and road management activities may influence vegetation composition, floodplain inundation patterns, and streams/wetlands along the transmission line right-of-way (ROW). City Light would use this information to work with LPs to identify protection, mitigation, and enhancement (PME) measures, including to inform future management of the City Light Chum channels or the potential for beaver relocations to benefit ecological processes, salmon habitat, and climate change resiliency.

2.0 STUDY PLAN ELEMENTS

2.1 Study Goals and Objectives

The goals of this study are to provide information that can be used to address the ongoing beaver conflicts at the Project's Chum Salmon off-channel sites and to characterize beaver habitat conditions in the study area to inform a Project effects assessment and development of PME measures.

The objectives are as follows:

- Use existing information from the Indian tribes and Flow/Non-Flow Coordinating Committee (FCC/NCC) to summarize beaver conflicts at the constructed Chum off-channel sites (Hall and Shanahan 2009; additional unpublished data, photos, and documents² provided by the Upper Skagit Indian tribe and Skagit River System Cooperative).
- Summarize results of the GE-04 Skagit River Geomorphology Between Gorge Dam and the Sauk River Study (Geomorphology Study) and FA-02 Instream Flow Model Development Study that relate to the Chum channels to assess hydrologic and geomorphologic conditions at the constructed Chum channels for use by LPs and City Light in assessing management options. (The current geomorphic and habitat conditions of the Chum channels, as well as hydrologic connectivity, water depth, velocity, and shear stress using the Instream Flow Model results for various flows will be assessed as part of the Geomorphology Study.)
- Identify beaver habitat and active beaver territories based on a combination of existing information from City Light and LPs as well as field observations by biologists during this and other relicensing studies throughout the study area.
- Assess beaver habitat in the study area using Beaver Intrinsic Potential (BIP) model in combination with morphological habitat, vegetation, and ownership/land use characteristics ultimately to assess ongoing Project effects from City Light's management of flow, vegetation, and roads and to inform potential PME measures, which could include beaver relocation if deemed appropriate.

2.2 Resource Management Goals

City Light's goals are to provide information useful for addressing beaver conflicts at the Chum channels and to assess overall beaver habitat potential within a 2-mile buffer of the Project Boundary and the channel migration zone (CMZ) downriver to the Sauk River confluence. This information will be used to assess potential management actions at the Chum channels during the next Project license. It will also be used to assess effects to beaver habitat from operation of the dams and from vegetation and road management. City Light will use this information to work with LPs to develop appropriate PME measures for the new license.

² Unpublished data, photos, and documents available on Resource Work Groups SharePoint site: [Skagit River Hydroelectric Project Resource Work Groups - Chum Channel Info - All Documents \(sharepoint.com\); https://hdrinc.sharepoint.com/teams/srrwg/Terrestrial_Erosion/Forms/AllItems.aspx?viewid=caeb6a87%2Da83a%2D4f02%2D9aa8%2D475a34097a2c&id=%2Fteams%2Fsrrwg%2FTerrestrial%5FErosion%2FBackground%20Documents%20Library%2FBeaver%2FChum%20Channel%20Info](https://hdrinc.sharepoint.com/teams/srrwg/Terrestrial_Erosion/Forms/AllItems.aspx?viewid=caeb6a87%2Da83a%2D4f02%2D9aa8%2D475a34097a2c&id=%2Fteams%2Fsrrwg%2FTerrestrial%5FErosion%2FBackground%20Documents%20Library%2FBeaver%2FChum%20Channel%20Info)

The study will provide information for resource agencies and Indian tribes with jurisdiction in the Project vicinity to address their respective goals and objectives for resource management. Resource management goals were provided by LPs in their study requests and PSP comments identified in Section 1.3 of this study plan.

2.3 Background and Existing Information

Beavers are widely recognized as important in maintaining high-quality diverse aquatic habitats for salmonids and other native biota, ecosystem health, and hydrologic connectivity and thermal conditions, especially in the face of climate change (Dittbrenner et al. 2018; Pollock et al. 2018). Pollock et al. (2004) found that increasing beaver populations may be effective in creating habitat for Coho Salmon in the Stillaguamish watershed. In many watersheds of Washington, beaver populations have been dramatically reduced because of trapping and habitat removal. In the Skagit River watershed, Beechie et al. (2001) reported that beaver dams historically accounted for at least 8 percent of tributary channel length, particularly in the lower Skagit sub-basin but that diking, draining, and hydromodification has substantially reduced this habitat and habitat complexity. In the unregulated Stillaguamish River watershed, Pollock et al. (2004) found an overall reduction of 86 percent of beaver habitat compared to historic conditions. While populations are reduced relative to pre-European settlement, Indian tribes and land management agencies have information on beaver territories and historic habitat along the Skagit, Sauk, and Stillaguamish rivers and tributaries.

As part of the relicensing studies completed for the current license, a Habitat Evaluation Procedure (HEP) study was completed to assess original reservoir inundation impacts to wildlife habitat (Envirosphere 1988). The beaver was selected by the HEP Study Team (City Light, NPS, WDFW, U.S. Fish and Wildlife Service [USFWS], and North Cascades Conservation Council) as one of the evaluation species. That study stated that “the steep, rocky terrain surrounding Gorge and Diablo during both the pre- and post-impoundment periods is not beaver habitat. Therefore, the beaver was used as an evaluation species for Ross only” (pp 3–20). It should be noted, however, that beavers use the upper portion of Gorge Lake, particularly near Stetattle Creek Reflector Bar. The HEP study results were used to help develop the Wildlife Settlement Agreement obligation to acquire and manage wildlife habitat and to fund wildlife research and NPS ecological monitoring. Many of the fish and wildlife mitigation lands acquired under this program, as well other conservation lands owned by City Light, provide important habitat for beavers in the Skagit, Sauk, and South Fork Nooksack watersheds.

As discussed previously, beavers routinely construct dams at several of the off-channel Chum habitat channels where the hyporheic flow from the river provides relatively stable water levels. The Upper Skagit Indian Tribe has employed annual, labor-intensive beaver dam removal in recent years to maintain Chum Salmon access in the channels. To alleviate adverse effects of beaver dams on water levels and fish access at Powerline Pond, a pond leveler was successfully installed through collaborative effort between City Light and the Upper Skagit Indian Tribe. The Upper Skagit Indian Tribe has also completed other non-lethal habitat management and lethal beaver removal at sites in the watershed and has partnered with National Oceanic and Atmospheric Administration (NOAA) to study fish passage and to have beaver experts provide consultation for the Chum channels (e.g., Hall and Shanahan 2009).

Another potential management tool that can sometimes be used to alleviate beaver conflicts is to trap and relocate beavers to other locations. Interest in re-establishing beaver populations to aid watershed restoration has led to recent publications that describe approaches to evaluating habitat and implementing beaver relocation projects (e.g., Pollock et al. 2018; Dittbrenner et al. 2018; Tulalip Tribes 2015). A first step in conducting a relocation project is to assess beaver habitat suitability and to gain landowner permission at potential release sites. Dittbrenner et al. (2018) has developed and employed a Geographic Information System (GIS)-based model to rate the BIP of stream segments in the Whatcom, Skagit, and Snohomish counties (among others), and evaluated the modeling in the Snohomish River basin. As one measure of model validity, they reported that 60 percent of stream segments in the Snohomish River basin with a high or moderate BIP had evidence of current or past beaver activity, while no segments classified as low BIP habitat had any beaver sign. This model does not factor in land ownership and land use aspects, which are significant determinants of beaver population capacity in a given area.

Restoration practitioners have sometimes installed BDA in degraded streams to mimic the form and function of natural beaver dams. BDAs are most useful in areas where beavers are not tolerated by landowners or where stream habitat is incised. BDAs alter hydraulics, capture sediment, and create deep water pools that help to increase the success rate of beaver recolonization or translocation.

Natural dispersal ability of beavers is common where degraded stream segments are restored, allowing beavers from nearby areas to move in. A good example of this is the Upper Skagit Indian Tribe's restoration of Hansen Creek, a Skagit River tributary near Sedro-Woolley. Within five years after mechanical stream restoration, 600 feet (ft) of new beaver dams had been built along 17,000 ft of stream (MacFarlane et al. 2014).

2.4 Project Operations and Effects on Resources

As reservoirs with large annual water level fluctuations preclude beaver use (Allen 1983), Ross Lake is generally not suitable beaver habitat. Beavers, however, likely use Ross Lake to swim between tributary streams and the Skagit River in British Columbia during summer months when the water level is typically near normal maximum water surface elevation. While Gorge Lake does not have large annual water level fluctuations, most of the lake is in a canyon with very steep shorelines lacking deciduous shrubs and trees and is not high-quality beaver habitat. The upper end of Gorge Lake and portions of Diablo Lake that are outside of the canyon and have bordering deciduous trees have some beaver activity. Although there are no known beaver constructed dams, or lodges, beavers are known to use the Diablo tailrace and riparian areas near the Diablo townsite.

Beavers are common in many portions of the Skagit floodplain below Newhalem, particularly on fish and wildlife mitigation lands and other conservation lands. Beavers are also common along the Sauk River near the fish and wildlife mitigation lands and in some sections of the Stillaguamish River and tributaries. However, in many sections of the Skagit River, bank armoring installed to protect private property or public infrastructure has reduced beaver habitat. Furthermore, there is a long history of private landowners removing beavers and their dams, thus affecting beaver habitat and populations.

Conflicts with beavers exist at some of the off-channel Chum channels constructed by City Light as fish mitigation under the current Project license. These include: Park Slough, Newhalem Pond,

County Line Pond, Taylor Channel, Powerline Pond, and Illabot Channel. The Upper Skagit Indian Tribe has, in the past, routinely removed beaver dams from several of the channels to facilitate Chum Salmon access and egress. At Powerline Pond channel, a beaver deceiver installed near the pond's connection with the Skagit River has been effective in maintaining fish access. The FCC/NCC is responsible for overseeing fisheries flow and habitat elements of the existing license and is discussing the future viability and management objectives for the Chum channels.

City Light has a shared interest in working with LPs to collect information on beavers and their habitats in areas where flow management can influence riparian vegetation composition and floodplain inundation patterns and where City Light vegetation and road management activities along the transmission line ROW alter riparian vegetation or contribute to erosion and sedimentation affecting aquatic habitats used by beavers. City Light would use this information to work with LPs to identify City Light PME measures.

2.5 Study Area

The study area for the beaver habitat assessment (BIP model) will cover the entire Project Boundary (Figure 2.5-1), including the transmission line ROW and fish and wildlife mitigation lands plus a 2-mile buffer. Identification of potential beaver habitat, known beaver territories, and incidental observations of beaver and beaver sign will occur within the respective study areas for field work in other relicensing studies. This includes: TR-01 Vegetation Mapping Study, TR-02 Wetland Assessment, TR-03 Rare, Threatened, and Endangered Plants Survey, TR-04 Invasive Plants Study, and GE-02 Erosion and Geologic Hazards at Project Facilities and Transmission Line Right-Of-Way Study, among others. The beaver habitat and conflicts will be summarized in the general vicinity of the Chum Salmon spawning channels funded by City Light. This includes the Newhalem and County Line Ponds, Park Slough, and the Taylor, Powerline Pond, and Illabot spawning channels (Figures 2.5-2 through 2.5-4).

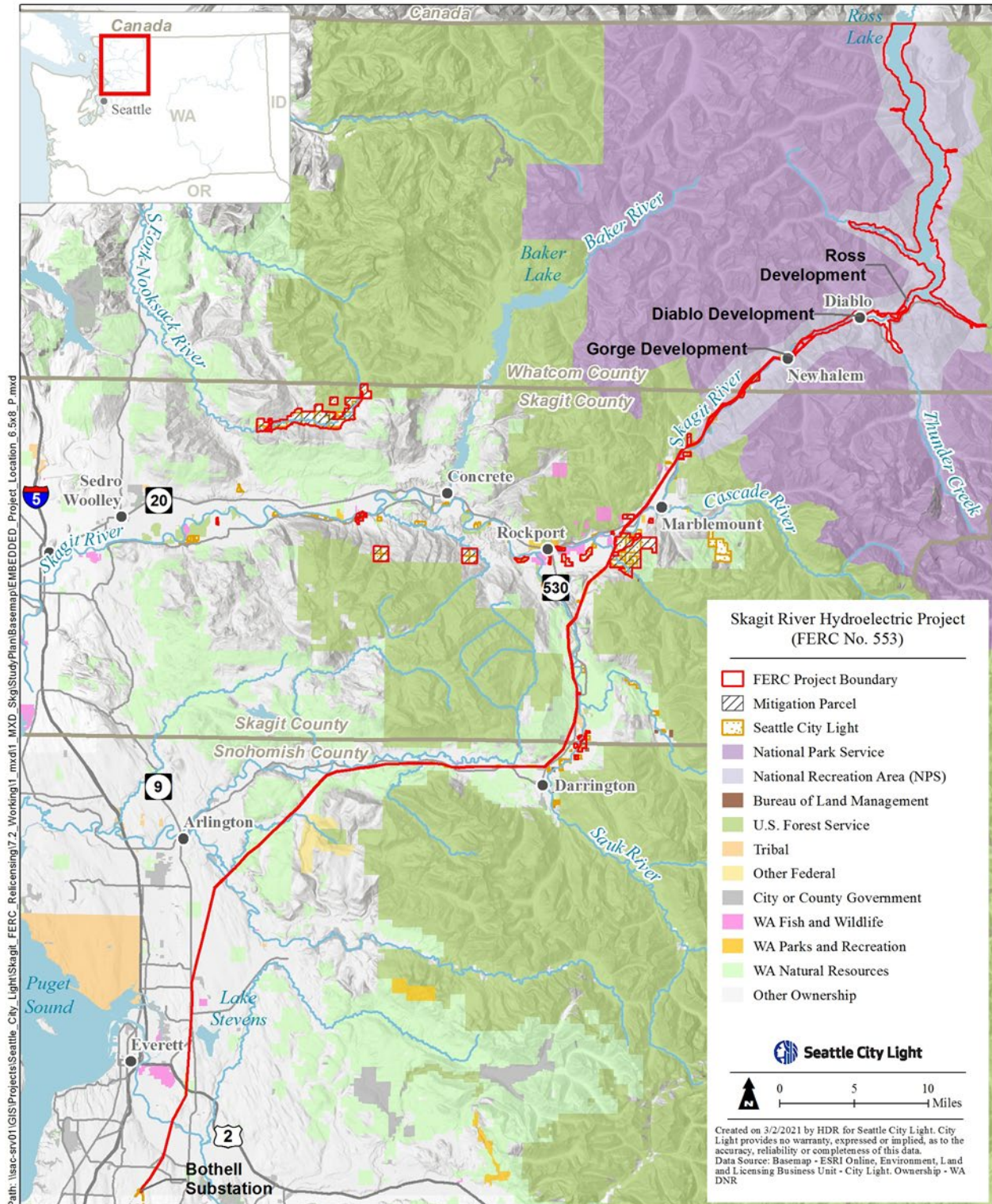


Figure 2.5-1. Location map of the Skagit River Project.

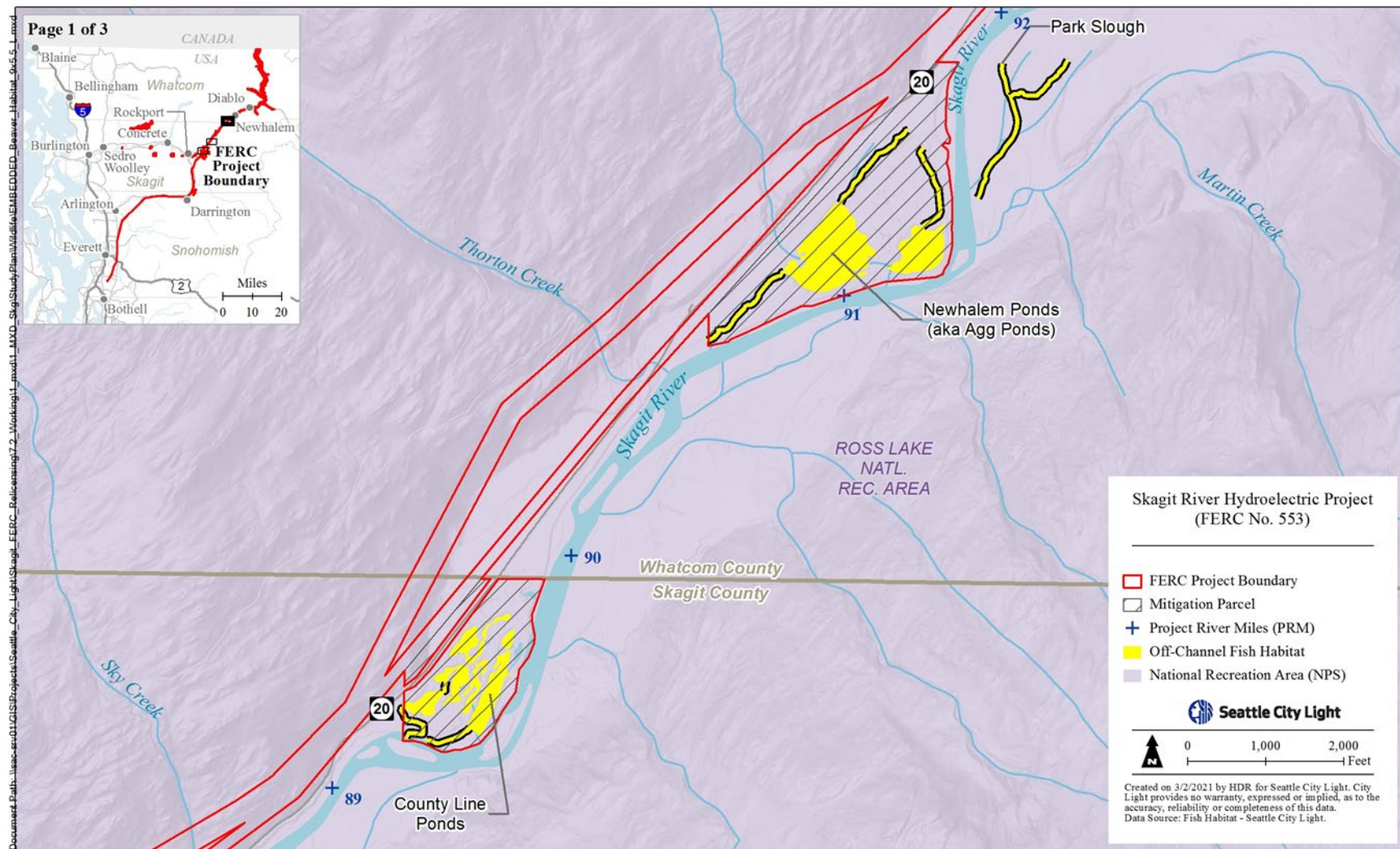


Figure 2.5-2. Chum Salmon spawning channels: Newhalem and County Line Ponds and Park Slough.

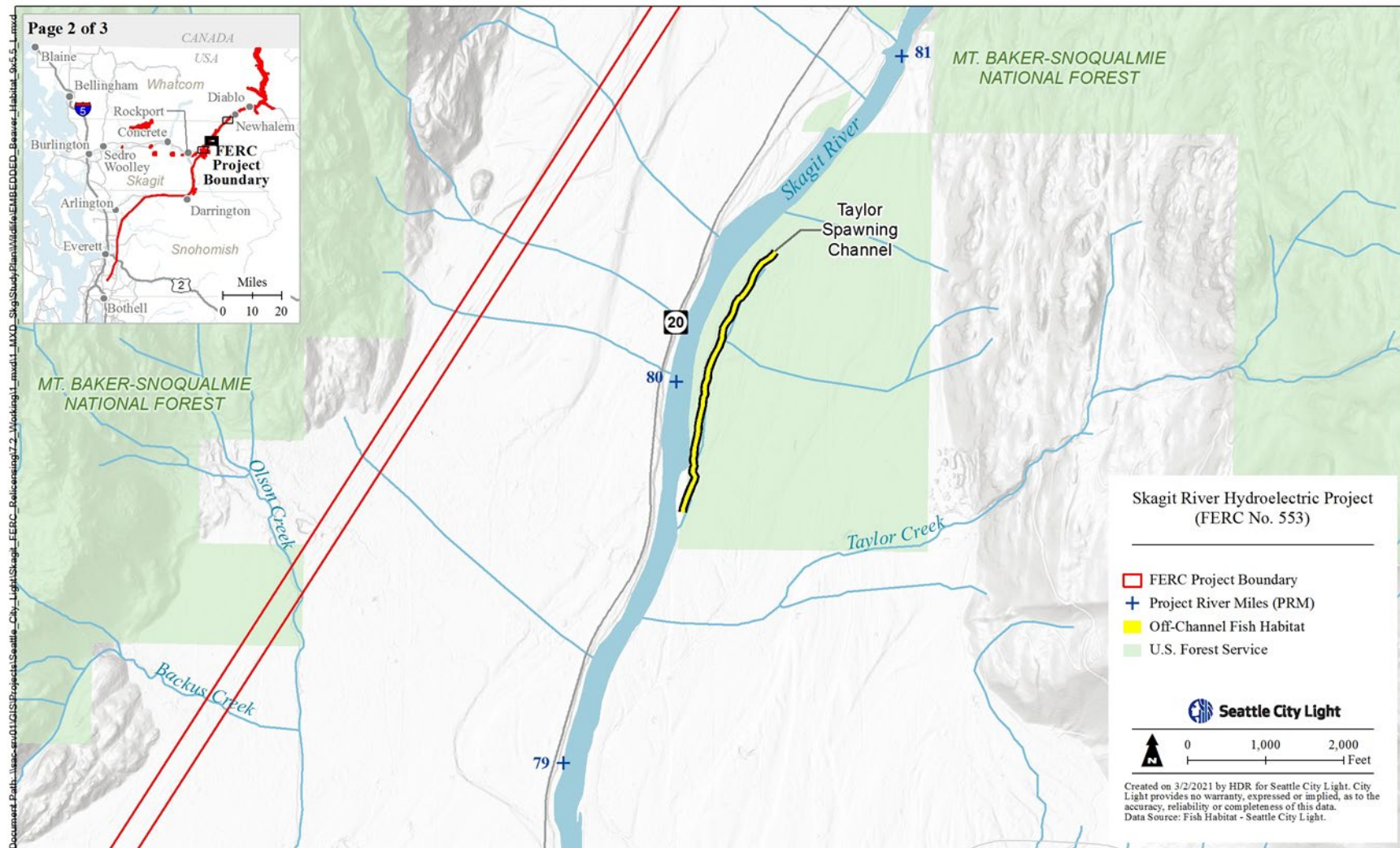


Figure 2.5-3. Chum Salmon spawning channels: Taylor spawning channel.

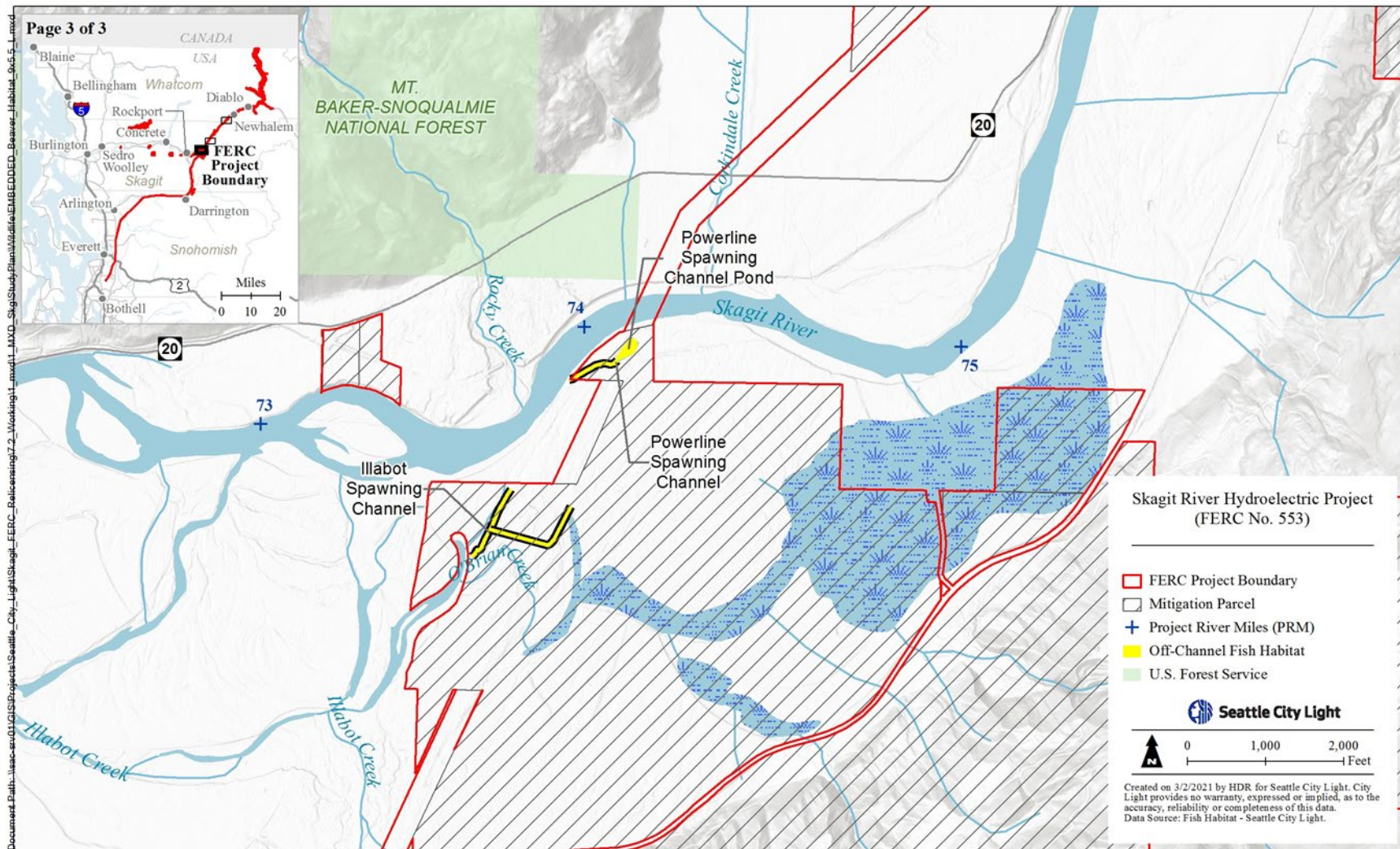


Figure 2.5-4. Chum Salmon spawning channels: Powerline and Illabot spawning channels.

2.6 Methodology

The following sections discuss methods to be used to conduct this assessment.

2.6.1 Evaluate Existing Conditions and Management Activities at Constructed Off-Channel Habitat Areas

The FCC/NFCC is responsible for overseeing fisheries flow and habitat elements of the existing license and is discussing the future viability and management objectives for the constructed Chum channels. The degree to which existing channels are evaluated for beaver management options will be dependent on the outcome of that assessment.

For any channels deemed important to be maintained, the following evaluation will be conducted. Existing information on salmon use, beaver occurrence, and past management activities at each of the off-channel Chum habitat sites will be summarized. Wetland/riparian vegetation mapping and plant species occurrence data collected during the Vegetation Mapping Study and Wetland Assessment studies will be combined with Light Detection and Ranging (LiDAR) to map and describe morphological and habitat conditions at each channel. Past beaver dam locations will be mapped and described from Upper Skagit Indian Tribe and City Light observations. Available photos will be included to show conditions. The Geomorphology Study will assess the current geomorphic and habitat conditions of the Chum channels, as well as hydrologic connectivity, water depth, velocity, and shear stress using the Instream Flow Model results for various flows.

2.6.2 Map Beaver Occurrence within the Project Boundary

To characterize existing distribution of beaver in the study area, City Light will summarize all relevant information obtained from Indian tribes, NPS, USFS, or other entities. All inactive and active beaver dams, concentrated beaver sign, or individual beavers observed during the relicensing studies will be mapped with Global Positioning System (GPS). Terrestrial field teams will use a data form (attached to this study plan) to collect information on beaver and habitat sightings during fieldwork. Information will be entered into a GIS database and displayed on a map to show beaver occurrence per study area.

2.6.3 Beaver Habitat Assessment

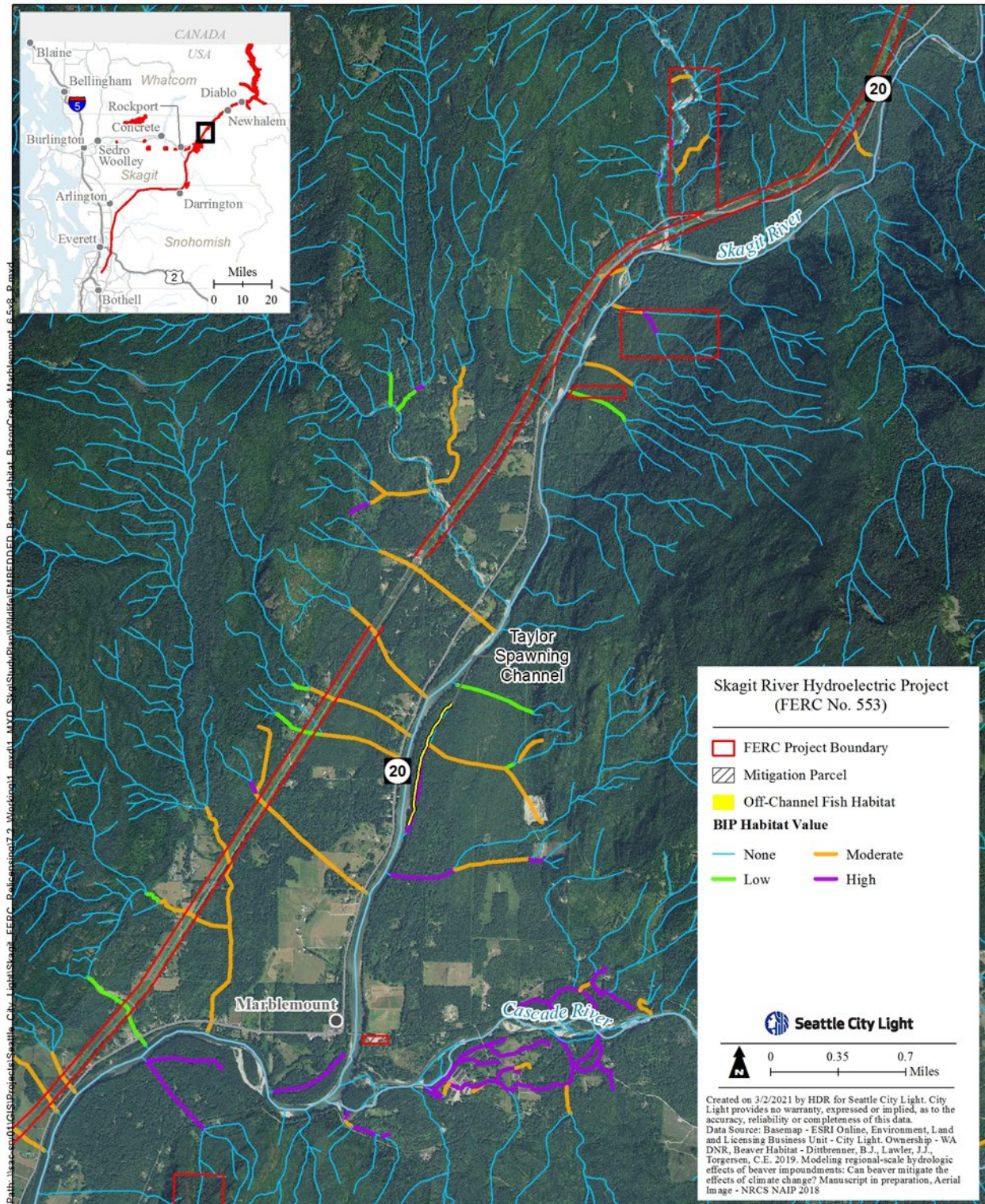
According to MacFarlane et al. (2014), there are five primary habitat conditions necessary for beaver dam occurrence: (1) a perennial water source; (2) availability of forage and dam building materials (woody deciduous vegetation); (3) ability to build a dam at baseflow; (4) likelihood of dams to withstand a typical flood; and (5) likelihood that stream gradient would not limit or completely eliminate dam building by beavers. As described in Section 2.3 of this study plan, several authors (e.g., Pollock et al. 2018; Dittbrenner et al. 2018; Tulalip Tribes 2015) have utilized geomorphic characteristics to map BIP and to use the mapping results to select beaver relocation sites.

City Light has reviewed GIS data of modeled BIP mapping of stream segments in Whatcom, Skagit, and Snohomish counties provided by B. Dittbrenner, a local beaver expert with Beavers Northwest, whose research is mentioned above (Dittbrenner 2019a). The GIS data rates habitat potential based on a combination of hydrogeomorphic characteristics such as stream gradient, stream size, and size of the valley bottom (Dittbrenner et al. 2018). This current assessment assigns a BIP-score data ranking of 0-3, (BIP scores: 0 = no habitat value, 1 = low value, 2 = moderate,

and 3 = high value) to each stream segment. Examples of the existing mapping are shown in Figures 2.6-1 and 2.6-2).

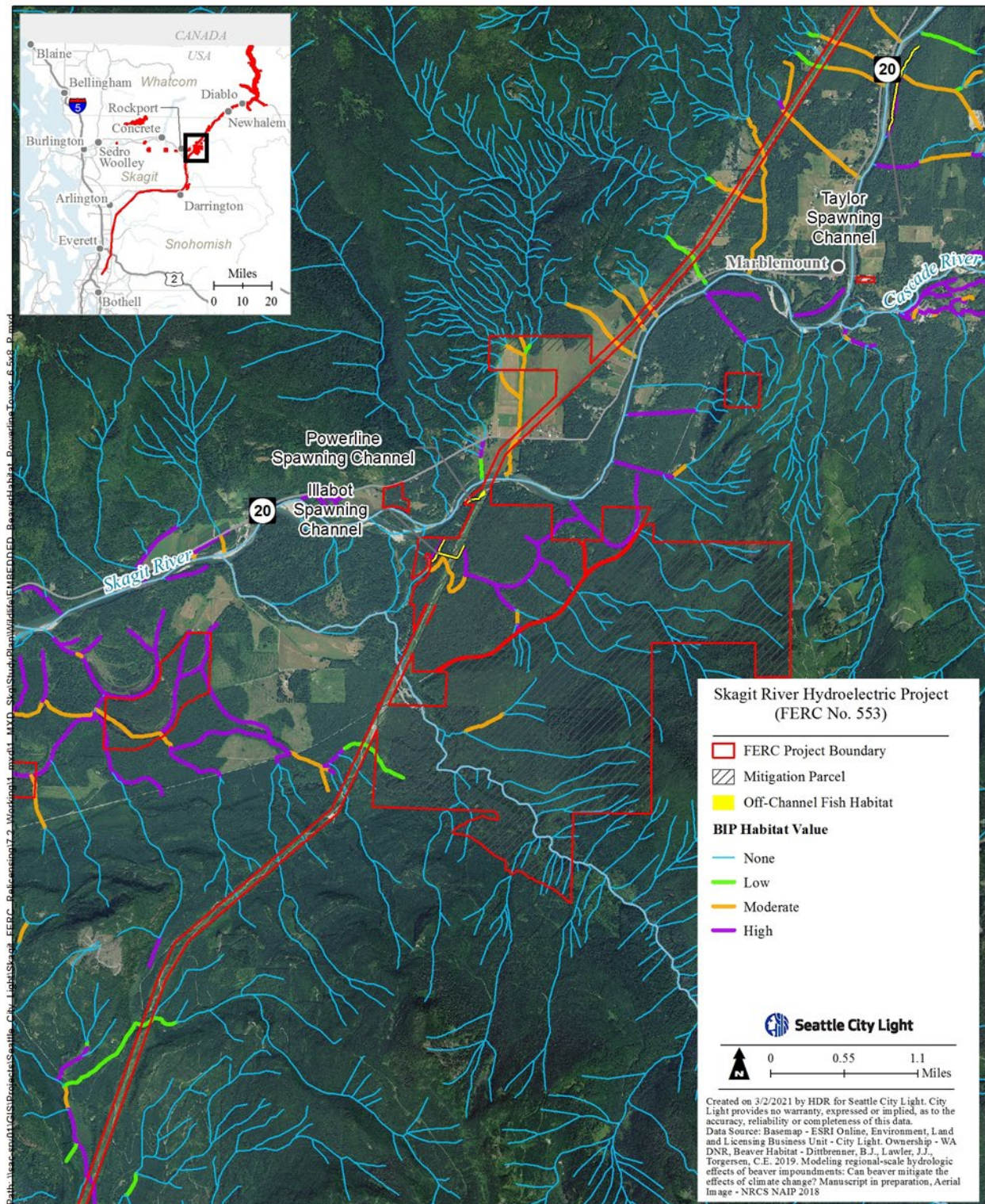
City Light will use the BIP mapping classifications (Dittbrenner 2019b) to characterize and assess stream segments within the study area. Remote sensing of aerial photography, LiDAR, and field observations will be used to verify and update parameter values in the BIP database for any segments that appear to be inaccurately characterized in the currently available dataset. A representative number of locations, up to 10 accessible sites, within the Project Boundary will be verified in the field. Changes will be tracked in the database and field verified, as appropriate. This effort will include consultation with expert staff from Beavers Northwest, as needed. Desktop analysis of BIP mapping supplemented with field observations of beaver sign and habitat conditions made during terrestrial studies and incidental observations of beaver and beaver sign from relicensing studies will be combined with the results of the Vegetation Mapping Study and Wetland Assessment studies and review of aerial photography and LiDAR to qualitatively identify areas that have high beaver habitat potential within two miles of the Project Boundary and in the CMZ downriver to the Sauk River confluence.

The BIP, habitat data, beaver activity locations, and landownership mapping will then be analyzed in GIS to identify locations of higher quality habitat to create a GIS database. This database and associated relicensing study results can be used to consider beaver relocation as potential PME measures, if deemed appropriate in coordination with LPs.



Source: Dittbrenner 2019b.

Figure 2.6-1. Beaver Intrinsic Potential between Bacon Creek and Marblemount.



Source: Dittbrenner 2019b.

Figure 2.6-2. Beaver Intrinsic Potential near Taylor, Powerline, and Illabot spawning channels.

2.7 Consistency with Generally Accepted Scientific Practice

This assessment uses methods consistent with those used by experts in beaver ecology, fisheries, hydrology and restoration to evaluate options for modifying the off-channel salmon channels or pursuing other options for Chum habitat management. The method for analyzing beaver habitat suitability follows approaches used in recent beaver habitat modeling and published studies.

2.8 Schedule

- Channels Existing Conditions Assessment – April 2021
- Field Mapping Verification – May 2021 to September 2021
- Incidental Observations of Beaver Sign in Field – April 2020 to September 2022
- BIP Map Review and Refinement – March 2021 to June 2021
- GIS Analyses – Fall/Winter 2021-2022
- Final Report (Initial Study Report [ISR]) – March 2022

As some relicensing studies will continue fieldwork during the 2022 field season and potentially document additional beaver or beaver habitat occurrences, an addendum report with any additional beaver observations would be issued in late 2022.

2.9 Level of Effort and Cost

The initial estimate for implementation and reporting associated with this study is approximately \$70,000.

3.0 REFERENCES

- Allen, A.W. 1983. Habitat suitability index models: beaver. FWS/OBS-82/10.30 (Revised). Washington, DC: U.S. Department of the Interior, Fish and Wildlife Service. 20 p.
- Beechie, T.J., B.D. Collins, and G.R. Pess. 2001. Holocene and recent geomorphic processes, land use, and salmonid habitat in two North Puget Sound River Basins. 194 In: Geomorphic Processes and Riverine Habitat (Dorava, J.M., D.R. Montgomery, B.B. Palcsak, F.A. Fitzpatrick, eds.). Water Science and Application Volume 4, pp.37-54.
- Dittbrenner B.J., M.M. Pollock, J.W. Schilling, J.D. Olden, J.J. Lawler, and C.E. Torgersen. 2018. Modeling intrinsic potential for beaver (*Castor canadensis*) habitat to inform restoration and climate change adaptation. PLoS ONE 13(2): e0192538. [Online] URL: <https://doi.org/10.1371/journal.pone.0192538>. Accessed: January 9, 2020.
- Dittbrenner, B.J. 2019a. Personal communication between Ben Dittbrenner and Ron Tressler, Seattle City Light, September 23, 2019.
- _____. 2019b. Restoration potential of beaver for hydrological resilience in a changing climate. Ph.D. dissertation. University of Washington, Seattle.
- Envirosphere Co. 1988. Study of Skagit Dams Original Impacts on Wildlife and Fish Habitats and Populations. Prepared for Seattle City Light. 212 pp.
- Hall, J. and J.P. Shannahan. 2009. Management of beaver in constructed off-channel spawning habitat for salmon on the upper Skagit River floodplain. Report prepared for Skagit River Non-Flow Plan Coordinating Committee. Prepared by Hall and Associates Consulting, Inc. and Upper Skagit Indian Tribe. 27pp.
- Macfarlane W.W., J.M. Wheaton, and M.L. Jensen. 2014. The Utah Beaver Restoration Assessment Tool: A Decision Support & Planning Tool. Ecogeomorphology and Topographic Analysis Lab, Utah State University, Prepared for Utah Division of Wildlife Resources, Logan, Utah, 142 pp. [Online] URL: <http://etal.usu.edu/BRAT/>. Accessed: January 9, 2020.
- Pollock, M.M., G.R. Pess, T.J. Beechie, and R. Montgomery. 2004. The Importance of Beaver Ponds to Coho Salmon Production in the Stillaguamish River Basin, Washington, USA. North American Journal of Fisheries Management 24:749–760.
- Pollock, M.M., G.M. Lewallen, K. Woodruff, C.E. Jordan, and J.M. Castro (Editors). 2018. The Beaver Restoration Guidebook: Working with Beaver to Restore Streams, Wetlands, and Floodplains. Version 2.01. United States Fish and Wildlife Service, Portland, Oregon. 189 pp. [Online] URL: <http://www.fws.gov/oregonfwo/ToolsForLandowners/RiverScience/Beaver.asp>. Accessed January 9, 2020.
- 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.


Tulalip Tribes. 2015. FY 2013 Noncompetitive Tribal Projects for Restoration and Protection of Puget Sound Evaluating the use of beaver relocation as an ecosystem tool in headwater streams of the Snohomish River Basin Project Deliverable: Beaver Relocation Strategy Report. [Online] URL: <http://blogs.nwifc.org/psp/files/2017/12/Beaver-Relocation-Strategy-Report.pdf>. Accessed December 13, 2019.

BEAVER HABITAT ASSESSMENT REVISED STUDY PLAN

ATTACHMENT A

RCW 77.32.585. RELEASE OF WILD BEAVERS

(1) The department shall permit the release of wild beavers on public and private lands with agreement from the property owner. (2) The department may limit the release of wild beavers to areas of the state where: (a) There is a low probability of released beavers becoming a nuisance or causing damage; (b) Conditions exist for released beavers to improve, maintain, or manage stream or riparian ecosystem functions; and (c) There is evidence of historic endemic beaver populations. (3) The department may condition the release of beaver to maximize the relocation's success and minimize risk. Factors that the department may condition include: (a) Stream gradient; (b) Sufficiency of the water supply; (c) Stream geomorphology; (d) Adequacy of a food source; (e) Proper site elevation and valley width; (f) Age of the beavers relocated; (g) Times of year for capture and relocation; (h) Requirements for the capture, handling, and transport of the live beavers; (i) Minimum and maximum numbers of beavers that can be relocated in one area; and (j) Requirements for the permit holder to initially provide supplemental food and lodge building materials. (4) The department may require: (a) Specific training for those involved with capture, handling, and release of beavers; and (b) The notification of any potentially affected adjacent landowners before permitting the release of wild beavers. (5) Nothing in this section creates any liability against the state or those releasing beavers nor authorizes any private right of action for any damages subsequently caused by beavers released pursuant to this section. (6) For the purposes of this section, "beaver" means the American beaver (*Castor canadensis*). (7) For the purposes of this section, beavers may only be released to carry out relocation: (a) Between two areas east of the crest of the Cascade mountains; or (b) between two areas west of the crest of the Cascade mountains. [2017 c 82 § 1; 2012 c 167 § 2.] NOTES: Finding—2012 c 167: "The legislature finds that beavers have historically played a significant role in maintaining the health of watersheds in the Pacific Northwest and act as key agents in riparian ecology. The live trapping and relocating of beavers has long been recognized as a beneficial wildlife management practice, and has been Beaver Management Technical Paper #2: Current Laws, Policies, and Practices King County Science and Technical Support Section F-2 September 2018 successfully utilized to restore and maintain stream ecosystems for over fifty years. The benefits of active beaver populations include reduced stream sedimentation, stream temperature moderation, higher dissolved oxygen levels, overall improved water quality, increased natural water storage capabilities within watersheds, and reduced stream velocities. These benefits improve and create habitat for many other species, including endangered salmon, river otters, sandhill cranes, trumpeter swans, and other riparian and aquatic species. Relocating beavers into their historic habitat provides a natural mechanism for improving the environmental conditions in Washington's riparian ecosystems without having to resort to governmental regulation or expensive publicly funded engineering projects." [2012 c 167 § 1.] Beaver Management Technical Paper #2: Current Laws, Policies, and Practices King County Science and Technical Support Section G-1 September 2018

SOP FOR MAINTENANCE BMPs IN SENSITIVE AREAS*: BEAVER DAM MAINTENANCE	 City of Seattle
<p>TASK DESCRIPTION:</p> <p>PERMITS:</p> <p>RESTRICTIONS:</p> <p>EQUIPMENT:</p> <p>PROCEDURE:</p>	<p>Task # 607 (Inspection) & 608 (Maintenance) The periodic removal of loose sticks and debris from beaver dams that directly affect trash racks. Partial circumvention or full removal may also be needed when barriers inhibit fish migration or create a flooding potential.</p> <p>A copy of the general Hydraulic Project Approval (HPA) for this activity is required if occurring in a riparian corridor and must be on site during the work.</p> <p>Care must be taken when circumventing and modifying dams to prevent accumulated sediment from creating excessive turbidity. Dams are not to be removed unless removal is the stated objective in the HPA. In most cases the dam is being modified to minimize blockages and accumulations on trash racks and allow fish migration. Care must be taken to prevent turbidity during modifications.</p> <p>Hand tools - rakes, shovels, etc.</p> <p>Approach the work situation carefully. Sticks and branches may be slick and a fall hazard exists. During periods of high flow there may be danger of drowning. Always perform this task with assistance. Avoid soil disturbance and vegetation removal whenever possible. When approaching the dam from the downstream side, visually check for stability before entering the streambed. Remove any debris from any downstream trash racks first. When working on the dam, several options may be available depending on your situation and the desired outcome.</p> <p><i>Dam modification to prevent trash rack blockage:</i> This involves removing only the most recent unstable material from the dam or removing recent materials to get the dam back to a stable state. Working the top of the dam remove any loose materials, sticks and branches that are not adequately secured. All removal needs to happen gradually to prevent significant increase in flows that may cause turbidity. If removing a substantial portion of a dam, proceed in stages to allow the water levels to drop slowly. If removal will occur below the accumulated sediment line, utilize additional BMP's to prevent turbidity. During certain times of year flow can be maintained by installing 4" pipes through the dam to allow water to pass. This is practical in younger dams without a lot of silt buildup. Avoid any water noise. Downstream ends of pipe should be submerged to prevent splashing. Water noise will trigger dam building.</p> <p><i>Dam modification to allow for fish migration.</i> Locate the most accessible part of the dam. Create an opening at the top of the dam to increase flow in a concentrated area. Reposition the sticks and debris to create an aquatic corridor over the dam. If the difference in elevation between the creek bed and backwater is greater than 18", remove a portion of the upper dam to lower the backwater level, or elongate the corridor to keep slope grades to a minimum. Stabilize the corridor as much as possible to prevent blowout. Insure there are no sticks jutting into the corridor that may injure fish.</p> <p><i>Dam modification for flood prevention and eventual breakup.</i> When Beaver build dams in areas where flooding and eventual dam blowout are inevitable, structural modification and controlled removal may be necessary. Dam removal must be approved before undertaking. WDFW would prefer that dams stay in place under most circumstances to create fish habitat. Take caution to allow water levels behind the dam to lower slowly to minimize turbidity. If no threat of downstream blockages exists, leave as much organic debris in the creek as possible.</p> <ul style="list-style-type: none"> - If significant vegetation has been disturbed (i.e., trampled or uprooted, and lots of exposed soil), contact Kevin Flanagan for site restoration guidance at 386-1802. <p>* The Standard Operating Procedure (SOP) detailed above is specific to the implementation of Best Management Practices (BMPs) for protecting sensitive areas and minimizing disturbance during routine maintenance activities. This is not meant to act as guidance on the mechanical aspects of the specified maintenance activity.</p>

BEAVER HABITAT ASSESSMENT REVISED STUDY PLAN

ATTACHMENT B

**SKAGIT RIVER HYDROELECTRIC PROJECT BEAVER SIGHTING
AND HABITAT FORM**

Skagit River Hydroelectric Project Beaver Sighting and Habitat Form

Date: _____ **Site ID:** _____ **Observer:** _____
GPS/Map Point No.: _____ **Subwatershed:** _____

Lat/Long Coordinates: _____ **Location Description** _____

Landowner (if known): _____

Observation(s): Beaver(s) No. adults/kits : Scat Dam Lodge Bank Den

Slide Food Cache Harvest Site

Age of Sign: Fresh Old

Stream Gradient: $\leq 3\%$ 4-6% 7-9% $\geq 9\%$

Habitat Unit Size: Extensive stretch / Small isolated pocket

Aquatic width (ft): _____

Community Type: Stream or Wetland (circle one)

Dominant Vegetation: Herbaceous Shrub Forest

Dominant Trees/Shrub(s): willow alder cottonwood other deciduous Conifer

Tree Canopy Cover $>50\%$?: Y / N

>50 percent of trees 1–6 inches dbh?: Y / N

>25 percent deciduous shrub canopy cover?: Y / N

Shrub height > 3.3 ft (1 m) tall?: Y / N

Herbaceous Food: Grasses and forbs abundant No Grass/Forbs Present

Photo number(s): _____

Conflicts: _____

Notes: _____

BEAVER HABITAT ASSESSMENT REVISED STUDY PLAN

ATTACHMENT C

**CITY LIGHT RESPONSES TO LP COMMENTS ON THE STUDY PLAN
PRIOR TO PSP**

Table 1. City Light responses to LP comments on the study plan prior to PSP.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
1.	Brock Applegate (WDFW)	05/11/2020	Section 1.2 Relicensing Process	1 st paragraph - Delete: effort Add: consultation	Change made in different location of sentence and paragraph. Text modified to include discussion and consultation.
2.	Brock Applegate (WDFW)	05/11/2020	Section 1.3 Study Plan Development	1 st Paragraph – Add: (<i>Castor canadensis</i>)	Change made in different location. Name of issue form did not include beaver scientific name.
3.	Jon-Paul Shannahan (Upper Skagit Indian Tribe)	05/11/2020	Section 1.3 Study Plan Development	NPS performs the survey and monitoring work at Park slough	Thank you for the clarification. Text added to make that clear.
4.	Jon-Paul Shannahan (Upper Skagit Indian Tribe)	05/11/2020	Section 1.3 Study Plan Development	Beaver dam building has been episodic across all channels, and are located throughout each channel, they are not limited to the outlet of channels.	Thank you. Text modified to incorporate this information.
5.	Jon-Paul Shannahan (Upper Skagit Indian Tribe)	05/11/2020	Section 1.3 Study Plan Development	Other aquatic species are also blocked	Thank you. Text modified to incorporate this information.
6.	Jon-Paul Shannahan (Upper Skagit Indian Tribe)	05/11/2020	Section 1.3 Study Plan Development	(3) Evaluation and feasibility study for a beaver relocation project through the project area.	Information added.
7.	Rick Hartson (Upper Skagit Indian Tribe)	05/08/2020	Section 1.3 Study Plan Development	This can be confidently inferred based on the overlap between known beaver habitat preferences and project-related impacts to floodplains. Beavers utilize low-gradient areas capable of supporting wetland habitats. As such, groundwater levels and the duration, extent, and timing of floodplain inundation affect the presence and quality of beaver habitat. Project-related flood control and power generation alter patterns of floodplain inundation; altered river hydrology and channel incision may lower the	Under current conditions, beaver appear to be well-distributed throughout the Skagit River floodplain in areas where altered land use or beaver removal is not occurring. The fact that the Chum channels and ponds as well as many sites on City Light mitigation lands have beaver-maintained wetlands is illustrative of beaver being well-distributed. The proposed study will document intrinsic beaver habitat potential within 2 mile of the Project Boundary and record beaver sign incidentally so there will be

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				groundwater table. We are requesting these impacts to beaver habitat be quantified. Other studies or available information will be used to understand how impaired beaver habitat reduces the quality and availability of off-channel salmonid habitats.	information beaver occurrence. The Wetland Assessment study and Skagit River Geomorphology Between Gorge Dam and the Sauk River study will provide information on wetlands on the Skagit River floodplain between the Gorge Powerhouse and the confluence of the Skagit and Sauk rivers. The planned update of the Wildlife Mitigation Lands Management Plan will incorporate beaver habitat maintenance along with fish and wildlife habitat and cultural resources protection.
8.	Brock Applegate (WDFW)	05/11/2020	Section 1.3 Study Plan Development	WDFW would postulate that the Project reduces migration between the bottom and the top of the Project.	Thank you for the comment. There are beaver above, throughout, and below the Project reservoirs so there is no demonstrated evidence that the Project reduces migration. City Light would appreciate receiving any information that supports the WDFW hypothesis from LPs.
9.	Jon-Paul Shannahan (Upper Skagit Indian Tribe)	05/11/2020	Section 1.3 Study Plan Development	In the last license study period (Envirosphere 1988) beaver were chosen as an evaluation species to represent riverine, riparian, and palustrine habitat types upstream of the dams. The 1988 study did not evaluate downstream project impacts on beaver or their habitat suitability, but the report highlighted significant impacts in the reservoir areas under post impoundment conditions- which are currently maintained due to project operations.	Thank you for your comment. The cited report selected beaver along with other target wildlife species to characterize habitat effects of the Project from the original reservoir inundation. The study results were used to develop the Wildlife Settlement Agreement signed by all parties that included habitat acquisition/ management, wildlife research, and NPS ecological monitoring funding to compensate for those effects.
10.	Curtis Clement (Upper Skagit Indian Tribe)	05/08/2020	Section 1.3 Study Plan Development	Instream flows affect water levels and flow in the chum channels, being fed by hyporheic exchange, groundwater, or backwatering. It has been observed that during low Skagit mainstem flows the chum channel water levels drop to nearly zero and the altered bed of the chum	Thank you for the comment. The instream flow study will develop a hydraulic model of the Skagit mainstem from Gorge Powerhouse to the Sauk which will be used to simulate water levels in that reach. The

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				channels become impassable even after beavers are gone. Please link instream flow study to examine this relationship.	simulation results could be used to support evaluation of water levels in the Chum channels. There is an action item for the Flow Coordinating Committee/Non-Flow Coordinating Committee (FCC/NCC) to form a subgroup tasked with evaluating deficiencies in the Chum channels. Bringing these observations/data/reports to the FCC/NCC will be important as the subgroup and committee evaluates alternative actions for these channels.
11.	Brock Applegate (WDFW)	05/11/2020	Section 1.3 Study Plan Development	WDFW would prefer the relocation alternative, but SCL should address the ability of beaver to return to the same area after they move the beavers.	<p>Thank you for the comment.</p> <p>City Light would appreciate receiving any information related to this topic from LPs. This conclusion assumes that parties agree that the Chum channels should be maintained for salmon and that no engineering alternatives are feasible. Please note that full relocation program would require much more intensive, and likely multiple, evaluations of proposed release sites that are selected from potential sites identified in this assessment. That intensive assessment would need to occur outside of the scope of this study plan, at a later time. City Light would be willing to cooperate with LPs and affected landowners if this is pursued.</p> <p>As there are beaver throughout the Skagit River floodplain, it is virtually certain that beavers from nearby areas will disperse and re-establish colonies at Chum channels. Relocation is an option that often is successful on a temporary basis and as part of a longer term management or monitoring approach; beaver will likely move throughout the Project vicinity and may return.</p>

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
12.	Shauna Hee (USFS)	05/10/2020	Section 2.1 Study Goals	Conflicts: Would be helpful to have the conflict described. Are incoming salmon not able to jump over the beaver dams? Is there a problem with insufficient stream pool depth for chum in summer early fall? The SOP for Beaver dam maintenance in the appendix has dam lowering if there is a difference of 18 inches? is that based on height fish are not able to breach?	Text edited to add details. The City of Seattle Standard Operating Procedure includes the 18-inch height as part of the general guidance for modifying beaver dams to maintain fish access. The height was based on WDFW information (see Comment #13). The SOP is included as example only and, as noted in the study plan and in the SOP, a HPA which can include more specific measures is required for instream work. The beaver dam modifications at the Chum channels have been completed under HPA obtained from WDFW.
13.	Brock Applegate (WDFW)	05/11/2020	Section 2.1 Study Goals and Objectives	Biologist have traditionally considered a 1.5-foot step upstream, a barrier to fish passage, especially for chum.	Thank you for the information. We have seen other maximum drops in fishways presented in literature. If WDFW or other LPs have current guidance on this topic, City Light would appreciate receiving it.
14.	Jon-Paul Shannahan (Upper Skagit Indian Tribe)	05/11/2020	Section 2.1 Study Goals and Objectives	This is a limited interpretation of the intended goal statement submitted by USIT; “The goals of this study are to characterize the ongoing beaver conflicts at the Projects’ Chum channels, characterize beaver habitat suitability in the project area, and assess how operations impact the abundance, distribution and movement of beaver through the project area, and then assess feasibility of a relocation program.	At the July 30, 2019 TRREWG meeting we discussed the Issue Form. City Light agreed to assess the beaver conflict issues at the Project’s Chum channels and conduct the general beaver occurrence and habitat mapping. However, City Light does not believe there is a documented Project effect on overall movement or distribution of beaver in the Skagit River watershed.
15.	Rick Hartson (Upper Skagit Indian Tribe)	05/08/2020	Section 2.1 Study Goals and Objectives	Additional objectives: 1) Assess how the project has degraded available beaver habitat, including areas no longer suitable for beaver colonization. 2) Consider how changes to current operations (e.g. process flows, wood and sediment reintroduction) could support natural off-channel habitat formation and	See response to Comment #14. The Draft License Application (DLA) will evaluate proposed Project operations effects on side- and off-channel wetlands and fish habitat.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				reduce needs for beaver management.	
16.	Brock Applegate (WDFW)	05/11/2020	Section 2.1 Study Goals and Objectives	Should we analyze if these channels even increase chum habitat? Do chum produce in these channels? Can we manage other things more effectively to increase the chum population?	As part of the Chum channel evaluation, City Light is open to working with the LPs to assess channel efficacy. Depending on the outcome of this assessment, the need for additional beaver management at the sites could be unnecessary.
17.	Brian (uploaded by Jon-Paul Shannahan) (Upper Skagit Indian Tribe)	05/05/2020	Section 2.1 Study Goals and Objectives	Specific language here to identify relocation sites to enhance ecological function within the Project boundary would be useful [Comment highlights on 3 objectives for study.]	Bullet #3 text revised. Also see revised text in last paragraph of Section 2.6.3.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
18.	Jon-Paul Shannahan (Upper Skagit Indian Tribe)	05/11/2020	Section 2.1 Study Goals and Objectives	Reservoir seasonal elevation management and riverine flow fluctuations may limit beaver colonization in the floodplains areas adjacent to Skagit mainstem. We are looking to map existing suitable habitat then assess projects hydrologic operations that may reduce habitat suitability.	There is no indication that the beaver population along the Skagit River is adversely affected downriver of the Project. Beavers occupy numerous channels, tributaries, and sloughs. Beaver Intrinsic Potential (BIP) mapping will cover areas within 2 miles of the Project Boundary (this captures the entire floodplain and some adjacent lands between Newhalem and the Sauk River) so there will be a map of habitat suitability. The mapping and characterization of floodplain wetlands will be combined with modeling tools to describe inundation and connections under different flows. This will then be used in the DLA to assess effects of proposed operations.
19.	Jon-Paul Shannahan (Upper Skagit Indian Tribe)	05/11/2020	Section 2.2 Resource Management Goals	USIT considers beaver a keystone species. The Tribe would like to assess habitat suitability across project area (reservoirs, river and floodplains) compared to ongoing projects operations throughout the project area including the 100 year floodplain of the project. "Immediate watershed" has no geographic context.	Text revised to replace "immediate" with "...within a 2-mile buffer of the Project, which includes the 100-year floodplain and segments of adjacent tributaries of the Skagit" The study area captures all areas within the 100-year floodplain upriver of the Sauk and 2 miles of tributaries around the reservoirs.
20.	Brock Applegate (WDFW)	05/11/2020	Section 2.2 Resource	Do we have other management actions that can help chum?	Exploring options for managing Chum Salmon is a discussion well-suited for the Fish and Aquatics RWG. This study plan focuses on

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
			Management Goals		ongoing beaver conflicts at the off-channel sites. Other management actions for Chum Salmon not related to the beaver conflicts are outside the scope of this study.
21.	Shauna Hee (USFS)	05/10/2020	Section 2.2 Resource Management Goals	Add the MBSNF LRMP 1990, as amended, management goals and direction. Taylor Channel is on FS managed land and is outside of the project boundary.	Thank you. Information has been added to the text.
22.	Shauna Hee (USFS)	05/10/2020	Section 2.3 Background and Existing Information	Good to have the identification of where a beaver deceiver works and where it doesn't. What site conditions are favorable to deceiver success? What sites within the watershed has beaver dam removal occurred and where have deceivers have been utilized with success and failure? Please include descriptions.	Thank you for your comment. These are good questions but broader in scale than can be described in the study plan. This information will be taken into consideration when determining best management approaches. We refer you to the Beavers Northwest website (http://www.beaversnw.org/) and the Beaver Restoration Handbook (Pollock et al. (2018) for specific information.
23.	Rick Hartson (Upper Skagit Indian Tribe)	05/08/2020	Section 2.3 Background and Existing Information	Dams and associated altered flows are hydromodifications. For example, see National Management Measures to Control Nonpoint Source Pollution from Hydromodification (EPA, 2007).	Thank you for your comment.
24.	Rick Hartson (Upper Skagit Indian Tribe)	05/08/2020	Section 2.3 Background and Existing Information	Indeed, dams and regulated flows are not the only factor affecting beavers and their habitat. That does not preclude Seattle City Light from mitigating for impacts caused by the project.	Thank you for your comment.
25.	Jon-Paul Shannahan (Upper Skagit Indian Tribe)	05/11/2020	Section 2.3 Background and Existing Information	The USIT has also adjusted instream LWD, build beaver exclusionary fencing at culverts, planted riparian corridors and lethally executed beaver from their habitats. We have partnered with NOAA to study fish passage and have had several beaver experts provide consultation for the chum channels etc.	Thank you for the information. Text has been added. City Light would appreciate receiving the information from past projects and consultations with NOAA and beaver experts as it will clearly be useful for this study.
26.	Jon-Paul Shannahan	05/11/2020	Section 2.4 Project	1 st paragraph – Add: and egress.	Thank you. Text revised.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
	(Upper Skagit Indian Tribe)		Operations and Effects on Resources	Delete: The Upper Skagit Indian Tribe biologists believe that pond leveler would not be effective at the other channels.	
27.	Shauna Hee (USFS)	05/10/2020	Section 2.4 Project Operations and Effects on Resources	Please provide the USFS with information pertaining to when and why dam removal occurred at Taylor Channel. Taylor Channel is located on USFS managed lands. No date, no beaver activity – past or present – is known at this site.	The degree of conflict at Taylor Channel has not been verified yet so text has been changed to indicate uncertainty. City Light will be compiling information on history of conflicts and maintenance activities as part of the study and will provide to USFS when available.
28.	Shauna Hee (USFS)	05/10/2020	Section 2.4 Project Operations and Effects on Resources	see comment above re: where and why deceivers work	See response to Comment #22.
29.	Brock Applegate (WDFW)	05/11/2020	Section 2.4 Project Operations and Effects on Resources	WDFW would assume that the Project blocks or at least severely reduces beaver migration.	Thank you for the comment. City Light would appreciate receiving any information that supports this comment.
30.	Jon-Paul Shannahan (Upper Skagit Indian Tribe)	05/11/2020	Section 2.4 Project Operations and Effects on Resources	USIT is not implying the utility is solely responsible loss of beavers in the watershed. We are asking for an account of project related activities on the abundance and dispersal of a keystone species. On going project related activities include: Hydrologic surface level fluctuations limit beaver use of the area, with no downstream movement of sediment and LWD downstream in the Skagit below Gorge PH can cause impacts to floodplain inundation, no disturbance flows limits habitat forming processes including recolonization veg species in the riparian and floodplain habitats, noise, light, disturbance and infrastructure limit or impact beaver movement through the project area- by pass is currently a 3 mile barrier for	Thank you for your comment. City Light also recognizes the importance of beaver in river and wetland ecology. However, there is no evidence that beaver are not well distributed in the appropriate habitats in the floodplain or that the Project is creating a barrier. City Light would appreciate receiving any information that demonstrates how the Project limits beavers under current operations. City Light believes that the proposed study will provide useful information to (1) characterize the ongoing beaver conflicts at the Project's Chum Salmon off-channel sites and (2) characterize beaver habitat suitability in the study area so information is available if beaver

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				upstream and downstream movement of these species.	<p>relocation is deemed appropriate. In addition, wetland characterization and instream flow modelling will provide information on connectivity of side and off-channel habitat for beaver and other fauna.</p> <p>A comprehensive resource effects analysis will be developed and integrated during the preparation of the Draft License Application (DLA). License participants will have an opportunity to consider effects of Project-related activities on beaver in their review of the DLA in the National Environmental Policy Act (NEPA) process.</p> <p>City Light has an interest in exploring, as part of a collaborative effort, discussions on beaver management in the watershed, but these discussions are outside the scope of this study plan.</p>
31.	Shauna Hee (USFS)	05/10/2020	Section 2.5 Study Area	Why include the powerline corridor all the way to Bothell? Is relocation to those areas likely?	While relocations might be unlikely along the lower section of the transmission corridor, we proposed to include the area in the assessment in the event that other studies such as the Erosion and Geologic Hazards at Project Facilities and Transmission Line Right-Of-Way or Wetland Assessment reveal issues involving beaver habitat.
32.	Jon-Paul Shannahan (Upper Skagit Indian Tribe)	05/11/2020	Section 2.5 Study Area	Should include floodplain assessment	The mapping will capture beaver habitat on the entire Skagit River floodplain upstream of the confluence with the Sauk River.
33.	Shauna Hee (USFS)	05/10/2020	Section 2.6.1 Evaluate Existing Conditions and	Does existing information include past management actions to control beavers and/or manage vegetation at each of the sites?	Yes. Text has been revised

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
			Management Activities at Off-Channel Habitat Areas		
34.	Curtis Clement (Upper Skagit Indian Tribe)	05/08/2020	Section 2.6.1 Evaluate Existing Conditions and Management Activities at Off-Channel Habitat Areas	In addition to the wood portion of beaver dams, beavers pile up gravel as the base which becomes the substantial barrier at low water even after dams have been removed. This plan should link to instream flows to see if there is potential to keep the beaver dams and their relict bedforms passable during spawning.	Thank you for the comment. Instream flow modelling will be used to help assess channel habitat. Text has been revised.
35.	Curtis Clement (Upper Skagit Indian Tribe)	05/08/2020	Section 2.6.1 Evaluate Existing Conditions and Management Activities at Off-Channel Habitat Areas	Please include water temperature.	City Light is not aware of water quality problems under current conditions and would appreciate receiving any relevant information. City Light acknowledges ongoing discussions with the FCC/NCC in regards to these concerns.
36.	Curtis Clement (Upper Skagit Indian Tribe)	05/08/2020	Section 2.6.1 Evaluate Existing Conditions and Management Activities at Off-Channel Habitat Areas	Also to reduce eutrophication of the channels, which is a big problem at Illabot, and NewHalem ponds possibly due to nitrogen fixing vegetation or lack of flow to remove organic matter and keep temperatures low enough not to fill up with periphyton.	City Light is not aware of water quality problems under current conditions and would appreciate receiving any relevant information. City Light acknowledges ongoing discussions with the FCC/NCC in regards to these concerns.
37.	Shauna Hee (USFS)	05/10/2020	Section 2.6.1 Evaluate Existing Conditions and Management Activities at Off-Channel Habitat Areas	How will the channel be defined? Is there a buffer around the feature that will be used to characterize conditions? Can it be assumed that Taylor Channel will be included as a site in the Wetland Study that would receive field assessment?	The “channel” will include all of the connected and potentially connected channels, ponds, and depressions on the immediate floodplain and sufficient buffer to inform condition assessment. All five of the spawning channels, being routinely maintained, will be targeted for visits as part of the Wetland Assessment study.
38.	Shauna Hee (USFS)	05/10/2020	Section 2.6.1 Evaluate Existing	The USFS is an interested LP.	Thank you. We will coordinate with all LPs so that anyone who is interested can participate.

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
			Conditions and Management Activities at Off-Channel Habitat Areas		
39.	Brian (uploaded by Jon-Paul Shannahan) (Upper Skagit Indian Tribe)	05/05/2020	Section 2.6.2 Map beaver Occurrence in Project Boundary	Would be useful to extend beaver occurrence to entire Skagit watershed to guide any re-location to areas that may be in need for some beaver activity.	BIP data can be provided for entire tri-county area (Whatcom, Skagit, and Snohomish counties) but City Light assessment will focus on the 2-mile buffer from Project Boundary.
40.	Brock Applegate (WDFW)	05/11/2020	Section 2.7 Consistency with Generally Accepted Scientific Practice	1 st paragraph – Add: or pursuing other options for chum habitat management.	Text revised.
41.	Brock Applegate (WDFW)	05/11/2020	Section 2.8 Schedule	6 th bullet – Add: Initial Study (ISR) Add ISR Meeting 2022	<p>Thank you for the comment; City Light acknowledges the ILP milestones provided. The ILP will provide the opportunity for comment on the final report submitted in the ISR and discussed at the ISR meeting; if any components of the study goals and objectives are not met in the first year, or there are anomalous conditions, any party may propose additional work or request additional study per FERC ILP regulations.</p> <p>No changes were made to the schedule in the draft study plan as City Light intends to complete the study within one year and wants to be clear with FERC and LPs on the proposed schedule. City Light believes that it will be beneficial to all parties to have complete information from the studies as soon as possible to inform development of management proposals and cross resource analysis.</p>

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
42.	Jon-Paul Shannahan (Upper Skagit Indian Tribe) Rick Hartson (Upper Skagit Indian Tribe)	07/16/2020	Section 2.2 Resource Management Goals	1st list – Add: <ul style="list-style-type: none"> ■“To gain an understanding on how project operations have impacted beaver occupancy through the project area and floodplain, to better address operational alternatives for future programs ■To assess the relationship between beaver occupancy and floodplain habitats used by rearing salmonids, such as Coho salmon use of off-channel ponds.” 	Bullets not added. City Light agreed to assess conflicts at Chum channels and collect information that will aid in describing current distribution of beavers and locations of suitable beaver habitat. This information will be available to inform potential future management actions at the Chum channels and partnerships to improve off-channel and tributary habitats.
43.	Jon-Paul Shannahan (Upper Skagit Indian Tribe)	07/16/2020	Section 2.2 Resource Management Goals	1 st paragraph – Add: “It will also be used to assess potential operational changes that may benefit beaver and salmonid habitat. “	Edit accepted.
44.	Jon-Paul Shannahan (Upper Skagit Indian Tribe) Rick Hartson (Upper Skagit Indian Tribe) Emily Wirtz (Sauk-Suiattle Indian Tribe)	07/16/2020	Section 2.2 Resource Management Goals	Last paragraph – Add Tribe Goals: “The Upper Skagit Indian Tribe (USIT) considers the beaver a keystone species for the Skagit River watershed. The USIT believes that healthy beaver populations are important for riverine and habitat, floodplain dynamics, LWD, hydrology , and off-channel salmonid and other aquatic dependent species habitats and wishes to include beaver abundance and beaver habitat suitability in the assessment of Project hydrologic effects. Additionally, USIT seeks to understand effects to anadromous salmonids, including Coho salmon use of beaver bonds. The USIT have been working with SCL on beaver and off-channel mitigation projects during the last license, and have advanced	Edits accepted, with revision to reflect Sauk-Suiattle Indian Tribe comments that it too considers beaver to be an essential part of ecosystem health for the Sauk and Skagit Watersheds and to specify the following: “(1) It was mostly Tulalip on the Snohomish River effort, Stilly may have assisted some and also have done some beaver work on the Stillaguamish Watershed, (2) It was Stillaguamish and Sauk-Suiattle on the Suiattle Project, (3) that WDFW permit is not required for relocating beavers to USFS lands.”

No.	Commenting Individual (Organization)	Date	Study Plan Section	Comment	Response
				capacity and understanding on how to protect and enhance beaver's ecological interactions in the floodplain with salmon recovery efforts. The tribes collaborate with local, state, and federal agencies and landowners to address beaver conflicts and enhance habitats for salmon throughout the watershed. The Stillaguamish Tribe and Tulalip Tribe have implemented many beaver relocations in the Snohomish River watershed. In the Suiattle River, these two tribes have worked with the USFS and the Sauk-Suiattle Tribe on beaver management projects to benefit salmon."	

**TR-10 NORTHERN SPOTTED OWL HABITAT
ANALYSIS
REVISED STUDY PLAN**

**SKAGIT RIVER HYDROELECTRIC PROJECT
FERC NO. 553**

Seattle City Light

**April 2021
RSP**

TABLE OF CONTENTS

Section No.	Description	Page No.
1.0	Introduction.....	1-1
1.1	General Description of the Project.....	1-1
1.2	Relicensing Process	1-1
1.3	Study Plan Development.....	1-2
2.0	Study Plan Elements	2-1
2.1	Study Goals and Objectives	2-1
2.2	Resource Management Goals	2-1
2.3	Background and Existing Information.....	2-2
2.4	Project Operations and Effects on Resources	2-4
2.5	Study Area	2-4
2.6	Methodology	2-6
	2.6.1 Review Scientific Literature	2-6
	2.6.2 Identify and Map Potentially Suitable Habitat.....	2-6
2.7	Consistency with Generally Accepted Scientific Practice.....	2-8
2.8	Schedule.....	2-8
2.9	Level of Effort and Cost	2-8
3.0	References	3-1

List of Figures

Figure No.	Description	Page No.
Figure 2.5-1.	Overview of study area.	2-5

List of Acronyms and Abbreviations

BMP	best management practice
CBI.....	Conservation Biology Institute
City Light.....	Seattle City Light
dB.....	decibels
ELC	Environmental Learning Center
ESA.....	Endangered Species Act
FERC.....	Federal Energy Regulatory Commission
FIA	Forest Inventory and Analysis
FR.....	Federal Register
GIS	Geographic Information System
LiDAR.....	Light Detection and Ranging
LP	licensing participant
MRLC	Multi-Resolution Land Characteristics
NLCD.....	National Land Cover Database
NPS	National Park Service
NRCS	National Resource Conservation Service
NRF.....	nesting, roosting, and foraging
NSO.....	northern spotted owl
NWFP	Northwest Forest Plan
O&M.....	operations and maintenance
PAD.....	Pre-Application Document
PRM	Project River Mile
Project	Skagit River Hydroelectric Project
RLNRA.....	Ross Lake National Recreation Area
RM	river mile
RSP	Revised Study Plan
RWG	resource work group
STL.....	Stillaguamish Tribe of Indians
U.S.C.....	United States Code
USDA.....	U.S. Department of Agriculture
USDI	U.S. Department of the Interior

USFSU.S. Forest Service
USFWSU.S. Fish and Wildlife Service
USGSU.S. Geological Survey
WDFWWashington Department of Fish and Wildlife

1.0 INTRODUCTION

1.1 General Description of the Project

The Skagit River Hydroelectric Project (Project), licensed to The City of Seattle, Washington, and operated through its publicly-owned electric power utility Seattle City Light (City Light), is located in northern Washington State and consists of three power generating developments on the Skagit River – Ross, Diablo, and Gorge – and associated lands and facilities. The Project generating facilities are in the Cascade Mountains of the upper Skagit River watershed, between Project River Miles (PRM) 94.7 and 127.9 (U.S. Geological Survey [USGS] RMs 94.2 and 127).¹ Power from the Project is transmitted via two 230-kilovolt 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, an Environmental Learning Center (ELC), several recreation facilities, and several parcels of fish and wildlife mitigation lands.

Project generating facilities are all located in Whatcom County, although Ross Lake, the most upstream reservoir, crosses the U.S.-Canada border and extends for about one mile into British Columbia at normal maximum water surface elevation. Gorge Powerhouse, the most downstream facility, is approximately 120 miles northeast of Seattle and 60 miles east of Sedro-Woolley, the nearest large town. The closest town is Newhalem, which is part of the Project and just downstream of Gorge Powerhouse. The primary transmission lines cross Whatcom, Skagit, and Snohomish counties; the fish and wildlife mitigation lands are in the same counties.

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, Diablo, and Gorge lakes.” The legislation maintains the Federal Energy Regulatory Commission's (FERC) 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).

1.2 Relicensing Process

The current FERC license for the Project expires on April 30, 2025, and City Light will apply for a new license no later than April 30, 2023. City Light formally initiated the relicensing process by filing a Notice of Intent and Pre-Application Document (PAD) with FERC on April 27, 2020 (City Light 2020a). The PAD includes descriptions of the Project facilities, operations, license

¹ 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 Project River Mile (PRM) system are provided throughout this document. For further details see Section 7.0 of the main body RSP.

requirements, and Project lands as well as a summary of the extensive existing information available on Project area resources and early consultation on potential resource issues to be addressed during the relicensing. In 2019-2020, City Light convened a series of Resource Work Groups (RWG) to engage agencies and other licensing participants (LP) in the Study Plan Development Process. Discussions with LPs continued in early 2021 with a series of topic-based discussions following filing of the Proposed Study Plan (PSP) on December 8, 2020 (City Light 2020b). This study plan reflects RWG and LP discussion and study requests and comments submitted by LPs.

1.3 Study Plan Development

The northern spotted owl (*Strix occidentalis caurina*) is federally-listed as threatened under the Endangered Species Act (ESA) and State-listed as endangered in Washington State. Northern spotted owls (NSO) in the Western Cascades primarily utilize late successional mature and old-growth forests with large diameter coniferous trees, snags, downed wood, and a closed canopy with multiple canopy layers for nesting and roosting (Davis et al. 2016; Buchanan 2016). Foraging habitat for NSO is similar but may not contain suitable nesting structures to support successful breeding pairs (Sovern et al. 2015).

City Light is filing this TR-10 Northern Spotted Owl Habitat Analysis Study Plan with FERC as part of its Revised Study Plan (RSP), an update to the version that was filed with the PSP and incorporating additional consultation with LPs prior to the filing date. This study plan is in response to study requests made by the U.S. Fish and Wildlife Service (USFWS)(USFWS-19 Impact of the Operations of Skagit Hydroelectric Project (#553) on Northern Spotted Owl) and Stillaguamish Tribe of Indians (STI-06 Spotted Owl Habitat Map). In its study request, the USFWS requested more information on Project effects to NSO and whether NSO could successfully establish around Project reservoirs and mitigation lands. USFWS states if Project activities from operations are located near NSO nesting, roosting, or foraging (NRF) habitat, or tree clearing or other modifications to suitable habitat are planned, then there is potential for disturbing nesting NSO. In its study request, the Stillaguamish Tribe of Indians requested City Light add a NSO habitat map. While existing information does not show a demonstrated effect of the Project on NSO populations, City Light has a mutual natural resource management interest in providing habitat information to inform potential NSO conservation measures and best management practices and has proposed this study in its PSP. This study plan addresses some of the elements identified in the study requests, as explained in Section 6 of the RSP.

PSP comments to this study plan were submitted by USFWS. City Light has responded to comments in the PSP comment/response table appended to the main body of the RSP. No modifications were made to the study plan in response to comments.

2.0 STUDY PLAN ELEMENTS

2.1 Study Goals and Objectives

The goal of this study is to identify and map potentially suitable NSO NRF habitat within the study area.

A NSO habitat suitability model was originally created by the Northwest Forest Plan's (NWFP) Effectiveness Monitoring Program in 2005 for the purposes of assessing trends of NSO populations and their habitat (Davis and Lint 2005). The NWFP Model has since been updated, based on the latest science and species location data (Davis et al. 2016). While the NWFP Model has been used to map suitable NSO habitat in its range and at regional scales, it has not been accurately applied at the local scale in the Skagit River watershed due to the lack of locally available NSO habitat and detection data. Therefore, a more detailed and refined map of suitable NSO habitat (if possible, splitting identified suitable habitat into 2 types: Nesting/Roosting and Foraging) is necessary to characterize baseline conditions, assess potential ongoing Project effects, and inform conservation measures under a new license.

2.2 Resource Management Goals

The NSO Habitat Analysis will inform City Light's long-term resource management. The study will also provide information for resource agencies and Indian tribes with jurisdiction in the Project vicinity to address their respective goals and objectives for resource management. Resource management goals were provided by LPs in their study requests identified in Section 1.3 of this study plan.

The Washington Department of Fish and Wildlife (WDFW), U.S. Fish and Wildlife Service (USFWS), Indian tribes and other natural resource agencies have responsibility to implement specific laws associated with fish and wildlife resources. These include, but are not limited to, the Fish and Wildlife Coordination Act, the Endangered Species Act (ESA), the Migratory Bird Treaty Act, Bald and Golden Eagle Protection Act, etc.).

- **U.S. Fish and Wildlife Service (USFWS)**

The objective of the USFWS Revised Recovery Plan for Northern Spotted Owls (USFWS 2011) is to support the recovery of NSO so that (1) populations are sufficiently large enough and distributed such that the species no longer requires listing under the ESA; (2) adequate habitat is available for NSO and will continue to exist to allow the species to persist without the protection of the ESA; and (3) the effects of threats have been reduced or eliminated such that NSO populations are stable or increasing and NSO are unlikely to become threatened again in the foreseeable future.

The resource management goals are to support the recovery of Northern Spotted Owl according to the USFWS Revised Recovery Plan. The USFWS Recovery Plan, Recovery Objectives are:

- (1) Spotted owl populations are sufficiently large and distributed such that the species no longer requires listing under the ESA;

- (2) Adequate habitat is available for spotted owls and will continue to exist to allow the species to persist without the protection of the ESA; and
- (3) The effects of threats have been reduced or eliminated such that spotted owl populations are stable or increasing and spotted owls are unlikely to become threatened again in the foreseeable future.

- U.S. Forest Service (USFS)

One of the primary objectives of the NWFP was to provide adequate amounts of forest cover to sustain NSO (U.S. Department of Agriculture [USDA] and U.S. Department of the Interior [USDI] 1994), which included the protection of large blocks of late-successional forests and maturing younger forests to support healthy populations of breeding NSO pairs. The goal was to increase the amount of suitable habitat for NSO across its range.

- National Park Service (NPS)

The NSO is considered to be an at-risk species by the NPS within the North Cascades National Park. Preserving and maintaining the species and its habitats is a management priority for the park. NSO detections within the park have become increasingly rare and the number of NSO found in the park is difficult to quantify (Hoffman et al. 2015).

- Washington Department of Fish and Wildlife (WDFW)

The NSO was listed as endangered by the Washington State Fish and Wildlife Commission in 1988 (Buchanan 2016). While the NWFP has significantly reduced the amount of habitat loss for the species, the increasing competition from barred owls (*Strix varia*) has further reduced NSO populations. The species is now considered to be critically imperiled at the state level as population estimates have continued to decline.

2.3 Background and Existing Information

The NSO was listed as a federally threatened species on June 26, 1990 (55 Federal Register [FR] 26114) and a Washington State endangered species in 1988 (Buchanan 2016). The NSO was listed because of widespread loss of temperate old-growth forest habitat across its range and inadequacy of existing regulatory mechanisms to conserve the spotted owl (USFWS 2011). The range of this species is from southwestern British Columbia through western Washington, western Oregon, and the Klamath Mountains and Coast Ranges of northwestern California south to San Francisco Bay (55 FR 26114). Critical habitat for NSO was designated in 1992, revised in 2008, and again in 2012 (77 FR 71876).

The NSO is a nocturnal owl species and resident of structurally complex forests. It prefers late-successional mature and old-growth forest or forests with old-growth characteristics. Preferred nesting and roosting habitat include a multi-story forest containing a diversity of tree species, moderate to dense canopy cover (>60 percent) dominated by large trees with a high incidence of cavities or broken tops, sufficient open space below the canopy for flight, and an accumulation of woody debris on the ground (USFWS 2011). NSO usually nest in tree and snag cavities or in broken tops of large trees. They less frequently nest in mistletoe clumps and abandoned raptor and raven nests (Zeiner et al. 1990).

NSO are territorial, although home ranges of adjacent pairs can overlap. The size of the home range varies with geography. Along the Cascade Range, the estimated average home range size is 2,955 acres (USFWS 2011). Variability in home range size has been attributed to differences in local prey species. In the Cascade Range of Washington, NSO feed predominantly on flying squirrels (Hamer et al. 2001; USFWS 2011). However, NSO will feed on a variety of prey items, including small mammals, birds, amphibians, reptiles, and insects (Zeiner et al. 1990; USFWS 2011). Foraging habitat for NSO is similar to nesting and roosting habitat but may not contain suitable nesting structures to support successful breeding pairs (Sovern et al. 2015).

The NSO is a long-lived species, with a long reproductive life span. It is monogamous, but pairs do not necessarily breed every year. Breeding generally begins at 2 to 5 years of age. Following courtship, breeding may start as early as mid-February, and the female typically lays 1 to 4 eggs by late-March or April. The male delivers food to the female and the young while the female is brooding. Juvenile owls fledge in late-May or June; however, they still depend on food provided by their parents until about September (Zeiner et al. 1990; USFWS 2011).

NSO detection data within and immediately surrounding the North Cascades National Park Complex is limited (Hoffman et al. 2015). Survey efforts began in the early 1980s and have sporadically continued since that time (Siegel et al. 2012). A baseline NSO owl inventory was conducted by the park in the mid-1990s with 11 NSO activity centers detected, including 6 pairs (Kuntz and Christopherson 1996). Additional surveys were conducted by the Institute of Bird Populations between 2007 and 2010 (Siegel et al. 2012), including follow-up surveys at the 11 NSO activity centers identified during the baseline inventory and additional surveys in the vicinity of reservoirs. The study indicated locations of five historical spotted owl activity centers, all 1 mi or farther from Project reservoirs (Deer Lick >2.5 mi from Ross Lake, Big Beaver Boundary >6 mi from Ross Lake, Pyramid Lake 1 mi from Diablo Lake/Colonial Creek Campground, Newhalem Creek >2 mi from Newhalem, and Little Devil/Stout Creek >3 mi from Newhalem). Surveys at each of these locations in 2009 and 2010 by Siegel et al. (2012) yielded a spotted owl response only at Newhalem Creek in 2009 (but not in 2010); the Newhalem Creek area was subsequently burned in the 2015 Goodell Creek Fire. An analysis of the NWFP Model was conducted for North Cascades National Park, comparing model results to known NSO nest sites in the park (Wilkerson and Siegel 2007). The analysis concluded that the NWFP Model performed relatively well for the park and the NWFP Model could be used as a reliable tool for land management decisions within the park.

City Light will review the following data sources to inform this study:

- Northwest Forest Plan—the first 10 years (1994–2003): status and trends of northern spotted owl populations and habitat. (Davis and Lint 2005)
- Northwest Forest Plan Revised NSO Habitat Suitability Model (Davis et al. 2016)
- Conservation Biology Institute (CBI) North Cascades Old Growth Mapping (CBI 2020)
- Interpreting the Northwest Forest Plan’s Northern Spotted Owl habitat suitability model for use in North Cascades National Park. The Institute for Bird Populations, Point Reyes Station, CA (Wilkerson and Siegel 2007)
- Seattle City Light Skagit River LiDAR (2018)

- USGS Western Washington 3DEP LiDAR, <http://lidarportal.dnr.wa.gov/> (2016/2017)

2.4 Project Operations and Effects on Resources

The operation and maintenance (O&M) of the existing Project has limited potential to directly affect NSO habitat from: (1) occasional cutting of hazard trees in forests adjacent to the transmission line or access roads; or (2) habitat management activities on mitigation lands. Another mechanism by which NSO may be affected is O&M activities or project-related recreation occurring close to active NSO nests which could disturb owls during the nesting season, if any such nests were to occur near Project facilities. Project-related noise disturbance could come from the operation of heavy equipment and tools, such as chainsaws, for maintenance of vegetation, structures, utilities, and roads near the dams, powerhouses, and transmission line corridor or during work on the mitigation lands. City Light boat use generates noise on the Project reservoirs. Some City Light boat activity occurs on Diablo Lake from operating the barge and crew ferry and on all three reservoirs from occasional research boat use and seasonal work boats used to maintain structures at the dams and collect floating driftwood. Most of the boat use on Ross Lake is related to small engine recreational boats and NPS management activities.

City Light periodically uses helicopters to inspect the transmission lines and towers. During these inspections the helicopter flies well over the tree tops and only hovers if potential structural problems are noted, which is rare. Project-related snow surveys, conducted by National Resource Conservation Service (NRCS) via helicopter for two days each month from the end of December through early May, also generate noise, which is most noticeable at take-off and landing in Newhalem and at the snow course stations, and during ascents and descents in the Gorge bypass reach area. Noise from helicopters has the potential to impact wildlife in and around the Newhalem area and in the Gorge bypass reach but the frequency of occurrence is low and intermittent and mostly outside of the nesting season.

2.5 Study Area

The study area will include the Project Boundary and also a 0.5-mile buffer surrounding the FERC Project Boundary (Figure 2.5-1).

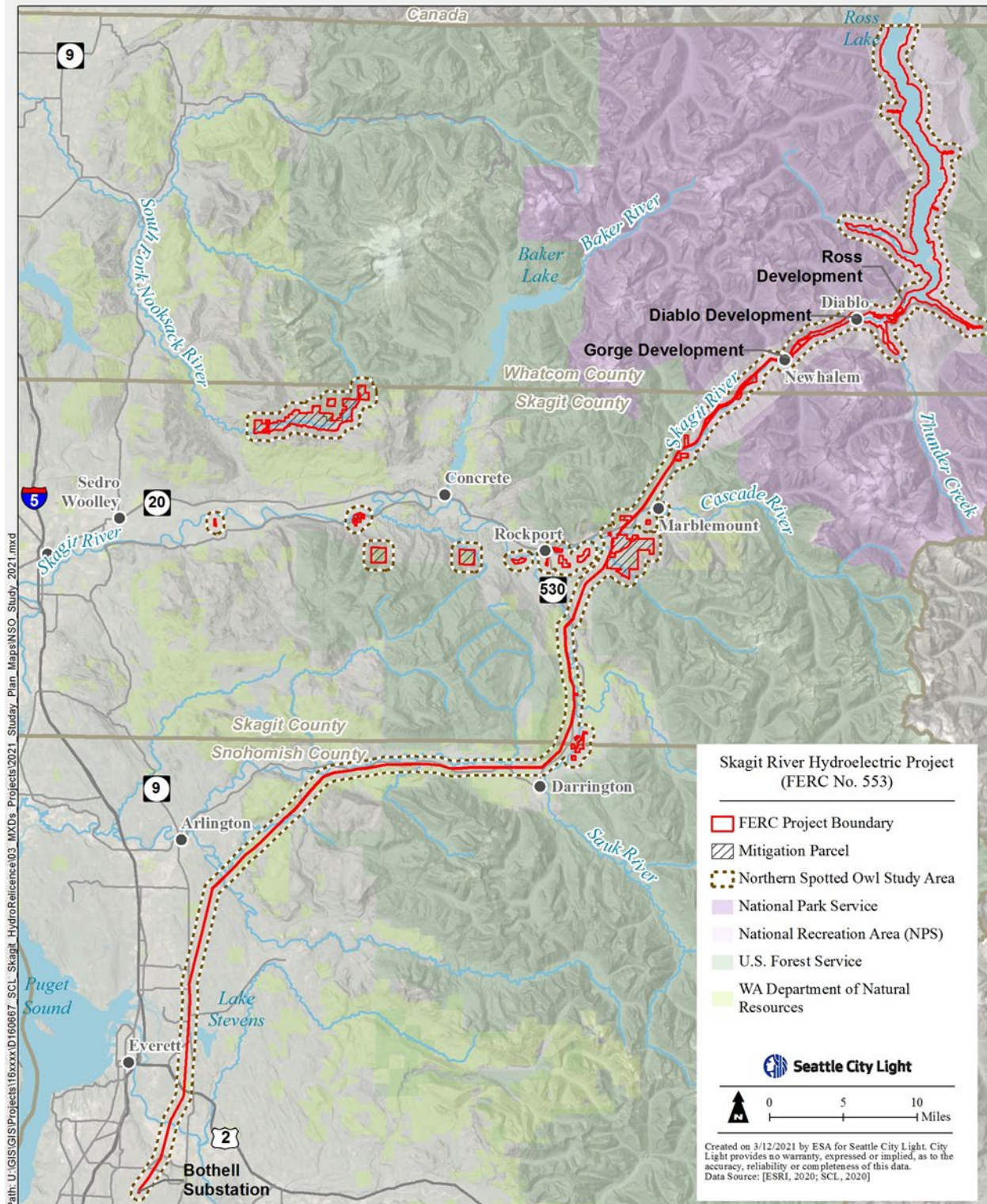


Figure 2.5-1. Overview of study area.

2.6 Methodology

The study will use available science and habitat models to identify potentially suitable NSO NRF habitat within the study area. The steps for conducting the study are detailed below.

2.6.1 Review Scientific Literature

Habitat parameters identified in the literature for NSO and available habitat models will be reviewed and summarized in tabular and narrative format. The types of information that will be reviewed include state and federal agency reports and management plans, previous Geographic Information System (GIS) NSO habitat mapping efforts and habitat models, existing Light Detection and Ranging (LiDAR) data, peer reviewed published literature, NPS and surrounding area's survey data, eBird records, and personal communications with current and former NPS, U.S. Forest Service (USFS), and WDFW staff and other relevant species experts.

2.6.2 Identify and Map Potentially Suitable Habitat

For the purposes of this study, City Light is considering suitable NSO habitat to be NRF habitat. Suitable NSO nesting and roosting habitat is generally defined as late successional mature and old-growth forests with large diameter coniferous trees, snags, downed wood, and a closed canopy (>60 percent canopy cover) with multiple canopy layers. Foraging habitat is often similar in structure to nesting and roosting habitat, though suitable foraging habitat can encompass a more diverse range of forest types such as younger forests with some component of residual large diameter conifer trees and snags (Forsman et al 2015; North et al. 1999).

Previous efforts by the Institute of Bird Populations in conjunction with NPS investigated the viability of developing a NSO habitat map for the North Cascades National Park but the lack of known NSO territories within the park precluded this model from being developed (Wilkerson and Siegel 2007). A larger and more robust NSO habitat suitability model, using data from NSO territories throughout the Pacific Northwest, was developed for the NWFP (Davis and Lint 2005). The NWFP Model produced vegetation maps that were developed using a combination of satellite imagery from various federal land agencies and Forest Inventory and Analysis (FIA)² plot data. FIA plots are forest inventory plots where a number of different forest inventory parameters for a specific location were collected and measured, such as tree height, species, canopy cover, canopy structure, downed woody debris, and snags. These vegetation maps were then analyzed using the habitat modeling software BioMapper (Hirzel et al. 2002) in combination with NSO detection data to create the NWFP Model for the range of the NSO. The seven habitat variables used for this modeling are: (1) quadratic mean diameter, which is the diameter at breast height of the dominant and codominant trees of an average basal area; (2) canopy cover of coniferous trees; (3) index of the product of conifer tree size and canopy cover; (4) canopy cover of deciduous trees; (5) an index of stand structure based on the number of vegetation-strike-team size classes within a 5x5 window (25 pixels = 3.9 ac square); (6) focal mean of discrete structure values within a 5x5 window; and (7) elevation from USGS digital elevation models.

² "The FIA Program collects, analyzes, and reports information on the status and trends of America's forests: how much forest exists, where it exists, who owns it, and how it is changing, as well as how the trees and other forest vegetation are growing and how much has died or has been removed in recent years." https://www.fia.fs.fed.us/about/about_us/

While the existing habitat map provides a generally good depiction of NSO habitat, refinements can be made using updated methods and information. Since the time Wilkerson and Siegel (2007) analyzed the original NWFP Model for use within North Cascades National Park, the NWFP Model has evolved based on the latest science and species detection information (Davis et al. 2016). The software MaxEnt (Phillips et al. 2020), is currently considered to be the software of choice for conducting presence-only species distribution modeling and has replaced the BioMapper software (Merow and Silander 2014). The NWFP Model has also refined the variables used for analysis to include: (1) diameter diversity index; (2) canopy cover of all conifers; (3) stand height; (4) mean conifer diameter; (5) density of large conifers; (6) stand age; and (7) forest species composition (Davis et al. 2016). Using the NWFP Model and the most up-to-date science and species detection information, a GIS map of potential suitable NSO NRF habitat will be developed for the study area.

Additional analysis using a combination of available LiDAR data will be used to produce a refined NSO habitat layer. LiDAR data was collected (2013–2018) for the entire Project Boundary. LiDAR is a remote sensing tool that can be used to describe the vertical structure of vegetation in a forested environment. When related to various forest structure variables associated with species-specific habitat features, LiDAR has been shown to accurately estimate the occupancy probability for species such as marbled murrelet, which share numerous nesting habitat features with NSO (Hagar et al. 2014). Recent research also suggests that LiDAR can be useful for identifying NSO habitat (Hagar et al. 2019), where maximum canopy height was determined to be the best predictor of NSO occupancy. Canopy cover, an important indicator of suitable NSO NRF habitat, can also be derived from LiDAR. This LiDAR data will be used to confirm the accuracy and reliability of the NSO habitat model developed above as well as to create a stand-alone NSO Suitable NRF habitat layer. If possible, nesting and roosting habitat will be mapped separately from foraging habitat. For the purposes of this analysis, foraging habitat includes all suitable nesting and roosting habitat along with younger forest stands that have the following three characteristics: (1) a canopy cover >60 percent; (2) containing some component of residual large diameter conifers and snags; and (3) within 1.8 miles of suitable nesting and roosting habitat.

CBI recently mapped old growth and late seral stage forests of the North Cascades (CBI 2020). The results from that mapping analysis will be combined in GIS with the data layers derived from the LiDAR analysis above to create a NSO Suitable NRF Habitat layer. Limited field verification during the TR-01 Vegetation Mapping Study and the TR-02 Wetland Assessment will provide additional refinement of the initial NSO habitat maps, providing information on the availability of suitable NSO habitat characteristics such as tree diameter and height, canopy cover, and canopy structure. If deemed necessary, using some of the methods outlined in the Vegetation Mapping Study, City Light will also conduct limited habitat assessments to verify the accuracy of the mapping of suitable NSO NRF habitat in areas where City Light may have activities that could potentially disturb nesting and roosting NSO. If possible, this effort will be coordinated in conjunction with the TR-05 Marbled Murrelet Study. City Light will use two biologists to sample and conduct a rapid assessment of representative sites (up to 6 days field effort) to verify accuracy of the mapping of NSO NRF habitat. A 25-meter radius plot will be conducted in each stand with the following information collected: forest species composition, conifer diameter, conifer tree height, canopy cover, canopy structure, and an assessment of flight access for NSO. At least five stands could be sampled per day or a total of ~30 stands during the week. This ground-truth information will be used to correct any inaccuracies in the final habitat model. If there are canopy

cover deficiencies in the NWFP or LiDAR models, we will also review an additional measure of canopy cover derived from the Multi-Resolution Land Characteristics (MRLC) Consortium, which produces the National Land Cover Database (NLCD).

The study will produce GIS layers showing NSO NRF habitat (possibly broken into NR vs. F) for the entire Project Boundary and 0.5-mile buffer derived from: (1) the updated NWFP Model; and (2) LiDAR analysis. The data will be presented in map format and summarized in a narrative. The results of the study will be used in the license application to assess Project effects and to inform development of NSO protection BMPs for O&M activities and new construction in or near NSO NRF habitat.

2.7 Consistency with Generally Accepted Scientific Practice

The study methods use a standard scientific approach by relying on documented occurrences of the species, a review of scientific literature and management guidelines, and a habitat assessment specific to western Washington using parameters identified in the scientific literature. The NWFP Model has been used to map habitat for a variety of federal projects that had the potential to impact NSO, including a recent pipeline development project in Oregon (USDA Forest Service 2018).

2.8 Schedule

- Literature Review – Spring 2021
- Habitat Mapping – Summer 2021
- Final Report (Initial Study Report [ISR]) – March 2022

2.9 Level of Effort and Cost

The initial estimate for implementation and reporting associated with this study is approximately \$60,000.

3.0 REFERENCES

- Buchanan, J.B. 2016. Draft periodic status review for the Northern Spotted Owl in Washington. Washington Department of Fish and Wildlife, Olympia, Washington. 13 + iv pp.
- Conservation Biology Institute (CBI) 2020. Data Basin website. [Online] URL: <https://databasin.org/galleries/90e11cbab3724db2aa801e67643d9151#expand=13863>. Accessed November 2020.
- Davis, R. and J. Lint. 2005. Habitat status and trends. Pages 21–82 in J. Lint (technical coordinator), Northwest Forest Plan—the first 10 years (1994–2003): status and trends of northern spotted owl populations and habitat. Gen. Tech. Rep. PNW-GTR-648, USDA Forest Service, Pacific Northwest Research Station, Portland, Oregon. 30 p.
- Davis, R.J., B. Hollen, J. Hobson, J.E. Gower, D. Keenum. 2016. Northwest Forest Plan—the first 20 years (1994–2013): status and trends of northern spotted owl habitats. Gen. Tech. Rep. PNW-GTR-929. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 54 p.
- Forsman, E.D.; Sovern, S.G.; Taylor, M.; Biswell, B.L. 2015. Home range and habitat selection by northern spotted owls on the eastern slope of the Cascade mountains, Washington. *Journal of Raptor Research*. 49(2): 109–128.
- Hagar, J.C., B.N.I. Eskelson, P.K. Haggerty, S.K. Nelson, and D.G. Vesely. 2014. Modeling marbled murrelet (*Brachyramphus marmoratus*) habitat using LiDAR-derived canopy data. *Wildlife Society Bulletin*. 38:237–249.
- Hagar, J.C., A. Yost, and P.K. Haggerty. 2019. Incorporating LiDAR metrics into a structure-based habitat model for a canopy-dwelling species. *Remote Sensing and Environment*. Volume 236. January 2020.
- Hamer, T.E., D.C. Hays, C.M. Seager, and E.D. Forsman. 2001. Diet of Northern Barred Owls and Northern Spotted Owls in an area of sympatry. USDA Forest Service Pacific Northwest Research Station. Corvallis, OR.
- Hirzel, A., Hausser, J., Perrin, N. 2002. BioMapper 3.1. Lausanne, Lab. for Conservation Biology. [Online] URL: <http://www.unil.ch/biomapper>. Accessed November 2020.
- Hoffman, R.L., A. Woodward, P. Haggerty, K. Jenkins, P. Griffin, M.J. Adams, J. Hagar, T. Cummings, D. Duriscoe, K. Kopper, J. Riedel, L. Marin, G.S. Mauger, K. Bumbaco, and J.S. Littell. 2015. North Cascades National Park Service Complex: Natural resource condition assessment. Natural Resource Report NPS/NOCA/NRR—2015/901.
- Kuntz, R.C. and R.G. Christopherson. 1996. A survey of northern spotted owls in North Cascades National Park Service Complex, Washington. USDI, National Park Service Technical Report NPS D 224, Sedro-Woolley, WA. 23 pp.
- Merow, C., J.A. Silander, Jr. 2014. A comparison of maxlike and maxent for modelling species distributions. *Methods in Ecology and Evolution*. 5: 215–225.
- North, M.P., J.F. Franklin, A.B. Carey, E.D. Forsman, and T.E. Hamer. 1999. Forest stand structure of the northern spotted owl's foraging habitat. *Forest Science* 45(4):520-527.

- Phillips, S.J., M. Dudík, R.E. Schapier. 2020. Maxent software for modeling species niches and distributions (Version 3.4.1). [Online] URL: http://biodiversityinformatics.amnh.org/open_source/maxent/. Accessed November 17, 2020.
- 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
- Sovern, S.G., E.D. Forsman, K.M. Dugger, and M. Taylor. 2015. Roosting habitat use and selection by northern spotted owls during natal dispersal. *Journal of Wildlife Management*. 79(2): 254–262. doi:10.1002/jwmg.834.
- Siegel, R. B., R. C. Kuntz II, R. L. Wilkerson, K. D. Kuhlman, and M. C. Toshack. 2012. Surveying for spotted owls in the Upper Skagit watershed of North Cascades National Park Complex, 2009-2010. Natural Resource Technical Report NPS/NOCA/NRTR—2012/597. National Park Service, Fort Collins, Colorado.
- United States Department of Agriculture, Forest Service; U.S. Department of the Interior, Bureau of Land Management (USDA and USDI). 1994. Final supplemental environmental impact statement on management of habitat for late-successional and old-growth forest related species within the range of the northern spotted owl. Portland, OR. 526 pp.
- United States Department of Agriculture, Forest Service 2018. Management Indicator Species Report; Pacific Connector Gas Pipeline Project. Medford, OR.
- U.S. Fish and Wildlife Service (USFWS). 1990. Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for the Northern Spotted Owl. *Federal Register* Volume 55: 26114-26194.
- _____. 2006. Estimating auditory and visual disturbance to northern spotted owls and marbled murrelets in northwestern California, July 26, 2006.
- _____. 2011. Revised Recovery Plan for the Northern Spotted Owl (*Strix occidentalis caurina*). Portland, Oregon.
- _____. 2012. Endangered and Threatened Wildlife and Plants; Designation of Revised Critical Habitat for the Northern Spotted Owl. *Federal Register* Volume 77: 71875-72068.
- Wilkerson, R. L. and R. B. Siegel. 2007. Interpreting the Northwest Forest Plan’s Northern Spotted Owl habitat suitability model for use in North Cascades National Park. The Institute for Bird Populations, Point Reyes Station, CA.
- Zeiner, D.C., W.F. Laudenslayer, Jr., K.E. Mayer, and M. White. 1990. California’s Wildlife, Volume II. Birds. California Wildlife Habitat Relationships. California Department of Fish and Game, Sacramento, California.