

Attachment 1: Introduction to Revised Study Plan

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1.0 GENERAL

This document presents Seattle City Light's (SCL's) Revised Study Plan (RSP) for the Boundary Hydroelectric Project (Project), Federal Energy Regulatory Commission (FERC) No. 2144. The RSP details the plans for those studies identified by SCL as necessary to develop sufficient information for FERC's analysis of the Project relicensing. This determination of study need is based on a review and evaluation of existing information, as summarized in SCL's Pre-Application Document (PAD) for the Boundary Project relicensing (SCL 2006a), as well as consultation with agencies, tribes, and other stakeholders (relicensing participants).

Recognizing the significant benefit of avoiding the need for dispute resolution regarding the proposed study program, which could jeopardize the timing of any disputed studies, SCL has worked to achieve a high level of concurrence with relicensing participants on the RSP. SCL engaged relicensing participants in an intensive series of technical workgroup meetings over five months to develop proposed study plan language prior to filing the Proposed Study Plan (PSP) with FERC on October 16, 2006.

Consistent with requirements under 18 CFR § 5.11(e), SCL conducted a formal study plan meeting with relicensing participants within 30 days of the deadline date for filing the PSP. This meeting, held on November 15, 2006 in Spokane, Washington, provided an opportunity to identify any points of disagreement between SCL and relicensing participants regarding proposed studies. SCL initiated additional communication with relicensing participants following the study plan meeting, especially regarding the *Toxics Assessment: Evaluation of Contaminant Pathways, Potential Project Nexus* study in an attempt to finalize an appropriate, consensus-based study plan (see Attachment 4 for the record of additional consultation).

Comments on the PSP were required to be filed with FERC within 90 days after the PSP was filed (18 CFR §5.12), or no later than January 16, 2007. Comments were received from the FERC (2007), U.S. Forest Service (USFS) (2007), U.S. Fish and Wildlife Service (USFWS) (2007) and Washington Department of Fish and Wildlife (WDFW) (2007). Individual comments and SCL responses are summarized in Attachment 3. Copies of comment letters filed with FERC are contained in Attachment 4.

This RSP encompasses a total of 24 individual study plans, which have been prepared in consultation with relicensing participants. These study plans are listed in section 4.0, along with the corresponding resource issue(s) that each plan is designed to address. The study plan components are organized by resource area, and indicate where one study will intersect with studies from other resource areas. For each study, the RSP provides all information specified under FERC's Integrated Licensing Process (ILP) requirements (18 CFR § 5.11). Presentation of the information for each study is organized as follows:

- Summary description of planned study
- Explanation of Project nexus to planned study
- Discussion of any known resource management goals of the agencies or Indian tribes with jurisdiction over the particular resource

- Description of study goals and objectives
- Description of relevant existing information and the need for the information to be provided by the planned study
- Detailed description of the study and methodology to be used
- Consistency of the planned study method with generally accepted scientific practice
- Consultation with agencies, tribes, and other relicensing participants
- Schedule for conducting the study
- Provisions for periodic progress reports
- Anticipated level of effort and cost

The process and schedule for development of remaining study implementation details, and opportunities for relicensing participants to be updated on the results of the studies are described in section 2.2 and 2.3, respectively.

Ultimately, the results of the relicensing studies program will be synthesized in an integrated resource analysis to characterize Project-related resource impacts and evaluate potential protection, mitigation, and enhancement (PME) measures. SCL plans to engage relicensing participants in these integrated resource analysis discussions beginning in early 2009. These supporting impacts/PME analyses will be presented in the Preliminary Licensing Proposal (PLP), which will be filed with FERC no later than April 2009, and ultimately in the License Application, which must be filed no later than September 30, 2009. Because these analyses do not themselves involve field work or other data collection (rather, they will synthesize results from various studies), they are not included as studies in this RSP. SCL's proposed plan for involving relicensing participants in the development of the PLP is described in section 2.4.

2.0 PROCESS AND SCHEDULE OVERVIEW

2.1. Final Study Plan Determination

FERC will issue its final study plan determination by March 16, 2007, within 30 days from filing of the RSP (18 CFR § 5.13(c)). If any portions of FERC's final study plan determination are disputed by federal agencies with Section 4(e) and Section 18 authority or an agency or Tribe with authority to issue Section 401 water quality certification for the Project, a formal dispute resolution process will be initiated, as provided for under 18 CFR § 5.14, and a final study dispute determination (constituting amendment of the approved study plan) for the disputed study components will be issued in June 2007. (Refer to Table 2.2-2 in section 2.2.1 of the PAD [SCL 2006a] for additional detail regarding specific study dispute resolution steps and milestones.)

2.2. Refinement of Study Implementation Details

The RSP study plan elements describe the planned study approach in sufficient detail for the parties to understand and agree on the study program. Greater specificity regarding the details of

study implementation (e.g., specific sampling sites and transect selection, if not identified in the RSP) may be needed for some of the studies before field work begins. SCL proposes to include interested relicensing participants, as well as the researchers who will be conducting the studies, in finalizing study implementation details.

SCL has contracted with a Technical Consultant team that will perform the relicensing studies. Prior to actual initiation of the studies, the Technical Consultant will participate, with SCL and relicensing participants, in developing and refining any remaining details related to implementation of the studies. The major steps SCL will take to finalize remaining implementation details (for non-disputed studies) are as follows:

- The Technical Consultant team will assist SCL in developing remaining study implementation details with a target for completion of no later than the end of March 2007.
- SCL will continue outreach with relicensing participants on implementation details.
- Agreed-upon implementation details will be finalized; dates for finalizing implementation details will likely be staggered, starting with those studies with the earliest scheduled field work.
- As implementation details are finalized, the Technical Consultant team will begin conducting the studies.

The recommended steps and schedule outlined above are shown in Table 2.2-1. For any disputed studies, adjustments will be made to this approach, as necessary, to finalize implementation details for those studies.

Table 2.2-1. Proposed steps and schedule for finalizing study implementation details.

| Timeframe (2007) | Task |
|-------------------------|--|
| February 14 | RSP filing due date |
| January–March | Technical Consultant assists SCL with developing study implementation details |
| January–April | Engage with relicensing participants to review and discuss the proposed study implementation details |
| Late Feb. / Early March | RSP comments due |
| Mid-March | FERC Study Plan Determination issued |
| Mid- to late April | Study implementation details finalized |
| Mid- to late April | Studies commence, as implementation details are finalized, and according to study schedules |

2.3. Study Reporting and Study Plan Modification

Formal reporting requirements related to the progress of the relicensing study program include the Initial Study Report (ISR) (March 2008), the Updated Study Report (USR) (March 2009), and the corresponding meetings to discuss these reports (18 CFR § 5.13(a), § 5.15(c) and (f)). In

addition, SCL plans to distribute information regarding the year one and year two study efforts and meet with relicensing participants to review this information prior to filing the ISR and USR with FERC. SCL also plans to provide informal updates on a quarterly basis to keep relicensing participants abreast of study progress and communicate significant developments. The proposed timeline for study progress reporting is presented in Table 2.3-1.

Table 2.3-1. Proposed study progress reporting and relicensing participant review opportunities, including the FERC-required Initial Study Report and Updated Study Report.

| Progress Report / Information Sharing | Proposed Timeframe | Review Comments Due |
|--|--|--|
| Updates on study implementation | August/September 2007 | NA |
| Distribute Year 1 study information | January 2008 | NA |
| Meet to review Year 1 study efforts and results | February 2008 | NA |
| File Initial Study Report ¹ | March 2008 ³ | Approximately 60 days ⁴ |
| Hold Initial Study Report meeting (meeting on study results and any proposals to modify study plan) ¹ | Within 15 days from initial study report | Disputes/requests to amend study plan due within 30 days from study report meeting summary |
| Updates on study implementation | June/July and September/Oct | NA |
| Distribute Year 2 study information | December 2008 | NA |
| Meet to review Year 2 study efforts and results and “cross-over” study results | January 2009 | NA |
| File Updated Study Report ² | March 2009 ⁵ | Approximately 60 days ⁴ |
| Hold Updated Study Report meeting (meeting on updated study results and any proposals to modify study plan) ² | Within 15 days from updated study report | Disputes/requests to amend study plan due within 30 days from study report meeting summary |

1 Required under 18 CFR section 5.15(c).

2 Required under 18 CFR section 5.15(f).

3 The Initial Study Report must be filed no later than 1 year after FERC approval of the study plan (18 CFR, section 5.15(c)(1)).

4 Applicant (SCL) must hold a meeting within 15 days of issuance of the study report (18 CFR section 5.15(c)(2)) and issue a meeting summary within 15 days of the meeting (18 CFR section 5.15(c)(3)). Participants then have 30 days to file any disputes or requests to amend the study plan (18 CFR section 5.15(c)(4)).

5 The Updated Study Report must be filed no later than 2 year after FERC approval of the study plan (18 CFR, section 5.15(f)).

The main purpose of the quarterly updates will be to inform relicensing participants regarding the progress of studies. Further, SCL plans to provide a number of study-specific opportunities for continuing relicensing participant involvement regarding study progress. These study-specific opportunities, which may or may not occur in conjunction with the quarterly updates, include, among others: reviewing proposed activities for Phase 1 and Phase 2 of the Evaluation of Total Dissolved Gas (TDG) and Potential Abatement Measures, which will include the most

promising structural and/or operational TDG abatement alternatives resulting from Phase 1 of the TDG study (see Attachment 2, Study No. 3), and planning for Phase 2 of the Toxics Assessment, as well as development of a Phase 2 Sampling and Analysis Plan (see Attachment 2, Study No. 4).

Following each required Study Report meeting (see Table 2.3-1), the FERC ILP regulations provide the opportunity for SCL and/or relicensing participants to request modifications to the study plan in light of the progress of the study program and results to date (18 CFR § 5.15(c) and (f)). Any study plan modifications would be subject to review and approval by FERC.

SCL may desire to modify portions of certain study plans if it appears that such modifications are warranted based on new information that clarifies future operations of Seven Mile Reservoir (immediately downstream from Boundary Dam) as a result of the proposed expansion of the Waneta Project. The limitation in generation capacity at Waneta has resulted in Seven Mile reservoir being used to re-regulate Boundary Dam discharges to minimize spill at Waneta Dam (CPC 2006). SCL will continue to closely monitor the Waneta Project expansion proceedings and will consult with Boundary Project relicensing participants regarding any new information on Seven Mile Project operations that may have implications on potential effects of Boundary Project operations.

As noted above in Table 2.3-1, SCL plans to distribute information regarding the ongoing study efforts and results and to meet to relicensing participants to review this information prior to the filing of the Initial and Updated Study Reports with FERC. SCL is committed to providing these additional opportunities for sharing information with relicensing participants to the extent possible within the overall time constraints of the ILP.

2.4. Development of Preliminary Licensing Proposal

The relicensing studies will provide much of the information necessary for determining and characterizing Project impacts and identifying appropriate PME measures in light of those impacts. As noted above, SCL's integrated resource analysis and proposed PME measures will be presented initially in the PLP, to be filed in April 2009 and later refined in the License Application, to be filed in September 2009. SCL intends to involve relicensing participants in substantive discussions related to development of the PLP, although not required to do so by FERC's ILP rules. SCL recognizes that it will be a challenge to accomplish this enhanced level of consultation on the PLP while still meeting the stringent process timelines of the ILP. SCL's proposed PLP relicensing participant involvement plan and schedule, which attempts to make the most effective use of the limited time available to interact with relicensing participants prior to issuance of the PLP, is summarized in Table 2.4-1.

A major limitation on the time available for developing the PLP is that full results from several of the more significant planned studies will not be available until late 2008, or in some cases, early 2009. To help alleviate the time limitations inherent in the ILP, SCL plans to provide relicensing participants with its preliminary conclusions regarding Project impacts and potential PME measures, to the extent possible and appropriate, in conjunction with the reporting of results from the first study season (early 2008). The impacts analysis and PME proposals will be completed based on the second year of study results and input from relicensing participants.

Figure 2.4-1 shows the general timeframes and relationships among the sequence of steps toward developing the PLP. As shown conceptually in Figure 2.4-1, relicensing participants will have the opportunity to provide input in the areas of study interpretation and Project impacts analysis as well as the development of PME proposals to be presented in the PLP and License Application. Further detail on the study timeframes, interrelationships among study elements, and opportunities for relicensing participants to provide input is provided in each specific resource area section in this RSP.

It should be noted that for any studies extending well into 2009, final conclusions regarding Project impacts and appropriate PME measures may not be timely for presenting in the PLP, or even in the License Application; rather, the final proposals related to these topics in the License Application may take the form of proposed processes for continued study and consultation toward ultimate development of appropriate PME measures.

One such process of continued study and consultation may be implemented to evaluate and select a method(s) (i.e., PMEs) for the control of exotic aquatic macrophytes, primarily Eurasian watermilfoil, in Boundary Reservoir. As part of the proposed integrated resource analysis to be conducted in 2008 and 2009, the aquatic habitat model will be used to assess the potential efficacy of reservoir drawdown as a method for controlling—through desiccation or freezing—the distribution and abundance of exotic macrophytes. If modeling indicates that reservoir drawdown will be ineffective for controlling macrophytes, potential alternative control strategies, such as rotoation or chemical treatment, will be identified in the PLP and License Application. A detailed protocol for the evaluation and application of these strategies will be included in an Aquatic Plant Management Plan, which will be submitted as part of SCL's License Application and application for Section 401 water quality certification. SCL will engage relicensing participants in discussion regarding the approach to evaluating aquatic macrophyte control strategies during the development of the PLP, License Application, and the application for the Section 401 water quality certification.

As it has during development of its PSP and this RSP, SCL hopes to achieve as much consensus as possible among relicensing participants on the elements of its licensing proposal prior to filing the PLP and License Application, to improve chances for a positive relicensing outcome and to foster effective working relationships with relicensing participants in the next license term. SCL believes its proposed approach is well-suited to accomplishing these objectives.

Table 2.4-1. Steps and schedule for relicensing participant involvement in PLP development.

| Timeframe | SCL Tasks | Interactions with Relicensing Participants |
|------------------------|--|---|
| Late 2007 – early 2008 | First-year studies completed | |
| February 2008 | | Hold workgroup meetings to review results of studies and discuss preliminary conclusions regarding Project impacts and potential PME measures |
| March 2008 | SCL files Initial Study Report with FERC | Official study report meeting and follow-up (meeting summary, etc.) |
| 2008 | Study program continues | |
| January 2009 | | Hold workgroup meetings to discuss second-year study results, cross-over issues and implications for conclusions regarding Project impacts and potential PME measures |
| January–February 2009 | SCL begins framing the PLP: Identify implications of study results for all cross-over issues Identify Project impacts (based on information to date) and proposed PMEs | Hold workgroup meetings to discuss integrated resource analysis |
| March 2009 | SCL files Updated Study Report with FERC | Official study report meeting and follow-up (meeting summary, etc.) |
| March–April 2009 | Final drafting, reviewing, and revisions of PLP | |
| Late April 2009 | File PLP (plus draft BA and draft HPMP) with FERC | |
| April–August 2009 | | Continue discussions with relicensing participants regarding impact analysis and PMEs (to be reflected in License Application) |
| May–August 2009 | Complete all studies and address PLP comments | |
| August 2009 | Finish preparation of License Application | |
| September 2009 | File License Application with FERC | |

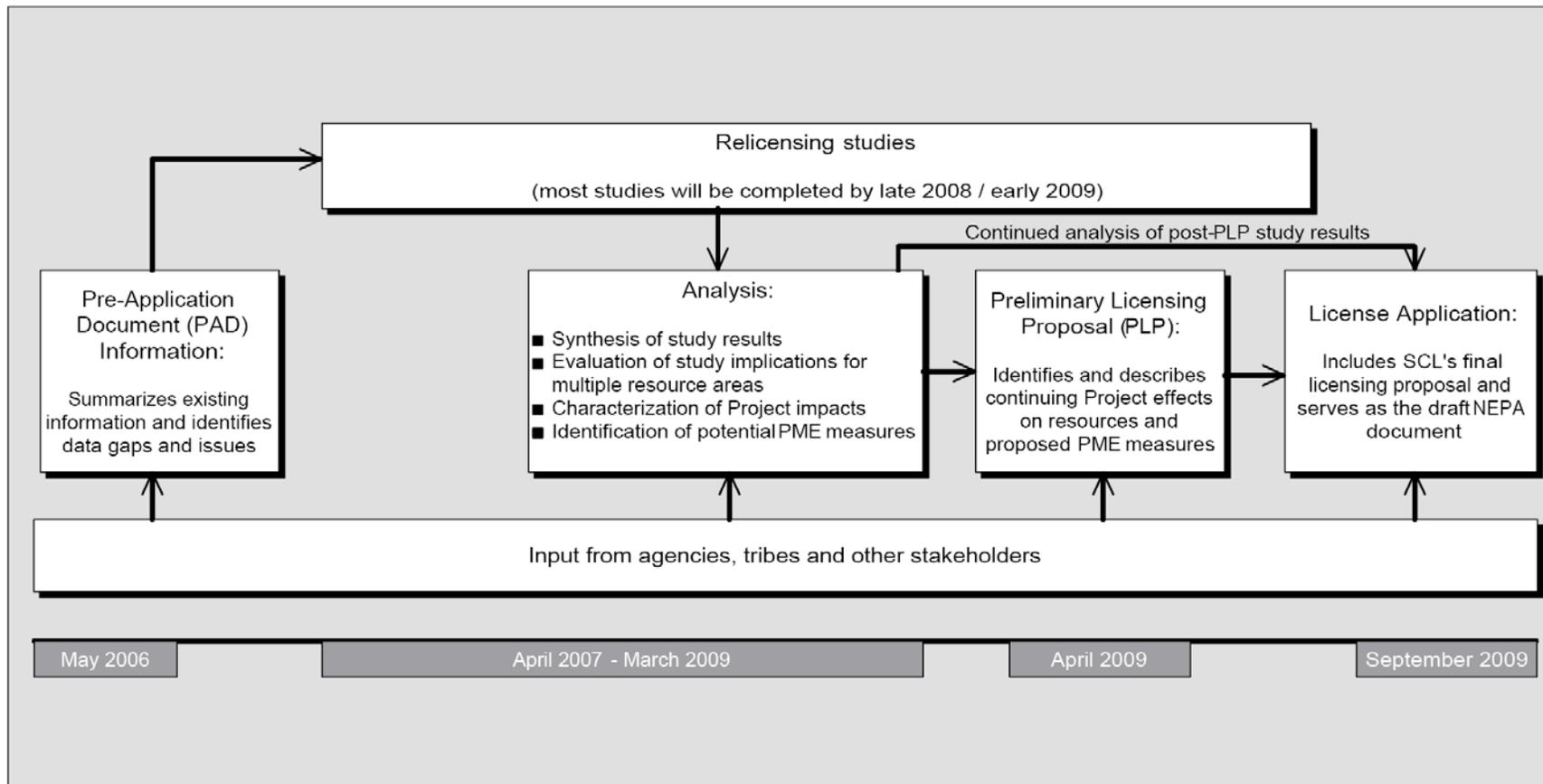


Figure 2.4-1. General sequence of steps, timeframes, and junctures for relicensing participants input related to development of the Preliminary Licensing Proposal and License Application.

3.0 ONGOING RELEVANT STUDIES AND ANALYSES

SCL is currently undertaking a number of studies and analyses that are relevant to, but not incorporated in, the study program outlined in this RSP. These efforts, which are described in this section, include hydrology analyses, development of an Excel spreadsheet application for facilitating and integrating comparison of various resource scenarios and water temperature modeling. SCL initiated these efforts prior to the formal relicensing study program because they were determined to be prerequisite to other studies and needed to be started in advance to be available to inform the study program. A process to assess Total Dissolved Gas (TDG) abatement alternatives is also currently underway as described in the Existing Information section of the TDG study plan (Attachment 2, Study No. 3).

SCL also previously completed (in 2005 and 2006) selected field and research efforts to provide additional basic resource information on the Project vicinity (such as vegetation cover and existing recreation facilities) (see PSP, Attachment 1-4; SCL 2006b). Development of this basic background information was undertaken in advance of the formal study program to help focus study planning and thereby make the most effective use of the limited field seasons available under the ILP. The results of these early information development (EID) efforts were described in the PAD (to the extent they were completed at that time) and are also summarized as applicable in the individual study plans of this RSP.

Although the ongoing studies and analyses described below are not presented as study plans, SCL did carefully consider them in light of the FERC requirements to ensure these efforts reflect consistency with the FERC study criteria (18 CFR § 5.9(b)), such as addressing a nexus between Project operations and resource effects and using methods that comport with generally accepted practice. SCL presented information regarding these early efforts to relicensing participants during development of the PSP and the RSP.

3.1. Hydrology Dataset and Statistics

Hydrologic conditions influence the way the Project operates. Daily reservoir surface elevation is influenced by changes in releases from upstream projects and inflow to Boundary Reservoir, in addition to operation of the Boundary Project. Analyses of existing hydrology data have been initiated by SCL to produce the reliable hydrologic dataset and statistics (hydrologic record) that are needed to conduct environmental and energy production analyses (as described in section 3.2) for FERC relicensing of the Project. These hydrology analyses therefore indirectly address a nexus between Project operations, resource effects, and potential alternative operational scenarios.

The primary sources of hydrologic data for the Project are USGS gages 12396500 (Pend Oreille River below Box Canyon) and 12398600 (Pend Oreille River below Boundary Dam), as well as SCL Boundary Project forebay water surface elevation records. Another source of hydrologic data consists of the BC Hydro Seven Mile Project forebay water surface elevations. The hydrologic analyses are being completed based on the data from these gages, hydrographic and topographic surveys, and stage recorder data. The analyses involve a rigorous quality assurance procedure to identify and correct errors before data are used in finalizing study implementation

plans and subsequent modeling. The end product will be a high-quality hourly hydrologic record that will be used to assess potential Project effects.

A draft Project hydrologic database of hourly flow and water surface elevation records was compiled in 2006 based on available data from Calendar Years 1987 through 2004, a period considered representative of current operations at Boundary Projects, as well as other projects in the Pend Oreille River Basin. Daily flow records are available for the Pend Oreille River in the vicinity of Boundary Dam since Calendar Year 1913, and these daily flow records will be incorporated into the final hydrologic database. Although the period selected for hourly records is much shorter than the period of available daily flow records, the 18-year period from 1987 through 2004 covers a wide range of hydrologic conditions. Calendar Years 2001 and 1997 were the second driest and second wettest of 92 years of record, respectively.

The quality assurance process will include a water balance comparison of inflow to Boundary Reservoir with outflow from Boundary Reservoir plus the change in reservoir storage. Missing data will be estimated using streamflow records from nearby watersheds with similar characteristics or from synthesized data. Accurate reservoir bathymetry data are currently being collected to help quantify the available reservoir storage. Following completion of the bathymetry survey, the reservoir elevation/storage capacity curve will be updated, and the quality assurance process will be completed.

The period of record of hourly hydrologic data will be extended to include Calendar Year 2005 for the final hydrologic database. Calendar Year 1986 will not be added to the record of hourly hydrologic data because Units 55 and 56 came on line in 1986 and 1987 is the first full calendar year with all six units in operation. Calendar Year 2006 will not be added to the record of hourly hydrologic data because these records are considered provisional until approved by the USGS. Thus the final hydrologic database will consist of hourly records from the 19-year period from Calendar Year 1987 through 2005, as well as daily flows and annual peak flows from 1913 through 2005.

A technical summary report including a database with hourly records of hydrologic data and statistics will be available in March 2007. Results from this technical summary report will be used as input for study implementation planning and related modeling efforts.

3.2. Technical Scenario Team and Modeling Efforts

SCL proposes to assemble a Technical Scenario Team (TST), envisioned as a working group consisting of representatives from agencies, tribes and other relicensing participants, SCL, and consultants with expertise in software modeling and analyses to evaluate pertinent study plan work efforts for the Boundary Project relicensing. The intent is for the TST to be a multi-resource group to ensure that requests to assess potential alternative scenarios contain well-formed input sets and that subsequent results are produced with a high level of confidence and understanding among relicensing participants. The main reason for forming the TST is to make the most efficient use of the time and resources of all interested relicensing participants. A flow diagram showing the general function of the TST and envisioned integration of study plan work efforts including habitat analysis and other resource analyses is shown in Figure 3.2-1.

The various study plan models and analytical efforts will be used to assist the comparison of environmental effects relative to alternative Project configurations (scenarios) developed and evaluated by the Boundary Project resource workgroups during the course of the relicensing process. Relicensing participants and SCL staff are currently represented in the various resource workgroups. SCL recognizes that results of any quantitative analysis of alternatives are usually only a small part of the input to the overall planning and decision-making process.

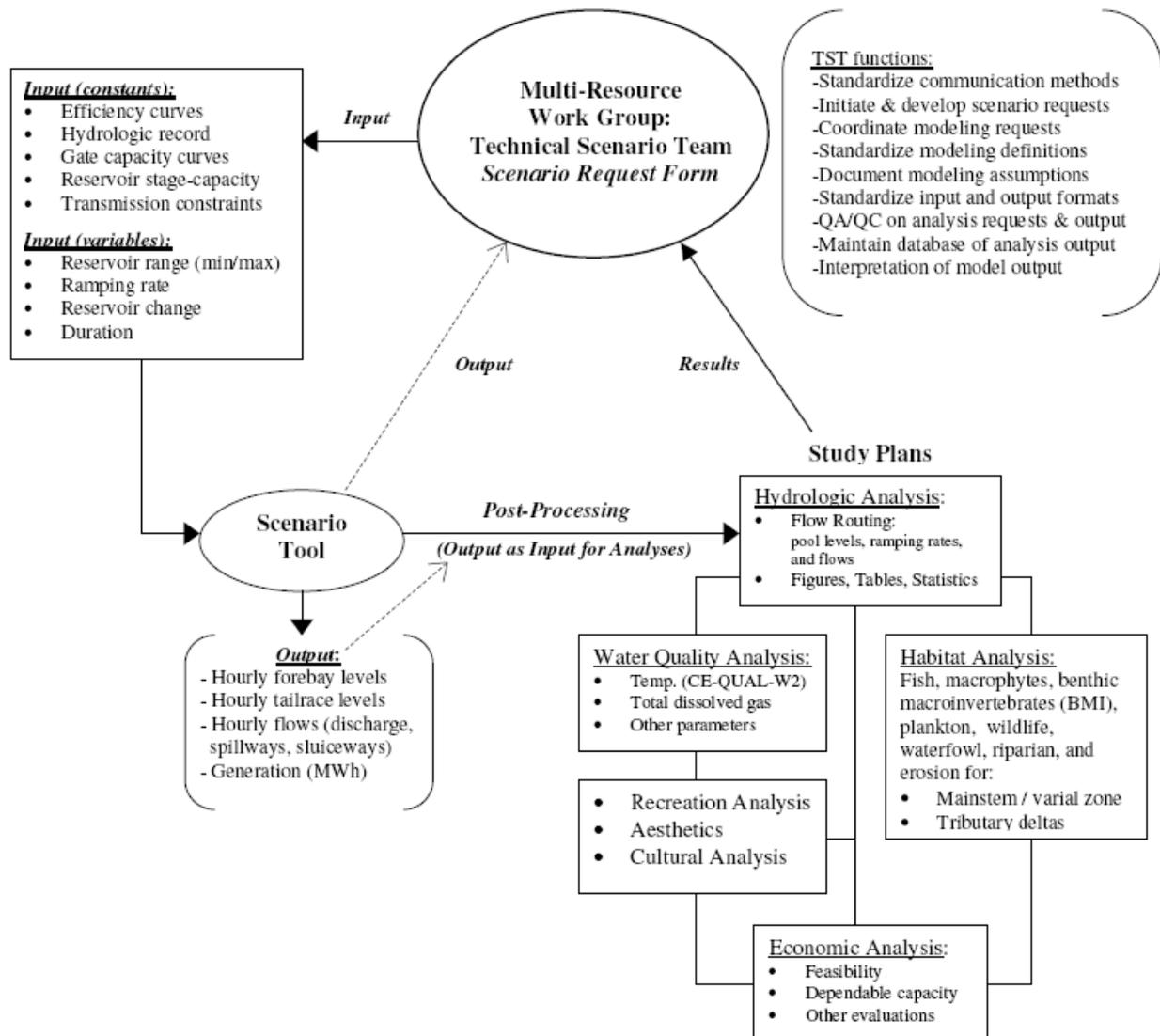


Figure 3.2-1. Conceptual workflow for integrated resource analyses.

Proposed Workflow for Study Plan Modeling Efforts and Analyses

Computational analysis and modeling of Project operations, hydrology, habitat analyses, and biologic time series are proposed for use in the Boundary Project relicensing effort to evaluate a range of potential environmental effects associated with alternative hydrologic and operational scenarios. Currently, the various study plan models are separate and unique pieces of software. During 2007–2008, when studies are being initiated and conducted, SCL will integrate the modeling systems as conceptually illustrated in Figure 3.2-1.

SCL began developing a Scenario Tool in 2005 to optimize and simulate existing physical and operating constraints using historic hydrologic regimes as a framework for assessing alternative Project scenarios as illustrated in Figure 3.2-1. Use of the Scenario Tool will only assist in the relative comparison of alternative resource scenarios in conjunction with study plan efforts and results; and due to this specific application, the Scenario Tool results cannot and will not directly translate to future operational changes at the Project.

Scenario Tool

The Scenario Tool, which is based on an optimization engine (Solver by Frontline Systems, Inc.) that operates as an add-in to Microsoft Excel® software, will be used to help assess potential future Project energy production associated with alternative scenarios. As a consistent foundation for comparing the relative differences in alternative scenarios, the Scenario Tool optimizes and calculates Project generation, upstream and downstream hydrologic conditions given reservoir inflows, and upstream and downstream water elevations. The Scenario Tool will produce hourly discharge output (in cfs) for use as input to the study plan models that will be used in Project relicensing as described in this RSP.

SCL presented information on the Scenario Tool to relicensing participants at workshops and workgroup meetings in November 2005, February, May, August and November 2006, during development of study plans presented in subsequent sections of this RSP. During these engagements, SCL provided and discussed a description of input data (hydrologic, operational and physical constraints, potential future constraints, etc.), information about how the Scenario Tool will generate output data, and example graphical and tabular output from runs of the Scenario Tool.

Development of the Scenario Tool is continuing in 2007, using the hydrologic record described in section 3.1 as part of the input data.

Habitat Analysis and Other Resource Models

Potential environmental impacts associated with existing and various alternative Project operation scenarios will be evaluated using models described in the Fish and Aquatic Resources study plans of this RSP (Attachment 2, Study Nos. 7 through 14). These models include the mainstem aquatic habitat model, which is the core tool that will be used for assessing changes in aquatic habitat in the mainstem Pend Oreille River (including Boundary Reservoir) under different Project operational scenarios. Various tributary delta habitat models will also be used to evaluate changes in habitat conditions at the mouth of tributaries to Boundary Reservoir under

each alternative operating scenario. These fish and aquatic resource models will route output from the Scenario Tool and associate the hydrologic signal upstream to aquatic habitat features in the Boundary Reservoir. For example, using these models, alternative ramping rate strategies can be evaluated in terms of instream habitat indicators. The models have been designed for use by fish resource experts familiar with hydraulic modeling and data processing. (Conceptual workflow diagrams for integration of the mainstem aquatic habitat modeling results and the tributary delta modeling results into the Scenario Tool application are presented in Attachment 2, Study No. 7, Figure 1.0-3 and Study No. 8, Figure 2.5-1, respectively.) SCL, in coordination with the Seven Mile Hydroelectric Project, will also model the combined effects of Boundary and Seven Mile Project operations on about 3.9 miles of mainstem aquatic habitat downstream of the Boundary Project in Seven Mile Reservoir.

Technical Scenario Team (TST)

The TST is proposed as the working group of representatives from agencies, tribes and other relicensing participants, SCL, and consultants with expertise in software modeling and analyses to evaluate pertinent study plan work efforts for the Boundary Project relicensing. The TST would help develop and receive input in the form of scenario modeling requests from the various resource workgroups.

The following functions would be performed by the TST:

1. Standardize methods of communication with resource groups
2. Initiate and develop scenario requests
3. Coordinate modeling requests to avoid redundant analyses
4. Standardize and document modeling definitions and assumptions
5. Define and standardize model input and output formats
6. Provide quality assurance and quality control (QA/QC) on analysis requests and modeling output
7. Maintain a database of analysis results
8. Provide interpretation of model output to resource groups

Using standardized definitions for input parameters and alternative scenarios, the TST would ensure that each modeling request contains a well-formed input set for analysis. As proposed, the TST would provide QA/QC for the Scenario Tool output, habitat analysis modeling output, and other resource analyses. The intent of the QA/QC effort would be to ensure that analysis results are consistent with the input assumptions prior to the transmittal of the results to the resource workgroups.

Modeling Limitations

Computational modeling as part of the Boundary Project relicensing analysis will assist in the evaluation of resource impacts and benefits relative to potential alternative operational scenarios. Models are inherently limited as representation of any real problem, and model input data,

including objectives and assumptions, can be controversial or uncertain; therefore, the study plans require field data collection to proof or calibrate the models that will be used in relicensing analyses. Again, SCL recognizes that results of any quantitative analysis of alternatives are usually only a small part of the input to the overall planning and decision-making process.

Evaluation of Alternative Scenarios to Inform Development of PME Measures

The workflow to help assist the evaluation of alternative scenarios (see Figure 3.2-1) for the Boundary Project relicensing analyses, as described above, is intended to provide relicensing participants and SCL with comparative information needed to evaluate the effects of the existing and alternative operational scenarios for use in the evaluation of potential PME measures as part of development of the PLP and License Application.

3.3. Temperature Modeling

Temperature modeling of the Boundary Project area is needed to satisfy regulatory requirements associated with certification of the Project under Section 401 of the federal Clean Water Act (401 certification) and for the Washington-Idaho Interstate Temperature TMDL process. Although this modeling is being conducted outside the formal relicensing studies program, it addresses a potential nexus between Project operations and resource effects, and has implications for evaluation of potential future alternative operational scenarios. Temperature modeling is being conducted for SCL by Battelle, Pacific Northwest National Laboratory.

The primary objective is to develop a predictive temperature model of the Pend Oreille River from the tailrace of Box Canyon Dam to the International Border downstream of Boundary Dam. The model, which is based on a state-of-the-art, industry-standard program (CE-QUAL-W2; Cole and Wells 2002), will be used to understand the physical processes controlling water temperature in the system, including the effects of Boundary Reservoir on existing conditions and potential future Project operating scenarios. The model will be used to demonstrate the Project's compliance with the Washington Department of Ecology's (Ecology) water temperature standards for the lower Pend Oreille River as part of the 401 certification process and will be linked to other CE-QUAL-W2 models developed for the remainder of the Pend Oreille River in Washington and Idaho to establish waste load allocations (WLAs) as part of the Interstate Temperature TMDL process.

Specific objectives being addressed as part of temperature modeling are as follows:

- Review and processing of available bathymetric, hydrologic, meteorological, and water quality data needed for setup and calibration of the model
- Setup and calibration of the model for simulation of hydrodynamics and temperature
- Conducting model application and analyses for the following scenarios:
 - Existing condition — Linkage of individual reaches of the model for the calibration condition to simulate the entire system using inflow data

- Natural Thermal Potential (NTP) — Simulation of temperature in the Project portion of the Pend Oreille River system in the absence of the Project, but with all other hydrologic and land-use conditions remaining the same
- Alternatives — Simulation of the temperature response in the Project area for alternative operational scenarios that may be identified during the FERC relicensing process

The review of available data, Objective 1 above, was completed in 2006. Model setup for existing conditions was also completed in 2006, as was initial calibration of the model. Computed error statistics demonstrate that the model is well calibrated, i.e., correspondence between measured data and model predictions is at a level acceptable to Ecology. The model inputs will be updated as new information on bathymetry and shade become available.

Modeling of existing conditions in the Project area, under 2004-2005 flows, NTP, and TMDL scenarios is expected to be completed in early 2007, contingent upon alternative scenarios input provided by Ecology as part of the TMDL process.

A draft report documenting model construction, calibration, and application will be available by no later than 2008. The report will include background, objectives, results, and a summary of the temperature modeling results to date. The report will also include provisional conclusions based on model results. Data products provided in the report will include:

- Graphical presentation of model inputs
- Temperature prediction time-series and vertical profiles compared to the observed data
- Model calibration results and a list of model parameters
- Model application results for existing conditions and NTP

4.0 SUMMARY LIST OF PROPOSED STUDIES

This RSP encompasses a total of 24 individual study plans. These study plans are summarized in Table 4.0-1, along with the corresponding resource issue(s) that each plan is designed to address. The study plan components are organized by resource area, and indicate, in shaded text, where one study will intersect with studies from other resource areas.

Table 4.0-1. Summary of studies proposed in this RSP to address identified resource issues. ¹

| Identified Resource Issue | Proposed Study Plan ^a | Study No. |
|--|---|-----------|
| Geology and Soils | | |
| Contribution of the Project to shoreline and hillslope erosion | <ul style="list-style-type: none"> ▪ Erosion Study | 1 |
| Water Resources | | |
| Potential Project-related flooding of private property adjacent to upper portion of Boundary Reservoir | <ul style="list-style-type: none"> ▪ Analysis of Peak Flood Flow Conditions Above Metaline Falls | 2 |
| | Other relevant study: <ul style="list-style-type: none"> ▪ Mainstem Aquatic Habitat Modeling Study (hydraulic routing model component) <i>(Described under Fish and Aquatic Resources)</i> | 7 |
| Contribution of the Project to total dissolved gas (TDG) in the Pend Oreille River below the Project | <ul style="list-style-type: none"> ▪ Evaluation of TDG and Potential Abatement Measures | 3 |
| | Other relevant studies: <ul style="list-style-type: none"> ▪ Fish Distribution, Timing, and Abundance Study <i>(Described under Fish and Aquatic Resources)</i> | 9 |
| | <ul style="list-style-type: none"> ▪ Fish Entrainment and Habitat Connectivity Study <i>(Described under Fish and Aquatic Resources)</i> | 12 |

¹ Shaded studies are being conducted under another resource area. The study plans for these studies are designed to address all identified issues within all of the relevant resource areas.

Table 4.0-1, continued...

| Identified Resource Issue | Proposed Study Plan ^a | Study No. | |
|--|---|---|---|
| Effect of the Project on toxic compounds in Boundary Reservoir | <ul style="list-style-type: none"> ▪ Toxics Assessment: Evaluation of Contaminant Pathways, Potential Project Nexus | 4 | |
| | Other relevant studies: <ul style="list-style-type: none"> ▪ Erosion Study <i>(Described under Geology and Soils)</i> ▪ Mainstem Aquatic Habitat Modeling Study (hydraulic routing model component) <i>(Described under Fish and Aquatic Resources)</i> ▪ Sediment Transport and Boundary Reservoir Tributary Delta Habitats Study <i>(Described under Fish and Aquatic Resources)</i> | 1 7 8 | |
| | General water quality in Boundary Reservoir and relation to fish and habitat | <ul style="list-style-type: none"> ▪ Water Quality Constituent and Productivity Monitoring | 5 |
| | | Other relevant study: <ul style="list-style-type: none"> ▪ Mainstem Aquatic Habitat Modeling Study (aquatic plant habitat suitability component) <i>(Described under Fish and Aquatic Resources)</i> | 7 |
| pH and dissolved oxygen (DO) in Boundary Reservoir | <ul style="list-style-type: none"> ▪ Evaluation of the Relationship of pH and DO to Macrophytes in Boundary Reservoir | 6 | |

Table 4.0-1, continued...

| Identified Resource Issue | Proposed Study Plan ^a | Study No. |
|--|--|-----------|
| Fish and Aquatic Resources | | |
| Effect of load-following operations and pool-level fluctuations on fish and aquatic species and habitats | <ul style="list-style-type: none"> ▪ Mainstem Aquatic Habitat Modeling Study; study includes the following components: <ul style="list-style-type: none"> ▪ Habitat mapping ▪ Hydraulic routing model ▪ Physical habitat model development ▪ Habitat suitability index (HIS) development, for: <ul style="list-style-type: none"> - Fish - Macrophytes - Periphyton and benthic macroinvertebrates | 7 |
| Sediment transport and effect of reservoir fluctuations on tributary delta habitat | <ul style="list-style-type: none"> ▪ Sediment Transport and Boundary Reservoir Tributary Delta Habitats Study; study includes the following components: <ul style="list-style-type: none"> ▪ Tributary delta habitat modeling ▪ Evaluation of tributary delta sediment processes ▪ Evaluation of mainstem sediment transport | 8 |
| Abundance, distribution, and periodicity of fish in Boundary Reservoir | <ul style="list-style-type: none"> ▪ Fish Distribution, Timing, and Abundance Study; study includes the following components: <ul style="list-style-type: none"> ▪ Passive and active sampling ▪ Biotelemetry | 9 |
| Effect of Project operations on wood recruitment and transport | <ul style="list-style-type: none"> ▪ Large Woody Debris Management Study | 10 |
| Aquatic productivity in Boundary Reservoir | <ul style="list-style-type: none"> ▪ Productivity Assessment | 11 |

Table 4.0-1, continued...

| Identified Resource Issue | Proposed Study Plan ^a | Study No. |
|---|--|------------------|
| Fish entrainment and connectivity | <ul style="list-style-type: none"> ▪ Fish Entrainment and Habitat Connectivity Study; study includes the following components: <ul style="list-style-type: none"> ▪ Evaluation of potential turbine entrainment ▪ Evaluation of potential spillway entrainment | 12 |
| Recreational fishery at the Project | <ul style="list-style-type: none"> ▪ Recreational Fishery Study; study includes the following components: <ul style="list-style-type: none"> ▪ Recreational creel and angler surveys ▪ Triploid trout biotelemetry ▪ Triploid trout management | 13 |
| Effect of Project operations on habitat in Boundary Reservoir tributaries | <ul style="list-style-type: none"> ▪ Assessment of Factors Affecting Aquatic Productivity in Tributary Habitats | 14 |
| Botanical and Wildlife Resources | | |
| Waterfowl nesting habitat and productivity at Boundary Reservoir | <ul style="list-style-type: none"> ▪ Waterfowl/Waterbird Study | 15 |
| | Other relevant study: <ul style="list-style-type: none"> ▪ Mainstem Aquatic Habitat Modeling Study (hydraulic routing and aquatic plant habitat suitability components) <i>(Described under Fish and Aquatic Resources)</i> | 7 |

Table 4.0-1, continued...

| Identified Resource Issue | Proposed Study Plan ^a | Study No. |
|--|---|-----------|
| Status of cottonwood and other riparian-dependent plant species adjacent to Boundary Reservoir | <ul style="list-style-type: none"> ▪ Inventory of Riparian Trees and Shrubs | 16 |
| | Other relevant studies: | |
| | <ul style="list-style-type: none"> ▪ Erosion Study <i>(Described under Geology and Soils)</i> | 1 |
| | <ul style="list-style-type: none"> ▪ Mainstem Aquatic Habitat Modeling Study (hydraulic routing model component) <i>(Described under Fish and Aquatic Resources)</i> ▪ Sediment Transport and Boundary Reservoir Tributary Delta Habitats <i>(Described under Fish and Aquatic Resources)</i> | 7 8 |
| Effect of the Project on rare, threatened, and endangered (RTE) plant species | <ul style="list-style-type: none"> ▪ Rare, Threatened, and Endangered (RTE) Plant Species Inventory | 17 |
| Effect of the Project on RTE wildlife species | <ul style="list-style-type: none"> ▪ RTE Wildlife Species Study | 18 |
| | Other relevant study: <ul style="list-style-type: none"> ▪ Big Game Study | 19 |
| Effect of the Project on deer, elk, and other big game species | <ul style="list-style-type: none"> ▪ Big Game Study | 19 |
| | Other relevant study: <ul style="list-style-type: none"> ▪ RTE Wildlife Species Study | 18 |
| Effect of the Project on bats | <ul style="list-style-type: none"> ▪ Bat Surveys and Habitat Inventory | 20 |

Table 4.0-1, continued...

| Identified Resource Issue | Proposed Study Plan ^a | Study No. |
|--|--|-----------|
| Recreation and Land Use | | |
| Recreational use, opportunities and demand in the Project area | <ul style="list-style-type: none"> ▪ Recreation Resource Study; study includes the following components: <ul style="list-style-type: none"> ▪ Recreation surveys ▪ Regional recreation analysis ▪ Dispersed recreation use, access, and condition analysis ▪ Future recreation use analysis ▪ Recreation carrying capacity analysis | 21 |
| | Other relevant studies: <ul style="list-style-type: none"> ▪ Recreational Fishery Study <i>(Described under Fish and Aquatic Resources)</i> ▪ Erosion Study <i>(Described under Geology and Soils)</i> | 13 |
| | <ul style="list-style-type: none"> ▪ Land and Roads Study | 1 |
| Project-related roads system (condition and needs) and public access | Other relevant studies: | |
| | <ul style="list-style-type: none"> ▪ Erosion Study <i>(Described under Geology and Soils)</i> | 1 |
| | <ul style="list-style-type: none"> ▪ Big Game Study <i>(Described under Botanical and Wildlife Resources)</i> ▪ Recreation Resource Study | 19 21 |

Table 4.0-1, continued...

| Identified Resource Issue | Proposed Study Plan ^a | Study No. |
|--|---|-----------|
| Aesthetic/Visual Resources | | |
| Effect of the Project on visual character and visual quality | <ul style="list-style-type: none"> ▪ Aesthetic/Visual Resource Study | 23 |
| | Other relevant studies: <ul style="list-style-type: none"> ▪ Erosion Study <i>(Described under Geology and Soils)</i> | 1 |
| | <ul style="list-style-type: none"> ▪ Recreation Resource Study (recreation surveys component) <i>(Described under Recreation and Land Use)</i> | 21 |
| Cultural Resources | | |
| Effect of the Project on cultural resources | <ul style="list-style-type: none"> ▪ Cultural Resource Study | 24 |
| | Other relevant studies: <ul style="list-style-type: none"> • Erosion Study <i>(Described under Geology and Soils)</i> | 1 |
| | <ul style="list-style-type: none"> • Dispersed Recreation Use, Access, and Condition Analysis (a component of the Recreation Resources Study) <i>(Described under Recreation and Land Use)</i> | 21 |
| | <ul style="list-style-type: none"> • Assessment of Factors Affecting Aquatic Productivity in Tributary Habitats <i>(Described under Fish and Aquatic Resources)</i> | 14 |
| | <ul style="list-style-type: none"> • Bat Surveys and Habitat Inventory <i>(Described under Botanical and Wildlife Resources)</i> | 20 |

5.0 CONVERSION TABLE FOR PROJECT ELEVATIONS

SCL is in the process of converting all Project information from an older elevation datum to a more recent elevation datum. Key elevations are provided relative to both the National Geodetic Vertical Datum of 1929 (NGVD 29) and the North American Vertical Datum of 1988 (NAVD 88) throughout this RSP. A conversion table for key Project elevations is provided in Table 5.0-1. Future licensing documents will primarily cite elevations relative to NAVD 88. Elevation or vertical data collection throughout relicensing studies will be collected in NAVD 88 datum.

Table 5.0-1 SCL Boundary Project datum conversion of key features, as of October 2, 2006.

| Feature | Elevation (NGVD 1929, Feet) | Elevation (NAVD 1988, Feet) |
|------------------------|--|--|
| Crest of Dam | 2000 | 2004.03 |
| Maximum Operating Pool | 1990 | 1994.03 |
| Minimum Operating Pool | 1950 | 1954.03 |
| Spillway Crest | 1946 | 1950.03 |
| Minimum Intake Pool | 1903 | 1907.03 |
| Normal Tailwater | 1729 | 1733.03 |

6.0 LITERATURE CITED

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