# PRELIMINARY DRAFT ENVIRONMENTAL ASSESSMENT

## BLUE LAKE HYDROELECTRIC PROJECT

FERC No. 2230-000-Alaska

**City and Borough of Sitka, Alaska**

**June, 2005**

**FEDERAL ENERGY REGULATORY COMMISSION**

Office of Energy Projects

Division of Environmental and Engineering Assessment

## EXECUTIVE SUMMARY

The City and Borough of Sitka, Alaska (City) holds a Federal Energy Regulatory Commission (FERC, Commission) license for the Blue Lake hydroelectric Project (Project), FERC No. 2230 that will expire on March 31, 2006. The Project is located approximately 5 miles southeast of Sitka, Alaska and impounds the waters of Sawmill Creek, formerly the Medvetche River. The 7.56 megawatt (MW) Project consists of three generating units, collectively capable of producing 7.5 MW of electrical power. Total average annual generation for the Project over the past four fiscal years has been 48,397 megawatt hours (MWH). The Project Boundary occupies 276 acres of land managed by the US Forest Service (USFS), Tongass National Forest, the City, the University of Alaska and several private land-owners.

On November 1, 2002, the City filed with the FERC a Notice of Intent to relicense the Blue Lake Project pursuant to 18 CFS, Section 16.6. On August 28, 2003, the City filed a request to use the Alternative Licensing Procedure (ALP) for relicensing the Blue Lake Project. The Commission granted this request on October 22, 2003.

The Proposed Action includes the following measures:

1. Increase the Project minimum flow release from 50 cubic feet per second (cfs) year around to 60 cfs during May and June to enhance habitat for steelhead spawning; flow for the remainder of the year would remain 50 cfs;

2. Install a third generation turbine at the Blue Lake Unit generating facility. This installation would better utilize Blue Lake water storage, avoid costly, polluting and unpredictably priced diesel generation, and confer benefits on anadromous fisheries in Sawmill Creek;

3. Develop and construct a drainage system for the USFS campground to relieve that area of annual flooding and improve camping and other recreational activities in the area;

4. Regrade and further develop the USFS campground parking lot; and

5. Improve the Blue Lake overlook at the terminus of USFS Road No. 5755 to provide better parking facilities and safety features.

This Preliminary Draft Environmental Assessment analyzes the effects of the Proposed Action and various alternatives to the proposed action, including no-action. Issuing a new license for the Blue Lake Project would allow the City to continue to operate the Project as a beneficial and dependable source of power. Overall, the proposed measures would protect and enhance fisheries, wildlife, recreation, aesthetic and cultural resources.

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## ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| **ADEC** | **Alaska Department of Environmental Conservation** |
| **ADF&G** | **Alaska Department of Fish and Game** |
| **ADNR** | **Alaska Department of Natural Resources** |
| **af** | **acre foot or feet** |
| **ALP** | **Alternative Licensing Process** |
| **APC** | **Alaska Pulp Company** |
| **APE** | **Area of Potential Effect (cultural resources)** |
| **BLU** | **Blue Lake (generating) Unit** |
| **cfs** | **Cubic foot or feet per second** |
| **CMT** | **Culturally-Modified tree** |
| **CZMA** | **Coastal Zone Management Act** |
| **EA** | **Environmental Assessment** |
| **EIS** | **Environmental Impact Statement** |
| **FERC** | **Federal Energy Regulatory Commission** |
| **FPA** | **Federal Power Act** |
| **FVU** | **Fish Valve Unit** |
| **FWS** | **United States Fish and Wildlife Service** |
| **HPA** | **Historic Preservation Act** |
| **ICD** | **Initial Consultation Document** |
| **IFIM** | **Instream Flow Incremental Methodology** |
| **IFT** | **Instream Flow Team** |
| **kW** | **kilowatt** |
| **kWh** | **kilowatt hour** |
| **mgd** | **Million gallons per day** |
| **MW** | **Megawatt** |
| **MWh** | **Megawatt hour** |
| **NEPA** | **National Environmental Policy Act** |
| **NGO** | **Non-governmental Organization** |
| **NMFS** | **National Marine Fisheries Service** |
| **NOI** | **Notice of Intent (to relicense)** |
| **PDEA** | **Preliminary Draft Environmental Assessment** |
| **PMFU** | **Pulp Mill Feeder Unit** |
| **SCIP** | **Sawmill Cove Industrial Park** |
| **SD1** | **Scoping Document 1** |
| **SD2** | **Scoping Document 2** |
| **SHPO** | **State Historic Preservation Officer** |
| **SM** | **Stream Mile** |
| **STA** | **Sitka Tribe of Alaska** |
| **USFS** | **United States Forest Service** |
| **USGS** | **United States Geological Survey** |
| **WUA** | **Weighted Usable Area** |

## PRELIMINARY DRAFT ENVIRONMENTAL ASSESSMENT

**Blue Lake Hydroelectric Project**
**FERC No. 2230 Alaska**

**City and Borough of Sitka, Alaska Electric Department**

## APPLICATION

The City and Borough of Sitka ("City"), Alaska hereby applies to the Federal Energy Regulatory Commission (FERC or Commission) for a new license for the Blue Lake Hydroelectric Project (Project), FERC Project No. 2230, as described in Exhibits A-D. The Project is located on Sawmill Creek in Southeast Alaska, approximately 7 miles from the city of Sitka, Alaska (Figure 1). The location of Project facilities is shown on Figure 2. Project facilities, including transmission corridors, variously occupy state, federal and private lands, including those lands administered by the U.S. Forest Service(USFS) Tongass National Forest.

The Project is an existing combined-purpose facility operated by the City and Borough of Sitka Electric Department. The Project utilizes water stored in Blue Lake to generate electricity and to provide for municipal water supply and certain permitted industrial and commercial uses.

## 1.0 PURPOSE AND NEED FOR POWER

### 1.1 PURPOSE of ACTION

The Commission must decide whether to relicense the Project and what conditions should be placed on any license issued. In deciding whether to issue any license, the Commission must determine that the project would be best adapted to a comprehensive plan for improving or developing a waterway. In addition to the power and developmental purposes for which licenses are issued, the Commission must give equal consideration to the purposes of energy conservation, enhancement of fish and wildlife (including related spawning grounds and habitat), the protection of recreational opportunities and the preservation of other aspects of environmental quality. This PDEA reflects the above considerations.

In this PDEA, we assess the environmental and economic effects of 1) operating the Project as proposed by the City and 2) the No Action Alternative. We also generally assess alternative generating capacities, decommissioning of the Project, federal government takeover, and issuance of a non-power license.

## 1.2 NEED for POWER

The City of Sitka's primary electrical power concern is the ability of the existing generation system to meet future electrical loads. Load forecasting and generation analysis for Sitka's existing electrical generation system under moderate growth projections have been conducted as part of the Project relicensing. These evaluations have shown that, with no change in current installed generating components or electrical system operation, the City's energy needs over a 30-year license period can be met only through increasing diesel generation, with attendant air quality, fuel handling and energy cost and stability disbenefits. In short, relicensing the Blue Lake Project represents a critical juncture in the City's overall future planning process, results of which will affect Sitka's economy into the future.

### 1.2.1 Sitka's Current Energy Needs

Concern for Sitka's energy future is heightened by several characteristics unique to the community:

- Sitka residents currently enjoy some of Alaska's lowest energy costs, particularly when compared to other southeast Alaska remote communities. Low energy costs encourage economic development in the area, and, to the extent that they may be depended upon, assure stability and quality of life in the community;

- Along with low cost, Sitka's total annual electrical generation, is comprised primarily of dependable and non-polluting hydroelectric generation. This largely avoids not only the pollution associated with diesel generation, but also the cost instability;

- Sitka is isolated from all other sources of energy such as natural gas or coal. Discovery of local reserves or development of delivery systems for these sources are not anticipated;

- Sitka's isolation from public utility interconnections makes purchasing or selling hydroelectric energy from other sources impossible. The City cannot simply flip a switch and tap energy from a local electrical grid. Future energy shortages can be met only through optimized operation of the existing generation system and/or installation of additional generation.

- The City and Borough of Sitka Electric Department is an independent, non-profit division of the City. Operation, maintenance, debt service and utility payroll are funded entirely through rate payer billing which is regulated by the Assembly of the City and Borough of Sitka. Rates are held at levels adequate to pay for expenses and a small margin to meet bond requirements.

### 1.2.2 Future Energy Concerns

Recent electrical load growth forecasts for the Sitka service area indicate a range of between 0.0 and 2.0 percent annual growth over a 30-year period (City of Sitka, 2005f). The current "Medium Case" or most likely growth rate is 0.8 percent. Even under this conservative load growth rate, diesel generation, if no operational or generation changes are made, becomes excessive about 20 years into the new license period. That is, significant additional diesel generation will be required both to meet load and to assure system frequency stability (due to low reservoir elevations resulting from excessive drafting to meet load). Under the 2.0% load growth scenario, substantial additional diesel generation would be required in less than 10 years.

As described below, however, there is considerable concern over increasing likelihood of a higher growth rate occurring much sooner than under the Medium Case.

The typical Sitka residence has electric baseboard heat supplemented with a high efficiency oil-fired space heater in the main living area. Currently, the oil-fired heater supplies most of the heating energy. The electric baseboard operates only when needed on cold winter days for comfort in the bedrooms or bathrooms.

Recent increases in fuel oil prices, however, may cause consumers to switch from fuel oil to electricity for space heating. Residential heating oil prices in the winter of 2004 peaked at $2.52 per gallon, which yields about the same heating energy bill for a residence as electric resistance heating.

If oil prices continue to escalate, it is likely that homeowners will select baseboard heating and use the oil stove as a back-up or supplementary heat source. The "high heat" case discussed in the load forecast represents estimated load growth rate in such a case. Under this scenario, critical generation shortages are predicted to occur within the first 5 to 8 years of the new license period.

If no action is taken to further optimize the Blue Lake Project's generation, diesel consumption will increase by 36,622 MWH per year over a thirty year license period, to a point at which it represents over a fourth of total energy generation. This would equate to roughly 40 tons of sulfur oxides, 35 tons of nitrous oxides and 9,000 tons of carbon dioxide emission per year.

Clearly, Sitka's energy future represents a planning challenge requiring informed decision-making and adequate lead times. Failure to address this challenge in the near future will leave the community excessively dependent on diesel, a costly and polluting energy source. Planning and development for Sitka's hydroelectric system is the key to Sitka's energy future.

## 1.3 BACKGROUND

### 1.3.1 Project History

The Federal Power Commission (FPC) Order issuing the original license is dated April 4, 1958. Construction began April 30, 1958 and commercial operation commenced July 23, 1961. In 1979, to meet increased electrical demands, the City obtained a license for the Green Lake project (FERC No. 2818), which was constructed in 1982 in the Vodopod River basin approximately 8 miles to the southeast of the Blue Lake project. The Blue Lake and Green Lake Projects operate conjunctively to supply the City's electrical needs.

The original Blue Lake license remains in effect, but with several amendments addressing various additions and upgrades to the original project design and/or operation. The following amendments are described relative to their provisions and respective issuance order dates:

- Due to increased loads and several dry years, an order amending the license to allow the current instream flow releases was issued on September 7, 1977, as described in subsequent sections;

- The construction of the Green Lake project necessitated upgrading of the Blue Lake transmission line capacity from 34.5 kV to 69 kV. The order amending the license for this change is dated June 12, 1980;

- An order was issued on November 15, 1983 to allow the 20" municipal water tap on the penstock.

- An amendment was ordered on September 6, 1991 to increase the Project nameplate capacity from 6000 kW to 7500 kW with the addition of the Fish Valve Unit and the Pulp Mill Feeder Unit (City and Borough of Sitka, 1990).

The Project maintains an excellent record of environmental license article compliance, dam safety and dependable generation. It's access roads and Blue Lake reservoir support excellent recreation opportunities for residents and visitors alike, and the reservoir is the primary source of Sitka's potable water. Sitka's predominantly hydroelectric generation base avoids use of approximately 7 million gallons of diesel fuel annually, significantly reducing air and noise pollution and fuel storage and transportation risks.

### 1.3.2 Agency Consultation

#### 1.3.2.1 Alternative Licensing Procedure (ALP)

The City filed an initial request to use the ALP on May 1, 2003. After review of this request, FERC staff returned comments requiring additional information, including resource agency approval of a Communications Protocol (CP).

The Draft CP was submitted for agency review on August 12, 2003, and comments were received between August 13 and 23 from ADNR, ADF&G, FWS, NMFS and USFS. Comments included agency statements approving the use of ALP. After comment incorporation and additional consultation, the Final CP and revised request to use ALP was filed with the FERC Secretary on August 28, 2003.

Authorization of use of ALP was transmitted by FERC letter dated October 22, 2003.

#### 1.3.2.2 Initial Consultation and Fish and Wildlife Study Planning

Preliminary consultation began prior to submission of the Notice of Intent (NOI) to relicense. City representatives conducted informational meetings and began early study planning for Sawmill Creek fisheries early 2002. The NOI was submitted to the FERC on November 11, 2002.

Initial consultation began with distribution of the Initial Consultation Document (ICD) in November, 2002. This represented initiation of the relicensing process 5 years and 6 months prior to license expiration.

Initial consultation meetings and a site visit, to discuss the project generally and to begin the study planning process, were held in Sitka on December 17, and December 18, 2002.

Based on comments from the November meeting(s), the City distributed a Draft Fish and Wildlife Study Plan on April 4, 2003. A fish and wildlife study planning meeting was held in Juneau on April 15, 2003. Based on comments on both the draft study plan and those received at the meeting, the City prepared a final Fish and Wildlife Study Plan on July 23, 2003. The instream flow component of fish and wildlife study planning was deferred to a later date.

#### 1.3.2.3 Instream Flow Study Planning.

Instream flow study planning began at a meeting in Sitka on October 22, 2003 at which the City proposed to focus on high-value anadromous fish spawning sites using the detailed information available from the ongoing Sawmill Creek Fisheries Surveys (Wolfe 2002-2005). A sub-group called the Instream Flow Team (IFT) was informally established at that meeting.

The City held another instream flow meeting on December 8, 2003, in Juneau and discussed both Expert Habitat Mapping (EHM) and a hydraulic measurement-based methods similar to the Instream Flow Incremental Methodology (IFIM). Also at that meeting, the IFT discussed and preliminarily approved a list of target fish species and life stages.

After the December 8th meeting, Alaska Department of Fish and Game (ADF&G), and National Marine Fisheries Service (NMFS) commented on the draft instream flow study plan and requested additional information.

After further consultation, the IFT agreed upon use of the IFIM methodology.

A Supplement to the Instream Flow Study Plan was distributed by the City on April 9, 2003. The Supplement, after revisions according to IFT comments, was considered the final Instream Flow Study Plan.

An instream flow site selection field trip, attended by some members of the IFT was held on April 20, 2004 at which IFIM cross-section locations were selected. The City and Miller Ecological Associates (MEC) of Ft. Collins, CO, conducted field measurements from April 20 through April 22, 2004.

On September 24 2004, MEC distributed a draft IFIM data report to the IFT (MEC, 2004).

On January 10 2005, the City distributed a draft Habitat Suitability Curve (HSC) paper to the IFT for review (City and Borough of Sitka 2005b).

On January 19, 2005, the IFT met in Juneau to discuss HSC's. Proposed changes to the various curves were offered, and the City distributed a revised draft HSC paper on February 15, 2005.

E-mail responses from four resource agencies indicated agreement with the changes in the revised draft HSC paper.

On April 22, 2005, the City held an instream flow negotiations meeting in Sitka to discuss the results of the IFIM work and updates to the Blue Lake system Operation Model.

#### 1.3.2.3 Study Planning for Other Resources

**Recreation**

After initial study planning with the USFS, the City distributed a Draft Recreation Study plan on September 9, 2004. Comments on this draft were submitted by USFS, and have been addressed by the City. The final Recreation study plan was approved in October, 2004.

**Subsistence**

The City distributed a Draft Subsistence Study Plan on June 8. 2004. Comments on this draft were received from Sitka Tribe of Alaska (STA), USFS ADF&G and FWS. The

City addressed all comments and distributed the Final Subsistence Study Plan on September 23, 2004.

**Cultural**

The City submitted a Preliminary Draft Cultural Resources Study Plan in to USFS on May 14, 2004, and addressed comments through a series of revisions. A Draft Cultural Resource Study Plans was distributed for review on September 28. The final Cultural Resources study plan was distributed in November, 2004.

### 1.3.3 Scoping

Copies of Scoping Document 1 (SD1) were distributed electronically on September 17th, 2003, with a cover letter describing the review process and dates and places of the Scoping Meeting and Site Visit. After the meeting and site visit (held on October 28th and 29th, 2003, respectively) comments were received from ADF&G, NMFS, USFS and FWS. Copies of the comment letters and assigned comment numbers are in Attachment I of Scoping Document 2 (SD2).

A draft of SD2 was distributed on April 2, 2004, for final review. All comments were addressed either through changes in the SD1 text or by explanation in the Tables in Attachment II of SD2. In response, USFS, by letter dated May 7, 2004, commented that the draft SD2 had not addressed its earlier requests for three study plans, specifically those for cultural, recreation and subsistence resources. The City, through spring and summer, 2004, continued consultation with various agencies and prepared draft study plans for those three resources. At the time of this PDEA, final versions of these three study plans have been developed.

# 2.0 PROPOSED ACTION AND ALTERNATIVES

## 2.1 PROJECT DESCRIPTION and OPERATION

### 2.1.1 Project Description

The Blue Lake Project is located approximately 5 miles east of the City of Sitka, Alaska, on Sawmill Creek, formerly the Medvetche River (Figure 1). The Project consists of ten major features: the dam; a submerged intake structure; a power conduit; three powerhouses; a switchyard and a primary and two secondary transmission lines (Figure 2). The Project Boundary Map (Figures 3 and 4) shows the FERC-designated boundary around the project features and primary transmission line to Sitka.

Throughout this document, the Project features are discussed relative to their Stream Mile (SM), or the centerline distance on Sawmill Creek upstream from the Creek's mouth at tidewater, as determined from the project map. Reservoir and stream or roadway directions (left or right) are looking downstream or down-road. Elevations are referenced as heights in feet above or below mean low sea level, denoted by the term "El".

### 2.1.2 Project Features and Boundary

Names of project features are in bold type on first reference in this section to introduce project terminology which will be used throughout this document.

**Dam**

Located at SM 2.31 on Sawmill Creek, the concrete arch dam is 211 feet high with a base width of 25 ft and a crest width of 256 ft. The 140 ft wide spillway at El 342 is centrally located in the dam, and is sized to transport 14,000 cubic feet per second (cfs). A release valve, installed at the base of the dam, is used to release water when the reservoir is below the spillway elevation. The valve capacity is up to 800 cfs. A natural plunge pool is located downstream of the dam, to dissipate energy from the spillway discharge.

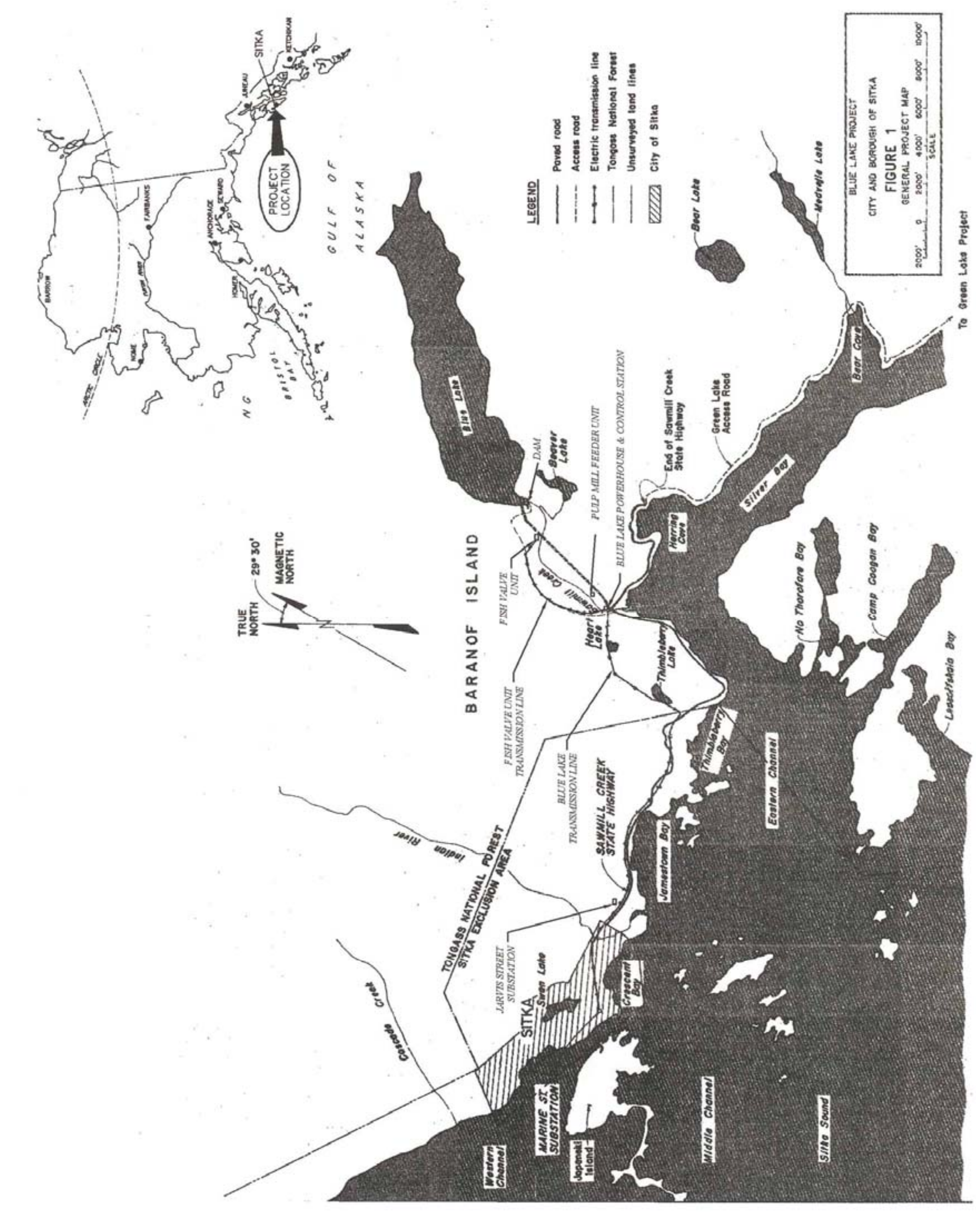


**Figure 1. Blue Lake Project Area Map**

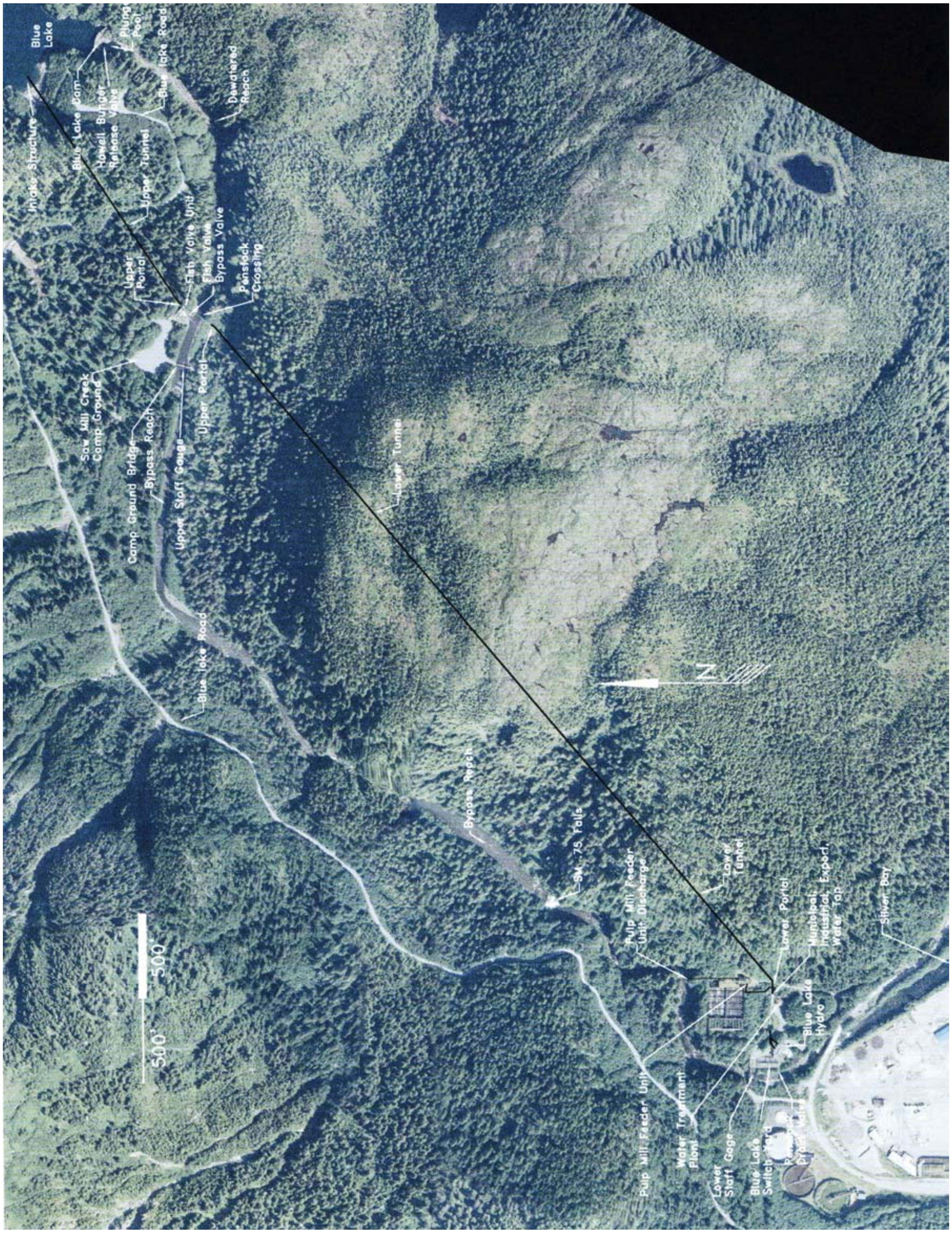


**Figure 2. Blue Lake Project Map Showing Project Features and Waterways.**

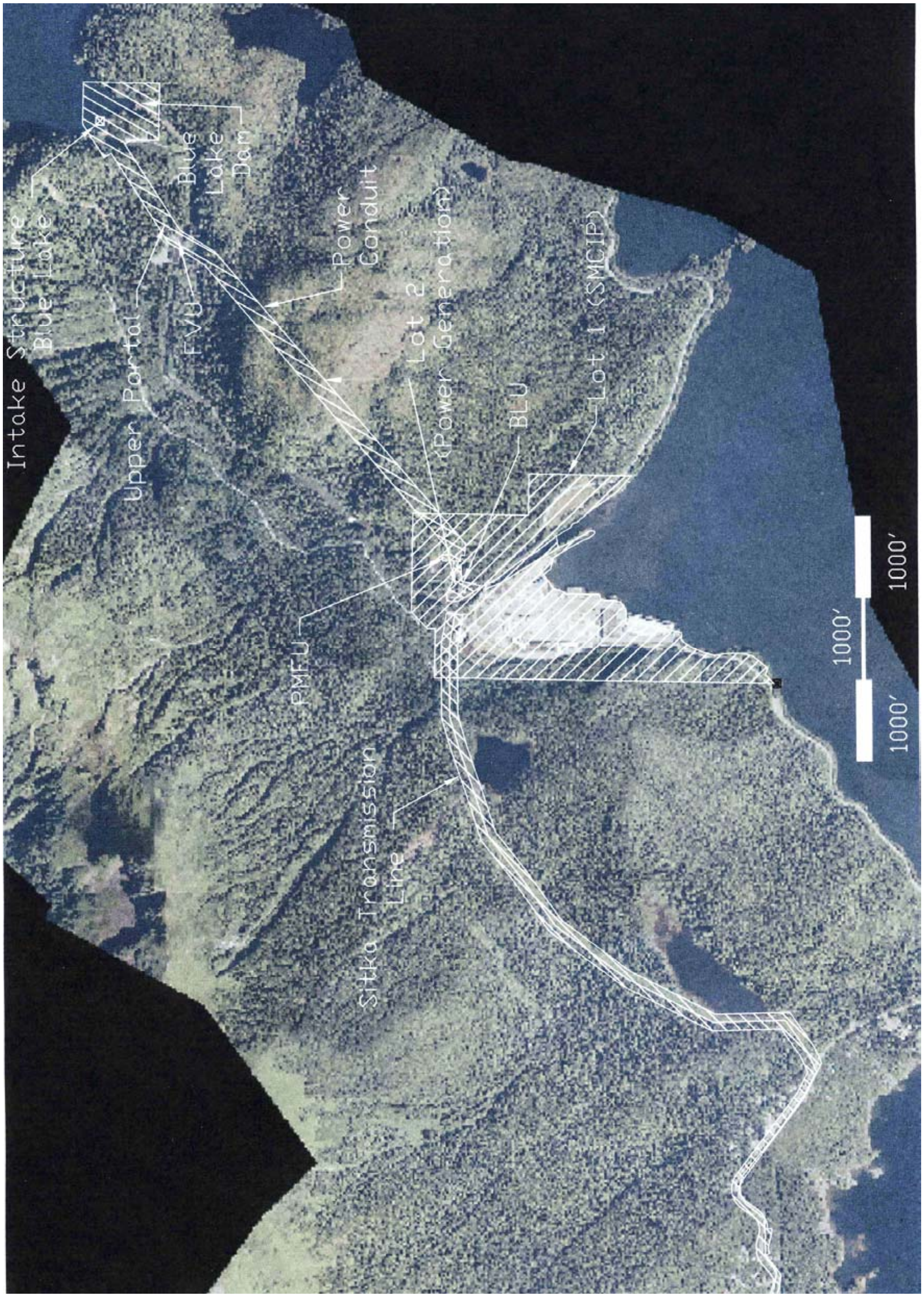


**Figure 3. Blue Lake Project Boundary, Eastern Segment.**


**Figure 4. Blue Lake Project Boundary, Western Segment**

## Reservoir

A reservoir, known as Blue Lake Reservoir, was created when the dam raised the natural Blue Lake water surface from El 208 to El 342 and increased the lake surface area from 490 to 1,225 surface acres. Blue Lake is 3.25 mi long and 0.625 mi in average width. The deepest point is at El minus 126 at a depth of 468 feet below the lake surface at spill elevation. The reservoir has gross storage capacity of 145,200 acre/feet (af) and usable storage of 102,200 af at spill level. A submerged concrete intake structure is located approximately 400 feet north of the dam at El 210.

## Power Conduit

A 7,110 ft. long power conduit extending from the intake structure to the Blue Lake powerhouse branches to provide water to the various powerhouses and other facilities described below. Figure 5 is a schematic representation of the Blue Lake Project power conduit system and associated taps and branches.

The power conduit consists of an upper tunnel with an unlined, 11.5 ft. diameter modified horseshoe cross-section extending 1,500 feet from the intake structure to the upper penstock on the right side of Sawmill Creek. The upper penstock, an 84 in. diameter, 460 ft. long, steel pipe crosses the stream supported on concrete piers and enters the lower tunnel on the left side of Sawmill Creek. The 4,650 ft. lower tunnel has an unlined, 10 ft. diameter modified horseshoe cross-section and extends to the lower penstock.

The lower penstock, an 84 in. diameter, 500 ft. long, steel pipe, has two taps immediately below the lower tunnel portal. A 36” tap supplies water to the Pulp Mill Feeder Unit and a 24” tap supplies water to the Sawmill Cove Industrial Park (SCIP), site of the former Alaska Pulp Company (APC) mill.

Approximately 90 feet below these two pipes is a 20 in. tap (the “water supply tap”) leading into the adjacent water treatment plant for municipal water supply. Approximately 50 feet below this tap is an 84 in. butterfly valve which allows shutdown of the main powerhouse and dewatering of the turbines while maintaining water to the Industrial Park and the Water Treatment Plant.

At the end of the lower penstock is a manually operated 24” conduit drain valve which discharges into Sawmill Creek.

## Project Powerhouses

The project consists of three powerhouses, including the Blue Lake, Fish Valve Unit and Pulp Mill Feeder Unit powerhouses. The Blue Lake powerhouse is the primary

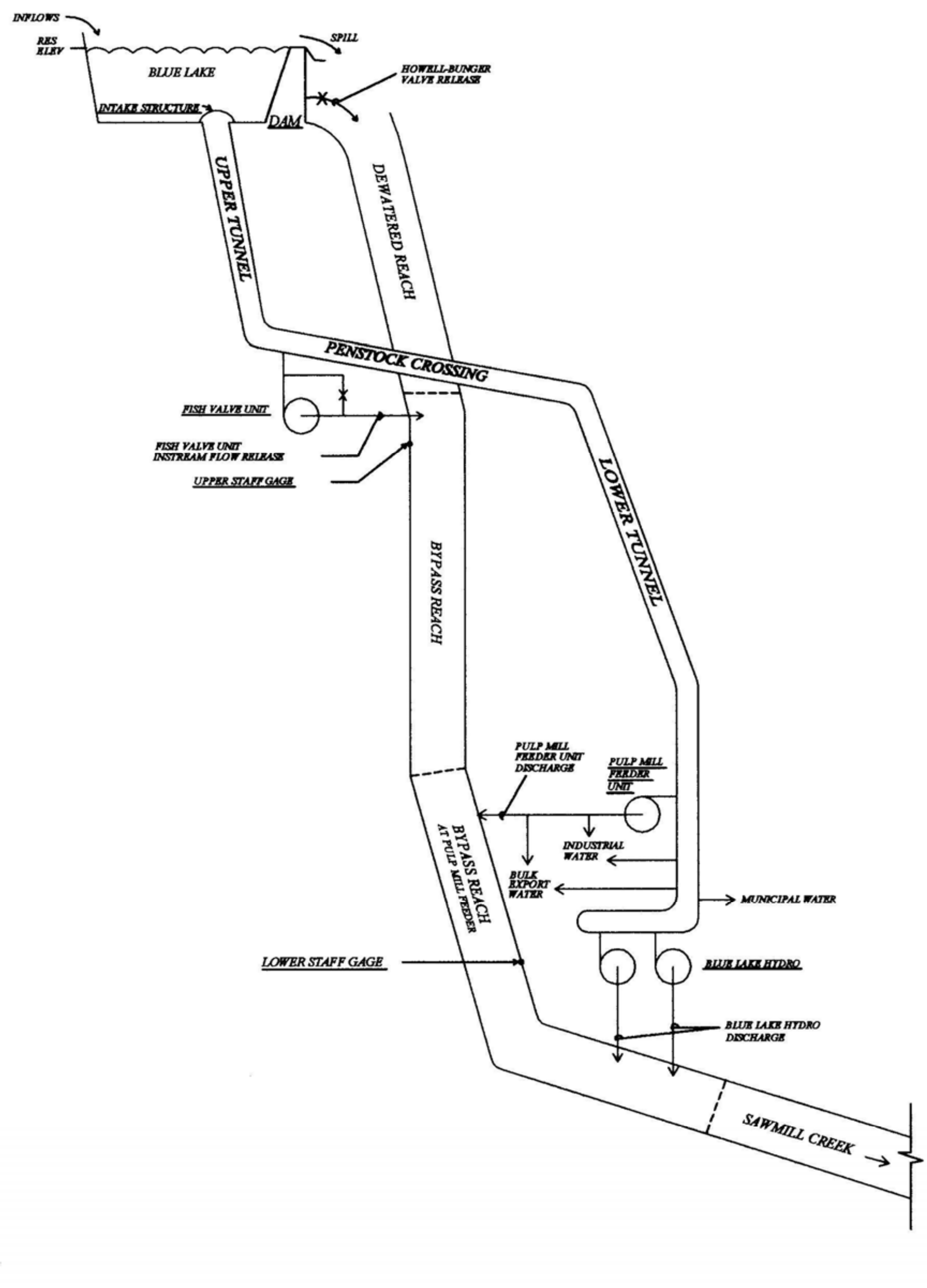


**Figure 5. Schematic of Blue Lake Project Power Conduit System**

generating unit, and the other two units provide additional generation capacity, as described in detail below.

***Blue Lake Powerhouse***

The Blue Lake Powerhouse houses the primary Project generating units. It is located on the left bank of Sawmill Creek at SM 0.32 and is a 35 ft. X 70 ft. steel superstructure, precast walls and concrete foundation structure housing two horizontal shaft Francis turbines each rated at 3000 kilowatt (kW) with provision for future installation of a third unit (Figure 6). The turbines discharge water into the approximately 150 ft long tailrace which carries water from the turbines to Sawmill Creek.

The Blue Lake Switchyard, located adjacent to the powerhouse, receives generation energy from the Blue Lake powerhouse, the Fish Valve Unit and the Pulp Mill Feeder Unit (described below). The switchyard includes 12.47/4.16 kV and a total of seven 2500 kVA single phase, 4.16/69 kV transformers, with associated bus-work and disconnect switches. This provides for redundant installed transformers and a total capacity of 15,000 kVA. Power from the Green Lake Project, FERC No. 2818, another hydroelectric facility owned by the City of Sitka, is also transmitted to the Blue Lake switchyard at 69 kV.

By FERC Order Amending License dated September 6, 1991, the Project was modified to include two additional generating units. These were:

***Fish Valve Unit (FVU)***

The FVU, located at SM 1.62, generates power from flows released for instream purposes through a valve located about 1900 ft. downstream of the dam (Figure 7). It is housed in a concrete powerhouse located approximately 175 feet below the upstream end of the upper penstock on the right side of the stream. A 36 in. diameter wye branch on the upper penstock supplies water to the FVU. An automatic bypass valve opens when the Fish Valve Unit is tripped off-line to maintain the required flow of 50 cfs in the stream at all times. A single Francis turbine spins a generator rated at 670 kW.

***Pulp Mill Feeder Unit (PMFU)***

The PMFU generates power from the water supply to the former Alaska Pulp Corporation (APC) filter plant. Since closure of the APC plant in 1993, the PMFU uses releases for bulk water export and other future uses. The PMFU consists of a 36 in. tee connected to the existing pulp mill feeder pipe and a 36 inch diameter, 24 ft. long penstock from the tee to the generating unit (Figure 8). The single horizontal shaft Francis turbine spins a generator rated at 870 kW.

Regular PMFU operation was discontinued in 1993 because of shutdown of the APC mill. The unit was returned to regular service in August, 2003.

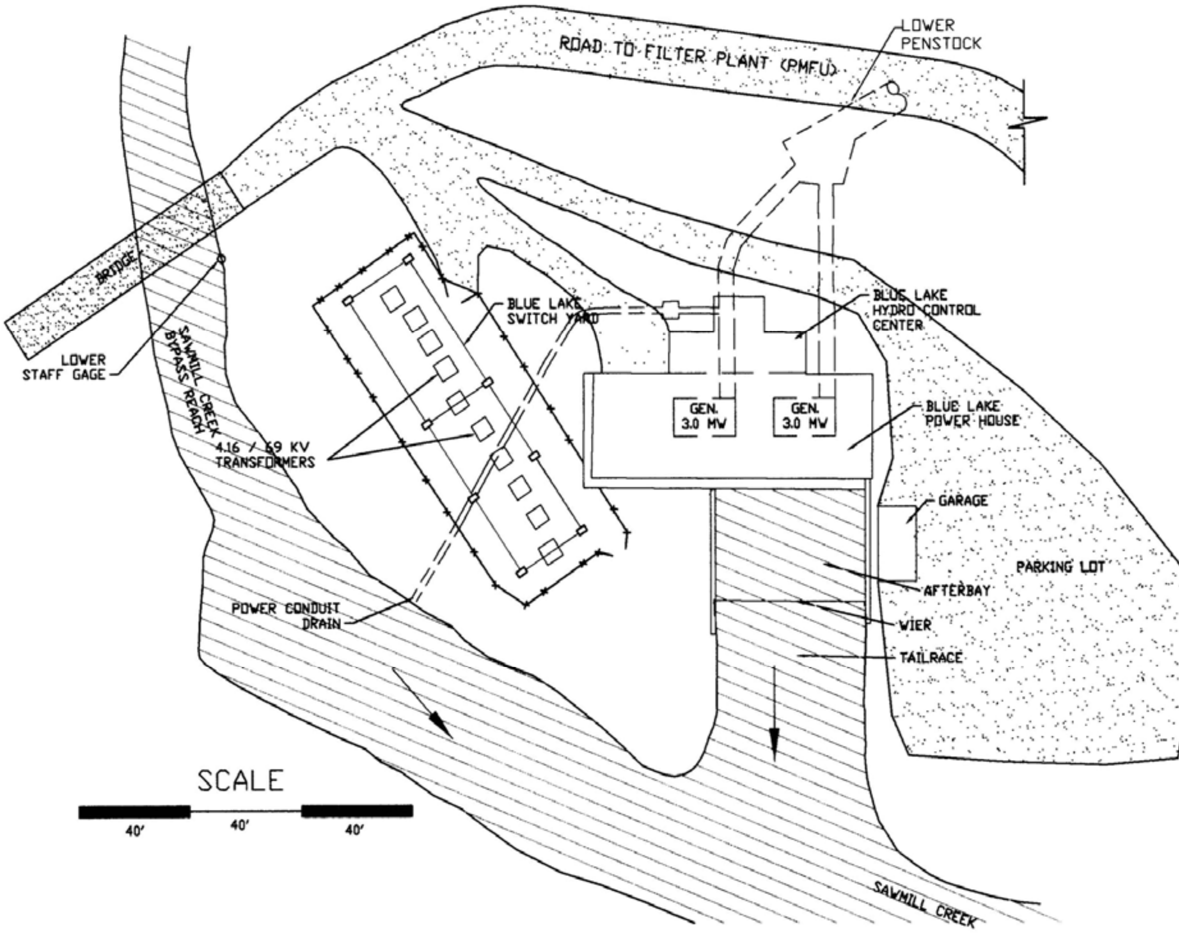


**Figure 6. Blue Lake Generating Unit**

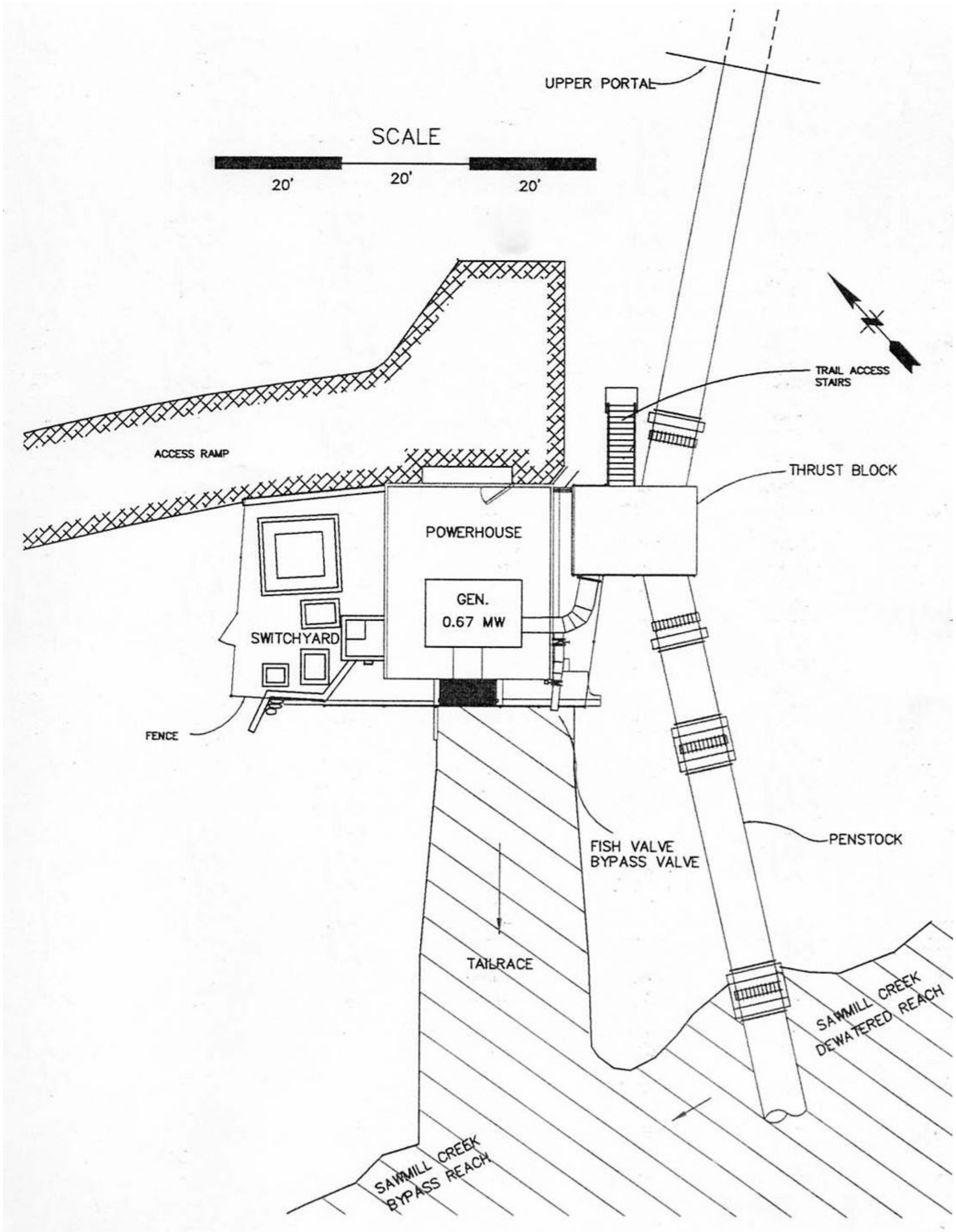


**Figure 7. Fish Valve Unit Components**

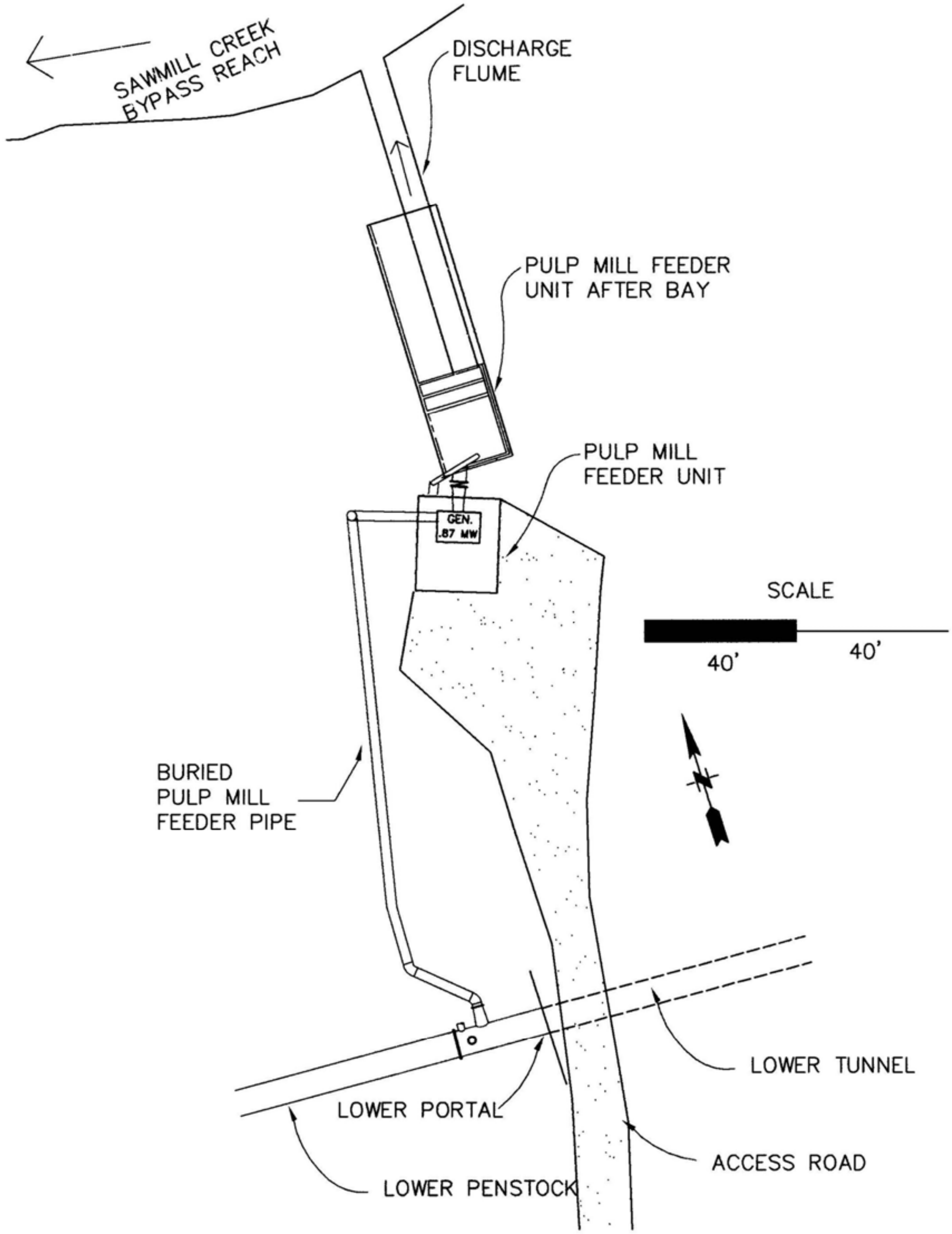


**Figure 8. Pulp Mill Feeder Unit Components.**

**Transmission Lines**

*Blue Lake Transmission Line.*

A 69 kV *Blue Lake transmission line* extends 5 miles from the Blue Lake Switchyard to the Jarvis Street and Marine Street substations in Sitka. The line consists of both H-frame and single pole, wood structures. The transmission line right of way occupies 27 acres of land. This land is administered by the U.S. Forest Service, the State of Alaska along the Sawmill Creek Highway right of way and private land owners.

***Pulp Mill Feeder Unit Transmission Line.***

Power from the PMFU is transmitted at 4.16 kV over a 470 ft. long, underground transmission line to the Blue Lake Powerhouse and connected to the main generation bus.

***Fish Valve Unit Transmission Line.***

Power from the FVU is transmitted over a 12.47 kV, transmission line 7,700 ft. long to the Blue Lake switchyard where it is transformed to 4.16 kV and connected to the main generation bus. The first 1,400 feet of the transmission line through the U.S. Forest Service Sawmill Creek recreation area is underground. The remaining portion is overhead.

**Access Roads.**

The dam access road is the USFS road No. 5755 (Blue Lake Road) and extends 2.19 miles to the dam from Sawmill Creek Road. Just downstream of the FVU, a footbridge bridge crosses Sawmill Creek at SM 1.57. Access to the Blue Lake powerhouse and the PMFU is along a licensee owned road connected to Sawmill Creek Road at mile 5.5; access to the FVU is via USFS road No. 5755. At SM 0.38, the Blue Lake Powerhouse bridge crosses Sawmill Creek just upstream of the Blue Lake powerhouse.

### 2.1.3 Project Lands

The existing facilities of the Blue Lake Project occupy 812 acres of U.S. lands administered by the Forest Service.

The project lies within U.S. Geological Survey Sitka A-4 and A-5 Quadrangle maps, within the land descriptions presented in Table 1.

**Table 1. Land Descriptions of Blue Lake Project Features.**

| Project Features | Map Locations |
|---|---|
| Dam, Spillway and Intake Structure | Section 35 of T55S, R64E, Copper River Meridian. |
| Power Conduit | Sections 34 and 35 of T55S, R64E, Copper River Meridian. |
| Fish Valve Unit | Section 34 of T55S, R64E, Copper River Meridian. |
| Pulp Mill Feeder Unit | Section 34 of T55S, R64E, Copper River Meridian. |
| Blue Lake Powerhouse | Section 34 of T55S, R64E, Copper River Meridian. |
| Primary Transmission Line | Section 33 & 34 of T55S, R64E, Copper River Meridian; Section 4, 5 and 6 of T56S, R64E, Copper River Meridian; Section 1 of T56S, R63E, Copper River Meridian; Section 35 & 36 of T55S, R63E, Copper River Meridian. |

### 2.1.4 Project Operation

#### 2.1.4.1 Project Role in Sitka's Electrical System

The Blue Lake Project is operated in conjunction with the Green Lake Project to meet the City's electric demand ("load"). The Blue Lake powerhouse is the control center for Sitka's entire electric system and is manned around the clock. Generally, the Blue Lake Project is operated as a "base-load" resource, that is, at a pre-set generation output. The Green Lake Project is used for "load-following" or at a continually changing generation output to meet the shifting load in addition to Blue Lake generation. Generation is also allocated between the Blue Lake and Green Lake Projects to manage storage levels in the reservoirs. Back-up generation for the hydroelectric system is supplied by four diesel powered electric generators totaling 11.9 mw nameplate capacity. The 2002 annual electric system load was 99024 Megawatt hours (Mwh).

Blue Lake reservoir levels are determined by two major factors: 1) reservoir inflow, resulting from precipitation and/or snowmelt, and 2) water releases for hydroelectric generation, spill, instream flow needs, municipal water use and water sales.

Hydroelectric generation is the largest of these releases, and has the greatest effect on Blue Lake reservoir levels.

Reservoir inflow is highest in summer and fall due to snowmelt and rainfall. During mid-winter, inflow decreases because precipitation is stored as snowpack. Sitka's electrical loads vary during the year due primarily to energy needs for heating. Demand is highest in winter and lowest in summer (Figure 9).

Because electrical load is lowest in summer and early fall, when inflow is highest, reservoir levels generally rise during this period. During winter, increased loads and reduced inflow cause the reservoir level to fall. Often, in early fall during the highest period of precipitation, reservoir levels exceed the height of the dam and water is "spilled" over the spillway at EL 342. Spilling in particularly wet years may last for several months. The reservoir is operated to maintain the highest possible level to maximize generation unless lower levels are desired for maintenance operations. Typically the lowest normal operational level is about El 280 at current load and average precipitation.

#### 2.1.4.2 Project Operation Criteria

The Project is operated according to conditions in the Original FPC License and certain license Amendments (described above) which specify Sawmill Creek streamflows. In addition, the City controls Blue Lake reservoir elevations on a monthly basis to assure adequate storage (in conjunction with the Green Lake Project), flood protection capacity, and maintenance access to the dam and intake, as required.

The City is required, under provisions of the Original license, to release flows for instream purposes ("instream flows") at the FVU, which generates power from these releases. From May through November, the minimum instream flow requirement is 50 (cfs), regardless of reservoir elevation. The license Amendment of 1977 provided that, from December through April, the 50 cfs flow could be reduced if the lake elevation

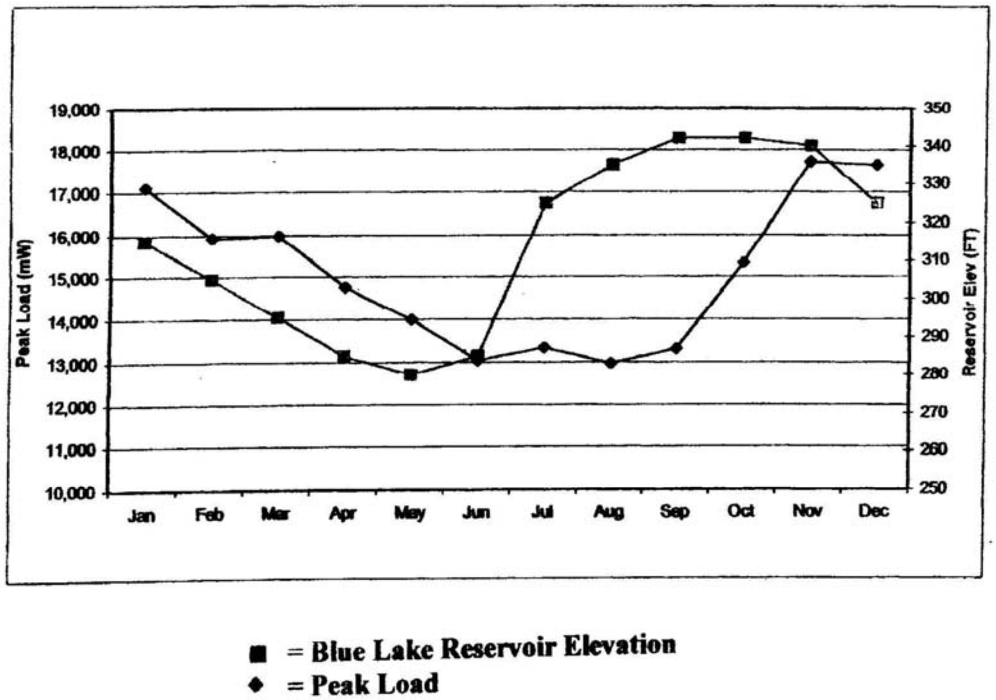


**Figure 9. Typical Monthly Peak Loads and Reservoir Elevations, Blue Lake Project**

dropped below certain critical levels (Table 2). Since the FVU was installed in 1992, the City has consistently exceeded the minimum Sawmill Creek instream flow requirements.

**Table 2. Sawmill Creek Minimum Instream Flow Requirements Allowed at Various Blue Lake Levels (FERC Order Dated September 7, 1977).**

| **Month** | **Lake Surface Elevation (feet)** | **Minimum Flow (cfs)** |
|---|---|---|
| December | 336 | 37 |
| January | 324 | 22 |
| February | 311 | 22 |
| March | 295 | 22 |
| April | 274 | 22 |

An automatic bypass valve opens when the FVU is not operating to maintain the required flow of 50 cfs in the stream. The reservoir release valve is used to maintain flow in the stream when the power conduit is out of service.

In addition to hydroelectric generation and instream flows, water is also released from Blue Lake reservoir to serve commercial interests, including bottled water and bulk water export operations located at or near the SCIP. The water rights for bulk water export, held by the City, require **that** withdrawals for this purpose cease when reservoir elevations fall below the elevations listed in Table 3. This is to assure priority for instream flow releases.

**Table 3. Blue Lake Reservoir Elevations Below Which Bulk Water Export Must be Discontinued.**

| Month | Lake Surface Elevation (feet) |
|---|---|
| March | 285 |
| April | 255 |
| May | 252 |
| June | 265 |
| July | 294 |
| Aug-Feb | 295 |

**Pulp Mill Feeder Unit operation.**

The PMFU was installed to generate power from process water for the APC mill. The mill was closed in 1993 and the PMFU operated only periodically. The PMFU was reactivated in August, 2003. This unit will be used to deliver water for bulk export and other potential uses. Water from the PMFU is discharged into Sawmill Creek when the water is not used concurrently for other uses.

## 2.2 APPLICANT'S PROPOSAL

### 2.2.1 Applicant's Proposal

The Applicant's Proposal at the time of this document consists of two primary measures, associated with fisheries and recreation issues evaluated in the Environmental Consequences sections, below.

### 2.2.2 Proposed Environmental Measures

Two primary measures are proposed at this time, relating to the resource issues they address, including 1) **Streamflow, Fish Habitat and Generation Measures**; and 2) **Recreation Measures**.

#### 2.2.2.1 Streamflow and Generation Measures

Streamflow and Generation Measures consist of two proposals:

a. **Instream Flow**: Increase the minimum instream flow release at the FVU from 50 cfs year round to 60 cfs during May and June to enhance steelhead spawning, and 50 cfs the remainder of the year; and
b. **Third Turbine Installation**: Install a third turbine at the BLU and operate that turbine to avoid diesel generation and utilize water much of which would have spilled under the current two-turbine configuration.

These instream flow and generation measures are discussed in more detail in the Fisheries Resources, Issue F1 Section, below, in Attachment I and in City and Borough of Sitka 2005f.

#### 2.2.2.2 Recreation Measures.

Recreation measures, based on suggestions from USFS, are as follows:

a. **Sawmill Creek Campground Drainage and Parking Lot:** Under this measure, the City would 1) install a culvert from the north side of the USFS campground to route water which normally collects in the campground into Sawmill Creek; and 2) Regrade the turnaround area and place large rock across the turnaround to block through traffic and divide the area into camping and day use.

b. **Blue Lake Reservoir Overlook:** Under this measure, the City would regrade the overlook parking area and place large rock at edge of bluff.

c. **Blue Lake Road - lower gate area:** Under this measure, the City would place signage directing traffic to additional parking across Sawmill Creek Road at the SCIP.

## 2.3 Agency and Interested Party Recommendations [Mandatory Conditions and 10(j)]

At the time of this document, no formal recommendations have been submitted by consulting agencies or the STA. We expect that, in response to the Applicant's Proposal, above, agencies and STA will issue written comment leading to negotiations and recommendations.

## 2.4 No Action Alternative

Under the no-action alternative, the Blue Lake Project would continue to operate as required by the existing Project license. No change to the current environmental setting the Project area would occur. No alterations or enhancements to existing environmental conditions would occur. The no-action alternative is used to establish a baseline environmental conditions for comparison with the other alternatives.

## 2.5 Alternatives Considered but Eliminated from Detailed Study

### 2.5.1 Raising Blue Lake Dam Height.

During the Initial Consultation Stage, the City discussed an alternative to raise the height of the Project dam to increase generation and operational flexibility. After further consideration of that alternative, the City announced at a study planning meeting held with fish and wildlife agencies in April, 2003, that it was no longer considering raising the dam. All changes in downstream release and Blue Lake levels will be considered based on the current dam height.

#### 2.5.2 Issuance of a Nonpower License

Issuing a nonpower license would not provide long-term resolution of the issues presented. A nonpower license is a temporary license that the Commission would terminate whenever it determines that another government agency would assume regulatory authority and supervision over the lands and facilities covered by the nonpower license. In this case, no agency has suggested its willingness or ability to do so. No party has sought a nonpower license, and the applicant has no basis for concluding that the project should no longer be used to produce power. Thus, in these circumstances, a nonpower license is not a realistic alternative to relicensing.

#### 2.5.3 Retiring the Project

Project retirement could be accomplished with or without dam removal. Either alternative would involve denial of a license application and surrender or termination f an existing license with appropriate conditions. Dam removal would not be appropriate in this case, and the City sees no basis for recommending it. The project provides many social and natural resource benefits that would not be available if the dam were removed.

The second decommissioning alternative would involve retaining the dam and disabling or removing equipment to generate power. Project works would remain in place and could be used for historic or other purposes. This would require identification of another government agency with authority to assume regulatory control and supervision of the remaining facilities. No agency has stepped forward, and no participant has advocated this alternative. Because the power supplied by the project is needed, a source of replacement power would have to identified. In these circumstances, the City does not consider removal of the electric generating equipment to be a reasonable alternative

## 3.0 ENVIRONMENTAL CONSEQUENCES

### 3.1 Description of the Locale

#### 3.1.1 Physiography

The Blue Lake Project area is on the west side of Baranof Island, a major component of the Alexander archipelago in southeast Alaska. Baranof Island, with an area of 1569 square miles, is generally characterized in its northern half by rugged mountainous terrain and by more gentle, but still mountainous topography in its southern half.

In the Project area, the Baranof Mountains rise to heights of over 4300 feet in the Blue Lake basin, and to over 5390 maximum on the island. The Blue Lake basin's topography is the product of both glacial and riverine erosion.

### 3.1.2 Climate

The climate is the Project area is characterized as marine, with heavy precipitation and mild temperatures. The Blue Lake Project area's temperature and precipitation differ significantly from data for those factors gathered at the Sitka airport. The airport NOAA weather station shows that Sitka receives 86 inches of precipitation per year. Temporary rainfall monitoring done in the mountains near the Project powerhouse shows over 105 inches of precipitation per year.

Average monthly temperature at the airport is 43F, and is expected to be somewhat higher than at the Project location. As with precipitation, temperature changes dramatically with elevation and is significantly lower in the mountains than at the elevations of both Blue Lake and Sawmill Creek. No long-term measured data are available for these areas.

## 3.2 Cumulatively Affected Resources

According to the CEQ regulations for implementing the National Environmental Policy Act (NEPA) (§1508.7), an action may cause cumulative impacts on the environment if its impacts overlap in space and/or time with the impacts of other past, present and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time to include hydropower and other land and water development activities.

The primary development activity in the project area, in addition to relicensing of the Blue Lake Project, is a fish hatchery proposed by the Northern Southeast Regional Aquaculture Association (NSRAA). Details of the hatchery's construction, design and operation are not available at the time of this document, but will be available prior to submission of the final license application.

Based on information gained from public and agency involvement and consultation, and from our own studies, we have identified three resources that have the potential to be cumulatively affected by relicensing of the Project and other foreseeable activities. These resources are: 1) fisheries, 2) recreation (including aesthetics), and 3) wildlife.

### 3.2.1 Geographic Scope

The geographic scope of analysis for the resources that could be cumulatively affected is defined by the physical limits or boundaries of: 1) the proposed action's effect on the resource; and 2) contributing effects from other hydropower and non-hydropower activities. Since the actions affect the resources differently, the geographic scope for each resource may vary.

For fisheries resources, the geographic scope of cumulative analysis is an area encompassing the Blue Lake and Sawmill Creek watersheds. Based on recommendations from the Alaska

Department of Fish and Game (ADF&G), the geographic scope of cumulative analysis for fisheries resources is the area associated with Game Management Unit 4 as defined by ADF&G. The boundaries of this Unit are defined and discussed in the Fisheries section of this document.

The geographic scope of cumulative analysis for wildlife species is Game Management Unit 4(GMU4), as defined by ADF&G. Geographic scope for recreation is the Project Boundary.

### 3.2.2 Temporal Scope

Cumulative analyses will include past, present, and future actions and their effects on aesthetic, recreational, fisheries and wildlife resources. Based on the potential 30-year relicense term for the Project, the temporal scope will look 30 years into the future, concentrating on environmental effects from reasonably foreseeable future actions.

## 3.3 Geology and Soils

### 3.3.1. Affected Environment

Geology in the Project area was documented in detail prior to construction of the original dam, tunnel and powerhouse (Athern, 1954). In that report, the authors presented results of both surface investigations and numerous drill holes in the Project area and evaluated subsurface conditions and rock competency.

No more recent geologic or soils information is available for the Project area. No additional geologic or soils surveys were conducted prior to construction of the small hydro features (FVU and PMFU) in the early 1990's. Therefore, information from the Athern report is used in this section. If new construction (envisioned only at the Blue Lake powerhouse at this time) is planned on relicensing, site-specific geologic and soils surveys will be performed.

The lowermost rocks in the Blue Lake area are a series of intricately folded, fractured, and recemented phyllite, graywacke, and argillite beds and lenses. These beds strike approximately North 60 degrees West and either dip very steeply to the southwest or stand vertically. They extend from approximately one mile below the lake outlet to some distance north and east from the inlet to the lake.

Exposed by roadcuts along the highway leading east from Sitka is a layer of volcanic ash that rests on the glaciated bedrock surface. It is dark, chocolate brown in color and varies in thickness from a few inches to about 2.5 ft.

Several light gray dioritic appearing dikes were mapped along the stream channel. Those observed ranged from 1 to 3 feet in width with exposures of limited later extent.

Recent alluvium covers the valley floors, both above the lake and below the outlet to the shore of Silver Bay. The mountain slopes are very steep and overlain by very little overburden of alluvium except where small talus slides will lesser drainage channels.

Considerable major and minor faulting has occurred in the Blue Lake–Sitka area. Two apparently major groups of faults trend northwesterly and easterly. One group of minor faults, no doubt associated with the major faulting, trending approximately east-west.

Geology in the Blue Lake powerhouse area was said to be underlain by the same general sedimentary series.

### 3.3.2 Environmental Effects and Recommendations

No issues relative to geology and soils were brought up during the Scoping process. However, since the applicant's proposal involves possible construction work at the Blue Lake Unit and the power conduit tunnel, geotechnical aspects of the rock structure in these areas may become relevant to relicensing. As the third-turbine alternative is better defined, applicable information on geologic effects and relationships will be developed.

## 3.4 Water Resources

### 3.4.1 Affected Environment

#### 3.4.1.1 Blue Lake

Blue Lake is a 1225 acre water body impounded by the Project dam. Maximum depth of Blue Lake is about 468 feet, placing the lake bottom about 126 feet below sea level. (The Blue Lake basin was carved by glacial activity, resulting in this very deep lakebed point). Blue Lake is generally deeper in the middle and lower (toward the Project dam) areas. Maximum depth at the dam face is 134 feet, but average depth in the upstream end of the lake is only about 20 feet. At maximum pool elevation of El 342, the capacity of Blue Lake is approximately 145,200 acre feet (af).

Clarity of Blue Lake water near the intake is very high, but, due to the glacial source of major inlet streams, is reduced in the upper end of the lake during periods of glacial melt. Most glacial material settles out in the upper areas of the lake.

The quality of Blue Lake water in terms of dissolved solids or pollutants is exceptionally high, as evidenced by the fact that it serves as the City of Sitka's drinking water supply and requires no additional filtration prior to consumption. The City and Borough of Sitka routinely monitors the quality of Blue Lake water. Typical monitoring results are presented in Table 4. Values for various inorganic, microbiological and volatile organic components are considered quite low.

**Table 4. Representative Concentrations Of Various Blue Lake Organic And Inorganic Contaminants. (City and Borough of Sitka Water and Wastewater Department data for Calendar Year 2003).**

| MICROBIOLOGICAL CONTAMINANTS | |
|---|---|
| **Contaminant** | **Level Detected** |
| **Total Coliform Bacteria** | **None** |
| **Turbidity** | **None** |
| **INORGANIC CONTAMINANTS** | |
| **Contaminant** | **Level Detected** |
| **Nitrate** | **1.0 ppm** |
| **Flouride** | **4.0 ppm** |
| **Arsenic** | **NA** |
| **Cyanide** | **0.2 ppm** |
| **VOLATILE ORGANIC CONTAMINANTS** | |
| **Contaminant** | **Level Detected** |
| **Total Trihalomethane** | **80 ppb** |
| **Bromodichloromethane** | **NA** |
| **Chloroform** | **NA** |
| **Total Haloacetic Acids** | **60 ppb** |

The temperature of Blue Lake water is somewhat variable, but generally reflects temperature regimes of other large lakes in Southeast Alaska. The City conducted temperature monitoring in Blue Lake and certain of its tributaries during 2002-2005 period, resulting in data showing that that average surface temperatures vary between 2C and 12C. It is generally believed that Blue Lake does not stratify each year, based on the temperature vs. depth profiles obtained from the City's ongoing temperature studies.

### 3.4.1.2 Sawmill Creek

Sawmill Creek is a moderately sized stream relative to others in Southeast Alaska. Average annual flow is Sawmill Creek is 441 cfs, ranging from an average low of 11 cfs in March to an average high of 1690 cfs which may occur from June to October each year depending on rainfall and snowmelt (Table 5, Figures 10 and 11). Recorded maximum flow in Sawmill Creek was 12,000 cfs in 1992.

**Table 5. Maximum and Minimum Average Daily Flows in Sawmill Creek, by Month, for 29-year Period of Record. Original USGS Gage 15088000.**

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Max** | **2,270** | **2,410** | **1,250** | **1,050** | **1,640** | **1,780** | **2,170** | **4,940** | **4,980** | **5,500** | **4,430** | **3,770** |
| **Min** | **24** | **16** | **11** | **14** | **57** | **308** | **311** | **200** | **71** | **84** | **46** | **34** |

Clarity of Sawmill Creek water is generally the same as for Blue Lake, particularly in the stream's upper reaches, before inflow from tributary sub-basins.  Sawmill Creek may carry a moderate sediment load during high flows (greater than 500 cfs) and after major rainstorms. Because of the overall good condition of the watersheds both above and below the Project dam, however, sediment input is moderate.

The quality Sawmill Creek water is also considered to be quite high in terms of dissolved solids, pollutants, although there has been no long-term monitoring of Sawmill Creek water as there has been for Blue Lake.  It is expected that Sawmill Creek becomes more turbid in a downstream direction after major rainstorms and that there may be in increase in certain organic solids related to inflow of leaf pack and other detritus.

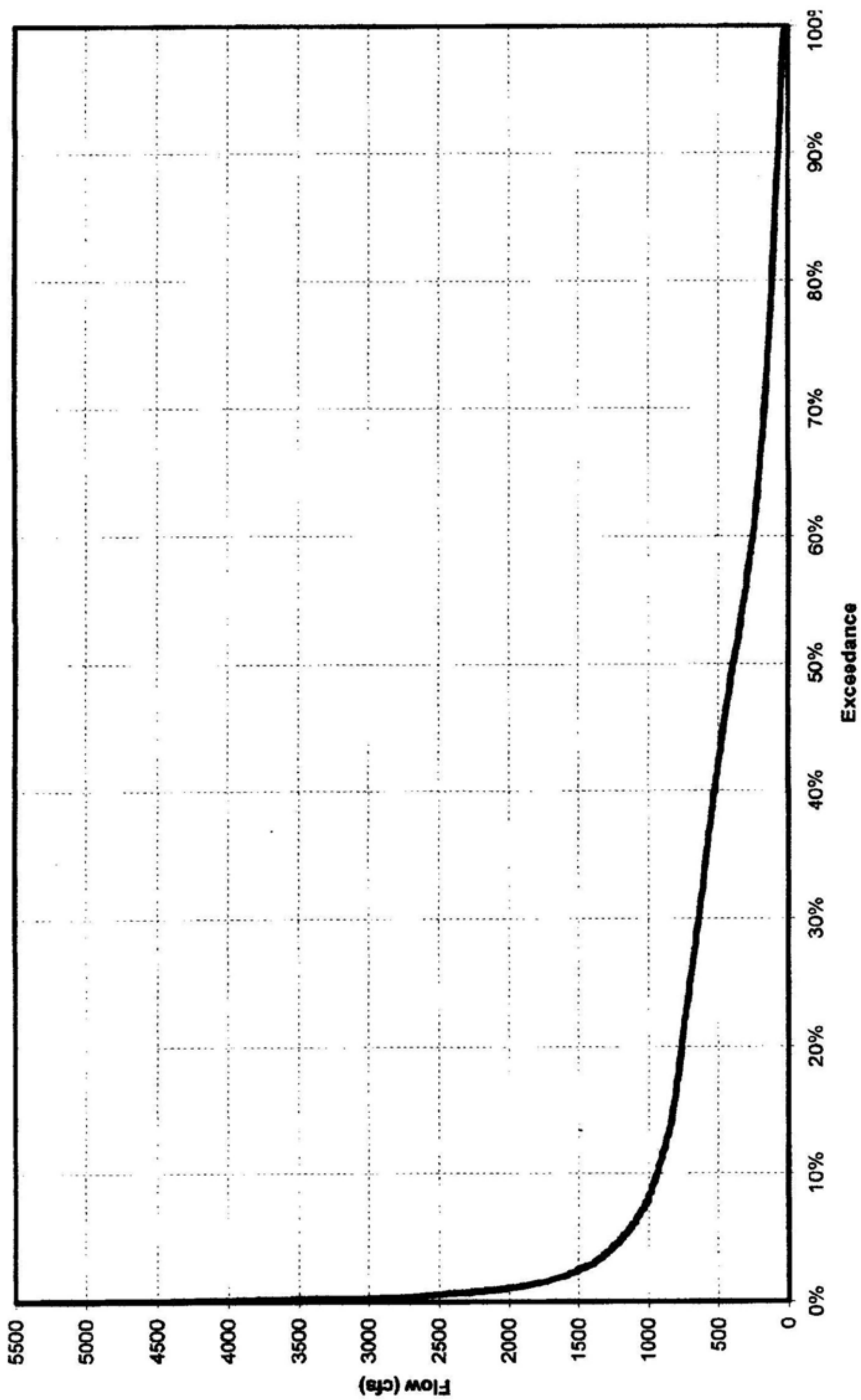


**Figure 10. Sawmill Creek Flow Duration Curve.**

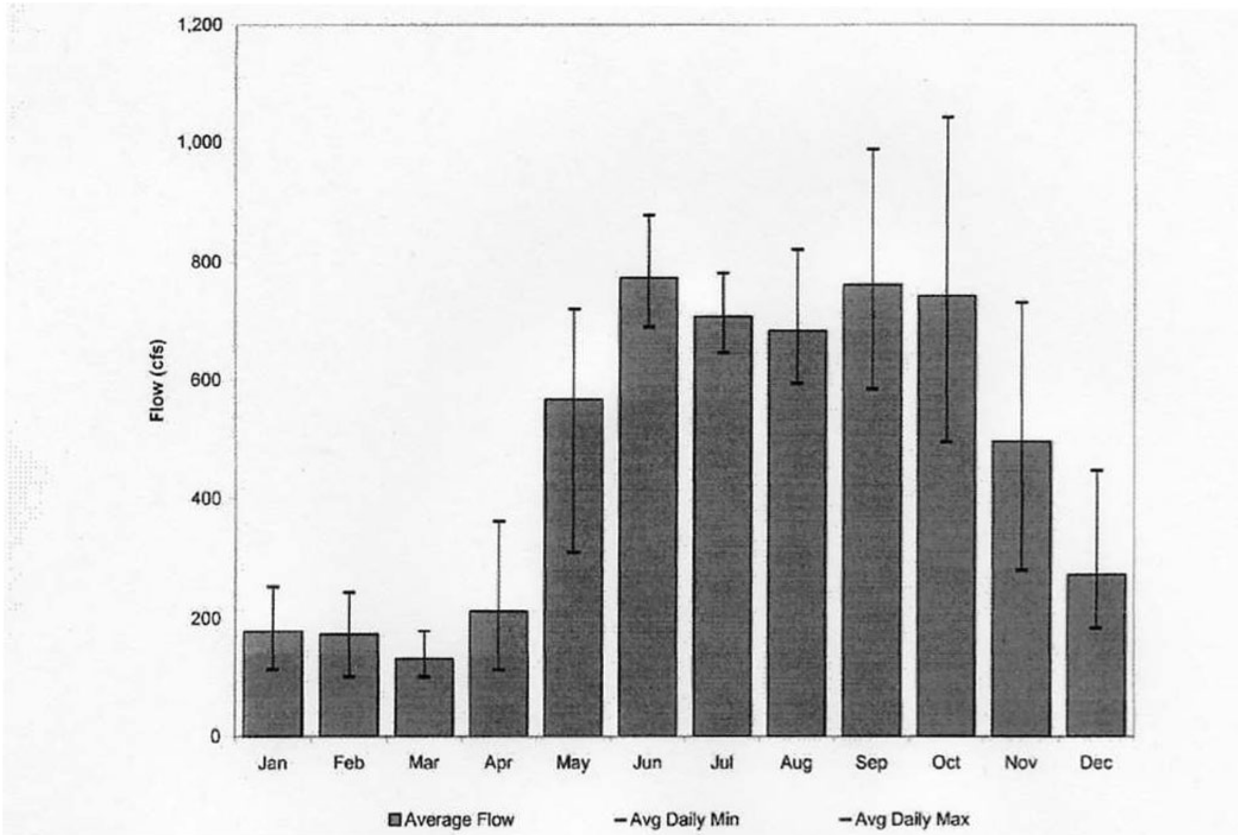


**Figure 11. Average Monthly Sawmill Creek Discharge.**

The City has monitored Sawmill Creek water temperature for approximately 2 years. Based on results of these studies, Sawmill Creek water temperatures range between 2C and 3C at the FVU and between 3C and 12C at the lower staff gage. This temperature regime characterizes Sawmill Creek as quite cold relative to other moderate-sized streams in Southeast Alaska, possibly because of the incised nature of the stream and resultant low solar insolation. Sawmill Creek water temperature is also affected by releases from the Blue Lake Project because the Project intake structure is about 140 feet below water level at the top of the dam.

### 3.4.2 Blue Lake and Sawmill Creek Water Rights

Following is a summary of the City & Borough of Sitka's water rights and allocations for the Blue Lake watershed (Table 6).

**Table 6. Current water rights relating to Blue Lake Project**

| Water Right | Use | Amount | Cfs equiv. | MGD equiv. | Af/y equiv. | Status |
|---|---|---|---|---|---|---|
| **ADL 51543** | Hydro | 191.4 mgd | 296 | 191.4 | 214,343 | Certificate |
| " | Drinking water | 8.6 mgd | 13.3 | 8.6 | 9,631 | " |
| **ADL 43826** | Public industrial water supply | 34,722 af/y | 48 | 31 | 34,723 | Certificate |
| **LAS 19669** | Bulk export/ | 14,000 af/yr | 19.4 | 12.5 | 14,000 | Certificate |
| " | Hydro | 1,000 af/yr | 1.4 | 0.9 | 1,000 | " |
| **LAS 11995** | Fish habitat | Varies by month | | | | Application |
| **LAS 13236** | FVU | 36,190 af/yr | 50 | 32.3 | 36,190 | Permit |
| **LAS 13237** | PMFU | 56,000 af/yr | 77.4 | 50 | 56,000 | Permit |
| **LAS 20526** | BL/SMC* | | | | | |

* These water rights correspond to Blue Lake level and Sawmill Creek release restrictions described in the Project Operation Section.

The City recently submitted a request to ADNR to amend the language of the various water rights in terms and units consistent with current ADNR practice (acre-feet per year with a maximum diversion rate in cubic feet per second) and to better reflect the City's current use of Blue Lake water.

### 3.4.3 Environmental Effects and Recommendations

**Issue WQ1. Effects of Blue Lake Water Temperature on Sawmill Creek Aquatic Resources.**

Whether water temperature from Blue Lake releases might affect aquatic resources in Sawmill Creek. The releases draw water from a zone of the lake which is usually colder than it would be were it drawn from the lake surface, or from the surface of the pre-project lake. Under this issue, the City would evaluate Blue Lake dam release temperatures together with Sawmill Creek temperature regimes, and examine potentials for changes in release temperature regimes.

**Response to Issue WQ1.**

The temperature regime of Blue Lake has probably been relatively unaffected by project operations. Recent temperature monitoring of Blue Lake indicates that the lake does not normally stratify, and this suggests that the lake did not stratify before the dam was installed. The temperature regime of Blue Lake is probably controlled more by inflow temperatures of tributaries than by Project operations, particularly in the upper end of the Lake.

Recent temperature surveys of Blue Lake tributaries and upper lake areas show the general warming trends during the early spring period, when temperatures in Blue Lake Creek rise from 2C to 7C during the period from February to July each year.

Even with the current data base, which offers considerable insight and detail, it is not possible to predict the effects of proposed project operations on water temperatures throughout the lake on a seasonal basis.

Sawmill Creek temperatures have been significantly changed by installation of the project. Whereas pre-project stream temperatures were always set by surface water temperature of Blue Lake, they are presently set at Blue Lake temperatures in the region of the intake whenever the lake is below dam spill level. This colder temperature regime is a condition to which Sawmill Creek aquatic resources have to some extent adapted, but it is clear that the generally colder water has had varying effects, depending on specific resources.

In terms of the City’s ability to change the present temperature regimes of either Blue Lake or Sawmill Creek, the only sure options would involve installation of multi-level release facilities at the dam. Such a release system would be unfeasible in terms of both installation costs and costs resulting from head losses and operations under certain release requirements.

**Issue WQ2. Effects of Relicensing on existing Sawmill Creek and Blue Lake Water Rights and Related Requirements.**

Whether instream flow or Blue Lake level regimes adopted during relicensing would affect existing permanent and conditional water rights in the Blue Lake basin. The Project and its water distribution system are subject to several water rights issued by the Alaska Department of Natural Resources (ADNR), which relate to both Blue Lake reservoir levels or Sawmill Creek streamflows. The water rights address several important water uses. Adoption of different lake levels or streamflow requirements would entail changes in this water rights and use structure. Under this issue, the City would evaluate the extent to which these changes might affect joint water uses among all permitted users, and the necessity for ADNR to reapportion the Basin's water rights.

**Response to Issue WQ2.**

As discussed in the Affected Environment section, the City has requested that ADNR modify the language of certain state water rights. Depending on instream flow, project configuration and project operation conditions established in the new license, there may be needs to further modify the existing water rights structure. All changes in water rights language, amounts and other conditions will be afforded full review and comment by relicensing participants prior to adoption by ADNR and/or the FERC.

## 3.5 Fisheries Resources

### 3.5.1 Affected Environment

#### 3.5.1.1 Sawmill Creek

Sawmill Creek supports a variety of salmonid and other fish species, including salmon, steelhead and char. Numbers of certain salmon produced in Sawmill Creek are great enough to define Sawmill Creek as a regionally-important base for commercial salmon fisheries. The importance of Sawmill Creek trout and char species to the regional and local sport fisheries is more speculative because Sawmill Creek is not heavily used as a sport fishery relative to other fishing destinations in the region.

Sources of information on Sawmill Creek fisheries distribution, abundance, habitat use and life history include the following:

- Reports by Karl Wolfe of Sitka, a contractor to the City, documenting fish observations and captures in Sawmill Creek during 2001-2004 (Wolfe, 2002-2005);

- A report by the City documenting fish life histories and time ("Periodicity") for use in the instream flow analyses related to relicensing (City and Borough of Sitka, 2004c);

- The Alaska State Fisheries "Atlas", a document, comprised of descriptive text and maps, which officially lists and shows the distribution the fish species which inhabit various streams and lakes in a region (ADF&G, 2005).

Information in this section is derived from these source reports and from communications with ADF&G personnel in Sitka regarding Sawmill Creek's contribution to the area's commercial and sport fisheries.

***General Description of Sawmill Creek Fishery Habitats***

Fish sampling was conducted within six stream reaches, established according to differences in fish habitat type, stream gradient or access considerations were developed (Table 7). Several project features referenced in this report are more fully described in the Initial Consultation Document (ICD, City and Borough of Sitka, 2002) and Scoping Document (SD1), City and Borough of Sitka, 2003.

The "Falls" referenced in the Reach designations is at Stream Mile (SM) 0.73 and is a major stream feature approximately 23 feet high. The "Slot", an area in which Sawmill Creek passes through an extremely narrow canyon constriction, is located from SM .95 to SM 1.06, and the FVU is the project powerhouse at SM 1.63 at which minimum stream flows are released into Sawmill Creek.

**Table 7. Sawmill Creek Reach Numbering from Lower Powerhouse Bridge Upstream To Base Of Blue Lake Project Dam.**

| Stream Reach and Location (Name) | Identifying Aquatic Habitats and Stream Characteristics |
|---|---|
| **Reach 1 (Index Survey Area).** | **From Project tailrace-Sawmill Creek confluence (SM 0.32) upstream to top of Index Area. (SM 0.42)** |
| **Reach 2.** | **Inlet of Index Pool to the Pulp Mill Feeder Pool (SM 0.53) (Includes Concrete Area)** |
| **Reach 3.** | **Pulp Mill Feeder Outflow pool to the base of the Falls (SM 0.73)** |
| **Reach 4.** | **From the top of the Falls to the Slot outflow (SM .95)** |
| **Reach 5.** | **From Slot outflow to Fish Valve Unit (SM 1.63)** |
| **Reach 6** | **From the Fish Valve Unit to the base of the Project dam (SM 2.03)** |

***Sawmill Creek Fish Species***

Results of the fisheries studies and reports cited above and accounts of local sport fishers and ADF&G personnel, indicate that six salmonid species utilize Sawmill Creek. Salmonid species listed as utilizing Sawmill Creek are:

| **Common Name** | **Scientific Name** |
|---|---|
| Coho salmon | *Oncorhynchus kisutch* |
| King salmon | *O. tshawytscha* |
| Pink salmon | *O. gorbuscha, and* |
| Chum salmon | *O.* keta |
| Steelhead trout | *O. mykiss*; |
| Dolly Varden char | *Salvelinus* malma |
| Arctic grayling | *Thymallus arcticus* |

The only other fish species found in Sawmill Creek were the staghorn sculpin (*Leptocottus armatus*) and prickly sculpin (*Cottus asper*).

No anadromous fish of any species were observed or captured upstream of the Falls at SM 0.73 in the Wolfe studies. The Anadromous Fish Atlas (ADF&G 2005) lists four anadromous fish species in Sawmill Creek: coho, pink and chinook salmon, and steelhead trout. The ADF&G Atlas shows the upstream range of these species in Sawmill Creek to be the vicinity of the Falls.

***Sawmill Creek Salmon Stocks in Relation to Regional Salmon Management***

Sawmill Creek is part of ADF&G's Sitka Management Area and in District 13, the geographical unit defined for management of commercial salmon fisheries in the region. District 13 consists of all outside waters between Cross Sound and Cape Ommaney as well as the waters of Peril Strait and Hoonah Sound. The District is further subdivided into three Sections (13-A, 13-B, and 13-C) with the waters of Sitka Sound part of Section 13-B. Smaller geographical units, called Subdistricts, are used for reporting of commercial salmon landings to ADF&G.

Sawmill Creek is also located in Subdistrict 113-35 which is the Subdistrict used to define the Silver Bay Special Harvest Area (SHA) for the Medvejie Hatchery (see following section). This Subdistrict includes all water of Silver Bay east of a line extending across the entrance of Silver Bay from Entry Point.

Of the various salmon stocks in the District, numbers of pink salmon are the largest, followed by chum salmon. Sockeye, coho and king salmon comprise the remainder of the salmon escapements in the District. Commercial fishing within the District is an important component of the regional and local economies, ranking high among Southeast and South-central Alaska's most extensive commercial fisheries.

Commercial seine fish management objectives within the District focus primarily on pink and secondarily on chum salmon.

***Regional Salmon Hatcheries***

Abundance and population characteristics of certain Sawmill Creek salmon stocks are affected by the presence of extensive fish hatchery and rearing facilities operated by the Northern Southeast Aquaculture Association (NSRAA). NSRAA is one of several privately-owned and operated, non-profit, Regional Aquaculture Associations in Southeast Alaska, authorized under special Alaska legislation to produce commercially important salmon species.

The primary hatchery operations which influence Sawmill Creek salmon stocks are the Medvejie hatchery and the Deep Inlet and Green Lake rearing areas, all of which are located in or near Silver Bay within 10 miles of the Project area.

Medvejie Hatchery is located 3 miles from Sawmill Creek's confluence with Silver Bay and produces chum, chinook and coho salmon.

Chum salmon returns to Medvejie have averaged 2.1 million fish over the last ten years, 1994-2003, with returns topping 3 million from 1998-2000. The commercial harvest has averaged 1.8 million fish over this same ten year period. A record 3.66 million chum returned in 1999. Most of the fish are harvested in the Deep Inlet harvest area located across Eastern Channel from Sitka by seiners and gillnetters. Trollers also harvest these chum salmon, primarily just outside of the terminal harvest area. Over the past ten years the troll catch has averaged 205,000 chum per year.

In recent years, Medvejie has been the most successful chinook program in Southeast Alaska in terms of commercial and sport contribution. Returns have averaged 32,000 chinook over the past 10 years. These fish are primarily harvested during special May and June openings for trollers. Contribution to the troll fleet has averaged 8,060 chinook over the past 10 years (1994-2003). The sport catch of Medvejie chinook has averaged over 2,700 fish over this period. In some years, Medvejie chinook have represented 30% or more of the chinook entered in the Sitka Salmon Derby.

Medvejie began a major expansion of its chinook program in 1997. This expansion, which involves rearing fry in net pens in Green Lake, has doubled the hatchery's chinook production. This increased production is just now being realized in terms of adult returns: 2003 marks the first year with the Green Lake fish contributing to all major age classes.

NSRAA's coho program has two existing components: a smolt release program near Sitka and a fry stocking program at Deer Lake , which is located about 50 miles south of Sitka. The smolt program primarily benefits the troll fishery, but does contribute to sport and net fisheries as well.

In 2004, NSRAA proposed construction of a hatchery in the vicinity of the SCIP, primarily for production of coho salmon. This hatchery would be fed with water from the Project, estimated to be about 20 cfs continuously, year-round. The estimated production of the SCIP hatchery would be about 2,000,000 coho smolts released directly into tidewater, with returns expected to be about 50,000-60,000 adult coho.

In the following sections, general and site-specific life history information is presented for the anadromous salmonid species known to utilize Sawmill Creek.

### ***Pink Salmon***

Pink salmon are Sawmill Creek's most abundant species. Average annual pink salmon escapement numbers in Sawmill Creek are greater than 25,000 fish, reaching an observed maximum of over 36,000. Pink salmon have been observed throughout Sawmill Creek to the base of the Falls at SM 0.73 (Wolfe 2002-2005) but are typically most concentrated in the Sawmill Creek delta area downstream of the Blue Lake Powerhouse.

Generally, pink salmon in Southeast Alaska begin their spawning migration in July, and spawn in September. They typically prefer small to medium gravels as spawning habitat. Pink salmon spawning, particularly in tidewater, is highly dependent on upwelling of well-aerated fresh water.

Pink salmon eggs incubate in the spawning gravel until late March and April of the following year when they emerge and almost immediately move downstream to intertidal areas where they rear as fry and juveniles. It is this immediate downstream movement which distinguishes the early life history of pink salmon from that coho and king salmon and steelhead. The juveniles slowly move into the open ocean, where they mature for one year before returning to fresh water to spawn.

### ***Chum Salmon***

Next in relative abundance among Sawmill Creek anadromous salmonids is the chum salmon. Estimated chum salmon numbers in Sawmill Creek have ranged from a low of about 250-300 chum in 2002 to a high of 8,000-9,000 chum in 2004 (Wolfe, 2003-2005).

Chum salmon have become regionally important through production in local hatcheries, and increased use of their roe for salmon caviar.

Sawmill Creek chum salmon normally ascend the stream to spawn from to July to early October  and reside in the river for about one to two weeks prior to spawning depending on condition upon arrival.

Spawning occurs between mid July and early October and eggs incubate in the gravel until emergence in late March through early June the following year.  As with pink salmon, chum salmon fry move immediately after emergence to intertidal areas where they rear for several months.   Unlike pink salmon, chum salmon may remain in salt water for three to five years before returning to spawn.

Chum salmon prefer medium gravel substrate for spawning, but will spawn in areas of finer or larger particles, depending on competition from other species.  As with pink salmon, chum salmon fresh-water rearing habitat, because of the limited time they spend in fresh water as fry or juveniles, is not normally critical.

***King Salmon***

King salmon are usually the next most abundant species of anadromous salmonid in Sawmill Creek.  Annual escapements have ranged from about 180 in 2004 to 575 in 2003 (Wolfe 2002-2005).  It is generally thought that Sawmill Creek king salmon are strays from nearby hatcheries. Emergency order sport fish regulations encourage the taking of king salmon in Sawmill Creek because of this factor.

Sawmill Creek king salmon normally ascend the stream to spawn in early July through August and reside in the river for about two to three weeks prior to spawning.

Spawning occurs between mid July and late August and eggs are presumed to incubate in the gravel until emergence in March.  King salmon fry mature in fresh water and , upon becoming juveniles, usually reside in their natal streams for one to two years.

In Sawmill Creek, it is believed that king salmon fry rearing is limited due to a general lack of rearing habitat.  No king salmon fry have been observed during the five seasons of study (Wolfe, 2002-2005).   King salmon may remain in salt water for as many as six years.

***Coho Salmon***

Although coho salmon have been observed throughout Sawmill Creek to the base of the Blue Lake Project dam at SM 2.03, no juveniles or adults were documented above the Falls at SM 0.73 during relicensing studies.   Surveys from 2001-2004 indicated that

Sawmill Creek coho numbers vary from a low of approximately 10 fish to possibly as many as 40 individuals during a typical escapement year (Wolfe 2002-2005).

Coho salmon in Sawmill Creek typically begin their spawning migration in late August or early September. Wolfe (2002-2005) found peak numbers of coho in Sawmill Creek from early October to early November. Spawning occurs from early October through mid November. Coho prefer small to medium gravel as spawning habitat and are not known to travel long distances up rivers to spawn, nor are they noted to ascend cascades or waterfalls greater than a few feet high.

Coho fry emerge from the gravel in late April or early May, and may rear in suitable stream areas, usually slow-moving sloughs or backwaters. They usually rear for two years before moving downstream to saltwater. They spend one, two, or three years in the ocean before reaching maturity and returning to fresh water to spawn.

Wolfe (2002-2005) found few juvenile coho in Sawmill Creek. He found relatively numerous juvenile rainbow trout and few Dolly Varden char in the same sampling areas. Sawmill Creek coho populations are probably limited by a lack of rearing habitat.

***Steelhead Trout***

Steelhead trout are anadromous (ocean-going) variant of rainbow trout. Sawmill Creek steelhead populations have ranged from about 30-40 fish in 2002 and 2004 to 40-50 fish in 2003.

Sawmill Creek steelhead spawning begins in late April and continues through early June (Wolfe 2003-2005). Steelhead prefer medium gravel as spawning habitat.

Steelhead fry emerge from the gravel in July and August. Steelhead normally rear for up to three years before moving downstream to saltwater. Juvenile steelhead habitat preferences mimic those of resident rainbow trout of the same size classes. They spend one, two, or three years in the ocean before reaching maturity and returning to fresh water to spawn.

***Resident Rainbow Trout***

Sawmill Creek fisheries surveys have consistently documented rainbow trout which could be either steelhead or residents. It is not possible, even with sophisticated genetic analyses, to distinguish between fish less than about 250mm. Larger rainbow trout (>250mm) observed in Sawmill Creek, however, are most likely resident. As discussed in the Blue Lake section below, rainbow trout have been introduced into Blue Lake on different occasions since the 1930's, and may have spilled over Blue Lake Project dam into Sawmill Creek.

Sawmill Creek resident rainbow trout are found throughout the stream but are concentrated in the reaches between the Project powerhouse and the base of the dam. Sawmill Creek rainbow trout populations support a moderate sport fishery.

Adult rainbow move to spawning areas in early spring and are through spawning by early summer. Eggs overwinter in the gravel and emerge as fry in September. Juveniles may remain in the creek for the remainder of their life, or become smolts and migrate to the ocean.

Larger resident rainbow trout prefer deeper water habitats in Sawmill Creek, especially those with access to more shallow swift water which provides a food source.

***Dolly Varden Char***

Wolfe (2002-2005) studies show that Sawmill Creek supports small populations of anadromous and resident Dolly Varden char.

Anadromous Dolly Varden in Sawmill Creek typically begin entering the stream in mid- to late July. Peak numbers of in-migrants were seen Wolfe (2002-2005) in early to late August. Anadromous Dolly Varden are known to follow salmon upstream and to consume salmon eggs shortly after deposition. Dolly Varden numbers tend to decline shortly after the end of the pink and chum salmon runs.

Dolly Varden prefer small to medium gravel for spawning. Incubation probably takes 5-6 months. Dolly Varden fry emerge from the gravel in April and May and are found near cover elements such as cobbles and boulders.

Sport fishing for Dolly Varden char in Sawmill Creek is mostly coincidental while angling for other species such as king salmon and rainbow trout.

#### 3.5.1.2 Blue Lake

The primary fish species in Blue Lake is rainbow trout (*O*. mykiss). It is not known whether rainbow trout were native to the Sawmill Creek watershed prior to stocking by the U.S. Forest Service in 1938 and 1939. During this period 9,000 fry, 200 adult rainbow trout, and 50,000 eggs from Sashin Lake were planted in Blue Lake ( Der Hovanisian 1994) . After this initial planting, 8,800 rainbow trout from the Willamette River in Oregon were released in Blue Lake. It is assumed that fish from these plantings spilled over the dam creating resident rainbow trout populations in Sawmill Creek. (ADF&G Sitka Sport fish Summary).

The Blue Lake rainbow trout population has been estimated twice in recent years. Der Hovanisian (1994), using mark-recapture techniques, estimated the total Blue Lake rainbow trout population at 4708, ranging from 3907 and 5508 fish. The City and ADF&G conducted a similar mark-recapture study during summer, 2004, which resulted in an initial estimate of 3605, ranging between 2848 and 4361 fish (Unpublished data, ADF&G, 2005).

The relatively large size and abundance of Blue Lake rainbow make this sport fishery comparable to the best available in southeast Alaska. Access to some extent limits overall fishing effort, but this limitation appears to have a moderating effect on fish take, resulting in both population and sport catch stability.

Blue Lake rainbow trout spawn in lake tributaries and perhaps along shoreline areas with groundwater upwelling. Of Blue Lake's four primary inflow tributaries, the three at the upper (northeastern) end of the lake probably support the majority of rainbow trout spawning. Spawning occurs in late spring and early summer and is usually complete by the beginning of July. Seasonal Blue Lake level does not appear to affect access to spawning tributaries.

### 3.5.2 Environmental Effects and Recommendations

**Issue F1. Sawmill Creek Instream Flow.** Whether the project-related streamflow in Sawmill Creek affects populations of anadromous and resident fish in that waterway. Under this issue, the City would examine potentials for implementation of a new flow regime which might improve fish habitat, water storage needs, and electric generation.

**Response to Issue F1.**

The City and Alaska state and federal resource agencies and STA have worked cooperatively to complete an Instream Flow Incremental Methodology (IFIM) study on Sawmill Creek [Participants in the IFIM study, including agency and STA representatives, City personnel and contractors, are referred to as the Instream Flow Team (IFT)] (Miller, 2004, City of Sitka, 2005b).

The IFT has agreed that Issue F1 would be addressed by conjunctively using two primary components: Sawmill Creek discharge (Q) vs. Weighted Usable Area (WUA) relationships from the IFIM study for target fish species/life stages; and 2) Results of the Blue Lake System Operations Model (Operations Model, City of Sitka 2005d) in terms of Sawmill Creek streamflow, Blue Lake elevation and electrical generation aspects of various alternative operations.

Methods, results and discussion of the process used to generate the Preferred Instream Flow and Generation Alternative are complex and extensive, and are presented in detail in Attachment I and City of Sitka 2005e. The Q vs. WUA relationships used in the analysis are in Attachment II and City of Sitka 2005c.

***Instream Flow and Generation Analyses.***

Three primary Q vs. WUA relationships were used to address Issue F1: 1) spawning for steelhead trout and coho salmon at the Falls Pool IFIM site; 2) rearing for steelhead and coho fry and juveniles at the Pulp Mill Outflow 2 (PMO2) site; and 3) for steelhead juveniles at the Index Pool 1 (IP1) site (Figures 12-14). These sites were selected as those representing the largest and most consistent fish utilization, as described in City and Borough of Sitka, 2005c. Spawning and rearing were observed only at these sites every year of the Wolfe surveys. Inclusion of other sites, we believe, would lead to the need for weighting of flow requirements, a complex and uncertain process.

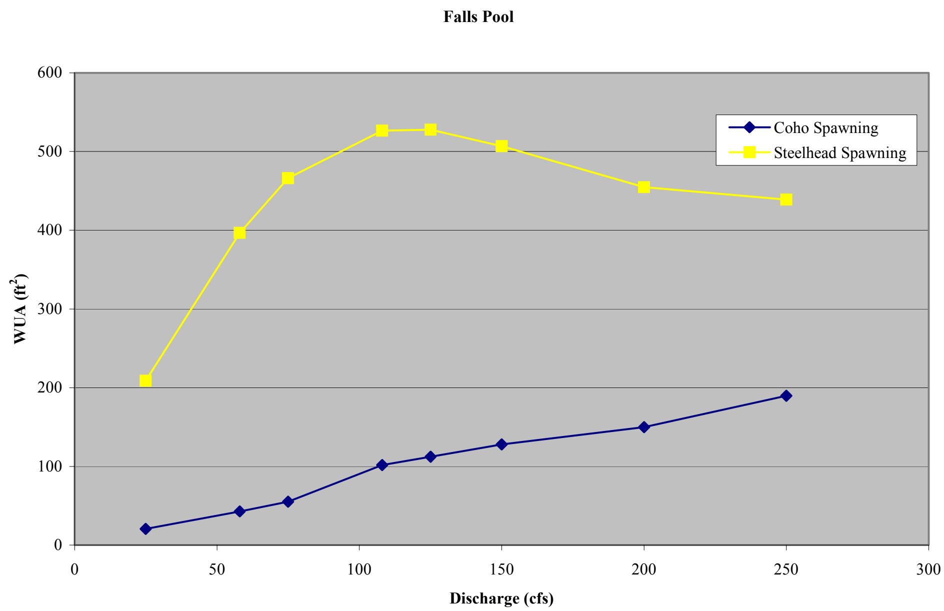


**Figure 12. Q vs. WUA Relationships for coho and steelhead spawning at Falls Pool.**

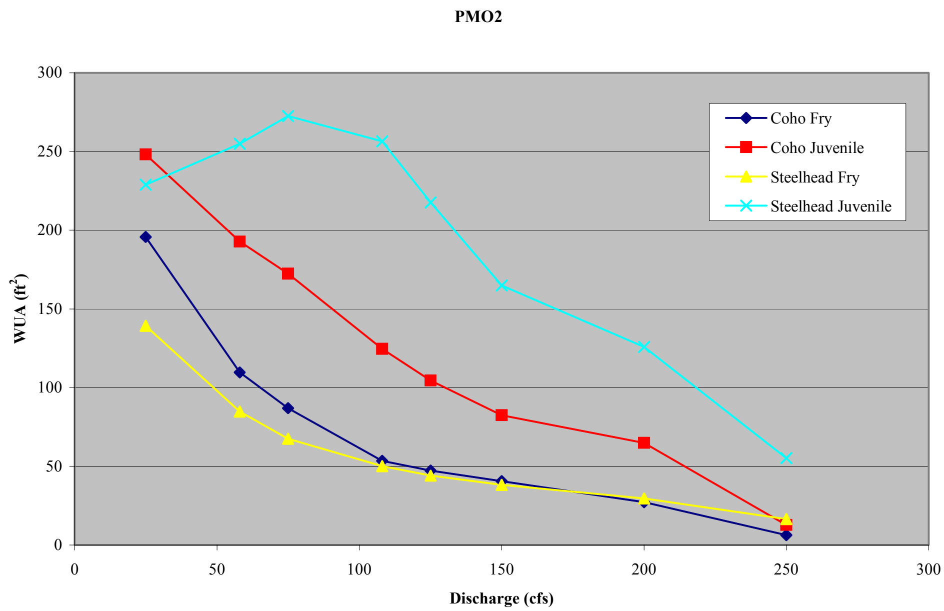


**Figure 13. Q vs. WUA Relationship for coho and steelhead rearing at PMO2.**

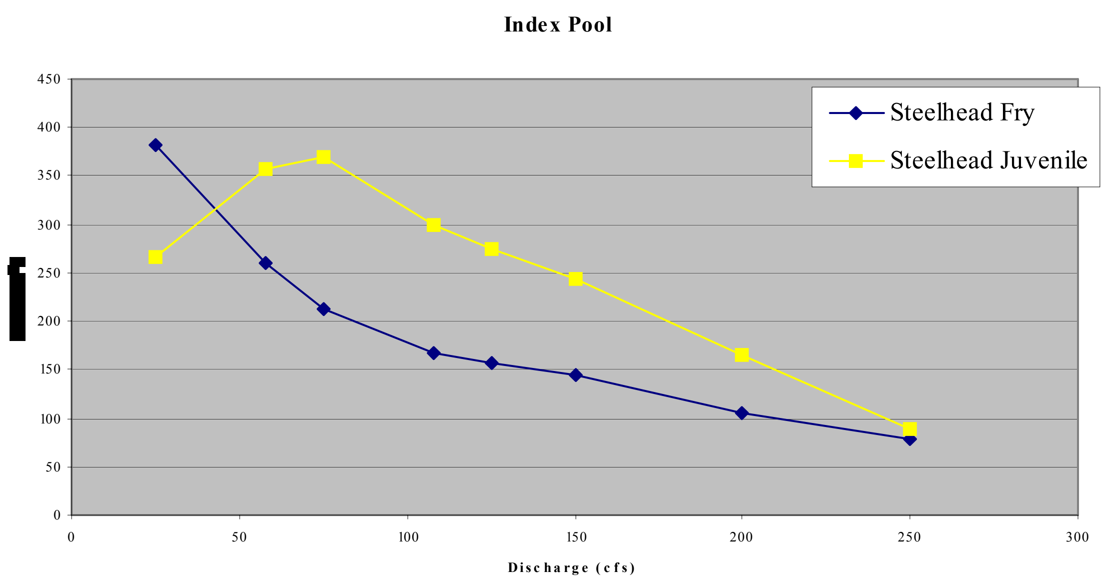


**Figure 14. Q vs. WUA Relationship for coho and steelhead rearing at IP1.**

For steelhead spawning, it can be seen that WUA peaks at about 100 cfs and then begins to decline for the remainder of the discharges. (Analysis of flows above 250 cfs showed that this relationship continued throughout the range of mean monthly flows (to 1700 cfs) although these values are not shown on the Figures in this document.)

For coho spawning at the Falls Pool, WUA, while lower overall than for steelhead, steadily increased with flow. This relationship trended downward as flow increased above 250 cfs.

Q vs. WUA relationships for fry of both species at both PMO2 and IP1 decreased rapidly with all increasing flows above 25 cfs. Steelhead juveniles WUA increased to about 100 cfs at both sites, then decreased steadily out to the limit of modeled flow (analyses were done to 1700 cfs).

The instream flow and generation analysis resulted in selection of an alternative (**3T60 0.8**, see below) under which 60 cfs would be released from the FVU during the months of May and June each year. During the remaining months, 50 cfs, as specified in the original license, would be released at the FVU. The IFIM analysis for spawning steelhead indicated that this flow increase resulted in about 15 percent additional WUA at the median level over the 28-year forecast period.

In addition, under Alternative 3T60 0.8 a third generating unit would be installed at the BLU to better utilize Blue Lake water resources. The primary fish habitat benefit of this action would reduction in spill frequency with associated benefits to rearing fish.

***Alternatives Evaluated***

To develop the Applicant's Proposal, we first developed a set of candidate Alternatives for evaluation. Alternatives were named relative to 1) Blue Lake Unit turbine configurations (either 2 or 3 turbines) instream flow release (in all cases for steelhead spawning during May and June) and load growth (either 0.0, 0.8 or 2.0 percent). Alternative names included contractions of these factors, as follows:

**NA 0.8 --** No Action Alternative, 0.8 percent load growth

**2T60 0.8 --**Two turbines, 60 cfs during May and June, 0.8 percent load growth

**3T 0.8 --**Three turbines, 0.8 percent load growth

**3T60 0.8 --**Three turbines, 60 cfs during May and June, 0.8 percent load growth

**NA 2.0 --** No Action Alternative, 2.0 percent load growth

**3T60 2.0 --** Three Turbines, 2.0 percent load growth

***Species/Life Stages/Periodicity***

Based on results of all Sawmill Creek fisheries surveys to date relative to the IFIM cross-sections below the Falls at SM 0.73, the species/life-stage/cross-section combinations shown in Table 8 were used.

**Table 8. Species/life stages, Cross sections and periodicity for Sawmill Creek Instream Flow analysis.**

| Species | Life-Stage | Cross-Section | Periodicity |
|---|---|---|---|
| Steelhead | Spawning | FP1-3 | May, June |
| Steelhead | Fry Rearing | PMO2 | August-May |
| Steelhead | Juvenile Rearing | PMO2, IP1 | Year around |
| Coho | Spawning | FP1-3 | October, November |
| Coho | Fry Rearing | PMO2 | Year around |
| Coho | Juvenile Rearing | PMO2 | Year around |

### *Comparison of Alternatives*

Generally, the WUA analysis showed that WUA for all species and life stages under all flow and load growth scenarios was relatively insensitive at the median level (Table 9). This is probably because fry and juvenile habitat for both species was reduced by high flows at some period during the applicable periodicity for those life stages. Only steelhead spawning increased predictably.

At the 20th percentile level of WUA, significant differences occurred. It will be beneficial in the future to analyze these differences in more detail, with respect to changes in flow across the entire discharge matrix.

As a general conclusion, however, it can be seen that alternative **3T60 0.8** offers among the highest habitat values of all alternatives for all species and life stages. This, in association with the economic and operational analysis detailed in Attachment I support its selection as preferred alternative at the current level of evaluation.

**Table 9. Comparisons Of Diesel Operation Cost And Median Time Series WUA for Various Blue Lake Project Alternatives (20th Percentile WUA Values in Parentheses).**

| Alternative | Steelhead Spawning | Steelhead Fry | Steelhead Juvenile PMO2/IP1 | Coho Spawning | Coho Fry | Coho Juvenile | Average Annual Cost (millions) |
|---|---|---|---|---|---|---|---|
| NA 0.8 | 386.8 (368.5) | 88.3 (25.1) | 251.1/232.0 (248.7/132.6) | 94.1 (37.7) | 115.2 (20.2) | 196.3 (132.2) | $1.016 |
| 2T60 0.8 | 431.5 (417.3) | 88.0 (26.0) | 251.2/228.9 (248.7/134.8) | 94.1 (37.7) | 110.0 (60.2) | 193.0 (133.8) | $1.021 |
| 3T 0.8 | 386.8 (368.5) | 88.3 (29.4) | 251.1/232.0 (248.7/225.2) | (98.6) (37.7) | 115.2 (106.8) | 196.3 (190.1) | $0.7006 |
| 3T60 0.8 | 431.5 (417.3) | 88.3 (30.0) | 251.1/210.1 (248.7/210.1) | 98.6 (37.7) | 110.0 (93.8) | 193.0 (178.2) | $0.705 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| NA 2.0 | 386.8<br>(368.5) | 88.3<br>(28.4) | 251.1/232.0<br>(248.7/225.8) | 87.0<br>(37.7) | 115.2<br>(107.3) | 196.3<br>(190.5) | $4.326 |
| 3T60 2.0 | 431.5<br>(417.3) | 88.3<br>(30.0) | 251.1/228.9<br>(248.7/210.1) | 71.7<br>(37.7) | 110.0<br>(93.8) | 193.0<br>(178.2) | $3.656 |

**Issue F2. Blue Lake Level.** Whether Blue Lake surface elevation fluctuations and/or seasonal levels affect resident fish populations in that water body. Changes in lake level may be harmful to fish during certain life stages, such as spawning and rearing, causing stranding, migration impediment, and habitat loss. Under this issue, the City would examine Blue Lake water surface level fluctuations during certain yearly periods, and determine the potential for and costs of minimizing impacts.

**Response to Issue F2.**

Recent studies have shown that spawning behavior and requirements of Blue Lake rainbow trout are complex and difficult to reduce to simple relationships between reservoir elevation and predicted spawning success or suitability. Generally, it is thought that the majority of rainbow spawning takes place in three or four tributaries, mostly in the upper end of the lake.

Historically, the lake begins filling in May, and spawning starts in late May and early June. By early May, the lowest reservoir elevation has been reached. Early study results have shown that trout begin to migrate into spawning tributaries when water temperatures reach about 5C, with actual spawning usually starting at water temperatures of about 6C or 7C.

Surveys suggest that spawning is concentrated near tributary confluences with the lake margin, and is highly associated with areas of upwelling. Most of the earlier spawning locations are eventually inundated by rising lake levels. It is assumed, since the Lake's rainbow populations are self-sustaining and generally stable in number, that this spawning mechanism is successful. Therefore, it is further assumed that the only operation which might reduce spawning success would be one in which the lake level was drawn down after spawning, thereby exposing deposited eggs.

Using the Operations Model, the Preferred Instream Flow Alternative (discussed under Issue F1, above) was evaluated in terms of monthly Blue Lake reservoir elevation. Of interest was whether Blue Lake level receded after reaching high-water marks during the period from May through July. Under Alternative 3T60 0.8, Blue Lake elevations continued to rise during this period for all years in the 28-year forecast. This result generally assures that Project operations under the Preferred Alternative allow for steady reservoir filling during the May-July period.

**Issue F3. Habitat Potential of the "Dewatered" reach**. Whether there is significant potential fish habitat in the "dewatered" reach directly downstream of Blue Lake dam, and the extent to which continuous streamflow from dam releases might improve existing fish habitat conditions. Under this issue, the City would examine potential benefits and costs associated with releasing water to the dewatered reach.

**Response to Issue F3.**

The Sawmill Creek area between Beaver Lake falls and the base of the dam is highly incised canyon with bedrock and boulder substrate. Although rainbow trout have access to this reach during normal reservoir spill periods, very few have been observed (Wolfe 2002-2004).

Downstream of the Beaver Lake falls confluence, studies have shown considerable use by rainbow trout, particularly rearing juveniles. This may be attributed to 1) the warming effect of Beaver Lake water and 2) additional nutrient input from the muskeg areas drained by Beaver Lake.

If reservoir water were input to increase dewatered reach flow, it would necessarily be released from the Howell-Bunger valve. Howell-Bunger valve releases are considered unfeasible at this time because of difficulty in regulating small flows with the valve**.** More importantly, releases at the valve's reservoir level would result in colder water in Sawmill Creek, which would reduce benefits of warmer, more productive Beaver Lake water in the lower parts of the reach.

As discussed in the Water Quality section it is also unfeasible to install multi-level releases in the dam to access warmer release water.

Finally, flow releases from the Howell-Bunger valve would provide no economic return in terms of hydroelectric generation, and would deplete the reservoir more than with releases at current or projected levels.

**Issue F4. Fish Entrainment.** Whether the existing Project intake in Blue Lake might be a source of fish mortality due to entrainment of fish during Project operations. Increased water velocities in the area of the active intake might draw fish, particularly those of smaller size, into the intake, causing impingement on the intake features and entrainment into the power conduit, with associated mortality passing through the turbines. Under this issue, the City would examine the likelihood of fish entrainment based on presence or absence of fish in the intake area and other estimates of entrainment likelihood.

**Response to Issue F4.**

To address this issue, the City initially proposed to conduct diving and electronic monitoring surveys of the intake to document fish utilization. For various safety and access reasons, these surveys were not conducted. However, the City did evaluate certain evidence for entrainment, to determine if the diving and instrumentation studies might be necessary.

It is believed that, if fish of any size were entrained at the intake, evidence of this would be found in various strainers installed in the water piping for the Project. Among these are the strainers in the cooling water piping for the Blue Lake unit and the basket on the release valve at the FVU. The bypass release valve basket is particularly good at detecting entrainment because it filters a large quantity of water (about 50 cfs) when in operation, and traps debris of all sizes. Observing the contents of both the cooling water strainers and the release valve basket over a period of several months during several years has yielded no evidence of fish or parts of fish.

In addition to this evidence, during the 2004 fish abundance estimates in Blue Lake, fish traps were set at all depths up to 150 feet to determine depths at which the traps should be set during the study. No rainbow trout of any size were found in the traps at depths greater than 120 feet.

Rainbow trout spawning surveys in 2004 and 2005 (in progress) have shown that most spawning takes place in the upper end of Blue Lake. Distances from these spawning locations to the intake are considered too great to be covered by a fish small enough to be entrained.

Finally, it is generally considered unlikely that fish of entrainable size would be found at 140 feet of depth, due simply to lack of food and light, and to buoyancy of the small fish.

In all, we generally find little evidence to indicate that fish of any size are entrained at the intake. This, coupled with the fact that the Blue Lake rainbow trout population is self-sustaining and stable, leads us to conclude that entrainment mortality is not significant, and that further entrainment studies are not necessary.

**Issue F5. Reservoir Woody Debris Storage**. Whether the existing dam and reservoir might block the downstream transport of woody debris, thereby depriving Sawmill Creek of stream habitat features. Woody debris is an important element of instream fish habitat and contributes to bank stability, shade and cover. Large dams and diversions often impede downstream contribution of LWD, affecting fish habitat. Under this issue, the City would examine existing throughput of LWD and the need for and costs of enhancement measures.

**Issue F6. Reservoir Sediment Storage**. Whether the existing dam and reservoir might block downstream transport of sediment, thereby depriving Sawmill Creek of a range of sediment sizes necessary and sufficient to maintain channel configuration and geomorphic process related to fish habitat retention. Under this issue, the City would examine sediment storage and transport potentials, and evaluate the need for and cost of enhancement measures.

**Response to Issues F5 and F6.**

The issue of whether Blue Lake reservoir impedes either sediment of large woody debris transport to Sawmill Creek is clarified by the fact that both sediment and LWD were probably retained in the reservoir prior to construction of the Blue Lake dam. Since the bottom of Blue Lake lies nearly 130 feet below sea level, it serves as a large sediment sink, and probably did so prior to impoundment. Blue Lake was probably not a good sediment provider at any point in its history.

Similarly, but to a lesser extent, the lake has probably also retained woody debris more than it would have if the lake were in a valley without a tightly constricted outlet.

Nonetheless, the US Forest Service Tier III survey (City and Borough of Sitka, 2004b) showed less woody debris and sediment in Sawmill Creek than in certain undammed streams in Southeast Alaska.

The sediment component of Blue Lake storage is difficult to address because of the need to physically input sediment to Sawmill Creek. There is no facility at the dam (such as a sluicegate) for controlled sediment release. Direct sediment input to Sawmill Creek would be prohibitively expensive and could harm as much as improve downstream fish habitat.

It is generally thought that while spawning is not limiting for any anadromous species in Sawmill Creek, rearing is. Therefore, in evaluating both sediment and woody debris contribution of Blue Lake, the woody debris component would have more positive effect on rearing cover and habitat in Sawmill Creek. Large and small woody debris are deposited annually in Sawmill Creek during spill events, and remain in the stream for varying time periods. Although no specific proposals for woody debris emplacement are made in this document, the City is prepared to discuss this as an enhancement measure.

**Issue F7. Water Release Temperature**. This issue is addressed under the Water Quality and Quantity Section, Issue WQ1, above.

**Issue F8. Tailrace Attraction.** Whether water velocity in the Project tailrace might serve to attract migrating anadromous fish, thereby delaying their upstream migration in Sawmill Creek. Experience has shown that differential water velocities offer various levels of attraction to migrating fish; increased velocities serve as "keys" to attract fish up one water course over another. Under this issue, the City would evaluate, through observations, whether anadromous fish concentrate in the tailrace and the effects such concentration might have on anadromous fish migration into Sawmill Creek.

**Response to Issue F8.**

Wolfe (2003-2005) began tailrace observations in 2002 by observing fish in various tailrace areas. (Below the powerhouse is an afterbay, extending about 40 feet to a weir, below which the tailrace extends to the tailrace's confluence with Sawmill Creek).

Anadromous fish were observed in the tailrace only, primarily steelhead and coho, which use this area as a resting area. As summer progresses, there have been some chum and pink salmon observed in the tailrace. Limited numbers of pink and chum salmon, relative to total escapement numbers, were observed spawning on a gravel bar at the downstream end of the tailrace at the Sawmill Creek confluence. No other species were observed spawning in the tailrace.

A few resident rainbow have been observed in the afterbay, particularly during low release periods. Dolly Varden have been observed in the tailrace in association with pink and chum salmon.

Based on these observations, it does not appear that tailrace attraction significantly affects upstream migration or spawning success, particularly for the target species (coho and steelhead).

**Issue F9. Ramping Rates.** Whether short-term (over minutes or hours) fluctuations in streamflow and resulting water level might affect various life-stages of fish in Sawmill Creek. Rapid increases or reductions of water level or velocity have been shown to displace, strand or otherwise stress fish below hydroelectric dams. Under this issue, the City would examine ramping rates associated with current Project operations, determine whether they offer significant potential for improvements, and evaluate costs and benefits of improvement measures.

**Response to Issue F9.**

License conditions require a fixed flow released from the FVU at all times when the Project is not spilling. This fixed flow is not allowed to fluctuate relative to changes in load. Therefore, ramping impacts, normally associated with load following, do not occur in the bypassed reach.

The only time that Sawmill Creek flow rate is changed significantly over a short period of time is for maintenance or study purposes. When flow must be lowered or raised for such purposes, a condition in the existing license regulates the rate of change based on a cfs/time unit criterion. The City seeks to have this criterion changed to be made relative to changes in stream elevation, as read from an applicable staff gage, simply to facilitate measurement. Any such changes will be approved by resource agencies prior to FERC's approval of the measurement standard.

**Issue F10. Draft Tube Injuries.** Whether the Blue Lake Powerhouse draft tubes are situated in such a way as to allow for fish passage into the tubes when one or both generating units were shut down. On certain hydroelectric projects, fish have been able to swim up the tubes during shut-down, and were injured on start-up. The City believes that the vertical alignment of the Project draft tubes completely prevents access into the turbines during shut-down. The City does not propose to address this issue in detail.

**Issue F11. Load Rejection.** Whether, following a load-rejection, when the generating units trip off, there would be a period of dewatering in Sawmill Creek during the period when no water was flowing through the generators. On certain projects without by-pass valve provisions, short-term dewatering has caused fish mortality in both by-passed reaches and below project powerhouses. The Blue Lake Project is fitted with rejection valves at the powerhouse which preclude the effects of load rejection in terms of dewatering. The City does not propose to address this issue in detail.

**Issue F12. Barrier Effects of Falls at SM 0.73.** Whether, at various discharge rates implemented on relicensing, the Falls acts as more or less a barrier to fish migration than it does in the current situation. Documentation of the ability of fish to migrate across a range of flows will assist habitat analyses associated with Issues F1 and F3.

**Response to Issue F12.**

During 2002 and 2003, following requests for implementation of the Powers and Orsborn fish passage evaluation technique, the City conducted quantitative studies of the Falls at SM 0.73. These studies led to preparation of a report (City and Borough of Sitka, 2005a) in which dimensional and hydraulic measurements at the falls at two separate flows were analyzed relative to the P&O upstream passage criteria. The report's conclusion was that the falls were not passable during flows between those measured in the study (approximately 70 cfs to 278 cfs). A question remains about the potential for passage at higher flows, but it is not feasible, due to the safety concerns, to perform the necessary measurements at the falls to extend the range of the evaluations.

We generally conclude, based on the P&O study and the fact that the Wolfe surveys from 2001 through 2004 did not record a single anadromous fish upstream of the falls, that the falls are essentially impassable within the range of flows encountered during this study period. Therefore, relative to Issue F12, since the Applicant's proposal for instream flow at the time of this draft assessment does not anticipate significant changes in the current flow regime, we conclude that passage at the falls will not change as a result of relicensing flow measures.

## 3.6 Wildlife and Botanical Resources

### 3.6.1 Affected Environment

#### 3.6.1.1 Wildlife Resources

Wildlife in the Project area represent important resources to the local population in terms of hunting, trapping and wildlife viewing. Generally, the area supports the typical wildlife species seen in this part of Southeast Alaska. No Alaska federally threatened or endangered species have been sighted or reported in the Project land area, although one species, the marbled murrelet, occupies the area, and is listed variously as threatened or endangered in the lower 48.

Following are descriptions of the most abundant or environmentally important species within various wildlife groups. The source of this information is Bovee (2005), documenting wildlife and botanical studies done specifically for the Project relicensing.

In the Bovee report, wildlife sighting locations were reported relative to the following Study Areas within the Project area: 1) Sawmill Creek; 2) Blue Lake Road; 3) Blue Lake; and 4) Transmission Lines and Corridors.

Wildlife resources in the Project area were described in seven major groups in Bovee (2005):

- Large Mammals
- Small Mammals
- Furbearers
- Raptors
- Songbirds
- Shorebirds
- Waterfowl.

**Large Mammals**

Large mammal species observed in the Bovee study area were:

| | |
|---|---|
| Sitka Black-tailed Deer | *Odocoileus hemionus sitkensis* |
| Mountain Goats | *Oreamnos americanus* |
| Brown Bear | *Ursus arctos* |

Of these large mammals, the most commonly seen, in terms of sign if not actual sightings, was Sitka black-tailed deer. Deer sign was seen in all study areas. Black-tailed deer are known to use most areas adjacent to the lake, especially the forested areas.

Next most important among large mammals was mountain goat. Goats were observed in the slopes above Blue Lake where they find good escape cover and feeding conditions. Goat hunting in the Blue Lake area has been noted as good, but limited by access which is restricted by steep slopes around the lake. Most goat hunting is done using boat access.

Least observed among large mammals were brown bears. Only brown bears occupy the Project area. While rarely seen, they are considered to be relatively abundant in the Project area, particularly in the slopes above Blue Lake. There is limited brown bear hunting within the Project area.

None of the large mammals in the Project area are species of concern relative to abundance or habitat needs.

**Small Mammals**

| | |
|---|---|
| Forest Deer Mouse | *Peromyscus keeni* |
| Common Shrew | *Sorex cinereus* |

Both of these small mammal species are known to be common in southeast Alaska, although there is some confusion as to their status.

**Furbearers**

Four furbearer species were identified during the Bovee surveys. Red squirrel is included in this category, although they are not normally used for fur.

| | |
|---|---|
| Red Squirrel | *Tamiasciurus hudsonicus* |
| Marten | *Martes americana* |
| Mink | *Mustela vison* |
| River Otter | *Lontra canadensis* |

Among these species, the red squirrel was by far the most common. They were particularly abundant in forested areas and near Project roads. Next most abundant among furbearers was the marten. Sign from several martens were seen, primarily in forested areas in the Blue Lake study area. Mink sign was relatively rare in the study area, with most observations made near Sawmill Creek. Two river otters were seen, in the lower areas of Sawmill Creek.

**Raptors**

| | |
|---|---|
| Bald Eagle | *Haliaeetus leucocephalus* |
| Northern Saw-whet Owl | *Aegolius acadicus* |

The most abundant raptor was the bald eagle. Several sightings were made in the upper end of Blue Lake. Bald eagles are notably common throughout the Sitka area. The saw-whet owl was noted in response to an owl call; no individuals were sighted. Several unconfirmed sightings of raptors thought to be goshawks were made, but not entered because of a lack of assurance of identification.

### Songbirds

A total of at least 22 songbird species were observed during the 2004-2005 wildlife surveys. More detailed descriptions of relative abundance and habitat use are in Bovee (2005).

| Songbird Common Name | Scientific Name |
|---|---|
| Wilson's warbler | *Wilsonia pusilla* |
| yellow-rumped warbler | *Denroica coronata* |
| black-capped Chickadee | *Poecile atricapilla* |
| common raven | *Corvus corax* |
| Steller's Jay | *Cyanocitta stelleri* |
| northwestern crow | *Corvus caurinus* |
| swallows of unknown species | |
| pine siskins | *Carduelis pinus* |
| common redpolls | *Carduelis flammea* |
| dark-eyed junco | *Junco hyemalis* |
| fox sparrows | *Passerella iliaca* |
| song sparrow | *Melospiza melodia* |
| Swainson's thrush | *Catharus ustulatus* |
| hermit thrush | *Catharus guttatus* |
| varied thrush | *Ixoreus naevius* |
| American robin | *Turdus migratorius* |
| winter wren | *Troglodytes troglodytes* |
| brown creeper | *Certhia americana* |
| cedar waxwing | *Bombycilla cedrorum* |
| golden-crowned kinglet | *Regulus satrapa* |
| red-breasted sapsucker | *Sphyrapicus ruber* |
| northern flicker | *Colaptes auratus* |
| rufous hummingbird | *Selasphorus rufus* |

Among songbirds, warblers and chickadees were the most common. Exact species identification was difficult for most of these sightings. Next most common among songbirds were ravens, followed by swallows of undetermined species. The remaining songbirds on the list were either sighted infrequently, or identified by sign.

### Shorebirds

| | |
|---|---|
| American Dippers | *Cinclus mexicanus* |
| belted Kingfishers | *Ceryle alcyon* |
| common snipe | *Gallinago gallinas* |
| spotted sandpiper | *Actitis macularia* |

All species of shorebirds observed, except for common snipe, appeared often in the surveys. Dippers were common along Sawmill Creek, as were kingfishers. Sandpipers were often seen near the Blue Lake shoreline.

**Waterfowl**

| | |
|---|---|
| marbled murrelet | *Brachyramphus marmoratus* |
| trumpeter swan | *Cygnus buccinator* |
| ring-necked duck | *Aythya collaris* |
| Canada goose. | *Branta canadensis* |
| bufflehead | *Bucephala albeola* |
| glaucous-winged gull | *Larus glaucescens* |
| herring Gull | *L. argentatus* |
| mallard | *Anas platyrhynchos* |
| harlequin duck. | *Histrionicus histrionicus* |
| Barrow's goldeneye | *Bucephala islandica* |
| common mergansers | *Mergus merganser* |

Among waterfowl species, trumpeter swans were the most common, seen regularly on or near Blue Lake in the winter months. Other species, including ducks and mergansers were seen frequently. The ring-necked duck and marbled murrelet are species of concern based on recent classifications of rarity.

### 3.6.1.2 Botanical Resources

Vegetation in the Project area is dominated by stands of western hemlock and Sitka spruce. Medium to high volume timber areas occur along some of the inlet streams and the southern shoreline. Most of the northern shoreline is very steep terrain, consisting of talus slopes with Sitka alder and cliff areas. Sitka spruce, western hemlock, and yellow cedar are found along Sawmill Creek, with Sitka alder growing on adjacent slide areas and Red alder along lower riparian areas. Hardwoods, mostly red alder and some cottonwood occur along Sawmill Creek and on adjacent slide areas.)

Understory vegetation is composed of blueberry, red huckleberry, bunchberry, rusty menziesia and devil's club. A variety of moss species form ground and exposed rock cover in most areas.

A sensitive plants survey will be conducted during summer, 2005 to determine if any listed sensitive species occur within the Project boundary.

### 3.6.2 Environmental Effects and Recommendations

**Issue W1. Blue Lake Nearshore Habitat Inundation.** Whether habitat inundation related to water elevation increase might reduce habitat for such large mammals as Sitka black-tailed deer, goats and small mammals and birds. Several large and small mammal species are known to utilize Blue Lake's shoreline areas and areas along tributaries which feed the Lake. This issue was raised early in the relicensing process when the City had not decided on whether or not to raise the elevation of the Project dam. The City has decided not to raise the dam on relicensing, and changes which result from adoption of different Sawmill Creek streamflow regimes with the current dam height would be minimal and within the current reservoir high water mark. The City therefore does not propose to address this issue in detail.

**Issue W2. Aquatic Mammal Effects of Flow Reduction.** Whether existing instream flows in Sawmill Creek would effect life histories, movement or feeding of aquatic mammals known to utilize the near stream environments. Under this issue, the City would evaluate the extent to which streamflow may affect existing aquatic mammal populations, and, if there are significant effects, seek alternative instream flow regimes which might reduce these effects. Streamflow optimization would be necessary to ensure that impacts and benefits for both fish and wildlife were adequately addressed.

**Response to Issue W2.**

Based on Project-related wildlife surveys, the only potentially-affected aquatic mammals would be mink and river otter. No muskrat or beaver were documented. Both mink and river otter utilize Sawmill Creek fish resources as a food source, primarily seeking young salmon and to a lesser extent adult salmonids and spawned out salmon.

While no specific aquatic mammals' assessment was conducted as part of the IFIM study, we have evaluated the IFIM results in terms of effects on aquatic mammals, and concluded that, by assuring fish populations equal to or exceeding those in the existing situation, there would be no food source effects on aquatic mammals.

Another factor which might affect aquatic mammals is stream level relative to dens and nursery areas. These factors are important to muskrat and beaver, which den or build lodges in contact with the water. River otter and mink, however, den upslope from water bodies or courses, and are not likely to be affected by changes in lake levels or stream elevations.

In any case, the instream flow and reservoir operations proposals reflect no significant change in either Sawmill Creek or Blue Lake elevations resulting from proposed operations.

**Issue W3. Transmission Line Effects.** Whether existing or new transmission lines pose the potential for raptor electrocution. Although no raptor interactions with existing Project-related electrical transmission lines or towers have been observed since original licensing or through the Amendment process, the City will evaluate all existing or new transmission facilities in the Application and related environmental documents.

**Response to Issue W3.** Minimum conductor spacing on the Project transmission line varies from 7 to 11.5 feet, which in either case is in excess of minimum requirements of avoid bird electrocutions. The City does not propose changes in the conductor arrangement of the Project transmission line. If new transmission facilities are developed, their design and construction will follow guidelines for prevention of raptor and other bird electrocutions.

## 3.7 Federally Listed Threatened and Endangered Species

### 3.7.1 Affected Environment

#### 3.7.1.1 Fish and Wildlife

No federally-listed Proposed, Endangered or Threatened (PET) species were found in the Bovee study area during the 2004-2005 surveys, and none have been reported or noted by responsible agencies or other studies. Two species, humpback whale (*Megaptera novaeangliae)* and Steller sea lion (*Eumetopias jubata)*, are listed as respectively endangered and threatened in the marine environments of southeast Alaska. Although both species are commonly encountered in Silver Bay, they are generally not considered likely to be affected by any measures currently considered under the Project relicensing.

The City proposes to complete a Biological Evaluation of T&E species in the time period between this draft license application and the final application for license in March, 2006.

#### 3.7.1.2 Botanical Resources

In his general survey of botanical resources in the Project area, Bovee (2005) did not note any T&E plants. However, his surveys were not meant to identify such plants in detail, and a thorough search of the area has not been performed. In consultation with the USFS and USFWS, the City intends to conduct a sensitive plant survey within various portions of the Project area during spring and summer, 2005.

### 3.7.2 Environmental Effects and Recommendations

Based on current information on T&E fish, wildlife and botanical resources, there are no such listed species in the potentially-affected Project areas.

## 3.8 Cultural Resources

### 3.8.1 Affected Environment

Three recent cultural resource investigations have been conducted in the Project Area: 1) The Blue Lake Road was surveyed by Charles Mobley (n.d.), 2) the campground area and site locations along the Sawmill Creek drainage were surveyed by Rabich Campbell (1989), and 3) cultural resources in the Project area were surveyed in 2005 by Paul

Rushmore of Wrangell Associates, Wrangell Alaska, (Rushmore, 2005.) Mr. Rushmore's studies included a literature review (including the sources cited above), consultation with the STA, USFS and ADNR, State Historic Preservation Officer (SHPO) and field surveys within the Area of Potential Effect (APE), defined by the Project Boundary.

In addition, STA conducted interviews with tribal members. Results of the interviews indicated that certain traditional uses, primarily fishing and berry gathering, were impacted by construction of the APC mill and the Blue Lake Project. The interviews did not indicate Project-related impacts on or conflicts with known cultural sites, artifacts or other cultural/historical values known to the interviewees. None of the above surveys disclosed significant archaeological sites and all suggested that there is little potential for archaeological remains in the areas surveyed.

The following descriptions of cultural resources in the APE are from Rushmore, 2005, with modifications.

**Alaska Native History**

Information collected from Goldschmidt and Haas (1946) and STA suggests that at the time of European contact members of the Kiks'adi clan of the Sitka Tribe had possession of Silver Bay and surrounding drainage systems, though no village sites are reported in the Project area.

With European contact in the late 1700s came the introduction of metal, guns, and contagious diseases, all of which had a significant effect on Native Alaskans. Smallpox was the greatest killer, first brought to the Tlingit by the Spanish in 1775. The greatest epidemic in Southeast Alaska was that of 1835-38, the disease spreading northward from California along the Northwest Coast affecting Alaska Natives well into the interior, on the Aleutians, and on the Arctic coast (de Laguna, 1991:361). Typhoid fever raged in 1819, 1848, and 1855 (Krause 1956:103). Smallpox was reintroduced in 1862 to the Tlingit as the miners began to move through their traditional territories.

As a result of European contact and rapid population decline from introduced diseases, traditional Tlingit settlement patterns and culture underwent fundamental change in the early 19th Century. Tlingit groups abandoned many traditional village and subsistence sites in favor of locations where trade goods were more available after the establishment of Russian forts and trading posts at Sitka in 1799 and at Wrangell in 1834. After destroying the Russian fort at Saint Archangel Michael in 1802, the Sitka Tribe was forced by the Russians to leave the area in 1804. The tribe was invited to resettle near New Archangel (Sitka) in 1822 (Krause 1956).

After the purchase of Alaska by the United States in 1867, a dramatic change occurred again in the lives of the Sitka Tlingit with the nonnative development of a substantial mining effort around Indian River and Silver Bay, followed closely by the fishing and timber industry (Selkregg 1976). As these industries developed, clan and tribal rights to their traditional territories became tenuous at best.

**Mining History**

Mining activity in the Silver Bay area includes historic mines, prospects, and mineral occurrences around Silver Bay itself, as well as properties east of Sitka in the Indian River basin. Prospecting for gold in the area began around 1871 and continued on a sporadic basis well into the 1990s.

The nearest mining claim to the APE is called Pande Basin, also known as Glacier Lake Placer, which is owned by Pande Basin Gold Mining Company. The claim itself is outside of the APE; though a partially intact corduroy road built to access the mine is located near the confluence of Blue Lake Creek and Blue Lake and is included in the SOW. This road was surveyed and photographed by Mr. Rushmore as part of his Project-related surveys.

### 3.8.2 Environmental Effects and Recommendations

The report by Rushmore, 2005, recommended cultural resources clearance. Because of the scarcity of cultural and historic sites in the APE, and because the City does not propose significant construction activities related to relicensing, no cultural resources impacts are expected. As with recreation resources, there may be a positive effects on cultural values associated with improved fishing in Sawmill Creek.

If construction on the third turbine is approved, the City will reinitiate cultural resource consultation prior to any land-disturbing activities, as required under Section 106 of the Historic Preservation Act and other Alaska state and federal requirements.

## 3.9 Recreation

### 3.9.1 Affected Environment

Recreation resources in the Blue Lake Project area are diverse, but, at present, not well documented. The major recreation activities are hiking, hunting, fishing and camping during the spring, summer and fall months.

#### 3.9.1.1 Sport Fishing

Sport fishing is popular on both Blue Lake and Sawmill Creek, with Blue Lake offering the greater recreational opportunity. The Blue Lake/Sawmill Creek system offers perhaps the most accessible fresh water sport fishery to Sitka area residents, although access difficulties probably reduce overall recreational use of these areas. Fresh-water sport fishing in the Project area is primarily done by local area residents; the area is not known to attract large numbers of out-or-region anglers, as does the Sitka area marine king salmon fishery.

Blue Lake reservoir offers excellent rainbow trout fishing, primarily by boat access. The Sport Fish Division of ADF&G conducts post-season surveys of area anglers. Blue Lake surveys from 1984 through 2003 that numbers of Blue Lake anglers ranged from 48 to about 536 per year. Rainbow trout harvest during these years ranged from 47 to 1116. Blue Lake rainbow trout populations, as discussed in the Fish Resources section, above, have remained relatively stable over the past ten years.

Rainbow trout fishing on Blue Lake is to some extent restricted by the lack of easy access, but, since Blue Lake is the City of Sitka's domestic water supply source, heavy recreational use is not encouraged through maintenance of access and boat launch facilities.

Sawmill Creek sport fishing effort is focused on steelhead in spring and early summer and king salmon in mid to late summer. Low steelhead populations in Sawmill Creek and difficult access to the most productive fishing areas limit the catch of this species. Only steelhead greater than 36 inches may be kept. Although no formal numbers are available, it is estimated (from BLU operator angler observations) that approximately 40 to 50 anglers harvest fewer than ten steelhead annually.

Sawmill Creek king salmon fishing has improved recently, due to liberalized early season fisheries for this species. As discussed in the Fish Resources section, above, Sawmill Creek king salmon populations are thought to be largely of hatchery origin and are not likely to spawn in Sawmill Creek, making them favored sport fishing target species.

Fishing for chum and pink salmon, while these species are periodically quite numerous, is not so intense as that for steelhead and king salmon.

Small numbers of local anglers take Dolly Varden char in Sawmill Creek, but numbers and effort are largely unknown.

#### 3.9.1.2 Hunting

Sport hunting in the Project area is popular with Sitka area residents. Hunting for Sitka black-tailed deer is probably the most popular pursuit, although numbers of hunters for all big- and small-game and birds in the Project area are poorly known. Hunters use the Blue Lake road to provide access to black-tailed deer hunting, most frequently near the US Forest Service campground and Beaver Lake.

Deer hunting is also facilitated by the road to Blue Lake, the Blue Lake boat launch and subsequent access to shoreline areas. The area surrounding Blue Lake Creek, the primary inflow to Blue Lake in its extreme eastern end is good overwintering habitat for black-tailed deer, but hunting effort in the area is not well documented.

Deer hunting in the Project area is done under both sport and subsistence regulations (subsistence hunting numbers are discussed the section on that resource topic.)

Goat hunting is done primarily by accessing Blue Lake by boat and subsequent hiking to upslope areas of good goat habitat. Goat hunting, like black-tailed deer hunting, is done under both sport hunting and subsistence regulations.

Hunting for small game and birds, primarily snowshoe hare and ptarmigan, is also done in the Project area. Steep terrain and limited access restrict these activities which are done by more hunters in other areas.

#### 3.9.1.3 Camping

Camping in the Project area is limited to the USFS campground (called "Sawmill Creek Campground") near the FVU. This area offers 11 campsites, restrooms and a parking lot. No RV hookups or other amenities are offered. The approximately 1 acre parking lot adjacent to the campground provides parking for day users and hikers.

While USFS does not keep detailed records of campground use at this location, it is estimated that approximately 1000 people per year use the campground. General usership consists of overnight campers using primarily tents, and to a lesser extent RV's, and day users seeking to picnic, hike nearby trails, or fish in Sawmill Creek or Beaver Lake.

Significant vehicular travel in the area appears to result from visitors simply driving to and from the campground without leaving their cars. This use may relate to sightseeing along the Blue Lake road which offers dramatic canyon views, and, at the Blue Lake overlook, an expansive view of the lake itself.

Within the area accessible to Sitka area residents and visitors, one other campground, the Starrigavin campground, which offers relatively easy road access. The Starrigavin campground provides for greater annual usership because of its easier access from the main Sitka road system.

#### 3.9.1.4 Hiking

The USFS administers the Beaver Lake hiking trail which begins across the Sawmill Creek bridge from the Sawmill Creek campground. This 2 mile trail to Beaver Lake is a popular hiking destination.

During 2004, the City and USFS began a use survey for the trail. Recording traffic counters were installed near the trailhead with the objective of determining number of hikers using the trail by season. Results of this monitoring survey will be available in fall, 2005.

In addition to the Beaver Lake traffic counters, the City also installed counters on the Blue Lake road to determine the number of hikers which use the road year around. As with the Beaver Lake counters, data from this study will be available in fall, 2005.

### 3.9.2 Environmental Effects and Recommendations

**Issue R1. Whether or not current and/or proposed project operations will affect recreational activities and opportunities within or adjacent to the project area.** The USFS operates the Sawmill Creek campground and administers the Beaver Lake hiking trail. Additionally, initial planning has begun for the reconstruction of the trail between Heart and Thimbleberry Lakes that lies within the transmission line corridor (Sitka Trail Plan 2003). Other recreational activities such as fishing on Blue Lake and Sawmill Creek, and hunting (goats and Sitka black-tailed deer), are known to take place on national forest lands accessed from the Blue Lake road and by boat from Blue Lake.

**Response to Issue R1.**

No direct recreation impacts are expected as a result of relicensing because, except for the third turbine installation, no new construction is proposed. Indirect effects of relicensing, however, may affect recreation, primarily through possible improvements in Sawmill Creek steelhead and coho salmon populations (and resultant sport fishing opportunities) resulting from proposed instream flow measures.

The USFS has suggested several recreation-related measures which might be applied as Project-related enhancements, including:

Among these measures, the City proposes the following:

- Sawmill Creek Campground: Remedy drainage problem by installing a culvert from the north side of the campground to route surface water to Sawmill Creek;
- Sawmill Creek Campground Turnaround Area: Regrade the turnaround area and place large rock across the turnaround to block through traffic and divide the area into camping and day use;
- Blue Lake Reservoir Overlook: Regrade parking area and place large rock at edge of the bluff overlooking the lake;
- Blue Lake Road Lower gate Area: Place signage directing traffic to additional parking across Sawmill Creek Road at the SCIP.

Further consultation with USFS and other agencies will lead to formal proposals and detailed plans which will be included in the final application for new license.

## 3.10 Land Use and Land Management

### 3.10.1 Affected Environment

Land ownership and management within the Project area is complex, particularly in or near the primary transmission line route as it nears the community of Sitka. Generally, however, land ownership in the Project area falls within three major categories: 1) US Forest Service, Tongass National Forest lands; 2) City and Borough of Sitka lands, 3) University of Alaska and Sheldon Jackson University lands, and 4) lands in private ownership (Figure 15). Within the Project Boundary, all lands are owned by the City, either associated with the Project dam, power conduit and generating features, or those included in the SCIP. In the SCIP, various land parcels are leased to industries operating in the Park, including, at the time of this draft document, the True Bottling Company, The Boat Co., Baranof Frozen Foods, Fortes of the Bears, and Theobroma Chocolate Co..

Land use in the Project area generally follows the major ownership categories listed above. Tongass National Forest lands are managed under the Tongass Land Use Plan (TLMP) noted in Section 5, Consistency with Comprehensive Plans. Lands under City ownership are used for power generation, water supply and commercial and industrial purposes, each administered by various City offices and departments. Among land use changes which might affect the Project relicensing is the NSRAA fish hatchery proposed for development and operation within the SCIP. This facility would use Blue Lake water and would release and retrieve a significant number of coho salmon each year. Exact location, size and operation of the hatchery are not known at the time of this draft document, but will be the subject of analysis is several areas in successive draft and final relicense application material.

### 3.10.2 Environmental Effects and Recommendations

No land ownership or use transfers or other changes are currently proposed relative to relicensing the Project. However, development of the NSRAA hatchery at the SCIP would result in significant change in industrial use within the Project Boundary, and could be the subject of review by the City and FERC.

## 3.11 Aesthetic Resources

### 3.11.1 Affected Environment

The Blue Lake Project area offers a variety of scenic and aesthetic opportunities. From the Blue Lake access road turnoff to the Sawmill Creek campground, the drive along the access road offers dramatic situations often characterized by exposure above the Sawmill Creek canyon and partial vistas of the surrounding mountains. At the Blue Lake overlook at road's end there is an expansive view of Blue Lake itself and the surrounding mountains. As discussed in the recreation section, it is estimated that considerable visitation in this area is occurs solely for the purpose of sightseeing.

Access on the Blue Lake road is often a factor limiting sightseeing. The road is generally maintained in good condition but may be made impassable by rock fall after landslides or downed trees after windstorms. The road is closed to vehicular traffic each winter due to avalanche dangers but the road is accessible to cross-country skiers, hikers and sledders. The parking area above the lake is small.

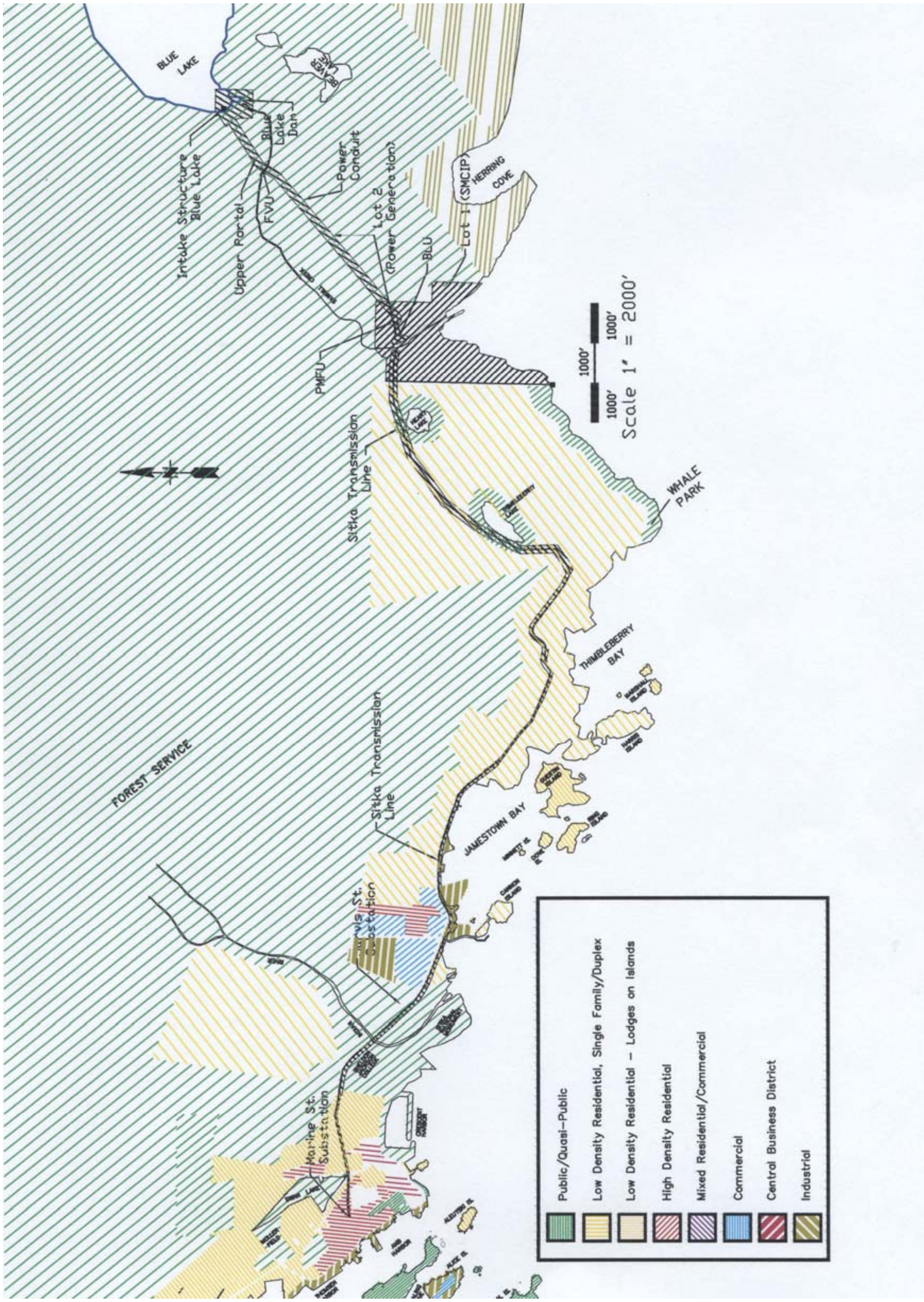


**Figure 15. Land Use Map, Blue Lake Project Area**

### 3.11.2 Environmental Effects and Recommendations

While no specific aesthetics issues were raised during the scoping process, the City has considered aesthetics resources in its overall Project proposals for relicensing. Generally, we expect no aesthetics impacts of the proposed measures because no significant new construction is planned. The enhancement measure associated with recreation which would improve parking conditions at the Blue Lake overlook is considered to relate to aesthetics as well as recreation.

## 3.12 Subsistence Resources

### 3.12.1 Affected Environment

Section 810 of the Alaska National Interest Lands Conservation Act (ANILCA) of 1980 requires an evaluation of effects to subsistence hunting, fishing, and gathering resources and the subsistence lifestyle for any project that uses federal public lands. Subsistence uses in the Project area include hunting, fishing, berry and other botanical gathering, and taking of certain shellfish.

#### 3.12.1.1 Subsistence Status of the General Area

ANILCA created a preference for rural Alaska residents who use subsistence resources on federal public lands. Within the Blue Lake Project area, the USFS, ADF&G and USFWS regulate various aspects of subsistence hunting, fishing and gathering, depending upon the resource and location.

The USFS controls subsistence hunts on its lands and is the only federal land manager involved in the project area. The Alaska Department of Fish and Game (ADF&G) controls hunting by urban, non-resident, and other non-rural hunters on these same lands and on any other land where hunting is allowed.

#### 3.12.1.2 Federal Public Land Affected

Federal public land is land owned by the federal government that is open to the public and unencumbered by overlying selection by the State of Alaska or by Native corporations formed under ANILCA. All lands owned or operated by the federal government in the Blue Lake Project area are administered by USFS, Sitka Ranger District, Tongass National Forest. The total area of federal public land within the Project Boundary is about 812 acres.

#### 3.12.1.3 Subsistence Communities and Their Resource Use Areas

The nearest community, Sitka, is approximately 5 miles north of the Project Area. Sitka is a traditional subsistence community as defined by ANILCA or designated by the ADF&G, Board of Fisheries or Board of Game. This classification is currently being reviewed because Sitka's population may increase beyond the level specified in ANILCA.

In 1996, the ADF&G Division of Subsistence, in cooperation with STA, conducted a household subsistence survey in Sitka (among other southeast communities) to determine the fish, game and other resources used by subsistence users in the community (ADF&G, 1997). The survey showed that almost every Sitka household (97 percent) used at least one species of subsistence resources.

Based on the sample, it is estimated that more than 1,746,463 pounds of wild resources were harvested by Sitka households from February 1, 1996 through January 31, 1997. Overall, the average Sitka household used 572 pounds of wild resources in the survey year, or about 205 pounds per person.

Fish contributed the major portion of the usable weight harvested (55 percent), while land mammals contributed almost 25 percent, marine invertebrates contributed 13 percent and vegetation contributed 3 percent (Table 10).

**Table 10. Estimated Total Subsistence Harvests of Wild Resources, Sitka, by Resource Category, February 1996 - January 1997 (Pounds of Usable Weight)**

| Subsistence Resource | Total Pounds Harvested | Mean Pounds Per Household | Pounds Per Person |
|---|---|---|---|
| **Fish** | 953,206.84 | 312.22 | 111.68 |
| **Land Mammals** | 434,971.05 | 142.47 | 50.96 |
| **Birds and Eggs** | 5,068.45 | 1.66 | 0.59 |
| **Marine Invertebrates** | 234,496.37 | 76.81 | 27.47 |
| **Marine Mammals** | 62,358.44 | 20.43 | 7.31 |
| **Vegetation** | 56,361.81 | 18.46 | 6.60 |

### 3.12.2 Environmental Effects and Recommendations

**Issue Sub1. Effects of relicensing on subsistence related resources.** Generally, the City believes that Project relicensing will not affect existing or future subsistence uses in the Project area, but will discuss existing uses and their related entitlements in all subsequent environmental and licensing documents.

Relevant sections of ANILCA require assessment of subsistence impacts according to the specific items below:

#### 3.13.2.1 Changes in Resources, Habitat, or Competition for Resources

Because no physical changes are proposed on relicensing, no impacts on resources, habitat or competition for resources are expected. Depending on the City's final proposals for Project operation and/or access improvements, populations of fish in Sawmill Creek and Blue Lake may be improved, but it is unknown how that improvement might affect subsistence harvest.

The same is true for hunting. The City's final proposals are expected to result either in improvement of access for these activities, or in no predictable change from current conditions.

#### 3.13.2.2 Changes in Resource Availability due to Alteration in Migration Pattern or Location

There is no known major migration pattern in the area for terrestrial wildlife. Relicensing the Project should have no measurable effect on location of deer, bears, goats, or any other wildlife species that could be important to subsistence hunters or gatherers.

#### 3.13.2.3 Physical or Legal Barriers to Accessing Resources

Depending on the City's final proposal for recreational improvements, it is expected that access for subsistence uses would not be affected, or would be improved by measures associated with relicensing the Project. An objective of improving facilities associated with the USFS campground as a proposed relicensing measure is to improve access for both recreational and subsistence-related uses.

#### 3.13.2.4 Cumulative Impacts on Federal Land

Cumulative impacts of relicensing on subsistence activities would be the same as impacts described in the Cumulative Impacts Section. Generally, if the City's final recommendations improve access or usability of locations in which hunting, fishing and gathering are done, it is expected that relicensing will offer an overall improvement to subsistence users. No individual or cumulative impacts are expected.

## 3.13 No Action Alternative

## 3.14 Irreversible and Irretrievable Commitment of Resources

At the time of this PDEA, no Irreversible and Irretrievable Commitment of Resources for any of the resources evaluation are expected. No significant impact to any resource has been demonstrated, based on studies and evaluation methods approved by Alaska state and federal resource agencies and STA.

# 4.0 DEVELOPMENTAL ANALYSIS

## 4.1 Power and Economic Benefits of the Project

The Sitka electric system is an isolated electric utility with no interconnection to any other electric utilities. As such, Sitka must use its own generating resources to supply the total power needs of the residential and commercial customers in the community. Further, the lack of a regional transmission grid in Southeast Alaska means that Sitka has no ability to sell power it generates outside its own system.

The Project provides a significant portion of Sitka's overall power and energy requirement. Without the Project, diesel generators would need to be used to generate the power currently supplied by the Project. There is no natural gas or coal in Southeast Alaska and diesel fuel used in Sitka must be transported by sea-going barge and stored locally. To replace the energy generation capability of the Project would require an estimated 4.4 million gallons of diesel fuel per year. In addition to the risks associated with transporting, handling and storing such a large quantity of fuel, it is estimated that using diesel generation to supplant the generation capability of the Project would result in annual pollutant emissions of 126 tons of sulfur oxides, 110 tons of nitrous oxides and over 26,700 tons of carbon dioxide.

It is also important to note that as a municipal electric system, Sitka's electric rates are cost-based. The benefits of the Project, when compared to the much higher cost of diesel generation, are passed on directly to the end consumer. From the other perspective, any additional cost burden placed on the Project must be recovered through electric rates charged to the residents and businesses of Sitka. The Sitka electric system has no revenue source other than the revenues received from sales of electricity to its customers.

Estimates of the value of the Project generation, both capacity and energy, and for the ancillary services provided by the generation source, may vary widely depending on the type of resource assumed for replacement and the possible location.

## 4.2 Cost of Environmental Enhancement Measures

The measures proposed in this PDEA for mitigation, protection and enhancement of environmental resources potentially-affected by the project are in four main categories: 1) Instream flow; 2) Off-site mitigation measures; 3) Sediments and erosion control and 4) Visual resources measures (such as painting the project features neutral colors, revegetation and grading and screening through vegetation). The effects and costs of these measures are discussed below.

- **Instream Flow**. The proposal to release 60 cfs during the months of May and June only as a minimum causes a revenue loss to the City of about $5000/yr. due to diesel operation under a 0.8% load growth scenario. This revenue loss is the same under either the two turbine or three turbine configurations.

Over the thirty-year license period, this would relate to a simple loss of $150,000 or about .07% of the total estimated project generation revenue. If instream flow were required 12 months, instead of two months per year, the cost of 1 cfs in additional minimum flow would be about $3,000, using the same cost calculation described above.

- **Installation Of Third Turbine**. Installation of the third turbine is estimated to cost $10,000,000. Assuming that the amortization cost of the equipment, the fuel inflation rate, and the inflation rate for power sales are all equal, the annual cost of the third turbine would be $333,000/yr. The cost benefit in terms of annual diesel operation of installing a third turbine under the 0.8% load growth scenario, would be $315,000/yr. over the 30 year period of the license.

- **Recreation Measures**. The primary enhancement measure for recreation are: 1) drainage at the USFS campground; 2) grading and rock moving at the campground and 3). Enlargement of the parking lot at the Blue Lake overlook. Respective costs of these measures would be 1) $30,000, 2) $10,000, and 3) $10,000. Costs for signage at the Blue Lake road gate are minimal.

# 5.0 COMPREHENSIVE DEVELOPMENT AND RECOMMENDATIONS

## 5.1 Comparison of Proposed Action and Alternatives

Table 9 shows a comparison among the various alternatives evaluated for instream flow habitat benefits and generation economics. The table demonstrates the instream flow benefits of Alternative 3T60 0.8 relative to the no action alternative and relative to the two turbine alternative and those with no spawning release for steelhead. Although the instream flow benefits are not large, they represent habitat increases for most species/life stages evaluated. As discussed in the fisheries section, more detailed analysis of flow-management capabilities afforded by the third turbine should be conducted prior to development of final Project operational conditions.

From the economic standpoint, benefits of the third turbine are only partially explained by a direct cost-benefit analysis which shows installation cost to about equal increased generation revenue. Beyond this comparison, the third turbine offers substantial operating flexibility by virtue of the capability to increase the flow through the Blue Lake Powerhouse by 50%. This facilitates managing reservoir storage to avoid diesel generation, optimize utilization of stored water and reduce flood flows thought to degrade salmon and steelhead rearing habitat;

## 5.2 Comprehensive Development and Recommended Alternative

Sections 4(e) and 10(a)(1) of the FPA require the Commission to give equal consideration to all uses of the waterway on which a project is located. When the Commission reviews a proposed project, they equally consider the environment, recreation, fish and wildlife , and other non-developmental values of the project as well as power and other developmental values. Accordingly, any license issued shall be best adapted to a comprehensive plan for improving or developing a waterway or waterways for all beneficial public uses.

Based on the City's re view of the environmental and economic effects the City has developed the preferred alternative described in previous sections. Further refinement and evaluation of this alternative will be done in consultation with resource agencies, during the remainder of the relicensing period.

We believe that the City's preferred alternative would be best adapted to the comprehensive development of Blue Lake Project for beneficial public uses.

## 5.3 Cumulative Effects Summary

Under evaluations conducted to date, we do not foresee cumulative impacts which might result from the preferred alternative. However, the development of the NSRAA hatchery at the SCIP might introduce factors influencing enhancement proposals for target fish species. As information on the hatchery becomes available, the City will address it in terms of cumulative impacts and proposed relicensing measures.

## 5.4 Fish and Wildlife Agency Recommendations

At this time, no formal fish and wildlife recommendations have been made. With distribution of this document, the City will request preliminary recommendations in response to the preferred alternative. We expect to conduct negotiations on these recommendations leading to settlement prior to submission of the Final Application for License in March, 2006.

## 5.5 Consistency with Comprehensive Plans

Six comprehensive state and federal management plans were identified during scoping and through agency comment as having relevance to the Project relicensing. These plans, with their applicable state or federal agencies, are the:

1. City of Sitka Comprehensive Plan (CSCP), City and Borough of Sitka;

2. Sitka Coastal Management Plan, Alaska Department of Natural Resources;

3. Tongass Land Use Management Plan, United States Forest Service, Tongass National Forest, Juneau; and

4. Northern Southeast Area Plan, Alaska Department of Natural Resources.

5. Sitka Trail Plan, US Forest Service.

6. Sawmill Cove Industrial Park Plan. City and Borough of Sitka Water Front Development Plan.

The City has generally evaluated these plans for 1) elements which directly affect Project area, features or operation, and 2) constraints or conditions which might bear on proposed changes such as installation of the third turbine, recreation measures or instream flow.

This preliminary review has shown no conflicts with conditions in any of these plans. However, as Project proposals are negotiated to final conditions, the City will continuously evaluate them in relation to comprehensive plan conditions. The City will also periodically review the applicable plans to check for any amendments or updates which might relate to relicensing conditions.

## 5.6 Relationships of License Process to Laws and Policies

### 5.6.1 Water Quality Certification

Application for Water Quality Certification will be part of the Coastal Zone Consistency Certification process described below. Alaska procedures for Water Quality Certification are currently in a state of flux; a more detailed description of the process will accompany the final application for license.

### 5.6.2 Coastal Zone Consistency Certification

Our preliminary review indicates no conflicts with Project relicensing proposals relative to the Sitka Coastal Management Plan. Normally, Coastal Project Review (by ADNR) does not begin until the application for license or relicense is accepted by the FERC and noticed in the Federal Register. A decision will be made within the coming months as to the future of Coastal Zone Planning statewide, which may result in elimination of the review process entirely.

### 5.6.3 Section 18

No Section 18 proposals which would be in the form of fish passage prescriptions, have been made at this time.

### 5.6.4 Endangered Species Act

Review at the time of this document did not disclose presence of any endangered species in the area potentially-affected by the Project relicensing.

## 6.0 LITERATURE CITED


Alaska Department of Fish and Game, 1997. Wild Food Resource Harvests in Sitka, Results of a Household Survey, 1996. Alaska Department of Fish and Game, Division of Subsistence, Juneau AK. 5pp.

Alaska Department of Fish and Game. 2005. An Atlas to the Catalogue of Water Important for Spawning, Rearing, or Migration of Anadromous Fishes, Southeast Region, State of Alaska, Division of Sport Fish, Juneau, AK. Map C-4.

Athearn, Murray J. 1954. Preliminary Report on the Geology of the Blue Lake Project Near Sitka, Alaska. United States Department of the Interior Bureau of Reclamation, Alaska Geologic Report No. 4, Alaska Investigation Office, Juneau, Alaska 18pp.

Bovee, Kent. 2005. Wildlife Investigations for 2004-2005. In Support of Blue Lake Project (FERC No. 2230) Relicensing. Prepared For: City And Borough Of Sitka Electric Department, Sitka, AK. June, 2005. 20 pp plus Appendix

City and Borough of Sitka 1990. Application for Amendment of License for the Blue Lake Hydroelectric Project, FERC No. 2230. Prepared by: R.W. Beck and Associates.

City And Borough Of Sitka Electric Department 2004a. Supplement To Instream Flow Study Plan, Blue Lake Project (FERC) 2230. City And Borough of Sitka Electric Department. April 2004. 12 pp.

City and Borough of Sitka 2004b. Draft USDA Forest Service Region 10 Aquatic Habitat Stream Survey (Tier III) Sawmill Creek, Sitka AK. Prepared by: City and Borough of Sitka Electric Department. October, 2004. 21pp.

City and Borough of Sitka Electric Department 2004c. Sawmill Creek Fisheries Information Paper. City and Borough of Sitka Electric Department, Sitka, AK. 17 pp

City And Borough Of Sitka Electric Department, 2005a. Powers & Orsborn Fish Passage Evaluation Sawmill Creek Falls. Blue Lake Project (FERC No. 2230) Relicensing. Prepared By: City And Borough Of Sitka Electric Department January, 2005 12 pp.

City and Borough of Sitka Electric Department 2005b. Revised Draft Habitat Suitability Curves And Coho Salmon And Steelhead Trout, Sawmill Creek Alaska. Blue Lake Hydroelectric Project, FERC No. 2230, Relicensing. Prepared by: City and Borough of Sitka Electric Department, Sitka AK. February, 2005. 28 pp

City and Borough of Sitka Electric Department 2005c. Q vs. WUA Relationships Sawmill Creek Instream Flow Analysis Blue Lake Project (FERC No. 2230) Relicensing, April, 2005. City and Borough of Sitka Electric Department, Sitka AK 13 pp.

City and Borough of Sitka Electric Department 2005d. The Sitka Hydroelectric Project Operations Model, Modification Update. Blue Lake Project (FERC No. 2230) Relicensing. Prepared by: City and Borough of Sitka Electric Department, 105 Jarvis St. Sitka, Alaska, 99835, April, 2005. 10 pp

City And Borough Of Sitka, Alaska, Electric Department, 2005e. Development Of Applicant's Preferred Instream Flow Alternative. Sawmill Creek, Alaska. In Support Of Relicensing For Blue Lake Hydroelectric Project, FERC No. 2230. City And Borough Of Sitka, Alaska, Electric Department, Relicensing Agent. May, 2005 6pp.

City and Borough of Sitka 2005f. Sitka Electric Load Forecast. Prepared by: D. Hittle and Associates, Prepared for: City and Borough of Sitka Municipal Electric Department, Sitka, Alaska. 11 pp, plus Tables.

de Laguna, F. 1960. The Story of a Tlingit Community: A Problem in the Relationship between Archaeological, Ethnological, and Historical Methods. Bureau of American Ethnology Bulletin No. 172. U.S. Government Printing Office, Washington, D.C.

de Laguna, F. 1991. Tlingit. In: Handbook of North American Indians, Vol. 7: Northwest Coast, W. Suttles, ed., pp 203-228. Washington D.C.: Smithsonian Institution.

Der Hovanisian, J. A. 1994. Stock assessment of rainbow trout in a southeast Alaska impoundment. Juneau: University of Alaska. Thesis.

Goldschmidt, W.R., and T.H. Haas 1946. Possessory Rights of the Natives of Southeastern Alaska: A Detailed Analysis of the Early and Present Territory Used and Occupied by the Natives of Southeastern Alaska, Except the Natives of the Village of Kake (Partially Treated), Hydaburg, and Klawock: a Report to the Commissioner of Indian Affairs. Mimeograph copy on file, Office of History and Archaeology, Anchorage.

Krause, A. 1956. The Tlingit Indians: Results of a Trip to the Northwest Coast of America and the Bering Straits, translated by Erna Gunther. The American Ethnological Society, Monograph 26, University of Washington Press, Seattle.

Miller Ecological Consultants, 2005. Preliminary Sawmill Creek Instream Flow Report, Blue Lake Hydroelectric Project (FERC No. 2230). Prepared for: City and Borough of Sitka Electric Department. Prepared by: Miller Ecological Consultants, Inc., Ft. Collins CO, 76 pp.

Rabich-Campbell, C. 1989 An Archaeological Survey of the Blue Lake Small Hydro Additions, Sitka, Alaska. Report prepared for R.W. Beck and Associates, Seattle, WA..

Rushmore, Paul, 2005. Archaeological Assessment of the Blue Lake Project, Sitka, Alaska, Final Report. Prepared for: Blue Lake Hydroelectric Project (FERC No. 2230) Relicensing, City and Borough of Sitka Electric Department, June 1, 2005. Prepared by: Wrangell Research Associates, Wrangell, Alaska. 17pp.

Seber, G.A.F. 1982. The estimation of animal abundance. Charles Griffin and Company, London, Great Britain.

Selkregg, L.L. 1976. Alaska Regional Profiles: Southeast Region. Arctic Environmental Information and Data Center, University of Alaska, Anchorage.

Wolfe, Karl 2002. Fisheries Survey Annual Report, Sawmill Creek, 2001. Blue Lake Project, Federal Energy Regulatory Commission (FERC) No. 2230. City And Borough Of Sitka, Licensee. Prepared By: Karl Wolfe, Sitka, AK. January, 2002. 22pp

Wolfe, Karl. 2003. Sawmill Creek Fisheries Survey Annual Report For 2002 Studies. Blue Lake Project, Federal Energy Regulatory Commission (FERC) No. 2230. City And Borough Of Sitka, Licensee. Prepared By: Karl Wolfe, Sitka AK. March, 2003. 41 Pp

Wolfe, Karl. 2004. Sawmill Creek Fisheries Survey Annual Report For 2003 Studies. Blue Lake Project, Federal Energy Regulatory Commission (FERC) No. 2230. City And Borough Of Sitka, Licensee. Prepared By: Karl Wolfe, Sitka AK., April, 2004, 41pp

Wolfe, Karl. 2005. Sawmill Creek Fisheries Survey Annual Report For 2004 Studies, Blue Lake Project, (FERC) No. 2230. Prepared For: City And Borough Of Sitka Electric Department, Relicensing Agent, March, 2005. 46pp

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# 9.0 ATTACHMENT I

## DEVELOPMENT OF PREFERRED INSTREAM FLOW and GENERATION ALTERNATIVE

Blue Lake Hydroelectric Project, FERC No. 2230

**City and Borough of Sitka, Alaska, Electric Department**

June, 2005

## INTRODUCTION AND BACKGROUND

As part of the relicensing for the Subject Project, the City and Borough of Sitka Electric Department (City) has evaluated alternative Project operational scenarios in terms of their engineering, economic and environmental effects. The objective of these evaluations has been to develop an operating regime which best serves the City's needs for electrical generation while protecting environmental resources through the period of the new license.

Consultation with Alaska state and federal resource agencies and the Sitka Tribe of Alaska (STA) led to performance of an Instream Flow Incremental Methodology (IFIM) application on Sawmill Creek to quantify effects of streamflow changes on target anadromous fish species (City and Borough of Sitka, 2004a). In addition to fish habitat effects in Sawmill Creek, the City has also developed an information base suitable to evaluate changes in Blue Lake level, in terms of effects on the resident rainbow trout population in that water body. Consultation, Methods and Results of these studies are in several City and contractor prepared documents, cited in the References Section, and available on the City's Blue Lake Project relicensing website.

In addition to the IFIM studies, the City has developed and refined the Blue Lake Operational Model (Operations Model) to predict Sawmill Creek stream flows, generating economics and water use factors under a variety of operational alternatives. These Operations Model and IFIM outputs are the basis for economic and environmental assessment, as described in the sections below.

## ALTERNATIVE EVALUATION METHODS

### SAWMILL CREEK INSTREAM FLOW TIME SERIES ANALYSIS

Among other revisions, the Operations Model has been revised to predict Sawmill Creek streamflow on a mean monthly basis for a 28-year forecast period. Details of Model calculational logic, input and output are in City and Borough of Sitka 2005d. Flows predicted for the 28-year period are displayed in a 12X28 matrix, called the "Discharge

Matrix" named according to a nomenclature system which describes the input variables specific to a selected operational alternative.

From the IFIM study, a group of "Q vs. Weighted Usable Area (WUA)" relationships were developed for the selected target species, steelhead trout and coho salmon. These relationships showed WUA for steelhead and coho spawning, fry rearing and juvenile rearing at specific Sawmill Creek cross-section locations selected to describe areas where the majority of Sawmill Creek target species had been observed during a 4 ½ year fisheries survey conducted for the relicensing. Discussion of specific cross-sections and species/life stages is in City and Borough of Sitka Electric Department, 2005c. Life history timing and habitat utilization are discussed in City and Borough of Sitka Electric Department, 2004c.

Using the Discharge Matrix and Q vs. WUA relationships, a "Habitat Matrix" was developed, in which each successive mean monthly discharge was converted to a mean monthly WUA using an Excel spreadsheet interpolational calculation. The Habitat Matrix was then evaluated by ranking the WUA values for the yearly time period when the selected species/life stage was active, known as "periodicity" (City and Borough of Sitka, 2004 b). We elected to examine the $50^{th}$ and $20^{th}$ percentile exceedance points as comparators of the habitat results for each alternative.

## ANALYSIS STRUCTURE

### ALTERNATIVES NOMENCLATURE

To develop the Applicant's Proposal, we first developed a set of candidate Alternatives for evaluation. Alternatives were named relative to 1) Blue Lake Unit turbine configurations (either 2 or 3 turbines) instream flow release (in all cases for steelhead spawning during May and June) and load growth (either 0.0, 0.8 or 2.0 percent). Alternative names included contractions of these factors, as follows:

**NA 0.8**--No Action Alternative, 0.8 percent load growth

**2T60 0.8**--Two turbines, 60 cfs during May and June, 0.8 percent load growth

**3T 0.8--**Three turbines, 0.8 percent load growth

**3T60 0.8**--Three turbines, 60 cfs during May and June, 0.8 percent load growth

**NA 2.0**-- No Action Alternative, 2.0 percent load growth

**3T60 2.0--**Three Turbines, 2.0 percent load growth

### Q vs. WUA RELATIONSHIPS

Three primary Q vs. WUA relationships were used to address Issue F1: 1) spawning for steelhead trout and coho salmon at the Falls Pool IFIM site; 2) rearing for steelhead and coho fry and juveniles at the Pulp Mill Outflow 2 (PMO2) site; and 3) for steelhead juveniles at the Index Pool 1 (IP1) site (Table 1). These sites were selected as those representing the largest and most consistent fish utilization, as described in City and Borough of Sitka, 2005c. Spawning and rearing were observed only at these sites every year of the Wolfe surveys. Inclusion of other sites, we believe, would lead to the need for weighting of flow requirements, a complex and uncertain process.

**Table 1. Species/life stages and associated cross-sections, Sawmill Creek instream flow alternatives analysis.**

| Species | Life-Stage | Cross-Section | Periodicity |
|---|---|---|---|
| **Steelhead** | Spawning | FP1-3 | May, June |
| **Steelhead** | Fry Rearing | PMO2 | August-May |
| **Steelhead** | Juvenile Rearing | PMO2, IP1 | Year around |
| **Coho** | Spawning | FP1-3 | October, November |
| **Coho** | Fry Rearing | PMO2 | Year around |
| **Coho** | Juvenile Rearing | PMO2 | Year around |

## RESULTS FORMAT and ALTERNATIVE SELECTION

Two primary factors were examined during evaluation of the output: 1) total fish habitat for the relevant species/life-stage/cross-section; and 2) economic evaluation of electrical generation. Details of the full Operations Model output for each alternative are not presented in this paper, but will be made available as appendices to the draft and final license applications.

A final generation economics vs. fish habitat benefit table was prepared after initial evaluation of alternatives. The Applicant's Preferred Flow Alternative was the one which offered the highest values for both fish habitat and generating economics.

## GENERATION COST CALCULATION

For economic comparisons among alternatives, the comparator was the difference in total cost of diesel operation (over the 28-year period) between the No Action Alternative and the Alternative under consideration. Diesel operation was selected as the cost comparator because the Sitka generation system has, and will retain into the future, an energy surplus. That is, the Blue Lake Project spills essentially every year, effectively releasing water which cannot be used for electrical generation. At the yearly periods when the Project is not spilling, however, load may not be met because of low reservoir elevation. When load is not met, or when reservoir elevation falls below El 342, diesels must be run. When these conditions occur, cost of electrical generation to the City increases dramatically. It is this cost that is shown in Table 1 as generation cost.

## RESULTS

Results are presented showing comparisons among alternatives in terms of 50th percentile habitat and total generating revenue for the 28-year forecast period (Table 2).

**Table 2. Comparisons Of Diesel Operation Cost And Median Time Series WUA for Various Blue Lake Project Alternatives (20th Percentile WUA Values in Parentheses).**

| Alternative | Steelhead Spawning | Steelhead Fry | Steelhead Juvenile PMO2/IP1 | Coho Spawning | Coho Fry | Coho Juvenile | Average Annual Cost (millions) |
|---|---|---|---|---|---|---|---|
| **NA 0.8** | 386.8 (368.5) | 88.3 (25.1) | 251.1/232.0 (248.7/132.6) | 94.1 (37.7) | 115.2 (20.2) | 196.3 (132.2) | $1.016 |
| **2T60 0.8** | 431.5 (417.3) | 88.0 (26.0) | 251.2/228.9 (248.7/134.8) | 94.1 (37.7) | 110.0 (60.2) | 193.0 (133.8) | $1.021 |
| **3T 0.8** | 386.8 (368.5) | 88.3 (29.4) | 251.1/232.0 (248.7/225.2) | (98.6) (37.7) | 115.2 (106.8) | 196.3 (190.1) | $0.7006 |
| **3T60 0.8** | 431.5 (417.3) | 88.3 (30.0) | 251.1/210.1 (248.7/210.1) | 98.6 (37.7) | 110.0 (93.8) | 193.0 (178.2) | $0.705 |
| **NA 2.0** | 386.8 (368.5) | 88.3 (28.4) | 251.1/232.0 (248.7/225.8) | 87.0 (37.7) | 115.2 (107.3) | 196.3 (190.5) | $4.326 |
| **3T60 2.0** | 431.5 (417.3) | 88.3 (30.0) | 251.1/228.9 (248.7/210.1) | 71.7 (37.7) | 110.0 (93.8) | 193.0 (178.2) | $3.656 |

### LOAD GROWTH of 0.8 PERCENT.

Under the 0.8 percent load growth projections, WUA for steelhead spawning showed the most consistent change relative to the different alternatives. Because the 60 cfs release under alternatives 2T60 0.8 and 3T60 0.8 was made during the May June period when there was no spill, the 10 cfs additional flow was the only difference between these alternatives, and resulted in about a 15 percent increase in median spawning WUA. The 20th percentile WUA for steelhead spawning increased proportionately under the two 60 cfs alternatives.

While steelhead fry median WUA values were the same for all alternatives, the 20th percentile values were higher under with 3 turbines, perhaps because of the flow reductions possible with greater generating capacity. While steelhead juvenile median WUA did not vary at PMO2, the 20th percentile WUA increased substantially under both 3 turbine scenarios, again probably because of reduced rearing flows resulting from more hydro utilization.

Coho spawning median WUA increased slightly under the 3 turbine scenarios and remained the same at the 20th percentile level. While coho spawning occurs during a time period when spill is common, the changes were apparently not significant.

As for steelhead fry, the 3 turbine alternatives offered considerably better 20th percentile WUA than did the 2 turbine scenarios, as did coho juvenile WUA.

**LOAD GROWTH of 2.0 PERCENT.**

Under high low-growth forecasts, steelhead spawning WUA was the same for both No Action and 3T60 alternatives. As before, steelhead fry were relatively insensitive to changes among all alternatives, as were steelhead juveniles.

Coho spawning median WUA decreased under both 2.0 percent load forecast scenarios, likely because reduced flows resulting from increased generation in the fall and early winter months. Coho fry and juvenile, however, remained relatively high under the 2.0 percent load growth scenarios, again probably because of lower flows.

## DISCUSSION

Generally, the WUA analysis showed that WUA for all species and life stages under all flow and load growth scenarios was relatively insensitive at the median level. This is probably because fry and juvenile habitat for both species was reduced by high flows at some period during the applicable periodicity for those life stages. Only steelhead spawning increased predictably.

At the 20th percentile level of WUA, significant differences occurred. It will be beneficial in the future to analyze these differences in more detail, with respect to the changes in flow across the entire matrix.

As a general conclusion, however, it can be seen that alternative 3T60 0.8 offers among the highest habitat values of all alternatives for all species and life stages. This, in association with the economic and operational analysis detailed below support its selection as preferred alternative at the current level of evaluation.

**ECONOMIC ANALYSIS.**

Examination of Table 1 shows that costs for either 3 turbine scenario over the 28 year forecast period are significantly lower than those for the 2 turbine cases. The 3 turbine scenario without the 60 cfs steelhead spawning release is marginally more cost-effective, but results in about 15 percent less spawning habitat, slightly lower rearing habitat for certain species/life stages. For these reasons, we can reasonably select alternative 3T60 0.8 as preferred at this time. Evaluation of the 2.0 percent load growth outcomes further confirm the benefits of this choice. The cost differential between the No Action and 3T60 2.0 cases is the single greatest in the entire analysis set.

**OPERATIONAL FACTORS.**

The costs shown in Table 1, while instructive, do not fully define the benefits of installing a third turbine. As discussed elsewhere, the installation cost of the third turbine is estimated at $10,000,000 or $333,000 per year over the 30-year license period. The annual benefit of the third turbine in avoided diesel costs is about $315,000 dollars, indicating a slightly negative benefit-cost comparison.

From the economic standpoint, however, benefits of the third turbine are only partially explained by a direct cost-benefit analysis which shows installation cost to about equal increased generation revenue.  Beyond this comparison, the third turbine offers substantial operating flexibility by virtue of the capability to increase the flow through the Blue Lake Powerhouse by 50%.  This facilitates managing reservoir storage to avoid diesel generation, optimize utilization of stored water and reduce flood flows thought to degrade salmon and steelhead rearing habitat.

## REFERENCES

(Note:  Reference dating and numbering corresponds to citations in the Literature Cited Section of the PDEA).


City And Borough Of Sitka Electric Department 2004a.  Supplement To Instream Flow Study Plan, Blue Lake Project (FERC) 2230.  City And Borough of Sitka Electric Department.  April 2004.  12 pp.

City and Borough of Sitka Electric Department 2004c.  Sawmill Creek Fisheries Information Paper.  City and Borough of Sitka Electric Department, Sitka, AK. 17 pp

City And Borough Of Sitka Electric Department, 2005a.  Powers & Orsborn Fish Passage Evaluation  Sawmill Creek Falls.  Blue Lake Project (FERC No. 2230) Relicensing. Prepared By:  City And Borough Of Sitka Electric Department January, 2005  12 pp.

City and Borough of Sitka Electric Department 2005b.   Revised Draft Habitat Suitability Curves And Coho Salmon And Steelhead Trout, Sawmill Creek Alaska.  Blue Lake Hydroelectric Project, FERC No. 2230, Relicensing. Prepared by:  City and Borough of Sitka Electric Department, Sitka AK.  February, 2005. 28 pp

City and Borough of Sitka Electric Department 2005c. Q vs. WUA Relationships Sawmill Creek Instream Flow Analysis Blue Lake Project (FERC No. 2230) Relicensing, April, 2005.  City and Borough of Sitka Electric Department, Sitka AK 13  pp.

City and Borough of Sitka Electric Department 2005d.  The Sitka Hydroelectric Project Operations Model, Modification Update.  Blue Lake Project (FERC No. 2230) Relicensing.  Prepared by: City and Borough of Sitka Electric Department, 105 Jarvis St. Sitka, Alaska, 99835, April, 2005.  10 pp