PRELIMINARY DRAFT WATER QUALITY MONITORING PLAN

BLUE LAKE HYDROELECTRIC PROJECT (FERC No. 2230) EXPANSION

Prepared by:

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INTRODUCTION

The City and Borough of Sitka Electric Department ("City") is in the process of applying for an amendment to the existing FERC license for the Blue Lake hydroelectric project ("Project", FERC No. 2230) to address recent electric load growth in the face of increasing diesel fuel costs. The amendment will reflect two significant changes in Project design: 1) construction of a new powerhouse including 3 new turbine generators and decommissioning of the existing turbine generators; and 2) raising the Project dam as much as 83 feet from the existing spillway height of El (elevation in feet above mean sea level) 342 to El 425. Collectively, these and other associated changes are referred to as the "Blue Lake Expansion" or simply "Expansion".

Details of the proposed Expansion are described in the Final Amendment Application (City, 2009), available at the City's Project website:

(www.cityofsitka.com/departments/electric/bluelakeexpansion).

NEED for WATER QUALITY MONITORING

Several aspects of the Expansion are likely to affect water quality in both Blue Lake and Sawmill Creek, the lake's primary outflow waterway. These changes will be important during both construction and long-term operation of the Expansion because 1) Blue Lake is the source of unfiltered drinking water for the City of Sitka; and 2) Sawmill Creek harbors several species of anadromous (migratory) and non-anadromous fishes.

As Sitka's water supply, Blue Lake's naturally high water quality obviates the need for water filtration. Any Project-related effects on Blue Lake water quality, particularly if suspended sediment or turbidity were increased, might require expensive water filtration.

Raising the reservoir would inundate approximately 362 acres of land around the reservoir, mostly in the Blue Lake Creek valley at the east end of the reservoir. Potentially-inundated vegetation in this valley consists primarily of standing spruce and hemlock timber, but with significant volumes of understory brush, deadfalls, and various wetlands.

After evaluating both removal and retention of vegetation in the potentially-inundated areas, the City proposes to leave the timber in place after filling the reservoir instead of felling and removing it. The rationale behind this decision is based primarily on water quality considerations. A 2002 analysis by CH2M Hill indicated that, while there were water quality risks associated with both plans, the primary risk of leaving the timber in place would be to increase concentrations of Total Organic Carbon (TOC) in lake water resulting from decomposition of coniferous needles and deciduous leaf pack. Higher TOC levels in raw water might require chlorination which could produce objectionable compounds.

Cutting and removing the potentially-inundated timber, however, could raise Blue Lake sediment levels both during construction and filling and over long-term operations. In either case, raw water turbidity might rise to the levels which would require water filtration.

WATER QUALITY MONITORING PROGRAM

Expansion-related water quality monitoring will address potential effects due to both construction and long-term operation, as described in the following sections. The program will be comprised of water quality monitoring to document both site-specific and non-point source inputs. At all times, in addition to monitoring at other locations and for other purposes, the City will conduct its required analysis of both raw and treated water to meet the City's Drinking Water Program requirements.

In the following sections, we describe the Expansion Water Quality Monitoring Program in three parts: 1) Construction Period Monitoring; 2) Long-Term Operation Monitoring; and 3) the City's Drinking Water Quality Monitoring.

CONSTRUCTION PERIOD MONITORING

The Objective of construction period monitoring will be to determine whether, where and in which quantities deleterious materials are entering potentially-affected water bodies. Construction period monitoring will be done 1) at certain fixed sites and on specific time intervals, to document comparative changes over time; and 2) on a daily basis and at varying locations corresponding directly to active construction.

Construction period monitoring will document water quality of both Blue Lake and Sawmill Creek, emphasizing detection of:

- Sediment from excavation, road use or vegetation clearing;
- Petroleum products from vehicles and other construction equipment;
- Materials from decay and burning of vegetation in the potentially-inundated areas; and
- Blasting residue**.**

Construction activity will be concentrated near 1) Blue Lake dam and the proposed intake structure; 2) segments of the Blue Lake road which will be widened and those on which

heavy equipment traffic may increase; 3) the Fish Valve Unit; and 4) the powerhouse/surge chamber areas.

In each of these areas, the City expects to generally emphasize sampling of water quality 1) in runoff water downslope of daily construction areas; and 2) in the effluent water from settling ponds.

Water samples will be collected at various intervals depending on schedule and proximity to active construction sites. In all these areas, water quality sampling will be conducted at locations and time intervals agreed to after completion of both the Final Project Design and the construction schedule.

It is expected that the City, the Environmental Compliance Monitor (ECM, position and duties described in a separate plan) and other appropriate state and federal resource agencies will consult prior to and during construction to define the exact locations, water quality constituents, and sampling and analytic methods for this daily monitoring program.

LONG-TERM OPERATION MONITORING

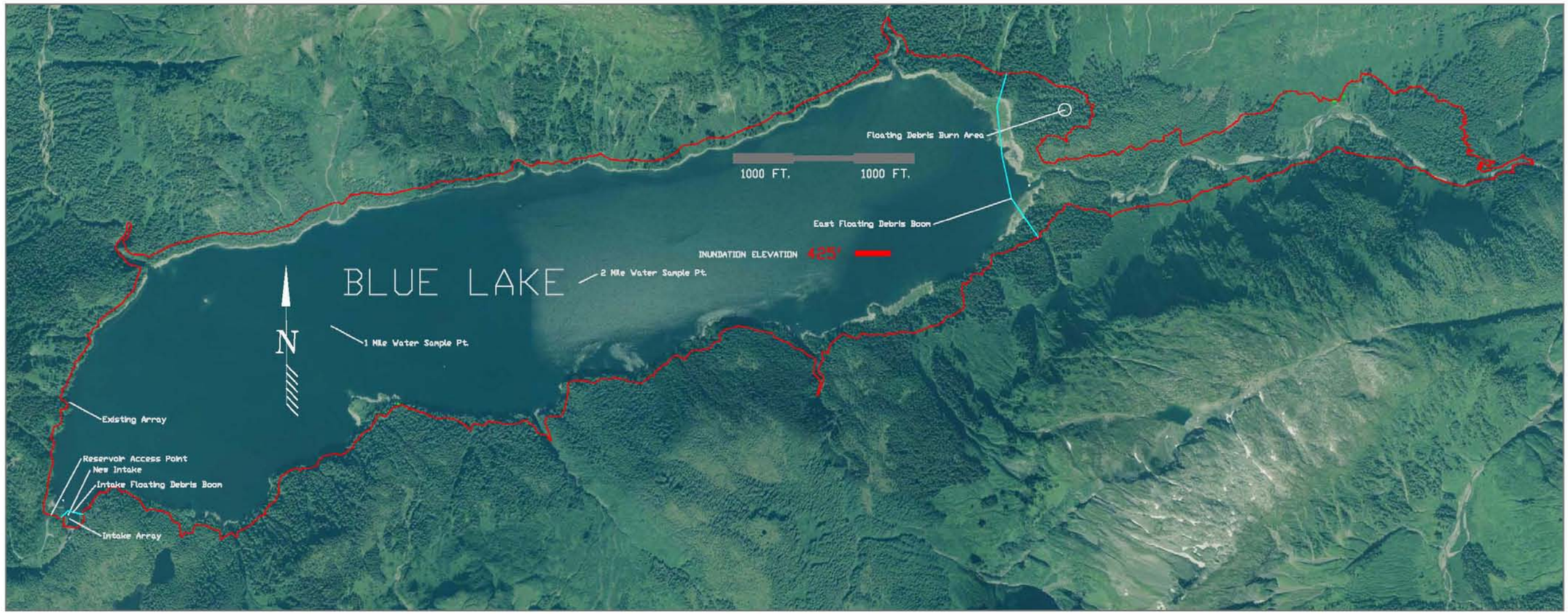
The objective of this program will be to develop a continuous record of water quality conditions with which to detect trends and upon which to make comparisons of effects relative to different climatological and operational conditions. Results of these analyses and comparisons may be used to determine effects on the City's Drinking Water Quality requirements and on environmental conditions, particularly water temperature effects on aquatic resources in both Blue Lake and Sawmill Creek.

Blue Lake

Continuous Temperature Monitoring

To continuously monitor water temperature at various levels down to and below the actual point at which water will enter the proposed intake, the City will install an array of electronic temperature measurement devices ("loggers") at various depths along a fixed cable. This will be called the "Intake Thermograph Array" or "Intake Array" (Figure 1). (Note that a similar array is currently installed about 400 yards east of the existing intake. This array will be replaced by the Intake Array, because 1) it will be very difficult to extend the existing array upwards to El 425 due to topography and vegetation; and 2) measurements will be taken closer to the intake which is the area of most interest).

The Intake Array will extend downward from an anchor point fixed about 10 feet above El 425 (spill elevation of the Expansion dam height above mean sea level) to about El 200, or at a depth of about 225 feet when the Expansion reservoir is at spill elevation. Loggers will be emplaced approximately every 15 feet along the cable.



BLUE LAKE EXPANSION INUNDATION AREA

1646 ACRES, 362 ADDITIONAL ACRES

RESERVOIR WATER QUALITY MONITORING FEATURES

Figure 1

Monitoring of Other Water Quality Parameters in Blue Lake

The City will also collect grab samples from two locations near the midline of Blue Lake during periods when weather and ice conditions permit boat access. These samples will be collected at points approximately 1 and 2 miles east of the dam (See Figure 1).

Constituents sampled at these two sites will include, but not be limited to:

- **Turbidity;**
- **Total Organic Carbon (TOC);**
- **Dissolved Oxygen (DO);**
- **pH;**
- **Iron;**
- **Manganese;**
- **Total Dissolved Solids (TDS); and**
- **Water Transparency (using Secchi disc)**

Exact constituents, sampling protocols and measurement methods will be determined based on agency comment and review of equipment and methods available at the time of the onset of monitoring.

Water Quality Monitoring at the City's Water Treatment Plant and Fish Valve Unit.

The City routinely monitors Blue Lake water at a tap at the existing water treatment plant. All sampling and analysis are done according to DEC requirements.

The City will install a continuous raw water turbidity monitor at the Fish Valve Unit. This monitor will provide advanced warning via the water treatment plant SCADA system of water turbidity approaching the treatment plant.

Sawmill Creek

Water Temperature Monitoring

Long-term water quality monitoring in Sawmill Creek will emphasize water temperature along the entire stream but with emphasis downstream of the new powerhouse. The primary concern for water temperature impacts would relate to effects from the new intake elevation which would be closer to the lake surface at all reservoir levels than is the current intake. This might cause water to be warmer at certain times of the year, with potential effects on aquatic resources in Sawmill Creek. All of Sawmill Creek from the output from the Fish Valve Unit to tidewater would be variously affected by the new intake location.

Continuous temperature monitoring in Sawmill Creek will be done using the same Onset loggers described for the Blue Lake continuous monitoring above. Several loggers have been active in Sawmill Creek for more than five years; loggers at these sites will serve as good sites at which to compare pre- and with-Expansion effects.

In addition, during 2010, the City commissioned a study of Sawmill Creek water temperature downstream of the powerhouse (EES 2010) to analyze potential temperature effects on pink and chum salmon populations in the stream reach from the powerhouse to low tide level. As part of this study, several additional continuous loggers were emplaced downstream of the powerhouse.

Other Water Quality Constituents

Depending on continuous measurement equipment available at the onset of Sawmill Creek monitoring, it may be possible to measure dissolved oxygen, turbidity, and certain other constituents using the same loggers installed to record water temperature. If not, the City may install separate loggers, or may collect grab samples for analysis in an acceptable lab. As in other sections of this document, detailed sampling locations, frequency, equipment and analysis techniques, specifics will be determined during consultation prior to installation.