Lake Lucille and Big Lake Water Quality Monitoring

Lake Lucille Sampling Plan

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Attachment A. USGS Open-File Report 97-401 VOC Sampler

1 Introduction

Lake Lucille is a small, shallow lake of 360 acres with a maximum depth of 20 feet. Located in Wasilla, the north and east shores are developed residential areas; a large lodge, restaurant, and flight service are located on the north shore. The south and west shores are less developed, but there are extensive recreational activities throughout the lake. The entire lake shore is private land except for a park on the south shore owned by the Matanuska-Susitna Borough.

Lake Lucille was listed on the Alaska Department of Environmental Conservation (ADEC) 1998 Section 303(d) list of impaired waters for failure to meet the dissolved oxygen criteria. A Ttoal Maximum Daily Load (TMDL) was completed in 2001 to determine the maximum dissolved oxugen levels that meet the 18 AAC 70 Alaska Water Quality Standards (AWQS). The TMDL recognized that anthropogenic sources of phosphorus have been reduced to help meet AWQS and part of the TMDL implementation is to continue this reduction.

The 2005 water quality monitoring at Lake Lucille is being performed for ADEC. Parameters that will be included in the monitoring are nutrients, dissolved oxygen, bacteria and hydrocarbons.

2 Sampling Design

2.1 Schedule

Samples will be collected at Lake Lucille over four sampling events; specific dates and corresponding analytes are presented in Table 1. All sampling events will take place on weekends, including Independence Day weekend. This sampling schedule will allow sample collection on dates with high recreational use as well as dates with less recreational use for comparison.

Table 1: 2005 Lake Lucille Sampling Events

Collection Date	Nutrients	Hydrocarbons
May 8, 2005	X	X
July 4, 2005	X	X
August 21, 2005	X	X
October 16, 2005	X	X

The first event intends to sample the lake prior to spring turnover. When ice cover melts, the water column is nearly isothermal. Sufficient wind energy then causes the lake to circulate completely, which is known as spring turnover. The last event intends to sample the lake following fall turnover when the epilimnion cools, becomes more dense, and is mixed with deeper strata by wind and convection currents. As the exact dates for turnover will depend on weather conditions, the scheduled dates of May 8 and October 16 are tentative and subject to change.

The remaining sampling events are scheduled to occur on weekends, when recreational use is highest. Sampling is scheduled for Independence Day weekend (July 2-4) when recreational use is expected to be at its peak for the season.

In addition to these analytical sampling events, under ice dissolved oxygen (DO) and temperature measurements will be collected once in January and once in February.

2.2 Site Selection

Sampling sites on Lake Lucille will be selected for nutrients and hydrocarbons based on the results of the 2004 water quality monitoring conducted at Lake Lucille. Proposed sampling locations for 2005 are presented in Table 2.

Table 2: 2005 Lake Lucille Sampling Locations

Sampling Site	Nutrients	Hydrocarbons	Description
LL-1	X	X	A public camp ground is near to this site as well as a large wetland area.
LL-3	X	X	This historic USGS sampling site is located in the deepest section of the lake, with an island to the south and waterfowl activity and residences to the north.
LL-4	X	X	This public boat launch on the east end of lake is heavily used. A public park is located approximately 0.25 miles to the south and there are residences in the area.

Nutrient sampling sites are located near areas of high density housing where inputs such as fertilizers, septic systems, outhouses, pet waste, etc. may contribute to nutrient loading. At each location, samples for nutrient analyses will be collected from a depth of one meter and seventy-five percent of the total depth. The exception to this is sampling locations with a total depth of less than two meters (seven feet), in which case samples will be collected at a depth of one meter only.

Hydrocarbon sampling sites are located in areas where TAH was detected during the 2004 water quality monitoring program (LL-1, LL-3, and LL-4). At each sampling location, hydrocarbon samples will be collected at two depths: 0.15 and 1.5 meters.

3 Methods

A small (15') aluminum skiff with a 25 hp outboard motor will be launched at the public boat launch on the east end of Lake Lucille. A handheld Garmin® GPS unit will be used to locate the sampling locations using the latitude and longitude data from the 2004 water quality monitoring program. The motor will be turned off prior to reaching the sample site and the boat will drift to the location. If necessary, an anchor will be dropped to keep the boat in place while sampling. Samplers will wear nitrile gloves at all times during sampling and new gloves will be used for collecting each set of samples. Observations and photographs will be taken at each sampling location and recorded in a field notebook. Observations will include algal presence on the lake surface; motorboat, plane and small motorcraft traffic near to the sampling site; approximate wind direction and speed; presence of surface sheen; and weather conditions. As Lake Lucille is a relatively small lake, observations of the entire lake will be recorded.

3.1 Analytical Sample Collection

Hydrocarbon samples will be collected using a Wildco® sampler specifically designed by the USGS for the collection of VOC samples from surface water. This VOC sampler is

designed to collect samples at depth without any loss to volatilization. For a complete description of the sampler, see Attachment A.

A Wildco® Kemmerer bottle will be used to collect water from the appropriate depth interval for nutrient samples. Containers will either be filled directly from the Kemmerer bottle or field filtered, as necessary. For the collection of chlorophyll a samples water will immediately be poured from the Kemmerer bottle to a graduated cylinder, which will be shielded from daylight during the sample collection process.

Sample collection equipment will be decontaminated at each location using an Alconox® and distilled water solution and rinsed with distilled water. After decontamination, the equipment will be flushed with lake water prior to collecting samples at each location. For samples collected at the same location but at different depths, the equipment will be flushed once with lake water at each depth interval prior to collection.

TAH samples will be collected prior to nutrient samples as they are more sensitive to loss or contamination. The nutrient samples can be collected in any order and include chlorophyll a, total phosphorus, filterable reactive phosphorus, Kjeldahl nitrogen, ammonia, and nitrate/nitrite.

When collecting samples for dissolved analyses (filterable reactive phosphorus), a 0.45-micron, high-capacity, disposable filter will be attached to flexible Teflon® tubing that has been threaded through a peristaltic pump. Prior to filling sample bottles, the tubing and filter will be flushed with approximately 500-mL of lake water from the Kemmerer water sampling bottle. A new filter and associated tubing will be used for each sample location.

Samples will be kept in a cooler with gel ice at 4°C (±2°C) for transport to the laboratory. Samples will be transported to the laboratory in Anchorage after collection for analysis to be completed within their holding times. Specific methods for collecting analytical samples and field parameters are provided in the QAPP.

3.2 Field Parameters

Field parameters will be measured after collection of analytical samples using a YSI® 556 multi-parameter water quality meter with a flow-through cell. Water quality parameters to be measured in the field include temperature, pH, dissolved oxygen, conductivity and turbidity. Measurements will be recorded every meter until the thermocline is reached, and then at one, three, and five meters from the lake bottom. Transparency will be measured with a Secchi disk at each sampling location. Specific methods for measuring Secchi depth transparency are included in the QAPP. Information on field instrument calibration and maintenance is also detailed in the QAPP.