

Water and Environmental
Research Center



Lake Chemistry and Physical Data For Selected North Slope, Alaska, Lakes: February 2008

By:

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North Slope Lakes Hydrologic Project

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DISCLAIMER

The contents of this report reflect the views of the authors, who are responsible for the accuracy of the data presented herein. This research was funded by the U.S. Department of Energy (DOE) and the National Energy Technology Laboratory (NETL). Funding and support was also provided by the Bureau of Land Management (BLM), BP Exploration (Alaska) Inc. (BPX), ConocoPhillips Alaska, Inc. (CPA), and Geo-Watersheds Scientific (GWS). The contents of the report do not necessarily reflect the views or policies of the DOE, NETL, BLM, BPX, CPA, GWS, or any local sponsor. This work does not constitute a standard, specification, or regulation.

The use of trade and firm names in this document is for the purpose of identification only and does not imply endorsement by the University of Alaska Fairbanks (UAF), DOE, NETL, BLM, BPX, CPA, GWS, or other project sponsors.

CONVERSION FACTORS, UNITS, WATER QUALITY UNITS, VERTICAL AND HORIZONTAL DATUM, ABBREVIATIONS AND SYMBOLS

Conversion Factors

Multiply	By	To obtain
<u>Length</u>		
inch (in.)	25.4	millimeter (mm)
inch (in.)	2.54	centimeter (cm)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
<u>Area</u>		
Acre	43559.999	square feet (ft ²)
Acre	0.405	hectare (ha)
Square foot (ft ²)	3.587e-8	square mile (mi ²)
square mile (mi ²)	2.590	square kilometer (km ²)
<u>Volume</u>		
gallon (gal)	3.785	liter (L)
gallon (gal)	3785.412	milliliter (mL)
Cubic foot (ft ³)	28.317	liter (L)
Acre-ft	1233	Cubic meter (m ³)
<u>Velocity and Discharge</u>		
foot per day (ft/d)	0.3048	meter per day (m/d)
Square foot per day (ft ² /d)	.0929	square meter per day (m ² /d)
cubic foot per second (ft ³ /s)	0.02832	cubic meter per second (m ³ /sec)
<u>Hydraulic Conductivity</u>		
foot per day (ft/d)	0.3048	meter per day (m/d)
foot per day (ft/d)	0.00035	centimeter per second (cm/sec)
meter per day (m/d)	0.00115	centimeter per second (cm/sec)
<u>Hydraulic Gradient</u>		
foot per foot (ft/ft)	5280	foot per mile (ft/mi)
foot per mile (ft/mi)	0.1894	meter per kilometer (m/km)
<u>Pressure</u>		
pound per square inch (lb/in ²)	6.895	kilopascal (kPa)

Units

For the purposes of this report, both English and Metric (SI) units were employed. The choice of “primary” units employed depended on common reporting standards for a particular property or parameter measured. Whenever possible, the approximate value in the “secondary” units was also provided in parentheses. Thus, for instance, stream flow was reported in cubic feet per second (cfs) followed by the equivalent value in cubic meters per second (m³/s) in parentheses.

Physical and Chemical Water-Quality Units:

Temperature:

Water and air temperature are given in degrees Celsius (°C) and in degrees Fahrenheit (°F).

Degrees Celsius can be converted to degrees Fahrenheit by use of the following equation:

$$^{\circ}\text{F} = 1.8(^{\circ}\text{C}) + 32$$

Specific electrical conductance (conductivity):

Conductivity of water is expressed in microsiemens per centimeter at 25°C (μS/cm). This unit is equivalent to microhms per centimeter at 25°C.

Milligrams per liter (mg/L) or micrograms per liter (μg/L):

Milligrams per liter is a unit of measurement indicating the concentration of chemical constituents in solution as weight (milligrams) of solute per unit volume (liter) of water. One thousand micrograms per liter is equivalent to one milligram per liter. For concentrations less than 7,000 mg/L, the numerical value is the same as for concentrations in parts per million.

Millivolt (mV):

A unit of electromotive force equal to one thousandth of a volt.

Vertical Datum:

In this report, "sea level" refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929), a geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called *Sea Level Datum of 1929*.

Horizontal Datum:

The horizontal datum for all locations in this report is the North American Datum of 1983 or North American Datum of 1927.

Abbreviations, Acronyms, and Symbols

AC	Actual conductivity
ADOT&PF	Alaska Department of Transportation and Public Facilities
ASTM	American Society for Testing and Materials
atm	atmospheres
C	Celsius
DO	Dissolved oxygen
DVM	digital voltage multi-meter
e-tape	electric tape
F	Fahrenheit (°F).
ft	feet
GWS	Geo-Watersheds Scientific
GWSI	USGS Ground-Water Site Inventory
km ²	square kilometers
kPa	kilopascal
lb/in ²	pounds per square inch
m	meters
mg/L	milligrams per liter, equivalent to ppm
µg/L	micrograms per liter
mi ²	square miles
mm	millimeters
µS/cm	microsiemens per centimeter
mV	Millivolt
NGVD	National Geodetic Vertical Datum
NTU	Nephelometric Turbidity Units
NWIS	National Water Information System
ORP	oxygen-reduction potential
ppm	parts per million, equivalent to mg/L
SC25	specific conductance at 25°C
SWE	Snow Water Equivalent
QA	quality assurance
QC	quality control
UAF	University of Alaska Fairbanks
USACE	U.S. Army Corps of Engineers, Alaska District
USGS	U.S. Geological Survey
WERC	Water and Environmental Research Center
WWW	World Wide Web
YSI	Yellow Springs Instruments

Lake Nomenclature

KDA	Kuparuk Dead Arm (Prudhoe Bay field, serves Prudhoe Bay field operations)
MSB	Mine Site B (Prudhoe Bay field, serves Milne Point and Kuparuk field operations)
L9312	Lake L9312 (Alpine field, serves Alpine field operations)
L9817	Lake L9817 (Alpine field, serves Alpine field operations)
K113	Lake K113 (Prudhoe Bay field, not currently used for field operations)

PROJECT COOPERATORS

The North Slope Lakes project covers a large area of the North Slope and benefits from a number of positive partnerships, all contributing to the overall project objectives.

- BP Exploration (Alaska) Inc.
- ConocoPhillips Alaska, Inc. (CPA)
- Bureau of Land Management
- Alaska Department of Natural Resources
- The Nature Conservancy
- Northern Alaska Environmental Center

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Lake Chemistry and Physical Data For Selected North Slope, Alaska, Lakes: February 2008

INTRODUCTION

The University of Alaska Fairbanks (UAF) Water and Environmental Research Center (WERC) and Geo-Watersheds Scientific (GWS), together with project cooperators, initiated a study in the Fall of 2002 (Phase One) to obtain baseline information about the physical and chemical characteristics of North Slope tundra lakes. The project was extended in 2005 (Phase Two). The location of the study lakes changed and was expanded to include other reservoirs so as to further develop the understanding and simulation tools necessary for water-source management. K113 is an un-pumped lake in the Kuparuk oilfield and is sampled on selected field trips during the year. L9312 is a natural lake studied in the Alpine operations area. L9817 is a natural lake in eastern NPRA, west of Nuiqsut. L9817 has been used in previous years for ice-road construction, but was not used during the 2005-06, or 2006-07 winters. Two reservoir systems (mine sites) were added to the study in 2005. Mine Site B, also known as Six-mile Lake, is located near the Milne Point facility at the intersection of the Spine Road with the Milne Point access road and has two cells connected to Milne Creek. The Kuparuk Reservoir System (Kuparuk Deadarm Lakes) has nine reservoirs. The three southernmost reservoir cells (1-3) are included in the study to observe ground-water and surface-water interactions between each cells and the adjacent Kuparuk River. Study location can be seen in Figure 1.

Water-quality and hydrologic data is collected in the field during monthly visits to the lakes and water samples are collected from priority locations for further analysis at the UAF-WERC chemistry laboratories. The purposes of this publication are to 1) report data collected for the month of February 2008, 2) summarize accomplished field trip objectives.

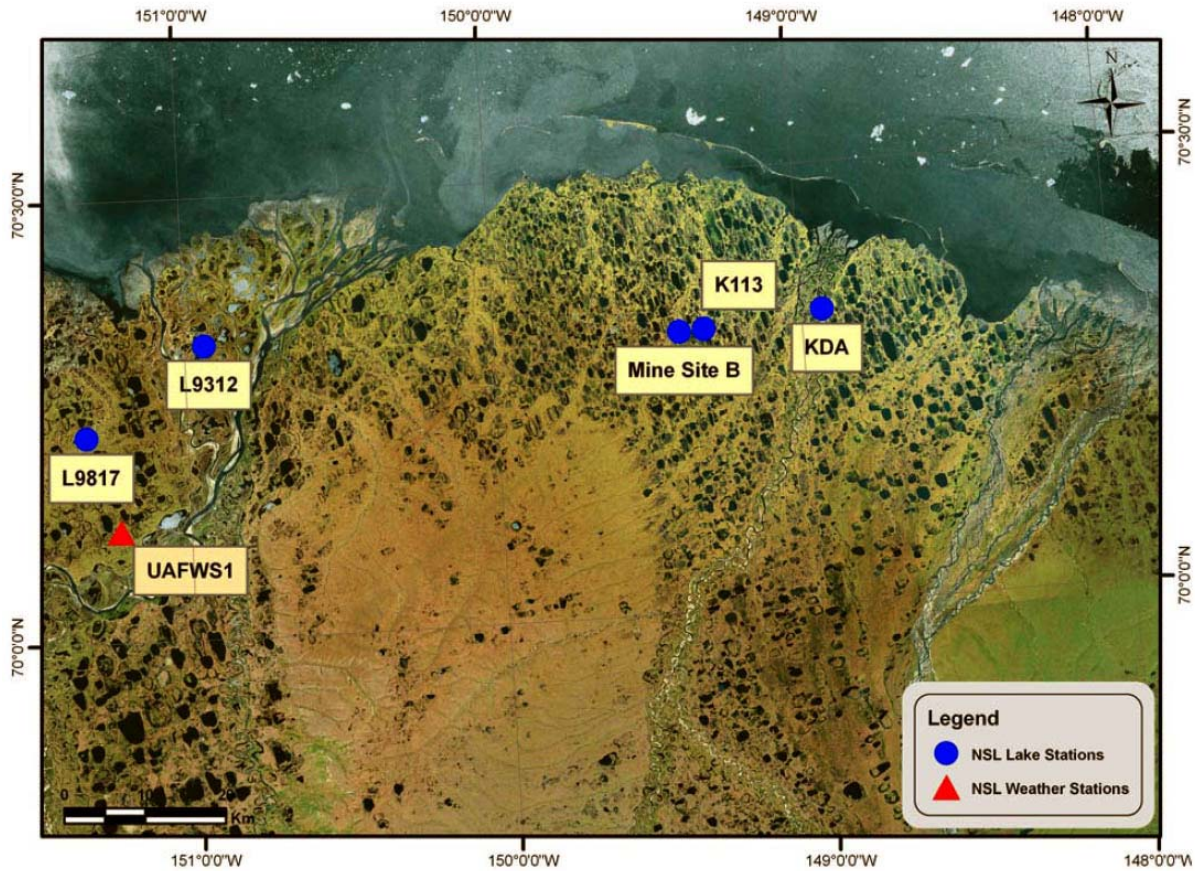


Figure 1. Location of study lakes in the NPR-A, Alpine, Kuparuk, and Prudhoe Bay field operating areas, North Slope, Alaska.

TRIP OBJECTIVES

The goal of each sampling trip is to collect physical and chemical data from each study lake. For each lake, a series of holes are drilled at designated sampling locations or a raft is taken onto the water when conditions are ice-free. Logistical, personnel, and weather constraints, can limit the amount of time available in the field for sampling. A project workplan was distributed before the trip outlining the sampling schedule (Lilly and others, 2008). In February 2008, we focused on the following locations/tasks:

1. L9312, Alpine Facility
 - Measure field water-quality parameters at standard locations.
 - Survey water levels to local elevation control.
 - Conduct snow surveys at standard locations.
 - Automated data collection and station maintenance.
2. L9817, NPR-A
 - Measure field water-quality parameters at standard locations.
 - Survey water levels to local elevation control.
 - Automated data collection and station maintenance.
3. Kugaruk Deadarm Lakes, (Cells 1-3)
 - Measure field water-quality parameters in cells 1, 2, and 3.
 - Survey water levels of KDA 1-3 to local elevation control.
 - Conduct snow surveys at standard locations.
 - Automated data collection station maintenance.
4. Mine Site B, Milne-Point Operating Area
 - Measure field water-quality parameters on North cell, South cell, and at Milne Creek upstream of South cell.
 - Survey water levels to local elevation control.
 - Conduct snow surveys at standard locations
5. Betty Pingo, Prudhoe Bay Operating Area
 - Automated data collection station maintenance.
 - Conduct snow survey at standard location.

PROCEDURES

Water Chemistry Sampling

All field work follows the specified health, safety, and environmental guidelines outlined by BPX and CPA (White and Lilly, 2008 *a, b, c*). Physical measurements of water depth were taken at each sampling location. Water quality parameters such as temperature, pH, turbidity,

oxygen reduction potential (ORP), conductivity, and dissolved oxygen (DO) were obtained by using an In-Situ Troll 9000 (submersible meter), at multiple depths throughout the water column. The precision with which physical measurements were reported takes into account field conditions. The calibration of each parameter was checked before and after each day of sampling using the criteria in Table 1.

Table 1. In-Situ Troll 9000 calibration quality control criteria.

Parameter	Standards used	Acceptable deviation from calibration standard value
Turbidity	Factory calibrated	± 2 (NTU)
pH	4.01, 7.0, 10.0	± 0.2
Conductivity	447 (µs/cm)	within 10%
100% DO	100 % saturated	within 10%
0% DO	0 % saturated solution	within 0.3 mg/L
ORP	In-Situ Quick Cal 224 mV	within 10%



Figure 2. Snow Water Equivalent measurement at Mine Site B by D. Reichardt

Snow Surveys

Small-scale snow depth measurements were conducted in “L” shaped patterns on lake surface and/or tundra surface at predetermined locations (Figure 2). Snow depth measurements were taken every meter for twenty-five meters, then turning 90 degrees, and continuing for another

twenty-five meters. Snow samples were also collected for density measurements with an Adirondack snow sampler. Five densities were collected from points on tundra and lake and averaged to establish a representative density.

SELECTED RESULTS

Sampling occurred at the Kuparuk Deadarm Reservoirs, Mine Site B, and L9312 during the February field campaign. Table 2 summarizes conditions at “Priority Sampling Sites”. These locations have more historical data than other locations on the lakes, and have been chosen as representative of the deeper portion of the respective lakes. KDA2, KDA3, MSBN, and MSBS all experienced increases in elevation while KDA1 and L9312 had drops in elevation.

Table 2. Ice thickness, Median DO Concentration, Median Actual Conductance and Monthly Water Drop for North Slope lakes in mid-February.

Sampling Site	Ice Thickness [ft; (m)]	Median DO Concentration [mg/L]	Median Actual Conductivity [μS/cm]	Water level change since mid January [ft; (m)]
KDA1-CT	5.10; (1.55)	16.15	118.40	-0.06; (-0.018)
KDA2-CT	4.85; (1.48)	15.75	128.35	+0.64; (+0.195)
KDA3-CT	4.75; (1.45)	15.03	116.5	+0.65; (+0.198)
MSBS-CT	4.55; (1.38)	11.28	168.85	+1.00;(+0.305)
MSBN-CT	4.80; (1.46)	14.37	161.6	+0.70;(+0.213)
L9312-B	3.65; (1.11)	12.38	79.25	-4.42; (-1.35)

SUMMARY

Continuous monitoring of water quality parameters and spatial distribution of snow cover at North Slope lakes throughout the winter will help in the understanding and development of simulation tools necessary for water resource management. As water levels drop during the winter, it is important to identify the changing water chemistry as well as the potential spring

recharge. This information is necessary for permitting agencies as well as the industry professionals who depend on this resource for facility use and ice road/pad construction. Through monthly hydrologic assessments, water chemistry testing, and water sample analysis, we will continue to answer some of the questions brought forth on the effects of mid-winter pumping of North Slope tundra lakes.

REFERENCES

- Reichardt, D., Holland, K., Lilly, M.R. 2008. A Workplan for Meteorological Station Maintenance, Lake Chemistry Sampling, and Surveying at Study Lakes in Alpine, Kuparuk River, and Prudhoe Bay Areas: February 2008. Water and Environmental Research Center, University of Alaska Fairbanks. 15 pages.
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APPENDIX A. WATER QUALITY FIELD SAMPLING FORMS

The following forms report the data collected with the water quality meters during field sampling.

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004a: Water Quality Field-Sampling General

Project ID: North Slope Lakes Site Location/Lake ID: L9312 Raft B
 Sample Purpose: Lake Water Quality Date: 2/15/08 Time: 10:09

FIELD MEASUREMENTS

GPS Coord. Northing: N70°19.995' Easting: W150°56.918' Datum: NAD83
 Measurements By: GMM Time: 10:11
 Water Depth (ft): 10.9 Ice Thickness (ft): 3.65
 Freeboard (ft): 0.2 Snow Depth (ft): 0.60
 Elev. (BPMSL +/- .02): 11.72 Survey By: MRL/Whitman Date: 2/15/08 Time: 13:35
 Water Sampling By: n/a Sample Depths BWS (ft): 1 n/a Date: n/a Time: n/a
2
3

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check					
MULTI	GWS	IN-SITU Troll 9000	33033	PASS	PASS - pH Fail					
Parameters										
Field Measurements										
Time:	10:20	10:23	10:26	10:30	10:32	10:35	10:38	10:41		
Depth BWS (ft):	4	5	6	7	8	9	10	10.5		
Temp (°C):	0.34	0.47	0.77	1.15	1.62	1.90	2.12	2.27		
pH:	7.70	7.81	7.81	7.72	7.68	7.62	7.49	7.20		
Barometric (mmHg):	747.1	747.0	747.0	747.0	747.1	747.1	747.2	747.3		
Pressure (kPa):	10.137	13.331	16.151	19.089	22.479	25.191	28.532	29.652		
Conductivity (µS/cm):	80.02	79.96	78.79	79.02	79.48	79.58	83.85	90.69		
RDO (ppm): (mg/L)	10.73	11.25	11.90	12.25	12.50	12.51	11.68	9.89		
Turbidity (NTU):	0.5	0.5	0.7	0.8	1.0	1.0	1.5	5.2		
ORP	295	281	280	281	281	282	285	297		

FIELD TESTING OF WATER SAMPLES (if small probe is used)

Probe:					
Depth (ft)					
Temp (°C)					
pH					
Eh					

NORTH SLOPE LAB CHEMISTRY ANALYSIS

Parameter	Depth BWS (ft): _____			Depth BWS (ft): _____			Depth BWS (ft): _____			Method
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec 0.3-15 mg/L
Alkalinity (mg/L as CaCO ₃)										Digital titrator 10-4000 mg/L as CaCO ₃
Total iron--UF (mg/L)										Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)										Hach spec 0.02-3.00 mg/L
Ammonia (mg/L NH ₃ -N)****										0.01-0.50 mg/L NH ₃ -N
Ammonia/ Iron dilution										

Remarks: Start Log not recorded. End log time 11:01. Water samples collected by M. Whitman for zooplankton

Field-Form Filled Out By: GMM Date: 2/16/08
 QAQC Check By: AJB Date: 3/18/08

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004a: Water Quality Field-Sampling General

Project ID: North Slope Lakes Site Location/Lake ID: L9312 Screen
 Sample Purpose: Lake Water Quality Date: 2/15/08 Time: 10:58

FIELD MEASUREMENTS

GPS Coord. Northing: N70°20.003' Easting: W150°57.005' Datum: NAD83
 Measurements By: GMM Time: 11:00
 Water Depth (ft): 11.2 Ice Thickness (ft): 3.80
 Freeboard (ft): 0.25 Snow Depth (ft): 0.50
 Elev. (BPMSL +/- .02): 11.72 Survey By: MRL/Whitman Date: 2/15/08 Time: 13:35
 Water Sampling By: n/a Sample Depths BWS (ft): 1 n/a Date: n/a Time: n/a
 2 _____
 3 _____

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check				
MULTI	GWS	IN-SITU Troll 9000	33033	PASS	PASS - pH Fail				
Parameters		Field Measurements							
Time:	11:03	11:06	11:09	11:11	11:14	11:17	11:19		
Depth BWS (ft):	4	5	6	7	9	10	11		
Temp (°C):	0.19	0.27	0.65	1.06	1.78	2.12	2.42		
pH:	6.98	6.96	6.86	6.83	6.75	6.64	6.60		
Barometric (mmHg):	747.4	747.4	747.5	747.6	747.6	747.7	747.7		
Pressure (kPa):	10.164	12.240	16.103	19.203	25.277	28.297	31.176		
Conductivity (µS/cm):	82.16	81.69	80.46	79.08	78.21	78.90	87.64		
RDO (ppm): (mg/L)	11.60	11.77	11.92	11.99	11.78	10.35	8.66		
Turbidity (NTU):	0.2	0.3	1.2	0.3	0.3	1.3	7.4		
ORP	354	355	358	358	361	365	361		

FIELD TESTING OF WATER SAMPLES (if small probe is used)					
Probe:					
Depth (ft)					
Temp (°C)					
pH					
Eh					

NORTH SLOPE LAB CHEMISTRY ANALYSIS

Parameter	Depth BWS (ft): _____			Depth BWS (ft): _____			Depth BWS (ft): _____			Method
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec 0.3-15 mg/L
Alkalinity (mg/L as CaCO ₃)										Digital titrator 10-4000 mg/L as CaCO ₃
Total iron--UF (mg/L)										Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)										Hach spec 0.02-3.00 mg/L
Ammonia (mg/L NH ₃ -N)****										0.01-0.50 mg/L NH ₃ -N
Ammonia/ Iron dilution										

Remarks: Log start 11:08. Log end 11:20. Samples collected by M. Whitman for zooplankton.

Field-Form Filled Out By: GMM Date: 2/16/08
 QAQC Check By: AJB Date: 3/18/08

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004a: Water Quality Field-Sampling General

Project ID: North Slope Lakes
 Sample Purpose: Lake Water Quality

Site Location/Lake ID: L9312 SH
 Date: 2/15/08 Time: 11:38

FIELD MEASUREMENTS

GPS Coord. Northing: N70°20.017' Easting: W150°57.076' Datum: NAD83
 Measurements By: GMM Time: 11:40
 Water Depth (ft): 9.3 Ice Thickness (ft): 3.75
 Freeboard (ft): 0.3 Snow Depth (ft): 0.65
 Elev. (BPMSL +/- .02): 11.72 Survey By: MRL/Whitman Date: 2/15/08 Time: 13:35
 Water Sampling By: n/a Sample Depths BWS (ft): 1 n/a Date: n/a Time: n/a
 2 _____
 3 _____

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check				
MULTI	GWS	IN-SITU Troll 9000	33033	PASS	PASS - pH Fail				
Parameters									
Field Measurements									
Time:	11:45	11:49	11:52	11:56	11:59	12:03			
Depth BWS (ft):	4	5	6	7	8	9			
Temp (°C):	0.16	0.31	0.66	1.06	1.38	1.65			
pH:	7.11	7.08	7.02	6.88	6.83	6.78			
Barometric (mmHg):	747.7	747.7	747.8	747.8	747.9	748.0			
Pressure (kPa):	10.487	13.296	16.507	19.376	22.462	25.231			
Conductivity (µS/cm):	80.49	80.70	81.70	81.56	81.31	80.99			
RDO (ppm): (mg/L)	10.76	10.66	9.91	9.44	9.08	8.48			
Turbidity (NTU):	0.6	1.0	1.4	1.4	2.1	2.8			
ORP	350	351	352	358	359	361			

FIELD TESTING OF WATER SAMPLES (if small probe is used)					
Probe:					
Depth (ft)					
Temp (°C)					
pH					
Eh					

NORTH SLOPE LAB CHEMISTRY ANALYSIS

Parameter	Depth BWS (ft): _____			Depth BWS (ft): _____			Depth BWS (ft): _____			Method
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec 0.3-15 mg/L
Alkalinity (mg/L as CaCO ₃)										Digital titrator 10-4000 mg/L as CaCO ₃
Total iron--UF (mg/L)										Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)										Hach spec 0.02-3.00 mg/L
Ammonia (mg/L NH ₃ -N)****										0.01-0.50 mg/L NH ₃ -N
Ammonia/ Iron dilution										

Remarks: Log start 11:45. Log end 12:04. Actual ice thickness 4.0 ft. Additional 0.25ft from ice road construction and surface flow.

Field-Form Filled Out By: GMM Date: 2/16/08
 QAQC Check By: AJB Date: 3/18/08

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004a: Water Quality Field-Sampling General

Project ID: North Slope Lakes
 Sample Purpose: Lake Water Quality

Site Location/Lake ID: L9312 SH_SHORE_MID
 Date: 2/15/08 Time: 12:27

FIELD MEASUREMENTS

GPS Coord. Northing: N70°20.017' Easting: W150°57.101' Datum: NAD83
 Measurements By: GMM Time: 12:27
 Water Depth (ft): 7.55 Ice Thickness (ft): 3.75
 Freeboard (ft): 0.1 Snow Depth (ft): 0.80
 Elev. (BPMSL +/- .02): 11.72 Survey By: MRL/Whitman Date: 2/15/08 Time: 13:35
 Water Sampling By: n/a Sample Depths BWS (ft): 1 n/a Date: n/a Time: n/a
 2 _____
 3 _____

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
MULTI	GWS	IN-SITU Troll 9000	33033	PASS	PASS - pH Fail
Parameters					
Field Measurements					
Time:	12:34	12:36	12:38	12:42	12:45
Depth BWS (ft):	4	5	6	7	7.5
Temp (°C):	0.15	0.26	0.66	1.02	1.14
pH:	7.13	7.10	7.03	6.95	6.92
Barometric (mmHg):	748.0	748.0	748.1	748.1	748.1
Pressure (kPa):	10.252	13.202	16.302	19.160	20.670
Conductivity (µS/cm):	82.35	81.23	81.92	82.36	82.35
RDO (ppm): (mg/L)	10.87	10.86	10.07	8.37	7.49
Turbidity (NTU):	0.7	0.9	1.4	1.9	2.4
ORP	363	363	365	367	368

FIELD TESTING OF WATER SAMPLES (if small probe is used)					
Probe:					
Depth (ft)					
Temp (°C)					
pH					
Eh					

NORTH SLOPE LAB CHEMISTRY ANALYSIS

Parameter	Depth BWS (ft): _____			Depth BWS (ft): _____			Depth BWS (ft): _____			Method
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec 0.3-15 mg/L
Alkalinity (mg/L as CaCO ₃)										Digital titrator 10-4000 mg/L as CaCO ₃
Total iron--UF (mg/L)										Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)										Hach spec 0.02-3.00 mg/L
Ammonia (mg/L NH ₃ -N)****										0.01-0.50 mg/L NH ₃ -N
Ammonia/ Iron dilution										

Remarks: Log Start 12:31 log end 12:45

Field-Form Filled Out By: GMM Date: 2/16/08
 QAQC Check By: AJB Date: 3/18/08

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004a: Water Quality Field-Sampling General

Project ID: North Slope Lakes
 Sample Purpose: Lake Water Quality

Site Location/Lake ID: L9817-1
 Date: 2/16/08 Time: 10:05

FIELD MEASUREMENTS

GPS Coord. Northing: N70°14.070' Easting: W151°20.121' Datum: NAD83
 Measurements By: GMM Time: n/a
 Water Depth (ft): 7.35 Ice Thickness (ft): 4.15
 Freeboard (ft): 0.15 Snow Depth (ft): 0.35
 Elev. (BPMSL): 52.11 Survey By: Lilly, Whitman Date: 2/17/08 Time: 16:00
 Water Sampling By: n/a Sample Depths BWS (ft): 1 n/a Date: n/a Time: n/a
 2 _____
 3 _____

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
MULTI	GWS	InSitu Troll 9000	33033	PASS	Pass
Parameters					
Field Measurements					
Time:	10:13	10:16	10:20	10:25	
Depth BWS (ft):	4	5	6	7	
Temp (°C):	0.17	0.16	0.21	0.74	
pH:	7.02	7.03	7.01	6.95	
Barometric (mmHg):	758.2	758.4	758.4	758.4	
Pressure (kPa):	10.214	13.293	16.375	19.318	
Conductivity (µS/cm):	700.4	696.2	690.2	699.7	
RDO (ppm): (mg/L)	2.23	2.31	2.23	1.99	
Turbidity (NTU):	4.5	4.2	4.6	6.3	
ORP	221	220	221	217	

FIELD TESTING OF WATER SAMPLES (if small probe is used)

Probe:					
Depth (ft)					
Temp (°C)					
pH					
Eh					

NORTH SLOPE LAB CHEMISTRY ANALYSIS

Parameter	Depth BWS (ft): _____			Depth BWS (ft): _____			Depth BWS (ft): _____			Method
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec 0.3-15 mg/L
Alkalinity (mg/L as CaCO ₃)										Digital titrator 10-4000 mg/L as CaCO ₃
Total iron--UF (mg/L)										Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)										Hach spec 0.02-3.00 mg/L
Ammonia (mg/L NH ₃ -N)****										0.01-0.50 mg/L NH ₃ -N
Ammonia/ Iron dilution										

Remarks: Log start 10:13. Log end 10:25

Field-Form Filled Out By: GMM Date: 2/15/08
 QAQC Check By: DAR Date: 2/17/08

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004a: Water Quality Field-Sampling General

Project ID: North Slope Lakes
 Sample Purpose: Lake Water Quality

Site Location/Lake ID: L9817 - 2
 Date: 2/16/08 Time: 10:32

FIELD MEASUREMENTS

GPS Coord. Northing: N70°14.046' Easting: W151°20.079' Datum: NAD83
 Measurements By: GMM Time: n/a
 Water Depth (ft): 5.85 Ice Thickness (ft): 4.45
 Freeboard (ft): 0.30 Snow Depth (ft): 0.25
 Elev. (BPMSL): 52.11 Survey By: Lilly, Whitman Date: 2/17/08 Time: 16:00
 Water Sampling By: n/a Sample Depths BWS (ft): 1 n/a Date: n/a Time: n/a
 2 _____
 3 _____

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
MULTI	GWS	InSitu Troll 9000	33033	PASS	PASS
Parameters					
	Field Measurements				
Time:	10:39	10:44	10:50	10:56	
Depth BWS (ft):	4	4.5	5	5.5	
Temp (°C):	0.07	0.05	0.04	0.03	
pH:	6.89	6.88	6.85	6.79	
Barometric (mmHg):	758.4	758.4	758.4	758.4	
Pressure (kPa):	10.431	12.189	13.253	15.103	
Conductivity (µS/cm):	696.6	696.6	696.8	697.9	
RDO (ppm): (mg/L)	2.59	2.39	2.36	2.41	
Turbidity (NTU):	6.2	6.0	5.7	5.8	
ORP	310	306	304	304	

FIELD TESTING OF WATER SAMPLES (if small probe is used)

Probe:					
Depth (ft)					
Temp (°C)					
pH					
Eh					

NORTH SLOPE LAB CHEMISTRY ANALYSIS

Parameter	Depth BWS (ft): _____			Depth BWS (ft): _____			Depth BWS (ft): _____			Method
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec 0.3-15 mg/L
Alkalinity (mg/L as CaCO ₃)										Digital titrator 10-4000 mg/L as CaCO ₃
Total iron--UF (mg/L)										Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)										Hach spec 0.02-3.00 mg/L
Ammonia (mg/L NH ₃ -N)****										0.01-0.50 mg/L NH ₃ -N
Ammonia/ Iron dilution										

Remarks: Log start 10:38. Log stop 10:32

Field-Form Filled Out By: GMM Date: 2/16/08
 QAQC Check By: DAR Date: 2/17/08

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004a: Water Quality Field-Sampling General

Project ID: North Slope Lakes
 Sample Purpose: Lake Water Quality

Site Location/Lake ID: L9817 - 3
 Date: 2/16/08 Time: 11:05

FIELD MEASUREMENTS

GPS Coord. Northing: N70°14.022' Easting: W151°20.037' Datum: NAD83
 Measurements By: GMM Time: n/a
 Water Depth (ft): 7.10 Ice Thickness (ft): 4.05
 Freeboard (ft): 0.25 Snow Depth (ft): 0.45
 Elev. (BPMSL): 52.11 Survey By: Lilly, Whitman Date: 2/17/08 Time: 16:00
 Water Sampling By: n/a Sample Depths BWS (ft): 1 n/a Date: n/a Time: n/a
 2 _____
 3 _____

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
MULTI	GWS	InSitu Troll 9000	33033	PASS	PASS
Parameters					
Field Measurements					
Time:	11:13	11:17	11:21	11:24	
Depth BWS (ft):	4	5	6	7	
Temp (°C):	0.07	0.09	0.22	0.48	
pH:	6.74	6.72	6.68	6.54	
Barometric (mmHg):	758.5	758.5	758.4	758.4	
Pressure (kPa):	10.367	13.263	16.323	19.286	
Conductivity (µS/cm):	695.3	691.7	694.2	711.6	
RDO (ppm): (mg/L)	2.30	2.29	2.20	2.04	
Turbidity (NTU):	7.8	8.5	7.7	10.0	
ORP	316	315	316	319	

FIELD TESTING OF WATER SAMPLES (if small probe is used)

Probe:					
Depth (ft)					
Temp (°C)					
pH					
Eh					

NORTH SLOPE LAB CHEMISTRY ANALYSIS

Parameter	Depth BWS (ft): _____			Depth BWS (ft): _____			Depth BWS (ft): _____			Method
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec 0.3-15 mg/L
Alkalinity (mg/L as CaCO ₃)										Digital titrator 10-4000 mg/L as CaCO ₃
Total iron--UF (mg/L)										Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)										Hach spec 0.02-3.00 mg/L
Ammonia (mg/L NH ₃ -N)****										0.01-0.50 mg/L NH ₃ -N
Ammonia/ Iron dilution										

Remarks: Log start 11:16. Log end 11:25

Field-Form Filled Out By: GMM Date: 2/16/08
 QAQC Check By: DAR Date: 2/17/08

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004a: Water Quality Field-Sampling General

Project ID: North Slope Lakes
 Sample Purpose: Lake Water Quality

Site Location/Lake ID: L9817 - 4
 Date: 2/16/08 Time: 11:35

FIELD MEASUREMENTS

GPS Coord. Northing: N70°13.998' Easting: W151°19.997' Datum: NAD83
 Measurements By: GMM Time: n/a
 Water Depth (ft): 4.80 Ice Thickness (ft): 4.60
 Freeboard (ft): 0.50 Snow Depth (ft): 0.60
 Elev. (BPMSL): 52.11 Survey By: Lilly, Whitman Date: 2/17/08 Time: 16:00
 Water Sampling By: n/a Sample Depths BWS (ft): 1 n/a Date: n/a Time: n/a
 2 _____
 3 _____

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
MULTI	GWS	InSitu Troll 9000	33033	PASS	PASS
Parameters					
Field Measurements					
Time:	11:41	11:45			
Depth BWS (ft):	4.5	BOT			
Temp (°C):	0.06	0.08			
pH:	6.70	6.68			
Barometric (mmHg):	758.4	758.5			
Pressure (kPa):	11.695	13.644			
Conductivity (µS/cm):	715.1	717.5			
RDO (ppm): (mg/L)	1.43	1.17			
Turbidity (NTU):	9.7	25.8			
ORP	346	343			

FIELD TESTING OF WATER SAMPLES (if small probe is used)

Probe:				
Depth (ft)				
Temp (°C)				
pH				
Eh				

NORTH SLOPE LAB CHEMISTRY ANALYSIS

Parameter	Depth BWS (ft): _____			Depth BWS (ft): _____			Depth BWS (ft): _____			Method
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec 0.3-15 mg/L
Alkalinity (mg/L as CaCO ₃)										Digital titrator 10-4000 mg/L as CaCO ₃
Total iron--UF (mg/L)										Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)										Hach spec 0.02-3.00 mg/L
Ammonia (mg/L NH ₃ -N)****										0.01-0.50 mg/L NH ₃ -N
Ammonia/ Iron dilution										

Remarks: Log start 11:39. Log stop 11:45

Field-Form Filled Out By: GMM Date: 2/16/08
 QAQC Check By: DAR Date: 2/17/08

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004a: Water Quality Field-Sampling General

Project ID: North Slope Lakes
 Sample Purpose: Lake Water Quality

Site Location/Lake ID: L9817 - 20
 Date: 2/16/08 Time: 13:32

FIELD MEASUREMENTS

GPS Coord. Northing: N70°14.079' Easting: W151°19.969' Datum: NAD83
 Measurements By: GMM Time: n/a
 Water Depth (ft): 8.40 Ice Thickness (ft): 4.55
 Freeboard (ft): 0.50 Snow Depth (ft): 0.45
 Elev. (BPMSL): 52.11 Survey By: Lilly, Whitman Date: 2/17/08 Time: 16:00
 Water Sampling By: n/a Sample Depths BWS (ft): 1 n/a Date: n/a Time: n/a
 2 _____
 3 _____

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
MULTI	GWS	InSitu Troll 9000	33033	PASS	Pass
Parameters					
	Field Measurements				
Time:	13:45	13:51	13:55	14:00	14:04
Depth BWS (ft):	5	6	7	8	8.5
Temp (°C):	0.47	0.46	0.69	1.09	1.30
pH:	6.75	6.73	6.70	6.67	6.76
Barometric (mmHg):	758.4	758.4	758.4	758.4	758.4
Pressure (kPa):	13.558	16.277	19.286	22.241	23.699
Conductivity (µS/cm):	658.7	683.0	694.1	710.7	740.5
RDO (ppm): (mg/L)	0.76	1.67	1.59	0.90	0.54
Turbidity (NTU):	20.2	12.6	11.8	15.4	19.4
ORP	338	338	335	312	283

FIELD TESTING OF WATER SAMPLES (if small probe is used)

Probe: _____

Depth (ft)				
Temp (°C)				
pH				
Eh				

NORTH SLOPE LAB CHEMISTRY ANALYSIS

Parameter	Depth BWS (ft): _____			Depth BWS (ft): _____			Depth BWS (ft): _____			Method
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec 0.3-15 mg/L
Alkalinity (mg/L as CaCO ₃)										Digital titrator 10-4000 mg/L as CaCO ₃
Total iron--UF (mg/L)										Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)										Hach spec 0.02-3.00 mg/L
Ammonia (mg/L NH ₃ -N)****										0.01-0.50 mg/L NH ₃ -N
Ammonia/ Iron dilution										

Remarks: Log start 13:37. Log end 14:04

Field-Form Filled Out By: GMM Date: 2/16/08
 QAQC Check By: DAR Date: 2/17/08

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004a: Water Quality Field-Sampling General

Project ID: North Slope Lakes
 Sample Purpose: Lake Water Quality

Site Location/Lake ID: L9817 - 22
 Date: 2/16/08 Time: 13:00

FIELD MEASUREMENTS

GPS Coord. Northing: N70°14.074' Easting: W151°20.017 Datum: NAD83
 Measurements By: GMM Time: n/a
 Water Depth (ft): 8.35 Ice Thickness (ft): 4.25
 Freeboard (ft): 0.15 Snow Depth (ft): 0.40
 Elev. (BPMSL): 52.11 Survey By: Lilly, Whitman Date: 2/17/08 Time: 16:00
 Water Sampling By: n/a Sample Depths BWS (ft): 1 n/a Date: n/a Time: n/a
 2 _____
 3 _____

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
MULTI	GWS	InSitu Troll 9000	33033	Pass	Pass
Parameters					
Field Measurements					
Time:	13:10	13:15	13:18	13:23	
Depth BWS (ft):	5	6	7	8	
Temp (°C):	0.12	0.16	0.25	0.77	
pH:	6.77	6.74	6.71	6.65	
Barometric (mmHg):	758.7	758.8	758.7	758.8	
Pressure (kPa):	13.142	16.488	19.360	22.458	
Conductivity (µS/cm):	685.6	691.4	709.6	731.2	
RDO (ppm): (mg/L)	2.60	2.47	2.44	1.92	
Turbidity (NTU):	8.0	6.0	4.2	8.9	
ORP	346	347	347	342	

FIELD TESTING OF WATER SAMPLES (if small probe is used)

Probe:					
Depth (ft)					
Temp (°C)					
pH					
Eh					

NORTH SLOPE LAB CHEMISTRY ANALYSIS

Parameter	Depth BWS (ft): _____			Depth BWS (ft): _____			Depth BWS (ft): _____			Method
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec 0.3-15 mg/L
Alkalinity (mg/L as CaCO ₃)										Digital titrator 10-4000 mg/L as CaCO ₃
Total iron--UF (mg/L)										Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)										Hach spec 0.02-3.00 mg/L
Ammonia (mg/L NH ₃ -N)****										0.01-0.50 mg/L NH ₃ -N
Ammonia/ Iron dilution										

Remarks: Log start 13:13. Log end 13:24.

Field-Form Filled Out By: GMM Date: 2/16/08
 QAQC Check By: DAR Date: 2/17/08

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004a: Water Quality Field-Sampling General

Project ID: North Slope Lakes
 Sample Purpose: Lake Water Quality

Site Location/Lake ID: L9817 - 23
 Date: 2/16/08 Time: 11:52

FIELD MEASUREMENTS

GPS Coord. Northing: N70°14.071' Easting: W151°20.067 Datum: NAD83
 Measurements By: GMM Time: n/a
 Water Depth (ft): 7.60 Ice Thickness (ft): 3.60
 Freeboard (ft): 0.35 Snow Depth (ft): 0.55
 Elev. (BPMSL): 52.11 Survey By: Lilly, Whitman Date: 2/17/08 Time: 16:00
 Water Sampling By: n/a Sample Depths BWS (ft): 1 n/a Date: n/a Time: n/a
 2 _____
 3 _____

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
MULTI	GWS	InSitu Troll 9000	33033	Pass	Pass
Parameters					
Field Measurements					
Time:	12:04	12:09	12:23	12:16	12:20
Depth BWS (ft):	4	5	6	7	BOT
Temp (°C):	0.08	0.12	0.30	0.71	1.03
pH:	6.76	6.73	6.70	6.67	6.64
Barometric (mmHg):	758.4	758.3	758.4	758.4	758.4
Pressure (kPa):	10.300	13.256	16.258	19.133	22.023
Conductivity (µS/cm):	684.7	679.9	681.1	686.6	705.5
RDO (ppm): (mg/L)	2.58	2.40	2.39	2.19	1.78
Turbidity (NTU):	4.9	4.8	4.9	6.3	47.1
ORP	361	358	357	357	344

FIELD TESTING OF WATER SAMPLES (if small probe is used)

Probe: _____

Depth (ft)					
Temp (°C)					
pH					
Eh					

NORTH SLOPE LAB CHEMISTRY ANALYSIS

Parameter	Depth BWS (ft): _____			Depth BWS (ft): _____			Depth BWS (ft): _____			Method
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec 0.3-15 mg/L
Alkalinity (mg/L as CaCO ₃)										Digital titrator 10-4000 mg/L as CaCO ₃
Total iron--UF (mg/L)										Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)										Hach spec 0.02-3.00 mg/L
Ammonia (mg/L NH ₃ -N)****										0.01-0.50 mg/L NH ₃ -N
Ammonia/ Iron dilution										

Remarks: Log start 12:01. Log stop 12:21

Field-Form Filled Out By: GMM Date: 2/16/08
 QAQC Check By: DAR Date: 2/17/08

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004a: Water Quality Field-Sampling General

Project ID: North Slope Lakes
 Sample Purpose: Lake Water Quality

Site Location/Lake ID: L9817 - 25
 Date: 2/16/08 Time: 14:15

FIELD MEASUREMENTS

GPS Coord. Northing: N70°14.100' Easting: W151°20.066' Datum: NAD83
 Measurements By: GMM Time: 14:15
 Water Depth (ft): 6.50 Ice Thickness (ft): 4.90
 Freeboard (ft): 0.30 Snow Depth (ft): 0.00
 Elev. (BPMSL): 52.11 Survey By: Lilly, Whitman Date: 2/17/08 Time: 16:00
 Water Sampling By: n/a Sample Depths BWS (ft): 1 n/a Date: n/a Time: n/a
 2 _____
 3 _____

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
MULTI	GWS	InSitu Troll 9000	33033	Pass	Pass
Parameters					
	Field Measurements				
Time:	14:27	14:30	14:35	14:40	
Depth BWS (ft):	5	5.5	6	BOT	
Temp (°C):	0.10	0.09	0.11	0.44	
pH:	6.80	6.79	6.78	6.75	
Barometric (mmHg):	758.3	758.3	758.3	758.2	
Pressure (kPa):	13.224	14.967	16.278	18.146	
Conductivity (µS/cm):	699.8	694.8	693.2	697.2	
RDO (ppm): (mg/L)	2.28	2.26	2.23	1.86	
Turbidity (NTU):	6.6	6.7	6.5	11.3	
ORP	337	337	336	334	

FIELD TESTING OF WATER SAMPLES (if small probe is used)

Probe:					
Depth (ft)					
Temp (°C)					
pH					
Eh					

NORTH SLOPE LAB CHEMISTRY ANALYSIS

Parameter	Depth BWS (ft): _____			Depth BWS (ft): _____			Depth BWS (ft): _____			Method
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec 0.3-15 mg/L
Alkalinity (mg/L as CaCO ₃)										Digital titrator 10-4000 mg/L as CaCO ₃
Total iron--UF (mg/L)										Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)										Hach spec 0.02-3.00 mg/L
Ammonia (mg/L NH ₃ -N)****										0.01-0.50 mg/L NH ₃ -N
Ammonia/ Iron dilution										

Remarks: Log start 14:21. Log stop 14:41.

Field-Form Filled Out By: GMM Date: 2/16/08
 QAQC Check By: DAR Date: 2/17/08

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004a: Water Quality Field-Sampling General

Project ID: North Slope Lakes Site Location/Lake ID: KDA1
 Sample Purpose: Lake Water Quality Date: 2/18/08 Time: 14:45

FIELD MEASUREMENTS

GPS Coord. Northing: N70°19.894' Easting: W148°56.743' Datum: NAD83
 Measurements By: GMM Time: nr
 Water Depth (ft): 20.2 Ice Thickness (ft): 5.10
 Freeboard (ft): 0.45 Snow Depth (ft): 0.10
 Elev. (BPMSL +/- .02): 8.02 Survey By: DAR/ MW Date: 2/18/08 Time: nr
 Water Sampling By: n/a Sample Depths BWS (ft): 1 n/a Date: n/a Time: n/a
 2 _____
 3 _____

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check						
MULTI	GWS	INSITU/ Troll 9000	33033	PASS	PASS						
Parameters											
Field Measurements											
Time:	15:03	15:07	15:11	15:17	15:21	15:26	15:30	15:36	15:44	15:47	15:51
Depth BWS (ft):	6	7	8	9	11	13	15	17	18	19	20
Temp (°C):	0.32	0.63	0.86	1.05	1.20	1.35	1.49	1.62	1.77	1.80	1.86
pH:	7.74	7.70	7.67	7.63	7.58	7.50	7.42	7.32	7.15	7.07	7.00
Barometric (mmHg):	752.4	752.5	752.7	752.8	752.8	752.9	752.9	752.9	753.0	753.0	753.00
Pressure (mmHg):	16.426	19.383	22.474	25.51	31.372	37.424	43.359	49.332	52.2	55.192	58.15
Conductivity (µS/cm):	118.8	117.9	118.1	118.3	118.3	118.4	118.4	118.50	119.70	122.80	130.10
RDO (ppm): (mg/L)	15.33	15.48	15.59	15.68	15.91	16.15	16.39	16.60	12.11	10.52	7.00
Turbidity (NTU):	0.7	0.9	1.1	1.0	0.9	0.7	0.5	0.2	0.1	0.4	1.1
ORP	278	278	278	278	280	282	286	289	293	295	282

FIELD TESTING OF WATER SAMPLES (if small probe is used)

Probe:					
Depth (ft)					
Temp (°C)					
pH					
Eh					

NORTH SLOPE LAB CHEMISTRY ANALYSIS

Parameter	Depth BWS (ft): _____			Depth BWS (ft): _____			Depth BWS (ft): _____			Method
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec 0.3-15 mg/L
Alkalinity (mg/L as CaCO ₃)										Digital titrator 10-4000 mg/L as CaCO ₃
Total iron--UF (mg/L)										Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)										Hach spec 0.02-3.00 mg/L
Ammonia (mg/L NH ₃ -N)****										0.01-0.50 mg/L NH ₃ -N
Ammonia/ Iron dilution										

Remarks: Log start 1457. Log stop 1552.

Field-Form Filled Out By: GMM Date: 2/20/08
 QAQC Check By: AJB Date: 3/10/08

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004a: Water Quality Field-Sampling General

Project ID: North Slope Lakes
 Sample Purpose: Lake Water Quality

Site Location/Lake ID: KDA2
 Date: 2/18/08 Time: 13:20

FIELD MEASUREMENTS

GPS Coord. Northing: N70°19.966' Easting: W148°56.429' Datum: NAD83
 Measurements By: GMM Time: nr
 Water Depth (ft): 18.05 Ice Thickness (ft): 4.85
 Freeboard (ft): 0.5 Snow Depth (ft): 0.10
 Elev. (BPMSL +/- .02): 6.06 Survey By: DAR/ MW Date: 2/18/08 Time: nr
 Water Sampling By: n/a Sample Depths BWS (ft): 1 n/a Date: n/a Time: n/a
 2 _____
 3 _____

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check							
MULTI	GWS	INSITU/ Troll 9000	33033	PASS	PASS							
Parameters												
	Field Measurements											
Time:	13:28	13:32	13:38	13:44	13:53	14:01	14:05	14:09	14:14	14:20		
Depth BWS (ft):	5	6	7	9	11	13	15	16	17	17.8		
Temp (°C):	0.18	0.28	0.69	1.00	1.20	1.40	1.60	1.75	1.91	2.01		
pH:	7.79	7.79	7.76	7.70	7.63	7.52	7.44	7.25	7.02	6.93		
Barometric (mmHg):	752.2	752.1	752.1	752.2	752.3	752.5	752.5	752.4	752.5	752.7		
Pressure (mmHg):	13.573	16.326	19.37	25.599	31.415	37.464	43.314	46.259	49.277	51.744		
Conductivity (µS/cm):	129.0	127.8	128.1	128.5	128.5	128.2	128.8	128.9	130.5	138.90		
RDO (ppm): (mg/L)	14.71	14.77	15.05	15.29	15.63	15.87	15.93	14.23	9.53	5.39		
Turbidity (NTU):	0.2	0.2	0.3	0.3	0.3	0.3	0.2	0.2	0.8	2.2		
ORP	212	213	215	214	219	223	226	232	239	243		

FIELD TESTING OF WATER SAMPLES (if small probe is used)					
Probe:					
Depth (ft)					
Temp (°C)					
pH					
Eh					

NORTH SLOPE LAB CHEMISTRY ANALYSIS

Parameter	Depth BWS (ft): _____			Depth BWS (ft): _____			Depth BWS (ft): _____			Method
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec 0.3-15 mg/L
Alkalinity (mg/L as CaCO ₃)										Digital titrator 10-4000 mg/L as CaCO ₃
Total iron--UF (mg/L)										Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)										Hach spec 0.02-3.00 mg/L
Ammonia (mg/L NH ₃ -N)****										0.01-0.50 mg/L NH ₃ -N
Ammonia/ Iron dilution										

Remarks: Log start 13:26. Log stop 14:21.

Field-Form Filled Out By: GMM Date: 2/20/08
 QAQC Check By: AJB Date: 3/10/08

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004a: Water Quality Field-Sampling General

Project ID: North Slope Lakes
 Sample Purpose: Lake Water Quality

Site Location/Lake ID: KDA3
 Date: 2/18/08 Time: 16:12

FIELD MEASUREMENTS

GPS Coord. Northing: N70°20.025' Easting: W148°56.204' Datum: NAD83
 Measurements By: GMM Time: nr
 Water Depth (ft): 21.7 Ice Thickness (ft): 4.75
 Freeboard (ft): 0.5 Snow Depth (ft): 0.25
 Elev. (BPMSL +/- .02): 6.06 Survey By: DAR/ MW Date: 2/18/08 Time: nr
 Water Sampling By: n/a Sample Depths BWS (ft): 1 n/a Date: n/a Time: n/a
2
3

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check							
MULTI	GWS	INSITU/ Troll 9000	33033	PASS	PASS							
Parameters												
	Field Measurements											
Time:	16:19	16:23	16:28	16:33	16:38	16:43	16:46	16:49	16:53	16:56	17:01	17:06
Depth BWS (ft):	5	6	7	9	11	13	15	17	19	20	21	21.5
Temp (°C):	0.18	0.40	0.85	1.27	1.50	1.62	1.71	1.82	1.94	2.06	2.13	2.10
pH:	7.77	7.74	7.70	7.65	7.58	7.50	7.46	7.36	7.27	7.09	6.88	6.88
Barometric (mmHg):	752.7	752.7	752.8	752.9	753.0	753.2	753.2	753.3	753.3	753.4	753.4	753.40
Pressure (mmHg):	31.521	16.316	19.425	25.56	31.542	37.411	43.451	49.469	55.03	58.239	61.331	62.766
Conductivity (µS/cm):	117.8	116.7	116.0	116.4	116.6	116.6	116.5	116.5	116.60	116.40	117.40	121.70
RDO (ppm): (mg/L)	14.59	14.71	14.72	14.83	14.93	15.03	15.03	15.01	14.57	12.03	7.95	7.85
Turbidity (NTU):	0.0	0.1	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.1	0.7	1.0
ORP	284	284	284	285	287	289	291	295	299	305	309	309

FIELD TESTING OF WATER SAMPLES (if small probe is used)

Probe:					
Depth (ft)					
Temp (°C)					
pH					
Eh					

NORTH SLOPE LAB CHEMISTRY ANALYSIS

Parameter	Depth BWS (ft): _____			Depth BWS (ft): _____			Depth BWS (ft): _____			Method
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec 0.3-15 mg/L
Alkalinity (mg/L as CaCO ₃)										Digital titrator 10-4000 mg/L as CaCO ₃
Total iron--UF (mg/L)										Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)										Hach spec 0.02-3.00 mg/L
Ammonia (mg/L NH ₃ -N)****										0.01-0.50 mg/L NH ₃ -N
Ammonia/ Iron dilution										

Remarks: Log start 1615. Log stop 1706.

Field-Form Filled Out By: GMM Date: 2/20/08
 QAQC Check By: AJB Date: 3/10/08

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004a: Water Quality Field-Sampling General

Project ID: North Slope Lakes Site Location/Lake ID: MSBN-CT
 Sample Purpose: Lake Water Quality Date: 2/19/08 Time: 14:25

FIELD MEASUREMENTS

GPS Coord. Northing: N70°19.280' Easting: W149°24.009' Datum: NAD83
 Measurements By: GMM Time: nr
 Water Depth (ft): 33.65 Ice Thickness (ft): 4.80
 Freeboard (ft): 0.5 Snow Depth (ft): 0.35
 Elev. (BPMSL +/- .02): 93.9 Survey By: DAR/MW Date: 2/19/08 Time: 17:00
 Water Sampling By: n/a Sample Depths BWS (ft): 1 n/a Date: n/a Time: n/a
 2 _____
 3 _____

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check							
Multi	GWS	INSITU/ Troll 9000	33033	PASS	PASS - pH ORP Fail							
Parameters		Field Measurements										
Time:	14:36	14:39	14:42	14:45	14:50	14:54	14:57	15:01	15:03	15:06	15:10	15:13
Depth BWS (ft):	5	6	7	9	11	13	15	17	19	21	23	25
Temp (°C):	0.26	0.19	0.20	0.35	0.72	1.07	1.27	1.42	1.53	1.61	1.67	1.75
pH:	[REDACTED]											
Barometric (mmHg):	752.7	752.7	752.6	752.6	752.6	752.7	752.7	752.8	752.9	752.9	753.0	753.0
Pressure (kPa):	13.361	16.279	19.228	25.001	31.028	37.005	42.933	49.212	55.399	60.818	66.753	72.639
Conductivity (µS/cm):	163.7	162.4	161.9	161.0	160.5	161.2	161.3	161.5	161.6	161.6	161.7	161.9
RDO (ppm): (mg/L)	12.84	13.28	13.70	13.97	14.45	14.33	14.36	14.64	14.53	14.21	14.73	14.75
Turbidity (NTU):	0.2	0.5	0.6	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
ORP	[REDACTED]											

FIELD TESTING OF WATER SAMPLES (if small probe is used)

Probe:				
Depth (ft)				
Temp (°C)				
pH				
Eh				

NORTH SLOPE LAB CHEMISTRY ANALYSIS

Parameter	Depth BWS (ft): _____			Depth BWS (ft): _____			Depth BWS (ft): _____			Method
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec 0.3-15 mg/L
Alkalinity (mg/L as CaCO ₃)										Digital titrator 10-4000 mg/L as CaCO ₃
Total iron--UF (mg/L)										Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)										Hach spec 0.02-3.00 mg/L
Ammonia (mg/L NH ₃ -N)****										0.01-0.50 mg/L NH ₃ -N
Ammonia/ Iron dilution										

Remarks: Sheet 1 of 2. No log taken. pH/ ORP probe sensor covered therefore reading inaccurate and thrown out.

Field-Form Filled Out By: GMM Date: 2/20/08
 QAQC Check By: AJB Date: 3/10/08

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004a: Water Quality Field-Sampling General

Project ID: North Slope Lakes
 Sample Purpose: Lake Water Quality

Site Location/Lake ID: MSBN-CT
 Date: 2/19/08 Time: 14:25

FIELD MEASUREMENTS

GPS Coord. Northing: N70°19.280' Easting: W149°24.009' Datum: NAD83
 Measurements By: GMM Time: nr
 Water Depth (ft): 33.65 Ice Thickness (ft): 4.80
 Freeboard (ft): 0.5 Snow Depth (ft): 0.35
 Elev. (BPMSL +/- .02): 93.9 Survey By: DAR/MW Date: 2/19/08 Time: 17:00
 Water Sampling By: n/a Sample Depths BWS (ft): 1 n/a Date: n/a Time: n/a
 2 _____
 3 _____

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
Multi	GWS	INSITU/ Troll 9000	33033	PASS	PASS - pH ORP FAIL
Parameters					
Field Measurements					
Time:	15:17	15:24	15:28	15:30	15:33 15:35
Depth BWS (ft):	27	29	31	32	33 33.4
Temp (°C):	1.88	2.09	2.18	2.17	2.13 2.11
pH:					
Barometric (mmHg):	753.0	753.0	753.0	753.1	753.1 753.2
Pressure (kPa):	78.535	84.723	90.403	93.811	96.710 98.139
Conductivity (µS/cm):	162.1	171.6	194.1	243.6	280.0 329.3
RDO (ppm): (mg/L)	13.94	7.29	6.15	4.18	3.85 3.37
Turbidity (NTU):	0.0	2.4	2.9	1.2	1.5 1.4
ORP					

FIELD TESTING OF WATER SAMPLES (if small probe is used)

Probe:					
Depth (ft)					
Temp (°C)					
pH					
Eh					

NORTH SLOPE LAB CHEMISTRY ANALYSIS

Parameter	Depth BWS (ft): _____			Depth BWS (ft): _____			Depth BWS (ft): _____			Method
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec 0.3-15 mg/L
Alkalinity (mg/L as CaCO ₃)										Digital titrator 10-4000 mg/L as CaCO ₃
Total iron--UF (mg/L)										Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)										Hach spec 0.02-3.00 mg/L
Ammonia (mg/L NH ₃ -N)****										0.01-0.50 mg/L NH ₃ -N
Ammonia/ Iron dilution										

Remarks: Sheet 2 of 2. No log taken. pH/ ORP probe sensor covered therefore reading inaccurate and thrown out.

Field-Form Filled Out By: GMM Date: 2/20/08
 QAQC Check By: AJB Date: 3/10/08

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004a: Water Quality Field-Sampling General

Project ID: North Slope Lakes Site Location/Lake ID: MSBS-CT
 Sample Purpose: Lake Water Quality Date: 2/19/08 Time: 15:53

FIELD MEASUREMENTS

GPS Coord. Northing: N70°19.214' Easting: W149°24.020' Datum: NAD83
 Measurements By: GMM Time: nr
 Water Depth (ft): 26.5 Ice Thickness (ft): 4.55
 Freeboard (ft): 0.4 Snow Depth (ft): 0.45
 Elev. (BPMSL +/- .02): 93.9 Survey By: DAR/MW Date: 2/19/08 Time: 17:00
 Water Sampling By: n/a Sample Depths BWS (ft): 1 n/a Date: n/a Time: n/a
 2 _____
 3 _____

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check							
Multi	GWS	INSITU/ Troll 9000	33033	PASS	PASS - pH ORP Fail							
Parameters												
Field Measurements												
Time:	15:58	16:02	16:07	16:10	16:12	16:15	16:18	16:21	16:25	16:28	16:30	16:33
Depth BWS (ft):	5	6	7	9	11	13	15	17	19	21	23	24
Temp (°C):	0.34	0.23	0.56	0.87	1.09	1.31	1.44	1.58	1.71	1.79	1.90	2.01
pH:	[REDACTED]											
Barometric (mmHg):	752.1	752.1	752.1	752.1	752.1	752.2	752.2	752.3	752.4	752.5	752.5	752.5
Pressure (kPa):	13.684	16.128	19.082	25.175	31.209	37.261	42.921	49.020	55.009	60.943	66.714	69.82
Conductivity (µS/cm):	169.7	169.0	168.5	168.7	169.2	169.4	169.1	168.6	168.5	169.1	169.4	169.7
RDO (ppm): (mg/L)	11.65	11.74	11.75	11.70	11.63	11.53	11.37	11.20	10.98	10.72	10.90	9.98
Turbidity (NTU):	0.2	0.2	0.2	0.2	0.3	0.2	0.3	0.3	0.4	0.4	0.6	0.9
ORP	[REDACTED]											

FIELD TESTING OF WATER SAMPLES (if small probe is used)

Probe:				
Depth (ft)				
Temp (°C)				
pH				
Eh				

NORTH SLOPE LAB CHEMISTRY ANALYSIS

Parameter	Depth BWS (ft): _____			Depth BWS (ft): _____			Depth BWS (ft): _____			Method
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec 0.3-15 mg/L
Alkalinity (mg/L as CaCO ₃)										Digital titrator 10-4000 mg/L as CaCO ₃
Total iron--UF (mg/L)										Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)										Hach spec 0.02-3.00 mg/L
Ammonia (mg/L NH ₃ -N)****										0.01-0.50 mg/L NH ₃ -N
Ammonia/ Iron dilution										

Remarks: Sheet 1 of 2. Log start 15:57. Log stop 16:38.. pH/ ORP probe sensor covered therefore reading inaccurate and thrown out.

Field-Form Filled Out By: GMM Date: 2/20/08
 QAQC Check By: AJB Date: 3/10/08

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004a: Water Quality Field-Sampling General

Project ID: North Slope Lakes
 Sample Purpose: Lake Water Quality

Site Location/Lake ID: MSBS-CT
 Date: 2/19/08 Time: 15:53

FIELD MEASUREMENTS

GPS Coord. Northing: N70°19.214' Easting: W149°24.020' Datum: NAD83
 Measurements By: GMM Time: nr
 Water Depth (ft): 26.5 Ice Thickness (ft): 4.55
 Freeboard (ft): 0.4 Snow Depth (ft): 0.45
 Elev. (BPMSL +/- .02): 93.9 Survey By: DAR/MW Date: 2/19/08 Time: 17:00
 Water Sampling By: n/a Sample Depths BWS (ft): 1 n/a Date: n/a Time: n/a
 2 _____
 3 _____

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
Multi	GWS	INSITU/ Troll 9000	33033	PASS	PASS - pH ORP Fail
Parameters					
Field Measurements					
Time:	16:35	16:38			
Depth BWS (ft):	25	26			
Temp (°C):	2.10	2.17			
pH:					
Barometric (mmHg):	752.5	752.1			
Pressure (kPa):	72.709	75.765			
Conductivity (µS/cm):	173.1	179.1			
RDO (ppm): (mg/L)	7.43	5.10			
Turbidity (NTU):	3.7	4.7			
ORP					

FIELD TESTING OF WATER SAMPLES (if small probe is used)

Probe:				
Depth (ft)				
Temp (°C)				
pH				
Eh				

NORTH SLOPE LAB CHEMISTRY ANALYSIS

Parameter	Depth BWS (ft): _____			Depth BWS (ft): _____			Depth BWS (ft): _____			Method
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec 0.3-15 mg/L
Alkalinity (mg/L as CaCO ₃)										Digital titrator 10-4000 mg/L as CaCO ₃
Total iron--UF (mg/L)										Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)										Hach spec 0.02-3.00 mg/L
Ammonia (mg/L NH ₃ -N)****										0.01-0.50 mg/L NH ₃ -N
Ammonia/ Iron dilution										

Remarks: Sheet 2 of 2. Log start 15:57. Log stop 16:38.. pH/ ORP probe sensor covered therefore reading inaccurate and thrown out.

Field-Form Filled Out By: GMM Date: 2/20/08
 QAQC Check By: AJB Date: 3/10/08

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004a: Water Quality Field-Sampling General

Project ID: North Slope Lakes
 Sample Purpose: Lake Water Quality

Site Location/Lake ID: MSBS-CNT
 Date: 2/19/08 Time: 16:48

FIELD MEASUREMENTS

GPS Coord. Northing: nr Easting: nr Datum: nr
 Measurements By: GMM Time: nr
 Water Depth (ft): 19.4 Ice Thickness (ft): 4.05
 Freeboard (ft): 0.5 Snow Depth (ft): 0.20
 Elev. (BPMSL +/- .02): n/a Survey By: n/a Date: n/a Time: n/a
 Water Sampling By: n/a Sample Depths BWS (ft): 1 n/a Date: n/a Time: n/a
 2 _____
 3 _____

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model		Serial No.		Pre-Sampling QAQC Check		Post-Sampling QAQC Check		
Multi	GWS	INSITU/ Troll 9000		33033		PASS		PASS - pH ORP Fail		
Parameters										
Field Measurements										
Time:	16:54	16:57	16:59	17:02	15:05	15:08	15:10	15:12	15:14	17:16
Depth BWS (ft):	5	6	7	9	11	13	15	17	18	19
Temp (°C):	0.22	0.20	0.36	0.83	1.09	1.19	1.35	1.40	1.49	1.52
pH:										
Barometric (mmHg):	751.8	751.8	751.8	751.8	751.8	751.8	751.8	751.9	751.9	751.9
Pressure (kPa):	13.349	16.119	19.226	25.081	31.154	37.039	43.079	48.909	52.194	55.100
Conductivity (µS/cm):	177.7	177.0	175.0	173.3	173.0	173.1	172.9	172.8	172.8	173.3
RDO (ppm): (mg/L)	13.00	13.06	13.05	12.77	12.67	12.59	12.31	12.29	11.76	11.35
Turbidity (NTU):	0.3	0.5	0.4	0.4	0.4	0.3	0.3	0.4	0.8	1.2
ORP										

FIELD TESTING OF WATER SAMPLES (if small probe is used)

Probe:				
Depth (ft)				
Temp (°C)				
pH				
Eh				

NORTH SLOPE LAB CHEMISTRY ANALYSIS

Parameter	Depth BWS (ft): _____			Depth BWS (ft): _____			Depth BWS (ft): _____			Method
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec 0.3-15 mg/L
Alkalinity (mg/L as CaCO ₃)										Digital titrator 10-4000 mg/L as CaCO ₃
Total iron--UF (mg/L)										Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)										Hach spec 0.02-3.00 mg/L
Ammonia (mg/L NH ₃ -N)****										0.01-0.50 mg/L NH ₃ -N
Ammonia/ Iron dilution										

Remarks: Log start 16:54. Log stop 17:16. pH/ ORP probe sensor covered therefore reading inaccurate and thrown out.

Field-Form Filled Out By: GMM Date: 2/20/08
 QAQC Check By: AJB Date: 3/10/08

APPENDIX B. WATER QUALITY METER CALIBRATION FORMS

The following forms report the pre- and post-calibration checks for the water quality meters used during field sampling.

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004e: Water Quality Meter Calibration Form

Project ID: North Slope Lakes Site Location/Lake ID: Alpine-L9312
 Sample Purpose: Lake Water Quality

WATER QUALITY METER INFORMATION

Meter Make: InSitu Make: Troll 9000
 Owner: GW Scientific S/N: 33033

CALIBRATION AND QUALITY ASSURANCE INFORMATION

Pre-Sampling QA

Parameter	Date	Time	Standard	Lot No.	Exp.	Meter Reading	Pass/Fail
pH 4.01	2/14/08	21:50	Oakton 4.01	2709256	Aug-09	4.08 @ 18.93	Pass
ph 7.00	2/14/08	21:52	Oakton 7.00	2709203	Aug-09	7.04 @ 18.42	Pass
ph 10.00	2/14/08	21:48	Oakton 10.00	2707084	Jan-09	10.02 @ 18.12	Pass
Conductivity 447 µS/cm	2/14/08	21:26	Oakton 447	2707012	Jul-08	376 @ 17.18	Pass
Conductivity 84 µS/cm	2/14/08	21:24	Oakton 84	2706156	Jun-08	80.81 @ 18.33	Pass
ORP	2/14/08	21:11	Zobell's	2709340	Jun-08	242 @ 18.52	Pass
Saturated O ₂	2/14/08	21:58	Bubbled Nanopure	--	--	94.7 @ 18.30	Pass
Zero O ₂	2/14/08	22:00	Oakton	2706384	Jun-08	0.01 @ 14.34	Pass

Post-Sampling QA

Parameter	Date	Time	Standard	Lot No.	Exp.	Meter Reading	Pass/Fail
pH 4.01	2/15/08	16:54	Oakton 4.01	2709256	Aug-09	4.0 @ 19.39	Pass
ph 7.00	2/15/08	16:51	Oakton 7.00	2709203	Aug-09	7.06 @ 19.26	Pass
ph 10.00	2/15/08	16:48	Oakton 10.00	2707084	Jan-09	10.04 @ 19.45	Pass
Conductivity 447 µS/cm	2/15/08	16:25	Oakton 447	270712	Jul-08	385.1 @ 18.20	Pass
Conductivity 84 µS/cm	2/15/08	16:22	Oakton 84	2706156	Jun-08	75.31 @ 18.16	Pass
ORP	2/15/08	17:09	Zobell's	2709340	Jun-08	248 @ 19.30	Pass
Saturated O ₂	2/15/08	17:03	Bubbled Nanopure	--	--	100.9 @ 19.13	Pass
Zero O ₂	2/15/08	17:06	Oakton	2706384	Jun-08	0.03 @ 16.18	Pass

Remarks: pH Failed 4.01 calibration. Re-calibrated.
ph/ORP probe SN:PP10242 (GWS)

Field-Form Filled Out By: GMM Date: 2/20/2008
 QAQC Check By: AJB Date: 3/10/2008

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004e: Water Quality Meter Calibration Form

Project ID: North Slope Lakes Site Location/Lake ID: Alpine-L9817
 Sample Purpose: Lake Water Quality

WATER QUALITY METER INFORMATION

Meter Make: InSitu Make: Troll 9000
 Owner: GW Scientific S/N: 33033

CALIBRATION AND QUALITY ASSURANCE INFORMATION

Pre-Sampling QA

Parameter	Date	Time	Standard	Lot No.	Exp.	Meter Reading	Pass/Fail
pH 4.01	2/15/08	16:54	Oakton 4.01	2709256	Aug-09	4.0 @ 19.39	Pass
ph 7.00	2/15/08	16:51	Oakton 7.00	2709203	Aug-09	7.06 @ 19.26	Pass
ph 10.00	2/15/08	16:48	Oakton 10.00	2707084	Jan-09	10.04 @ 19.45	Pass
Conductivity 447 µS/cm	2/15/08	16:25	Oakton 447	270712	Jul-08	385.1 @ 18.20	Pass
Conductivity 84 µS/cm	2/15/08	16:22	Oakton 84	2706156	Jun-08	75.31 @ 18.16	Pass
ORP	2/15/08	17:09	Zobell's	2709340	Jun-08	248 @ 19.30	Pass
Saturated O ₂	2/15/08	17:03	Bubbled Nanopure	--	--	100.9 @ 19.13	Pass
Zero O ₂	2/15/08	17:06	Oakton	2706384	Jun-08	0.03 @ 16.18	Pass

Post-Sampling QA

Parameter	Date	Time	Standard	Lot No.	Exp.	Meter Reading	Pass/Fail
pH 4.01	2/16/08	18:13	Oakton 4.01	2709256	Aug-09	4.11 @ 18.71	Pass
ph 7.00	2/16/08	18:15	Oakton 7.00	2709203	Aug-09	7.01 @ 18.09	Pass
ph 10.00	2/16/08	18:21	Oakton 10.00	2707084	Jan-09	10.04 @ 19.7	Pass
Conductivity 447 µS/cm	2/16/08	18:05	Oakton 447	270712	Jul-08	397 @ 19.04	Pass
Conductivity 84 µS/cm	2/16/08	18:00	Oakton 84	2706156	Jun-08	76.31 @ 19.08	Pass
ORP	2/16/08	18:27	Zobell's	2709340	Jun-08	220 @ 19.3	Pass
Saturated O ₂	2/16/08	17:52	Bubbled Nanopure	--	--	97.6 @ 18.22	Pass
Zero O ₂	2/16/08	18:38	Oakton	2706384	Jun-08	0.03 @ 16.1	Pass

Remarks: _____
 ph/ORP probe SN:PP10242 (GWS)

Field-Form Filled Out By: GMM Date: 2/20/2008
 QAQC Check By: AJB Date: 3/10/2008

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004e: Water Quality Meter Calibration Form

Project ID: North Slope Lakes
 Sample Purpose: Lake Water Quality

Site Location/Lake ID: Kuparuk Deadarm Lakes

WATER QUALITY METER INFORMATION

Meter Make: InSitu
 Owner: GW Scientific

Make: Troll 9000
 S/N: 33033

CALIBRATION AND QUALITY ASSURANCE INFORMATION

Pre-Sampling QA

Parameter	Date	Time	Standard	Lot No.	Exp.	Meter Reading	Pass/Fail
pH 4.01	2/16/08	18:13	Oakton 4.01	2709256	Aug-09	4.11 @ 18.71	Pass
ph 7.00	2/16/08	18:15	Oakton 7.00	2709203	Aug-09	7.01 @ 18.09	Pass
ph 10.00	2/16/08	18:21	Oakton 10.00	2707084	Jan-09	10.04 @ 19.7	Pass
Conductivity 447 µS/cm	2/16/08	18:05	Oakton 447	270712	Jul-08	397 @ 19.04	Pass
Conductivity 84 µS/cm	2/16/08	18:00	Oakton 84	2706156	Jun-08	76.31 @ 19.08	Pass
ORP	2/16/08	18:27	Zobell's	2709340	Jun-08	220 @ 19.3	Pass
Saturated O ₂	2/16/08	17:52	Bubbled Nanopure	--	--	97.6 @ 18.22	Pass
Zero O ₂	2/16/08	18:38	Oakton	2706384	Jun-08	0.03 @ 16.1	Pass

Post-Sampling QA

Parameter	Date	Time	Standard	Lot No.	Exp.	Meter Reading	Pass/Fail
pH 4.01	2/18/08	19:29	Oakton 4.01	2709256	Aug-09	4.01 @ 22.59	Pass
ph 7.00	2/18/08	19:31	Oakton 7.00	2612531	Dec-08	6.98 @ 21.68	Pass
ph 10.00	2/18/08	19:33	Oakton 10.00	2612532	Jun-08	9.94 @ 22.59	Pass
Conductivity 447 µS/cm	2/18/08	19:28	Oakton 447	2707012	Jul-08	428.8 @ 22.48	Pass
Conductivity 84 µS/cm	2/18/08	19:24	Oakton 84	2706156	Jun-08	80.62 @ 21.43	Pass
ORP	2/18/08	19:35	Zobell's	2709340	Aug-07	217 @ 22.20	Pass
Saturated O ₂	2/18/08	19:38	Bubbled Nanopure	--	--	115 @ 21.62	Pass
Zero O ₂	2/18/08	19:40	Oakton	270638	Jun-08	0.04 @ 19.62	Pass

Remarks: ph/ORP probe SN:PP10242 (GWS)

Field-Form Filled Out By: GMM
 QAQC Check By: AJB

Date: 2/20/2008
 Date: 3/10/2008

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-004e: Water Quality Meter Calibration Form

Project ID: North Slope Lakes Site Location/Lake ID: Mine Site B
 Sample Purpose: Lake Water Quality

WATER QUALITY METER INFORMATION

Meter Make: InSitu Make: Troll 9000
 Owner: GW Scientific S/N: 33033

CALIBRATION AND QUALITY ASSURANCE INFORMATION

Pre-Sampling QA

Parameter	Date	Time	Standard	Lot No.	Exp.	Meter Reading	Pass/Fail
pH 4.01	2/18/08	19:29	Oakton 4.01	2709256	Aug-09	4.01 @ 22.59	Pass
ph 7.00	2/18/08	19:31	Oakton 7.00	2612531	Dec-08	6.98 @ 21.68	Pass
ph 10.00	2/18/08	19:33	Oakton 10.00	2612532	Jun-08	9.94 @ 22.59	Pass
Conductivity 447 µS/cm	2/18/08	19:28	Oakton 447	2707012	Jul-08	428.8 @ 22.48	Pass
Conductivity 84 µS/cm	2/18/08	19:24	Oakton 84	2706156	Jun-08	80.62 @ 21.43	Pass
ORP	2/18/08	19:35	Zobell's	2709340	Aug-07	217 @ 22.20	Pass
Saturated O ₂	2/18/08	19:38	Bubbled Nanopure	--	--	115 @ 21.62	Pass
Zero O ₂	2/18/08	19:40	Oakton	270638	Jun-08	0.04 @ 19.62	Pass

Post-Sampling QA

Parameter	Date	Time	Standard	Lot No.	Exp.	Meter Reading	Pass/Fail
pH 4.01	2/19/08	-	Oakton 4.01	2709256	Aug-09	-	-
ph 7.00	2/19/08	-	Oakton 7.00	2612531	Dec-08	-	-
ph 10.00	2/19/08	-	Oakton 10.00	2612532	Jun-08	-	-
Conductivity 447 µS/cm	2/19/08	19:22	Oakton 447	2707012	Jul-08	420.8 @ 21.69	Pass
Conductivity 84 µS/cm	2/19/08	19:20	Oakton 84	2706156	Jun-08	84.43 @ 21.41	Pass
ORP	2/19/08	-	Zobell's	2709340	Aug-07	-	-
Saturated O ₂	2/19/08	19:18	Bubbled Nanopure			104.9 @ 20.81	Pass
Zero O ₂	2/19/08	19:28	Oakton	270638	Jun-08	0.03 @ 17.97	Pass

Remarks: ph/ORP probe SN:PP10242 (GWS)
pH/ORP not cal-checked due to field error of values. pH/ ORP sensor covered up during field reading.

Field-Form Filled Out By: GMM Date: 2/20/2008
 QAQC Check By: AJB Date: 3/10/2008

APPENDIX C. ELEVATION SURVEY FORMS

The following form reports the elevation survey information obtained during field sampling.

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-011: Elevation Survey Form

Project ID: North Slope Lakes Site Location/Lake ID: L9312
 Survey Purpose: Water-Level Elevations Date: 2/15/2008 Time: 13:35

Location:	Lake L9312, located southeast of Alpine pad, survey by pump house benchmarks								
Survey objective:	Determine FWS Elevation.					Weather Observations:			
Instrument Type:	LCMF Zeiss Ni2	Instrument ID:	#147298			-15°F, 10-15 mph winds, Clear			
Rod Type:	Fiberglass	Rod ID:	Sokkia Fiber Glass						
Bench Mark Information:						Survey Team Names			
Name	Agency Responsible	Elevation (ft)	Latitude (dd-mm.mmm)	Longitude (ddd-mm.mmm)		Michael Lilly, Matthew Whitman			
L9312"P"	CP	11.72	na	na					
Station	BS (ft)	HI (ft)	FS (ft)	Elevation (fasm)	Distance (ft)	Horizontal Angle	Vertical Angle	Remarks	
TBM "P"	0.590	12.31		11.72				Top of inlet pipe support	
TBM "O"		12.31	0.85	11.46				Top of inlet pipe support. BM Elev=11.46'	
99-32-59		12.31	2.24	14.55				Top of Pumphouse SE VSM. BM Elev = 14.57	
L9312 WL		12.31	5.10	7.21				Water Surface Level	
Turn on L9312 WL									
L9312 WL	5.20	12.41		7.21					
99-32-59		12.41	2.14	14.55				Inverted shot	
TBM"O"		12.41	0.95	11.46					
TBM"P"		12.41	0.69	11.72				close survey to 0.00	

Note:

Abbreviations: backsight, BS; degrees, dd; feet, ft; feet above mean sea level, fasm!; foresight, FS; height of instrument, HI; minutes, mm; seconds, ss; BP Mean Sea Level, BPMSL

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-011: Elevation Survey Form

Project ID: North Slope Lakes Site Location/Lake ID: L9817
 Survey Purpose: Water-Level Elevations Date: 2/17/2008 Time: 16:00

Location:	Near rebar on west side of lake. Water surface elevation taken near sample point #4							
Survey objective:	Lake water elevation survey					Weather Observations:		-15 F, partly cloudy, 10-15 mph winds
Instrument Type:	Leica NA 720		Instrument ID:	5482372 (GWS owned)				
Rod Type:	Craine fiberglass 20'		Rod ID:					
Bench Mark Information:						Survey Team Names		
Name	Agency Responsible	Elevation (ft)	Latitude (dd-mm.mmm)	Longitude (ddd-mm.mmm)		Michael Lilly, Matthew Whitman		
B	nr	54.98	na	na				
Station	BS (ft)	HI (ft)	FS (ft)	Elevation (fasl)	Distance (ft)	Horizontal Angle	Vertical Angle	Remarks
B	4.98	59.96		54.98				rebar survey control
C		59.96	4.03	55.93				rebar survey control
E		59.96	3.62	56.34				rebar survey control
Top of Lake Ice		59.96	7.10	52.86				Near TBM E
Top of 2x2		59.96	6.54	53.42				Near TBM E
Top of Rebar #1		59.96	6.40	53.56				Near TBM E
Outlet Channel Ice		59.96	7.72	52.24				Adjacent to Marking Lath
Top of Lake Ice, Outlet Channel		59.96	7.18	52.78				Top of Ice, 0,5 ft from outlet bank
Water surface		59.96	7.85	52.11				All measuements to water level
								Turn point, moved instrument.
Water surface	8.04	60.15		52.11				L9817 Water Level
Top of Lake Ice, Outlet Channel		60.15	7.37	52.78				Top of Ice, 0,5 ft from outlet bank
Outlet Channel Ice		60.15	7.92	52.23				Adjacent to Marking Lath
Top of Rebar #1		60.15	6.60	53.55				Near TBM E
Top of 2x2		60.15	6.74	53.41				Near TBM E
Top of Lake Ice		60.15	7.30	52.85				Near TBM E
E		60.15	3.81	56.34				rebar survey control
C		60.15	4.22	55.93				rebar survey control
B		60.15	5.17	54.98				Survey closes within 0.00'

Note: Survey control rebar points A, D were not found, Lath missing

Abbreviations: backsight, BS; degrees, dd; feet, ft; feet above mean sea level, fasm; foresight, FS; height of instrument, HI; minutes, mm; seconds, ss; BP Mean Sea Level, BPMSL

University of Alaska Fairbanks, Water and Environmental Research Center

Form F-011: Elevation Survey Form

Project ID: North Slope Lakes Site Location/Lake ID: KDA
 Survey Purpose: Water-Level Elevations Date: 2/18/2008 Time: nr

Location:	KDA1,2,3								
Survey objective:	Lake water elevation survey					Weather Observations:	0F, 60% cloudy, 4 mph winds SW		
Instrument Type:	Leica NA 720	Instrument ID:	5482372 (GWS owned)						
Rod Type:	Craine fiberglass 20'	Rod ID:							
Bench Mark Information:						Survey Team Names			
Name	Agency Responsible	Elevation (ft)	Latitude (dd-mm.mmm)	Longitude (ddd-mm.mmm)	DAR, Matt Whitman				
BM1	nr	19.32	N70 20.048	W148 56.367 (NAD83)					
Station	BS (ft)	HI (ft)	FS (ft)	Elevation (fasl)	Distance (ft)	Horizontal Angle	Vertical Angle	Remarks	
BM1	1.18	20.50		19.32					
KDA3-SH		20.50	14.44	6.06					
KDA2-SHA		20.50	14.44	6.06					
KDA2-ICE		20.50	13.71	6.79					
Move instrument ^2 , turn on KDA2-ICE									
KDA2-ICE	13.59	20.37							
KDA2-SHA		20.37	14.31						
KDA3-SH		20.37	14.31						
BM1		20.37	1.05						
Move instrument ^3 (island) , turn on KDA2-SH									
KDA2-SHB	8.42	14.48		6.06					
KDA1-SH		14.48	6.46	8.02					
KDA1-ICE		14.48	5.60	8.88					
Move to ^4, turn on KDA1-ICE									
KDA1-ICE	5.42	14.30		8.88					
KDA1-SH		14.30	6.28	8.02					
KDA2-SHB		14.30	8.23	6.07					

Note:

Abbreviations: backsight, BS; degrees, dd; feet, ft; feet above mean sea level, fasm; foresight, FS; height of instrument, HI; minutes, mm; seconds, ss; BP Mean Sea Level, BPMSL

University of Alaska Fairbanks, Water and Environmental Research Center
Form F-011: Elevation Survey Form

Project ID: North Slope Lakes Site Location/Lake ID: MSB
 Survey Purpose: Water-Level Elevations Date: 2/19/2008 Time: 17:00

Location:	Mine Site B								
Survey objective:	Lake water elevation survey					Weather Observations:	Clear, 8F, 3mph winds from the East		
Instrument Type:	Leica NA 720	Instrument ID:	5482332						
Rod Type:	Craine fiberglass 20'	Rod ID:							
Bench Mark Information:						Survey Team Names			
Name	Agency Responsible	Elevation (ft)	Latitude (dd-mm.mmm)	Longitude (ddd-mm.mmm)		DAR, Matt Whitman			
TBM1	nr	100	N70 20.048	W148 56.367 (NAD83)					
Station	BS (ft)	HI (ft)	FS (ft)	Elevation (fasi)	Distance (ft)	Horizontal Angle	Vertical Angle	Remarks	
TBM 1	5.72	105.72		100.00					
MSBN-SHA		105.72	11.82	93.90					
VSMS		105.72	1.91	103.81				11/17/06 103.882	
VSMN		105.72	2.27	103.45					
VSM CUT		105.72	4.42	101.303					
Turn on VSM_Cut move ^2									
VSM CUT	0.16	105.46		101.30					
VSM-N		105.46	2.01	103.45					
VSM-S		105.46	1.64	103.82					
MSBN-SHA		105.46	11.558	93.9					
TBM1		105.46	5.46	100.00				close survey to 0.002	
Move to island ^3, turn on MSBS -WS									
MSBN-SHB	7.64	101.54		93.90				Elevation from MSBN-SHA	
MSBS-SH		101.54	7.32	94.23					
MSBS-ICE		101.54	6.69	94.584					
Turn on Ice move to ^4									
MSBN-ICE	6.42	101.27		94.85					
MSBS-SH		101.27	7.04	94.23					
MSBN-SHB		101.27	7.36	93.91				close elevation to + 0.007	

Note:

Abbreviations: backsight, BS; degrees, dd; feet, ft; feet above mean sea level, fasm; foresight, FS; height of instrument, HI; minutes, mm; seconds, ss; BP Mean Sea Level, BPMSL

APPENDIX D. SNOW SURVEY FORMS

The following forms report the snow survey information obtained during field sampling.

University of Alaska Fairbanks, Water and Environmental Research Center
Form F-012: Snow Depth and Water Content Survey Form

Project ID: North Slope Lakes Site Location/Lake ID: L9312_Raft_B
 Survey Purpose: Determine snow water equivalent Date: 2/15/2008 Time: 12:00

Location Description:	Started 5 meters north of "Raft B" on L9312. Travelled 25 meters northerly towards Raft A. Turned left 90° and travelled 25 meters west to end point.				
Survey objective:	Determine Snow Water Equivalent			Weather Observations:	-10°F, 10 mph winds, partly cloudy
Latitude:	N 70° 19.995'	Longitude:	W 150° 56.918'	Datum:	NAD 83
Elevation:	7 ft	Elevation Datum:	BPMSL	Reference Markers:	Raft B is marked with lathe
Drainage Basin:	Lake L9312	Slope Direction:	Flat	Vegetation Type:	Ice
Slope Angle:	Flat	Access Notes:	Snowmobile	Other:	
Snow Depth Probe Type:	T-handle probe			Snow-Survey Team Names	
Snow Tube Type:	Arinodack snow tube			Michael Lilly, Matthew Whitman, DAR	

Snow Course Depths, in cm.

	1	2	3	4	5
1	20.0	5.5	11.5	11.0	9.0
2	19.0	3.5	12.0	13.5	10.0
3	12.5	5.0	10.0	12.0	14.0
4	10.0	9.5	9.0	9.0	25.0
5	11.0	10.5	7.0	10.0	11.0
6	10.5	8.5	7.0	8.5	14.0
7	12.0	10.5	6.5	10.0	8.5
8	13.0	10.0	9.0	11.0	9.0
9	13.0	7.5	10.0	13.0	16.0
10	9.0	9.0	10.0	14.0	13.5

(cm)

Average snow depth = 10.9
 Maximum snow depth = 25.0
 Minimum snow depth = 3.5
 Standard variation = 3.7

Snow Sample Depths and Weights

Bag #	Depth (cm)	Weight (gr)	Volume (cm ³)	Density (gr/cm ³)
L1	10	80.3	357.0	0.22
L2	12	122.8	428.4	0.29
L3	11	151.3	392.7	0.39
L4	14	161.9	499.8	0.32
L5	12	123.3	428.4	0.29

Average Density = 0.30
 Average Snow Water Equivalent (SWE) = 3.3 cm H2O
 Average Snow Water Equivalent = 1.29 inches H2O
 Average Snow Water Equivalent = 0.11 feet H2O

SWE = avg. snow depth*(density snow/density water)

University of Alaska Fairbanks, Water and Environmental Research Center
Form F-012: Snow Depth and Water Content Survey Form

Project ID: North Slope Lakes Site Location/Lake ID: KDA
 Survey Purpose: Determine snow water equivalent Date: 2/18/2008 Time: 15:30

Location Description:	50m South x 50m East				
Survey objective:	Determine Snow Water Equivalent			Weather Observations:	0°F, 4 mph winds out of SW, 60% cloudy
Latitude:	70 20.048	Longitude:	148 56.048	Datum:	NAD 83
Elevation:	7 ft	Elevation Datum:	BPMSL	Reference Markers:	nr
Drainage Basin:	nr	Slope Direction:	Flat	Vegetation Type:	Ice
Slope Angle:	Flat	Access Notes:	Snowmobile	Other:	
Snow Depth Probe Type:	T-handle probe			Snow-Survey Team Names	
Snow Tube Type:	Arinodack snow tube			Matthew Whitman, DAR	

Snow Course Depths, in cm.

	1	2	3	4	5
1	2.0	0.0	0.0	0.0	0.0
2	0.0	0.0	1.5	2.0	1.5
3	1.0	2.5	0.0	1.0	0.5
4	0.5	0.0	0.0	0.0	0.0
5	2.0	1.0	1.5	0.5	0.0
6	3.0	4.5	0.5	0.0	0.0
7	0.0	0.0	0.0	0.0	1.5
8	2.0	0.5	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	1.0	0.0

(cm)
 Average snow depth = 0.6
 Maximum snow depth = 4.5
 Minimum snow depth = 0.0
 Standard variation = 1.0

Snow Sample Depths and Weights

Bag #	Depth (cm)	Weight (gr)	Volume (cm ³)	Density (gr/cm ³)
no densities taken				

Average Density = _____
 Average Snow Water Equivalent (SWE) = _____ cm H2O
 Average Snow Water Equivalent = _____ inches H2O
 Average Snow Water Equivalent = _____ feet H2O

SWE = avg. snow depth*(density snow/density water)

University of Alaska Fairbanks, Water and Environmental Research Center
Form F-012: Snow Depth and Water Content Survey Form

Project ID: North Slope Lakes Site Location/Lake ID: MSBN-CT
 Survey Purpose: Determine snow water equivalent Date: 2/19/2008 Time: 15:30

Location Description:	Starting at center, West 25m, South 25m				
Survey objective:	Determine Snow Water Equivalent			Weather Observations:	-8°F, calm, mostly sunny
Latitude:	N70°19.280'	Longitude:	W149°24.009'	Datum:	NAD83
Elevation:	7 ft	Elevation Datum:	BPMSL	Reference Markers:	nr
Drainage Basin:	generally drains SE	Slope Direction:	Flat	Vegetation Type:	tussocks tundra
Slope Angle:	Flat	Access Notes:	nr	Other:	
Snow Depth Probe Type:	T-handle probe			Snow-Survey Team Names	
Snow Tube Type:	Arinodack snow tube			Matthew Whitman, DAR	

Snow Course Depths, in cm.

	1	2	3	4	5
1	3.0	1.5	13.0	4.0	0.0
2	0.0	2.0	9.0	1.0	0.0
3	0.0	4.0	9.0	1.0	0.0
4	1.0	2.5	11.0	1.0	0.0
5	1.0	5.5	12.0	1.0	1.0
6	0.0	5.0	11.0	2.0	1.0
7	1.0	3.0	10.0	2.0	0.0
8	0.0	5.5	11.0	2.0	0.0
9	2.0	11.0	12.0	0.0	0.0
10	1.5	15.0	11.0	0.0	1.0

(cm)
 Average snow depth = 3.8
 Maximum snow depth = 15.0
 Minimum snow depth = 0.0
 Standard variation = 4.5

Snow Sample Depths and Weights

Bag #	Depth (cm)	Weight (gr)	Volume (cm ³)	Density (gr/cm ³)
AW1	10	133.5	357.0	0.37
A2	11.5	171.9	410.6	0.42
A3	6	40.0	214.2	0.19
A4	9	71.3	321.3	0.22
A5	15.5	229.5	553.4	0.41

Average Density = 0.32
 Average Snow Water Equivalent (SWE) = 1.2 cm H2O
 Average Snow Water Equivalent = 0.48 inches H2O
 Average Snow Water Equivalent = 0.04 feet H2O

SWE = avg. snow depth*(density snow/density water)

University of Alaska Fairbanks, Water and Environmental Research Center
Form F-012: Snow Depth and Water Content Survey Form

Project ID: North Slope Lakes Site Location/Lake ID: MSBN-Tun
 Survey Purpose: Determine snow water equivalent Date: 2/19/2008 Time: 16:00

Location Description:	Located at MSBN-TUN stake West 25m x South 25m				
Survey objective:	Determine Snow Water Equivalent			Weather Observations:	-8°F, calm, mostly sunny
Latitude:	nr	Longitude:	nr	Datum:	nr
Elevation:	7 ft	Elevation Datum:	BPMSL	Reference Markers:	nr
Drainage Basin:	generally drains SE	Slope Direction:	Flat	Vegetation Type:	tussocks tundra
Slope Angle:	Flat	Access Notes:	nr	Other:	
Snow Depth Probe Type:	T-handle probe			Snow-Survey Team Names	
Snow Tube Type:	Arinodack snow tube			Matthew Whitman, DAR	

Snow Course Depths, in cm.

	1	2	3	4	5
1	39.0	34.5	22.0	9.5	37.0
2	42.0	33.5	24.5	18.5	37.0
3	33.5	35.0	14.0	28.0	34.5
4	31.5	41.0	13.0	23.0	35.0
5	31.0	42.0	14.0	19.0	23.0
6	30.5	37.5	14.0	25.0	8.0
7	35.0	27.0	17.0	14.5	6.5
8	47.0	20.5	12.0	16.0	12.5
9	46.0	24.5	14.0	14.0	20.0
10	38.0	21.0	14.5	32.0	38.5

(cm)
 Average snow depth = 26.0
 Maximum snow depth = 47.0
 Minimum snow depth = 6.5
 Standard variation = 11.0

Snow Sample Depths and Weights

Bag #	Depth (cm)	Weight (gr)	Volume (cm ³)	Density (gr/cm ³)
V1	35.5	467.3	1267.4	0.37
V2	27.5	319.5	981.8	0.33
V3	19.5	115.9	696.2	0.17
V4	19.5	179.9	696.2	0.26
V5	30	259.6	1071.0	0.24

Average Density = 0.27
 Average Snow Water Equivalent (SWE) = 7.1 cm H₂O
 Average Snow Water Equivalent = 2.79 inches H₂O
 Average Snow Water Equivalent = 0.23 feet H₂O

SWE = avg. snow depth*(density snow/density water)

University of Alaska Fairbanks, Water and Environmental Research Center
Form F-012: Snow Depth and Water Content Survey Form

Project ID: North Slope Lakes Site Location/Lake ID: Betty Pingo
 Survey Purpose: Determine snow water equivalent Date: 2/20/2008 Time: nr

Location Description:	Started East, turn North 25m x 25m.				
Survey objective:	Determine Snow Water Equivalent			Weather Observations:	nr
Latitude:	N70°16.772'	Longitude:	W148°53.741'	Datum:	NAD83
Elevation:	nr	Elevation Datum:	BPMSL	Reference Markers:	nr
Drainage Basin:	nr	Slope Direction:	Flat	Vegetation Type:	nr
Slope Angle:	Flat	Access Notes:	nr	Other:	
Snow Depth Probe Type:	T-handle probe			Snow-Survey Team Names	
Snow Tube Type:	Arinodack snow tube			Matthew Whitman, DAR	

Snow Course Depths, in cm.

	1	2	3	4	5
1	46.0	11.0	26.5	17.0	31.0
2	42.5	21.0	30.0	11.0	27.5
3	18.0	17.0	30.5	19.0	33.0
4	16.0	20.5	34.0	25.0	22.0
5	13.0	18.0	26.0	21.5	36.0
6	14.5	18.0	15.0	19.0	33.0
7	15.0	16.0	18.0	37.5	23.0
8	25.0	23.0	14.0	17.0	19.0
9	24.0	23.5	10.0	24.0	13.0
10	17.0	29.0	8.0	29.0	12.0

(cm)
 Average snow depth = 22.2
 Maximum snow depth = 46.0
 Minimum snow depth = 8.0
 Standard variation = 8.5

Snow Sample Depths and Weights

Bag #	Depth (cm)	Weight (gr)	Volume (cm ³)	Density (gr/cm ³)
F1	36	374.3	1285.2	0.29
F2	18	160.2	642.6	0.25
F3	18	136.6	642.6	0.21
F4	22	239.2	785.4	0.30
F5	27	288.0	963.9	0.30

Average Density = 0.27
 Average Snow Water Equivalent (SWE) = 6.0 cm H2O
 Average Snow Water Equivalent = 2.37 inches H2O
 Average Snow Water Equivalent = 0.20 feet H2O

SWE = avg. snow depth*(density snow/density water)