Lake Chemistry and Physical Data For Selected North Slope, Alaska, Lakes: January 2006

Drilling sampling hole on Alpine- L9312, Photo by D. Reichardt..

by

Kristie Hilton, Dan Reichardt, Michael Lilly, and Daniel White

March 2007

North Slope Lakes Hydrologic Modeling Project

Report No. INE/WERC 06.04

Lake Chemistry and Physical Data For Selected North Slope, Alaska, Lakes: January 2006

by

Kristie Hilton[1], Dan Reichardt[2], Michael Lilly[1], and Daniel White[2]

A report on research sponsored by the

Alaska Department of Energy, National Energy Technology Laboratory, BP Exploration (Alaska) Inc., ConocoPhillips Alaska, Inc., and the Bureau of Land Management.

March 2007

North Slope Lakes Hydrologic Modeling Project

Report Number INE/WERC 06.04

[1]Geo-Watersheds Scientific
[2]University of Alaska Fairbanks, Water and Environmental Research Center

Recommended Citation:

Hilton, K.M., Reichardt, D., Lilly, M.R., and White, D.M., 2007. Lake chemistry and physical data for selected North Slope, Alaska, lakes: January 2006. University of Alaska Fairbanks, Water and Environmental Research Center, Report INE/WERC 06.04, Fairbanks, Alaska, 9 p.

Fairbanks, Alaska
March 2007

For additional copies write to:

Publications,
Water and Environmental Research Center
University of Alaska Fairbanks
Fairbanks, Alaska 99775
www.uaf.edu/water/

For Project Information write to:

Daniel White- Project Manager
Box 5860, WERC, UAF
Fairbanks, AK 99775-5860
907-474-6222, ffdmw@uaf.edu

TABLE OF CONTENTS

LIST OF FIGURES

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), 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, 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
	Length	
inch (in.)	25.4	millimeter (mm)
inch (in.)	2.54	centimeter (cm)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
	Area	
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)
	Volume	
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)
	Velocity and Discharge	
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)
	Hydraulic Conductivity	
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)
	Hydraulic Gradient	
foot per foot (ft/ft)	5280	foot per mile (ft/mi)
foot per mile (ft/mi)	0.1894	meter per kilometer (m/km)
	Pressure	
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 value in cubic meters per second (m^3/s) in parentheses.

Physical and Chemical Water-Quality Units:

Temperature:

Water and air temperature is given in degrees Celsius (°C) and in degrees Fahrenheit (°F). Degrees Celsius can be converted to degrees Fahrenheit by use of the following equation:

$$°F = 1.8(°C) + 32$$

Electrical Conductance (Actual Conductivity and Specific Conductance):

In this report conductivity of water is expressed as Actual Conductivity [AC] in microSiemens per centimeter (µS/cm). This unit is equivalent to micromhos per centimeter. Elsewhere, conductivity is commonly expressed as Specific Conductance at 25°C [SC25] in µS/cm which is temperature corrected. To convert AC to SC25 the following equation can be used:

$$SC25 = \frac{AC}{1 + r(T - 25)}$$

where:

SC25 = Specific Conductance at 25°C, in µS/cm

AC = Actual Conductivity, in µS/cm

R = temperature correction coefficient for the sample, in °C

T = temperature of the sample, in °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 (ppm).

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 (^{o}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
NWIS	National Water Information System
ORP	oxygen-reduction potential
ppm	parts per million, equivalent to mg/L
SC25	specific conductance at 25^{o}C
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

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.

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

ACKNOWLEDGEMENTS

This project was funded by cooperative agreement number DE-FC26_01NT41248, from the U.S. Department of Energy's (DOE) Arctic Energy Office to the University of Alaska- Fairbanks Arctic Energy Technology Development Laboratory (AETDL). Field coordination and logistics support were provided by BP Exploration (Alaska) Inc. and ConocoPhillips Alaska. Additional support was provided by other project cooperators, Geo-Watersheds Scientific (GWS), North Slope Borough, Bureau of Land Management (BLM), and National Weather Service in the form of financial and in-kind match.

Lake Chemistry and Physical Data For Selected North Slope, Alaska, Lakes: January 2006

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 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 unpumped lake in the Kuparuk oilfield and is sampled on selected field trips during the year. L9312 is a pumped lake studied in the Alpine operations area. L9817 is a natural lake in eastern NPRA, west of Nuiqsut. This lake has been used in previous years for ice-road construction, but was not used during winter 2005-06. Two new reservoir systems (former mine sites) were included in the study in 2005. Mine Site B 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 9 reservoirs. The three southernmost reservoir cells (1-3) are included in the study to observe ground-water and surface-water interactions between each cell and the adjacent Kuparuk River.

Water-quality data is collected during monthly visits to the lakes and samples are collected for further analysis in UAF-WERC chemistry laboratories.

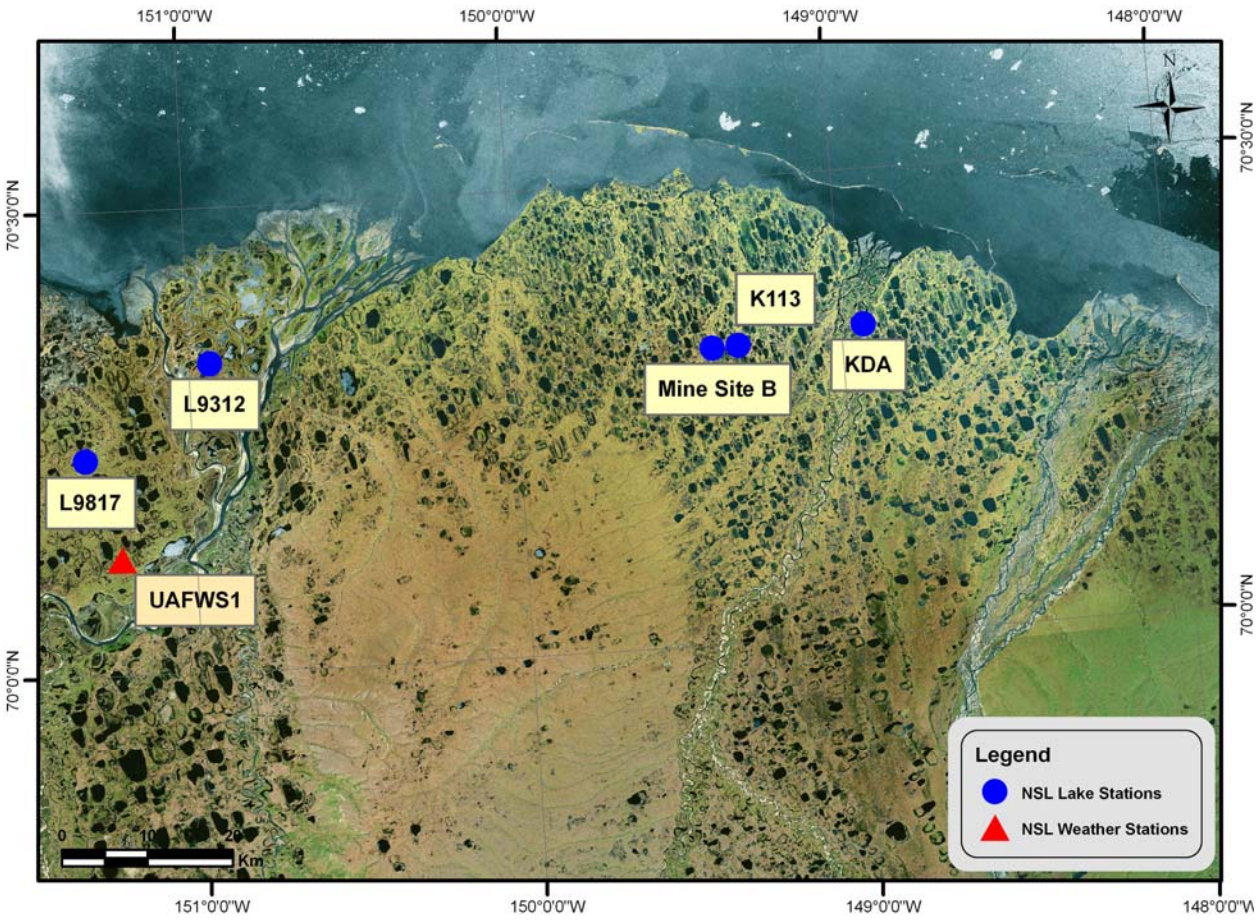

Figure 1. Location of study lakes in the NPRA, Alpine, Kuparuk, and Prudhoe Bay field operating area, North Slope, Alaska.

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. 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, 2006). In January, we focused on the following locations/tasks:

1. Kuparuk Dead Arm Reservoirs: Prudhoe Bay operating area.
   - KDA-1, KDA-2, and KDA-3.
   - Survey water levels to local elevation control.

- Measure snow depth, ice thickness, and field water quality parameters.
- Collect water samples for analysis.
- Hydrologic assessment of watershed area.

2. Mine Site B: Prudhoe Bay operating area.
   - North Cell, South Cell, and stream junction.
   - Survey water levels to local elevation control.
   - Measure snow depth, ice thickness, and field water quality parameters.
   - Collect water samples for analysis.
   - Conduct snow survey.
   - Hydrologic assessment of watershed area.

3. K113: Kuparuk operating area.
   - Measure snow depth, ice thickness, and field water quality parameters.
   - Collect water samples for analysis.
   - Conduct snow survey.
   - Hydrologic assessment of watershed area.

4. L9817: Eastern NPR-A
   - Survey water levels to local elevation control.
   - Measure snow depth, ice thickness, and field water quality parameters.
   - Collect water samples for analysis.
   - Conduct snow survey.
   - Hydrologic assessment of watershed area.

5. L9312: Alpine operating area.
   - Survey water levels to local elevation control.
   - Measure snow depth, ice thickness, and field water quality parameters.
   - Collect water samples for analysis.
   - Conduct snow survey.

- Hydrologic assessment of watershed area.

PROCEDURES

All field work follows the specified health, safety, and environmental guidelines outlined by BPX and CPA (White and Lilly, 2006*a,b,c*). Using a gas powered auger, holes were drilled through the ice at specified locations at each study lake. Physical measurements of water depth (top of water to bottom of lake), ice thickness (top of ice to bottom of ice), freeboard (top of water to top of ice), and snow depth (top of ice to top of snow), were taken at each sampling location. Water quality parameters such as temperature, pH, conductivity, and dissolved oxygen (DO) were obtained by using an In-Situ Troll 9000 (submersible meter), at several depths throughout the water column. The precision with which physical measurements were reported takes into account field conditions, and the calibration of each parameter was checked before and after each day of sampling. To pass the calibration check, pH had to be within 0.2 pH units, turbidity had to be within 2 NTU, and ORP, DO, and conductivity had to be within 10% of the calibration standard value. Water samples were also taken at 3 depths (1 ft. below bottom of ice, middle of water column, and 1 ft. above lake bottom). Some of these samples were preserved for further analysis at UAF, while other samples were analyzed with a Hach spectrophotometer while still at the facility. Chemistry analysis will be addressed in a separate report.

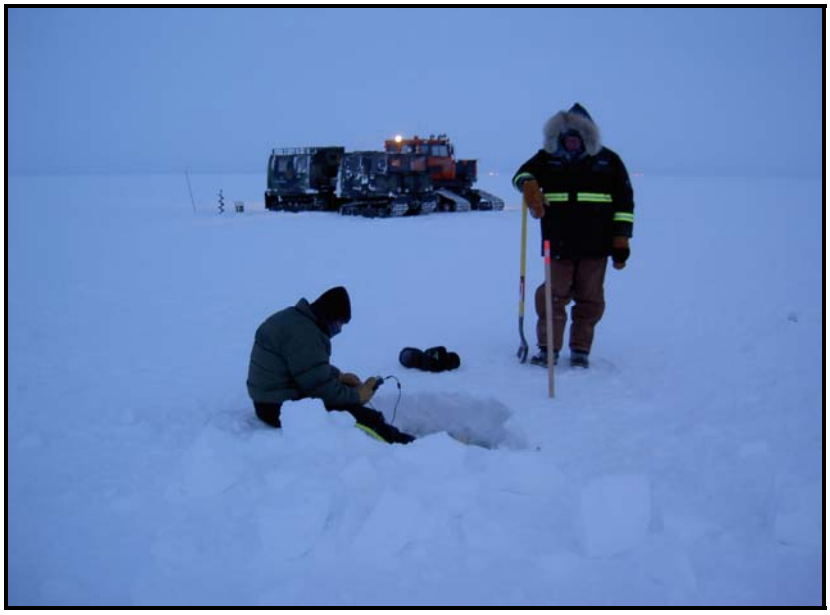

Figure 2. Water-quality sampling at Alpine-L9817, Photo by D. Reichardt.

SELECTED RESULTS

All of the sampling locations showed an increase in temperature and a decrease in oxygen levels towards the lake bottom, as well as pH levels around 7.0 throughout the water column. DO was generally higher, and conductivity was slightly lower at L9312 when compared to L9817. At L9312-B and at L9817-1, 2, there was a slight decrease in pH as the probe got closer to the bottom, with a relatively sharp increase at the lake bottom. The most likely explanation is the result of chemical properties at the soil/water interface. Noticeable pH change was not observed in the L9817-3, 4 locations because the probe did not get close enough to the lake bottom to detect the soil/water interface. The most notable difference between L9312 and L9817 is the DO levels. At L9312 there were readings above 15 mg/L, whereas at L9817 the highest reading was approximately 12 mg/L.

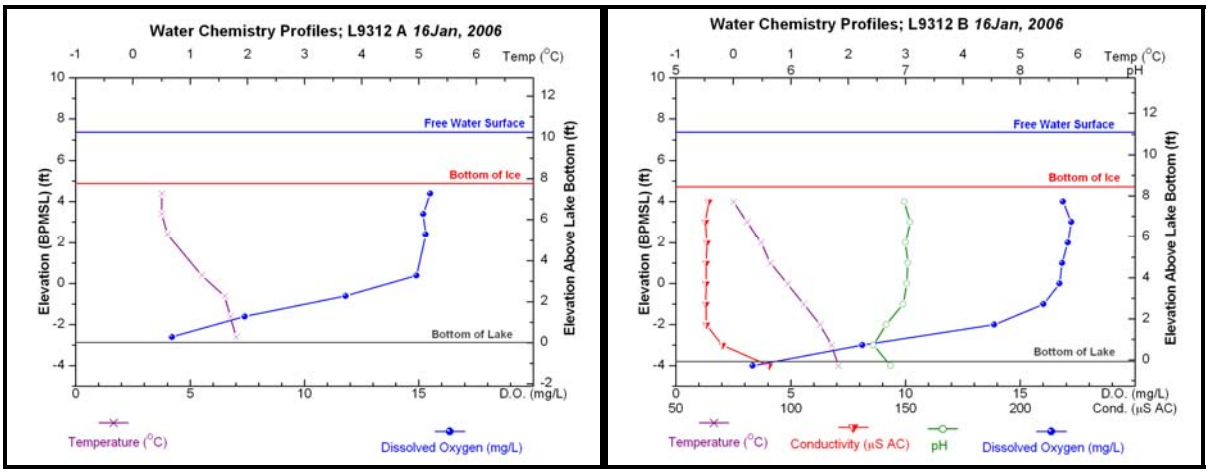

Figure 3. Water chemistry profiles of L9312.

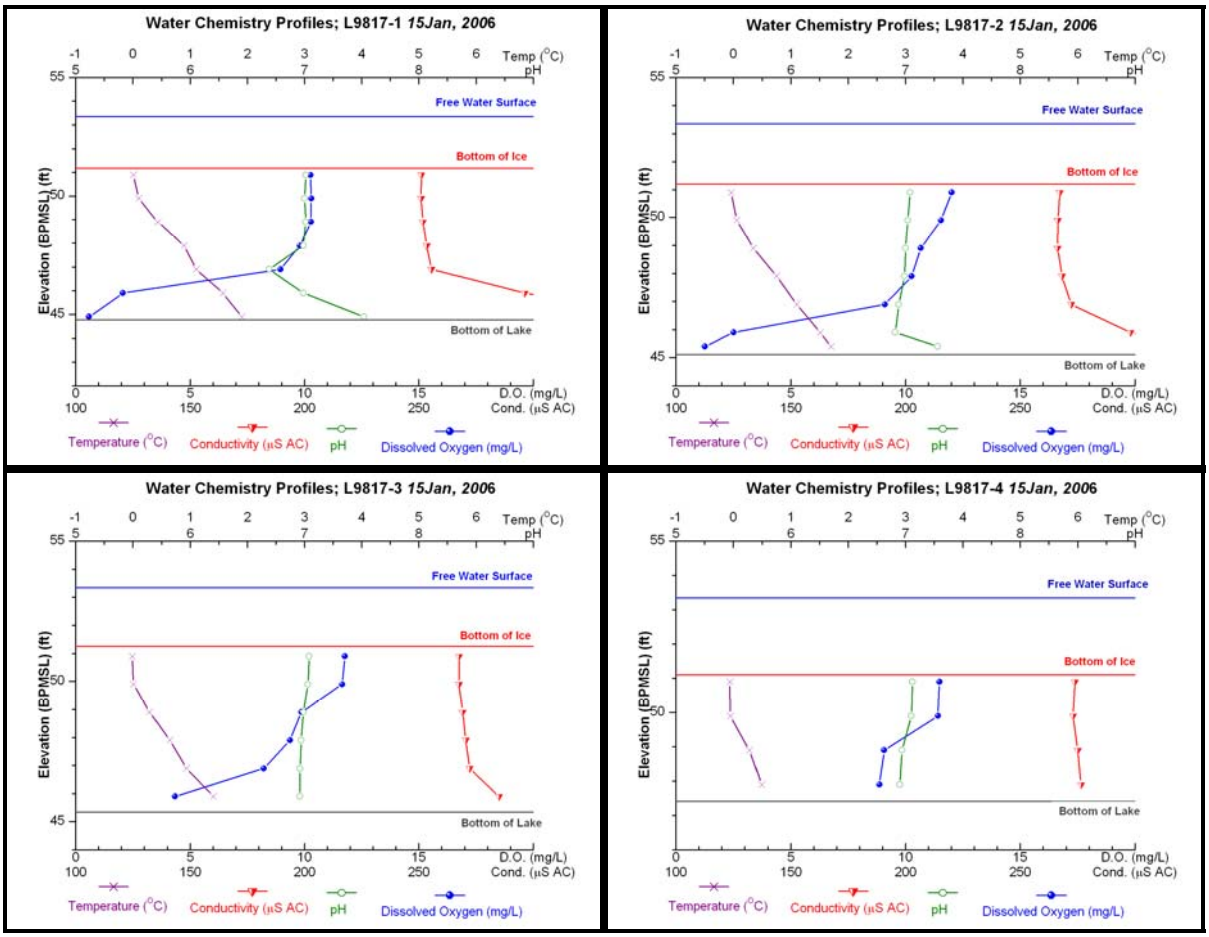

Figure 4. Water chemistry profiles of L9817.

At the Kuparuk Deadarm Reservoirs high DO levels were observed throughout the water column, with a decrease towards the lake bottom. The concentration of DO throughout the water column was quite different than at Mine Site B, where a gradual decrease in oxygen was measured near the lake bottom. In addition, conductivity was also much lower at the Kuparuk Deadarm locations in comparison to the Mine Site B. The pH levels at both locations decreased slightly at the bottom; however the change was observed over a larger depth at Mine Site B. The pH at the two mine sites was also higher than those observed at either L9312 or L9817. At K113 there was relatively high DO and conductivity, with a sharp decrease in oxygen and increase in conductivity at the bottom. The pH remained stable throughout the water column, but increased at the bottom. A similar observation was observed at L9817, which could be a result of the substrate and subsequent chemical properties of the bottom.

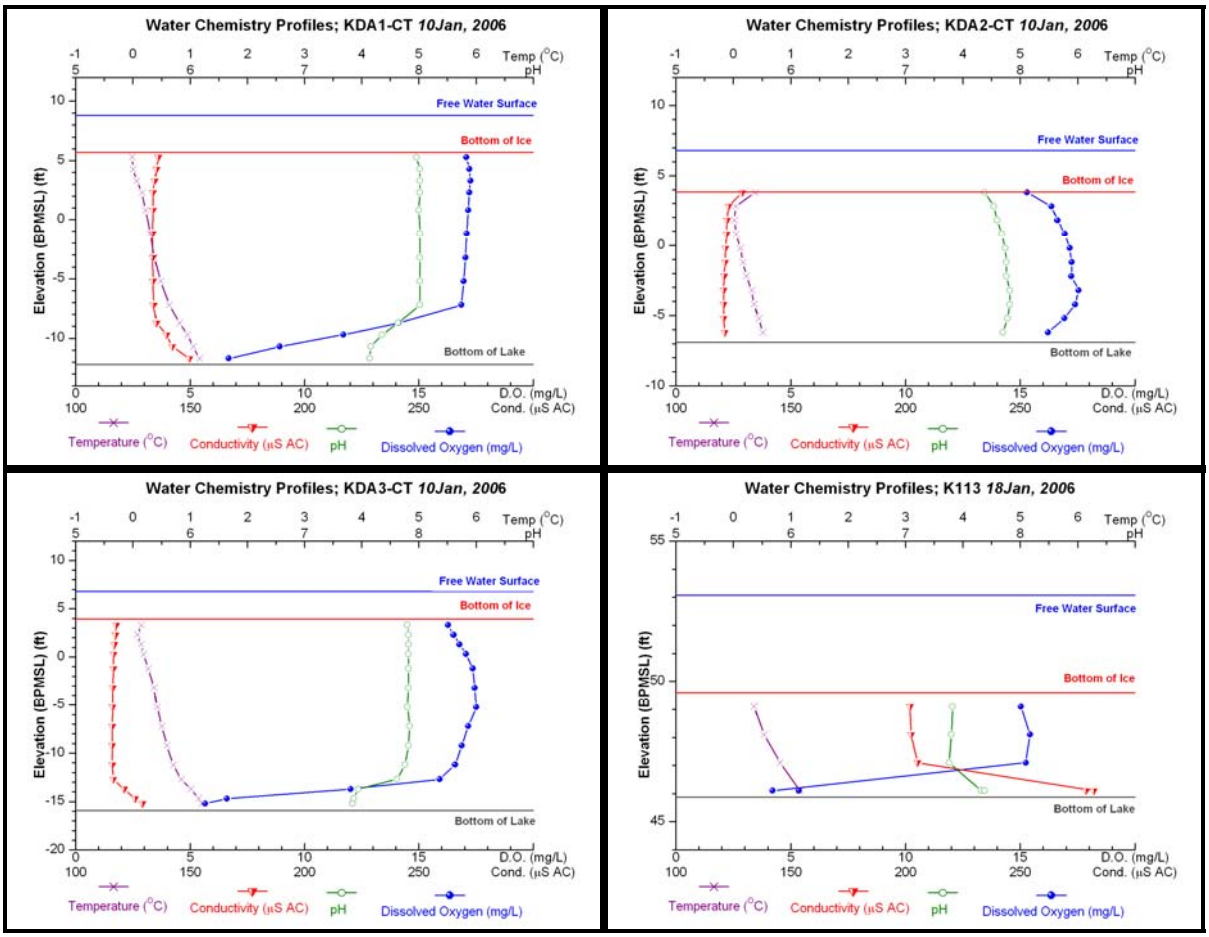

Figure 5. Water chemistry profiles of Kuparuk Deadarm Reservoirs 1-3 and K113.

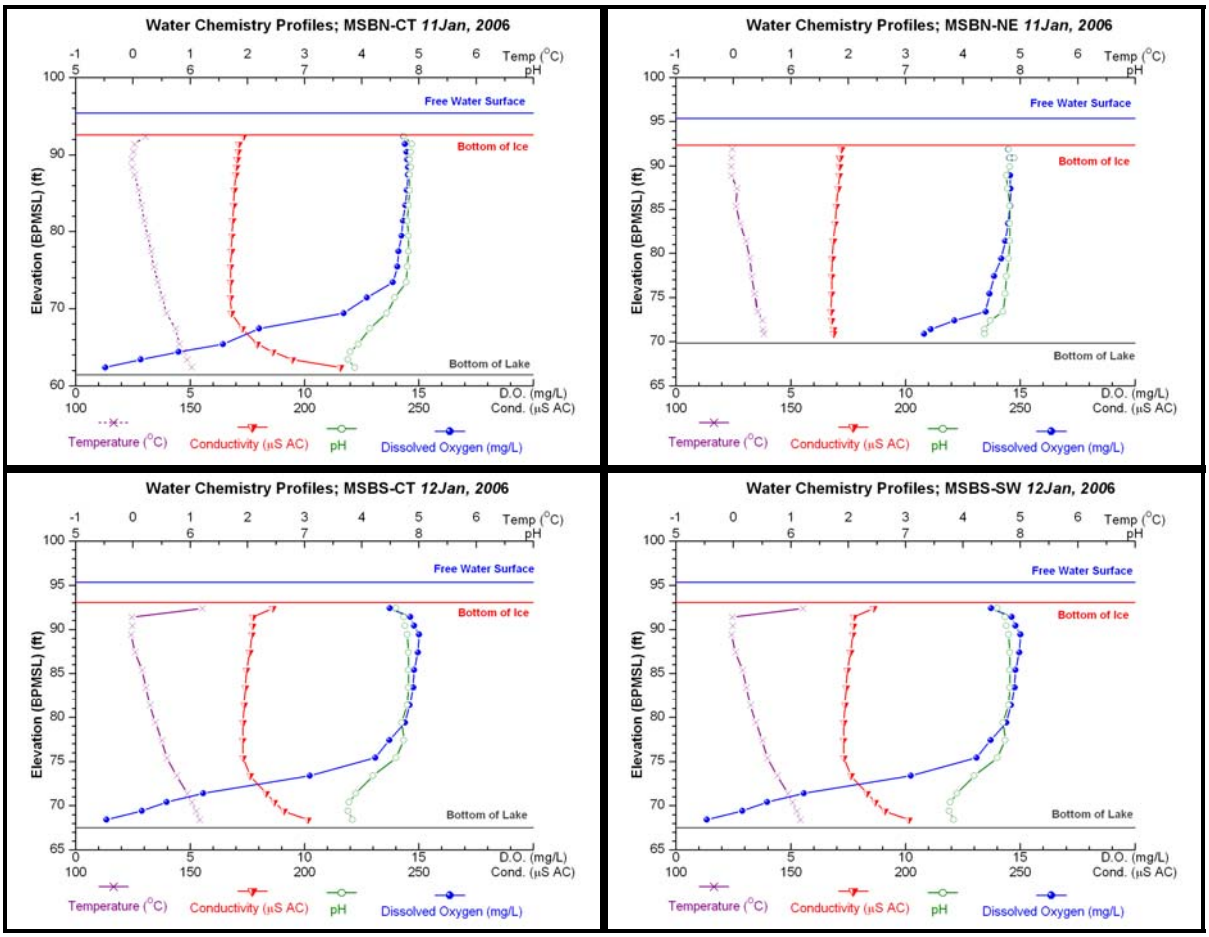

Figure 6. Water chemistry profiles of Mine Site B, north and south cells.

SUMMARY

Continuous monitoring of the water-quality parameters seen in North Slope lakes throughout the winter will help in the understanding and development of simulation tools necessary for water resource management. As water levels change due to freezing and pumping activities in the winter, it is important to identify the changing water chemistry as well as the potential spring recharge. This information is important 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 hope to answer some of the questions brought forth on the effects of mid-winter pumping of North Slope tundra lakes.

REFERENCES

Lilly, M.R., Reichardt, D., White, D.M., 2006. A Workplan for Chemistry Sampling and Surveying at Mine Site B and Kuparuk Deadarm Lakes: January 2006. Water and Environmental Research Center, University of Alaska Fairbanks. 13 p.

White, D.M., and Lilly, M.R. 2006*a*. BPX: Health, Safety, and Environmental Interface Document. Water and Environmental Research Center, University of Alaska Fairbanks. 4 p.

White, D.M., and Lilly, M.R. 2006*b*. BPX: Health, Safety, and Environmental Plan. Water and Environmental Research Center, University of Alaska Fairbanks. 6 p.

White, D.M., and Lilly, M.R. 2006*c*. Conoco Phillips Alaska, Inc.: Health, Safety, and Environmental Plan. Water and Environmental Research Center, University of Alaska Fairbanks. 5 p.

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
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: 1/10/06 Time: 16:53

FIELD MEASUREMENTS

GPS Coord. Northing: N70.33181 Easting: W148.94644 Datum: WGS84

Measurements By: Reichardt Time: 16:53

Water Depth (ft): 21 Ice Thickness (ft): 3.29

Freeboard (ft): 0.18 Snow Depth (ft): 0.45

Elev. (BPMSL): 8.81 +/- .02 Survey By: DAR Date: 1/10/06 Time: nr

Water Sampling By: DAR/MC Sample Depths BWS (ft): 1 4 Date: 01/10/06 Time: 18:00

2 12

3 20.5

WATER QUALITY METER INFORMATION

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
DO, pH, temp, pressure, cond., turb.	GWS	In-Situ Troll 9000	33033	yes	yes

Parameters											
Time:	16:57	17:02	17:05	17:08	17:09	17:11	17:14	17:16	17:18	17:23	
Depth BWS (ft):	3.5	4.5	5.5	6.5	8.0	10.0	12.0	14.0	16.0	17.5	
Temp (°C):	-0.01	0.00	0.07	0.16	0.22	0.31	0.37	0.48	0.63	0.81	
pH:	7.98	8.01	8.01	8.01	8.00	8.01	8.01	8.01	8.01	7.82	
Barometeric (mmHg):	755.5	755.5	755.5	755.5	755.5	755.6	755.6	755.7	755.8	755.8	
Pressure (kPa):	8.987	11.678	14.991	17.388	22.285	28.138	34.263	40.258	46.126	50.794	
Conductivity (µS/cm):	136.0	135.3	134.4	133.8	133.8	133.6	133.7	133.8	134.0	135.2	
RDO (ppm):	17.07	17.19	17.24	17.19	17.15	17.08	17.03	16.94	16.85	14.12	
Turbidity (NTU):	-0.3	-0.3	-0.4	-0.3	-0.3	-0.3	-0.3	-0.4	-0.4	-0.3	
ORP	270	265	263	262	262	260	260	259	258	261	
Hach Temp (°C):											
Hach LDO											

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): 4**			**Depth BWS (ft): 12**			**Depth BWS (ft): 20.5**			**Method**	**Detection range**
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3		
Oxygen (mg/L)	*14.2			*14.3			5.4			Hach spec	0.3-15 mg/L
Alkalinity (mg/L as $CaCO_3$)	108/ 98	95	94	94/ 94	92	94	118	118	119	Digital titrator	10-4000 mg/L as CaCO3
Nitrite (mg/L NO_2^--N)	0.004	0.003	0.009	0.005	0.003	0.004	0.005	0.005	0.007	Hach spec	0.002-0.300 mg/L NO_2^--N
Ammonia (mg/L NH_3-N)	-0.01	-0.01	0	-0.01	-0.02	-0.01	0.32	0.32	0.3	Hach spec	0.01-0.50 mg/L NH_3-N
Total iron--UF (mg/L)	0.01	0.01	0.01	0.01	0.01	0.01	0.05	0.07	0.05	Hach spec	0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)	0.02	0.01	0.01	0.01	0.01	0.02	0.05	0.07	0.05	Hach spec	0.02-3.00 mg/L

Remarks: Center of lake. *Nanopure water used as blank when sample should have been used, 12ft sample reads as 0.2 mg/L relative to blank after appropriate re-zeroing, samples read: 14.0, 14.1, and Over Range respectively. Alkalinity was repeated to verify results.

Field-Form Filled Out By: Hilton Date: 2/15/06

QAQC Check By: St. Amand Date: 3/12/06

University of Alaska Fairbanks, Water and Environmental Research Center
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: 1/10/06 Time: 16:53

FIELD MEASUREMENTS

GPS Coord. Northing: N70.33181 Easting: W148.94644 Datum: WGS84
Measurements By: Reichardt Time: 16:53
Water Depth (ft): 21 Ice Thickness (ft): 3.29
Freeboard (ft): 0.18 Snow Depth (ft): 0.45
Elev. (BPMSL): 8.81 +/- .02 Survey By: DAR Date: 1/10/06 Time: nr
Water Sampling By: DAR/MC Sample Depths BWS (ft): 1 4 Date: 01/10/06 Time: 18:00
2 12
3 20.5

WATER QUALITY METER INFORMATION

Parameter (s)	Owner	Meter Make/Model			Serial No.				Pre-Sampling QAQC Check		Post-Sampling QAQC Check
DO, pH, temp, pressure, cond., turb.	GWS	In-Situ Troll 9000			33033				yes		yes
Parameters	**Field Measurements**										
Time:	17:32	17:38	17:44	17:50							
Depth BWS (ft):	18.5	19.5	20.5	12.0							
Temp (°C):	0.95	1.05	1.16	0.47							
pH:	7.68	7.58	7.57	8.02							
Barometeric (mmHg):	755.8	755.9	755.9	755.7							
Pressure (kPa):	53.714	56.724	59.562	33.996							
Conductivity (µS/cm):	139.6	142.1	149.6	133.7							
RDO (ppm):	11.70	8.92	6.68	16.54							
Turbidity (NTU):	-0.20	-0.30	-0.20	-0.30							
ORP	266	267	268	253							
Hach Temp (°C):											
Hach LDO											

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	Detection range
	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 CaCO3
Nitrite (mg/L NO_2^--N)										Hach spec	0.002-0.300 mg/L NO_2^--N
Ammonia (mg/L NH_3-N)										Hach spec	0.01-0.50 mg/L NH_3-N
Total iron--UF (mg/L)										Hach spec	0.02-3.00 mg/L
Ferrous (II) Iron--F tot Fe (mg/L)										Hach spec	0.02-3.00 mg/L

Remarks:

Field-Form Filled Out By: Hilton Date: 2/15/06
QAQC Check By: St. Amand Date: 3/12/06

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: KDA2

Sample Purpose: **Lake Water Quality** Date: 1/10/06 Time: 13:01

FIELD MEASUREMENTS

GPS Coord. Northing: N70.33296 Easting: W148.94077 Datum: WGS84

Measurements By: Reichardt Time: 13:01

Water Depth (ft): 13.7 Ice Thickness (ft): 3

Freeboard (ft): 0.02 Snow Depth (ft): nr

Elev. (BPMSL): 6.81 +/- .02 Survey By: DAR/ML Date: 1/10/06 Time: nr

Water Sampling By: Reichardt Sample Depths BWS (ft): 1 3.5 Date: 01/10/06 Time: nr

2 8

WATER QUALITY METER INFORMATION 3 13

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
DO, pH, temp, pressure, cond., turb.	GWS	In-Situ Troll 9000	33033	yes	yes

Parameters										
Time:	13:14	13:19	13:22	13:25	13:27	13:29	13:30	13:34	13:38	13:40
Depth BWS (ft):	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0
Temp (°C):	0.38	0.04	0.02	0.05	0.12	0.17	0.23	0.32	0.36	0.44
pH:	7.69	7.77	7.80	7.84	7.87	7.88	7.88	7.91	7.91	7.89
Barometeric (mmHg):	755.5	755.3	755.3	755.3	755.3	755.4	755.4	755.4	755.4	755.4
Pressure (kPa):	7.804	10.668	13.558	16.546	19.559	22.511	25.516	28.571	31.385	34.212
Conductivity (µS/cm):	128.90	122.90	122.30	122.10	121.60	121.40	121.00	120.80	120.80	120.80
RDO (ppm):	15.30	16.36	16.62	16.93	17.14	17.23	17.22	17.53	17.38	16.91
Turbidity (NTU):	-0.20	0.10	-0.10	-0.10	nr	0.00	0.00	-0.30	-0.30	-0.30
ORP	239	242	242	242	243	243	244	245	247	248
Hach Temp (°C):										
Hach LDO										

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): 3.5**			**Depth BWS (ft): 8**			**Depth BWS (ft): 13**			**Method/**
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	**Detection Range**
Oxygen (mg/L)	OR			13.5			11.8			Hach spec 0.3-15 mg/L
Alkalinity (mg/L as $CaCO_3$)	85	84	83	86	84	86	85	84	84	Digital titrator 10-4000 mg/L CaCo3
Nitrite (mg/L NO_2^--N)	0.003	0.002	0.004	0.002	0.003	0.004	0.003	0.004	0,003	Hach spec 0.002-0.300 mg/L NO2--N
Ammonia (mg/L NH_3-N)	-0.01	-0.01	-0.01	-0.01	0	0.02	0	0	0.02	Hach spec 0.01-0.50 mg/L NH3-N
Total iron--UF (mg/L)	0			0.01			0.01			Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)	0	0.01	0.01	0.01	0.01	0.01	0	0.01	spilled	Hach spec 0.02-3.00 mg/L

Remarks: Hole #1, near permanent station (near shore/pump house). No faith in turbidity

Field-Form Filled Out By: Hilton Date: 2/15/06

QAQC Check By: St. Amand Date: 3/12/06

University of Alaska Fairbanks, Water and Environmental Research Center
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: KDA2

Sample Purpose: **Lake Water Quality** Date: 1/10/06 Time: 13:01

FIELD MEASUREMENTS

GPS Coord. Northing: N70.33296 Easting: W148.94077 Datum: WGS84

Measurements By: Reichardt Time: 13:01

Water Depth (ft): 13.7 Ice Thickness (ft): 3

Freeboard (ft): 0.02 Snow Depth (ft): nr

Elev. (BPMSL): 6.81 +/- .02 Survey By: DAR/ML Date: 1/10/06 Time: nr

Water Sampling By: Reichardt Sample Depths BWS (ft): 1 3.5 Date: 01/10/06 Time: nr

2 8

3 13

WATER QUALITY METER INFORMATION

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
DO, pH, temp, pressure, cond., turb.	GWS	In-Situ Troll 9000	33033	yes	yes

Parameters	**Field Measurements**									
Time:	13:43	13:49	13:55	13:58						
Depth BWS (ft):	13.0	6.0	3.0	13.0						
Temp (°C):	0.51	0.12	-0.30	0.49						
pH:	7.85	7.95	7.95	7.90						
Barometeric (mmHg):	755.5	755.3	755.3	755.6						
Pressure (kPa):	37.272	16.330	7.693	37.600						
Conductivity (µS/cm):	121.30	121.70	123.30	120.80						
RDO (ppm):	16.21	17.71	18.25	16.84						
Turbidity (NTU):	-0.30	-0.30	-0.30	-0.30						
ORP	251	250	252	256						
Hach Temp (°C):										
Hach LDO										

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):__3_____**			**Depth BWS (ft):___16____**			**Depth BWS (ft):___27____**			**Method**
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec
Alkalinity (mg/L as $CaCO_3$)										Digital titrator
Nitrite (mg/L NO_2^--N)										Hach spec
Ammonia (mg/L NH_3-N)										Hach spec
Total iron--UF (mg/L)										Hach spec
Ferrous (II) Iron--F tot Fe (mg/L)										Hach spec

Remarks: Northeast corner of north cell, near permanent monitoring site. Snow depth non-uniform, heavy influence of wind.

Field-Form Filled Out By: Hilton Date: 2/15/06

QAQC Check By: St. Amand Date: 3/12/06

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: KDA3

Sample Purpose: **Lake Water Quality** Date: 1/10/06 Time: 10:57

FIELD MEASUREMENTS

GPS Coord. Northing: N70.33375 Easting: W148.93674 Datum: WGS84

Measurements By: Reichardt Time: 10:57

Water Depth (ft): 22.7 2.95 3

Freeboard (ft): 0.15 Snow Depth (ft): .7, .4, .45

Elev. (BPMSL): 6.78 +/- .02 Survey By: DAR/ML Date: 1/10/06 Time: nr

Water Sampling By: DAR/MC Sample Depths BWS (ft): 1 3.5 Date: 01/10/06 Time: 12:45

2 14

WATER QUALITY METER INFORMATION 3 22

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
DO, pH, temp, pressure, cond., turb.	GWS	In-Situ Troll 9000	33033	yes	yes

Parameters										
Time:	11:11	11:15	11:17	11:19	11:23	11:26	11:31	11:34	11:36	11:38
Depth BWS (ft):	3.5	4.5	5.5	6.5	8.0	10.0	12.0	14.0	16.0	18.0
Temp (°C):	0.15	0.08	0.14	0.19	0.27	0.37	0.42	0.50	0.59	0.70
pH:	7.90	7.91	7.91	7.91	7.91	7.91	7.90	7.92	7.91	7.88
Barometeric (mmHg):	758.2	758.2	758.2	758.2	758.3	758.4	758.5	758.6	758.6	758.7
Pressure (kPa):	9.013	11.760	14.736	17.861	22.343	28.148	34.278	40.132	46.175	52.288
Conductivity (µS/cm):	117.70	117.40	116.90	116.60	116.50	116.20	116.10	116.00	115.90	116.00
RDO (ppm):	16.28	16.52	16.77	17.05	17.35	17.43	17.50	17.15	16.86	16.58
Turbidity (NTU):	0.10	0.10	0.10	0.10	-0.20	-0.30	-0.30	-0.30	-0.30	-0.30
ORP	194	196	197	199	202	203	206	207	207	209
Hach Temp (°C):										
Hach LDO										

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): 3.5**			**Depth BWS (ft): 8**			**Depth BWS (ft): 13**			**Method/**
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	**Detection**
Oxygen (mg/L)	OR			14.2			5.2			Hach spec 0.3-15 mg/L
Alkalinity (mg/L as $CaCO_3$)	83	82	83	81	79	78	95	93	94	Digital titrator 10-4000 mg/L CaCo3
Nitrite (mg/L NO_2^--N)	0.002	0.002	0.002	0.005	0.005	0.004	0.008	0.007	0.007	Hach spec 0.002-0.300 mg/L NO2--N
Ammonia (mg/L NH_3-N)	0	-0.01	0	0	-0.01	-0.02	0.04	0.03	0.04	Hach spec 0.01-0.50 mg/L NH3-N
Total iron--UF (mg/L)	0.01			0.01			0.04			Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.01	Hach spec 0.02-3.00 mg/L

Remarks: Center of lake. On first oxygen test in lab, accuvac was only 2/3 full because the tip broke low and sucked air

Field-Form Filled Out By: Hilton Date: 2/15/06

QAQC Check By: St. Amand Date: 3/20/06

University of Alaska Fairbanks, Water and Environmental Research Center
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: KDA3

Sample Purpose: **Lake Water Quality** Date: 1/10/06 Time: 10:57

FIELD MEASUREMENTS

GPS Coord. Northing: N70.33375 Easting: W148.93674 Datum: WGS84

Measurements By: Reichardt Time: 10:57

Water Depth (ft): 22.7 2.95 3

Freeboard (ft): 0.15 Snow Depth (ft): .7, .4, .45

Elev. (BPMSL): 6.78 +/- .02 Survey By: DAR/ML Date: 1/10/06 Time: nr

Water Sampling By: DAR/MC Sample Depths BWS (ft): 1 3.5 Date: 01/10/06 Time: 12:45

2 14

3 22

WATER QUALITY METER INFORMATION

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
DO, pH, temp, pressure, cond., turb.	GWS	In-Situ Troll 9000	33033	yes	yes

Parameters	**Field Measurements**									
Time:	11:41	11:48	12:01	12:06	12:12	12:15				
Depth BWS (ft):	19.5	20.5	21.5	22.0	10.0	4.5				
Temp (°C):	0.84	1.01	1.14	1.20	0.41	0.15				
pH:	7.81	7.47	7.43	7.42	7.93	7.96				
Barometeric (mmHg):	758.7	758.9	759.0	759.0	758.7	758.5				
Pressure (kPa):	56.160	59.735	62.635	64.089	28.268	11.716				
Conductivity (µS/cm):	116.40	121.20	125.90	129.20	116.20	116.90				
RDO (ppm):	15.91	12.01	6.59	5.65	16.61	16.94				
Turbidity (NTU):	-0.20	0.00	0.10	0.30	-0.30	-0.30				
ORP	212	220	223	224	214	215				
Hach Temp (°C):										
Hach LDO										

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):__3_____**			**Depth BWS (ft):___16____**			**Depth BWS (ft):___27____**			**Method**
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec
Alkalinity (mg/L as $CaCO_3$)										Digital titrator
Nitrite (mg/L NO_2^--N)										Hach spec
Ammonia (mg/L NH_3-N)										Hach spec
Total iron--UF (mg/L)										Hach spec
Ferrous (II) Iron--F tot Fe (mg/L)										Hach spec

Remarks: Northeast corner of north cell, near permanent monitoring site. Snow depth non-uniform, heavy influence of wind.

Field-Form Filled Out By: Hilton Date: 2/15/06

QAQC Check By: St. Amand Date: 3/20/06

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 A

Sample Purpose: **Lake Water Quality** Date: 1/16/06 Time: 12:32

FIELD MEASUREMENTS

GPS Coord. Northing: N70 20.071 Easting: W150 56.401 Datum: NAD 27

Measurements By: DAR Time: 12:32

Water Depth (ft): 10 Ice Thickness (ft): 2.6

Freeboard (ft): 0.1 Snow Depth (ft): 0.6

Elev. (BPMSL +/- .02): 7.5 Survey By: Lilly Date: 1/16/06 Time: 11:15

Water Sampling By: DAR Sample Depths BWS (ft): 1 na Date: na Time: na

2 na

3 na

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
All	GWS	In-Situ Troll 9000	33033	yes	yes

Parameters	**Field Measurements**									
Time:	12:37	12:42	12:45	12:48	12:54	12:56	13:11	13:18	nr	
Depth BWS (ft):	3.0	4.0	5.0	6.0	7.0	8.0	9.0	9.5	10.0	
Temp (°C):	0.00	0.14	0.38	0.58	0.87	1.13	1.35	nr	1.48	
pH:	7.09	7.07	7.07	7.06	7.03	6.98	6.78	nr	6.66	
Barometeric (mmHg):	761.6	761.7	761.8	761.9	761.9	761.9	761.9	nr	761.9	
Pressure (kPa)	7.587	nr	13.534	16.326	19.330	22.768	25.499	nr	28.104	
Conductivity (µS/cm):	68.71	67.00	67.26	67.23	67.18	67.26	70.35	nr	77.33	
RDO (ppm):	17.86	17.68	16.94	17.26	16.87	16.47	11.50	nr	7.22	
Turbidity (NTU):	3.7	0.3	0.5	0.5	0.0	0.5	2.0	nr	3.5	
ORP	734	735	740	734	733	730	716	nr	720	
LDO Temp (UAF/BLM)	0.4/0.5	0.4/0.5	0.7/0.6	0.8/1.1	1.1/1.2	1.2/1.6	1.3/1.7	1.6	1.6/1.8	
LDO DO (UAF/BLM)	17.1/15.5	17/15.2	16.5/15.3	16.6/14.8	16.5/14.9	15/11.8	14.3/7.38	9.6	7.73/4.19	

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 $CaCO_3$)										10-4000 mg/L as CaCO3
Nitrite (mg/L NO2--N)										0.002-0.300 mg/L NO2--N
Total iron--UF (mg/L)										0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)										0.02-3.00 mg/L
Ammonia (mg/L NH_3-N)										0.01-0.50

Remarks: BLM LDO 10 was originally used and UAF LDO 20 was also used.

Field-Form Filled Out By: Blackburn Date: 8/23/06

QAQC Check By: Hilton Date: 8/23/06

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-A

Sample Purpose: **Lake Water Quality** Date: 1/16/06 Time: 12:12

FIELD MEASUREMENTS

GPS Coord. Northing: N70 20.071 Easting: W150 56.401 Datum: NAD 27

Measurements By: DMW/MRL Time: nr

Water Depth (ft): 10.25 Ice Thickness (ft): 2.6

Freeboard (ft): 0.1 Snow Depth (ft): 0.6

Elev. (BPMSL +/- .02): 7.5 Survey By: DMW/MRL Date: 1/16/06 Time: nr

Water Sampling By: DAR Sample Depths BWS (ft): 1 na Date: na Time: na

2 na

3 na

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model		Serial No.		Pre-Sampling QAQC Check		Post-Sampling QAQC Check	
d.o., temp	BLM	HACH LDO-10		nr		yes		yes	
Parameters	**Field Measurements**								
Time:									
Depth BWS (ft):	3.0	4.0	5.0	5.0	7.0	8.0	9.0	10.0	
Temp (°C):	0.50	0.50	0.60	1.10	1.20	1.60	1.70	1.80	
LDO (ppm):	15.50	15.20	15..3	14.80	14.90	11.80	7.38	4.19	

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 CaCO3
Nitrite (mg/L NO2--N)										Hach spec 0.002-0.300 mg/L NO2--N
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)										Hach spec 0.01-0.50 mg/L NH3-N

Remarks:

Field-Form Filled Out By: DAR Date: 1/21/06

QAQC Check By: St. Amand Date: 3/22/06

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: 1/16/06 Time: 10:01

FIELD MEASUREMENTS

GPS Coord. Northing: N70 20.014 Easting: W150 56.725 Datum: NAD 27

Measurements By: DAR Time: nr

Water Depth (ft): 11.18 Ice Thickness (ft): 2.67

Freeboard (ft): 0 Snow Depth (ft): 0.6

Elev. (BPMSL +/- .02): 7.5 Survey By: DMW/MRL Date: 1/16/05 Time: nr

Water Sampling By: DAR Sample Depths BWS (ft): 1 4 Date: 1/16/05 Time: nr

2 8

3 11

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
all	GWS	In Situ Troll 9000	33033	ok	ok
temp/ LDO	BLM	Hach LDO	nr	yes	yes

Parameters	**Field Measurements**									
Time:	10:07	10:19	10:22	10:28	10:31	10:36	10:48	10:53	10:58	
Depth BWS (ft):	3	4	5	6	7	8	9	10	11	Bottom
Temp (°C):	0.00	0.24	0.48	0.64	0.94	1.22	1.51	1.71	1.83	
pH:	6.99	7.04	7.00	7.02	7.01	6.98	6.83	6.72	6.87	
Barometeric (mmHg):	761.4	761.4	761.4	761.4	761.5	761.5	761.5	761.5	761.6	
Pressure (kPa):	7.420	10.373	13.544	16.354	19.342	22.768	25.634	28.174	30.787	
Conductivity (µS/cm):	64.30	62.86	63.56	63.17	63.14	63.06	63.25	70.28	90.46	
RDO (ppm): (mg/L)	16.85	17.21	17.06	16.81	16.70	16.02	13.86	8.12	3.34	
Turbidity (NTU):	0.5	0.1	0.1	1.9	0.2	0.1	0.5	2.1	3.5	
ORP	726	768	762	763	764	758	762	741	711	
Hach temp °C	0.7	0.3	0.4	0.9	1.0	1.3	1.5	1.8	2.0	2.1
Hach LDO	17.6	18.0	17.6	16.5	16.3	15.8	14.0	9.19	4.8	0.17
Stable RDO	15.7	16.11	16.24	16.42						

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):___4___**			**Depth BWS (ft):___8___**			**Depth BWS (ft):___11___**			**Method**
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)							3.8			Hach spec 0.3-15 mg/L
Alkalinity (mg/L as $CaCO_3$)	35	37	36	37	40	38	52	59	59	Digital titrator 10-4000 mg/L as CaCO3
Nitrite (mg/L NO2--N)	0.001	0.003	0.003	0.004	0.003	0.003	UR, - 0.002	UR, - 0.003	UR, - 0.002	Hach spec 0.002-0.300 mg/L NO2--N
Total iron--UF (mg/L)	0.04			0.04			0.85*10 =8.5			Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)	0.02			0.02			0.66*10 =6.6			Hach spec 0.02-3.00 mg/L
Ammonia (mg/L NH_3-N)****	0.01	0.02	0.01	0.01	0.02	0.04	0.51	0.48	0.50	Hach spec 0.01-0.50 mg/L NH3-N

Remarks: Note: 3 foot RDO was read while "jigging" inst. Reading later stabilized to 15.70. Some small bubbles were observed under ice.

Field-Form Filled Out By: Dan Reichardt Date: 1/21/06

QAQC Check By: St. Amand Date: 3/13/06

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: Survey Hole/L9312

Sample Purpose: **Lake Water Quality** Date: 1/16/06 Time: 15:00

FIELD MEASUREMENTS

GPS Coord. Northing: N70 20.037 Easting: W150 56.884 Datum: NAD 27

Measurements By: DMW/MRL Time: nr

Water Depth (ft): 9.58 Ice Thickness (ft): 3

Freeboard (ft): 0 Snow Depth (ft): 0.6

Elev. (BPMSL +/- .02): 7.5 Survey By: DMW/MRL Date: 1/16/06 Time: nr

Water Sampling By: DAR Sample Depths BWS (ft): 1 na Date: na Time: na

2 na

3 na

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
all	GWS	In_Situ Troll 9000	33033	yes	yes

Parameters	**Field Measurements**									
Time:	14:30	14:32	14:35	14:39	14:44	14:48	14:50			
Depth BWS (ft):	3.0	4.0	5.0	5.0	7.0	8.0	9.0			
Temp (°C):	-0.01	0.04	0.32	0.39	0.78	1.00	1.21			
pH:	6.86	6.83	6.86	6.85	6.85	6.77	6.74			
Barometeric (mmHg):	761.8	761.8	761.8	761.8	761.8	761.8	761.8			
Pressure (kPa):	7.533	10.159	13.747	13.052	19.044	22.332	25.147			
Conductivity (µS/cm):	74.08	73.36	71.80	71.71	71.21	71.95	72.71			
RDO (ppm):	12.76	12.74	12.78	12.83	12.92	10.54	8.87			
Turbidity (NTU):	3.20	6.60	6.50	7.10	5.60	5.90	5.70			
ORP	741.00	730.00	742.00	736.00	741.00	753.00	753.00			

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 CaCO3
Nitrite (mg/L NO2--N)										Hach spec 0.002-0.300 mg/L NO2--N
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)										Hach spec 0.01-0.50 mg/L NH3-N

Remarks:

Field-Form Filled Out By: DAR Date: 1/21/06

QAQC Check By: St. Amand Date: 3/22/06

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: Survey Hole/L9312

Sample Purpose: **Lake Water Quality** Date: 1/16/06 Time: 15:00

FIELD MEASUREMENTS

GPS Coord. Northing: N70 20.037 Easting: W150 56.884 Datum: NAD 27

Measurements By: DMW/MRL Time: nr

Water Depth (ft): 9.58 Ice Thickness (ft): 3

Freeboard (ft): 0 Snow Depth (ft): 0.6

Elev. (BPMSL +/- .02): 7.5 Survey By: DMW/MRL Date: 1/16/06 Time: nr

Water Sampling By: DAR Sample Depths BWS (ft): 1 na Date: na Time: na

2 na

WATER QUALITY METER INFORMATION 3 na

Calibration Information

Parameter (s)	Owner	Meter Make/Model			Serial No.		Pre-Sampling QAQC Check		Post-Sampling QAQC Check	
d.o., temp	UAF	HACH LDO-20			nr		yes		yes	
Parameters	**Field Measurements**									
Time:										
Depth BWS (ft):	3.0	4.0	5.0	5.0	8.0	9.0	bottom			
Temp (°C):	0.70	0.20	0.40	0.50	1.00	1.40	1.60			
LDO (ppm):	12.90	13.20	13.10	13.20	12.90	7.78	0.02			

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 CaCO3
Nitrite (mg/L NO2--N)										Hach spec 0.002-0.300 mg/L NO2--N
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)										Hach spec 0.01-0.50 mg/L NH3-N

Remarks: Note that bottom readings may not be representative of oxygen levels.

Field-Form Filled Out By: DAR Date: 1/21/06

QAQC Check By: St. Amand Date: 3/22/06

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-SH midpoint

Sample Purpose: **Lake Water Quality** Date: 1/16/06 Time: 10:01

FIELD MEASUREMENTS

GPS Coord. Northing: N70 20.043 Easting: W150 56.563 Datum: NAD 27

Measurements By: Lilly Time: 14:30

Water Depth (ft): nr Ice Thickness (ft): 2.6

Freeboard (ft): 0.1 Snow Depth (ft): 0.8

Elev. (BPMSL +/- .02): 7.5 Survey By: DMW/MRL Date: 1/16/05 Time: nr

Water Sampling By: na Sample Depths BWS (ft): 1 na Date: na Time: na

2 na

WATER QUALITY METER INFORMATION 3 na

Calibration Information

Parameter (s)	Owner	Meter Make/Model			Serial No.		Pre-Sampling QAQC Check		Post-Sampling QAQC Check	
temp/ LDO	BLM	Hach LDO			nr		yes		yes	
Parameters	**Field Measurements**									
Time:	14:35	nr	nr	nr	nr	nr	nr	nr	nr	
Depth BWS (ft):	3	4	5	6	7	8	9	10	10.5	
Temp (°C):										
pH:										
Barometeric (mmHg):										
Pressure (kPa):										
Conductivity (µS/cm):										
RDO (ppm): (mg/L)										
Turbidity (NTU):										
ORP										
Hach temp °C	0.2	0.1	0.1	0.1	0.1	0.1	1.6	2.0	2.1	
Hach LDO	15.5	15.5	15.5	15.6	15.6	15.6	6.3	2.37	1.0	

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 CaCO3
Nitrite (mg/L NO2--N)										Hach spec 0.002-0.300 mg/L NO2--N
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)****										Hach spec 0.01-0.50 mg/L NH3-N

Remarks: Midpoint between survey hole and raft B

Field-Form Filled Out By: Hilton Date: 2/15/06

QAQC Check By: Blackburn Date: 7/31/06

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: L9817-1

Sample Purpose: **Lake Water Quality** Date: 1/15/06 Time: 11:24

FIELD MEASUREMENTS

GPS Coord. Northing: N70 14.090 Easting: W151 19.929 Datum: Nad 27

Measurements By: DAR, BC Time: nr

Water Depth (ft): 8.57 Ice Thickness (ft): 2.18

Freeboard (ft): 0.02 Snow Depth (ft): nr

Elev. (BPMSL): 53.35 +/- .02 Survey By: DAR Date: 1/15/06 Time: nr

Water Sampling By: DAR Sample Depths BWS (ft): 1 2.5 Date: 1/16/06 Time: nr

2 5.5

WATER QUALITY METER INFORMATION 3 8

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
all	GWS	InSitu troll 9000	33033	yes	yes
Temp/ LDO	BLM	Hach LDO	nr	yes	yes

Parameters	**Field Measurements**									
Time:	11:33	11:36	11:40	11:50	11:53	12:07	12:14			
Depth BWS (ft):	2.5	3.5	4.5	5.5	6.5	7.5	8.5	Bottom		
Temp (°C):	0.01	0.10	0.43	0.89	1.10	1.57	1.90			
pH:	7.01	7.00	7.01	6.99	6.69	6.99	7.52			
Barometeric (mmHg):	759.3	759.3	759.3	759.3	759.3	759.4	759.5			
Pressure (kPa):	6.327	8.699	12.199	14.810	17.787	20.898	23.889			
Conductivity (µS/cm):	251.1	251.0	251.8	253.5	255.5	296.2	368.4			
RDO (ppm):	10.26	10.29	10.28	9.79	8.94	2.07	0.58			
Turbidity (NTU):	1.30	1.20	1.40	3.20	3.10	3.60	5.50			
ORP	1014	1020	1023	1013	1003	929	911			
Hach LDO temp	0.4	0.3	0.7	1.1	1.2	1.5	2.0	2.0		
Hach LDO DO	11.0	11.1	10.9	8.40	8.11	2.58	0.12	UR		

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): 2.5**			**Depth BWS (ft): 5.5**			**Depth BWS (ft): 8**			**Method**
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)				11.3						Hach spec 0.3-15 mg/L
Alkalinity (mg/L as $CaCO_3$)	64	70	66	67	71	71	66	71	69	Digital titrator 10-4000 mg/L as CaCO3
Nitrite (mg/L NO2--N)	0.006	0.006	0.005	0.006	0.006	0.007	0.006	0.006	0.005	Hach spec 0.002-0.300 mg/L NO2--N
Total iron--UF (mg/L)	0.04	0.04	0.05	0.08			0.06			Hach spec 0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)	0.02	0.01	0.01	0.01			0.01			Hach spec 0.02-3.00 mg/L
Ammonia (mg/L NH_3-N)	0.13	0.14	0.14	0.15	0.16	0.16	0.21	0.22	0.20	Hach spec 0.01-0.50 mg/L NH3-N

Remarks: All depths recorded according to yellow cord. Sample drawn from bottom was drawn from an intermediate depth between 5.5' and 8.5'.

Subtract 0.3' from recorded Hach depths.

Field-Form Filled Out By: DAR Date: 1/15/06

QAQC Check By: St. Amand Date: 3/12/06

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: L9817-2

Sample Purpose: **Lake Water Quality** Date: 1/15/06 Time: 15:48

FIELD MEASUREMENTS

GPS Coord. Northing: N70 14.071 Easting: W151 19.870 Datum: Nad 27

Measurements By: Lilly Time: nr

Water Depth (ft): 8.24 Ice Thickness (ft): 2.15

Freeboard (ft): 0 Snow Depth (ft): nr

Elev. (BPMSL): 53.35 +/- .02 Survey By: DAR Date: 1/15/06 Time: nr

Water Sampling By: DAR Sample Depths BWS (ft): 1 na Date: na Time: na

2 na

WATER QUALITY METER INFORMATION 3 na

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
all	GWS	In Situ MP Troll 9000	33033	yes	yes
Temp/ LDO	BLM	Hach LDO	nr	yes	yes

Parameters	**Field Measurements**									
Time:	15:54	16:01	16:05	16:10	16:15	16:20	16:28			
Depth BWS (ft):	2.5	3.5	4.5	5.5	6.5	7.5	8.0	Bottom		
Temp (°C):	-0.04	0.06	0.35	0.75	1.10	1.51	1.70			
pH:	7.04	7.02	7.00	6.99	6.94	6.91	7.28			
Barometeric (mmHg):	759.0	759.5	nr	759.6	759.7	759.7	759.8			
Pressure (kPa):	6.348	8.711	11.677	15.154	18.057	21.014	22.422			
Conductivity (µS/cm):	267.1	266.3	266.2	268.1	272.1	297.9	338.4			
RDO (ppm):	12.02	11.54	10.66	10.27	9.09	2.51	1.27			
Turbidity (NTU):	1.50	3.80	2.10	0.80	0.90	3.20	7.00			
ORP	980	980	982	983	975	952	933			
Hach LDO temp	nr	0.1	0.3	0.9	1.2	1.6	nr	1.8		
Hach LDO DO	nr	11.7	11.3	10.7	9.66	3.53	nr	0.5		

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 CaCO3
Nitrite (mg/L NO2--N)										Hach spec 0.002-0.300 mg/L NO2--N
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)										Hach spec 0.01-0.50 mg/L NH3-N

Remarks: Bottom reading was with LDO probe in the mud or on the mud. All depths recorded according to yellow cord. Subtract 0.3' from recorded Hach depths.

Field-Form Filled Out By: DAR Date: 1/16/06

QAQC Check By: St. Amand Date: 3/12/06

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: L9817-3

Sample Purpose: **Lake Water Quality** Date: 1/15/06 Time: 14:54

FIELD MEASUREMENTS

GPS Coord. Northing: N70 14.029 Easting: W151 19.746 Datum: Nad 27

Measurements By: Lilly Time: nr

Water Depth (ft): 8.0 Ice Thickness (ft): 2.1

Freeboard (ft): 0 Snow Depth (ft): nr

Elev. (BPMSL): 53.35 +/- .02 Survey By: DAR Date: 1/15/06 Time: nr

Water Sampling By: na Sample Depths BWS (ft): 1 na Date: na Time: na

2 na

WATER QUALITY METER INFORMATION 3 na

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
all	GWS	In Situ MP Troll 9000	33033	yes	yes
Temp/ LDO	BLM	Hach LDO	nr	yes	yes

Parameters	**Field Measurements**									
Time:	15:00	15:03	15:13	15:17	15:24	15:32				
Depth BWS (ft):	3.5	2.5	4.5	5.5	6.5	7.5	Bottom			
Temp (°C):	0.01	-0.01	0.29	0.64	0.93	1.40				
pH:	7.03	7.04	6.99	6.97	6.96	6.96				
Barometeric (mmHg):	759.6	759.5	759.5	759.5	754.6	nr				
Pressure (kPa):	9.103	6.519	12.186	14.758	17.436	20.844				
Conductivity (µS/cm):	267.4	267.4	269.0	270.4	272.1	284.9				
RDO (ppm):	11.65	11.77	9.86	9.36	8.22	4.33				
Turbidity (NTU):	4.4	8.8	1.3	0.50	2.40	6.50				
ORP	971	973	970	962	974	955				
Hach LDO temp	0.2		0.5	0.5	1.2	1.5	1.7			
Hach LDO DO	11.0		10.1	9.95	7.58	4.28	UR			

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 CaCO3
Nitrite (mg/L NO2--N)										Hach spec 0.002-0.300 mg/L NO2--N
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)										Hach spec 0.01-0.50 mg/L NH3-N

Remarks: All depths recorded according to yellow cord. Subtract 0.3' from recorded Hach depths.

Field-Form Filled Out By: DAR Date: 1/16/06

QAQC Check By: St. Amand Date: 3/12/06

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: L9817-4

Sample Purpose: **Lake Water Quality** Date: 1/15/06 Time: 14:18

FIELD MEASUREMENTS

GPS Coord. Northing: N70 14.018 Easting: W151 19.805 Datum: Nad 27

Measurements By: Lilly Time: nr

Water Depth (ft): 5.94 Ice Thickness (ft): 2.4

Freeboard (ft): 0.15 Snow Depth (ft): nr

Elev. (BPMSL): 53.35 +/- .02 Survey By: DAR Date: 1/15/06 Time: nr

Water Sampling By: na Sample Depths BWS (ft): 1 na Date: na Time: na

2 na

WATER QUALITY METER INFORMATION 3 na

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
all	GWS	In Situ mp troll 9000	33033	yes	yes
Temp/ LDO	BLM	Hach LDO	nr	yes	yes

Parameters	**Field Measurements**									
Time:	14:22	14:25	14:30	14:36						
Depth BWS (ft):	2.5	3.5	4.5	5.5	Bottom					
Temp (°C):	-0.06	-0.05	0.28	0.49						
pH:	7.06	7.05	6.97	6.95						
Barometeric (mmHg):	759.6	759.6	759.6	759.5						
Pressure (kPa):	6.496	9.623	12.434	15.200						
Conductivity (µS/cm):	273.70	272.90	275.00	276.40						
RDO (ppm):	11.48	11.41	9.07	8.86						
Turbidity (NTU):	0.60	1.60	1.30	2.60						
ORP	7.62	916.00	944.00	965.00						
Hach LDO temp	0.1	0.1	0.3	0.7	0.8					
Hach LDO DO	12.4	11.9	10.1	9.20	0.03					

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 CaCO3
Nitrite (mg/L NO2--N)										Hach spec 0.002-0.300 mg/L NO2--N
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)										Hach spec 0.01-0.50 mg/L NH3-N

Remarks: All depths recorded according to yellow cord. Subtract 0.3' from recorded Hach depths.

Field-Form Filled Out By: DAR Date: 1/16/06

QAQC Check By: St. Amand Date: 3/12/06

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: MSB-NC-Center

Sample Purpose: **Lake Water Quality** Date: 1/11/06 Time: 15:59

FIELD MEASUREMENTS

GPS Coord. Northing: N70.32134 Easting: W149.40015 Datum: WGS 84

Measurements By: Reichardt Time: nr

Water Depth (ft): 33.9 Ice Thickness (ft): 2.95

Freeboard (ft): 0.18 Snow Depth (ft): 0.4

Elev. (BPMSL): 95.35 +/- .02 Survey By: Lilly Date: 1/11/06 Time: nr

Water Sampling By: Reichardt Sample Depths BWS (ft): 1 3.5 Date: 1/11/06 Time: nr

2 18

WATER QUALITY METER INFORMATION 3 33

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
DO, pH, temp, pressure, cond., turb.	GWS	In-Situ Troll 9000	33033	yes	yes

Parameters	**Field Measurements**										
Time:	17:59	18:01	18:04	18:06	18:08	18:08	18:09	18:11	18:13	18:16	18:19
Depth BWS (ft):	3.0	4.0	5.0	6.0	7.0	8.0	10.0	12.0	14.0	16.0	18.0
Temp (°C):	0.22	0.03	0.01	-0.02	-0.01	0.03	0.10	0.15	0.20	0.26	0.32
pH:	7.87	7.94	7.93	7.92	7.93	7.92	7.92	7.91	7.90	7.91	7.91
Barometeric (mmHg):	758.5	758.6	758.6	758.6	758.6	758.7	758.7	758.8	758.8	758.8	759.0
Pressure (kPa):	7.345	10.330	13.510	16.363	14.350	22.402	28.886	34.883	40.498	46.491	52.195
Conductivity (µS/cm):	173.30	171.30	170.90	170.50	170.20	169.90	169.20	169.00	168.50	168.20	168.00
RDO (ppm):	14.33	14.40	14.46	14.50	14.53	14.53	14.48	14.41	14.31	14.24	14.12
Turbidity (NTU):	-0.20	-0.20	-0.20	-0.20	-0.20	-0.20	-0.20	-0.20	-0.20	-0.20	-0.20
ORP	193	193	193	193	193	194	195	195	196	197	198
Hach Temp (°C):											
Hach LDO											

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): 3.5**			**Depth BWS (ft): 18**			**Depth BWS (ft): 33**			**Method**	**Detection range**
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3		
Oxygen (mg/L)	13.9			13.7			3.7			Hach spec	0.3-15 mg/L
Alkalinity (mg/L as $CaCO_3$)	112	110	115	110	115	108	151	145	151	Digital titrator	10-4000 mg/L as CaCO3
Nitrite (mg/L NO_2^--N)	0.005	0.005	0.004	0.003	0.004	0.003	UR-.003	UR-.003	UR-.002	Hach spec	0.002-0.300 mg/L NO_2^--N
Ammonia (mg/L NH_3-N)	0	0.01	0	0	0	0	OR	0.09x10=.9	0.10x10=1.0	Hach spec	0.01-0.50 mg/L NH_3-N
Total iron--UF (mg/L)	0.02			0.03			*	1.00x5=5.00	1.00x5=5.00	Hach spec	0.02-3.00 mg/L
Filtered Iron--F tot Fe (mg/L)	0.05			0			OR	*1.40x5=7.0	*1.40x5=7.0	Hach spec	0.02-3.00 mg/L

Remarks: * = diluted by a factor of 5

Field-Form Filled Out By: Hilton Date: 2/15/06

QAQC Check By: St. Amand Date: 3/12/06

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: MSB-NC-Center

Sample Purpose: **Lake Water Quality** Date: 1/11/06 Time: 15:59

FIELD MEASUREMENTS

GPS Coord. Northing: N70.32134 Easting: W149.40015 Datum: WGS 84

Measurements By: Reichardt Time: nr

Water Depth (ft): 33.9 Ice Thickness (ft): 2.95

Freeboard (ft): 0.18 Snow Depth (ft): 0.4

Elev. (BPMSL): 95.35 +/- .02 Survey By: Lilly Date: 1/11/06 Time: nr

Water Sampling By: Reichardt Sample Depths BWS (ft): 1 3.5 Date: 1/11/06 Time: nr

2 18

3 33

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
DO, pH, temp, pressure, cond., turb.	GWS	In-Situ Troll 9000	33033	yes	yes

Parameters	**Field Measurements**										
Time:	18:22	18:25	18:29	18:33	18:37	18:52	18:55	18:58	19:00	19:06	19:09
Depth BWS (ft):	20.0	22.0	24.0	26.0	28.0	30.0	31.0	32.0	33.0	16.0	4.0
Temp (°C):	0.37	0.43	0.51	0.58	0.74	0.81	0.88	0.94	1.02	0.26	-0.04
pH:	7.90	7.89	7.79	7.72	7.57	7.47	7.40	7.38	7.44	7.92	7.96
Barometeric (mmHg):	759.1	759.2	759.3	759.3	759.3	759.6	759.6	759.7	759.7	759.1	758.9
Pressure (kPa):	58.026	62.042	70.072	75.809	81.924	88.323	91.079	94.007	96.766	40.018	10.160
Conductivity (µS/cm):	167.60	167.60	167.60	168.00	172.80	179.30	186.10	194.70	215.70	168.60	170.80
RDO (ppm):	14.07	13.87	12.73	11.71	8.01	6.43	4.48	2.84	1.29	13.57	14.54
Turbidity (NTU):	-0.20	-0.20	0.10	0.30	0.10	0.80	1.30	1.60	1.70	-0.20	-0.20
ORP	198	199	202	204	208	212	214	214	63	129	144.00
Hach Temp (°C):											
Hach LDO											

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): 3**			**Depth BWS (ft): 16**			**Depth BWS (ft): 27**			**Method**	**Detection range**
	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 CaCO3
Nitrite (mg/L NO_2^--N)										Hach spec	0.002-0.300 mg/L NO_2^--N
Ammonia (mg/L NH_3-N)										Hach spec	0.01-0.50 mg/L NH_3-N
Total iron--UF (mg/L)										Hach spec	0.02-3.00 mg/L
Ferrous (II) Iron--F tot Fe (mg/L)										Hach spec	0.02-3.00 mg/L

Remarks:

Field-Form Filled Out By: Hilton Date: 2/15/06

QAQC Check By: St. Amand Date: 3/12/06

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: MSB-NC-NE

Sample Purpose: **Lake Water Quality** Date: 1/11/06 Time: 15:28

FIELD MEASUREMENTS

GPS Coord. Northing: N70 19.312 Easting: W149 23.715 Datum: NAD 27

Measurements By: Reichardt Time: nr

Water Depth (ft): 25.5 Ice Thickness (ft): 3.2

Freeboard (ft): 0.2 Snow Depth (ft): nr

Elev. (BPMSL): 95.35 +/- .02 Survey By: Lilly Date: 1/11/06 Time: nr

Water Sampling By: na Sample Depths BWS (ft): 1 na Date: na Time: na

2 na

WATER QUALITY METER INFORMATION 3 na

Calibration Information

Parameter (s)	Owner	Meter Make/Model			Serial No.		Pre-Sampling QAQC Check		Post-Sampling QAQC Check	
DO, pH, temp, pressure, cond., turb.	GWS	In-Situ Troll 9000			33033		yes		yes	
Parameters										
Time:	15:32	15:34	15:36	15:38	15:40	15:42	15:43	15:45	15:48	15:50
Depth BWS (ft):	3.5	4.5	5.5	6.5	8.0	10.0	12.0	14.0	16.0	18.0
Temp (°C):	-0.02	-0.03	-0.04	-0.03	0.06	0.05	0.12	0.22	0.29	0.32
pH:	7.90	7.91	7.91	7.88	7.89	7.91	7.91	7.91	7.90	7.88
Barometeric (mmHg):	758.1	758.1	758.1	758.1	758.2	758.3	758.3	758.4	758.5	758.5
Pressure (kPa):	8.617	11.562	14.445	17.814	22.721	28.721	34.517	40.817	46.650	52.302
Conductivity (µS/cm):	172.00	171.20	171.20	171.10	170.60	169.80	169.30	168.50	168.00	167.80
RDO (ppm):	14.48	14.53	14.55	14.56	14.58	14.56	14.48	14.35	14.18	13.86
Turbidity (NTU):	-0.10	-0.20	-0.20	-0.20	-0.20	-0.20	-0.20	-0.20	-0.10	0.00
ORP	212	209	208	209	208	208	207	207	207	207
Hach Temp (°C):										
Hach LDO										

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
Alkalinity (mg/L as $CaCO_3$)										Digital titrator
Nitrite (mg/L NO_2^--N)										Hach spec
Ammonia (mg/L NH_3-N)										Hach spec
Total iron--UF (mg/L)										Hach spec
Filtered Iron--F tot Fe (mg/L)										Hach spec

Remarks: Northeast corner of north cell, near permanent monitoring site. Snow depth non-uniform, heavy influence of wind.

Field-Form Filled Out By: Hilton Date: 2/15/06

QAQC Check By: St. Amand Date: 3/12/06

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: MSB-NC-NE

Sample Purpose: **Lake Water Quality** Date: 1/11/06 Time: 15:28

FIELD MEASUREMENTS

GPS Coord. Northing: N70 19.312 Easting: W149 23.715 Datum: NAD 27

Measurements By: Reichardt Time: nr

Water Depth (ft): 25.5 Ice Thickness (ft): 3.2

Freeboard (ft): 0.2 Snow Depth (ft): nr

Elev. (BPMSL): 95.35 +/- .02 Survey By: Lilly Date: 1/11/06 Time: nr

Water Sampling By: na Sample Depths BWS (ft): 1 na Date: na Time: na

2 na

WATER QUALITY METER INFORMATION 3 na

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
DO, pH, temp, pressure, cond., turb.	GWS	In-Situ Troll 9000	33033	yes	yes

Parameters	**Field Measurements**									
Time:	15:54	15:59	16:06	16:09	16:13	16:18	16:20			
Depth BWS (ft):	20.0	22.0	23.0	24.0	24.5	12.0	4.5			
Temp (°C):	0.37	0.42	0.50	0.51	0.53	0.22	-0.03			
pH:	7.87	7.85	7.74	7.69	7.69	7.94	7.95			
Barometeric (mmHg):	758.7	758.7	758.8	758.8	758.8	758.5	758.2			
Pressure (kPa):	58.111	64.041	66.929	70.247	71.440	34.229	11.420			
Conductivity (µS/cm):	167.70	167.50	167.80	168.60	168.60	168.50	171.50			
RDO (ppm):	13.67	13.49	12.13	11.10	10.81	14.04	14.63			
Turbidity (NTU):	0.10	0.20	0.50	0.70	1.20	-0.20	-0.20			
ORP	208	209	211	213	213	208	208			
Hach Temp (°C):										
Hach LDO										

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
Alkalinity (mg/L as $CaCO_3$)										Digital titrator
Nitrite (mg/L NO_2^--N)										Hach spec
Ammonia (mg/L NH_3-N)										Hach spec
Total iron--UF (mg/L)										Hach spec
Ferrous (II) Iron--F tot Fe (mg/L)										Hach spec

Remarks: Northeast corner of north cell, near permanent monitoring site. Snow depth non-uniform, heavy influence of wind.

Field-Form Filled Out By: Hilton Date: 2/15/06

QAQC Check By: St. Amand Date: 3/12/06

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: MSB-SC-Center

Sample Purpose: **Lake Water Quality** Date: 1/12/06 Time: 15:33

FIELD MEASUREMENTS

GPS Coord. Northing: N70.32024 Easting: W149.40034 Datum: WGS 84

Measurements By: Reichardt Time: 15:30

Water Depth (ft): 27.83 Ice Thickness (ft): 2.5

Freeboard (ft): 0.2 Snow Depth (ft): 0.4

Elev. (BPMSL): 95.35 +/- .02 Survey By: Lilly Date: 1/11/06 Time: nr

Water Sampling By: Reichardt Sample Depths BWS (ft): 1 3 Date: 1/12/06 Time: nr

2 16

WATER QUALITY METER INFORMATION 3 27

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
DO, pH, temp, pressure, cond., turb.	GWS	In-Situ Troll 9000	33033	yes	yes
Temp/ LDO	BLM	Hach LDO	nr	yes	yes

Parameters	**Field Measurements**										
Time:	15:35	15:42	15:46	15:52	15:35	15:58	16:03	16:07	16:12	16:15	
Depth BWS (ft):	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	
Temp (°C):	1.21	-0.02	-0.01	-0.03	0.04	0.16	0.23	0.30	0.39	0.50	
pH:	7.80	7.87	7.88	7.90	7.91	7.91	7.91	7.90	7.85	7.87	
Barometeric (mmHg):	762.6	762.3	762.1	762.2	762.2	762.2	762.2	762.2	762.3	762.3	
Pressure (kPa):	10.652	13.827	13.602	16.502	22.388	28.360	34.256	40.279	46.391	51.966	
Conductivity (µS/cm):	186.10	177.50	177.30	176.90	176.00	174.60	174.10	173.60	173.10	172.90	
RDO (ppm):	13.73	14.63	14.79	15.02	14.96	14.80	14.76	14.60	14.39	13.71	
Turbidity (NTU):	-0.20	-0.20	-0.20	-0.30	-0.20	-0.20	-0.20	-0.20	-0.30	-0.20	
ORP	216	207	205	203	202	202	202	202	202	203	
Hach Temp (°C):	nr	nr	nr	nr	0.5	0.3	0.4	0.5	0.6	0.6	
Hach LDO	nr	nr	nr	nr	14.7	14.7	14.3	14.1	nr	13.7	

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): 3**			**Depth BWS (ft): 16**			**Depth BWS (ft): 27**			**Method**	**Detection range**
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3		
Oxygen (mg/L)	OR			13			3.4			Hach spec	0.3-15 mg/L
Alkalinity (mg/L as $CaCO_3$)	114	116	115	113	113	116	146	141	150	Digital titrator	10-4000 mg/L as CaCO3
Nitrite (mg/L NO_2^--N)	0.005	0.005	0.003	0.004	0.004	0.005	UR-.004	UR-.004	UR-.004	Hach spec	0.002-0.300 mg/L NO_2^--N
Ammonia (mg/L NH_3-N)	0.02	0.01	0.03	0	0	0.01	OR	.10x10=1.0	0.10x10=1.0	Hach spec	0.01-0.50 mg/L NH_3-N
Total iron--UF (mg/L)	0.02	0.03	0.02	0.03	0.03	0.03	.65x10=6.5	.79x10=7.9	.79x10=7.9	Hach spec	0.02-3.00 mg/L
Ferrous (II) Iron--F tot Fe (mg/L)	0.02	0.02	0.02	0.02	0.01	0.01	OR	.88x10=8.8	0.88x10=8.8	Hach spec	0.02-3.00 mg/L

Remarks: Hach LDO is 0.35' higher than In-Situ, Sample taken at 27 feet has color

Field-Form Filled Out By: Hilton Date: 2/15/06

QAQC Check By: St. Amand Date: 3/13/06

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: MSB-SC-Center

Sample Purpose: **Lake Water Quality** Date: 1/12/06 Time: 15:33

FIELD MEASUREMENTS

GPS Coord. Northing: N70.32024 Easting: W149.40034 Datum: WGS 84

Measurements By: Reichardt Time: 15:30

Water Depth (ft): 27.83 Ice Thickness (ft): 2.5

Freeboard (ft): 0.2 Snow Depth (ft): 0.4

Elev. (BPMSL): 95.35 +/- .02 Survey By: Lilly Date: 1/11/06 Time: nr

Water Sampling By: Reichardt Sample Depths BWS (ft): 1 3 Date: 1/12/06 Time: nr

2 16

3 27

WATER QUALITY METER INFORMATION

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
DO, pH, temp, pressure, cond., turb.	GWS	In-Situ Troll 9000	33033	yes	yes
Temp/ LDO	BLM	Hach LDO	nr	yes	yes

Parameters	**Field Measurements**									
Time:	16:18	16:22	16:27	16:31	16:36	16:39	16:46	16:49		
Depth BWS (ft):	20.0	22.0	24.0	25.0	26.0	27.0	14.0	3.0		
Temp (°C):	0.59	0.76	0.95	1.03	1.10	1.16	0.40	0.00		
pH:	7.80	7.60	7.45	7.39	7.38	7.42	7.88	7.92		
Barometeric (mmHg):	762.3	762.4	762.4	762.5	762.6	762.6	762.2	761.9		
Pressure (kPa):	57.743	nr	69.947	72.881	75.925	79.195	40.402	7.711		
Conductivity (µS/cm):	173.10	176.20	183.20	186.80	191.00	201.40	173.60	176.90		
RDO (ppm):	13.09	10.23	5.56	3.97	2.90	1.35	13.02	14.49		
Turbidity (NTU):	-0.20	-0.10	0.30	1.00	2.40	1.30	-0.20	-0.30		
ORP	204	208	211	188	68	-18	134	143		
Hach Temp (°C):	0.7	0.9	1.1	1.1	1.2	1.3	0.6	0.2		
Hach LDO	13.1	9.18	5.49	3.51	1.87	0.28	13.4	14.8		

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
Alkalinity (mg/L as $CaCO_3$)										Digital titrator
Nitrite (mg/L NO_2^--N)										Hach spec
Ammonia (mg/L NH_3-N)										Hach spec
Total iron--UF (mg/L)										Hach spec
Ferrous (II) Iron--F tot Fe (mg/L)										Hach spec

Remarks: Hach LDO is 0.35' higher than In-Situ, Sample taken at 27 feet has color. See page 1 for chemistry info.

Field-Form Filled Out By: Hilton Date: 2/15/06

QAQC Check By: St. Amand Date: 3/13/06

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: MSB-SC-SW

Sample Purpose: **Lake Water Quality** Date: 1/12/06 Time: 18:00

FIELD MEASUREMENTS

GPS Coord. Northing: N70.31977 Easting: W149.40390 Datum: WGS 84

Measurements By: Reichardt Time: nr

Water Depth (ft): 19.75 Ice Thickness (ft): 2.33

Freeboard (ft): 0.08 Snow Depth (ft): 0.4

Elev. (BPMSL): 95.35 +/- .02 Survey By: Lilly Date: 1/11/06 Time: nr

Water Sampling By: na Sample Depths BWS (ft): 1 na Date: na Time: na

2 na

WATER QUALITY METER INFORMATION 3 na

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
DO, pH, temp, pressure, cond., turb.	GWS	In-Situ Troll 9000	33033	yes	yes
temp, do	BLM	Hach LDO	nr	yes	yes

Parameters										
Time:	18:10	18:13	18:14	18:16	18:17	18:20	18:21	18:24	18:25	18:27
Depth BWS (ft):	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	15.0	16.0
Temp (°C):	0.08	0.00	-0.02	0.00	0.03	0.11	0.16	0.23	0.32	0.36
pH:	7.87	7.87	7.83	7.85	7.86	7.91	7.90	7.89	7.89	7.88
Barometeric (mmHg):	761.7	761.7	761.7	761.7	761.7	761.7	761.8	761.9	761.9	762.0
Pressure (kPa):	6.973	10.341	13.655	16.609	22.329	28.547	34.093	40.145	43.670	46.600
Conductivity (µS/cm):	177.40	176.20	176.10	175.80	175.60	175.30	175.10	174.80	174.80	174.80
RDO (ppm):	14.48	14.51	14.53	14.55	14.54	14.45	14.41	14.24	14.07	13.92
Turbidity (NTU):	-0.30	-0.30	-0.30	-0.20	-0.20	-0.20	-0.20	-0.20	0.10	-0.30
ORP	213	214	214	213	213	210	210	210	210	210
Hach Temp (°C):	0.1	0.1	0.1	0.2	0.2	0.3	0.3	0.4	0.4	0.5
Hach LDO	14.8	14.8	14.8	14.7	14.7	14.5	14.4	14.1	14	13.8

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):__3.5_____**			**Depth BWS (ft):___18____**			**Depth BWS (ft):___33____**			**Method**
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec
Alkalinity (mg/L as $CaCO_3$)										Digital titrator
Nitrite (mg/L NO_2^--N)										Hach spec
Ammonia (mg/L NH_3-N)										Hach spec
Total iron--UF (mg/L)										Hach spec
Filtered Iron--F tot Fe (mg/L)										Hach spec

Remarks: Hach LDO low/cold battery, Hach 0.35' higher than In-Situ

Field-Form Filled Out By: Hilton Date: 2/15/06

QAQC Check By: St. Amand Date: 3/13/06

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: MSB-SC-SW

Sample Purpose: **Lake Water Quality** Date: 1/12/06 Time: 18:00

FIELD MEASUREMENTS

GPS Coord. Northing: N70.31977 Easting: W149.40390 Datum: WGS 84

Measurements By: Reichardt Time: nr

Water Depth (ft): 19.75 Ice Thickness (ft): 2.33

Freeboard (ft): 0.08 Snow Depth (ft): 0.4

Elev. (BPMSL): 95.35 +/- .02 Survey By: Lilly Date: 1/11/06 Time: nr

Water Sampling By: na Sample Depths BWS (ft): 1 na Date: na Time: na

2 na

3 na

WATER QUALITY METER INFORMATION

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
DO, pH, temp, pressure, cond., turb.	GWS	In-Situ Troll 9000	33033	yes	yes
temp, do	BLM	Hach LDO	nr	yes	yes

Parameters	**Field Measurements**									
Time:	18:29	18:31	18:34							
Depth BWS (ft):	17.0	18.0	19.0							
Temp (°C):	0.39	0.42	0.49							
pH:	7.87	7.86	7.83							
Barometeric (mmHg):	762.0	762.1	762.2							
Pressure (kPa):	49.160	52.105	55.139							
Conductivity (µS/cm):	174.80	174.80	174.70							
RDO (ppm):	13.78	13.58	13.28							
Turbidity (NTU):	-0.30	-0.20	-0.20							
ORP	211	211	211							
Hach Temp (°C):	0.5	0.6	0.6							
Hach LDO	13.7	13.5	13.2							

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): 3**			**Depth BWS (ft): 16**			**Depth BWS (ft): 27**			**Method**
	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	rep 1	rep 2	rep 3	
Oxygen (mg/L)										Hach spec
Alkalinity (mg/L as $CaCO_3$)										Digital titrator
Nitrite (mg/L NO_2^--N)										Hach spec
Ammonia (mg/L NH_3-N)										Hach spec
Total iron--UF (mg/L)										Hach spec
Ferrous (II) Iron--F tot Fe (mg/L)										Hach spec

Remarks: Northeast corner of north cell, near permanent monitoring site. Snow depth non-uniform, heavy influence of wind.

Field-Form Filled Out By: Hilton Date: 2/15/06

QAQC Check By: St. Amand Date: 3/13/06

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: MSB-SJ

Sample Purpose: **Lake Water Quality** Date: 1/12/06 Time: nr

FIELD MEASUREMENTS

GPS Coord. Northing: N70 19.202 Easting: W149 24.114 Datum: Nad 27

Measurements By: Lilly Time: nr

Water Depth (ft): 4 Ice Thickness (ft): 2.47

Freeboard (ft): 0.1 Snow Depth (ft): 0.6

Elev. (BPMSL): 95.35 +/- .02 Survey By: Lilly Date: 1/11/06 Time: nr

Water Sampling By: na Sample Depths BWS (ft): 1 na Date: na Time: na

2 na

WATER QUALITY METER INFORMATION 3 na

Calibration Information

Parameter (s)	Owner	Meter Make/Model	Serial No.	Pre-Sampling QAQC Check	Post-Sampling QAQC Check
DO, pH, temp, pressure, cond., turb.	GWS	In-Situ Troll 9000	33033	yes	yes
do,temp	BLM	Hach LDO	nr	yes	yes

Parameters										
Time:	18:55									
Depth BWS (ft):	3.5									
Temp (°C):	-0.10									
pH:	7.37									
Barometeric (mmHg):	761.7									
Pressure (kPa):	8.820									
Conductivity (µS/cm):	338.70									
RDO (ppm):	1.20									
Turbidity (NTU):	2.20									
ORP	232									
Hach Temp (°C):	0.1									
Hach LDO	0.83									

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
Alkalinity (mg/L as $CaCO_3$)										Digital titrator
Nitrite (mg/L NO_2^--N)										Hach spec
Ammonia (mg/L NH_3-N)										Hach spec
Total iron--UF (mg/L)										Hach spec
Filtered Iron--F tot Fe (mg/L)										Hach spec

Remarks: LDO is 0.35' higher than In-Situ.

Field-Form Filled Out By: Hilton Date: 2/15/06

QAQC Check By: St. Amand Date: 3/13/06

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: K113

Sample Purpose: **Lake Water Quality** Date: 1/18/2006

WATER QUALITY METER INFORMATION

Meter Make: In-Situ Make: Troll 9000

Owner: GWS S/N: 33033

CALIBRATION AND QUALITY ASSURANCE INFORMATION

Pre-Sampling QA

Parameter	Date	Time	Standard	Lot No.	Exp.	Meter Reading	Pass/Fail
pH 7.00	1/17/06	nr	Oakton pH 7.00	2405162	Dec-05	6.87	Pass
pH 10.01	1/17/06	nr	In-Situ pH 10.01	531001-1	Sep-06	9.84	Pass
Conductivity	1/17/06	nr	Oakton 447 uS	2412150	Dec-05	283.5 @ 5.61C	Pass
Zero Oxygen	1/17/06	nr	Hanna HI7040	690	Dec-05	-0.01	Pass
Oxygen Saturation	1/17/06	nr	tetra bubbler	na	na	12.68 @ 2.5C	Pass

Post-Sampling QA

Parameter	Date	Time	Standard	Lot No.	Exp.	Meter Reading	Pass/Fail
pH 7.00	1/18/06	19:50	In-Situ pH 7.00	531034 3	Sep-06	6.96	Pass
Conductivity	1/18/06	19:50	Oakton 447 uS	2412150	Dec-05	251.3 @ 1.5C	Pass
Zero Oxygen	1/18/06	19:50	Hanna HI7040	690	Dec-05	-0.03	Pass
Oxygen Saturation	1/18/06	19:50	tetra bubbler	na	na	12.67 @ 2.72C	Pass

Remarks: 17Jan06 RDO initially failed cal-check, and was recalibrated.

Field-Form Filled Out By: Hilton Date: 2/17/2006

QAQC Check By: Reichardt Date: 2/28/2006

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: K113

Sample Purpose: **Lake Water Quality** Date: 1/18/2006

WATER QUALITY METER INFORMATION

Meter Make: Hach Make: LDO

Owner: UAF S/N: nr

CALIBRATION AND QUALITY ASSURANCE INFORMATION

Pre-Sampling QA

Parameter	Date	Time	Standard	Lot No.	Exp.	Meter Reading	Pass/Fail
Zero Oxygen	1/17/06	nr	Hanna HI7040	690	Dec-06	-0.06 mg/L	Pass
Oxygen Saturation	1/17/06	nr	tetra bubbler	na	na	99.9%	Pass

Post-Sampling QA

Parameter	Date	Time	Standard	Lot No.	Exp.	Meter Reading	Pass/Fail
Zero Oxygen	1/18/06	nr	Hanna HI7040	690	Dec-06	-0.06 mg/L	Pass
Oxygen Saturation	1/18/06	nr	tetra bubbler	na	na	104.4%	Pass

Remarks:

Field-Form Filled Out By: Hilton Date: 2/17/2006

QAQC Check By: Reichardt Date: 2/18/2006

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: KDA-1, 2, 3

Sample Purpose: **Lake Water Quality** Date: 1/10/2006

WATER QUALITY METER INFORMATION

Meter Make: In-Situ Make: Troll 9000

Owner: GWS 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	1/9/06	nr	In-Situ pH 4.01	530478-2	Jul-06	4.19	Pass
pH 7.00	1/9/06	nr	Oakton pH 7.00	2405162	May-06	7.08	Pass
pH 10.01	1/9/06	nr	In-Situ pH 10.01	531001-1	Sep-06	10.12	Pass
Conductivity	1/9/06	nr	Oakton 447 uS	2412150	Dec-05	280.8 @ 2.8C	Pass
Zero Oxygen	1/9/06	nr	Hanna HI7040	690	Dec-06	-0.01	Pass
Oxygen Saturation	1/9/06	nr	tetra bubbler	na	na	12.48 @ 2.06C/ 751.7mmHg	Pass

Post-Sampling QA

Parameter	Date	Time	Standard	Lot No.	Exp.	Meter Reading	Pass/Fail
pH 4.01	1/10/06	nr	In-Situ pH 4.01	530478-2	Jul-06	4.16	Pass
pH 7.00	1/10/06	nr	Oakton pH 7.00	2405162	Dec-05	7.08	Pass
pH 10.01	1/10/06	nr	In-Situ pH 10.01	531001-1	Sep-06	10.04	Pass
Conductivity	1/10/06	nr	Oakton 447 uS	2412150	May-06	250.7 @ 2.27C	Pass
Zero Oxygen	1/10/06	nr	Hanna HI7040	690	Dec-06	0.05	Pass
Oxygen Saturation	1/10/06	nr	tetra bubbler	na	na	12.51 @ 6.56C/ 754.7 mmHg	Pass

Remarks: RDO failed the pre-sample check. Was re-calibrated.

Field-Form Filled Out By: Hilton Date: 2/17/2006

QAQC Check By: Reichardt Date: 2/28/2006

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: L9312, L9817

Sample Purpose: **Lake Water Quality** Date: 1/16/2006

WATER QUALITY METER INFORMATION

Meter Make: In-Situ Make: Troll 9000

Owner: GWS S/N: 33033

CALIBRATION AND QUALITY ASSURANCE INFORMATION

Pre-Sampling QA

Parameter	Date	Time	Standard	Lot No.	Exp.	Meter Reading	Pass/Fail
pH 7.00	1/15/06	nr	Oakton pH 7.00	2405162	Dec-06	6.98	Pass
pH 10.01	1/15/06	nr	In-Situ pH 10.01	531001-1	Sep-06	9.98	Pass
Conductivity	1/15/06	nr	Oakton 447 uS	2412150	May-05	258.5 @ 2.81C	Pass
Zero Oxygen	1/15/06	nr	Hanna HI7040	90	Dec-05	7.01	Pass
Oxygen Saturation	1/15/06	nr	tetra bubbler	na	na	12.21 @ 2.34C/ 759.9mmHg	Pass

Post-Sampling QA

Parameter	Date	Time	Standard	Lot No.	Exp.	Meter Reading	Pass/Fail
pH 7.00	1/16/06	nr	Oakton pH 7.00	2405162	Dec-06	6.96	Pass
pH 10.01	1/16/06	nr	In-Situ pH 10.01	531001-1	Sep-06	9.94	Pass
Conductivity	1/16/06	nr	Oakton 447 uS	2412150	May-05	268.2 @ 2.41C	Pass
Oxygen Saturation	1/16/06	nr	tetra bubbler	na	na	12.3 @ 5.7C/ 760.0 mmHg	Pass

Remarks:

Field-Form Filled Out By: Hilton Date: 2/17/2006

QAQC Check By: Reichardt Date: 2/18/2006

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: L9312, L9817

Sample Purpose: **Lake Water Quality** Date: 1/16/2006

WATER QUALITY METER INFORMATION

Meter Make: Hach Make: LDO

Owner: BLM/UAF S/N: nr

CALIBRATION AND QUALITY ASSURANCE INFORMATION

Pre-Sampling QA

Parameter	Date	Time	Standard	Lot No.	Exp.	Meter Reading	Pass/Fail
BLM							
Zero Oxygen	1/15/06	nr	Hanna HI7040	90	Dec-06	0.14	Pass
Oxygen Saturation	1/15/06	nr	tetra bubbler	na	na	93.60%	Pass
UAF							
Zero Oxygen	1/15/06	nr	Hanna HI7040	90	Dec-05	-0.04	Pass
Oxygen Saturation	1/15/06	nr	tetra bubbler	na	na	102.80%	Pass

Post-Sampling QA

Parameter	Date	Time	Standard	Lot No.	Exp.	Meter Reading	Pass/Fail
BLM							
Oxygen Saturation	1/16/06	nr	tetra bubbler	na	na	92.10%	Pass
UAF							
Oxygen Saturation	1/16/06	nr	tetra bubbler	na	na	100.90%	Pass

Remarks:

Field-Form Filled Out By: Hilton Date: 2/17/2006

QAQC Check By: St. Amand Date: 3/20/2006

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: MSB

Sample Purpose: **Lake Water Quality** Date: 1/11/2006, 1/12/06

WATER QUALITY METER INFORMATION

Meter Make: Hach Make: LDO

Owner: BLM S/N: nr

CALIBRATION AND QUALITY ASSURANCE INFORMATION

Pre-Sampling QA

Parameter	Date	Time	Standard	Lot No.	Exp.	Meter Reading	Pass/Fail
Zero Oxygen	12/16/05	nr	Hanna HI7040	690	Dec-06	-1.00	Pass
Oxygen Saturation	12/16/05	nr	tetra bubbler	na	na	10.5 @ 16.4C/ 745 mmHg	Pass

Post-Sampling QA

Parameter	Date	Time	Standard	Lot No.	Exp.	Meter Reading	Pass/Fail
Zero Oxygen	1/15/06	nr	Hanna HI7040	690	Dec-06	0.14	Pass
Oxygen Saturation	1/15/06	nr	tetra bubbler	na	na	93.60%	Pass

Remarks: QAQC check not completed for Pre-Sampling QA

Field-Form Filled Out By: Hilton Date: 2/17/2006

QAQC Check By: Reichardt Date: 2/28/2006

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: MSB

Sample Purpose: **Lake Water Quality** Date: 1/11/2006

WATER QUALITY METER INFORMATION

Meter Make: In-Situ Make: Troll 9000

Owner: GWS 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	1/10/06	22:57	In-Situ pH 4.01	530478-2	Jul-06	4.16	Pass
pH 7.00	1/10/06	22:57	Oakton pH 7.00	2405162	Dec-06	7.08	Pass
pH 10.01	1/10/06	22:57	In-Situ pH 10.01	531001-1	Sep-06	10.04	Pass
Conductivity	1/10/06	22:57	Oakton 447 uS	2412150	May-05	250.7 @ 2.27C	Pass
Zero Oxygen	1/10/06	22:57	Hanna HI7040	90	Dec-05	0.05	Pass
Oxygen Saturation	1/10/06	22:57	tetra bubbler	na	na	12.15 @ 6.56C/ 754.7 mmHg	Pass

Post-Sampling QA

Parameter	Date	Time	Standard	Lot No.	Exp.	Meter Reading	Pass/Fail
pH 4.01	1/11/06	23:55	In-Situ pH 4.01	530478-2	Jul-06	4.18	Pass
pH 7.00	1/11/06	23:55	Oakton pH 7.00	2405162	Dec-06	7.14	Pass
pH 10.01	1/11/06	23:55	In-Situ pH 10.01	531001-1	Sep-06	10.11	Pass
Conductivity	1/11/06	23:55	Oakton 447 uS	2412150	May-05	254.4 @ 1.95C	Pass
Zero Oxygen	1/11/06	23:55	Hanna HI7040	90	Dec-05	0.02	Pass
Oxygen Saturation	1/11/06	23:55	tetra bubbler	na	na	12.46 @ 4.42C/ 760.4 mmHg	Pass

Remarks:

Field-Form Filled Out By: Hilton Date: 2/17/2006

QAQC Check By: Reichardt Date: 2/18/2006

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: MSB

Sample Purpose: **Lake Water Quality** Date: 1/12/06

WATER QUALITY METER INFORMATION

Meter Make: In-Situ Make: Troll 9000

Owner: GWS 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	1/11/06	23:55	In-Situ pH 4.01	530478-2	Jul-06	4.18	Pass
pH 7.00	1/11/06	23:55	Oakton pH 7.00	2405162	May-06	7.14	Pass
pH 10.01	1/11/06	23:55	In-Situ pH 10.01	531001-1	Sep-06	10.11	Pass
Conductivity	1/11/06	23:55	Oakton 447 uS	2412150	Dec-05	254.4 @ 1.95C	Pass
Zero Oxygen	1/11/06	23:55	Hanna HI7040	90	Dec-05	0.02	Pass
Oxygen Saturation	1/11/06	23:55	tetra bubbler	na	na	12.46 @ 4.42C/ 760.4 mmHg	Pass

Post-Sampling QA

Parameter	Date	Time	Standard	Lot No.	Exp.	Meter Reading	Pass/Fail
pH 4.01	1/12/06	nr	In-Situ pH 4.01	530478-2	Jul-06	4.15	Pass
pH 7.00	1/12/06	nr	Oakton pH 7.00	2405162	May-06	7.10	Pass
pH 10.01	1/12/06	nr	In-Situ pH 10.01	531001-1	Sep-06	9.97	Pass
Conductivity	1/12/06	nr	Oakton 447 uS	2412150	Dec-05	293 @ 7.79C	Pass
Zero Oxygen	1/12/06	nr	Hanna HI7040	90	Dec-05	0.05	Pass
Oxygen Saturation	1/12/06	nr	tetra bubbler	na	na	12.790 @ 4.17C/ 760.7 mmHg	Pass

Remarks:

Field-Form Filled Out By: Hilton Date: 2/17/2006

QAQC Check By: St. Amand Date: 3/8/2006

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: K113

Survey Purpose: **Water-Level Elevations** Date: 1/18/2006 Time: 13:10

Location:	K113, located east of Mine Site B and south of Spine Road							
Survey objective:	Lake water elevation survey					Weather Observations:		
Instrument Type:	Optical Survey Level		Instrument ID:	na		Cold		
Rod Type:	Fiberglass		Rod ID:	na				
Bench Mark Information:						Survey Team Names		
Name	Agency Responsible	Elevation (ft)	Latitude (dd-mm.mmm)	Longitude (ddd-mm.mmm)		Michael Lilly Daniel Reichardt		
TBM 615	CP	59.33	na	na				
Station	BS (ft)	HI (ft)	FS (ft)	Elevation (fasl)	Distance (ft)	Horizontal Angle	Vertical Angle	Remarks
TBM 615	-1.49	57.84		59.33				Top plate on VSM, SE corner
TBM 617		57.84	-0.64	58.48				Top plate on VSM, SW corner, Elev =
WL		57.84	4.77	53.07				Top of ice in refrozen hole
								moved Instr., used WL ice as turn point
WL	4.95	58.02		53.07				
TBM 617		58.02	-0.46	58.48				Top plate on VSM, SW corner
TBM 615		58.02	-1.31	59.33				Close survey to 0.00
Note: Need to verify								

Abbreviations: backsight, BS; degrees, dd; feet, ft; feet above mean sea level, fasml; 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: Kuparuk Deadarm Mine Sites

Survey Purpose: **Water-Level Elevations** Date: 1/18/2006 Time: 16:00

Location:	Kuparuk Deadarm Mine Sites, reservoir 1, 2, 3. Adjacent to Kuparuk River							
Survey objective:	Determine elevations in reservoirs 1, 2, 3					Weather Observations:		
Instrument Type:	Optical Survey Level		Instrument ID:	na		Cold		
Rod Type:	Fiberglass		Rod ID:	na				
Bench Mark Information:						Survey Team Names		
Name	Agency Responsible	Elevation (ft)	Latitude (dd-mm.mmm)	Longitude (ddd-mm.mmm)		Dan Reichardt Michael Lilly		
BM #1 WO040768	BP	19.32	N70 20.065 NAD27	W148 56.183 NAD27				
Station	BS (ft)	HI (ft)	FS (ft)	Elevation (fasl)	Distance (ft)	Horizontal Angle	Vertical Angle	Remarks
BM#1	0.66	19.98		19.32				Bell Assoc. Benchmark
KDA2-S1		19.98	12.98	7.00				S1 was measured at top of Ice
KDA2-S1WL				6.80				S1WL was measured at water surface, Freeboard = 0.20
KDA3-S1		19.98	13.20	6.78				S1 was measured at water surface
KDA3-S2		19.98	13.11	6.87				S2 was measured at ice surface, frozen previous week
								moved Instr. Used KDA3-S2 as turn pt.
KDA3-S2	12.96	19.83		6.87				S2 was measured at ice surface
KDA3-S1		19.83	13.04	**6.78**				**WS Elevation for Reservoir #3**
KDA2-S1		19.83	12.82	7.01				S1 was measured at top of Ice
KDA2-S1WL				**6.81**				**WS Elevation for Reservoir #2**
BM #1		19.83	0.49	19.34				Close survey to 0.02
KDA2-S2	7.68	14.63		6.95				S2 was measured at ice surface
KDA2-S1WL				6.81				S2WL is water level, freeboard is 0.14 feet
KDA1-S1		14.63	5.82	8.81				S1 was measured on ice surface
								moved Instr. Used KDA1-S1 as turn pt.
KDA1-S1	6.1	14.91		**8.81**				**WS Elevation for Reservoir #1**
KDA2-S2		14.91	7.94	6.97				Close survey to 0.02
Note: Field notes use temperary datum for BM #1 = 100.00 ft.								
KDA2-S1 is in NW Corner of Resevoir 2, KDA3-S1 is in SW Corner of Resevoir 3, BM #1 is set in dirt west of dike with pink flagging. KDA2-S2 is in SE Corner of Resevoir 2. KDA1-S1 is in NE corner of Resevoir 1.								

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: 1/16/2006 Time: 11:15

Location:	Lake L9312, located southeast of Alpine pad, survey by pump house benchmarks							
Survey objective:	Lake water elevation survey					Weather Observations:		
Instrument Type:	Optical Survey Level		Instrument ID:	na		Cold, windy, blowing snow		
Rod Type:	Fiberglass		Rod ID:	na				
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	11.61 BPMSL	na	na				
Station	BS (ft)	HI (ft)	FS (ft)	Elevation (fasl)	Distance (ft)	Horizontal Angle	Vertical Angle	Remarks
P	1.59	13.31		11.72				Top of inlet pipe support
O		13.31	1.84	11.47				Top of inlet pipe support
PH-VSM		13.31	-1.25	14.56				Top of VSM plate, SE corner of pump house
WL		13.31	5.81	**7.50**				Top of ice in refrozen hole
								moved Instr., used WL ice as turn point
WL	6.05	13.55		7.50				
PH-VSM		13.55	-1.03	14.58				+0.02
O		13.55	2.06	11.49				+0.02
P		13.55	1.81	11.74				close survey to +0.02

Abbreviations: backsight, BS; degrees, dd; feet, ft; feet above mean sea level, fasml; 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: 1/15/2006 Time: 14:30

Location:	Lake L9817, located west of Nuiqsut, survey control at southeast corner of lake							
Survey objective:	Lake water elevation survey					Weather Observations:		
Instrument Type:	Optical Survey Level		Instrument ID:	na		Cold, slight breeze		
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		
L9817 "B"	BLM	54.98 BPMSL	na	na				
Station	BS (ft)	HI (ft)	FS (ft)	Elevation (fasl)	Distance (ft)	Horizontal Angle	Vertical Angle	Remarks
B	5.38	60.36		54.98				SE TBM, rebar stake
A		60.36	5.96	54.40				NE TBM, rebar stake
D		60.36	5.33	55.03				NW TBM, rebar stake
C		60.36	4.41	55.95				south-central TBM, rebar stake
E		60.36	3.95	56.41				SW TBM, rebar stake
WL		60.36	7.01	**53.35**				Top of ice in refrozen hole
								moved Instr., used WL ice as turn point
WL	6.95	60.30		**53.35**				**L9817 WL**
E		60.30	3.89	56.41				+0.00
C		60.30	4.34	55.96				+0.01
D		60.30	5.26	55.04				+0.01
A		60.30	5.89	54.41				+0.01
B		60.30	5.32	54.98				close survey to +0.00

Abbreviations: backsight, BS; degrees, dd; feet, ft; feet above mean sea level, fasml; 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: Mine Site B

Survey Purpose: **Water-Level Elevations** Date: 1/11/2006 Time: 16:30

Location:	Mine Site B, NE corner of North Cell, temporary datum						
Survey objective:	Lake water elevation survey				Weather Observations:		
Instrument Type:	Optical Survey Level	Instrument ID:	na		Cold, sligh breeze		
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 Dan Reichardt		
"Post"	WERC	100 Temp.	na	na			

Station	BS (ft)	HI (ft)	FS (ft)	Elevation (fasl)	Distance (ft)	Horizontal Angle	Vertical Angle	Remarks
Post TBM1	5.40	105.40		100.00				Top of nail in post, temp elevation
WL1		105.40	10.05	**95.35**				Top of ice in refrozen hole, closest to bank
								moved Instr., used WL ice as turn point
WL1	9.91	105.26		95.35				Top of ice in refrozen hole, closest to bank
Post TBM1		105.26	5.24	100.02				close survey to +0.02

Abbreviations: backsight, BS; degrees, dd; feet, ft; feet above mean sea level, fasml; 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:	K113 - Tundra
Survey Purpose:	**Snow Depth and Water Content**	Date: 1/18/2006	Time: 12:30

Location:	K113, location is on North side of lake, near survey tripid location between pipeline and lake shore		
Survey objective:	Snow depths and snow-water content for lake recharge estimates	Weather Observations:	mild, slight breeze
Snow Depth Probe Type:	T-handle snow depth probe,	Snow-Survey Team Names	
Snow Tube Type:	Adiraondak, 6.8 cm diameter cutter, area = 36.33 cm^2	Michael Lilly	

Snow Course Depths

	1	2	3	4	5
1	40.5	40.5	25.0	32.0	37.0
2	41.0	40.0	26.0	33.0	34.5
3	40.0	39.0	25.5	33.0	34.5
4	39.5	39.0	26.0	32.0	33.0
5	39.5	38.0	28.0	33.0	33.5
6	38.5	36.0	30.0	34.0	33.0
7	38.0	34.5	31.0	34.5	33.5
8	39.5	33.5	31.5	34.0	33.0
9	40.0	29.5	31.0	34.0	33.0
10	39.5	23.0	31.0	35.0	33.5

Average snow depth =	**34.1**
Maximum snow depth =	41
Minimum snow depth =	23
Standard variation =	4.5

Snow Sample Depths and Weights

Bag #	Depth (cm)	Weight (gr)	(gr/cm^2)	(unitless)
1	40	318	8.8	0.22
2	38	277	7.6	0.20
3	39	312	8.6	0.22
4	25	148	4.1	0.16
5	34	295	8.1	0.24
			Average =	**0.21**

Average Snow Water Equivalent =	**7.1**	cm H2O
Average Snow Water Equivalent =	**2.80**	inches H2O
Average Snow Water Equivalent =	**0.23**	feet H2O

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 - Tundra**
Survey Purpose:	**Snow Depth and Water Content**	Date: 1/16/2006	Time: 11:00

Location:	L9312 snow survey located west of pump house and south of water pipeline		
Survey objective:	Snow depths and snow-water content for lake recharge estimates	Weather Observations:	mild
Snow Depth Probe Type:	Folding tape	Snow-Survey Team Names	
Snow Tube Type:	Adiraondak, 6.8 cm diameter cutter, area = 36.33 cm^2	Dan White Matthew Whitman	

Snow Course Depths, in cm.

	1	2	3	4	5
1	14.3	11.9	31.4	33.5	32.0
2	13.7	18.3	34.7	32.9	26.5
3	15.5	19.5	28.3	33.5	22.3
4	13.1	19.5	36.6	29.0	24.4
5	7.6	23.2	36.6	29.6	19.8
6	12.2	23.5	35.7	33.5	22.6
7	10.1	21.9	34.4	29.0	18.3
8	12.2	22.9	33.8	33.8	18.0
9	12.5	24.4	33.8	32.9	15.2
10	10.1	23.2	33.5	32.9	18.9

Average snow depth =	**24.1**
Maximum snow depth =	36.576
Minimum snow depth =	7.62
Standard variation =	8.7

Snow Sample Depths and Weights

Bag #	Depth (cm)	Weight (gr)	(gr/cm^2)	(unitless)
1	10.1	61	1.7	0.17
2	23.2	165	4.5	0.20
3	33.5	299	8.2	0.25
4	32.9	264	7.3	0.22
5	18.9	111	3.1	0.16
			Average =	**0.20**

Average Snow Water Equivalent =	**4.8**	cm H2O
Average Snow Water Equivalent =	**1.88**	inches H2O
Average Snow Water Equivalent =	**0.16**	feet H2O

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:	**L9817 - Tundra**
Survey Purpose:	**Snow Depth and Water Content**	Date: 1/15/2006	Time: 14:00

Location:	L9817, survey located south of monitoring station on eastern lake shore		
Survey objective:	Snow depths and snow-water content for lake recharge estimates	Weather Observations:	mild
Snow Depth Probe Type:	Folding tape	Snow-Survey Team Names	
Snow Tube Type:	Adiraondak, 6.8 cm diameter cutter, area = 36.33 cm^2	Dan White Matthew Whitman	

Snow Course Depths, in cm.

	1	2	3	4	5
1	29.0	36.6	44.2	23.2	35.1
2	30.5	39.6	43.3	23.2	39.6
3	30.5	38.1	39.6	23.8	33.5
4	30.5	41.1	36.6	24.4	39.6
5	28.0	39.0	37.5	25.0	39.6
6	28.7	39.6	39.9	27.4	41.1
7	32.0	36.0	29.3	29.0	42.4
8	32.0	42.1	24.7	30.5	42.1
9	32.6	43.3	25.0	32.9	39.6
10	33.5	44.2	24.1	34.4	42.7

Average snow depth =	**34.4**
Maximum snow depth =	44.196
Minimum snow depth =	23.1648
Standard variation =	6.5

Snow Sample Depths and Weights

Bag #	Depth (cm)	Weight (gr)	(gr/cm^2)	(unitless)
1	30.48	322	8.9	0.29
2	36.58	263	7.2	0.20
3	39.62	440	12.1	0.31
4	39.93	249	6.9	0.17
5	27.43	296	8.1	0.30
			Average =	**0.25**

Average Snow Water Equivalent =	**8.7**	cm H2O
Average Snow Water Equivalent =	**3.42**	inches H2O
Average Snow Water Equivalent =	**0.29**	feet H2O

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:	Mine Site B - Tundra
Survey Purpose:	**Snow Depth and Water Content**	Date: 1/12/2006	Time: 16:00

Location:	Mine Site B, located north of stream junction samplnig point, on tundra between Milne Creek and south cell		
Survey objective:	Snow depths and snow-water content for lake recharge estimates	Weather Observations:	cold, slight breeze
Snow Depth Probe Type:	T-handle snow depth probe,	Snow-Survey Team Names	
Snow Tube Type:	Adiraondak, 6.8 cm diameter cutter, area = 36.33 cm^2	Michael Lilly	

Snow Course Depths, in cm.

	1	2	3	4	5
1	19.0	16.0	23.0	27.0	20.5
2	16.0	16.5	23.0	23.0	19.5
3	15.5	20.0	27.0	23.0	17.5
4	15.0	17.5	29.0	23.0	16.0
5	19.5	15.5	27.5	22.0	14.5
6	16.5	21.0	23.5	21.5	19.5
7	18.0	21.5	26.0	20.5	26.5
8	16.0	23.0	28.0	26.0	22.5
9	16.5	25.5	32.0	20.0	18.5
10	23.0	28.0	27.0	22.5	23.0

Average snow depth =	**21.4**
Maximum snow depth =	32
Minimum snow depth =	14.5
Standard variation =	4.3

Snow Sample Depths and Weights

Bag #	Depth (cm)	Weight (gr)	(gr/cm^2)	(unitless)
1	14	84	2.3	0.17
2	20.5	140	3.9	0.19
3	24	169	4.7	0.19
4	22	67	1.8	0.08
5	16	105	2.9	0.18
			Average =	**0.16**

Average Snow Water Equivalent =	**3.5**	cm H2O
Average Snow Water Equivalent =	**1.37**	inches H2O
Average Snow Water Equivalent =	**0.11**	feet H2O