




ALPINE SATELLITE DEVELOPMENT PLAN

2011 WATER QUALITY MONITORING REPORT

Submitted to


ConocoPhillips
Alaska

Prepared by


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CONTENTS

Acronyms and Abbreviations	iv
1.0 Introduction	1
2.0 Methods	3
2.1 Sample Location Selection.....	4
2.2 In-Situ Water Quality Parameters.....	5
2.2.1 Instrument Calibration.....	5
2.3 Laboratory Sample Collection and Analysis.....	8
2.3.1 Sample Collection.....	8
2.3.2 Laboratory Analysis.....	8
3.0 Results	11
3.1 Field Conditions August 8, 2011.....	11
3.1.1 Lake M9313 and M9313 SW.....	11
3.1.2 Lake L9323.....	13
3.1.3 Lake L9324 and L9324 NE.....	14
3.2 In-Situ Results.....	16
3.2.1 Specific Conductance.....	17
3.2.2 Dissolved Oxygen and Water Temperature.....	17
3.2.3 Salinity.....	17
3.3 Laboratory Results.....	17
4.0 References	19

FIGURES

Figure 1.1: 2011 Alpine Satellite Development Project Water Quality Monitoring Locations.....	2
Figure 2.1: Lake M9313 and M9313 SW Sampling Locations.....	6
Figure 2.2: Lake L9323, Lake L9324, and L9324 NE Sampling Locations.....	7

TABLES

Table 2.1: In-Situ Water Quality Parameters.....	5
Table 2.2: Laboratory Sampling Parameters.....	8
Table 3.1: In-Situ Water Quality Results.....	16
Table 3.2: Laboratory Analytical Results.....	18

PHOTOS

Photo 2.1: Inflatable kayak and support equipment, Lake L9323; August 8, 2011 3
Photo 3.1: Lake M9313, looking west; August 8, 2011 11
Photo 3.2: Lake M9313, looking southwest; August 8, 2011 12
Photo 3.3: Marshy area adjacent to Lake M9313 (M9313 SW); August 8, 2011 12
Photo 3.4: Lake L9323, looking northwest; August 8, 2011 13
Photo 3.5: Lake L9323, looking southeast; August 8, 2011 13
Photo 3.6: Lake L9324, looking east; August 8, 2011 14
Photo 3.7: Lake L9324, looking northwest; August 8, 2011 15
Photo 3.8: Marshy area adjacent to Lake L9324 (L9324 NE); August 8, 2011 15

APPENDICES

Appendix A Laboratory Samples - Analysis Report

ACRONYMS AND ABBREVIATIONS

μS/cm	microsiemens per centimeter	NTU	Nephelometric Turbidity Units
°C	degrees Celsius	ppt	parts per thousand
°F	degrees Fahrenheit	RCRA	Resource Conservation and Recovery Act
ADEC	Alaska Department of Environmental Conservation	RRO	Residual Range Organics
ASDP	Alpine Satellite Development Plan	SG	Silica Gel
Baker	Michael Baker Jr., Inc.	SGS	SGS North America, Inc.
CD	Colville Delta	SW	southwest
CPAI	ConocoPhillips Alaska, Inc.	USACE	U.S. Army Corps of Engineers
CRD	Colville River Delta	USGS	U.S. Geological Survey
DO	Dissolved Oxygen		
DRO	Diesel Range Organics		
EPA	U.S. Environmental Protection Agency		
FID	Flame Ionization Detector		
GC	Gas Chromatography		
GPS	Global Positioning System		
ICP-MS	Inductively Coupled Plasma-Mass Spectrometry		
JSA	Job Safety Analysis		
LDO	Light Dissolved Oxygen		
LOQ	Limit of Quantitation		
mg/L	milligrams per liter		
MS	Mass Spectrometer		
NAD83	North American Datum of 1983		
ND	not detected		
NE	northeast		

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1.0 INTRODUCTION

The Alpine Satellite Development Plan (ASDP) 2011 Water Quality Monitoring Report presents the result of the field sampling conducted in August 2011 for ConocoPhillips Alaska, Inc. (CPAI). Annual monitoring of lakes M9313, L9323, and L9324 is required by North Slope Borough Ordinance Serial No. 75-6-46, Stipulation IV.2.4.3(h). At the request of CPAI, these three lakes have been monitored annually by Michael Baker Jr. Inc. (Baker) since 2007. An overview of the three study lakes relative to Alpine facilities is presented in Figure 1.1.

During the winter of 1998/1999, CPAI initiated construction of the Alpine Facility, Colville Delta (CD) 1 and CD2, in the Colville River Delta (CRD). Alpine operations expanded with the implementation of the ASDP during the 2004/2005 winter season. Construction included placement of gravel facilities for two new satellite drill sites, CD3 and CD4. The CD3 pad development included an airstrip and pad/ airstrip access road, apron, and taxiway. The CD4 pad development included an access road running parallel to the existing Alpine Sales Pipeline, connecting to the CD2 access road. Lake M9313 is near CD3, and lakes L9323 and L9324 are located north and south of CD4, respectively.

The 2011 water quality monitoring program included in-situ field sampling of the lakes for temperature, dissolved oxygen (DO), salinity, conductivity/specific conductance, and turbidity. Additional water samples were collected at the lakes for laboratory analysis of dissolved hydrocarbons: diesel range organics (DRO), residual range organics (RRO) and Resource Conservation and Recovery Act (RCRA) metals. The laboratory analyses for the lakes were chosen to identify and monitor the persistence of trace concentrations originally observed in 2007.

Samples were collected for laboratory analysis from the adjacent tundra areas if a film was observed when accessing the lakes. A film was observed on the tundra adjacent to lakes M9313 and L9324. No film was observed when accessing Lake L9323. Samples were collected to determine if hydrocarbons were present or if the film was the result of natural biological activity. The samples were analyzed for DRO and RRO using standard methods (AK 102 and AK 103) and silica gel extraction procedures.



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Legend	
Roads	Sample Lakes
Pipelines	Facilities



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2011 OVERVIEW
ASDP WATER QUALITY
MONITORING AREA

FIGURE: 1.1
(SHEET 1 of 1)

2.0 METHODS

On August 8, 2011, Baker conducted field investigations at lakes M9313, L9323, and L9324. Bristow Helicopters provided access to Lake M9313, and an Alpine Environmental pickup truck was used to access Lake L9323 and Lake L9324.

In-situ water quality data measurements and laboratory sample collection were performed by a two-person Baker team; each in an inflatable kayak, with an attached support raft for transporting the sampling equipment (Photo 2.1). In-situ water quality instruments were provided by TTT Environmental. Laboratory analyses and sample collection bottles were provided by SGS North America, Inc. (SGS).



Photo 2.1: Inflatable kayak and support equipment, Lake L9323; August 8, 2011

Prior to sampling, aerial reconnaissance was conducted to identify possible inflow and outflow sources, and to determine if each lake was hydraulically connected to other nearby

surface water sources. It was also confirmed that each lake was well-mixed and lacked significant stratification prior to analytic sample collection.

Field sampling methods were based on U.S. Geologic Survey (USGS 2006a), Ward and Harr (1990), and U.S. Army Corps of Engineers (USACE 1987) methods.

Safety precautions were followed, as outlined in the North Slope Water Resources 2011 Health, Safety and Environmental Safety Plan (Baker 2011a) and the 2011 Job Safety Analysis (JSA) - 2011 Alpine Pipeline Hydrology and 2011 ASDP Water Quality Monitoring (Baker 2011b). Baker employees worked in groups of two, and an UMIAQ (LCMF) employee served as a bear guard during sampling of Lake M9313 because of its distance from the Alpine facilities and proximity to the coast. Bristow Helicopters communicated travel plans to Alpine Security. Personnel were equipped with U.S. Coast Guard approved personal flotation devices (float-coats).

2.1 SAMPLE LOCATION SELECTION

Past in-situ monitoring of North Slope lakes indicates hydraulically isolated lakes are well-mixed during open water conditions. The likelihood of homogeneous conditions, which are verified at each lake with in-situ measurements, supports the use of single point sampling. For this project, it is assumed that data collected at specific stations are representative of conditions throughout the well-mixed water body and thus, water samples collected at a single location are representative of the lake.

Lake selection was based on maximum lake depth and relative proximity to gravel facilities. Lake bathymetry was used to identify the deepest part of the water body, and a single representative sampling location was selected. In 2010, the location of the deepest part of each lake was confirmed using a hand-held sonar depth finder.

Sample locations were identified and confirmed using a handheld global positioning system (GPS) Garmin Rino 520HCx referenced to the North American [horizontal] Datum of 1983 (NAD83). Samples were collected at locations confirmed by the 2010 field investigation to be the deepest part of lakes M9313, L9323, and L9324 (Baker 2010). The sample location for Lake M9313 is shown in Figure 2.1. Figure 2.2 shows the sample locations for lakes L9323 and L9324.

When accessing lakes M9313 and L9323 in 2010, a film was observed on the tundra adjacent to the shore; analytical samples were not collected. Visual observations confirmed a film was present in 2011 on the tundra at access locations adjacent to lakes M9313 (identified as M9313 southwest [SW]) and L9324 (identified as L9324 northeast [NE]). No film was observed in the access area adjacent to Lake L9323. Samples were collected for laboratory analyses if a film was observed.

2.2 IN-SITU WATER QUALITY PARAMETERS

In-situ water quality was measured at two-foot intervals throughout the water column. A tabulation of parameters is presented in Table 2.1.

Table 2.1: In- Situ Water Quality Parameters

Parameter	Units
Temperature	°C
Dissolved Oxygen	mg/L
Dissolved Oxygen	%
Salinity	ppt
Conductivity	μS/cm
Specific Conductance	μS/cm
Turbidity	NTU
Notes: °C – degrees Celsius mg/L – milligrams per liter ppt – parts per thousand μS/cm – microsiemens per centimeter NTU – Nephelometric Turbidity Unit	

Conductivity measurements are temperature dependent. To quantify this value for area-wide comparison, specific conductance is calculated from temperature and conductivity after field measurements are completed using a conversion coefficient of 0.0196 based on empirical data.

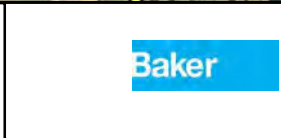
2.2.1 INSTRUMENT CALIBRATION

The primary and backup meters, both YSI 650 MDS handheld units with YSI 6920V2 Sondes sensors, were calibrated by TTT Environmental according to the manufacturer's specifications. Prior to sampling, a calibration check of the dissolved oxygen sensor was performed using tap water, as directed by the manufacturer. An optical or light dissolved oxygen (LDO) sensor was used for the dissolved oxygen sampling. Prior to each field sampling event, the meter was thoroughly rinsed with lake water.



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Legend	
	Water Quality Sampling Point
	Sample Lakes
	Roads
	Pipelines
	Facilities



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LAKE M9313 ASDP WATER QUALITY SAMPLING LOCATIONS
FIGURE: 2.1
(SHEET 1 of 1)



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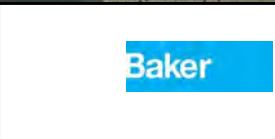
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Legend

- Water Quality Sampling Point
- Roads
- Pipelines
- Sample Lakes
- Facilities



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**LAKE L9323 & L9324
ASDP WATER QUALITY
SAMPLING LOCATIONS**

FIGURE 2.2
(SHEET 1 of 1)

2.3 LABORATORY SAMPLE COLLECTION AND ANALYSIS

2.3.1 SAMPLE COLLECTION

In-situ sampling was performed to confirm well-mixed water quality constituents within the water column at each sample location prior to laboratory sample collection. Neither oxycline (notable change in oxygen values with depth) nor thermocline (notable change in temperature values with depth) was apparent at any of the sampling sites (see Table 3.1). Therefore, a representative single point sample at mid-depth was collected at each location. In the event of lake stratification, multiple samples would have been collected throughout the water column and combined for laboratory analysis. Samples were collected from lakes and adjacent tundra using a 500 milliliter stainless steel bomb sampler. The bomb sampler was rinsed with lake water prior to each use.

Sample bottles provided by SGS were stored in the provided cooler before, during, and after sample collection to maintain adequate storage temperatures and ensure chain of custody procedures were followed. Field samples were transported to SGS within 31 hours of initial sample collection. The procedures for transport and transfer are described in Appendix A as part of the SGS analysis report. Table 2.2 shows the field parameters and laboratory analyses performed for each water sample.

Table 2.2: Laboratory Sampling Parameters

Location Designation	Laboratory Analyses
M9313 L9323 L9324	Diesel Range Organics (DRO) Residual Range Organics (RDO) Resource Conservation and Recovery Act Metals (RCRA Metals)
M9313 SW L9324 NE	DRO RRO DRO Silica Gel (SG) Extraction RRO SG Extraction

2.3.2 LABORATORY ANALYSIS

2.3.2.1 DIESEL RANGE ORGANICS (AK 102)

The AK 102 method for DRO, developed by the Alaska Department of Environmental Conservation (ADEC), is based on a solvent extraction, gas chromatography (GC) procedure for the detection of semi-volatile petroleum products such as diesels. Other nonpetroleum compounds of similar characteristics may be detected with this method. Samples spiked with a surrogate (o-Terphenyl) are extracted with methylene chloride. The GC is temperature programmed to facilitate separation of organic compounds detected by a flame ionization detector (FID). Quantification is based on FID response compared to a diesel calibration standard.

2.3.2.2 RESIDUAL RANGE ORGANICS (AK 103)

The AK 103 method for RRO, developed by ADEC, was originally designed to measure lubricating or motor oils and other heavy petroleum products in soils. The *Underground Storage Tanks Procedures* (ADEC 2002) identifies the method as adequate for determining such compounds in solution. The method is an extension of ADEC AK102, employing solvent extractions and GC to identify heavier RRO. Quantification is based on FID response compared to a residuals calibration standard.

2.3.2.3 SILICA GEL EXTRACTION FOR DRO AND RRO

Laboratory samples containing organic plant material are especially susceptible to background biogenic interference and may result in false positive results for DRO or RRO defined petroleum hydrocarbon ranges (ADEC 2006). The silica gel procedure is recommended by the ADEC in *Technical Memorandum 06-001, Biogenic Interference and Silica Gel Cleanup* (2006) to evaluate the presence and degree of biogenic interference. This procedure is used to preferentially remove the biogenic compounds from a sample leaving the non-biodegraded petroleum hydrocarbon compounds. The remaining sample is then tested for DRO and RRO according to AK 102 and AK 103, respectively.

2.3.2.4 RCRA TRACE METALS (SW6020)

This method, developed by the U.S. Environmental Protection Agency (EPA) Office of Solid Waste, employs inductively coupled plasma-mass spectrometry (ICP-MS) to determine trace elements, including metals, in solution. Elements tested include arsenic, barium, cadmium, chromium, lead, selenium, and silver. This method measures ions produced by a radio frequency inductively coupled plasma. High temperatures are used to produce ions, which are then entrained in a plasma gas and extracted. The ions are separated on the basis of their mass-to-charge ratio by a mass spectrometer (MS).

2.3.2.5 MERCURY IN LIQUID WASTE (SW7470A/E245.1)

This EPA method employs a cold-vapor atomic adsorption procedure approved for determining mercury concentration in liquid wastes. Aqueous samples are digested with sulfuric acid, nitric acid, potassium permanganate, and potassium persulfate. The organo-mercury compounds are oxidized to the mercuric ion. Once samples have cooled, the excess permanganate is chemically reduced as is the elemental mercury, which is immediately measured by a cold-vapor atomic absorption spectrophotometer or equivalent instrument.

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3.0 RESULTS

In-situ measurements were collected throughout the water column at the deepest part of each lake. Based on the relative homogeneity of results in all locations, lakes M9313, L9323 and L9324 were determined to be well-mixed at the time of sampling. Samples for laboratory analysis were collected from the middle of the water column. The in-situ measurements from lakes M9313, L9323 and L9324 are presented in Table 3.1. Laboratory sampling results from the lakes, M9313 SW, and L9324 NE are presented in Table 3.2.

3.1 FIELD CONDITIONS AUGUST 8, 2011

On August 8, the temperature ranged from 50°F to 55°F. The weather was foggy and breezy in the morning during sampling at Lake M9313 and clearer and calm in the afternoon during sampling at lakes L9323 and L9324.

3.1.1 LAKE M9313 AND M9313 SW

Lake M9313, located near CD3, is large with low grassy banks (Photo 3.1). No hydraulic connectivity between M9313 and any other body of water was observed during spring breakup 2011.



Photo 3.1: Lake M9313, looking west; August 8, 2011



Photo 3.2: Lake M9313, looking southwest; August 8, 2011

At the time of sampling, Lake M9313 was connected to some areas of water ponded in adjacent polygons along the eastern side, but flow was localized within the bank areas (Photo 3.2). Neither odor nor film was observed on the lake. A film was present in the tundra adjacent to the southwest bank, M9313 SW (Photo 3.3), but no odor was detected and surrounding vegetation appeared healthy.



Photo 3.3: Marshy area adjacent to Lake M9313 (M9313 SW); August 8, 2011

3.1.2 LAKE L9323

Located near CD4, Lake L9323 is moderately sized with grassy banks and some reeds on the periphery (Photo 3.4). During spring breakup flooding, this lake was hydraulically connected to Lake L9324 to the south via CD4 road culverts, to Lake M9252 to the north also via CD4 road culverts, and briefly to the Nigliq Channel to the west. No hydraulic connectivity between Lake L9323 and any other body of water was observed at the time of sampling (Photo 3.5). Neither odor nor film was observed on the lake. No film was observed on the tundra when accessing the lake.



Photo 3.4: Lake L9323, looking northwest; August 8, 2011



Photo 3.5: Lake L9323, looking southeast; August 8, 2011

3.1.3 LAKE L9324 AND L9324 NE

Located near CD4, Lake L9324 is moderately sized with grassy banks and willows (Photo 3.6). Some large bluffs surround the lake.



Photo 3.6: Lake L9324, looking east; August 8, 2011



Photo 3.7: Lake L9324, looking northwest; August 8, 2011



Photo 3.8: Marshy area adjacent to Lake L9324 (L9324 NE); August 8, 2011

During spring breakup flooding, this lake was hydraulically connected to the Sakoonang Channel and Lake M9934 to the south, to Lake L9323 via CD4 road culverts to the north, and to the Nigliq Channel via Tapped Lake to the west. No hydraulic connectivity between Lake L9323 and any other body of water was observed at the time of sampling (Photo 3.7). Neither odor nor film was observed on the lake. A film was observed on the tundra adjacent to the northeast bank, L9324 NE (Photo 3.8), but no odor was detected and surrounding vegetation appeared healthy.

3.2 IN-SITU RESULTS

The in-situ water quality results from the August 8, 2011, sampling event are tabulated in Table 3.1. Turbidity values are not presented in this report because of the inaccuracy of readings related to meter calibration for this specific parameter.

Table 3.1: In- Situ Water Quality Results

Lake Location Time	Total Depth (ft)	Sample Depth ¹ (ft)	Temp ² (°C)	Conductivity ² (µS/cm)	Specific Conductance ³ (µS/cm)	DO ² (mg/L)	DO ² (Percent Saturation)	Salinity ² (ppt)	pH ²
M9313 N70°25'18.9" W 150°53'58.2" 9:45 a.m.	25.0	Surface	-	-	-	-	-	-	-
		1.0	13.2	553	720	10.60	101.2	0.35	8.09
		3.0	13.2	553	720	10.59	101.1	0.35	8.09
		5.0	13.2	553	720	10.59	101.1	0.35	8.09
		7.0	13.2	553	720	10.58	100.1	0.35	8.08
		9.0	13.2	553	720	10.57	100.9	0.35	8.08
		11.0	13.2	553	720	10.56	100.9	0.35	8.08
		13.0	13.2	553	720	10.55	100.6	0.35	8.08
		15.0	13.2	553	720	10.54	100.7	0.35	8.08
		17.0	13.2	553	720	10.52	100.5	0.35	8.08
		19.0	13.2	553	720	10.49	100.2	0.35	8.07
		21.0	13.2	553	720	10.47	99.8	0.35	8.06
23.0	13.1	553	721	10.31	98.4	0.35	8.05		
L9323 N70°17'45.9" W 150°59'17.9" 4:20 p.m.	19.0	Surface	-	-	-	-	-	-	-
		1.0	14.5	68	86	10.03	98.3	0.04	7.69
		3.0	14.4	68	86	10.07	98.6	0.04	7.79
		5.0	14.2	68	86	10.07	98.2	0.04	7.82
		7.0	14.2	68	86	10.08	98.4	0.04	7.85
		9.0	14.2	68	86	10.09	98.3	0.04	7.87
		11.0	14.1	68	86	10.09	98.2	0.04	7.87
		13.0	14.1	68	87	10.09	98.1	0.04	7.89
		15.0	14.1	68	87	10.09	98.1	0.04	7.88
17.0	14.0	67	85	10.04	97.4	0.04	7.87		
L9324 N70°17'24.7" W 150°58'58.6" 2:50 p.m.	9.5	Surface	-	-	-	-	-	-	-
		1.0	14.2	88	112	9.92	96.8	0.05	8.07
		3.0	14.2	88	112	9.94	96.8	0.05	8.07
		5.0	14.1	88	112	9.91	96.3	0.05	8.06
		7.0	14.0	88	112	9.87	95.8	0.05	8.04
9.0	14.0	88	112	9.86	95.7	0.05	8.04		

Notes:

- (1) Sample depth is measured from the water surface.
 (2) Temperature, conductivity, dissolved oxygen, salinity and pH were measured using a YSI 650 MDS meter.
 (3) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
 * Turbidity values were measured with a YSI 6920V2 Sondes sensor and are not included due to inaccuracy of readings.

3.2.1 SPECIFIC CONDUCTANCE

Specific conductance varied little within the water column, but was notably different between lakes. The average specific conductance in Lake M9313 was 720 microsiemens per centimeter ($\mu\text{S}/\text{cm}$). Measured values that exceed 500 $\mu\text{S}/\text{cm}$ are indicative of saline environments which are usually noted in lakes near the coast. Average specific conductance was 86 $\mu\text{S}/\text{cm}$ in Lake L9323 and 112 $\mu\text{S}/\text{cm}$ in Lake L9324.

3.2.2 DISSOLVED OXYGEN AND WATER TEMPERATURE

Concentrations of DO varied little between lakes. In 2011, the average DO was measured at 10.53 milligrams per liter (mg/L) in Lake M9313, 10.07 mg/L in Lake L9323, and 9.90 mg/L in Lake L9324.

A 100% saturation level is based on standard temperature and pressure conditions. The percent-saturation at Lake M9313 was 100.5%, Lake L9323 was 98.2%, and Lake L9324 was 96.3%. DO saturation values greater than 100% are influenced by temperature, time of day, and the photosynthetic activity of plants in the water body.

Oxyclines or thermoclines were not apparent at any of the sampling sites (see Table 3.1). There was a slight decrease of oxygen saturation corresponding with depth and temperature in all the lakes. The maximum difference of 2.8% was measured between the surface and the bottom of Lake M9313. Temperatures in all three lakes ranged from 13.1 degrees Celsius ($^{\circ}\text{C}$) in Lake M9313 to 14.5 $^{\circ}\text{C}$ in Lake L9323. The coolest temperatures were collected from the bottom of the deepest lake, Lake M9313.

3.2.3 SALINITY

Salinity remained consistent with depth. The greatest concentration was measured in Lake M9313 at 0.35 parts per thousand (ppt) likely because of its coastal proximity. Lakes L9323 and L9324 had concentrations of 0.04 ppt and 0.05 ppt, respectively.

3.3 LABORATORY RESULTS

Analytical results show the targeted compounds and metals were not detected above the laboratory detection limit in lakes M9313, L9323, and L9324 except for barium. Barium was detected in all lakes at concentrations below the ADEC cleanup level of 2.0 mg/L. The greatest measured concentration of barium was 0.238 mg/L in Lake M9313. Barium is not uncommon in arctic waters at concentrations similar to those measured at the three lakes (Guay and Falkner 1998). Analytical results are shown in Table 3.2. The laboratory report is presented in Appendix A.

Biogenics, or naturally occurring organic materials, are present in many soils in Alaska especially tundra peat. Biogenics interference complicates petroleum range organic analysis for AK 102 (DRO) and AK 103 (RRO) methods. SG cleanup is an established analytical

procedure used to separate analytes from interfering compounds. SG cleanup was used in M9313 SW and L9324 NE samples. RRO was detected at a concentration of 3.33 mg/L in sample M9313 SW. The same sample after the SG cleanup method was applied showed RRO concentrations of 2.69 mg/L above the ADEC cleanup level of 1.1 mg/L.

The laboratory results are presented with a low level of confidence. There was a potential for cross contamination during onsite equipment decontamination and sample collection. However, vegetation in the area appeared healthy, no odor was noted, and no other indications of hydrocarbons were present. Additional sample collection during the open water season in summer 2012 is suggested to further investigate the area and verify the laboratory results.

DRO and RRO were not detected above the laboratory detection limit in any of the other samples (M9313, L9323, L9324, L9324 NE) collected from the lakes or tundra.

Table 3.2: Laboratory Analytical Results

Analyte	ADEC Cleanup Level ¹ (mg/L)	M9313 (mg/L)	M9313 SW ² (mg/L)	L9323 (mg/L)	L9324 (mg/L)	L9324 NE ² (mg/L)
Mercury	0.002	ND	--	ND	ND	--
Arsenic	0.010	ND	--	ND	ND	--
Barium	2.0	0.238	--	0.0492	0.0713	--
Cadmium	0.005	ND	--	ND	ND	--
Chromium	0.10	ND	--	ND	ND	--
Lead	0.015	ND	--	ND	ND	--
Selenium	0.05	ND	--	ND	ND	--
Silver	0.10	ND	--	ND	ND	--
DRO	1.5	ND	ND	ND	ND	ND
RRO	1.1	ND	3.33 ³	ND	ND	ND
DRO SG	1.5	--	ND	--	--	ND
RRO SG	1.1	--	2.69 ³	--	--	ND

Notes:
 1 - ADEC Water Quality Standards 18 AAC 75.345 Table C Groundwater Cleanup Levels (2009)
 2 - Due to onsite field equipment decontamination and sample collection procedures, results for this location are presented with a low level of confidence.
 3 - Lab Sample Remarks: AK 103 - Unknown hydrocarbon with several peaks present
 -- Not tested
 DRO - Diesel Range Organics
 mg/L - milligrams per liter
 ND - Analyte not detected above the laboratory detection limit
 RRO - Residual Range Organics
 SG - Silica Gel
 Source: SGS Laboratory Analysis Report 113717

4.0 REFERENCES

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Appendix A LABORATORY SAMPLES – ANALYSIS REPORT

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Shawn Snisarenko
Michael Baker Jr., Inc.
1400 West Benson Blve Suite 20
Anchorage, AK 99503

Work Order: 1113717
ASDP WQ 123685

Client: Michael Baker Jr., Inc.

Report Date: August 25, 2011

Enclosed are the analytical results associated with the above work order. All results are intended to be used in their entirety and SGS is not responsible for use of less than the complete report. If you have any questions regarding this report, or if we can be of any other assistance, please contact your SGS Project Manager at 907-562-2343. All work is provided under SGS general terms and conditions (http://www.sgs.com/terms_and_conditions.htm), unless other written agreements have been accepted by both parties.

SGS maintains a formal Quality Assurance/Quality Control (QA/QC) program. A copy of our Quality Assurance Plan (QAP), which outlines this program, is available at your request. The laboratory certification numbers are AK00971 (DW Chemistry & Microbiology) & UST-005 (CS) for ADEC and AK100001 for NELAP (RCRA methods: 1020A, 1311, 3010A, 3050B, 3520C, 3550C, 5030B, 5035B, 6010B, 6020, 7470A, 7471B, 8021B, 8081B, 8082A, 8260B, 8270D, 8270D-SIM, 9040B, 9045C, 9056A, 9060A, AK101 and AK102/103). Except as specifically noted, all statements and data in this report are in conformance to the provisions set forth by the SGS QAP and, when applicable, the National Environmental Laboratory Accreditation Program and other regulatory authorities. The following descriptors or qualifiers may be found in your report:

*	The analyte has exceeded allowable regulatory or control limits.
!	Surrogate out of control limits.
B	Indicates the analyte is found in a blank associated with the sample.
CCV	Continuing Calibration Verification
CL	Control Limit
D	The analyte concentration is the result of a dilution.
DF	Dilution Factor
DL	Detection Limit (i.e., maximum method detection limit)
E	The analyte result is above the calibrated range.
F	Indicates value that is greater than or equal to the DL
GT	Greater Than
ICV	Initial Calibration Verification
J	The quantitation is an estimation.
JL	The analyte was positively identified, but the quantitation is a low estimation.
LCS(D)	Laboratory Control Spike (Duplicate)
LOD	Limit of Detection (i.e., 2xDL)
LOQ	Limit of Quantitation (i.e., reporting or practical quantitation limit)
LT	Less Than
M	A matrix effect was present.
MB	Method Blank
MS(D)	Matrix Spike (Duplicate)
ND	Indicates the analyte is not detected.
Q	QC parameter out of acceptance range.
R	Rejected
RPD	Relative Percent Difference
U	Indicates the analyte was analyzed for but not detected.

Note: Sample summaries which include a result for "Total Solids" have already been adjusted for moisture content.
All DRO/RRO analyses are integrated per SOP.



SGS Ref.# 1113717001
Client Name Michael Baker Jr., Inc.
Project Name/# ASDP WQ 123685
Client Sample ID M9313 - DRO/RRO/RCRA8
Matrix Water (Surface, Eff., Ground)

Printed Date/Time 08/25/2011 8:03
Collected Date/Time 08/08/2011 10:00
Received Date/Time 08/09/2011 15:54
Technical Director Stephen C. Ede

PWSID 0

Sample Remarks:

Parameter	Results	LOQ	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
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Metals Department

Mercury	ND	0.200	ug/L	SW7470A/E245.1	A		08/10/11	08/10/11	CDE
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Metals by ICP/MS

Arsenic	ND	5.00	ug/L	SW6020	A		08/12/11	08/17/11	NRB
Barium	238	3.00	ug/L	SW6020	A		08/12/11	08/17/11	NRB
Cadmium	ND	2.00	ug/L	SW6020	A		08/12/11	08/17/11	NRB
Chromium	ND	4.00	ug/L	SW6020	A		08/12/11	08/17/11	NRB
Lead	ND	1.00	ug/L	SW6020	A		08/12/11	08/17/11	NRB
Selenium	ND	5.00	ug/L	SW6020	A		08/12/11	08/17/11	NRB
Silver	ND	2.00	ug/L	SW6020	A		08/12/11	08/17/11	NRB

Semivolatile Organic Fuels Department

Diesel Range Organics	ND	0.638	mg/L	AK102	B		08/10/11	08/17/11	MCS
Residual Range Organics	ND	0.532	mg/L	AK103	B		08/10/11	08/17/11	MCS

Surrogates

5a Androstane <surr>	92.4		%	AK102	B	50-150	08/10/11	08/17/11	MCS
n-Triacontane-d62 <surr>	97.3		%	AK103	B	50-150	08/10/11	08/17/11	MCS



SGS Ref.# 1113717002
Client Name Michael Baker Jr., Inc.
Project Name/# ASDP WQ 123685
Client Sample ID M9313 - SW Wetland DRO/RRO/SG
Matrix Water (Surface, Eff., Ground)

Printed Date/Time 08/25/2011 8:03
Collected Date/Time 08/08/2011 8:30
Received Date/Time 08/09/2011 15:54
Technical Director Stephen C. Ede

Sample Remarks:

AK103 - Unknown hydrocarbon with several peaks is present.

Parameter	Results	LOQ	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
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Semivolatile Organic Fuels Department

Diesel Range Organics	ND	1.29	mg/L	AK102	A		08/12/11	08/17/11	MCS
Residual Range Organics	3.33	1.08	mg/L	AK103	A		08/12/11	08/17/11	MCS

Surrogates

5a Androstane <surr>	86.7		%	AK102	A	50-150	08/12/11	08/17/11	MCS
n-Triacontane-d62 <surr>	85.9		%	AK103	A	50-150	08/12/11	08/17/11	MCS

Semivolatile Organic Fuels Department, Silica Gel

DRO Silica Gel	ND	1.29	mg/L	AK102	A		08/12/11	08/18/11	EAB
RRO Silica Gel	2.69	1.08	mg/L	AK103	A		08/12/11	08/18/11	EAB

Surrogates

5a Androstane <surr>	67.5		%	AK102	A	50-150	08/12/11	08/18/11	EAB
n-Triacontane-d62 <surr>	71.9		%	AK103	A	50-150	08/12/11	08/18/11	EAB



SGS Ref.# 1113717003
Client Name Michael Baker Jr., Inc.
Project Name/# ASDP WQ 123685
Client Sample ID L9324 - DRO/RRO/RCRA 8
Matrix Water (Surface, Eff., Ground)

Printed Date/Time 08/25/2011 8:03
Collected Date/Time 08/08/2011 14:50
Received Date/Time 08/09/2011 15:54
Technical Director Stephen C. Ede

Sample Remarks:

Parameter	Results	LOQ	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
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Metals Department

Mercury	ND	0.200	ug/L	SW7470A/E245.1	A		08/10/11	08/10/11	CDE
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Metals by ICP/MS

Arsenic	ND	5.00	ug/L	SW6020	A		08/12/11	08/17/11	NRB
Barium	71.3	3.00	ug/L	SW6020	A		08/12/11	08/17/11	NRB
Cadmium	ND	2.00	ug/L	SW6020	A		08/12/11	08/17/11	NRB
Chromium	ND	4.00	ug/L	SW6020	A		08/12/11	08/17/11	NRB
Lead	ND	1.00	ug/L	SW6020	A		08/12/11	08/17/11	NRB
Selenium	ND	5.00	ug/L	SW6020	A		08/12/11	08/17/11	NRB
Silver	ND	2.00	ug/L	SW6020	A		08/12/11	08/17/11	NRB

Semivolatile Organic Fuels Department

Diesel Range Organics	ND	0.638	mg/L	AK102	B		08/10/11	08/17/11	MCS
Residual Range Organics	ND	0.532	mg/L	AK103	B		08/10/11	08/17/11	MCS

Surrogates

5a Androstane <surr>	97.2		%	AK102	B	50-150	08/10/11	08/17/11	MCS
n-Triacontane-d62 <surr>	100		%	AK103	B	50-150	08/10/11	08/17/11	MCS



SGS Ref.# 1113717004
Client Name Michael Baker Jr., Inc.
Project Name/# ASDP WQ 123685
Client Sample ID L9324 - NE Wetlands DRO/RRO/SG
Matrix Water (Surface, Eff., Ground)

Printed Date/Time 08/25/2011 8:03
Collected Date/Time 08/08/2011 14:10
Received Date/Time 08/09/2011 15:54
Technical Director Stephen C. Ede

Sample Remarks:

Parameter	Results	LOQ	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
<u>Semivolatile Organic Fuels Department</u>									
Diesel Range Organics	ND	1.60	mg/L	AK102	B		08/12/11	08/17/11	MCS
Residual Range Organics	ND	1.33	mg/L	AK103	B		08/12/11	08/17/11	MCS
Surrogates									
5a Androstane <surr>	88.3		%	AK102	B	50-150	08/12/11	08/17/11	MCS
n-Triacontane-d62 <surr>	88.6		%	AK103	B	50-150	08/12/11	08/17/11	MCS
<u>Semivolatile Organic Fuels Department, Silica Gel</u>									
DRO Silica Gel	ND	1.60	mg/L	AK102	B		08/12/11	08/18/11	EAB
RRO Silica Gel	ND	1.33	mg/L	AK103	B		08/12/11	08/18/11	EAB
Surrogates									
5a Androstane <surr>	72.7		%	AK102	B	50-150	08/12/11	08/18/11	EAB
n-Triacontane-d62 <surr>	74.5		%	AK103	B	50-150	08/12/11	08/18/11	EAB



SGS Ref.# 1113717005
Client Name Michael Baker Jr., Inc.
Project Name/# ASDP WQ 123685
Client Sample ID L9323 - DRO/RRO/RCRA8
Matrix Water (Surface, Eff., Ground)

Printed Date/Time 08/25/2011 8:03
Collected Date/Time 08/08/2011 14:20
Received Date/Time 08/09/2011 15:54
Technical Director Stephen C. Ede

Sample Remarks:

Parameter	Results	LOQ	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
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Metals Department

Mercury	ND	0.200	ug/L	SW7470A/E245.1	A		08/10/11	08/10/11	CDE
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Metals by ICP/MS

Arsenic	ND	5.00	ug/L	SW6020	A		08/12/11	08/17/11	NRB
Barium	49.2	3.00	ug/L	SW6020	A		08/12/11	08/17/11	NRB
Cadmium	ND	2.00	ug/L	SW6020	A		08/12/11	08/17/11	NRB
Chromium	ND	4.00	ug/L	SW6020	A		08/12/11	08/17/11	NRB
Lead	ND	1.00	ug/L	SW6020	A		08/12/11	08/17/11	NRB
Selenium	ND	5.00	ug/L	SW6020	A		08/12/11	08/17/11	NRB
Silver	ND	2.00	ug/L	SW6020	A		08/12/11	08/17/11	NRB

Semivolatile Organic Fuels Department

Diesel Range Organics	ND	0.638	mg/L	AK102	B		08/10/11	08/17/11	MCS
Residual Range Organics	ND	0.532	mg/L	AK103	B		08/10/11	08/17/11	MCS

Surrogates

5a Androstane <surr>	96.3		%	AK102	B	50-150	08/10/11	08/17/11	MCS
n-Triacontane-d62 <surr>	99.6		%	AK103	B	50-150	08/10/11	08/17/11	MCS



SGS North America Inc. CHAIN OF CUSTODY RECORD

- Locations Nationwide
- Alaska
 - Maryland
 - New Jersey
 - North Carolina
 - West Virginia
 - Kentucky
- www.us.sgs.com

1 CLIENT: Michael Baker Jr., Inc.
 CONTACT: Haley Runa PHONE NO: (907) 351.2372
 PROJECT NAME: ASDP wq PROJECT/ PWSID/ PERMIT#: 123685
 REPORTS TO: Shawn Snisarenko hruna@mbakercorp.com EMAIL:
 INVOICE TO: Forest Taylor QUOTE #: 9676 P.O. #:

SGS Reference #: _____ page 1 of 2

# CONTAINERS	SAMPLE TYPE C= G= GRAB MI= Multi Incremental Samples	PRESERVATIVES USED ANALYSIS REQUIRED (3)	ANALYSIS				REMARKS/ LOC ID	
			HCL	HCL	HND ₃	HCL		
1	G	X	HCL	HCL	HND ₃	HCL	HCL	PRO'SG
1	G	X	PRO					PRO'SG
1	G	X						RCR ₈
1	G				X			
1	G	X						
1	G			X				
1	G	X						
1	G			X				
1	G							
1	G							

2

RESERVED for lab use	SAMPLE IDENTIFICATION	DATE	TIME	MATRIX/ MATRIX CODE
	M9313 - DRO	08/08	10:00AM	
① A-C	M9313 - RRO		↓	
② A-B	M9313 SW wetland - DRO SOO wetland - SG		8:30AM	
	M9313 wetland - SG		↓	
③ A-G	L9324 - DRO		2:50PM	
	L9324 - RRO		↓	
	L9324 - RCR ₈		↓	
④ A-B	L9324 NE wetland - DRO NE wetland - SG		2:10PM	
	L9324 wetland - RRO wetland - SG		↓	

5

Collected/Relinquished By: (1) <u>Haley Runa</u>	Date <u>08/08</u>	Time <u>8:30 AM</u>	Received By:	Received Time
Relinquished By: (2)	Date	Time	Received By:	Received Time
Relinquished By: (3)	Date	Time	Received By:	Received Time
Relinquished By: (4)	Date	Time	Received For Laboratory By: <u>8/9/11</u> <u>ISS4</u>	Received Time

4

DOD Project? YES NO

Cooler ID 27 of 32

Data Deliverable Requirements:

Requested Turnaround Time and-or Special Instructions:

Temperature Blank °C: 10 201
5.5 350 - cooled
 or Ambient []

Chain of Custody Seal: (Circle)
 INTAC BROKEN ABSENT
 (See attached Sample Receipt Form)



SGS North America Inc. CHAIN OF CUSTODY RECORD

- Locations Nationwide
- Alaska
 - Maryland
 - New Jersey
 - North Carolina
 - West Virginia
 - Indiana
 - Kentucky
- www.us.sgs.com

1 CLIENT: Michael Baker Jr., Inc. PHONE NO: (907) 351.2372 page 2 of 2

CONTACT: Halley Runa PROJECT/ PWSID/ PERMIT#: 123685

PROJECT NAME: ASDP wq EMAIL: Shawn Snisarenko hrnaembababcorp.com

REPORTS TO: Shawn Snisarenko hrnaembababcorp.com QUOTE #: 9076

INVOICE TO: Forest Taylor P.O. #:

2 RESERVED for lab use

RESERVED for lab use	SAMPLE IDENTIFICATION	DATE	TIME	MATRIX/ MATRIX CODE	# CONTAINERS	SAMPLE TYPE	Preservatives Used	Analysis Required	REMARKS/ LOC ID
	<u>L9323 - DRO</u>	<u>08/08</u>	<u>4:20 PM</u>		<u>1</u>	<u>G</u>		<u>X</u>	
<u>5</u>	<u>A-C</u>	<u>L9323 - RRO</u>	<u>↓</u>		<u>1</u>	<u>G</u>		<u>X</u>	
	<u>L9323 - RQA8</u>	<u>↓</u>			<u>1</u>	<u>G</u>		<u>X</u>	
		<u>samples =></u>		<u>13 total</u>					

Barcode: 1113717

3 DOD Project? YES NO Cooler ID: 27 of 32

4 Data Deliverable Requirements: Requested Turnaround Time and-or Special Instructions:

Temperature Blank °C: _____ or Ambient []

Chain of Custody Seal: (Circle) INTACT BROKEN ABSENT (See attached Sample Receipt Form)

5 Collected/Relinquished By: (1) Halley Runa Date: 08/09 Time: 8:30 AM

Relinquished By: (2) _____ Date: _____ Time: _____

Relinquished By: (3) _____ Date: _____ Time: _____

Relinquished By: (4) _____ Date: _____ Time: _____

Received For Laboratory By: Halley Runa 8/9/11 1554



SAMPLE RECEIPT FORM

Review Criteria:	Condition:	Comments/Action Taken:
Were custody seals intact? Note # & location, if applicable. COC accompanied samples?	<input checked="" type="radio"/> Yes No N/A <input checked="" type="radio"/> Yes No N/A	2F each
Temperature blank compliant* (i.e., 0-6°C after correction factor)? * Note: Exemption permitted for chilled samples collected less than 8 hours ago. Cooler ID: <u>1</u> @ <u>1.0</u> w/ Therm.ID: <u>201</u> Cooler ID: <u>2</u> @ <u>5.5</u> w/ Therm.ID: <u>350</u> Cooler ID: _____ @ _____ w/ Therm.ID: _____ Cooler ID: _____ @ _____ w/ Therm.ID: _____ Cooler ID: _____ @ _____ w/ Therm.ID: _____ Note: If non-compliant, use form FS-0029 to document affected samples/analyses. If samples are received <u>without</u> a temperature blank, the "cooler temperature" will be documented in lieu of the temperature blank & "COOLER TEMP" will be noted to the right. In cases where neither a temp blank <u>nor</u> cooler temp can be obtained, note "ambient" or "chilled." If temperature(s) <0°C, were all sample containers ice free?	<input checked="" type="radio"/> Yes No N/A <input checked="" type="radio"/> Yes No N/A <input checked="" type="radio"/> Yes No <input checked="" type="radio"/> N/A * Cooler temp on 2, as there was no temp blank	
Delivery method (specify all that apply): USPS Alert Courier Road Runner AK Air Lynden Carlile ERA PenAir FedEx UPS NAC Other: → For WO# with airbills, was the WO# & airbill info recorded in the Front Counter eLog?	<input checked="" type="radio"/> Client Note airbill/tracking # See Attached <input checked="" type="radio"/> or N/A Yes No <input checked="" type="radio"/> N/A	
→ For samples received with payment, note amount (\$) and cash / check / CC (circle one). → For samples received in FBKS, ANCH staff will verify all criteria are reviewed.		SRF Initiated by: <input checked="" type="radio"/> N/A <input checked="" type="radio"/> N/A
Do samples match COC* (i.e., sample IDs, dates/times collected)? * Note: Exemption permitted if times differ <1hr; in which case, use times on COC. Were analyses requested unambiguous?	<input checked="" type="radio"/> Yes No N/A Yes <input checked="" type="radio"/> No N/A	* 4B was received with a broken lid, but sample was intact.
Were samples in good condition (no leaks/cracks/breakage)? Packing material used (specify all that apply): Bubble Wrap Separate plastic bags Vermiculite Other:	Yes <input checked="" type="radio"/> No N/A Yes <input checked="" type="radio"/> No N/A	Client is aware of this & wants to proceed
Were all VOA vials free of headspace (i.e., bubbles ≤6 mm)? Were all soil VOAs field extracted with MeOH+BFB? Were the bottles provided by SGS? (Note apparent exceptions.)	Yes No <input checked="" type="radio"/> N/A Yes No <input checked="" type="radio"/> N/A <input checked="" type="radio"/> Yes No N/A	
Were proper containers (type/mass/volume/preservative*) used? * Note: Exemption permitted for waters to be analyzed for metals. Were Trip Blanks (i.e., VOAs, LL-Hg) in cooler with samples?	<input checked="" type="radio"/> Yes No N/A Yes No <input checked="" type="radio"/> N/A	
For special handling (e.g., "MI" or foreign soils, lab filter, limited volume, Ref Lab), were bottles/paperwork flagged (e.g., sticker)?	Yes No <input checked="" type="radio"/> N/A	
For preserved waters (other than VOA vials, LL-Mercury or microbiological analyses), was pH verified and compliant? If pH was adjusted, were bottles flagged (i.e., stickers)?	Yes <input checked="" type="radio"/> No N/A Yes No N/A	* 4A & B were non-compliant. Added HCL, LW05-0314-078-02
For RUSH/SHORT Hold Time or site-specific QC (e.g., BMS/BMSD/BDUP) samples, were the COC & bottles flagged (e.g., stickers) accordingly? For RUSH/SHORT HT, was email sent?	Yes No <input checked="" type="radio"/> N/A	
For any question answered "No," has the PM been notified and the problem resolved (or paperwork put in their bin)?	<input checked="" type="radio"/> Yes No N/A	SRF Completed by: <u>VMB</u> PM = <u>FAT</u> N/A
Was PEER REVIEW of sample numbering/labeling completed (i.e., compare WO# on containers to COC, unique lab ID on each container, LIMS container labels used)? Was selection of "Bill to" client PEER REVIEWed?	<input checked="" type="radio"/> Yes No N/A Yes No <input checked="" type="radio"/> N/A	Peer Reviewed by: <u>ICMB</u> Metrics: <u>1842</u>

Additional notes (if applicable):
 SAMPLES 1,3,5 : AK102/103, 2CRA-METALS
 2,4 : AK102/103, PK102/103 SILICA GEL FAT 8/9/11

Note to Client: Any "no" circled above indicates non-compliance with standard procedures and may impact data quality.

