




ALPINE SATELLITE DEVELOPMENT PLAN **2013** WATER QUALITY MONITORING REPORT

Prepared for:


ConocoPhillips
Alaska

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Appendix A Laboratory Analytical Results

Acronyms and Abbreviations

μS/cm	Microsiemens per centimeter
°C	Degrees Celsius
°F	Degrees Fahrenheit
ADEC	Alaska Department of Environmental Conservation
ASDP	Alpine Satellite Development Plan
Baker	Michael Baker Jr., Inc.
CD5	Alpine West/CD5 facility
CPAI	ConocoPhillips Alaska, Inc.
DO	Dissolved oxygen
DRO	Diesel range organics
EPA	U.S. Environmental Protection Agency
FID	Flame ionization detector
GC	Gas chromatography
ICP	Inductively coupled plasma
mg/L	Milligrams per liter
NTU	Nephelometric turbidity units
ppt	Parts per thousand
PSS	Practical Salinity Scale
RCRA	Resource Conservation and Recovery Act
RRO	Residual range organics
SGS	SGS North America, Inc.
USGS	U.S. Geological Survey

1.0 INTRODUCTION

The Alpine Satellite Development Plan (ASDP) 2013 Water Quality Monitoring Report presents the results of the field sampling conducted in August 2013 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) (NSB 2004). At the request of CPAI, M9313, L9323, and L9324 have been monitored annually by Michael Baker Jr., Inc. (Baker) since 2007. In 2013, CPAI requested water quality monitoring of Lake MB0301 in anticipation of the development of the Alpine West/CD5 facility (CD5). An overview of the four study lakes relative to Alpine facilities is presented in Figure 1.1.

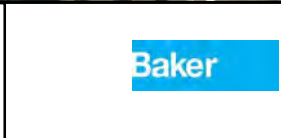
During the winter of 1998/1999, CPAI initiated construction of the Alpine Facility, CD1 and CD2, in the Colville River Delta. Alpine operations expanded with the implementation of the ASDP during the 2004/2005 winter season. Construction included placement of gravel facilities for two new satellite drill 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. In December 2011, CPAI was granted a permit allowing construction of a gravel road, bridge, and pipeline crossing over the Nigliq channel of the Colville River for the development of a satellite field five miles west of Alpine in the National Petroleum Reserve Alaska. First production of the CD5 project is expected to start in late 2015. Lake MB0301 is located approximately 0.5 miles southeast of the proposed CD5 pad.

The 2013 water quality monitoring program included in-situ field sampling of the four 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 lakes M9313, L9323, L9324, and MB0301 were chosen to identify and monitor the persistence of trace concentrations originally observed in 2007.



Date: 9/27/2013	Project: 136068
Drawn: BTG	File: Figure 1.1
Checked: SME	Scale: 1 in = 2 miles

Legend	
Existing Road	Existing Facility
Proposed Road	Proposed Facility
Pipelines	Sample Lakes



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2013 OVERVIEW ASDP WATER QUALITY MONITORING AREA
FIGURE: 1.1
(SHEET 1 of 1)

2.0 METHODS

On August 19 and 20, 2013, Baker conducted field investigations at lakes M9313, L9323, L9324, and MB0301. Bristow Helicopters provided access to lakes MB0301 and M9313. An Alpine Environmental pickup truck was used to access lakes L9323 and L9324.

In-situ water quality data measurements and laboratory sample collection were performed by a two-person Baker team. The Baker team used 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 kayaks and support equipment at Lake L9323; August 20, 2013

Prior to sampling, aerial reconnaissance was conducted to identify possible inflow and outflow sources, and to determine if lakes were hydraulically connected to other nearby surface water sources. It was also confirmed that each lake was well-mixed and lacked definable stratums prior to analytic sample collection.

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

Safety precautions were followed, as outlined in the North Slope Water Resources 2013 Health, Safety, and Environmental Plan (Baker 2013a) and the 2013 ASDP Water Quality Monitoring Job Safety Analysis (Baker 2013b). Baker employees worked in groups of two, and the helicopter remained on-site during

the duration of the sampling process. Personnel were equipped with U.S. Coast Guard approved personal flotation devices.

2.1 SAMPLE LOCATION SELECTION

Previous 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.

Selection of the appropriate location for samples was based on maximum lake depth and relative proximity to gravel facilities. The bathymetry of each lake was used to identify the deepest part of the water body, and a single representative sampling location was selected. The locations of the deepest part of lakes M9313, L9323, and L9324 were confirmed in 2010 using a hand-held sonar depth finder (Baker 2010). The deepest part in Lake MB0301 was determined from lake bathymetry collected in July, 2004.

Sample locations were identified and confirmed using a handheld global positioning system Garmin Rino 520HCx referenced to the North American [horizontal] Datum of 1983. The sample location for Lake M9313 is shown in Figure 2.1. Figure 2.2 shows the sample locations for lakes L9323 and L9324, and the sample location for Lake MB0301 is shown in Figure 2.3.

2.2 IN-SITU WATER QUALITY PARAMETERS

In-situ water quality was measured at 2-foot intervals throughout the water column. A list of parameters collected is presented in Table 2.1.

Table 2.1: In-Situ Water Quality Parameters

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

Conductivity is a measurement of the water's ability to carry an electrical current. Dissolved salts (ions) are conductors of electrical current, and conductivity is proportional to the ion concentration (salinity) in an aqueous solution. The salinity is calculated using the in-situ conductivity, temperature and pressure measurements, and the conversions defined by the Practical Salinity Scale (PSS) of 1978 (YSI 2007). The PSS is derived for standard seawater with a known ion composition; therefore, using the PSS for freshwater with unknown ion composition provides an estimate of the salinity.

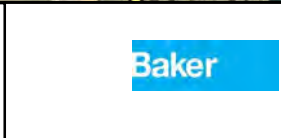
Specific conductance is a metric commonly used to report the concentration of salts in freshwater. Conductivity measurements are temperature dependent. Specific conductance is calculated from in-situ conductivity and temperature using a site specific temperature correction coefficient. The correction coefficient is determined for a site by relating the conductivity of a sample at the in-situ temperature and the conductivity of the same sample at 25° C. Baker completed this analysis for the Colville River in 2005 resulting in a correction coefficient of 0.0196 (Baker 2006). The recharge of lakes from the Colville River flood waters during spring break-up justifies using the same correction coefficient for the lake measurements.

Turbidity refers to the cloudiness of a fluid which is caused by suspended solids that tend to be invisible to the naked eye. As particles in a fluid will scatter light focused on them, turbidity can be measured by the quantity of reflected light for a given amount of particulates. A Nephelometer is equipped with a detector next to the light beam and is used to measure turbidity. When using a calibrated Nephelometer the units of turbidity are NTU.



Date:	9/27/2013	Project:	136068
Drawn:	BTG	File:	Figure 2.1
Checked:	SME	Scale:	1 in = 1000 feet

Legend	
	Water Quality Sampling Point
	Facility
	Sample Lake
	Pipelines



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Lake M9313
 ASDP Water Quality
 Sampling Location
 FIGURE: 2.1
 (SHEET 1 of 1)



Date: 9/27/2013	Project: 1360068
Drawn: BTG	File: Figure 2.2
Checked: SME	Scale: 1 in = 2000 feet

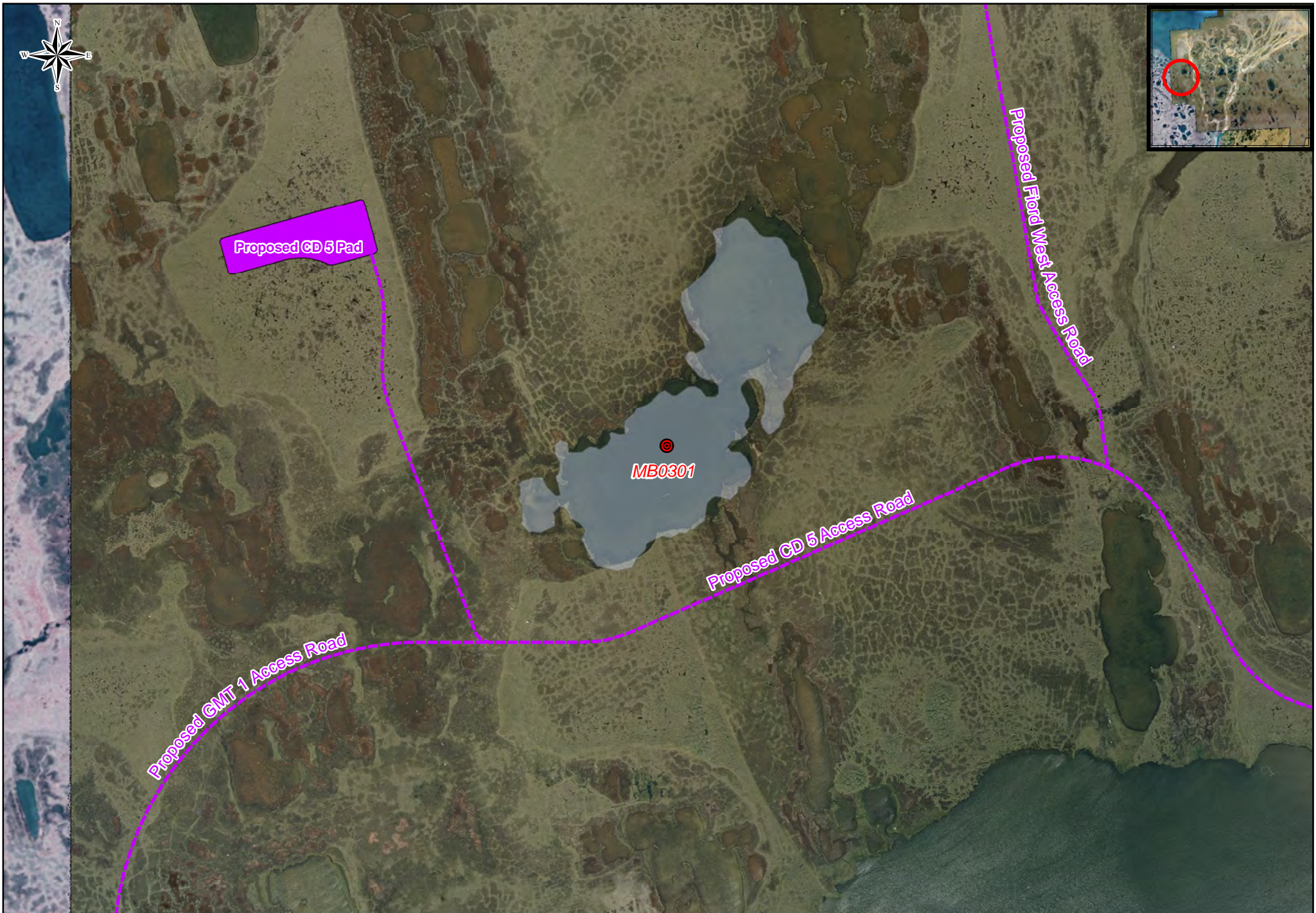
Legend	
Water Quality Sampling Point	Sample Lakes
Roads	Facility
Pipelines	



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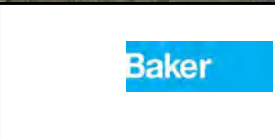
Lake L9323 & L9324
 ASDP Water Quality
 Sampling Locations

FIGURE 2.2
 (SHEET 1 of 1)



Date: 9/27/2013	Project: 136068
Drawn: BTG	File: Figure 2.3
Checked: SME	Scale: 1 in = 1000 feet

Legend	
Proposed Roads	Proposed Facilities
Sample Lake	



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Lake MB0301
 ASDP Water Quality
 Sampling Location

FIGURE: 2.3
 (SHEET 1 of 1)

2.2.1 INSTRUMENT CALIBRATION

A YSI 650 MDS handheld unit with YSI 6920 V2 Sonde sensor was calibrated by TTT Environmental according to the manufacturer's specifications. The YSI 690 V2 meter was calibrated for conductivity and pH by Baker personnel the morning of sampling. In addition, a calibration check of the DO sensor was performed each morning using tap water as directed by the manufacturer. An optical DO sensor was used for the DO sampling. Prior to each field sampling event, the meter was thoroughly rinsed with lake water.

2.3 LABORATORY SAMPLE COLLECTION AND ANALYSIS

2.3.1 SAMPLE COLLECTION

In-situ sampling was performed to confirm that the water quality constituents were well-mixed within the water column at each sample location prior to laboratory sample collection. No oxyclines (notable change in oxygen concentration with depth) were apparent at any of lakes and a negligible thermocline (notable change in temperature values with depth) was apparent in Lake M9313 (Table 3.1). Therefore, a representative single point sample at mid-depth was collected at each location. In the event of significant lake stratification, multiple samples would have been collected throughout the water column and combined for laboratory analysis. Samples were collected from lakes using a 1.6" x 36" disposable polyethylene bailer (1000 milliliter capacity). Nitrile gloves were worn during sample collection and changed between samples. Bailers were discarded after use. A duplicate sample was collected from one lake.

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 88 hours of initial sample collection. The procedures for transport and transfer are described in the SGS analysis report in Appendix A.

2.3.2 LABORATORY ANALYSIS

The laboratory analyses performed for each water sample obtained from lakes M9313, L9323, L9324, and MB0301 included DRO, RRO, and RCRA metals.

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 2009) identifies the method as adequate for determining such compounds in solution. The method is an extension of ADEC AK 102, 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 RCRA METALS (SW6020)

The RCRA metals laboratory analysis method SW6020, developed by the U.S. Environmental Protection Agency (EPA) Office of Solid Waste, employs inductively coupled plasma (ICP) -mass spectrometry to determine trace elements, including metals in solution (EPA 2006). Elements tested include arsenic, barium, cadmium, chromium, lead, selenium, and silver. This method measures ions produced by a radio frequency ICP. 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 with a mass spectrometer.

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, the study lakes 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, L9324, and MB0301 are presented in Table 3.1.

3.1 FIELD CONDITIONS AUGUST 19 AND 20, 2013

On August 19 during sampling at Lake MB0301, the temperature was 36 degrees Fahrenheit (°F). The weather was cloudy and moderately breezy with occasional gusts and approximately 0.5 foot wave on the lake surface. On August 20 during sampling at lakes M9313, L9323, and L9324, the temperature was 32°F. The weather was cloudy with a light breeze and approximately 0.2 foot waves on the lake surface.

3.1.1 LAKE M9313

Lake M9313, located near CD3 and the Ulamnigiq Channel, is large with low grassy banks (Photo 3.1). At the time of sampling, Lake M9313 was connected to some areas of water ponded in adjacent polygons (Photo 3.2), but flow was not observable between water bodies. No odor or film was observed while sampling the lake.



Photo 3.1: Lake M9313, looking northeast; August 20, 2013



Photo 3.2: Lake M9313, looking south; August 20, 2013

3.1.2 LAKE L9323

Located near CD4 and the Nigliq Channel, Lake L9323 is moderately sized with grassy banks and some reeds on the periphery (Photo 3.3). Lake L9323 was hydraulically isolated at the time of sampling (Photo 3.4). No odor or film was observed while sampling the lake.

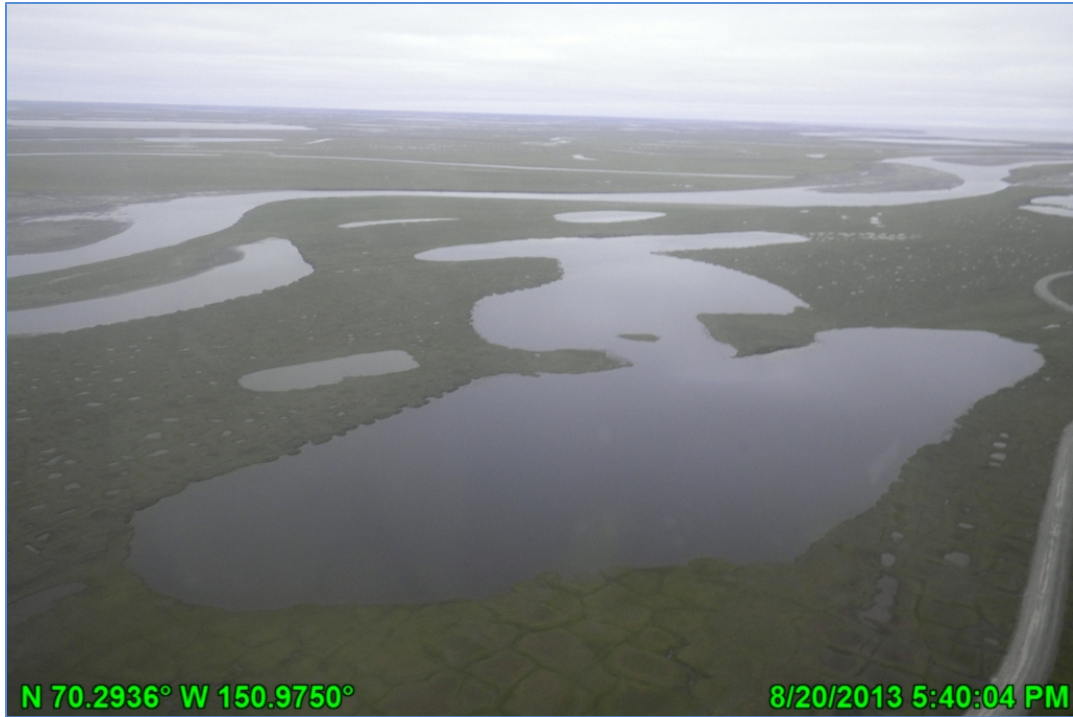


Photo 3.3: Lake L9323, looking northwest; August 20, 2013



Photo 3.4: Lake L9323, looking south; August 20, 2013

3.1.3 LAKE L9324

Located near CD4 and the Nigliq Channel, Lake L9324 (Photo 3.5) is moderately sized with grassy banks and willows (Photo 3.6). Some large bluffs surround the lake. At the time of sampling, Lake L9324

appeared to be connected to the Sakoonang Channel, however, no flow could be verified between the two water bodies (Photo 3.7). No odor or film was observed while sampling the lake.



Photo 3.5: Lake L9324, looking southeast; August 20, 2013



Photo 3.6: Lake L9324, looking northwest; August 20, 2013



Photo 3.7: Lake L9324 connection with the Sakoonang Channel, looking east; August 20, 2013

3.1.4 LAKE MB0301

Located near the proposed CD5 facilities, Lake MB0301 is a moderately sized lake, with grassy banks (Photo 3.8). During sampling, Lake MB0301 was hydraulically connected to a Lake L9308/Oil Lake via the small stream to the south (Photo 3.9) and was connected to the extensive wetlands to the northeast.



Photo 3.8: Lake MB0301, looking north; August 19, 2013

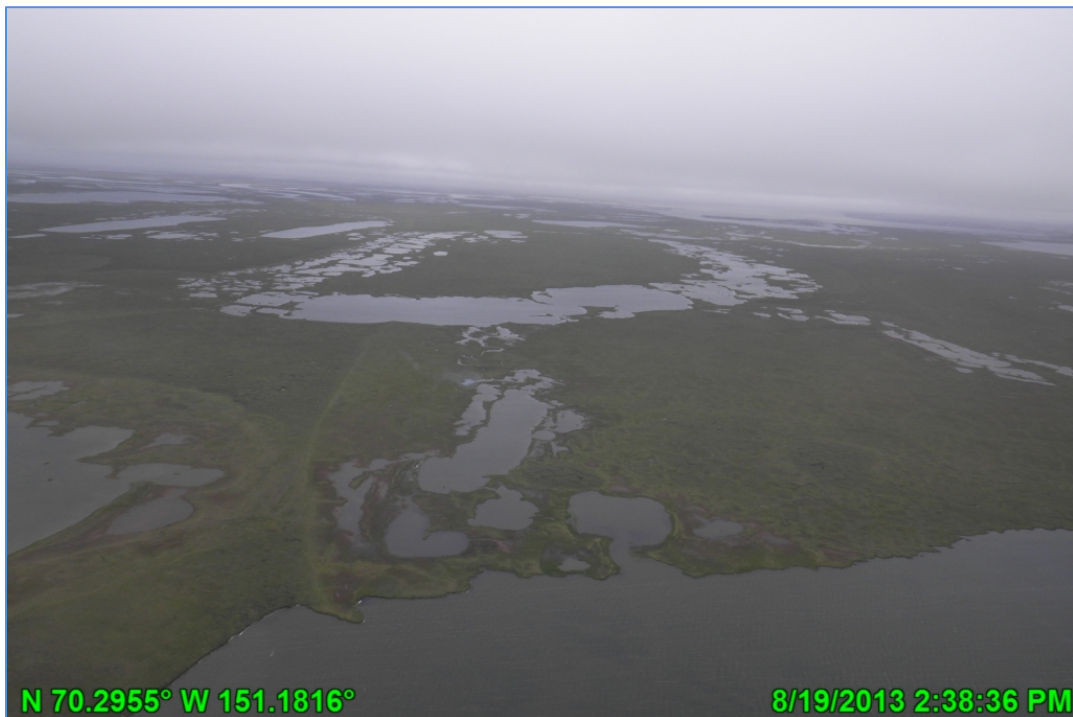


Photo 3.9: Lake MB0301, looking northwest; August 19, 2013

3.2 IN-SITU RESULTS

The in-situ water quality results from the August 19 and 20, 2013 sampling event are tabulated in Table 3.1.

Table 3.1: In-Situ Water Quality Results

CPAI 2013 Lake Monitoring Program
In-Situ Water Quality

Baker

Sample Date: August 19 & 20, 2013

Lake Location Time	Total Depth (ft)	Turbidity (NTU)	Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	pH
L9323 N70°17'45.9" W150°59'17.9" 8/20/2013 1:35 PM	19.25	-0.1	Surface	-	-	-	-	-	-	-
			1.0	8.08	40	60	11.36	96.1	0.03	7.52
			2.0	8.10	40	60	11.37	96.2	0.03	7.52
			4.0	8.10	40	60	11.36	96.2	0.03	7.53
			6.0	8.11	40	60	11.36	96.2	0.03	7.53
			8.0	8.09	40	60	11.36	96.2	0.03	7.53
			10.0	8.09	40	60	11.36	96.2	0.03	7.54
			12.0	8.10	40	60	11.34	96.1	0.03	7.55
			14.0	8.07	40	60	11.34	95.9	0.03	7.55
16.0	8.07	40	60	11.35	95.9	0.03	7.56			
17.0	8.07	40	60	11.34	95.9	0.03	7.57			
L9324 N70°17'24.7" W150°58'58.6" 8/20/2013 10:10 AM	10.10	-0.4	Surface	-	-	-	-	-	-	-
			1.0	7.27	54	83	11.96	99.3	0.04	7.86
			2.0	7.28	54	83	11.94	99.1	0.04	7.80
			4.0	7.30	54	83	11.93	99.0	0.04	7.75
			6.0	7.29	54	83	11.93	99.0	0.04	7.67
			8.0	7.31	54	83	11.93	99.0	0.04	7.61
9.0	7.35	54	83	11.93	99.1	0.04	7.54			
M9313 N70°25'18.9" W150°53'58.2" 8/20/2013 14:30 PM	25.50	-0.8	Surface	-	-	-	-	-	-	-
			1.0	7.49	477	726	11.69	97.8	0.35	8.01
			2.0	7.47	477	727	11.69	97.7	0.35	8.01
			4.0	7.49	477	726	11.69	97.6	0.35	8.02
			6.0	7.48	477	726	11.66	97.5	0.35	8.02
			8.0	7.48	477	726	11.68	97.6	0.35	8.02
			10.0	7.49	477	726	11.66	97.5	0.35	8.02
			12.0	7.50	477	726	11.67	97.5	0.35	8.02
			14.0	7.48	477	726	11.69	97.6	0.35	8.02
			16.0	7.36	475	726	11.69	97.5	0.35	8.02
			18.0	7.21	474	728	11.71	97.1	0.35	8.01
			20.0	7.16	473	727	11.69	96.9	0.35	7.99
			22.0	7.15	473	728	11.67	96.7	0.35	7.99
24.0	7.15	473	728	11.66	96.6	0.35	7.99			
MB0301 N70°18'28.8" W151°12'5.5" 8/19/2013 3:30 PM	7.30	0.1	Surface	-	-	-	-	-	-	-
			1.0	8.20	146	218	11.51	97.8	0.10	8.27
			2.0	8.21	146	218	11.53	97.9	0.10	8.27
			4.0	8.20	146	218	11.52	97.9	0.10	8.26
6.0	8.22	146	218	11.52	97.8	0.10	8.26			

Notes:

- (1) Sample depth is measured from the water surface.
- (2) Turbidity, temperature, conductivity, dissolved oxygen, and salinity were measured using a YSI 650-6920V2 meter.
- (3) Turbidity is presented as an average of the sampled values in the water column.
- (4) Negative turbidity is typically traced to minute contamination of the zero calibration standard. According to the meter manufacture, a used instrument can contaminate a zero standard to almost 1.0 NTU.
- (5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.

3.2.1 SPECIFIC CONDUCTANCE

Specific conductance was considered homogenous throughout the water column at all sample locations, but was notably different between lakes. The average specific conductance in Lake M9313, located nearest to the coast, was 727 $\mu\text{S}/\text{cm}$. Measured values exceeding 500 $\mu\text{S}/\text{cm}$ are indicative of saline environments (ADF&G, 2008) which are usually noted in lakes near the coast. Average specific conductance was 60 $\mu\text{S}/\text{cm}$ in Lake L9323, 83 $\mu\text{S}/\text{cm}$ in Lake L9324, and 218 $\mu\text{S}/\text{cm}$ in Lake MB0301.

3.2.2 DISSOLVED OXYGEN AND WATER TEMPERATURE

The concentrations of DO varied slightly within the water column at all sample locations. In 2013, the average DO was measured at 11.68 mg/L in Lake M9313, 11.35 mg/L in Lake L9323, 11.94 mg/L in Lake L9324, and 11.52 mg/L in Lake MB0301. Compared to average DO values in 2012, the 2013 average DO value was slightly lower in Lake L9323 and higher in lakes L9324 and M9313.

A 100% saturation level is based on standard temperature and pressure conditions. The average percent-saturation at Lake M9313 was 97.4%, Lake L9323 was 96.1%, and Lake L9324 was 99.1%. The percent-saturation levels in 2013 were lower for the aforementioned lakes compared to values in 2012. Percent-saturation in Lake MB0301 was 97.9%.

There were no significant oxyclines or thermoclines at any of the sampling sites. Generally, there was a slight decrease of oxygen saturation corresponding with depth in all lakes. The maximum difference in oxygen saturation of 1.2% was measured between the surface and the bottom of Lake M9313.

Temperatures in all lakes ranged from a maximum of 8.22°C in Lake MB0301 to a minimum of 7.15°C in Lake M9313. The maximum water column temperature variation of 0.34°C was observed in Lake M9313, where cooler temperatures were measured at the bottom of the lake. Lake M9313 was the deepest lake sampled, and the observed variations in temperature and oxygen saturation are likely attributed to the attenuated mixing of the water column from wind action with depth.

Salinity remained consistent with depth at all lakes. The greatest concentration was measured in Lake M9313 at 0.35 ppt likely because of its coastal proximity. Lakes L9323, L9324, and MB0301 had concentrations of 0.03 ppt, 0.04 ppt, and 0.1 ppt, respectively.

3.2.3 TURBIDITY

Average turbidity for lakes M9313, L9323, and L9324 was below 0.0 NTU. According to the meter manufacturer, a used instrument can contaminate a zero standard to almost 1.0 NTU. In addition, negative bias can result from interference due to absorbing particles, particle size, sample cell variations, particle density, and particle settling (Sadar, 2004). As a result, the negative turbidity measurements for these lakes can be interpreted as being close to 0.0 NTU. Average turbidity in Lake MB0301 was 0.1 NTU.

3.3 LABORATORY RESULTS

With the exception of barium, analytical results show that targeted compounds and metals were not detected above the laboratory detection limit in lakes M9313, L9323, L9324, and MB0301. 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 0.221 mg/L in Lake M9313. Barium is not uncommon in arctic waters at concentrations similar to those measured at the four lakes (Guay and Falkner 1998). Analytical results and the laboratory report are presented in Table 3.2 and Appendix A, respectively.

DRO and RRO were not detected above the laboratory detection limits in samples collected from lakes L9323, L9324, M9313, and MB0301.

Table 3.2: Laboratory Analytical Results

Parameter	ADEC Cleanup Level ¹ (mg/L)	Lake M9313 (mg/L)	Lake L9323 (mg/L)	Lake L9324 (mg/L)	Lake L9324 ² (mg/L)	Lake MB0301 (mg/L)
Arsenic	0.01	ND ³	ND	ND	ND	ND
Barium	2	0.221	0.0424	0.0485	0.0498	0.168
Cadmium	0.005	ND	ND	ND	ND	ND
Chromium	0.1	ND	ND	ND	ND	ND
Lead	0.015	ND	ND	ND	ND	ND
Mercury	0.002	ND	ND	ND	ND	ND
Selenium	0.05	ND	ND	ND	ND	ND
Silver	0.1	ND	ND	ND	ND	ND
DRO	1.5	ND	ND	ND	ND	ND
RRO	1.1	ND	ND	ND	ND	ND

1. ADEC Water Quality Standards 18 AAC 75.345 Table C Groundwater Cleanup Waters (2009).
 2. Duplicate Sample.
 3. ND indicates analyte is not detected above the laboratory detection limit.
 Source: SGS Laboratory Analysis Report 1134009

4.0 REFERENCES

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- Guay, C.K. and K.K. Falkner. 1998. A Survey of Dissolved Barium in the Estuaries of Major Arctic Rivers and Adjacent Seas. *Continental Shelf Research* 18:8 859-882.
- Michael Baker Jr., Inc. (Baker) 2013a. North Slope Water Resources 2013 Health, Safety, and Environmental Plan. Prepared for ConocoPhillips Alaska, Inc.
- 2013b. 2013 Alpine Satellite Development Plan (ASDP) Water Quality Monitoring Job Safety Analysis. Prepared for ConocoPhillips Alaska, Inc.
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- 2006. Colville River Ice Bridge Monitoring. April.
- North Slope Borough. 2004 North Slope Borough Ordinance Serial No. 75-6-46
- Sadar, M. 2004. Making Sense of Turbidity Measurements - Advantages In Establishing Traceability Between Measurements and Technology.
- <http://acwi.gov/monitoring/conference/2004/conference_agenda_links/papers/poster_papers/215_SadarMike.pdf>
- United States Army Corps of Engineers (USACE). 1987. Reservoir Water Quality Analysis. Engineering Manual EM-1110-2-1201.
- United States Environmental Protection Agency (EPA). 2006. 2006 Edition of the Drinking Water Standards and Health Advisories. EPA 822-R-06-013.
- United States Geological Survey (USGS). 2006. National Field Manual for the Collection of Water-Quality Data. Book 9 Handbooks for Water-Resources Investigations. Chapter A4 Collection of Water Samples.
- Ward, J.R. and C.A. Harr eds. 1990. Methods for Collection and Processing Surface-Water and Bed-Material Samples for Physical and Chemical Analyses. Open-File Report 90-147.
- YSI Incorporated. 2007. YSI Model 30/30M Handheld Salinity, Conductivity and Temperature System Operations Manual.

Appendix A LABORATORY ANALYTICAL RESULTS

Shawn Snisarenko
Michael Baker Jr., Inc.
1400 West Benson Blvd, Ste 200
Anchorage, AK 99503

Work Order: 1134009
ASDP WQ

Client: Michael Baker Jr., Inc.

Report Date: September 03, 2013

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 2944.01 for DOD ELAP/ISO 17025 (RCRA methods: 1020A, 1311, 3010A, 3050B, 3520C, 3550C, 5030B, 5035B, 6020, 7470A, 7471B, 8015C, 8021B, 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, 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.# 1134009001
Client Name Michael Baker Jr., Inc.
Project Name/# ASDP WQ
Client Sample ID MB0301
Matrix Water (Surface, Eff., Ground)

Printed Date/Time 09/03/2013 8:51
Collected Date/Time 08/19/2013 16:00
Received Date/Time 08/23/2013 8:08
Technical Director Stephen C. Ede

Sample Remarks:

Parameter	Results	LOQ	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
<u>Metals by ICP/MS</u>									
Arsenic	ND	5.00	ug/L	SW6020	C		08/28/13	08/30/13	HKS
Barium	168	3.00	ug/L	SW6020	C		08/28/13	08/30/13	HKS
Cadmium	ND	2.00	ug/L	SW6020	C		08/28/13	08/30/13	HKS
Chromium	ND	4.00	ug/L	SW6020	C		08/28/13	08/30/13	HKS
Lead	ND	1.00	ug/L	SW6020	C		08/28/13	08/30/13	HKS
Mercury	ND	0.200	ug/L	SW6020	C		08/28/13	08/30/13	HKS
Selenium	ND	5.00	ug/L	SW6020	C		08/28/13	08/30/13	HKS
Silver	ND	2.00	ug/L	SW6020	C		08/28/13	08/30/13	HKS
<u>Semivolatile Organic Fuels Department</u>									
Diesel Range Organics	ND	0.638	mg/L	AK102	A		08/25/13	08/28/13	EAB
Residual Range Organics	ND	0.532	mg/L	AK103	A		08/25/13	08/28/13	EAB
<u>Surrogates</u>									
5a Androstane <surr>	85.9		%	AK102	A	50-150	08/25/13	08/28/13	EAB
n-Triacontane-d62 <surr>	87.1		%	AK103	A	50-150	08/25/13	08/28/13	EAB



SGS Ref.# 1134009002
Client Name Michael Baker Jr., Inc.
Project Name/# ASDP WQ
Client Sample ID L9324-A
Matrix Water (Surface, Eff., Ground)

Printed Date/Time 09/03/2013 8:51
Collected Date/Time 08/20/2013 10:10
Received Date/Time 08/23/2013 8:08
Technical Director Stephen C. Ede

Sample Remarks:

Parameter	Results	LOQ	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
<u>Metals by ICP/MS</u>									
Arsenic	ND	5.00	ug/L	SW6020	C		08/28/13	08/30/13	HKS
Barium	48.5	3.00	ug/L	SW6020	C		08/28/13	08/30/13	HKS
Cadmium	ND	2.00	ug/L	SW6020	C		08/28/13	08/30/13	HKS
Chromium	ND	4.00	ug/L	SW6020	C		08/28/13	08/30/13	HKS
Lead	ND	1.00	ug/L	SW6020	C		08/28/13	08/30/13	HKS
Mercury	ND	0.200	ug/L	SW6020	C		08/28/13	08/30/13	HKS
Selenium	ND	5.00	ug/L	SW6020	C		08/28/13	08/30/13	HKS
Silver	ND	2.00	ug/L	SW6020	C		08/28/13	08/30/13	HKS
<u>Semivolatile Organic Fuels Department</u>									
Diesel Range Organics	ND	0.625	mg/L	AK102	A		08/25/13	08/28/13	EAB
Residual Range Organics	ND	0.521	mg/L	AK103	A		08/25/13	08/28/13	EAB
<u>Surrogates</u>									
5a Androstane <surr>	87.2		%	AK102	A	50-150	08/25/13	08/28/13	EAB
n-Triacontane-d62 <surr>	90.8		%	AK103	A	50-150	08/25/13	08/28/13	EAB



SGS Ref.# 1134009003
Client Name Michael Baker Jr., Inc.
Project Name/# ASDP WQ
Client Sample ID L9324-B
Matrix Water (Surface, Eff., Ground)

Printed Date/Time 09/03/2013 8:51
Collected Date/Time 08/20/2013 10:10
Received Date/Time 08/23/2013 8:08
Technical Director Stephen C. Ede

Sample Remarks:

Parameter	Results	LOQ	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
<u>Metals by ICP/MS</u>									
Arsenic	ND	5.00	ug/L	SW6020	C		08/28/13	08/30/13	HKS
Barium	49.8	3.00	ug/L	SW6020	C		08/28/13	08/30/13	HKS
Cadmium	ND	2.00	ug/L	SW6020	C		08/28/13	08/30/13	HKS
Chromium	ND	4.00	ug/L	SW6020	C		08/28/13	08/30/13	HKS
Lead	ND	1.00	ug/L	SW6020	C		08/28/13	08/30/13	HKS
Mercury	ND	0.200	ug/L	SW6020	C		08/28/13	08/30/13	HKS
Selenium	ND	5.00	ug/L	SW6020	C		08/28/13	08/30/13	HKS
Silver	ND	2.00	ug/L	SW6020	C		08/28/13	08/30/13	HKS
<u>Semivolatile Organic Fuels Department</u>									
Diesel Range Organics	ND	0.625	mg/L	AK102	A		08/25/13	08/28/13	EAB
Residual Range Organics	ND	0.521	mg/L	AK103	A		08/25/13	08/28/13	EAB
<u>Surrogates</u>									
5a Androstane <surr>	95.5		%	AK102	A	50-150	08/25/13	08/28/13	EAB
n-Triacontane-d62 <surr>	95.7		%	AK103	A	50-150	08/25/13	08/28/13	EAB



SGS Ref.# 1134009004
Client Name Michael Baker Jr., Inc.
Project Name/# ASDP WQ
Client Sample ID L9323
Matrix Water (Surface, Eff., Ground)

Printed Date/Time 09/03/2013 8:51
Collected Date/Time 08/20/2013 13:25
Received Date/Time 08/23/2013 8:08
Technical Director Stephen C. Ede

Sample Remarks:

Parameter	Results	LOQ	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
<u>Metals by ICP/MS</u>									
Arsenic	ND	5.00	ug/L	SW6020	C		08/28/13	08/30/13	HKS
Barium	42.4	3.00	ug/L	SW6020	C		08/28/13	08/30/13	HKS
Cadmium	ND	2.00	ug/L	SW6020	C		08/28/13	08/30/13	HKS
Chromium	ND	4.00	ug/L	SW6020	C		08/28/13	08/30/13	HKS
Lead	ND	1.00	ug/L	SW6020	C		08/28/13	08/30/13	HKS
Mercury	ND	0.200	ug/L	SW6020	C		08/28/13	08/30/13	HKS
Selenium	ND	5.00	ug/L	SW6020	C		08/28/13	08/30/13	HKS
Silver	ND	2.00	ug/L	SW6020	C		08/28/13	08/30/13	HKS
<u>Semivolatile Organic Fuels Department</u>									
Diesel Range Organics	ND	0.632	mg/L	AK102	A		08/25/13	08/28/13	EAB
Residual Range Organics	ND	0.526	mg/L	AK103	A		08/25/13	08/28/13	EAB
<u>Surrogates</u>									
5a Androstane <surr>	83.3		%	AK102	A	50-150	08/25/13	08/28/13	EAB
n-Triacontane-d62 <surr>	87.3		%	AK103	A	50-150	08/25/13	08/28/13	EAB



SGS Ref.# 1134009005
Client Name Michael Baker Jr., Inc.
Project Name/# ASDP WQ
Client Sample ID M9313
Matrix Water (Surface, Eff., Ground)

Printed Date/Time 09/03/2013 8:51
Collected Date/Time 08/20/2013 16:30
Received Date/Time 08/23/2013 8:08
Technical Director Stephen C. Ede

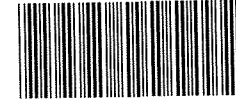
Sample Remarks:

Parameter	Results	LOQ	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
<u>Metals by ICP/MS</u>									
Arsenic	ND	5.00	ug/L	SW6020	C		08/28/13	08/30/13	HKS
Barium	221	3.00	ug/L	SW6020	C		08/28/13	08/30/13	HKS
Cadmium	ND	2.00	ug/L	SW6020	C		08/28/13	08/30/13	HKS
Chromium	ND	4.00	ug/L	SW6020	C		08/28/13	08/30/13	HKS
Lead	ND	1.00	ug/L	SW6020	C		08/28/13	08/30/13	HKS
Mercury	ND	0.200	ug/L	SW6020	C		08/28/13	08/30/13	HKS
Selenium	ND	5.00	ug/L	SW6020	C		08/28/13	08/30/13	HKS
Silver	ND	2.00	ug/L	SW6020	C		08/28/13	08/30/13	HKS
<u>Semivolatile Organic Fuels Department</u>									
Diesel Range Organics	ND	0.622	mg/L	AK102	A		08/25/13	08/28/13	EAB
Residual Range Organics	ND	0.518	mg/L	AK103	A		08/25/13	08/28/13	EAB
<u>Surrogates</u>									
5a Androstane <surr>	74.4		%	AK102	A	50-150	08/25/13	08/28/13	EAB
n-Triacontane-d62 <surr>	74.4		%	AK103	A	50-150	08/25/13	08/28/13	EAB



SGS North America Inc.
CHAIN OF CUSTODY RECORD

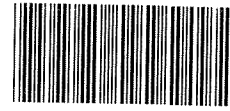
1134009



www.sgs.com

Section 1 CLIENT: MICHAEL BAKER JR CONTACT: GARRETT YAGER PHONE NO: 907-334-0960 PROJECT NAME: ASDP WQ PROJECT/PWSID/PERMIT#: 136068 REPORTS TO: KAREN BROWN E-MAIL: garrett.yager@MBAKER.CORP.COM INVOICE TO: QUOTE #: P.O. #: 136068					Instructions: Sections 1 - 5 must be filled out. Omissions may delay the onset of analysis.					Page ___ of ___									
					Section 3		Preservative												
					# CONTAINER S	Type C = COMP G = GRAB MI = Multi Incremental Soils	HCL	HNO ₃	HCL										
							RROR	RCRA-METALS	DRO	W/SA-CLEAN									
RESERVED for lab use	SAMPLE IDENTIFICATION	DATE mm/dd/yy	TIME HH:MM	MATRIX/ MATRIX CODE	CONTAINER S	Type	HCL	HNO ₃	HCL							REMARKS/ LOC ID			
	①A+B MB0301	8/19/13	16:00		2	G	X		X							COOLER #1			
	①C MB0301	8/19/13	16:00		1	G		X								"			
	②A+B L9324-A	8/20/13	10:10		2	G	X		X							"			
	②C L9324-A	8/20/13	10:10		1	G		X								"			
	③A+B L9324-B	8/20/13	10:10		2	G	X		X							"			
	③C L9324-B	8/20/13	10:10		1	G		X								"			
	④A+B L9323	8/20/13	13:35		2	G	X		X							COOLER #2			
	④C L9323	8/20/13	13:35		1	G		X								"			
	⑤A+B M9313	8/20/13	16:30		2	G	X		X							"			
	⑤C M9313	8/20/13	16:30		1	G		X								"			
Section 2 Section 3 Section 4 Section 5		Relinquished By: (1)		Date	Time	Received By:		Section 4		DOD Project? Yes (No)		Data Deliverable Requirements:							
		GARRETT YAGER		8/22/13	10:00	GARRETT YAGER		Cooler ID: 136068											
		Relinquished By: (2)		Date	Time	Received By:		Requested Turnaround Time and/or Special Instructions:											
		GARRETT YAGER		8/23/13	8:00														
Relinquished By: (3)		Date	Time	Received By:		Temp Blank °C: 3.3/205		Chain of Custody Seal: (Circle)											
						or Ambient []		<input checked="" type="radio"/> INTACT <input type="radio"/> BROKEN <input type="radio"/> ABSENT											
Relinquished By: (4)		Date	Time	Received For Laboratory By:		(See attached Sample Receipt Form)		(See attached Sample Receipt Form)											
		8/23/13	8:08																

1.2/205



SAMPLE RECEIPT FORM

Review Criteria:	Condition:	Comments/Action Taken:
Were custody seals intact? Note # & location, if applicable. COC accompanied samples?	Yes No N/A Yes No N/A	IF
Temperature blank compliant* (i.e., 0-6°C after CF)? * Note: Exemption permitted for chilled samples collected less than 8 hours ago. Cooler ID: <u>1</u> @ <u>3.3</u> w/ Therm.ID: <u>205</u> Cooler ID: <u>2</u> @ <u>1.2</u> w/ Therm.ID: <u>205</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 without 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 nor cooler temp can be obtained, note "ambient" or "chilled." If temperature(s) <0°C, were all sample containers ice free?	Yes No N/A Yes No N/A	
Delivery method (specify all that apply): USPS Alert Courier C&D Delivery 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?	Note ABN/tracking # See Attached or N/A Yes No N/A	
→ For samples received with payment, note amount (\$) and cash / check / CC (circle one) or note: → For samples received in FBKS, ANCH staff will verify all criteria are reviewed.		N/A SRF Initiated by: CES N/A
Were samples received within hold time? Note: Refer to form F-083 "Sample Guide" for hold time information. Do samples match COC* (i.e., sample IDs, dates/times collected)? * Note: Exemption permitted if times differ <1hr; in that case, use times on COC. Were analyses requested unambiguous?	Yes No N/A Yes No N/A Yes No N/A	
Were samples in good condition (no leaks/cracks/breakage)? Packing material used (specify all that apply): Bubble Wrap Separate plastic bags Vermiculite Other:	Yes No N/A	new lid on sample L9324-A
Were all VOA vials free of headspace (i.e., bubbles ≤6 mm)? Were all soil VOAs field extracted with MeOH+BFB?	Yes No N/A 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?	Yes No N/A Yes No 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 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 No N/A Yes No N/A	
For RUSH/SHORT Hold Time, were COC/Bottles flagged accordingly? Was Rush/Short HT email sent, if applicable?	Yes No N/A	
For SITE-SPECIFIC QC, e.g. BMS/BMSD/BDUP, were containers / paperwork flagged accordingly?	Yes No N/A	
For any question answered "No," has the PM been notified and the problem resolved (or paperwork put in their bin)?	Yes No N/A	SRF Completed by: CES PM = N/A
Was PEER REVIEW of sample numbering/labeling completed?	Yes No N/A	Peer Reviewed by: SLC N/A
Additional notes (if applicable):		

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

2013 Alpine Satellite Development Plan (ASDP) Water Quality Monitoring Report
