Part 2 of 6: Appendix S of Resource Report No. 2

ATTACHMENT B: LIQUEFACTION FACILITIES AQUIFER PUMP TEST WELL AND GROUNDWATER OBSERVATION WELL INSTALLATION REPORT

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LNG FACILITIES AQUIFER PUMP TEST WELL AND GROUNDWATER OBSERVATION WELL INSTALLATION REPORT

USAL-FG-GRZZZ-00-002016-002

Rev	Date	Revision Description	Originator	Reviewer / Endorser	Response Code	Approver
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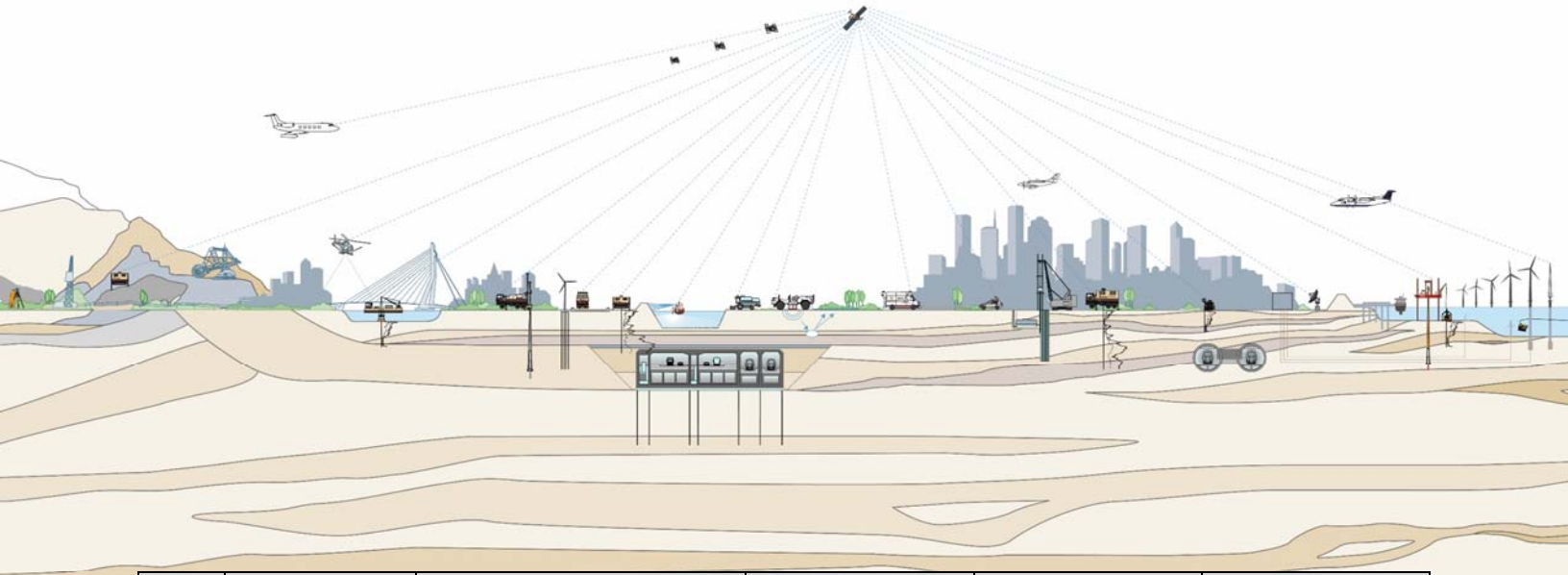
FUGRO CONSULTANTS, INC.

Alaska LNG™

LNG FACILITIES AQUIFER PUMP TEST WELL AND GROUNDWATER OBSERVATION WELL INSTALLATION REPORT
ONSHORE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

AKLNG REPORT NO. USAL-FG-GRZZZ-00-002016-002
REPORT NO. 04.10160001-4
EXXONMOBIL ALASKA LNG LLC (EMALL)
HOUSTON, TEXAS



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Revision	Section	Description

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December 2, 2016
Report No. 04.10160001-4

ExxonMobil Alaska LNG LLC (EMALL)
10613 W. Sam Houston Pkwy N, Suite 500
Houston, Texas 77064

Attention: Patrick Wong
Geotechnical Engineering Advisor Alaska LNG/Technical POC

Subject: **LNG Facilities Aquifer Pump Test Well and Groundwater Observation Well Installation Report, Onshore LNG Facilities, Alaska LNG Project, Nikiski, Alaska**

Fugro Consultants, Inc. (Fugro) is pleased to present this well installation completion report for the onshore facilities of the Alaska LNG Project (AKLNG) located in Nikiski, Alaska. Our services were authorized under Service Work Order No. AKLNG-FUG-US-005 Rev 0, dated March 2, 2016 in accordance with the Service Agreement No. A2275592 between Fugro and ExxonMobil Global Services Company, dated October 29, 2012. Fugro has been contracted by ExxonMobil Alaska LNG LLC (EMALL) under the service order to provide site investigation services for the proposed AKLNG Project. Fugro has been providing services to EMALL since 2014.

We appreciate the opportunity to be of service to EMALL. Please call Mr. Abhishek Shethji, P.E., Fugro's Project Manager at (713) 369-5431, if you have any questions or comments concerning this report, or when we may be of further assistance.

Sincerely,

FUGRO CONSULTANTS, INC.
TBPE Firm Registration No. 299

Dave Sadoff, P.G. (CA), C.P.G
Associate Geologist/Hydrogeologist

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1.0 INTRODUCTION

1.1 PROJECT DESCRIPTION

The Alaska Gasline Development Corporation, BP Alaska LNG LLC, ConocoPhillips Alaska LNG Company, and ExxonMobil Alaska LNG LLC (Applicants) plan to construct one integrated liquefied natural gas (LNG) Project (Project) with interdependent facilities for the purpose of liquefying supplies of natural gas from Alaska, in particular from the Point Thomson Unit (PTU) and Prudhoe Bay Unit (PBU) production fields on the Alaska North Slope (North Slope), for export in foreign commerce and opportunities for in-state deliveries of natural gas.

The Natural Gas Act (NGA), 15 U.S.C. § 717a(11) (2006), and Federal Energy Regulatory Commission (FERC) regulations, 18 C.F.R. § 153.2(d) (2014), define "LNG terminal" to include "all natural gas facilities located onshore or in State waters that are used to receive, unload, load, store, transport, gasify, liquefy, or process natural gas that is ... exported to a foreign country from the United States." With respect to this Project, the "LNG Terminal" includes the following: a liquefaction facility (Liquefaction Facility) in Southcentral Alaska; an approximately 804-mile gas pipeline (Mainline); a gas treatment plant (GTP) on the North Slope; an approximately 62-mile gas transmission line connecting the GTP to the PTU gas production facility (PTU Gas Transmission Line or PTTL); and an approximately 1-mile gas transmission line connecting the GTP to the PBU gas production facility (PBU Gas Transmission Line or PBTL). All of these facilities are essential to export natural gas in foreign commerce.

The new Liquefaction Facility would be constructed on the eastern shore of Cook Inlet just south of the existing Agrium fertilizer plant on the Kenai Peninsula, approximately 3 miles southwest of Nikiski and 8.5 miles north of Kenai (Plate 1). The Liquefaction Facility would include the structures, equipment, underlying access rights, and all other associated systems for final processing and liquefaction of natural gas, as well as storage and loading of LNG, including terminal facilities and auxiliary marine vessels used to support Marine Terminal operations (excluding LNG carriers [LNGCs]). The Liquefaction Facility would include three liquefaction trains combining to process up to approximately 20 million metric tons per annum (MMTPA) of LNG. Two 240,000-cubic-meter tanks would be constructed to store the LNG. The Liquefaction Facility would be capable of accommodating two LNG carriers. The size of LNGCs that the Liquefaction Facility would accommodate would range between 125,000–216,000-cubic-meter vessels.

EMALL contracted Fugro to investigate the site conditions of the onshore LNG facilities, marine LNG Terminal, and marine pipeline corridors. This report documents the installation of Observation Wells (OW) and Aquifer Pump Test (APT) wells during the 2016 geophysical and geotechnical site investigation (G&G) program at the Alaska LNG site (Site) near Nikiski, Alaska (Plate 1).

A list of the reports (including the superseded reports) that are generated by Fugro as part of 2014, 2015 and 2016 G&G programs are presented in Table 1.1.1. A copy of Table 1.1.1 is also separately submitted to AKLNG under document number USAL-FG-BRCTL-00-000001-000.

Table 1.1.1: Summary of Fugro Reports Developed for 2014, 2015 and 2016 G&G Programs

G&G Program	Report Title (Superseded Reports in Gray)	AKLNG Document Number	Fugro Report Number
2014	Project Execution Plan for 2014 Onshore and Marine G&G	USAL-FG-GPZZZ-00-000001-000	04.10140094-1
	Geologic Mapping Report	USAL-FG-GRZZZ-00-000001-000	04.10140094-2
	Marine Survey Report Pipeline Corridor Route 1	USAP-FG-GRZZZ-10-000001-000	04.10140094-3
	Marine Survey Report Pipeline Corridor Route 2	USAP-FG-GRZZZ-10-000002-000	04.10140094-4
	Marine Survey Report Nearshore LNG Facilities and Approach Channel	USAL-FG-GRZZZ-90-000003-000	04.10140094-5
	Probabilistic Seismic Hazard Analysis Report(1)	USAL-FG-GRHAZ-00-000001-000	04.10140094-6
	Geophysical Survey Report	USAL-FG-GRZZZ-00-000002-000	04.10140094-7
	Geotechnical Data Report Onshore LNG Facilities	USAL-FG-GRZZZ-00-000003-000	04.10140094-8
	Geologic Hazard Report(2)	USAL-FG-GRHAZ-00-000002-000	04.10140094-9
	Hydrogeologic Report(3)	USAL-FG-GRZZZ-00-000004-000	04.10140094-10
	Groundwater Monitoring Well Installation Report	USAL-FG-GRZZZ-00-000007-000	04.10140094-10A
	Liquefaction Potential Evaluation Report(4)	USAL-FG-GRZZZ-00-000005-000	04.10140094-11
	Integrated Site Characterization and Engineering Report(5)	USAL-FG-GRZZZ-00-000006-000	04.10140094-12
2015	Project Execution Plan for 2015 Onshore and Marine G&G Program	USAL-FG-GPZZZ-00-000002-000	04.10140334-1
	LNG Facilities Onshore Geologic Field Mapping Report	USAL-FG-GRZZZ-00-002015-004	04.10140334-2
	Pipeline Marine Geophysical Survey Report - Route 1	USAP-FG-GRZZZ-10-002015-013	04.10140334-3
	Pipeline Marine Geophysical Survey Report - Route 2	USAP-FG-GRZZZ-10-002015-014	04.10140334-4
	LNG Facilities Marine Geophysical Survey Report	USAL-FG-GRZZZ-90-002015-010	04.10140334-5
	LNG Facilities Probabilistic Seismic Hazard Analysis (PSHA) Report(1)	USAL-FG-GRHAZ-00-002015-001	04.10140334-6

G&G Program	Report Title (Superseded Reports in Gray)	AKLNG Document Number	Fugro Report Number
2015	LNG Facilities Onshore Geophysical Survey Report	USAL-FG-GRZZZ-00-002015-005	04.10140334-7
	LNG Facilities Onshore Geotechnical Data Report	USAL-FG-GRZZZ-00-002015-006	04.10140334-8
	LNG Facilities Marine Geotechnical Data Report	USAL-FG-GRZZZ-90-002015-011	04.10140334-9
	LNG Facilities Geologic Hazard Report(2)	USAL-FG-GRHAZ-00-002015-002	04.10140334-10
	LNG Facilities Onshore Groundwater Monitoring Well Installation Report	USAL-FG-GRZZZ-00-002015-007	04.10140334-11
	LNG Facilities Onshore Hydrogeologic Report(3)	USAL-FG-GRZZZ-00-002015-008	04.10140334-12
	LNG Facilities Seismic Engineering Report(4)	USAL-FG-GRZZZ-00-002015-003	04.10140334-13
	LNG Facilities Onshore Integrated Site Characterization and Geotechnical Engineering Report(5)	USAL-FG-GRZZZ-00-002015-009	04.10140334-14
	LNG Facilities Marine Integrated Site Characterization and Geotechnical Engineering Report	USAL-FG-GRZZZ-90-002015-012	04.10140334-15
2016	Project Execution Plan for 2016 Onshore and Marine G&G Program	USAL-FG-GPZZZ-00-002016-001	04.10160001-1
	LNG Facilities Groundwater Quality Sampling and Testing Report – Event 1	USAL-FG-GRZZZ-00-002016-003	04.10160001-2
	LNG Facilities Groundwater Quality Sampling and Testing Report – Event 2	USAL-FG-GRZZZ-00-002016-004	04.10160001-3
	LNG Facilities Aquifer Pump Test Well and Groundwater Observation Well Installation Report	USAL-FG-GRZZZ-00-002016-002	04.10160001-4
	LNG Facilities Onshore Geotechnical Data Report	USAL-FG-GRZZZ-00-002016-001	04.10160001-5
	LNG Facilities Onshore Hydrogeologic Report(3)	USAL-FG-GRZZZ-00-002016-007	04.10160001-8
	LNG Facilities Seismic Engineering Report(4)	USAL-FG-GRZZZ-00-002016-008	04.10160001-9
	Pipeline Marine Shallow Geotechnical Report	USAP-FG-GRZZZ-10-002016-011	04.10160001-10

G&G Program	Report Title (Superseded Reports in Gray)	AKLNG Document Number	Fugro Report Number
2016	LNG Facilities Marine Survey Report	USAL-FG-GRZZZ-90-002016-010	04.10160001-11
	LNG Facilities Onshore Integrated Site Characterization and Geotechnical Engineering Report[5]	USAL-FG-GRZZZ-00-002016-009	04.10160001-12
	LNG Facilities Rigs Tenders Wharf Siltation Survey Report	USAL-FG-CRZZZ-90-002016-001	04.10160001-13

Notes: [1] Fugro Report No. 04.10140334-6 supersedes Fugro Report No. 04.10140094-6.

[2] Fugro Report No. 04.10140334-10 supersedes Fugro Report No. 04.10140094-9.

[3] Fugro Report No. 04.10160001-8 supersedes Fugro Report Nos. 04.10140094-10 and 04.10140334-12.

[4] Fugro Report No. 04.10160001-9 supersedes Fugro Report Nos. 04.10140094-11 and 04.10140334-13.

[5] Fugro Report No. 04.10160001-12 supersedes Fugro Report Nos. 04.10140094-12 and 04.10140334-14.

1.2 GENERAL SCOPE OF WORK

Fugro's scope of work included the installation of four (4) OW wells and three (3) APT wells. These wells were installed near a former quarry to enable water withdrawal and aquifer monitoring to assess the nature of groundwater flow, yield, quality, and interconnectedness of the underlying water bearing units. As part of this scope of work, Fugro also installed a replacement monitoring well (designated MW-86BA), in the vicinity of the location of former monitoring well MW-86B, which was damaged during previous well completion activities and abandoned in 2016. The locations of all Site wells are depicted on Plate 2 – Investigation Plan.

Well installation, subsequent development, and data acquisition activities documented herein were conducted in accordance with a Project Execution Plan (PEP) (USAL-FG-GPZZZ-00-002016-001). Specific deviations from the PEP, which were discussed with the EMALL representatives prior to implementation included the following:

- Installation of replacement well MW-86BA.
- Installation of three (3) individual APT wells instead of two (2) APT wells. Two (2) APT wells (designated APT-1 and APT-2) were completed in Water Bearing Unit 2 and one (1) APT well (designated APT-3) was completed within Water Bearing Unit 3.

1.3 LIMITATIONS

Fugro makes no claim or representation concerning any activity or condition falling outside the specified purposes to which this report is directed. We have conducted our work using the standard level of care and diligence normally practiced by recognized engineering firms now performing similar services under similar circumstances. We intend for this report, including all illustrations, to be used in its entirety. The information presented in this report may not apply to locations not explored by borings or areas outside the project boundaries. This information should be made available to prospective users for information only, and not as a warranty of subsurface conditions.

1.4 UNIT CONVERSIONS AND ELEVATION DATUMS

The data presented herein are based on the Imperial Unit System. Table 1.4.1 provides a quick reference for conversion from Imperial Units to International System of Units (SI).

Table 1.4.1: Conversion Units

From SI System	To Imperial System	Multiply by
Kilo Newtons – kN	Kips – k	0.224809
Mega Newtons – MN	Kips – k	224.809
Kilo Newtons/meter^2 – kN/m^2 (kPa)	Pounds/feet^2 - psf	20.885
Kilo Newtons/meter^3 – kN/m^3	Pounds/feet^3 - pcf	6.3659
Meters – m	Feet – ft	3.2808
Millimeters – mm	Inches – in.	0.03937

All coordinates are reported in Zone AK4 North, NAD83 (NSRS 2007), and are in feet. Topographic elevations for onshore areas are referenced to NAVD88. It should be noted that the marine survey report is referenced to Mean Lower Low Water (MLLW). The following conversion formula is used to convert the elevations from MLLW to NAVD88:

- Elevation, in feet (NAVD88) = Elevation, in ft (MLLW) – 7.32 ft

Please note that this conversion formula is only applicable at Nikiski Area. Elevations presented in this report, and the corresponding illustrations and engineering plates are all referenced to the NAVD88 datum, unless noted otherwise.

2.0 WELL INSTALLATION AND DATA COLLECTION

Four (4) OW wells and three (3) APT wells were installed between July 16th and September 19th, 2016 to facilitate the evaluation of the nature of groundwater flow, yield, quality, and interconnectedness of the underlying water bearing units during future aquifer pump tests. The APT and OW well locations were selected by consultation with EMALL representatives. One (1) monitoring well (MW-86BA) was installed between August 10 and 11, 2016 to replace well MW-86B which was previously damaged and abandoned in 2016.

This section of the report documents well completion details including a summary of well completion dates and construction details. Subsequent activities, including well development, slug testing, and Micro-Diver pressure transducer installation, commenced following well installation and are also discussed in this section. Locations of the wells are depicted on Plate 2 – Investigation Plan.

In general, prior to installing OW and APT wells, previous boring logs and geophysical logging records were initially reviewed to develop a general understanding of the stratigraphic materials anticipated to be encountered in Water Bearing Unit 1 (an unconfined aquifer and the first encountered aquifer in the Site area) and Water Bearing Unit 2 (a semi-confined aquifer and the second encountered aquifer in the Site area) and to identify the presence and location of aquitard materials within the proposed well locations. Well installation details were then developed in discussion with EMALL representatives for implementation by the field crews at specific well locations. During well borehole

drilling, drill cuttings were visually classified and compared to completed borehole logging specific to each well pair location, which allowed changes to be made in the well design as work progressed.

During drilling, field screening was performed by the field logger using photo-ionization detectors (PID) to check for volatile organic compounds (VOC), hydrogen sulfide (H_2S), lower explosive limit (LEL) or methane gas, (CH_4), oxygen (O_2), and carbon monoxide. No detectable PID measurements were observed. Field measurements are documented on the respective borehole logs. Cuttings and water spray generated during the drilling were managed in accordance with the approved Method Statements (Appendix A), and given that no odors or sheen was observed, were discharged to the ground surface in the vicinity of the well locations.

2.1 OBSERVATION WELL INSTALLATION

All OWs were installed in pairs to monitor both Water Bearing Units 1 and 2. OW-1 and OW-3 were completed in Water Bearing Unit 1; OW-2 and OW-4 were completed in Water Bearing Unit 2. Well boreholes were drilled using a truck-mounted drill rig and air rotary drilling method. OW installation details included the following:

- Installing an 8-inch nominal diameter surface conductor casing to 20 feet deep, drilling a 6-inch diameter boring through the conductor casing to depth.
- Installing a well screen assembly, consisting of:
  - A K Packer on top of a 5-foot nominal riser length situated above the well screen. The K Packer transitioned from 6-inch nominal diameter casing to 4-inch nominal diameter riser pipe.
  - A 20-foot long, 4”x6” nominal diameter well screen with pre-pack sand filter.
  - A three-foot interval of 6-inch nominal diameter tailpipe with base plate at the bottom of the boring.
- Installing 6-inch nominal diameter schedule 40 steel well casing from the K Packer to 3 feet above existing ground surface.
- Removal of the 20 feet of 8-inch nominal diameter surface conductor casing, and backfilling the resultant annulus with bentonite.

Borehole logs and OW installation details are presented on Plates 3 through 10. Manufacturer specifications for the K Packer and well screen are included in Appendix D. OW construction details and groundwater levels are summarized below in Tables 2.1.1 and 2.1.2, respectively.

Table 2.1.1: Observation Well Construction Details

Water Bearing Unit	Well ID	Completion Date [1]	Borehole Termination Depth (feet bgs)	Borehole/ Well Casing Diameter (inches)	Well Screen Diameter (inches)	Steel Tailpipe Termination Depth (feet bgs)	Screen Interval Depth (feet bgs)	Riser Pipe Height Above Ground (inches)
1	OW-1	7/25/2016	79.1	6.0	4.0	79.1	56.1 - 76.1	32
2	OW-2	7/20/2016	140.9	6.0	4.0	140.9	117.9 - 137.9	36
1	OW-3	7/30/2016	67.0	6.0	4.0	67.0	44.0 – 64.0	36
2	OW-4	7/28/2016	137.6	6.0	4.0	137.6	114.6 - 134.6	30

Notes:
bgs = below ground surface
1. Completion Date refers to date of well development

Table 2.1.2: Observation Well Groundwater Details

Water Bearing Unit	Well ID	Static Groundwater Depth (feet bgs) [1,2]	GW Elevation (feet) [1,2]
1	OW-1	15.29	96.94
2	OW-2	37.48	74.61
1	OW-3	34.26	97.00
2	OW-4	55.70	75.09

Notes:
bgs = below ground surface
1. Groundwater depths measured at 18:00 hrs. on 9/22/16; corresponding elevations are referenced to NAVD88.
2. To convert NAVD88 to MLLW add 7.32 feet.

The OW locations were surveyed by McLane Consulting Group (McLane), a qualified and licensed State of Alaska surveyor, on August 25, 2016. The elevations are referenced to Permanent Survey Monuments surveyed to the NAVD88 datum and the horizontal location information is referenced to NAD83 – NSRS2007. Data points were acquired in general accordance with the scope of work outlined in GESP-CIV-EP-006. OW surveying data are summarized below in Table 2.1.3.

Table 2.1.3: As-Built Coordinates and Elevations for Observation Wells

Water Bearing Unit	Monitoring Well ID	As Built Coordinates (NAD 83)		Depth (feet bgs)	As Built Elevation, Top of Casing, feet (NAVD88)	Ground Surface Elevation, feet (NAVD88)
		Latitude	Longitude			
1	OW-1	60.66385170	-151.34463703	79.1	112.23	109.56
2	OW-2	60.66382579	-151.34460741	140.9	112.09	109.09
1	OW-3	60.66235654	-151.34191656	67.0	131.26	128.26
2	OW-4	60.66238108	-151.34194479	137.6	130.79	128.29

2.2 AQUIFER PUMP TEST WELL INSTALLATION

Three APT wells (designated APT-1 through APT-3) were installed to depths between 138 and 286 feet bgs. The APT well boreholes were drilled using a truck-mounted drill rig and air rotary drilling methods. APT well installation details included the following:

- Installing a 16-inch nominal diameter surface conductor casing to 20 feet deep, drilling a 12-inch diameter boring through the conductor casing to depth.
- Installing a well screen assembly consisting of:
  - A K Packer on top of a 5-foot nominal riser length situated above the well screen. The K Packer transitioned from 12-inch nominal diameter casing to 8-inch nominal diameter riser pipe.
  - A 27-foot long, 8-inch nominal diameter well screen (APT-2), and a 30-foot long, 8-inch nominal diameter well screen (APT-1 and APT-3).
  - A three-foot interval of 8-inch nominal diameter tailpipe with base plate at the bottom of the boring.
- Installing a 12-inch nominal diameter schedule 40 steel well casing from the K Packer to 3 feet above existing ground surface.
- Removal of the 20-feet of 16-inch nominal diameter surface conductor casing, and backfilling the resultant annulus with bentonite.

Borehole logs and APT well installation details are presented on Plates 11 through 16. Manufacturer specifications for the K Packer and well screen are included in Appendix D. APT well construction details and groundwater levels are summarized below in Tables 2.2.1 and 2.2.2, respectively.

Table 2.2.1: Aquifer Pump Test Well Construction Details

Water Bearing Unit	Well ID	Completion Date [1]	Borehole Termination Depth (feet bgs)	Borehole / Steel Casing Diameter (inches)	Well Screen Diameter (inches)	Steel Tailpipe Termination Depth (feet bgs)	Screen Interval Depth (feet bgs)	Riser Pipe Height Above Ground (inches)
2	APT-1	9/13/2016	135.0	12	8.0	135.0	102.0 – 132.0	36
2	APT-2	9/19/2016	138.5	12	8.0	138.5	108.5 - 135.5	36
3	APT-3	9/3/2016	437.0	12	8.0	286.0	253.0 – 283.0	36

Notes:
bgs = below ground surface
1. Completion Date refers to date of well development

Table 2.2.2: Aquifer Pump Test Well Groundwater Details

Water Bearing Unit	Well ID	Static Groundwater Depth (feet bgs) [1,2]	GW Elevation (feet) [1,2]
2	APT-1	47.87	72.22
2	APT-2	55.64	74.35
3	APT-3	72.97	45.86

Notes:
bgs = below ground surface
1. Groundwater depths measured at 18:00 hrs. on 9/22/16; corresponding elevations are referenced to NAVD88.
2. To convert NAVD88 to MLLW add 7.32 feet.

The APT well locations were surveyed by McLane on September 26, 2016. The elevations are referenced to Permanent Survey Monuments surveyed to the NAVD88 datum and the horizontal location information is referenced to NAD83 – NSRS2007. Data points were acquired in general accordance with the scope of work outlined in GESP-CIV-EP-006. APT well surveying data are summarized below in Table 2.2.3.

Table 2.2.3: As-Built Coordinates and Elevations for Aquifer Pump Test Wells

Water Bearing Unit	Monitoring Well ID	As Built Coordinates (NAD 83)		Depth (feet bgs)	As Built Elevation, Top of Casing, feet (NAVD88)	Ground Surface Elevation, feet (NAVD88)
		Latitude	Longitude			
2	APT-1	60.66315390	-151.3470609	135.0	120.09	117.09
2	APT-2	60.66107404	-151.3419546	138.5	129.99	126.99
3	APT-3	60.66312928	-151.3469876	286.0	118.83	115.83

2.3 GROUNDWATER MONITORING WELL INSTALLATION

In 2016, well MW-86B was selected to be retrofitted due to a missing bentonite seal above the permeable sand columns. Denali Drilling, Inc. (Denali) was engaged to conduct over-drilling of this well with hollow-stem auger drilling methodologies, around the initially installed 2-inch PVC well casing, to remove the upper 10-feet of annular materials. During the drilling operations, PVC casing was damaged and the decision was made to abandon well MW-86B in place. As a result, the annulus and inside of the well were backfilled with a cement-bentonite grout mix.

A replacement well (designated MW-86BA) was installed approximately 10-feet west of abandoned well MW-86B. Replacement well MW-86BA was installed using a truck mounted drill rig and hollow-stem auger drilling techniques. As well MW-86B was observed to be a dry well, the replacement well was installed into a borehole which was extended to the top of the aquitard separating Water Bearing Units 1 and 2. In general, well construction details included the following:

- Placing hydrated-bentonite chips from the bottom of the borehole to bottom of the proposed well depth.

- Installing a 2-inch nominal diameter PVC well comprising a solid riser, well screen, and a lower silt trap above the hydrated-bentonite chip layer.
- Placing sand above the top of the hydrated-bentonite chip layer and around the screen section, to 3 feet above the top of the screen section.
- Placing another hydrated-bentonite chip layer above the sand, followed by bentonite grout to function as the well sanitary seal.
- Placing bentonite chips, followed by a layer of gravel, was then placed on top of the bentonite grout and extending to the ground surface.

A borehole log and well installation details are presented on Plates 17 and 18, respectively. Well construction details are also summarized below in Table 2.3.1. For consistency and to aid in comparing data, information collected during all phases of field investigation are included in this table.

Table 2.3.1: Monitoring Well Construction Details

Water Bearing Unit	Well ID	Completion Date[1]	Nominal Borehole Diameter (inches)	Nominal Borehole Termination Depth (feet)	PVC Casing Termination Depth (feet)	PVC Casing Diameter (inches)	Screen Interval Depth (feet)	Groundwater Depth (feet, BTOC)	Groundwater Elevation (feet) (NAVD88)[2]
Water Bearing Unit 1	MW-14B	11/20/2014	8.25	56.0	55.0	2	30.0 - 50.0	44.60	91.64
	MW-27B	11/17/2014	8.25	57.0	56.0	2	31.0 - 51.0	34.25	92.54
	MW-39B	11/17/2014	8.25	40.0	39.0	2	14.5 - 34.5	25.13	72.62
	MW-50B	11/20/2014	8.25	55.5	55.0	2	30.0 - 50.0	45.20	89.47
	MW-62B	8/15/2015	4.00	47.0	46.5	2	20.5 - 41.0	NA	NA
	MW-74B	9/4/2015	4.00	81.0	80.4	2	54.4 - 74.9	41.46	72.92
	MW-77B	8/6/2015	4.00	61.0	60.8	2	34.8 - 55.3	NA	NA
	MW-80B	8/28/2015	4.00	61.7	60.9	2	34.9 - 55.4	48.95	84.69
	MW-82B	9/4/2015	4.00	52.0	51.3	2	14.8 - 45.8	23.24	99.21
	MW-86B[3]	8/6/2015	4.00	42.0	41.0	2	14.6 - 35.1	NA	NA
	MW-86BA	8/19/2016	4.00	66.0	63.5	2	42.5 - 63.0	55.75	71.23
	MW-87B	8/17/2015	4.00	52.5	51.0	2	25.0 - 45.5	30.29	79.56
	MW-91B	9/9/2015	4.00	64.0	63.6	2	37.6 - 58.1	NA	NA
	MW-98B	9/17/2015	4.00	43.0	42.3	2	5.8 - 36.8	33.92	91.30
	MW-112B	9/15/2015	4.00	61.0	60.8	2	34.8 – 55.3	NA	NA
	MW-138B	9/14/2015	4.00	43.3	43.3	2	6.8 - 37.8	23.38	82.84
Water Bearing Unit 2	MW-39A	11/16/2014	4.00	147.0	146.0	2	120.5 – 141.0	64.51	33.48
	MW-50A	11/17/2014	4.00	146.0	145.0	2	120.0 - 140.0	66.12	69.00
	MW-62A	8/19/2015	4.00	145.4	143.4	2	117.4 - 137.9	79.91	50.01
	MW-74A	9/2/2015	4.00	159.0	153.5	2	133.0 - 153.5	51.14	63.36
	MW-77A	8/9/2015	4.00	146.0	143.4	2	117.4 - 137.9	90.55	28.69
	MW-82A	8/28/2015	4.00	150.0	143.5	2	117.5 - 138	26.84	94.84
	MW-86A	8/9/2015	4.00	146.0	145.2	2	119.2 - 139.7	70.46	56.83
	MW-91A	9/2/2015	4.00	146.0	144.8	2	118.8 - 139.3	104.27	15.71
	MW-98A	9/20/2015	4.00	116.0	114.9	2	87.9 - 114.9	98.44	26.81
	MW-112AA	10/1/2015	4.00	115.0	112.5	2	85.5 - 107.0	98.67	19.50
	MW-138A	9/14/2015	4.00	146.8	146.8	2	120.8 - 141.3	44.96	61.28

Notes:
1. Completion Date refers to date of well development
2. Groundwater depths measured at 18:00 hrs. on 9/22/16; corresponding elevations are referenced to NAVD88.
3. Well subsequently abandoned in place following damage to the well casing during well seal placement in 2016.
4. To convert NAVD88 to MLLW add 7.32 feet.
5. NA = Not Applicable

The location of well MW-86BA was surveyed by McLane on August 25, 2016. The elevation is referenced to Permanent Survey Monuments surveyed to the NAVD88 datum and the horizontal location information is referenced to NAD83 – NSRS2007. The data point was acquired in general accordance with the scope of work outlined in GESP-CIV-EP-006. Survey data are summarized in

Table 2.3.2. For consistency and to aid in comparing data, information collected during all phases of investigation are included in this table.

Table 2.3.2: As-Built Coordinates and Elevations for Monitoring Wells

Water Bearing Unit	Monitoring Well ID	As Built Coordinates (NAD83, NSRS 2007)		Well Depth (feet bgs)	As Built Elevation, Top of Casing, feet (NAVD88)	Ground Surface Elevation, feet (NAVD88)
		Latitude	Longitude			
Water Bearing Unit 1	MW-14B	60.67001490	-151.35376400	55.0	136.24	133.40
	MW-27B	60.66445950	-151.35037400	56.0	126.79	124.35
	MW-39B	60.65560510	-151.35613500	39.0	97.75	95.51
	MW-50B	60.67526070	-151.35336700	55.0	134.67	131.66
	MW-62B	60.67373017	-151.36896400	46.0	130.44	127.63
	MW-74B	60.66822293	-151.36390200	80.5	114.38	111.53
	MW-77B	60.66654214	-151.37506300	60.5	119.04	116.25
	MW-80B	60.66660888	-151.35796500	60.7	133.64	130.99
	MW-82B	60.66654604	-151.34358300	51.3	122.45	119.22
	MW-86BA	60.66299257	-151.36456512	62.0	126.98	124.73
	MW-87B	60.66293920	-151.35826100	51.0	109.85	106.91
	MW-91B	60.66131503	-151.36858400	64.0	119.87	117.31
	MW-98B	60.65952300	-151.36003300	42.0	125.22	122.26
	MW-112B	60.65124196	-151.35847800	60.0	118.67	115.76
	MW-138B	60.65927616	-151.34973400	43.7	106.22	103.33
Water Bearing Unit 2	MW-39A	60.65557930	-151.35615700	146.0	97.99	95.51
	MW-50A	60.67523060	-151.34331500	145.0	135.12	131.66
	MW-62A	60.67372736	-151.36900800	144.0	129.92	127.36
	MW-74A	60.66825113	-151.36390300	160.0	114.50	111.70
	MW-77A	60.66655739	-151.37507200	146.0	119.24	116.31
	MW-82A	60.66651744	-151.34354400	144.0	121.68	118.58
	MW-86A	60.66301342	-151.36452000	145.0	127.29	124.44
	MW-91A	60.66133530	-151.36859500	144.5	119.98	117.27
	MW-98A	60.65949114	-151.36000900	115.4	125.25	122.17
	MW-112AA	60.65125990	-151.35845000	112.5	118.17	115.55
	MW-138A	60.65926678	-151.34969500	147.0	106.24	103.22

2.4 WELL DEVELOPMENT

Development methodologies for the four OWs, three APT wells, and the new groundwater monitoring well are presented below.

2.4.1 Observation Well and Aquifer Pump Test Well Development

Development of the OW and APT wells was performed by agitating and purging the water within the wells using either a pump or through air lifting methodologies. No sheen, odors, or discoloration of well development groundwater was observed during well development. A summary of the OW and APT well development program records and details are presented in Table 2.4.1.1.

Table 2.4.1.1: Observation Well and Aquifer Pump Test Well Development Records

Water Bearing Unit	Well ID	Date of Well Development	Dry or Pumped Dry	Assumed Casing Volume, gallons[1]	Approximate Gallons of Water Flushed Through Screen	Approximate Number of Casing Volumes of Water Flushed Through Screen
1	OW-1	7/25/16	No	29.4	1,500	51.0
2	OW-2	7/20/16	No	152.8	283	1.9
1	OW-3	7/30/16	No	NA[2]	1,045	NA[2]
2	OW-4	7/28/16	No	122.5	1,350	11.0
2	APT-1	9/12/16	No	399.0	7,540	18.9
2	APT-2	9/19/16	No	221.0	7,000	31.7
3	APT-3	9/3/16	No	712.0	1,835	2.6

Notes: 1. Estimates of the volume of water removed from a well during development is presented in units of the casing volume of water present. Casing volumes for development is based on observed feet of water within the casing as measured at the beginning of well development, and at a minimum no less than the feet of screened well length.
2. Not Available, initial depth to water could not be measured. Water was added to equalize pressure due to heaving sand conditions.

Water generated during OW development was discharged to the ground surface in accordance with the approved Method Statements (Appendix A). No odor or sheen was observed; no detectable PID measurements were observed.

Based on a review of preliminary water quality data from the OW sampling event, well development water from each APT well was individually containerized and temporarily stored onsite. Preliminary data showed low level detections of select analytes, including arsenic, chloromethane, and trichloroethene, from an unknown source in the well area. Samples were collected from the APT well development water and analyzed to facilitate offsite waste disposal as summarized below.

2.4.1.1 Aquifer Pump Test Well Development Water

Between September 6 and 19, 2016, field personnel from Fugro and SLR International Corp (SLR, a subcontractor retained by Fugro to assist with sampling activities) visited the Site to collect samples of the containerized well development water from each APT well in order to characterize the water for offsite disposal. Samples were retained in analyte-appropriate containers pre-cleaned by the laboratory in accordance with Environmental Protection Agency (EPA) protocols. All sampling containers were uniquely labeled and placed in ice-filled coolers, pending delivery to the testing laboratory.

Following sample collection, the well development water samples were packed and shipped under chain-of-custody documentation to SGS North America Inc. (SGS) in Anchorage, Alaska, an Alaska Department of Environmental Conservation (ADEC)-certified testing laboratory. A total of three

samples, APT-1-DEV-TK-0916 through APT-3-DEV-TK-0916, were analyzed for the constituents presented below in Table 2.4.1.1.1.

Table 2.4.1.1.1: Aquifer Pump Test Well Development Water Analytical Testing Parameters

Parameter	Method
Volatile Organic Compounds (VOCs)	EPA SW8260B
Total Metals – As, Ba, Cd, Cr, Pb, Hg, Se, Au	EPA SW6020A
pH	SM21 4500-H B

Analytical results are summarized in Table B-1 and are summarized below by well. Table B-1 and the analytical laboratory reports are presented in Appendix B.

APT-1 Development Water

- With the exception of toluene and trichloroethene, no VOCs were detected in the sample analyzed. Toluene and trichloroethene were reported at concentrations of 0.00225 milligrams per liter (mg/L) and 0.00158 mg/L, respectively.
- Analyses reported a pH value of 8.3 Standard Units (SU).
- For the metals, analyses detected 0.027 mg/L of arsenic, 0.0277 mg/L of barium, 0.00165 mg/L of chromium, and 0.000796 of lead in the sample analyzed.

APT-2 Development Water

- With the exception of chloromethane and toluene, no VOCs were detected in the sample analyzed. Chloromethane and toluene were reported at concentrations of 0.00031 mg/L and 0.00088 mg/L, respectively.
- Analyses reported a pH value of 8.3 SU.
- For the metals, analyses detected 0.0369 mg/L of arsenic, 0.0917 mg/L of barium, 0.0208 mg/L of chromium, 0.00412 mg/L of lead, and 0.000197 mg/L of mercury in the sample analyzed.

APT-3 Development Water

- Several VOCs including 1,2,4-trimethylbenzene (0.0023 mg/L), 1,3,5-trimethylbenzene (0.00067 mg/L), n-Propylbenzene (0.0004 mg/L), toluene (0.00324 mg/L), and trichloroethene (0.00262 mg/L) were reported in the sample analyzed.
- Analyses reported a pH value of 8.8 SU.
- For the metals, analyses detected 0.0775 mg/L of arsenic, 0.361 mg/L of barium, 0.101 mg/L of chromium, and 0.0237 mg/L of lead in the sample analyzed.

Based on the results for samples collected from the containerized water, the water generated from the development of the APT wells was removed from the Site between September 15 and October 5, 2016 and disposed as a non-hazardous waste by NRC Alaska LLC at their facility in Anchorage, Alaska. Copies of the non-hazardous waste manifests are presented in Appendix C.

2.4.2 Monitoring Well Development

Well MW-86BA was developed by flushing the well with water until the discharge water was clear. The well screen was then agitated in 1 to 2-foot intervals using a surge block. The well was then flushed with water again until the discharged water was clear. No sheen, odors, or discoloration of well development groundwater was observed during well development. Well development water was discharged onto the ground surface.

A summary of the monitoring well development program records and details are presented in Table 2.4.2.1. For consistency and to aid in comparing data, information collected during all phases of field investigation are included in this table. In some cases, wells were dry following installation or were pumped dry during development. In these cases, clean water was introduced to complete the flushing and settling of the sand pack. Wells which were dry or which were pumped dry are indicated as such in the table.

Table 2.4.2.1: Monitoring Well Development Records

Water Bearing Unit	Well ID	Date of Well Development	Dry or Pumped Dry	Assumed Casing Volume, gallons[1]	Approximate Gallons of Water Flushed Through Screen	Approximate Number of Casing Volumes of Water Flushed Through Screen
Water Bearing Unit 1	MW-14B	11/20/14	No	3.3	109	33
	MW-27B	11/17/14	No	3.3	60	18
	MW-39B	11/17/14	No	3.3	34	10
	MW-50B	11/20/14	No	3.3	27	8
	MW-62B	8/18/15	Yes	3.3	150	45
	MW-74B	9/6/15	No	8.2	50	6
	MW-77B	8/18/15	Yes	3.3	250	75
	MW-80B	9/6/15	No	3.3	150	45
	MW-82B	9/6/15	No	4.9	75	15
	MW-86BA	8/11/16	No	NA[2]	NA[2]	NA[2]
	MW-87B	8/19/15	No	3.3	150	45
	MW-91B	9/21/15	Yes	3.3	50	15
	MW-98B	9/22/15	No	4.9	50	10
	MW-112B	9/21/15	Yes	3.3	50	15
	MW-138B	9/22/15	No	4.9	100	20
Water Bearing Unit 2	MW-39A	11/16/14	No	12.4	100	8
	MW-50A	11/17/14	No	12	78	6
	MW-62A	8/19/15	No	9.5	300	31
	MW-74A	9/5/15	No	16.8	175	10
	MW-77A	8/19/15	No	8.2	200	24
	MW-82A	9/5/15	No	17.1	150	9
	MW-86A	8/19/15	No	11.5	300	26
	MW-91A	9/5/15	No	5.1	100	20
	MW-98A	9/22/15	No	4.1	150	37
	MW-112AA	10/3/15	No	5.2	250	48
	MW-138A	9/22/15	No	16.5	200	12

Note:

1. Estimates of the volume of water removed from a monitoring well during development is presented in units of the casing volume of water present. Casing volumes for development is based on observed feet of water within the casing or as measured at the beginning of well development, and at a minimum no less than the feet of screened well length.

2. NA = Not Available, initial depth to water was not measured. Water was added to flush the well initially for 5 minutes, then surged, then flushed again for 10 minutes until discharge water ran clear. At least 250 gallons of water was introduced, however, the total volume of water used for flushing or removed during purging was not recorded.

2.5 Hydraulic Testing

Changes in water levels measured and recorded during well development and during slug testing were processed using the Hvorslev Method to preliminarily evaluate hydraulic conductivity. The derived

hydraulic conductivity values are shown in Table 2.5.1. For consistency and to aid in comparing data, information collected during all phases of field investigation are included in this table.

Table 2.5.1: Hydraulic Test Results

Water Bearing Unit	Well ID	Date of Well Development	Methodology	Hydraulic Conductivity in feet/day Hvorslev Method of Analysis
Water Bearing Unit 1	MW-14B	11/20/14	Slug Test	51.32
	MW-27B	11/17/14	Slug Test	129.34
	MW-50B	11/20/14	Slug Test	22.91
	MW-74B	9/6/15	Slug Test	9.38
	MW-98B	9/22/15	Slug Test	0.10
	OW-1	7/25/16	Development by Air Lift Methods	NA
	OW-3	7/30/16	Development by Air Lift Methods	NA
Water Bearing Unit 2	MW-39A	11/17/14	Slug Test	96.16
	MW-50A	11/17/14	Slug Test	28.25
	MW-62A	8/19/15	Slug Test	8.86
	MW-74A	9/5/15	Slug Test	0.18
	MW-77A	8/19/15	Slug Test	1.29
	MW-82A	9/5/15	Slug Test	0.22
	MW-91A	9/5/15	Slug Test	33.18
	MW-138A	9/22/15	Slug Test	0.19
	OW-2	7/20/16	Development by Air Lift Methods	NA
	OW-4	7/28/16	Development by Air Lift Methods	NA
	APT-1	9/12/16	Development by Pumping	30.40
	APT-2	9/19/16	Development by Pumping	49.90
Water Bearing Unit 3	APT-3	9/1/16 & 9/3/16	Development by Pumping	0.12

Notes: NA, Not Available. Utilization of the air lift method of development precluded any additional instrumentation to be downhole during development. Micro-Divers installed post-development.

2.6 Pressure Transducers

Fugro installed an instrumentation system to measure groundwater levels and to allow wireless retrieval of water level data from each well location. The instrumentation system, acquired from Schlumberger Water Services, is referred to as the Diver-NETZ system, and consists of the following components:

- ***Micro-Diver*** – absolute (non-vented) pressure transducer used to measure water pressure (which is converted to a pressure head by the data logger) and temperature, and to store the data.
- ***Diver-DXT*** – short range radio transmitter with built in barometer that connects to the diver unit via a coaxial cable and wirelessly connects to a Diver-Gate unit for data transmission.
- ***DXT Cable*** – coaxial cable for suspending the Micro-Diver unit in the riser pipe, and transmitting data from the Micro-Diver to the Diver-DXT transmitter.
- ***Diver-Gate*** – portable modem device used to connect the Diver-DXT transmitter to a mobile handheld device or laptop computer via Bluetooth connection for data transmission.

The groundwater level data is collected wirelessly utilizing the handheld Diver-Gate, along with periodic data downloads using a portable laptop at the well locations. A list of the equipment installed downhole and the setting of the Micro-diver is identified in Table 2.6.1. For consistency and to aid in comparing data, information collected during all phases of field investigation are included in this table.

Table 2.6.1: Diver-NETZ System Components for Well Locations

Water Bearing Unit	Monitoring Well ID	Final DXT Cable Length, feet.	Elevation of Micro-Driver, feet (NAVD88)	Micro-Diver Serial No.	Diver-DXT Serial No.
Water Bearing Unit 1	MW-14B	49.7	86.54	S3097	E2164
	MW-27B	49.7	77.09	R2357	E2532
	MW-39B	34.7	63.05	R2351	E2311
	MW-50B	50.4	84.27	R2349	E2153
	MW-62B	42.5	87.94	R6888	E2888
	MW-74B	75.0	39.38	R6876	E2951
	MW-77B	57.0	62.04	R6895	E3398
	MW-80B	50.1	83.54	R6873	E2418
	MW-82B	45.0	77.45	R6868	E2970
	MW-86BA	65.0	61.98	S6399	E3016
	MW-91B	59.0	60.87	S6396	E2940
	MW-98B	40.2	85.02	R2352	E3373
	MW-112B	57.0	61.67	R7654	E3315
	MW-138B	38.1	68.12	R8434	E3389
	OW-1	79.0	33.23	U7033	E4268
	OW-3	67.0	64.26	U7025	E4318
Water Bearing Unit 2	MW-39A	140.9	-42.91	R2346	E2285
	MW-50A	139.6	-4.48	R2354	E2274
	MW-62A	139.8	-9.88	R6887	E3394
	MW-74A	150.2	-35.70	R6875	E3304
	MW-77A	140.2	-20.96	R6894	E3384
	MW-82A	140.2	-18.52	R8437	E2910
	MW-86A	139.8	-12.51	S4378	E2908
	MW-87A	45.1	64.75	R6891	E3285
	MW-91A	141.5	-21.52	R6886	E2898
	MW-98A	110.0	15.25	R6892	E3361
	MW-112AA	109.0	9.17	R7653	E3258
	MW-138A	145.3	-39.06	R8433	E3413
	OW-2	140.0	-27.91	U7028	E4277
	OW-4	137.0	-6.21	U7023	E4303
	APT-1	91.0	29.09	S6424	E4315
	APT-2	91.0	38.99	S6401	E4275
Water Bearing Unit 3	APT-3	250.1	-131.27	T7714	E4356

3.0 CONCLUSIONS

Fugro's scope of work included the installation of four (4) OW wells and three (3) APT wells. These wells were installed near a former quarry to enable water withdrawal and aquifer monitoring to assess the nature of groundwater flow, yield, quality, and interconnectedness of the underlying water bearing units. As part of this scope of work, Fugro also installed a replacement monitoring well, MW-86BA, in the vicinity of former monitoring well MW-86B which was damaged during previous well completion activities and abandoned in 2016.

Accordingly, a total of twenty-six (26) groundwater monitoring wells, four (4) OW, and three (3) APT wells have been installed at the Site between 2014 and 2016 and comprise the well network for the Site. Based on lithologic data, fifteen (15) wells are screened within Water Bearing Unit 1, seventeen (17) wells are screened within the Water Bearing Unit 2, and one (1) well is screened within Water Bearing Unit 3. The thirty-three (33) wells can be used for future groundwater quality monitoring and ongoing assessment of aquifer characteristics at the Site, as well as for future aquifer pump tests.

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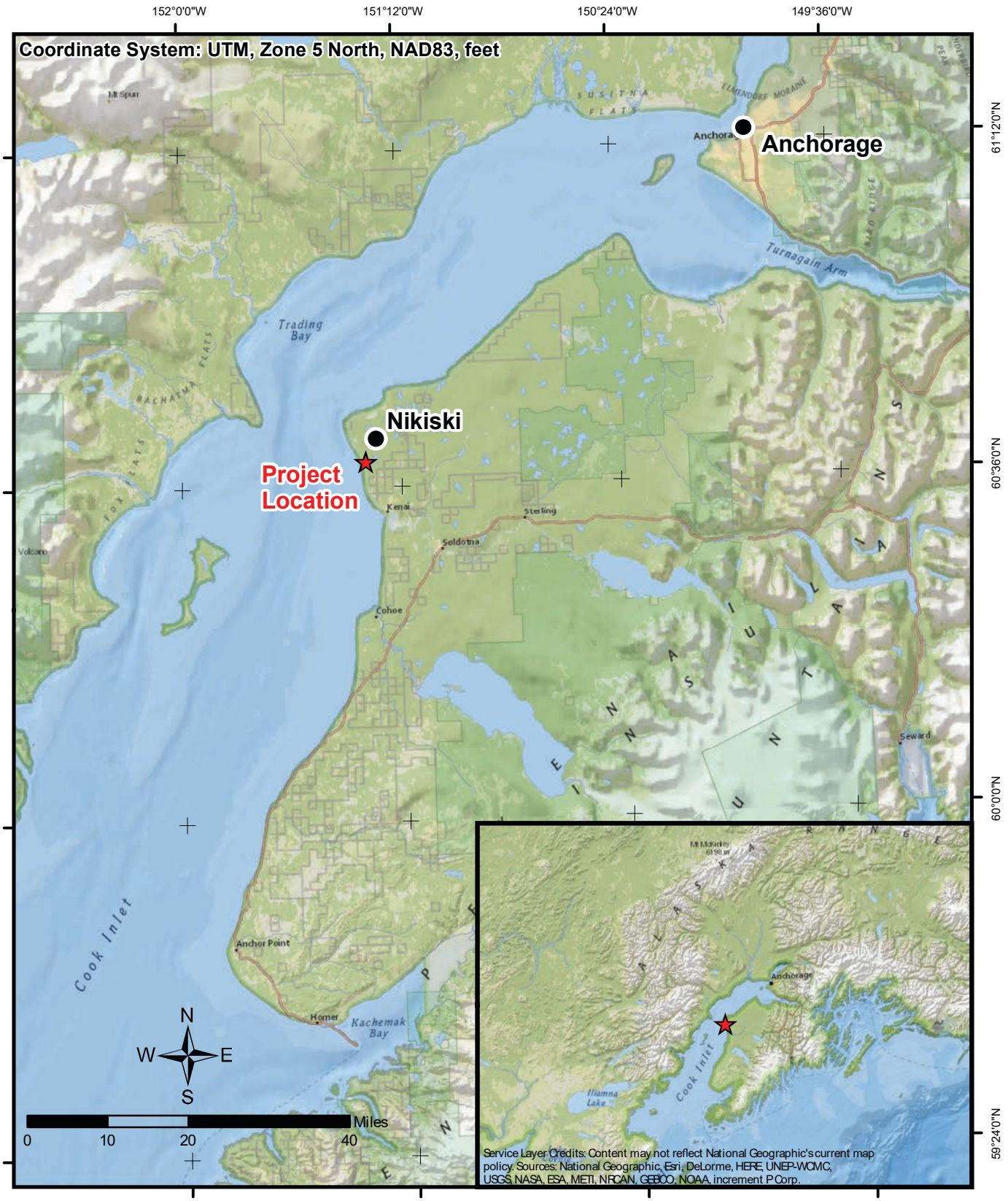
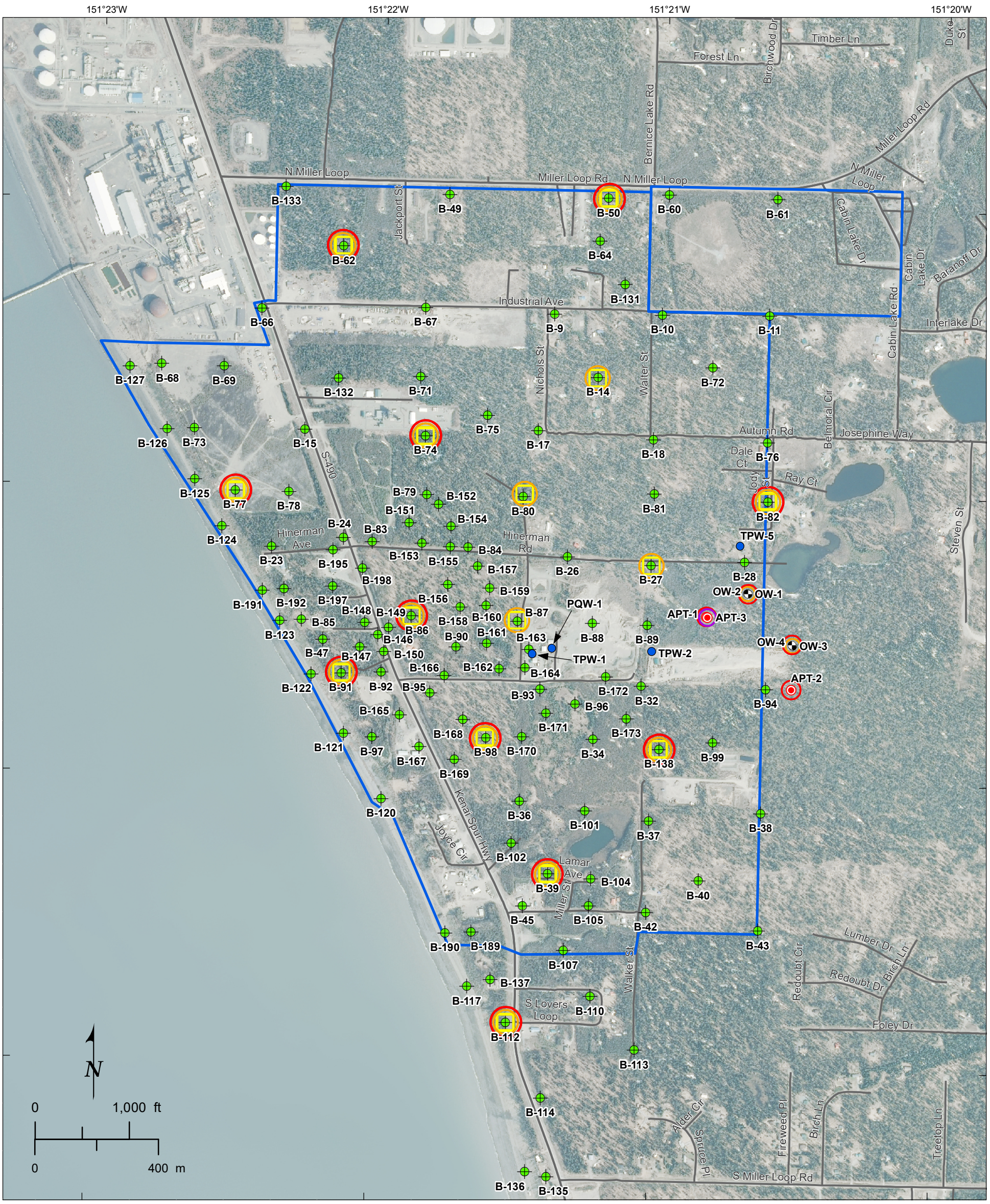
ILLUSTRATIONS



VICINITY MAP
ONSHORE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

PLATE 1



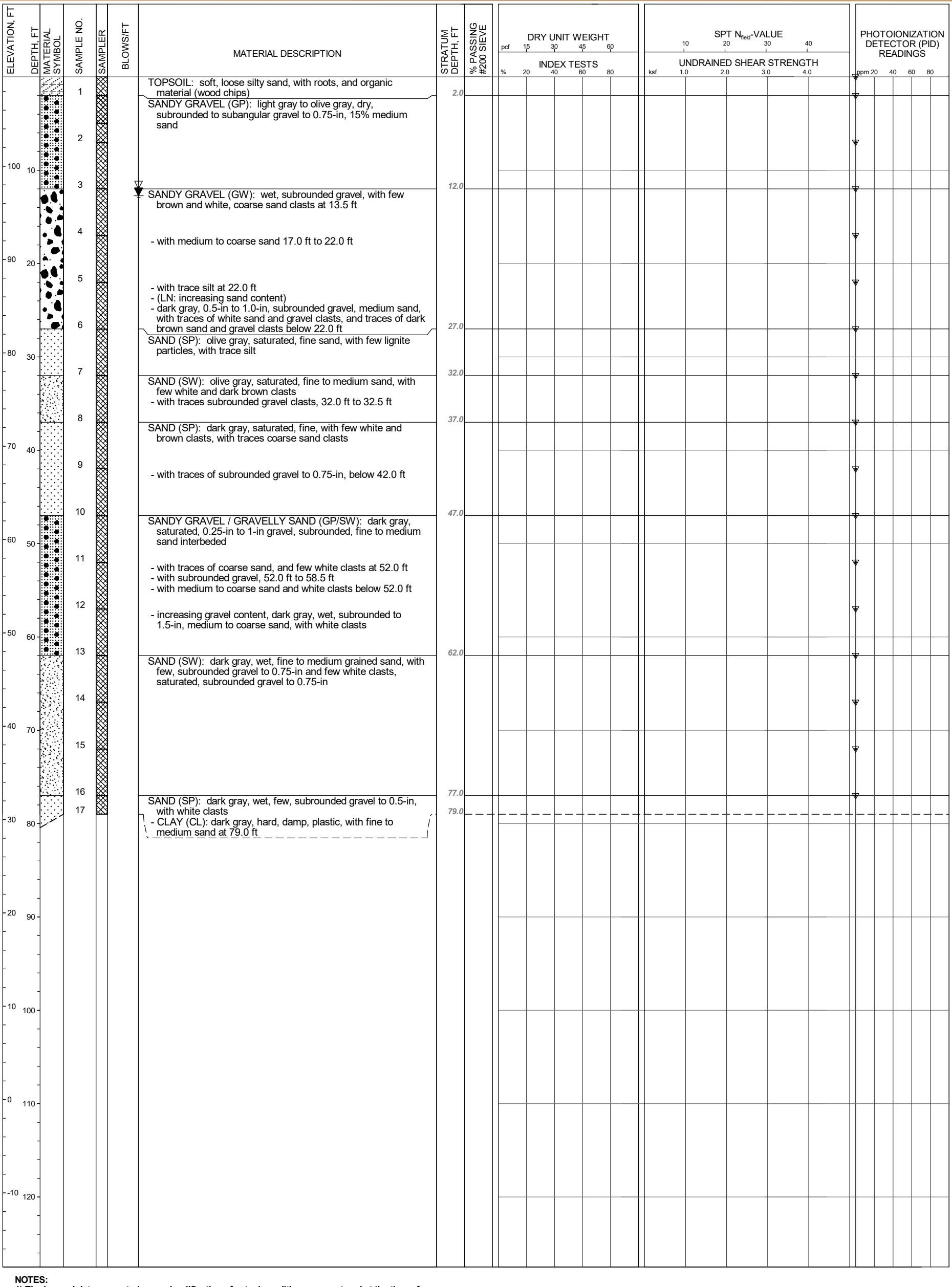
LEGEND

- Onshore Borings (completed)
- Monitoring Well Locations
  Note: colocated well pairs are present at locations B-39, B-50, B-62, B-74, B-77, B-82, B-86, B-91, B-98, B-112, and B-138
- Onshore LNG Facilities Study Area
- APT Well
- Observation Well Pair
- Third Party Well
- Shallow Well - Water Bearing Unit 1
- Intermediate Well - Water Bearing Unit 2
- Deep Well - Water Bearing Unit 3

INVESTIGATION PLAN
ONSHORE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

PLATE 2

P:\Projects\10_0000\10_160001_AKLNG_2016\05_Graphics\04.10160001_Well_Installation\Plate_1_InvestigationPlan.mxd, m.ticci, 11/11/2016



NOTES:
1) **The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.**
2) **For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.**
3) **DN = Driller's Note**
4) **▽ = PID (ppm)**
5) **▽ = Initial water level during drilling**
6) **▼ = Static water level after drilling**

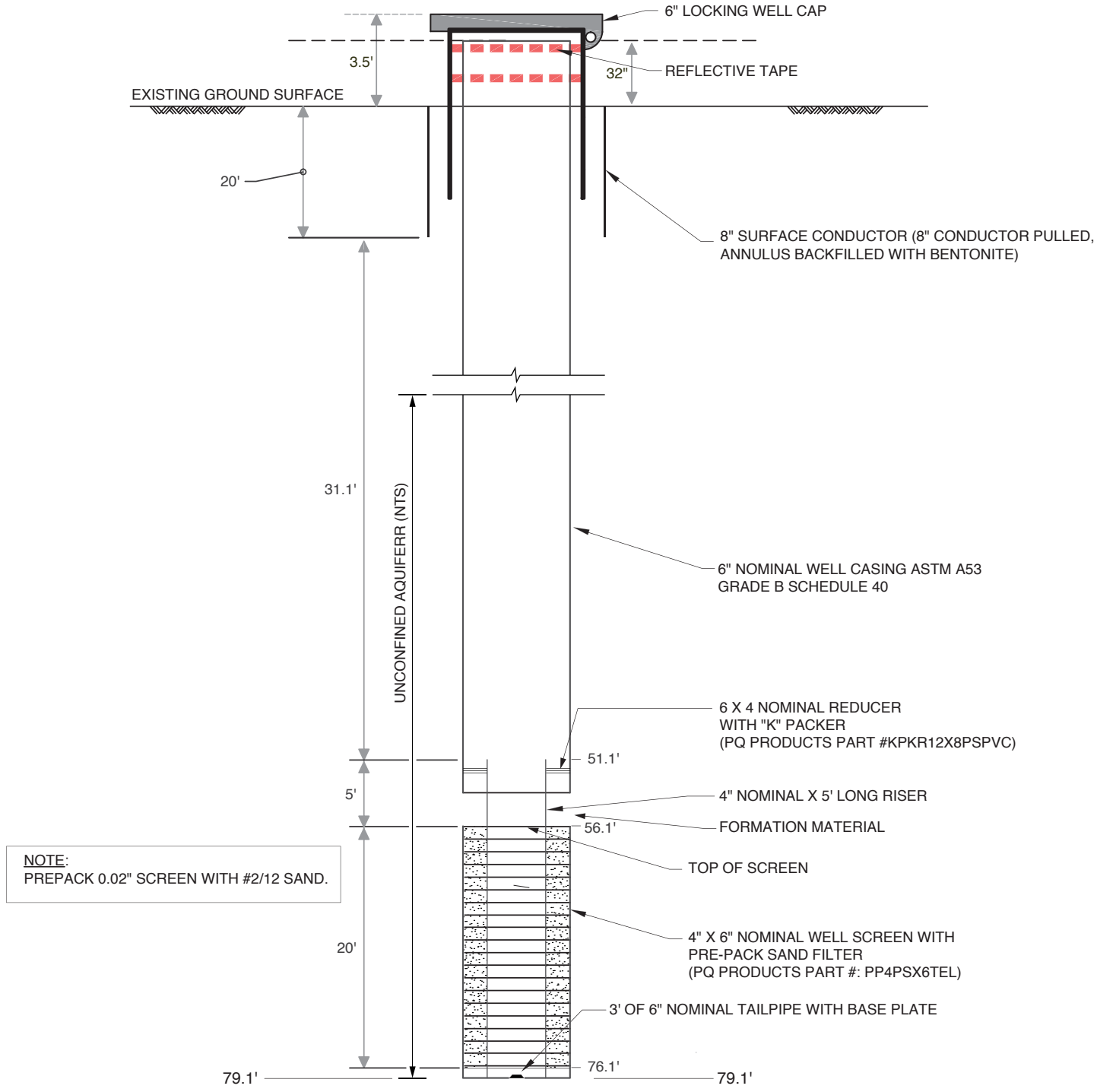
COMPLETION DEPTH: 79.1 ft
COORDINATES: LONG: -151.34463703 LAT: 60.66385170 (GCS, NAD 1983, NSRS2007, Alaska Zone 4, degrees)
SURFACE ELEVATION: 109.56 ft (NAVD88)
EXPLORATION START DATE: 9/20/2016
COMPLETION DATE: 7/21/2016
LOGGED BY: D. Sadoff

BORING LOG OW-1
ONSHORE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

DRILLING COMPANY: M-W
DRILLER: K. Westberg
DRILLING RIG: Truck (T2W)
DRILLING METHOD: Air Rotary

PLATE 3

DRILLER: MW Drilling				PROJECT:	04.10160001
DRILL RIG: Ingersol Rand T2W	COORDINATES (NAD83)	ELEVATION (ft, NAVD88)		LOCATION:	Nikiski, Alaska
METHOD: Air rotary	60.66385170 Lat.	GROUND SURFACE:	106.66	DATE STARTED:	7/20/2016
LOGGER: DS	-151.344103703 Lon.	CASING (TOP):	109.56	DATE COMPLETED:	7/25/2016



SCHEMATIC OF OW-1
ONSHORE FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA
(NOT TO SCALE)

PLATE 4

ELEVATION, FT	DEPTH, FT	SAMPLE NO.	BLOWS/FT	MATERIAL DESCRIPTION	STRATUM DEPTH, FT
				TOPSOIL: SILTY SAND:: loose, moist, fine sand, with organic material (wood chips)	
		1		SANDY GRAVEL (GP): light gray, 15% medium sand, gravel clasts and sand - subangular gravel to 0.75-in	4.0
100	10	2		- (LN: becoming subrounded gravel at 10.75 ft to 0.75-in)	
		3		SANDY GRAVEL (GW): wet, coarse sand, with minor white clasts, subrounded sand (good water producer), and rare silt below - (LN: increasing sand content ~40% at 13.0 ft)	13.0
90	20	4		GRAVELLY SAND (SW): medium to coarse, subrounded gravel and subrounded sand - (LN: decreasing gravel at 23.0 ft)	20.0
		5		SAND (SW): olive gray, wet, fine to medium sand, with traces (~3%) subrounded gravel (0.5-in), with silt content increasing	25.0
80	30	6			
		7		SILTY SAND (SM): olive gray to dark gray, wet, fine sand, with minor medium sand and white, subangular clasts, rare, subangular gravel 35.5 ft to 0.5-in	35.0
70	40	8		SAND (SW): olive gray to dark gray, saturated, fine to coarse, subrounded to subangular sand, with trace of red and white sand and gravel	40.0
		9		- (DN: heaving around 15.0 ft every pull up)	
60	50	10		SANDY GRAVEL (GW): dark gray, saturated, 0.25-in to 1.0-in subrounded to subangular gravel, medium sand, with trace of white clasts (sand and gravel)	50.0
		11		GRAVELLY SAND (SW): dark gray, wet, 0.25-in to 0.5-in, medium to coarse gravel, trace of red to trace of white sand and gravel	55.0
50	60	12		SANDY GRAVEL (GW): light gray to dark gray, saturated, 0.25-in to 1.0-in, subangular to subrounded gravel, with few white clasts, medium to coarse sand, with few white clasts	60.0
		13		GRAVELLY SAND (SW): dark gray, saturated, fine to coarse sand, with few coarse, white sand, with few coarse white sand, gravel 0.5-in to 1-in, with silt traces, at 70.0 ft	65.0
40	70	14		SAND (SW): dark gray, saturated, fine to medium sand, with few coarse white sand, few gravel and silt traces	70.0
		15		SAND (SP): dark gray, saturated, with few coarse sand and gravel	75.0
30	80	16		- medium sand, trace of fine sand below 80.0 ft	80.7
		17		LEAN CLAY (CL): hard, dark gray, damp, with few fine and medium sand - (DN: back into gravel with water at 86.5 ft)	
20	90	18		- (DN: back into clay at 89.0 ft)	90.0
		19		GRAVELLY SAND (SP): dark gray, saturated, fine sand, subrounded gravel to 91.0 ft to 1.0-in	95.0
10	100	20		CLAYEY SAND (SC): dark gray, damp, fine sand, with few silt	
		21			105.0
0	110	22		SILTY SAND (SM): dark gray, fine sand	
		23		- minor lignite below 115.0 ft	
-10	120	24		SAND (SP): dark gray, wet, fine, with few silt	120.0
		25			

DRY UNIT WEIGHT (pcf 15 30 45 60) / INDEX TESTS (% 20 40 60 80)

SPT N_{field}-VALUE (10 20 30 40) / UNDRAINED SHEAR STRENGTH (ksf 1.0 2.0 3.0 4.0)

PHOTOIONIZATION DETECTOR (PID) READINGS (ppm 20 40 60 80)

NOTES:
1) **The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.**
2) **For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.**
3) **DN = Driller's Note**
4) **▽ = PID (ppm)**
5) **▽ = Initial water level during drilling**
6) **▼ = Static water level after drilling**

COMPLETION DEPTH: 150 ft
COORDINATES: LONG: -151.34460741 LAT: 60.66382579 (GCS, NAD 1983, NSRS2007, Alaska Zone 4, degrees)
SURFACE ELEVATION: 109.09 ft (NAVD88)
EXPLORATION START DATE: 7/16/2016
COMPLETION DATE: 7/19/2016
LOGGED BY: D. Sadoff

BORING LOG OW-2
ONSHOTE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

DRILLING COMPANY: M-W
DRILLER: K. Westberg
DRILLING RIG: Truck (T2W)
DRILLING METHOD: Air Rotary

PLATE 5a

ELEVATION, FT	DEPTH, FT	SAMPLE NO.	BLOWS/FT	MATERIAL DESCRIPTION	STRATUM DEPTH, FT
-20	130	26		SAND (SP): dark gray, wet, fine, with few silt	
		27		- few lignite at 135.0 ft - (DN: back into clay at 135.0 ft) - saturated below 135.0 ft	
-30	140	28		CLAYEY SILT (ML/CL): dark gray, saturated - very dense, 141.0 ft to 150.0 ft	140.0
		29		CLAY (CL): very stiff, dark gray	145.0
-40	150	30		DN: the lower 9.1 ft backfilled with bentonite chips.	150.0
-50	160				
-60	170				
-70	180				
-80	190				
-90	200				
-100	210				
-110	220				
-120	230				
-130	240				
-140	250				

SAMPLER

% PASSING #200 SIEVE

DRY UNIT WEIGHT
pcf 15 30 45 60
INDEX TESTS
% 20 40 60 80

SPT N_{field}-VALUE
10 20 30 40
UNDRAINED SHEAR STRENGTH
ksf 1.0 2.0 3.0 4.0

PHOTOIONIZATION DETECTOR (PID) READINGS
ppm 20 40 60 80

NOTES:
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2) **For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.**
3) **DN = Driller's Note**
4) **▽ = PID (ppm)**
5) **▽ = Initial water level during drilling**
6) **▼ = Static water level after drilling**

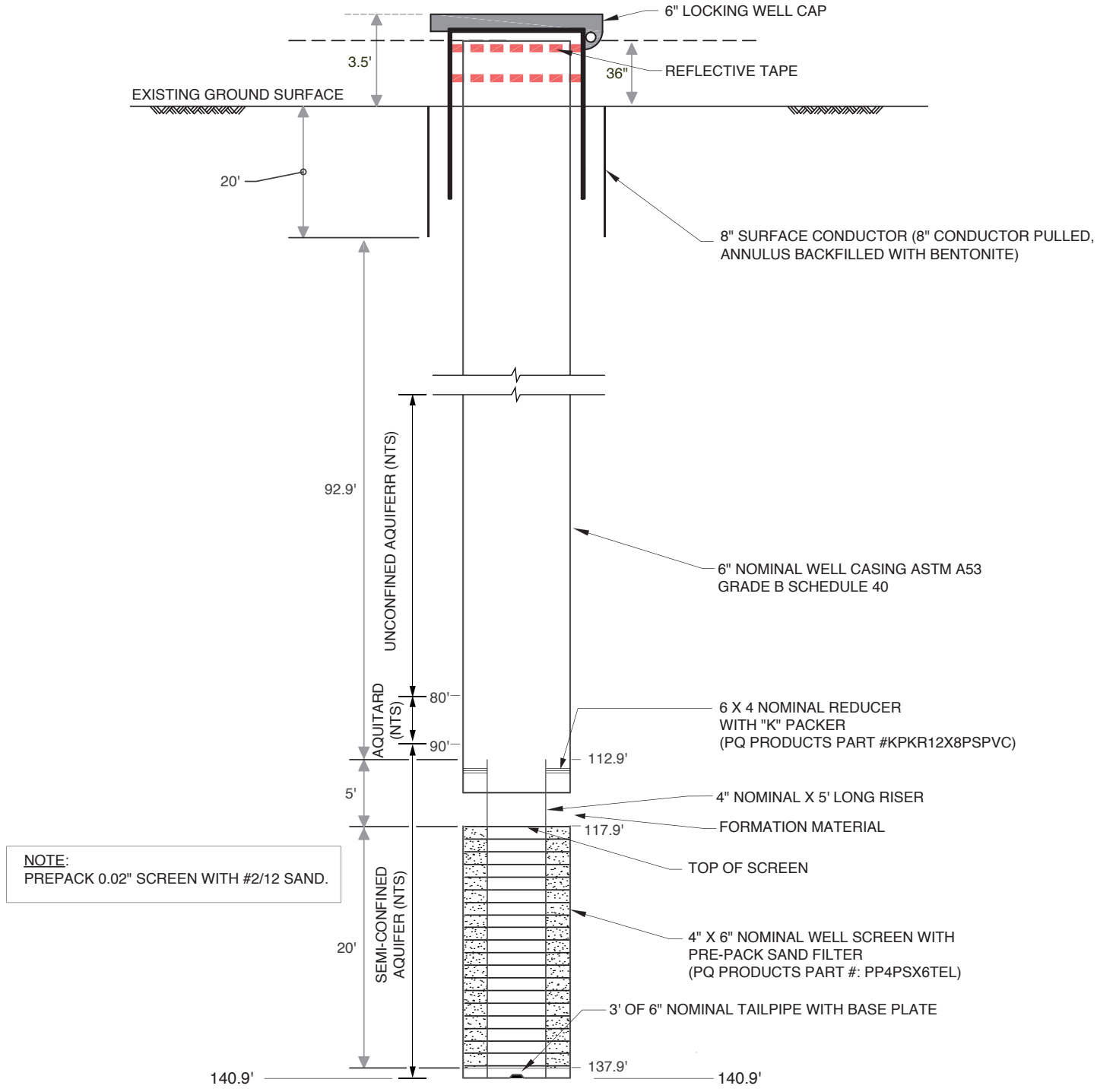
COMPLETION DEPTH: 150 ft
COORDINATES: LONG: -151.34460741 LAT: 60.66382579 (GCS, NAD 1983, NSRS2007, Alaska Zone 4, degrees)
SURFACE ELEVATION: 109.09 ft (NAVD88)
EXPLORATION START DATE: 7/16/2016
COMPLETION DATE: 7/19/2016
LOGGED BY: D. Sadoff

BORING LOG OW-2
ONSHORE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

DRILLING COMPANY: M-W
DRILLER: K. Westberg
DRILLING RIG: Truck (T2W)
DRILLING METHOD: Air Rotary

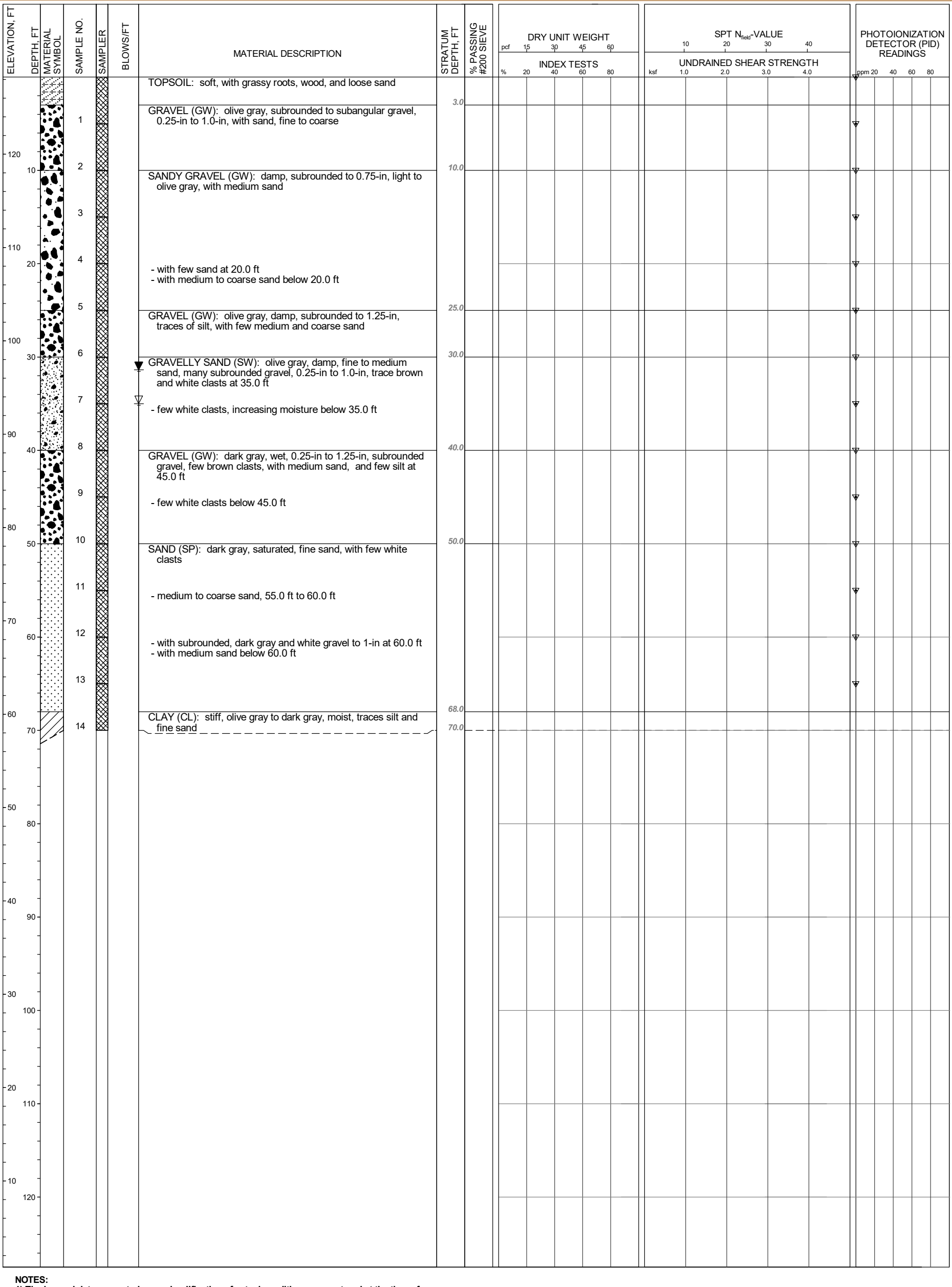
PLATE 5b

DRILLER: MW Drilling				PROJECT:	04.10160001
DRILL RIG: Ingersol Rand T2W	COORDINATES (NAD83)	ELEVATION (ft, NAVD88)		LOCATION:	Nikiski, Alaska
METHOD: Air rotary	60.66382579 Lat.	GROUND SURFACE:	106.09	DATE STARTED:	7/16/2016
LOGGER: DS	-151.34460741 Lon.	CASING (TOP):	109.09	DATE COMPLETED:	7/20/2016



SCHEMATIC OF OW-2
ONSHORE FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA
(NOT TO SCALE)

PLATE 6



NOTES:
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2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.
3) DN = Driller's Note
4) ▽ = PID (ppm)
5) ▽ = Initial water level during drilling
6) ▼ = Static water level after drilling

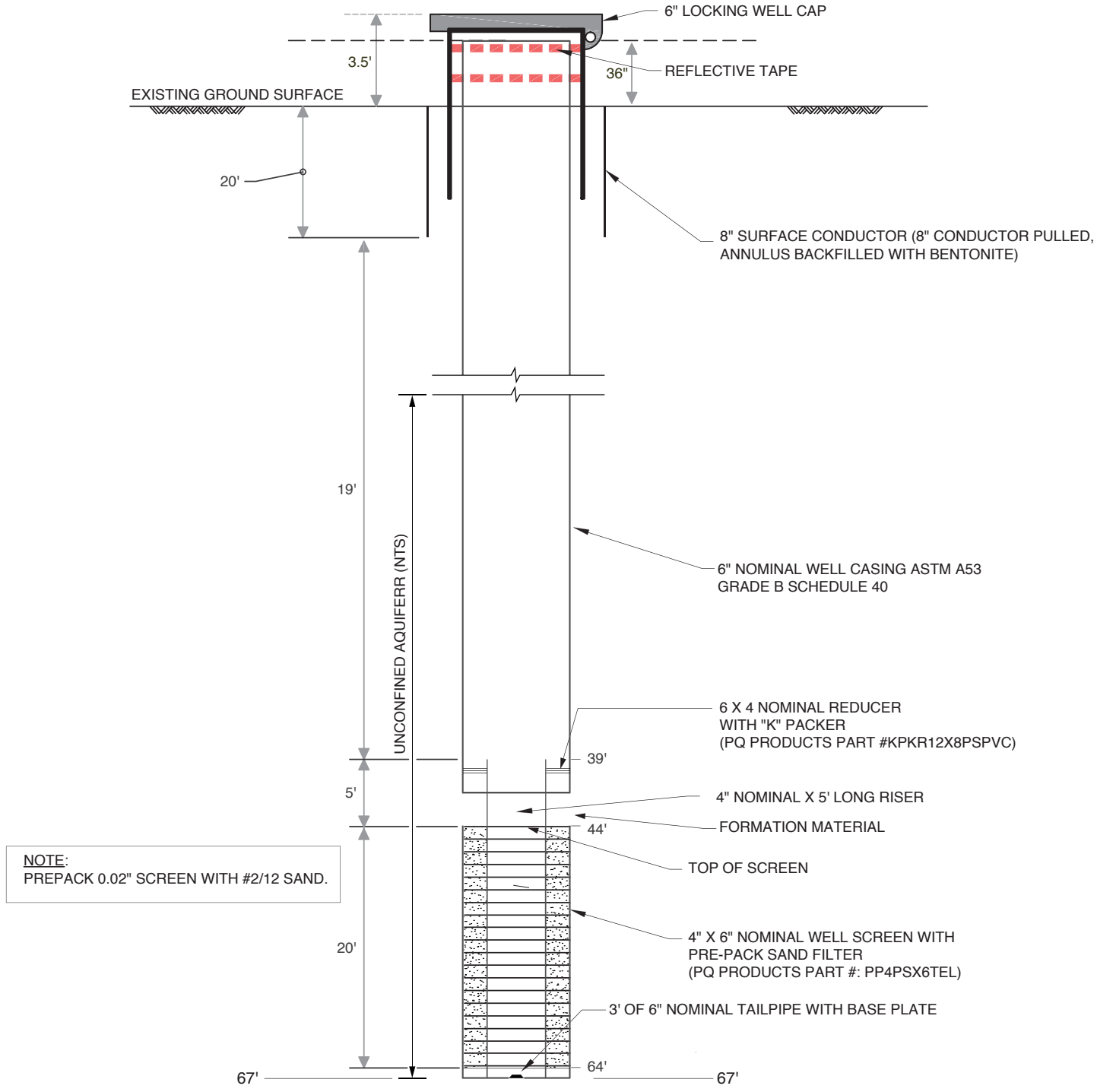
COMPLETION DEPTH: 67 ft
COORDINATES: LONG: -151.34191656 LAT: 60.66235654 (GCS, NAD 1983, NSRS2007, Alaska Zone 4, degrees)
SURFACE ELEVATION: 128.26 ft (NAVD88)
EXPLORATION START DATE: 7/29/2016
COMPLETION DATE: 7/30/2016
LOGGED BY: D. Sadoff

BORING LOG OW-3
ONSHORE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

DRILLING COMPANY: M-W
DRILLER: K. Westberg
DRILLING RIG: Truck (T2W)
DRILLING METHOD: Air Rotary

PLATE 7

DRILLER: MW Drilling				PROJECT:	04.10160001
DRILL RIG: Ingersol Rand T2W	COORDINATES (NAD83)	ELEVATION (ft, NAVD88)		LOCATION:	Nikiski, Alaska
METHOD: Air rotary	60.66235654 Lat.	GROUND SURFACE:	125.26	DATE STARTED:	7/29/2016
LOGGER: DS	-151.34191656 Lon.	CASING (TOP):	128.26	DATE COMPLETED:	7/30/2016



SCHEMATIC OF OW-3
ONSHORE FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA
(NOT TO SCALE)

PLATE 8

ELEVATION, FT	DEPTH, FT	SAMPLE NO.	BLOWS/FT	MATERIAL DESCRIPTION	STRATUM DEPTH, FT
				TOPSOIL: soft, with loose sand, roots and wood	2.5
		1		SANDY GRAVEL (GW): olive gray, moist, 0.75-in, subrounded gravel, fine to coarse sand	
120	10	2		- subrounded gravel to 1-in, light gray to olive gray, damp, fine sand, 10.0 ft to 20.0 ft	
		3			
110	20	4		- with few white clasts at 20.0 ft - olive gray to dark gray, 0.25-in to 1-in, subangular to subrounded gravel, fine to medium sand, few brown gravel clasts below 20.0 ft	
		5		GRAVELLY SAND (SW): olive gray, damp, fine to medium, 0.5-in to 1-in, subrounded gravel	25.0
100	30	6			
		7		- wet, with few white clasts below 35.0 ft	
90	40	8			
		9		GRAVEL (GW): dark gray, wet, 0.25-in to 1-in, subrounded gravel, with medium sand to 05-in, few silt, with few white sand, and gravel clasts	45.0
80	50	10		SAND (SP): olive gray to dark gray, saturated, fine sand, with few white clasts to 55.0 ft	50.0
		11		- dark gray, medium to coarse,subangular to subrounded sand, 55.0 ft to 60.0 ft	
70	60	12		- with white clasts, and traces 0.25-in gravel, at 60.0 ft - few white clasts below 60.0 ft	
		13		CLAY (CL): stiff, olive gray to dark gray, moist, traces of silt, and traces of fine sand	65.0
60	70	14		SAND (SP): wet, fine sand, with traces of silt and clay	70.0
		15		CLAY (CL): olive gray to dark gray, wet, few silt and fine sand	75.0
50	80	16		GRAVEL (GW): dark gray, wet, subangular to subrounded gravel, with white, brown and greenish gray clasts, 0.25-in to 2-in	80.0
		17		- (DN: Clay at 86.0 ft)	
40	90	18		CLAY (CL): stiff, olive gray to dark gray, damp	90.0
		19		SILT (ML): olive gray, saturated	95.0
30	100	20		SAND (SP): dark gray, saturated, fine sand, trace silt	100.0
		21		- with few lignite at 105.0 ft	
20	110	22			
		23		SAND (SW): dark gray, fine to medium sand, with traces of white clasts	115.0
10	120	24			
		25		SAND (SP): olive gray to dark gray, wet, fine sand, with traces of white clasts, and traces of silt	125.0

DRY UNIT WEIGHT (pcf 15 30 45 60) / INDEX TESTS (% 20 40 60 80) | SPT N_{field}-VALUE (10 20 30 40) / UNDRAINED SHEAR STRENGTH (ksf 1.0 2.0 3.0 4.0) | PHOTOIONIZATION DETECTOR (PID) READINGS (ppm 20 40 60 80)

NOTES:
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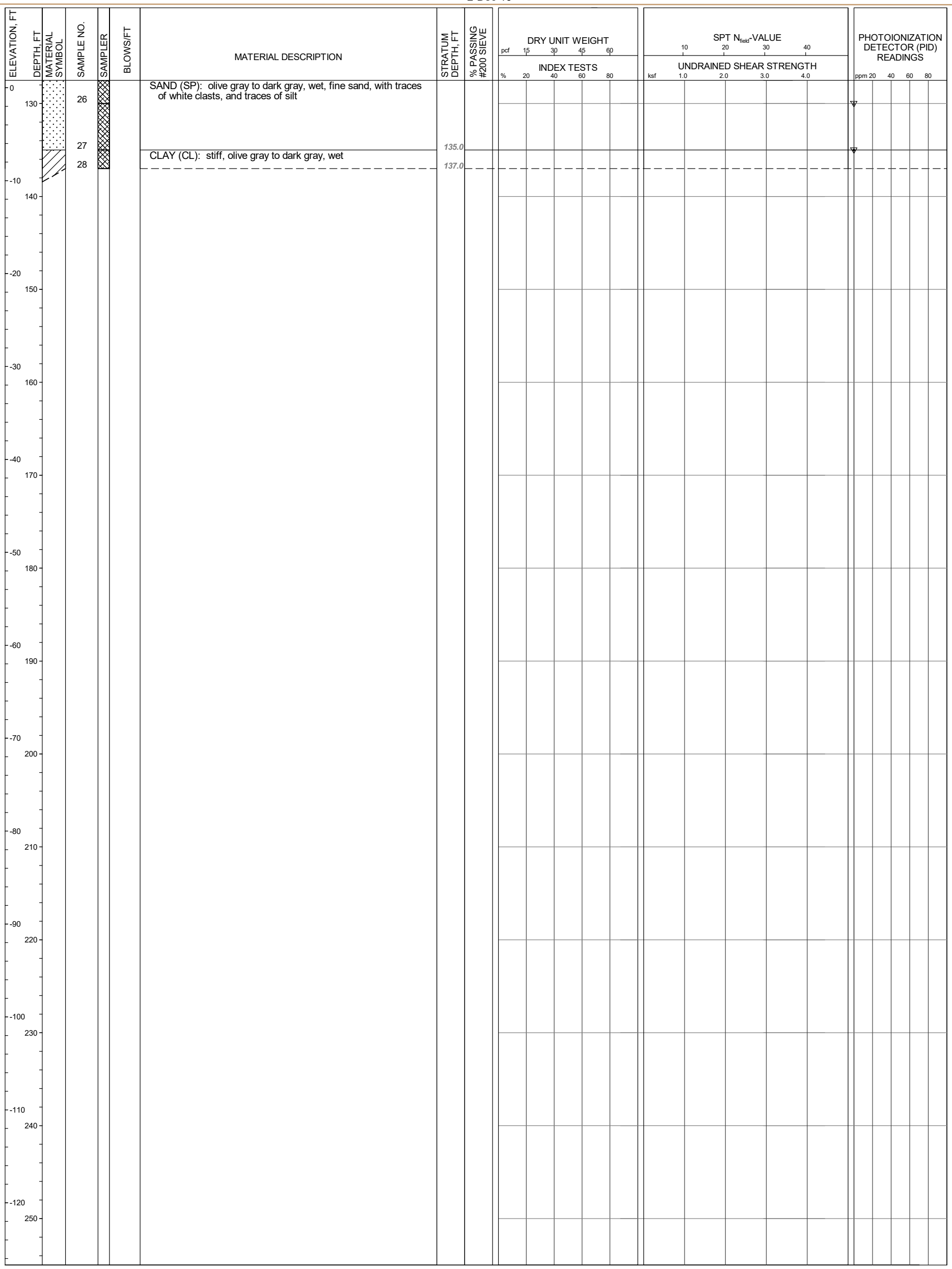
2) **For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.**
3) **DN = Driller's Note**
4) **▽ = PID (ppm)**
5) **▽ = Initial water level during drilling**
6) **▼ = Static water level after drilling**

COMPLETION DEPTH: 137.6 ft
COORDINATES: LONG: -151.34194479 LAT: 60.66238108 (GCS, NAD 1983, NSRS2007, Alaska Zone 4, degrees)
SURFACE ELEVATION: 128.29 ft (NAVD88)
EXPLORATION START DATE: 7/26/2016
COMPLETION DATE: 7/28/2016
LOGGED BY: D. Sadoff

DRILLING COMPANY: M-W
DRILLER: K. Westberg
DRILLING RIG: Truck (T2W)
DRILLING METHOD: Air Rotary

BORING LOG OW-4
ONSHORE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

PLATE 9a



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3) **DN = Driller's Note**
4) **▽ = PID (ppm)**
5) **▽ = Initial water level during drilling**
6) **▼ = Static water level after drilling**

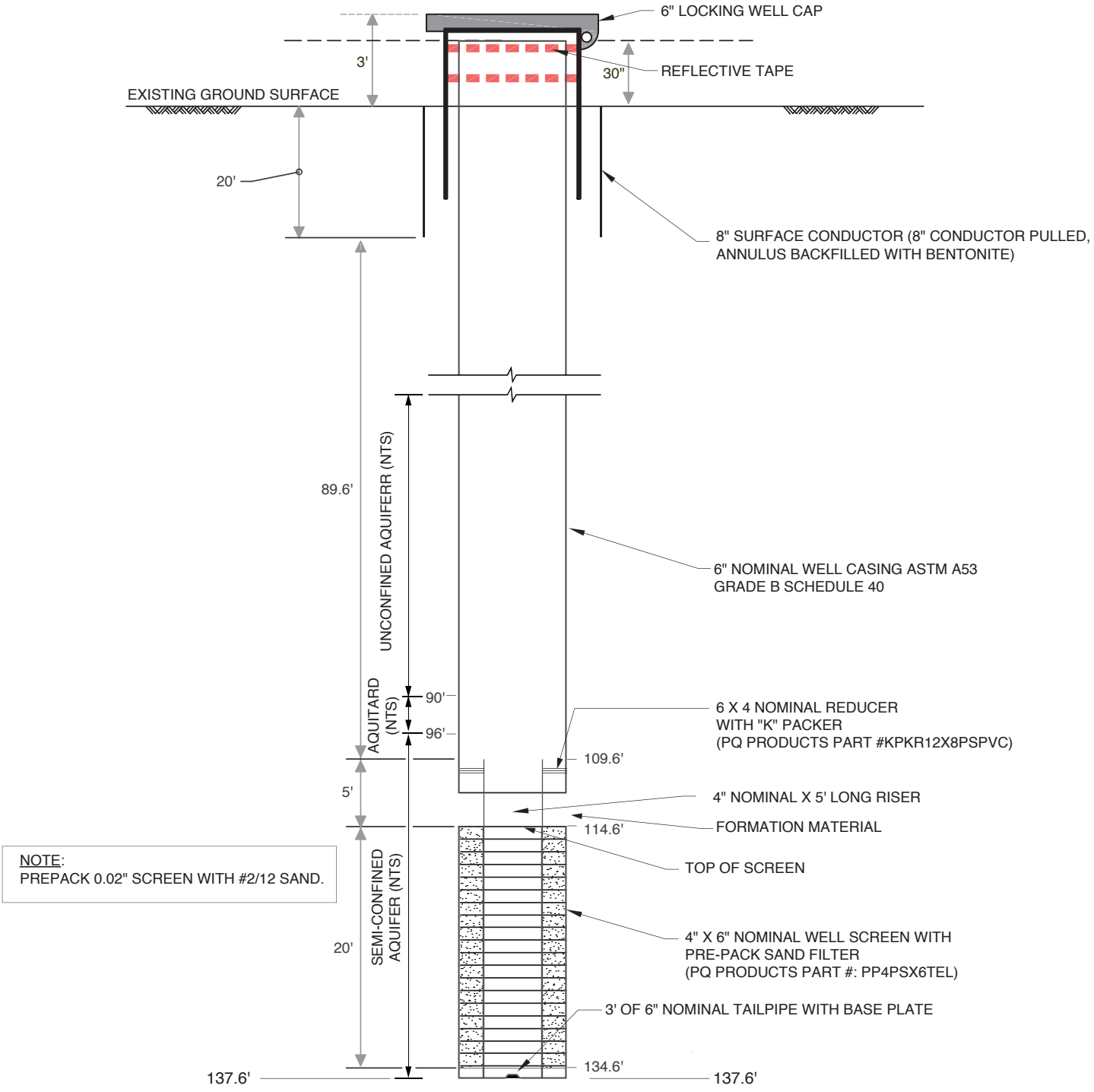
COMPLETION DEPTH: 137.6 ft
COORDINATES: LONG: -151.34194479 LAT: 60.66238108 (GCS, NAD 1983, NSRS2007, Alaska Zone 4, degrees)
SURFACE ELEVATION: 128.29 ft (NAVD88)
EXPLORATION START DATE: 7/26/2016
COMPLETION DATE: 7/28/2016
LOGGED BY: D. Sadoff

DRILLING COMPANY: M-W
DRILLER: K. Westberg
DRILLING RIG: Truck (T2W)
DRILLING METHOD: Air Rotary

BORING LOG OW-4
ONSHORE LNG FACILITIES
ALAKSA LNG PROJECT
NIKISKI, ALASKA

PLATE 9b

DRILLER: MW Drilling				PROJECT:	04.10160001
DRILL RIG: Ingersol Rand T2W	COORDINATES (NAD83)	ELEVATION (ft, NAVD88)		LOCATION:	Nikiski, Alaska
METHOD: Air rotary	60.66238108 Lat.	GROUND SURFACE:	125.79	DATE STARTED:	7/26/2016
LOGGER: DS	-151.34194479 Lon.	CASING (TOP):	128.29	DATE COMPLETED:	7/28/2016



SCHEMATIC OF OW-4
ONSHORE FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA
(NOT TO SCALE)

PLATE 10

ELEVATION, FT	DEPTH, FT	SAMPLE NO.	BLOWS/FT	MATERIAL DESCRIPTION	STRATUM DEPTH, FT
				TOPSOIL: brown, moist, with minor organics and silt	
110		1		GRAVEL WITH SAND (GP): subrounded to round, with clasts up to 1.5-in, medium to fine sands	5.0
	10	2			
		3		SAND WITH GRAVEL (SP): fine grained with traces silt, few subrounded clasts, fine sand 60-70%, medium sand 20-30%, 10-20% fine to coarse gravel	15.0
100					
	20	4			
		5		SAND WITH GRAVEL (SW): moist, fine, 25-30% subrounded to rounded gravel	25.0
90					
	30	6		SAND WITH GRAVEL (SP): olive gray to dark gray, moist, 5-10% subrounded to rounded gravel	30.0
		7		- large lignite clasts 2.0-in long, 5% fine gravel, moist	
80					
	40	8		GRAVEL WITH SAND (GP): olive gray to dark gray, saturated, fine gravel to 1.0-in, traces of white clasts, fine to medium sand	40.0
		9			
70					
	50	10		SAND WITH GRAVEL (SW): saturated, fine to medium, subrounded clasts, with silt, lignite	50.0
		11		- more coarse sand, with trace white clasts, fine, rounded gravel	
60					
	60	12		- increase in silt, quartz clasts, subrounded to round, lignite, gravel clasts to 0.75-in	
		13		- increase in gravel, 0.75-in max	
50					
	70	14		- smaller gravel 0.5-in max	
		15		SAND WITH SILT (SP-SM): dark gray, with trace gravel, 5-10% up to 0.5-in, increase in silt	75.0
40					
	80	16		- fine to medium sand, with trace gravel 0.25-in, rounded, saturated, dark gray	83.0
		17		LEAN CLAY (CL): greenish gray to olive gray, saturated	
30				- (DN: add water to blow out clay)	
	90	18			
		19			
20					
	100	20			
		21		SAND (SP): dark gray to olive gray, fine grained sand, saturated, with silt and trace clay	103.0
10					
	110	22		SILT (ML): dark gray with fine sands	110.0
		23		SAND (SP): sand with silts, dark gray, semi-saturated, clean sand	115.0
0					
	120	24		- (DN: blowout - lots of lignite when well flushed out at start of day)	
		25			
-10					

DRY UNIT WEIGHT (pcf 15 30 45 60)
INDEX TESTS (% 20 40 60 80)
% PASSING #200 SIEVE
SPT N_{field}-VALUE (10 20 30 40)
UNDRAINED SHEAR STRENGTH (ksf 1.0 2.0 3.0 4.0)
PHOTOIONIZATION DETECTOR (PID) READINGS (ppm 20 40 60 80)

NOTES:
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3) DN = Driller's Note
4) ▽ = PID (ppm)
5) ▽ = Initial water level during drilling
6) ▼ = Static water level after drilling

COMPLETION DEPTH: 135 ft
COORDINATES: LONG: -151.3470609 LAT: 60.66315390 (GCS, NAD 1983, NSRS2007, Alaska Zone 4, degrees)
SURFACE ELEVATION: 117.09ft (NAVD88)
EXPLORATION START DATE: 9/5/2016
COMPLETION DATE: 9/8/2016
LOGGED BY: K. Johnson

DRILLING COMPANY: M-W
DRILLER: K. Westberg
DRILLING RIG: Truck (T2W)
DRILLING METHOD: Air Rotary

BORING LOG APT-1
ONSHORE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

PLATE 11a

ELEVATION, FT	DEPTH, FT	MATERIAL SYMBOL	SAMPLE NO.	SAMPLER	BLOWS/FT	MATERIAL DESCRIPTION	STRATUM DEPTH, FT	% PASSING #200 SIEVE	DRY UNIT WEIGHT (pcf) / INDEX TESTS (%)	SPT N_{field}-VALUE / UNDRAINED SHEAR STRENGTH (ksf)	PHOTOIONIZATION DETECTOR (PID) READINGS (ppm)
130	0		26			SAND (SP): sand with silts, dark gray, semi-saturated, clean sand	130.0				
						SILT (ML): dark gray to olive gray					
	-20		27								
			28			- (DN: clay, sealing off air outlet, added water to clear out caking of clay on casing)	138.0				
140	-30										
150	-40										
160	-50										
170	-60										
180	-70										
190	-80										
200	-90										
210	-100										
220	-110										
230	-120										
240	-130										
250											

NOTES:
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2) **For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.**
3) **DN = Driller's Note**
4) **▽ = PID (ppm)**
5) **▽ = Initial water level during drilling**
6) **▼ = Static water level after drilling**

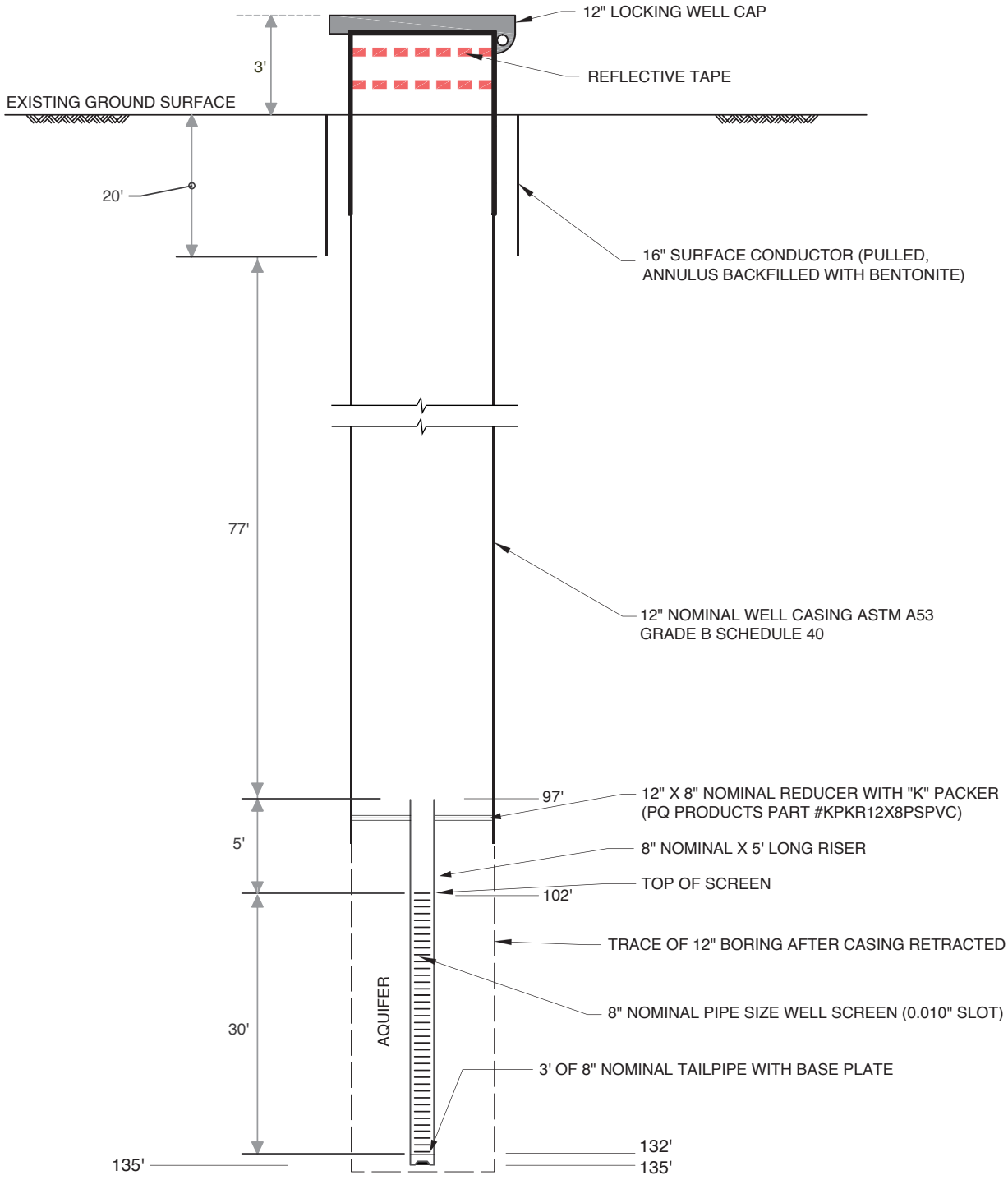
COMPLETION DEPTH: 135 ft
COORDINATES: LONG: -151.3470609 LAT: 60.66315390 (GCS, NAD 1983, NSRS2007, Alaska Zone 4, degrees)
SURFACE ELEVATION: 117.09 ft (NAVD88)
EXPLORATION START DATE: 9/5/2016
COMPLETION DATE: 9/8/2016
LOGGED BY: K. Johnson

DRILLING COMPANY: M-W
DRILLER: K. Westberg
DRILLING RIG: Truck (T2W)
DRILLING METHOD: Air Rotary

BORING LOG APT-1
ONSHORE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

PLATE 11b

DRILLER: MW Drilling				PROJECT:	04.10160001
DRILL RIG: Ingersol Rand T2W	COORDINATES (NAD83)	ELEVATION (ft, NAVD88)		LOCATION:	Nikiski, Alaska
METHOD: Air rotary	60.66315390 Lat.	GROUND SURFACE:	114.09	DATE STARTED:	9/5/16
LOGGER: DS	-151.3470609 Lon.	CASING (TOP):	117.09	DATE COMPLETED:	9/12/16



SCHEMATIC OF APT 1
ONSHORE FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA
(NOT TO SCALE)

PLATE 12

ELEVATION, FT	DEPTH, FT	SAMPLE NO.	BLOWS/FT	MATERIAL DESCRIPTION	STRATUM DEPTH, FT
120	0	1		TOPSOIL: wood particles, soft, with loose sand	5.0
110	10	2		SAND AND GRAVEL (SW): olive gray, moist, fine to coarse sand, with few white clasts, fine, subangular to subrounded gravel, fine to 1.5-in olive gray, subrounded, moist	
				- increasing gravel content and many sand	
	20	3			
100		4			
	30	5			
90		6			
	40	7		SAND (SW): olive gray to dark gray, fine to medium, with few white clasts, few gravel, subrounded	35.0
80		8		- increasing gravel content, wet	
	50	9		- with little coarse sand	
70		10		- becoming dark gray only	
	60	11		- (DN: heaving sands)	
60		12		- fine to coarse sand, olive to dark gray, saturated, with gravel, subrounded, fine to 1.25-in, dark gray, with white clasts	
	70	13		- fewer white clasts	
50		14			73.0
	80	15		LEAN CLAY (CL): medium stiff, olive gray to dark gray, damp, with silt	75.0
		16		SAND (SW): gray to dark gray, saturated, fine to medium sand with trace coarse sand, with silt	
40		17		SILTY CLAY (CL-ML): olive gray to dark gray, with subangular gravel to 0.5-in	80.0
	90	18		- with many subrounded gravel to 1.25-in	
30		19		- with fine sand	95.0
	100	20		SILT (ML): olive gray to dark gray, with trace clay	
20		21		- wet, with few clay and few fine sand	
	110	22		SAND (SP): dark gray, wet, fine with medium sand and trace coarse sand, with few subrounded gravel to 0.75-in, few silt	110.0
10		23		- increasing silt , with few subrounded gravel to 2-in and few lignite	
	120	24		- (DN: better water at 119.0 ft)	
0		25		- olive gray to dark gray, saturated, fine, with trace subrounded gravel to 0.25-in and silt	

DRY UNIT WEIGHT (pcf: 15, 30, 45, 60) / INDEX TESTS (%: 20, 40, 60, 80)

SPT N_{field}-VALUE (10, 20, 30, 40) / UNDRAINED SHEAR STRENGTH (ksf: 1.0, 2.0, 3.0, 4.0)

PHOTOIONIZATION DETECTOR (PID) READINGS (ppm: 20, 40, 60, 80)

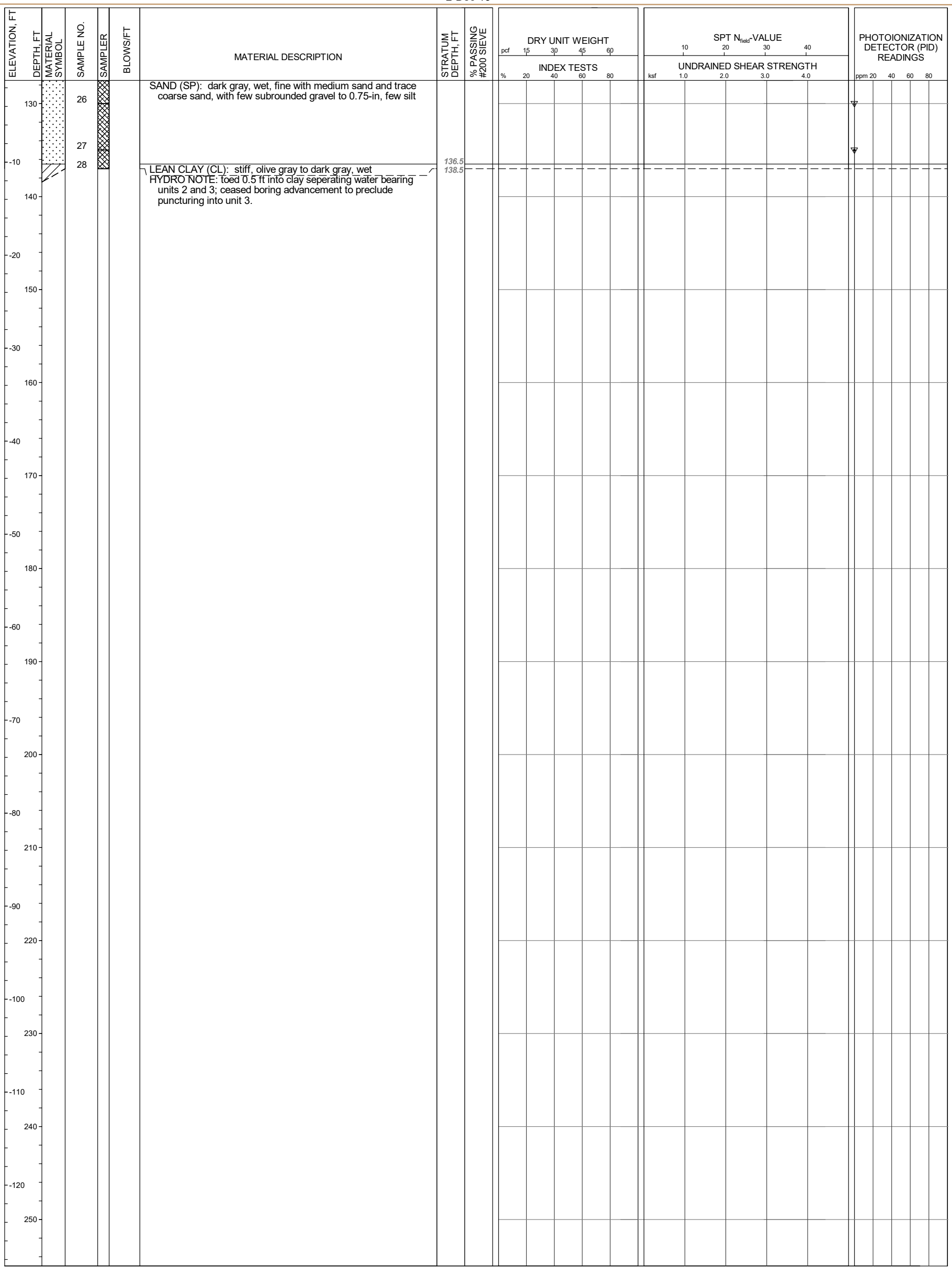
NOTES:
1) The log and data presented are a simplification of actual conditions encountered at the time of sampling at the exploration location. Subsurface conditions may differ at other locations and with the passage of time.
2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.
3) DN = Driller's Note
4) ▽ = PID (ppm)
5) ▽ = Initial water level during drilling
6) ▼ = Static water level after drilling

COMPLETION DEPTH: 138.5 ft
COORDINATES: LONG: -151.3419546 LAT: 60.66107404 (GCS, NAD 1983, NSRS2007, Alaska Zone 4, degrees)
SURFACE ELEVATION: 126.99 ft (NAVD88)
EXPLORATION START DATE: 9/15/2016
COMPLETION DATE: 9/20/2016
LOGGED BY: D. Sadoff

DRILLING COMPANY: M-W
DRILLER: K. Westberg
DRILLING RIG: Truck (T2W)
DRILLING METHOD: Air Rotary

BORING LOG APT-2
ONSHORE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

PLATE 13a



NOTES:
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2) **For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.**
3) **DN = Driller's Note**
4) **= PID (ppm)**
5) **= Initial water level during drilling**
6) **= Static water level after drilling**

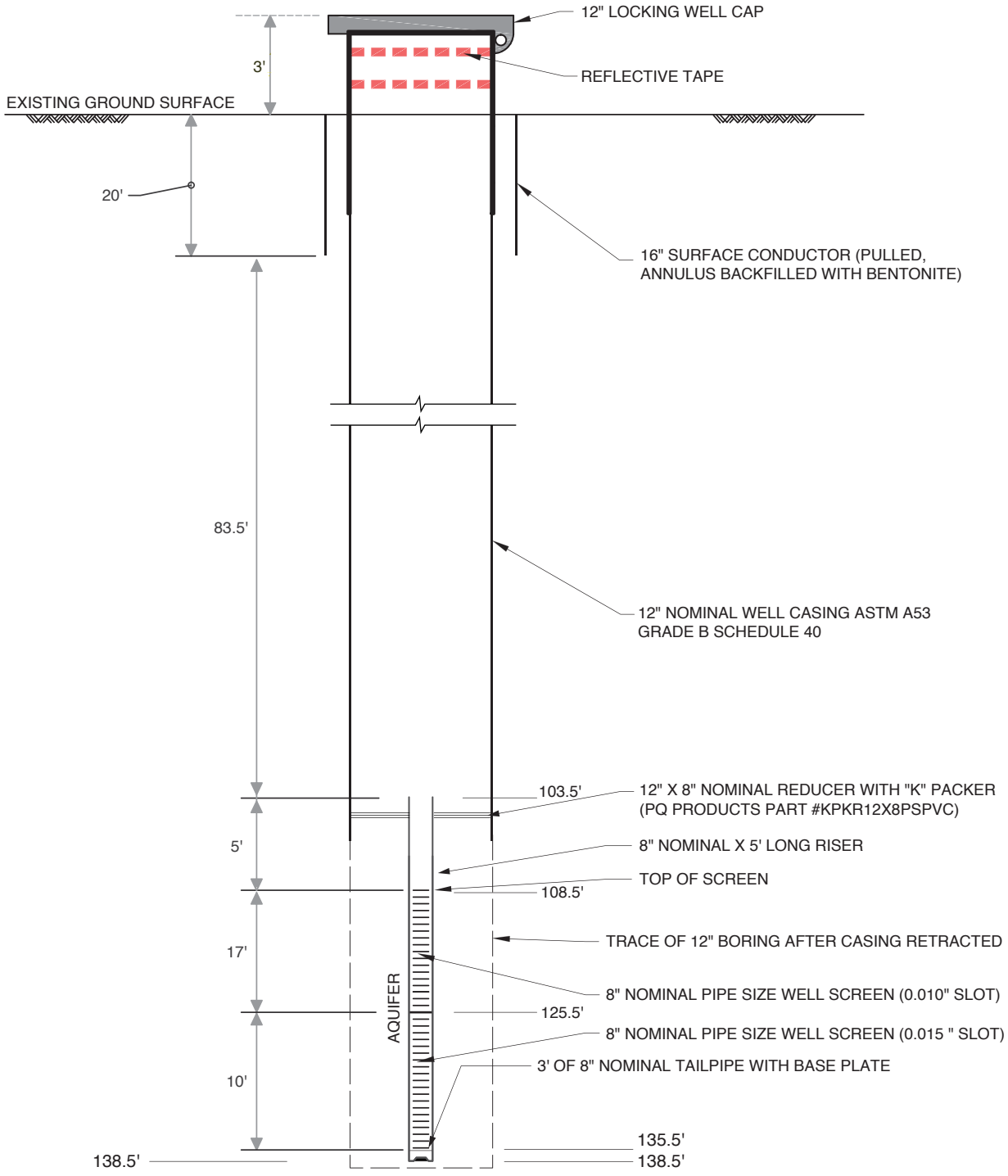
COMPLETION DEPTH: 138.5 ft
COORDINATES: LONG: -151.3419546 LAT: 60.66107404 (GCS, NAD 1983, NSRS2007, Alaska Zone 4, degrees)
SURFACE ELEVATION: 126.99 ft (NAVD88)
EXPLORATION START DATE: 9/15/2016
COMPLETION DATE: 9/20/2016
LOGGED BY: D. Sadoff

DRILLING COMPANY: M-W
DRILLER: K. Westberg
DRILLING RIG: Truck (T2W)
DRILLING METHOD: Air Rotary

BORING LOG APT-2
ONSHORE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

PLATE 13b

DRILLER: MW Drilling				PROJECT:	04.10160001
DRILL RIG: Ingersol Rand T2W	COORDINATES (NAD83)	ELEVATION (ft, NAVD88)		LOCATION:	Nikiski, Alaska
METHOD: Air rotary	60.66107404 Lat.	GROUND SURFACE:	123.99	DATE STARTED:	9/15/16
LOGGER: DS	-151.3419546 Lon.	CASING (TOP):	126.99	DATE COMPLETED:	9/19/16



SCHEMATIC OF APT 2
ONSHORE FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA
(NOT TO SCALE)

PLATE 14

ELEVATION, FT	DEPTH, FT	SAMPLE NO.	BLOWS/FT	MATERIAL DESCRIPTION	STRATUM DEPTH, FT
				TOPSOIL: with organic debris	
				SILTY CLAY (CL-ML): gray, with gravel	3.0
110		1		SANDY GRAVEL (GP): dark gray, with white clast, medium sand, subrounded to 0.75-in	5.0
	10	2		- DN: Started encountering cobbles, 7.0 ft to 8.0 ft with gravel (based on drill rod bouncing off bottom) only fragments observed in discharge material	
		3		- gravel to 1.25-in	
100					
	20	4		- DN: Conductor installed	
		5			25.0
90				SAND (SP): olive to dark gray, wet, fine grained, with traces of silt, subangular gravel and few lignite	
	30	6		- wet, increasing gravel content	
		7			35.0
80				SAND (SW): olive to dark gray, wet, fine to medium grained sand, with few subangular gravel to 1.0-in	
	40	8		- with few white clast, subangular to subrounded gravel	
		9			45.0
70				SANDY GRAVEL (GP): dark gray, subangular to subrounded gravel, with fine to medium sand and few white clasts, saturated	
	50	10			50.0
				SAND WITH GRAVEL (SW): dark gray, with fine to medium, subrounded gravel to 1.0-in, with few white clasts, trace silt, saturated	
60		11		- less gravel	
	60	12		- fine to coarse sand, with gravel to 0.75-in, dark gray with white clast, saturated	
50		13		- with trace silt	
	70	14			
		15		SAND (SP): dark gray, fine grained, with silt, trace subrounded gravel to 0.5-in, few lignite, saturated	75.0
40					
	80	16		- fine grained, dark gray, with trace 0.25-in gravel, saturated	
		17		CLAY (CL): stiff, olive gray to dark gray, moist	84.0
30					
	90	18			
		19			
20					
	100	20			
		21		SAND (SP): olive gray to dark gray, wet, fine grained, with silt	103.0
10					
	110	22		SILT (ML): dark gray, with fine sand and few clay, saturated	110.0
		23		- with few lignite and trace subrounded gravel to 0.5-in	
0					
	120	24		- increasing lignite content, clasts to 1.25-in, saturated	
		25			125.0
-10				SAND (SP): olive gray to dark gray, fine, with silt, saturated	

DRY UNIT WEIGHT (pcf: 15, 30, 45, 60)
INDEX TESTS (%: 20, 40, 60, 80)
SPT N_{field}-VALUE (10, 20, 30, 40)
UNDRAINED SHEAR STRENGTH (ksf: 1.0, 2.0, 3.0, 4.0)
PHOTOIONIZATION DETECTOR (PID) READINGS (ppm: 20, 40, 60, 80)
% PASSING #200 SIEVE

NOTES:
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2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.
3) DN = Driller's Note
4) ▽ = PID (ppm)
5) ▽ = Initial water level during drilling
6) ▼ = Static water level after drilling

COMPLETION DEPTH: 437 ft
COORDINATES: LONG: -151.3469876 LAT: 60.66312928 (GCS, NAD 1983, NSRS2007, Alaska Zone 4, degrees)
SURFACE ELEVATION: 115.83ft (NAVD88)
EXPLORATION START DATE: 8/1/2016
COMPLETION DATE: 8/24/2016
LOGGED BY: D. Sadoff

DRILLING COMPANY: M-W
DRILLER: K. Westberg
DRILLING RIG: Truck (T2W)
DRILLING METHOD: Air Rotary

BORING LOG APT-3
ONSHORE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

PLATE 15a

ELEVATION, FT	DEPTH, FT	SAMPLE NO.	BLOWS/FT	MATERIAL DESCRIPTION	STRATUM DEPTH, FT	% PASSING #200 SIEVE
				SAND (SP): olive gray to dark gray, fine, with silt, saturated		
130		26		SILTY SAND (SM): dark gray, fine sand, saturated	130.0	
		27		SILT (ML): dark gray, saturated - (DN: Does not appear to be good water producer)	135.0	
-20						
140		28		- (DN: Sand heaved 20.0 ft overnight) - HYDRONOTE: Top of confining layer - Clayey Silt, olive gray to dark gray, saturated		
		29				
-30						
150		30		- (DN: clay, 152.0 ft to 155.0 ft based on drilling pressure)		
		31				
-40						
160		32		CLAY (CL): very stiff, olive gray to dark gray, wet - (DN: Nothing out blow hole, 160.0 ft to 165.0 ft = Clay Zone) - (DN: Back into water zone at 165.0 ft)	160.0	
		33		CLAYEY SILT (ML/CL): olive gray to dark gray, saturated	165.0	
-50						
170		34		- (DN: Appears small interbeded 1.0 ft Clay/Silt based on hammer resistance) - with large 3.0-in pieces very stiff clay		
		35		- clay becoming hard, with few small black specs (lignite?)		
-60						
180		36		SILT (ML): olive gray to dark gray, with fine sand and few subangular gravel to 2.0-in and few black specs (lignite?)	180.0	
		37		- (DN: Heaved 20.0 ft overnight) - no gravel, wet with trace clay		
-70						
190		38				
		39				
-80						
200		40				
		41		- (DN: Increased hammer resistance) - with few clay, saturated		
-90						
210		42		- (DN: adding water downhole)		
		43		CLAYEY SILT (ML/CL): olive gray to dark gray	215.0	
-100						
220		44		- increasing clay content	220.0	
				SILTY CLAY (CL-ML): olive gray to dark gray		
		45		CLAY (CL): very stiff, olive gray to dark gray, (based on hammer resistance)	225.0	
-110						
230		46				
		47				
-120						
240		48		- (DN: Very hard casing advance, very hard/stiff material)		
		49				
-130						
250		50		- HYDRONOTE: Bottom of confining layer - Clay, hard, olive gray to dark gray, with few medium to coarse, angular sand - (DN: In water at 251.0 ft) - HYDRONOTE: No back pressure, water discharge stops		

SAMPLER

DRY UNIT WEIGHT (pcf: 15, 30, 45, 60)
INDEX TESTS (%: 20, 40, 60, 80)

SPT N_{field}-VALUE (10, 20, 30, 40)
UNDRAINED SHEAR STRENGTH (ksf: 1.0, 2.0, 3.0, 4.0)

PHOTOIONIZATION DETECTOR (PID) READINGS (ppm: 20, 40, 60, 80)

NOTES:
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2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.
3) DN = Driller's Note
4) ▽ = PID (ppm)
5) ▽ = Initial water level during drilling
6) ▼ = Static water level after drilling

COMPLETION DEPTH: 437 ft
COORDINATES: LONG: -151.3469876 LAT: 60.66312928 (GCS, NAD 1983, NSRS2007, Alaska Zone 4, degrees)
SURFACE ELEVATION: 115.83ft (NAVD88)
EXPLORATION START DATE: 8/1/2016
COMPLETION DATE: 8/24/2016
LOGGED BY: D. Sadoff

DRILLING COMPANY: M-W
DRILLER: K. Westberg
DRILLING RIG: Truck (T2W)
DRILLING METHOD: Air Rotary

BORING LOG APT-3
ONSHORE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

PLATE 15b

ELEVATION, FT	DEPTH, FT	SAMPLE NO.	BLOWS/FT	MATERIAL DESCRIPTION	STRATUM DEPTH, FT
-140	260	51		CLAY (CL): very stiff, olive gray to dark gray, (based on hammer resistance)	
		52		- (DN: In good water at 258.0 ft)	
				- increasing sand content, subangular to subrounded	
		53			265.0
-150	270			SAND (SP): dense to very dense, dark gray, wet, fine sand, with few lignite to 4.0-in and flat pieces	
		54		- (DN: Sand heaved overnight above bit, required 300 CFM to dislodge and blow material and water out of casing)	
		55		- no lignite - Blow count, 270.0 ft to 271.0 ft , 350 blows, hammer delivers 5800 foot pounds. Took approximately 10 mins for 1.0 ft (very hard drilling/hammering to 275.0 ft)	
-160	280	56		- with coarse sand and gravel, subrounded, dark gray clast, with silty clay, dark gray, very stiff	
		57			285.0
-170	290	58		SILT (ML): very stiff, dark gray, very little to no water - with few lignite	
		59		- with olive gray to dark gray, subanglular to subrounded gravel, 0.25-in to 0.5-in	
-180	300	60		- (DN: heaved 20.0 ft overnight)	
		61		- no gravel	
-190	310	62			
		63		- (DN: Slightly easier drilling)	
-200	320	64		- (DN: back into very hard, slow drilling) - very stiff, dark gray, very little to no water	
		65			
-210	330	66			
		67			
-220	340	68			
		69			
-230	350	70		- (DN: Easier drilling)	
		71		- few gravel, subangular to subrounded to 0.25-in	
-240	360	72		- very stiff, dark gray, very little to no water	
		73			
-250	370	74			
		75		- (DN: Approximately 1,500 gallons of water added during the day)	
-260	380	76		- (DN: Clay plug ejected, back pressure dropped from 120 to 80 normal) - very stiff, dark gray, with trace of subrounded to subangular, medium to coarse sand	

% PASSING #200 SIEVE

DRY UNIT WEIGHT (pcf: 15, 30, 45, 60)
INDEX TESTS (%: 20, 40, 60, 80)

SPT N_{field}-VALUE (10, 20, 30, 40)
UNDRAINED SHEAR STRENGTH (ksf: 1.0, 2.0, 3.0, 4.0)

PHOTOIONIZATION DETECTOR (PID) READINGS (ppm: 20, 40, 60, 80)

NOTES:
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3) DN = Driller's Note
4) ▽ = PID (ppm)
5) ▽ = Initial water level during drilling
6) ▼ = Static water level after drilling

COMPLETION DEPTH: 437 ft
COORDINATES: LONG: -151.3469876 LAT: 60.66312928 (GCS, NAD 1983, NSRS2007, Alaska Zone 4, degrees)
SURFACE ELEVATION: 115.83 ft (NAVD88)
EXPLORATION START DATE: 8/1/2016
COMPLETION DATE: 8/24/2016
LOGGED BY: D. Sadoff

DRILLING COMPANY: M-W
DRILLER: K. Westberg
DRILLING RIG: Truck (T2W)
DRILLING METHOD: Air Rotary

BORING LOG APT-3
ONSHORE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

PLATE 15c

ELEVATION, FT	DEPTH, FT	SAMPLE NO.	BLOWS/FT	MATERIAL DESCRIPTION	STRATUM DEPTH, FT
-270	390	77		- very stiff silt, started showing trace to few medium to coarse grained sand SILT (ML): very stiff, dark gray, very little to no water - increasing clay content	
		78		- (DN: little to no materials return, clay plug discharged)	390.0
-280	400	79		CLAY (CL): hard, dark gray, with silt - (DN: little to no materials return, added 1,500 gallons of water downhole)	
		80			
-290	410	81		- (DN: Better materials discharge, major clay ejection at 408.0 ft and little to no formation water)	
		82			
-300	420	83			
		84		- with trace silt	
-310	430	85			
		86			
-320	440	87			
		88			437.0
-330	450			HYDRO NOTE: Downhole casing cutter utilized to sever casing at 288.0 ft to enable well construction. Lower casing between 288.0 ft and 437.0 ft backfilled with bentonite and abandoned in place.	
-340	460				
-350	470				
-360	480				
-370	490				
-380	500				
-390	510				

DRY UNIT WEIGHT (pcf 15 30 45 60)
INDEX TESTS (% 20 40 60 80)
SPT N_{field}-VALUE (10 20 30 40)
UNDRAINED SHEAR STRENGTH (ksf 1.0 2.0 3.0 4.0)
PHOTOIONIZATION DETECTOR (PID) READINGS (ppm 20 40 60 80)

NOTES:
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2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.
3) DN = Driller's Note
4) ▽ = PID (ppm)
5) ▽ = Initial water level during drilling
6) ▽ = Static water level after drilling

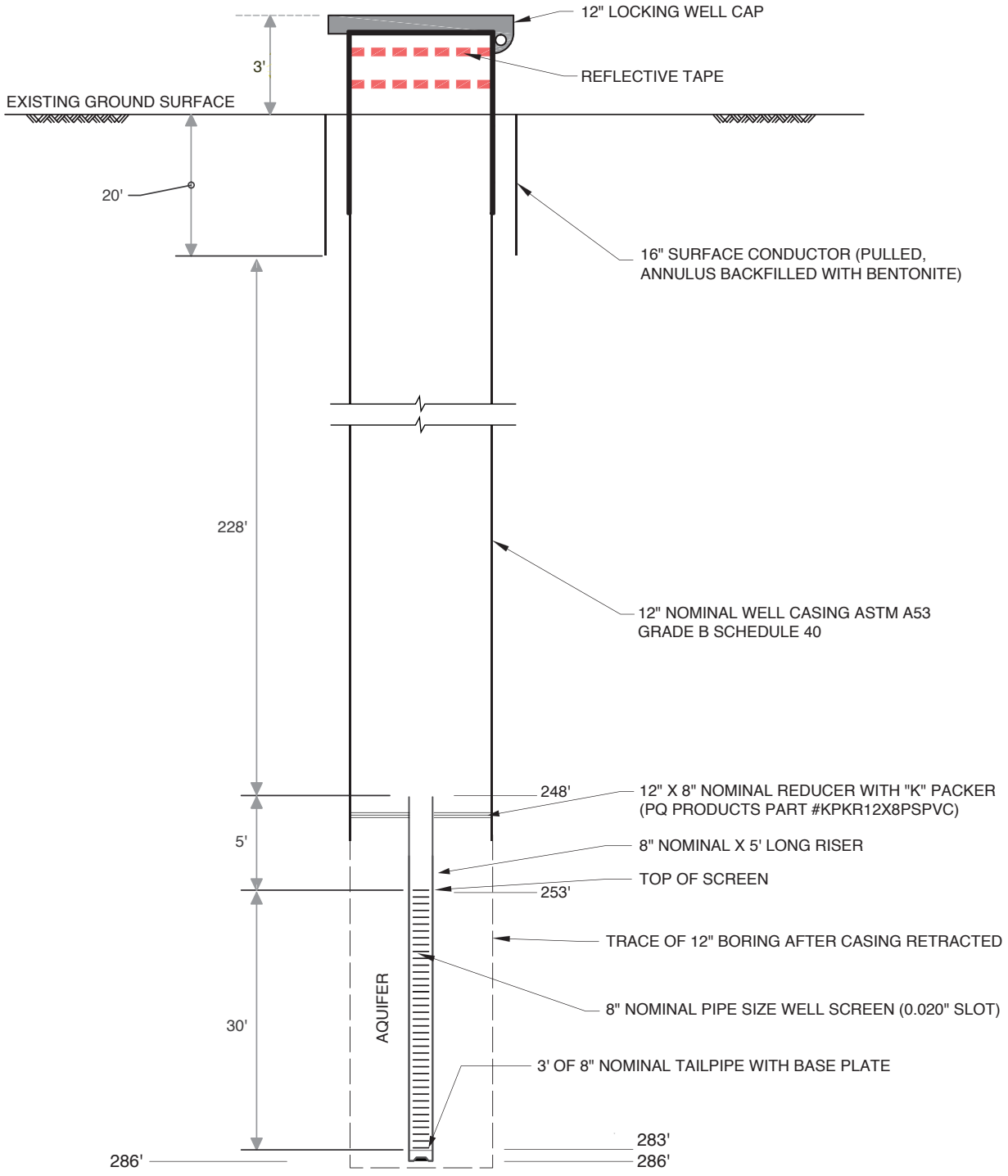
COMPLETION DEPTH: 437 ft
COORDINATES: LONG: -151.3469876 LAT: 60.66312928 (GCS, NAD 1983, NSRS2007, Alaska Zone 4, degrees)
SURFACE ELEVATION: 115.83 ft (NAVD88)
EXPLORATION START DATE: 8/1/2016
COMPLETION DATE: 8/24/2016
LOGGED BY: D. Sadoff

DRILLING COMPANY: M-W
DRILLER: K. Westberg
DRILLING RIG: Truck (T2W)
DRILLING METHOD: Air Rotary

BORING LOG APT-3
ONSHORE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

PLATE 15d

DRILLER: MW Drilling				PROJECT:	04.10160001
DRILL RIG: Ingersol Rand T2W	COORDINATES (NAD83)	ELEVATION (ft, NAVD88)		LOCATION:	Nikiski, Alaska
METHOD: Air rotary	60.66312928 Lat.	GROUND SURFACE:	112.83	DATE STARTED:	8/1/16
LOGGER: DS	-151.3469876 Lon.	CASING (TOP):	115.83	DATE COMPLETED:	9/3/16



SCHEMATIC OF APT 3
ONSHORE FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA
(NOT TO SCALE)

PLATE 16

ELEVATION, FT	DEPTH, FT	MATERIAL SYMBOL	SAMPLE NO.	SAMPLER	BLOWS/FT	MATERIAL DESCRIPTION	STRATUM DEPTH, FT	% PASSING #200 SIEVE
120						- (Open drilling with no sampling was performed to 39.0 ft)		
	10					- (DN: Drilling conditions of sand with gravel)		
110								
	20							
100						- (DN: 200 gallons of water used by 25.0 ft)		
	30							
90								
	40		S-1		92|10"	SAND (SP): very dense, dark gray to olive gray, moist to wet, medium to coarse sand - with few fine, subrounded to rounded gravel to 49.0 ft - with few fine sand to 56.5 ft	39.0	
80			S-2		66	- olive gray, 44.0 ft to 49.0 ft - with lignite partings at 45.1 ft and 45.8 ft		
	50		S-3		89	- medium sand, with few coarse sand, with trace of fine, subangular gravel, 49.0 ft to 51.5 ft		
			S-4		86|11"	- with trace of fine, subrounded gravel, 51.5 ft to 54.0 ft		
70			S-5		63	- with trace of coarse, subrounded gravel, 54.0 ft to 56.5 ft - with lignite, 55.3 ft to 56.0 ft		
			S-6		59	- with coarse, subrounded gravel, with few fine, subrounded gravel, 56.5 ft to 59.0 ft		
	60		S-7		50|5"	- dark gray below 59.0 ft		
			S-8a		50	- with fine to coarse, subrounded gravel below 61.5 ft		
			S-8b			SILTY CLAY WITH SAND (CL-ML): hard, dark gray, moist, fine sand, low plasticity	62.9 64.0	
60			S-9		24	LEAN CLAY (CL): very stiff, dark gray, moist, medium plasticity, laminated, with silt partings - with fine sand partings below 65.7 ft	66.0	
	70							
50								
	80							
40								
	90							
30								
	100							
20								
	110							
10								
	120							
0								

DRY UNIT WEIGHT (pcf 15 30 45 60)
INDEX TESTS (% 20 40 60 80)

SPT N_{field}-VALUE (10 20 30 40)
UNDRAINED SHEAR STRENGTH (ksf 1.0 2.0 3.0 4.0)

PHOTOIONIZATION DETECTOR (PID) READINGS (ppm 20 40 60 80)

NOTES:
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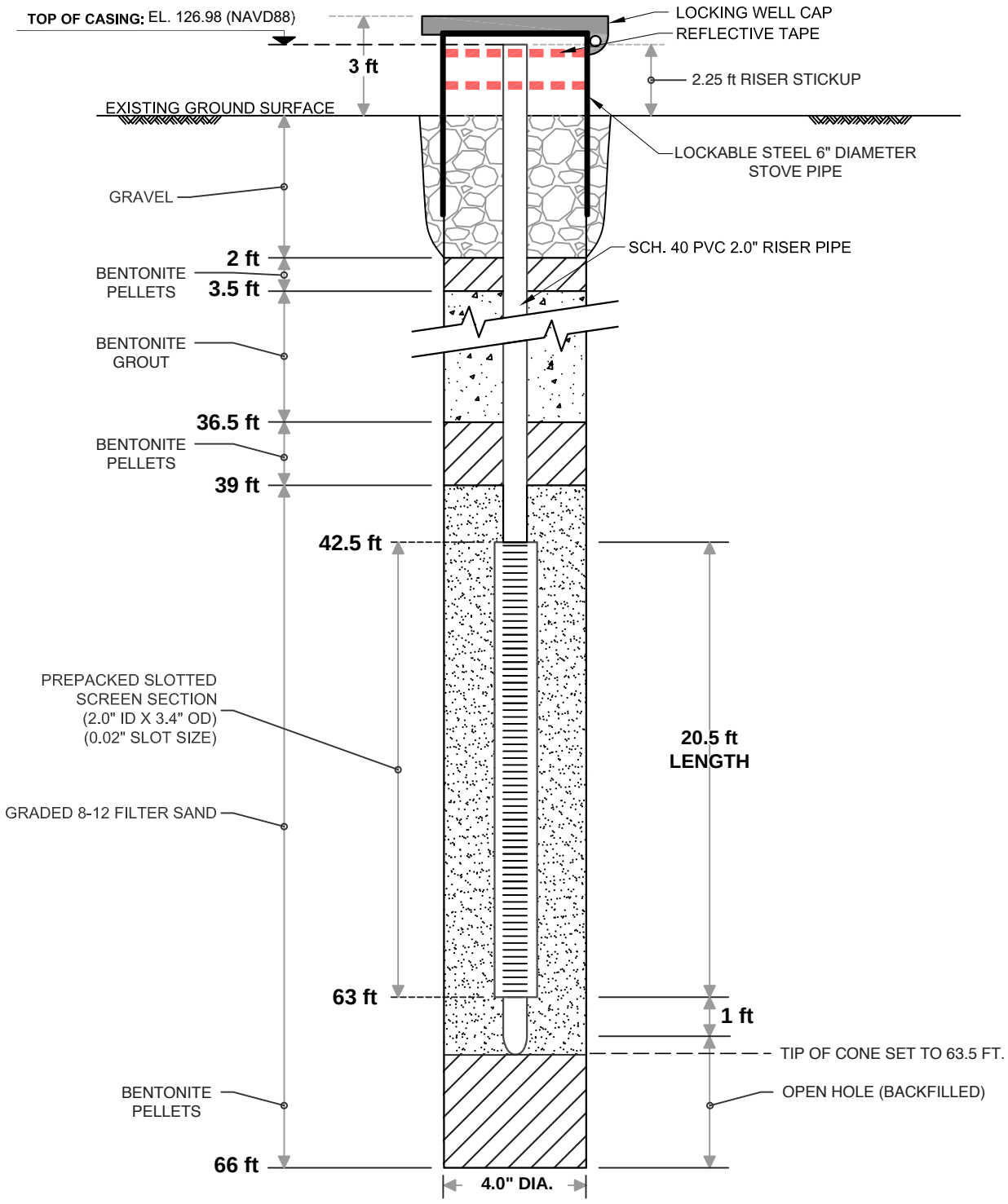
2) For additional symbol identification, refer to Key to Terms & Symbols Used on Logs.
3) DN = Driller's Note
4) ▼ = PID (ppm)
5) ▼ = Initial water level during drilling
6) ▼ = Static water level after drilling

COMPLETION DEPTH: 66 ft
COORDINATES: LONG: -151.36456512 LAT: 60.6629957 (GCS, NAD 1983, NSRS2007, Alaska Zone 4, degrees)
SURFACE ELEVATION: 124.73 ft (NAVD88)
EXPLORATION START DATE: 8/9/2016
COMPLETION DATE: 8/11/2016
LOGGED BY: J. Soto

DRILLING COMPANY: Denali
DRILLER: M. Kocian
DRILLING RIG: CME-850X
DRILLING METHOD: Wet Rotary

BORING LOG MW-86BA
ONSHORE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

PLATE 17



SCHEMATIC OF MW-86BA
ONSHORE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA
(NOT TO SCALE)

PLATE 18

SOIL TYPES

- Sandy GRAVEL (GP)
- Gravelly Poorly Graded SAND (SP)
- Gravelly Well Graded SAND (SW)
- Poorly Graded SAND (SP)
- Well Graded SAND (SW)
- Poorly Graded SAND with Silt and Gravel (SP-SM)
- Well Graded SAND with Silt and Gravel (SW-SM)
- Poorly Graded SAND with Silt (SP-SM)
- Well Graded SAND with Silt (SW-SM)
- Poorly Graded SAND with Clay (SP-SC)
- Well Graded SAND with Clay (SW-SC)
- Clayey SAND (SC)
- Silty SAND (SM)
- Silty GRAVEL (GM)
- Sandy Silty CLAY (CL-ML)
- Sandy Lean CLAY (CL)
- Lean CLAY with Sand (CL)
- Lean CLAY (CL)
- Silty CLAY (CL-ML)
- Silty CLAY with Sand (CL-ML)
- Sandy SILT (ML)
- Topsoil
- Lean CLAY with Gravel (CL)
- Silty Clayey SAND (SC-SM)
- Sandy Lean CLAY with Gravel (CL)
- Fill
- Silty GRAVEL with Sand (GM)
- Fat CLAY (CH)
- Clayey GRAVEL (GC)
- GRAVEL with Sand (GP)
- GRAVEL with Silt and Sand (GP-GM)
- Elastic SILT (MH)
- Elastic SILT with Sand (MH)
- SILT (ML)
- SILT with Gravel (ML)
- SILT with Sand (ML)
- Sandy SILT with Gravel (ML)
- Silty Clayey SAND with Gravel (SC-SM)
- Silty SAND with Gravel (SM)
- Well Graded SAND with Gravel (SW)
- Poorly Graded SAND with Gravel (SP)
- Well Graded GRAVEL (GW)
- GRAVEL with Silt and Sand (GW-GM)

SAMPLERS

- Grab Sample
- Oversized Split-Spoon Sampler
- Standard Penetration (SPT) Test Sampler
- No Recovery
- Thin-Walled Shelby Tube Sampler
- Denison Sampler

STRENGTH TESTS

- ⊗ Pocket Penetrometer
- ⌖ Torvane
- ⌖ Remote Vane
- ◆ Miniature Vane
- ⌖ Residual Vane
- ▲ Unconsolidated Undrained Triaxial
- ▣ Unconfined Compression (soil)

- ⊙ SPT N-Value
- » SPT N-Value Exceeds Data Scale
- PID
- ◇△ (Open symbols indicate remolded tests)
- \+ Strength exceeds capacity of measureing device

WOR - Weight of Rod
WOH - Weight of Hammer

CLASSIFICATION TESTS/BLOW COUNTS

- ● Water Content
- □ Dry Unit Weight
- ○ Submerged Unit Weight
- ■ Non-Plastic

Plastic Limit — Liquid Limit

KEY TO TERMS AND SYMBOLS USED ON BORING LOGS
ONSHORE LNG FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

PLATE 19

APPENDIX A
METHOD STATEMENTS

METHOD STATEMENT		No: Hydro-MS-02
		Page: 1 of 14
ALASKA LNG (AKLNG) Aquifer and Observation Well Installations		Issue: 1 Rev 1
		Date: July 2016

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2. Main Activity/Area of Work
3. Manpower and Supervision
4. Associated Documents (Drawings, Manuals, Method Statements, Plans, Permits)
5. Hazard/Risk Assessments
6. Security - Barriers/Fences/Warning Signs
7. Constraints/Restrictions/Special Considerations
8. Plant and Equipment
9. Materials (handling/storage/disposal)
10. Welding and Hot Work
11. Preparation of Works/Location of Services
12. Emergency Procedures
13. Personal Protective Equipment/Safety Equipment
14. Methodology & Sequence of Work
15. Appendices

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Distribution:	Controlled copies: Project Manager Contract File	Uncontrolled copies: Client: AKLNG
Originated from: **Dave Sadoff, P.G., C.P.G.**		Reviewed/authorised for issue by: **Jeriann Alexander, PE, REAP**

A METHOD STATEMENT IS ONLY A SAFE METHOD OF WORKING IF IT IS DISCUSSED AND AGREED BEFORE WORK BEGINS AND THEN FOLLOWED BY THOSE CARRYING OUT THE WORK.

METHOD STATEMENT		No: Hydro-MS-02	
		Page: 2 of 14	
ALASKA LNG (AKLNG) Aquifer and Observation Well Installations		Issue: 1	Rev 1
		Date: July 2016	

1. Introduction

This method statement outlines the activities involved to perform air drilling to develop wells for both observation (OW) and to facilitate an aquifer pump test (APT) in Nikiski Alaska for the 2016 AKLNG Geophysical and Geotechnical site investigation. Pumped and observation wells will be installed to enable water withdrawal and aquifer monitoring to assess the nature of the ground water flow, yield, quality, and interconnectedness of the underlying water bearing strata.

2. Work Description

Aquifer pump test well installations will include the drilling of 7 borings, completed as groundwater wells in the areas shown on Plates 1 and 2 (all referenced plates are included in Appendix 1). Access routes are shown on Plate 3. The general The main office and field support building is located at the ASRC/Rig Tenders, Milepost 22.5 of the Kenai Spur Highway.

Seven new wells will be installed in support of the aquifer pump test (APT) program. Two 200-foot deep wells (designated APT 1 and APT 2) will be installed within aquifer 2. One 260-foot deep well (designated APT 3) will be installed within aquifer 3. Two observation well pairs (designated OW 1 through OW 4), with each pair comprising of one 150-foot deep well (screened within aquifer 2) and one 100-foot deep well (screened within aquifer 1) will be installed.

All new wells will be installed in accordance with water well drilling and installation standards (ANSI/NGWA) and guidance. Water quality monitoring and sampling will be conducted following well completion in accordance with Hydro-MS-01.

3. Manpower and Supervision

The table below lists the manpower involved with well installation and aquifer pump test activities and their responsibilities.

Nominated Person	Responsibility

Fugro Site Manager	• Oversee the overall implementation of Onshore scope • All incident and accident reporting shall be reviewed and where necessary, investigated by the site manager to Fugro's satisfaction. • Liaise with the Fugro HSSE Manager, Marine Geophysical Lead, Geotechnical Lead, Site HSSE Manager, and with FUGRO's Project Manager on all matters related to HSSE. • Have an appreciation of HSSE standards / legislation affecting site operations and an understanding of their role in the management of health and safety. • Ensure that health and safety documentation is suitable and sufficient and meets contract HSSE requirements. • Ensure field supervisors are formally assigned appropriate duties and responsibilities to assist with the implementation of the project safety. • Ensure that any person that appears to be affected by alcohol or drug abuse is removed from site and tested as appropriate. • Organize appropriate fire precautions, spill and first aid measures. • Ensure that plant and equipment is properly maintained in good working order. • Ensure only trained and competent personnel are allocated to operate equipment and tools on site. • Ensure that the Subcontractors Managers are aware of the safety requirements of the work involved to undertake this task. • Monitor the health and safety aspects of the project and operations. • Ensure that security measures are in place and utilized. • Ensure that all incidents are immediately communicated with the AKLNG. • Empowering all project personnel with STOP WORK AUTHORITY, and; ensuring all personnel understand that they have STOP WORK RESPONSIBILITY in accordance to Fugro policy.

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ALASKA LNG (AKLNG) Aquifer and Observation Well Installations		Issue: 1	Rev 1
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Lead Hydrogeologic Services Manager	• Overall responsibility for all site activities • Advise hydrogeologic staff on the requirement to comply with this method statement in order to enable the work to be carried out safely and obtain the required quality
Field Hydrogeologist/ Engineer	• Overall responsibility for onsite well installation and aquifer pump test activities • Ensures subcontractors follow standard operating procedures and project requirements for site access, drilling, and well construction activities • Communications with the Lead Hydrogeologic Services Manager during the drilling and well construction activities • Report all incidents immediately to the Site Manager and Project HSSE Manager • Be aware of the limits of land access to project sites (onshore). Stop work and seek clarification if unsure of access. • Report any unsafe acts, practices or conditions via Hazard Observation Card. • Develop a personal concern for the safety of themselves and others (iPOWER). • Ensure that safe work practices and procedures are defined, documented and that geotechnical personnel are appropriately trained for their assigned tasks. • Utilize STOP WORK AUTHORITY, in accordance to Fugro policy

METHOD STATEMENT		No: Hydro-MS-02
		Page: 6 of 14
ALASKA LNG (AKLNG) Aquifer and Observation Well Installations		Issue: 1 Rev 1
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MW – Field Supervisor	• Conducts drilling and well installation activities in accordance with project requirements • Provides well construction materials and means to transport the materials to the well pads • Conducts well development activities • Report all incidents that result in injuries, illness, equipment damage/loss, fires, or cause environmental damage. • Manages drilling activities • Completes 24-hour hazwoper training • Conducting daily tool box talks/participation in HSE observation program • Ensuring all necessary equipment inspections/observations are completed • Ensure personnel are fit for work • Manages logistics • Ensures proper area signage and barriers are in place • Utilize STOP WORK AUTHORITY, in accordance to Fugro policy
MW- Driller	• Conducts daily rig and equipment • inspections/observations, ensure all safeguards are functional • Participates in daily tool box talks/participation in HSE observation program • Oversees drilling and associated activities • Conducts fueling of rig and equipment as necessary • Ensure fit for work • Utilize STOP WORK AUTHORITY, in accordance to Fugro policy
MW- Helper	• Participates in daily tool box talks/participation in HSE observation program • Ensures stop work policy is followed • Conducts fueling of rig and equipment as necessary • Assists in drilling activities • Ensure fit for work • Utilize STOP WORK AUTHORITY, in accordance to Fugro policy

METHOD STATEMENT		No: Hydro-MS-02
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4. Associated Documents (Drawings, Manuals, Method Statements, Plans, Permits)

All borings and well installations, and temporary field staging areas, will be located within AKLNG property boundary, and at the staging area located at the ASRC.

The table below lists the other documents relevant to the groundwater monitoring activities.

Document	**Reference Number**
Fugro Project Execution Plan	USAL-FG-GPZZZ-00-002016-001_A PEP for 2016 G&G
Onshore Emergency Response Plan	PEP Appendix 0-1
Project Emergency Contact List	Latest Issue
UTV MS	OS-GN-MS-001
Well Sampling Method Statement	HYDRO-MS-01
Air Drilling and Generator Refueling	HYDRO-MS-04
Location Plates, Routing Plate, and Well Schematic Plates	Appendix 1
APT Well Installation Drill Waste Screening and Discharging Procedures	Appendix 2
Site-Specific Lift Plans HS-F20; Slings and Rigging Handling HS-R73	Appendix 3
Permit to Work HS-R72, HS-F15	Appendix 4
Critical Spares	Appendix 5
Water Quality Sampling Schedule	Appendix 6

5. Risk Assessments

Risk assessment and Standard Operating Procedures for drilling and well installation activities are listed in the following table and are held on site enclosed in the Project Execution Plan.

Applicable Risk Assessment	TRA-Drilling Operations and Well Installation
HYD-TRA-003	Drilling/Well Installation
HYD-TRA-004	Fueling Air Drill Rig and Generator
HYD-TRA-005	Welding, Cutting, Grinding
HYD-TRA-006	Making Crane Lifts
AKLNG-002	Skid Steer Loader Operations
ON-GN-TRA-005	Equipment Recovery
ON-GN-TRA-001	Utility Terrain Vehicle Usage

6. Security - Barriers/Fences/Warning Signs

Access to the well locations will be restricted to Fugro employees, Client Representatives and Land Agents, and M-W Drilling.

A restricted area will be maintained for non-essential personnel. The restricted area will cover the drilling pad and extremities, as required by specific activities. Candlestick vertical delineators will be used to mark the extent of the no go area. Only personnel required to be within this area in order to complete assigned task will be allowed inside.

Due to the nature of the drilling operations, no personnel shall be within 50 feet of an operating machine without direct communication with the operator of the machine.

Required PPE signs will be posted at access point(s).

Welding will be conducted above the borehole. For arc flash, a single curtain will be deployed to offer protection to others in the area.

Equipment shall be properly secured at the end of each day.

7. Constraints/Restrictions/Special Conditions

Drilling and well construction activities will take place during daylight hours only.

No smoking will be allowed while operating equipment.

No cell phone use while operating or spotting equipment.

Ensure spill prevention measures are in place.

Ensure first aid kit and eyewash in place.

Ensure refueling activities are consistent with HYDRO-MS-004 and HYDRO-TRA-004. All personnel will continually monitor for wildlife habitat. In the event of a sighting, the wildlife specialist or site manager will be notified.

Weather will continually be monitored. If inclement weather is encountered, appropriate safety measures will be followed.

If elevated work is required, ensure that ladder complies with appropriate industrial standards.

A roaming wildlife specialist will be available onsite.

The cuttings discharge area will be evaluated, and an exclusion zone/soft barrier will be installed if required.

A hot work permit will be in place for welding activities.

During welding, a fire watch will be utilized, a 20-pound ABC fire extinguisher will be staged at the welding location and for at least 30 minutes after completion of hot work.

8. Plant and Equipment

The following equipment will be used during drilling activities.:

Ingersoll Rand T2W Drill Rig and/or Shramm T555
Terex BT3470 Crane Truck
Chrysler Ram 4550
Chrysler Ram 5500 Service Truck/with refueling tank and 200-gallon water tank
Arctic Cat XT650 UTV
Trax Skid Steer
Project support trucks

Utility trailer
Rig-mounted welder/generator
Mesh reinforced visqueen and duck ponds
PID meters
Rig mats ABS 4X8
Surge block and bailer (for well development)
Water totes (for well development water and sediment)

9. Materials (handling/storage/disposal)

Materials will be staged at selected areas to minimize handling distances.

Casing will be moved utilizing one or more of the following: trailer, crane truck or skid steer.

Boom truck/crane lifts: A lift plan will be in place for anticipated lifts. For non-plan lifts, a lift plan will be developed as necessary. Tag lines will be in place for crane lifts along with a dedicated rigger/signaler. Daily inspection of equipment will be conducted.

Recyclable waste and refuse will be processed at the ASRC.

Drill and well development water waste will be discharged according to the Well Installation Drill Waste Screening and Discharging Procedure.

Water generated during setting of well pumps in wells APT 1, APT 2 and APT 3 will be containerized in portable totes (fitted with a discharge valve) and staged onsite pending water sampling analytical results. Water will subsequently be transported and disposed in accordance with regulatory requirements. If water analytical results are within water discharge permit thresholds, water may be discharged into the Peterkin Quarry.

10. Welding and Hot Work

A hot work permit will be completed before performing hot work. Before commencing work, the area will be inspected within a 75-foot radius of the hot work activity location. Where practical, all combustible materials will be relocated 35-feet away from hot work activity location. Where impractical, combustible material will be covered with flameproof cover, shields, and/or wet down the material to help prevent ignition.

Planned welding and hot work activities include:

- Casing string assembly (welded each section joint)
- Screen section assembly

- Grinding for weld prep and weld
- Drilling shoe for first section
- Tool joint for lower screen section

A fire watch and 20-gallon ABC fire extinguisher will be staged at the hot work activity location during all hot work, and a minimum of 30 minutes after completion of the hot work.

Proper industry standard shades will be utilized for welding (minimum #10) and cutting (minimum #5) activities.

Grinders will be fitted with industry standard guards.

Portable well curtain or shield will be utilized to protect other workers in the area.

A letter of competency will be in place to ensure the welder is fit for task.

All compressed gas cylinders will be mounted upright. Cylinders will be fitted with DOT-approved caps during transportation.

Backflow prevention shall be in place. An approved device to prevent flashback will be in place.

All leads will be inspected, and replaced if found to be defective, or splices utilized.

All ground connections shall be checked to determine that they are mechanically strong and electrically adequate.

11. Preparation of Works/Location of Services

- Ground truthing has been performed at the drill pad locations in anticipation of drilling activities.

- Vegetation has been cleared from the well drilling locations under observation by Fugro. Additionally, an electromagnetic survey and GPR will be performed within the 60 feet by 60 feet pad clearance area.

- Proposed borehole locations will be marked to allow for subsurface utility locating efforts. Alaska One Call will be notified to ensure that proposed boreholes are not located near existing subsurface utilities.

Constructed drill pads will be prepared with sufficient space to be able to stage equipment and materials as displayed on the Conceptual Drilling Pad Equipment and Materials Layout plate. The staging will also facilitate access for refuelling and crane lifting activities.

Rig mats will be deployed as necessary to allow drill rig ingress/egress and for support at drill pad areas.

12. Emergency Procedures

Details of emergency response are incorporated in the project Specific Emergency Response Plan. Applicable sections of the PSERP will be discussed at the kickoff meeting. A copy of this document will be maintained onsite.

A spill kit and fire extinguishers will be staged onsite for quick response.

Emergency evacuation routes will be discussed during daily tool box talks.

Primary method for communication will be with cell phones. Good cell phone coverage has been encountered during past site activities.

13. Personal Protective Equipment (PPE) & Safety Equipment

The following personal protective equipment shall be worn during operations, and shall meet the applicable minimum ANSI standard:

Item	**Description**
Safety boots/shoes	Mandatory (for all site activities)
Hard hat	Mandatory
High visibility jacket/shirt/vest	Mandatory
Long sleeves	Mandatory
Gloves	As per risk assessment/safety data sheets
Safety glasses	As per light level and risk assessment
Ear defenders/ear plugs	Mandatory if noise above FAL 85dB(A); double hearing protection may be required in proximity to rig if applicable decibel standards are exceeded.

Additional personal protective equipment may be worn in case of special activities as deemed required.

14. Methodology & Sequence of Work

- Mobilization to site, journey management will be utilized.
- Stage casing to drill pads, lay rig mats as needed, utilizing service truck, crane truck, skid steer as necessary
- Move in and setup as shown on Conceptualized Pad Layout plate (see Appendix 3)
- Welfare facility, comfort station to be located as close to working area as practical
- Advance borings and casing to desired depths utilizing air drilling (casing hung and sections welded in vertical orientation).
- Field screening of drill cuttings (PID, visual, and olfactory)
- Surface discharge of drill waste in accordance with APT Well Installation Drill Waste Screening and Discharging Procedures (see Appendix 1)
- Install wells
- Develop wells (see detail below)
- Instrumentation of each well with water-level data loggers
- Installing electric downhole pumps into APT 1, APT 2, and APT 3
- Securing the wells
- Demobilization from site

Well development methods to be employed include the following:

Well development methods may include sand lifting, swabbing, airlifting, and bailing. The method(s) of development selected will depend on several factors, including water quality, aquifer quality, and water discharge considerations. Parameters such as initial depth to water, depth to water during purging, purging volume, water temperature, pH, DO, Ox/ReDOX, turbidity, temperature, and specific conductance will be recorded. A hand-held multimeter and water level indicator will be used during development activities, at intervals sufficient to gather representative groundwater data.

Groundwater from the pumped and observation wells will be sampled and tested following well development. In addition, groundwater collected from five Third-Party private wells near the APT area will also be sampled and tested at this time. The water quality sampling and testing will follow the procedures outlined in the Water Quality Monitoring Method Statement and as summarized in the sampling and monitoring matrix presented in Appendix 6. The data will be provided to AKLNG to aid in completing the permit requirements for allowing discharge into the quarry.

15. Appendices

Appendix 1. Plates: General APT Locations, APT and Observation Wells, APT Wells Routing, Conceptualized Pad and Refueling Setup, Well Schematics
Appendix 2. APT Well Installation Drill Waste Screening and Discharging Procedures
Appendix 3. Site Specific Lift and Slings/Rigging Handling Plans
Appendix 4. Permit to Work
Appendix 5. Critical Spares
Appendix 6. Water Quality Sampling Schedule

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ALASKA LNG (AKLNG) Aquifer and Observation Well Installations		Issue: 1 Rev 1
		Date: July 2016

APPENDIX 1
PLATES

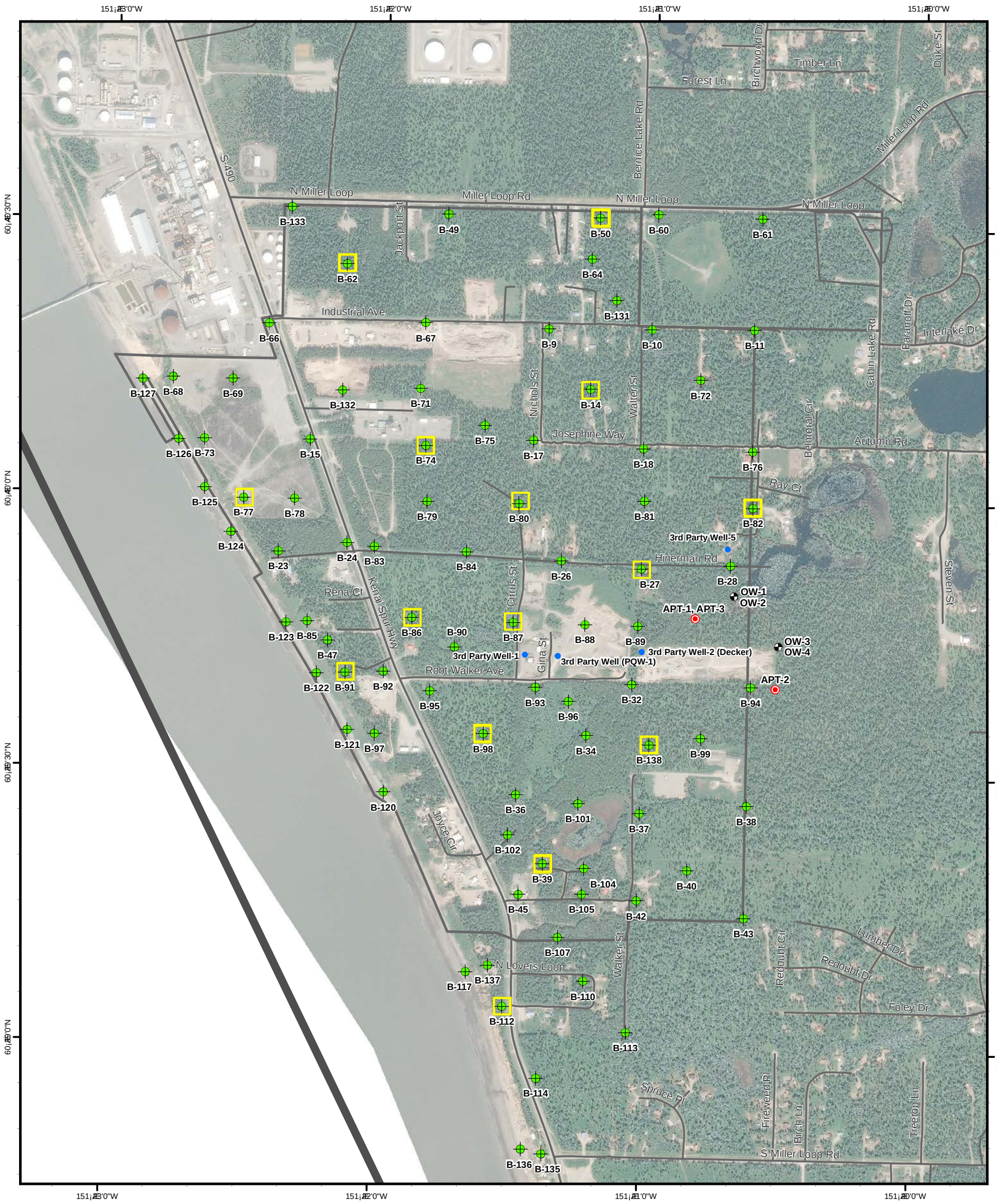
APT AND OBSERVATION WELL LOCATIONS

WELL ROUTING

CONCEPTUALIZED PAD AND REFUELING SETUP

WELL SCHEMATICS

Project No. 04.10160001



LEGEND

- Onshore borings (Completed)
- Well Locations
- Onshore LNG Facilities Area
- APT Well
- Observation Well Pair
- 3rd Party Well

0 500 1,000 2,000 Feet

APT WELL LOCATIONS
ONSHORE FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

PLATE 2

R:\04100\2014 Projects\04.10140334 - Phase 2 Alaska LNG Project\09_GIS\Outputs\99_WORKING\2016_03_09_APT_well_pipeline_WQ_well\Plate-01-APT_well.mxd, 4/29/2016, kimk

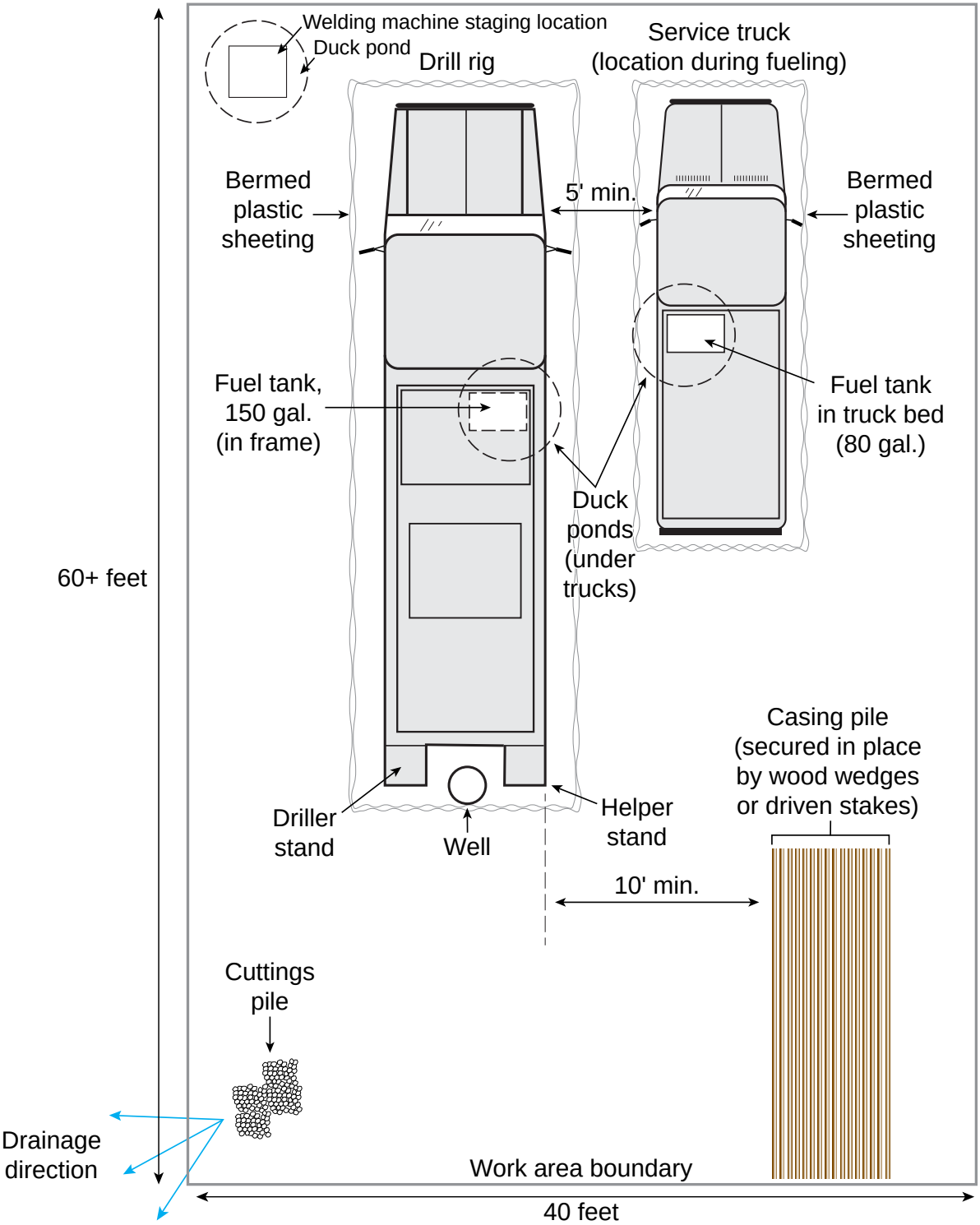
Alaska LNG Project
Project No. 04.10160001

oakpfcfs01/data/public08/jobdocs/04.10160001 Alaska 2016/Graphics/Plate 5 APT Wells Routing.ai

APT WELLS ROUTING
ALASKA LNG PROJECT
NIKISKI, ALASKA

PLATE 5

Alaska LNG Project
Project No. 04.10160001



Plan View

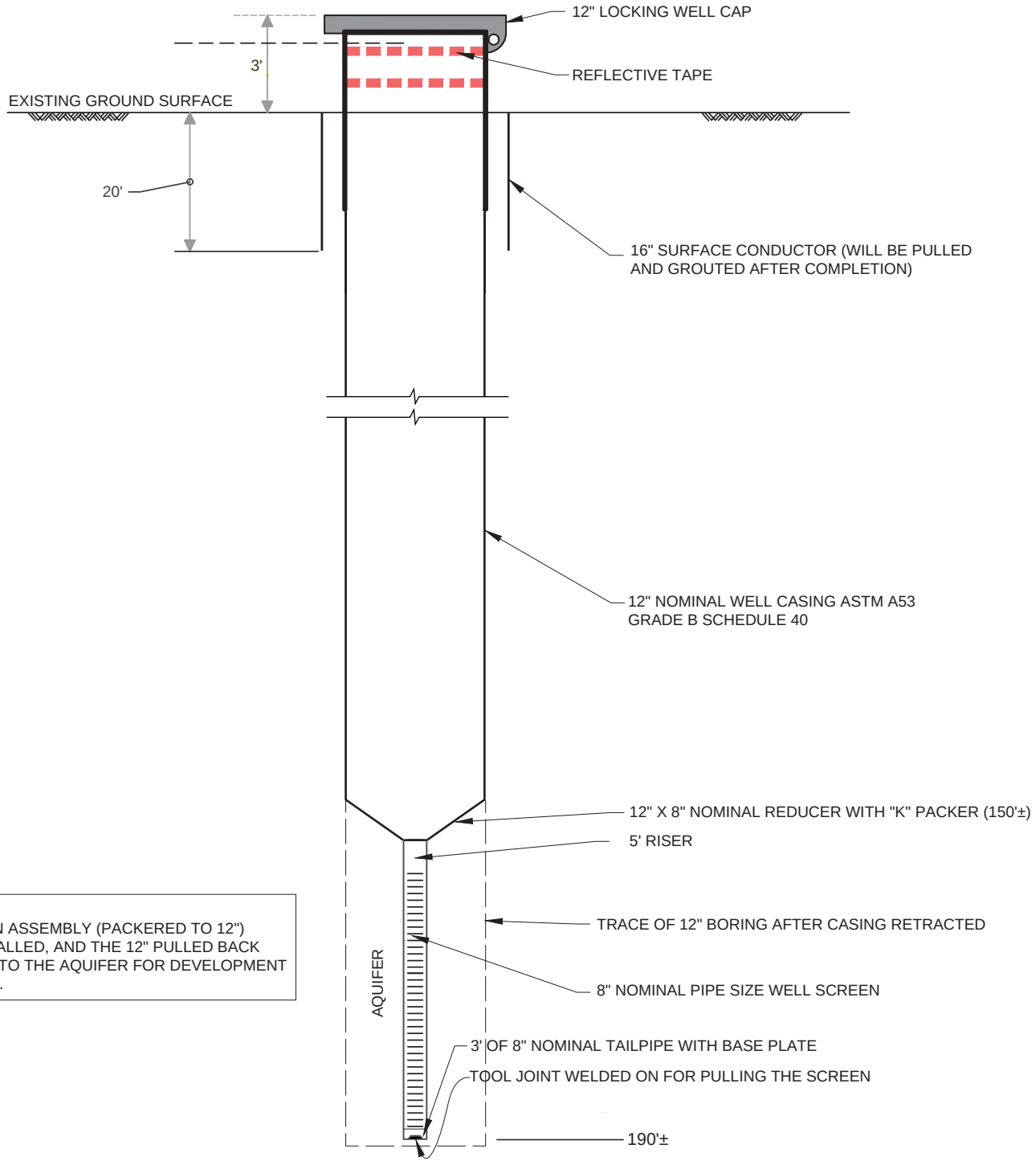
Notes:
1. No-go perimeters to be maintained for non-essential personnel.
2. Required PPE signs to be posted at access points.
3. The cuttings pile will be located at the lowest downgradient side of the pad; casing will be staged at a relatively higher elevation.

CONCEPTUAL DRILLING PAD EQUIPMENT AND MATERIALS LAYOUT
ALASKA LNG PROJECT
NIKISKI, ALASKA

PLATE 3

Alaska LNG Project
Project No. 04.10160001

DRILLER:				PROJECT:	04.10160001
DRILL RIG:	COORDINATES (NAD83)	ELEVATION (ft, NAVD88)		LOCATION:	
METHOD: Air rotary	N:	GROUND SURFACE:		DATE STARTED:	
LOGGER:	E:	PVC CASING (TOP):		DATE COMPLETED:	



NOTE:
AN 8" SCREEN ASSEMBLY (PACKERED TO 12") WILL BE INSTALLED, AND THE 12" PULLED BACK EXPOSING IT TO THE AQUIFER FOR DEVELOPMENT AND TESTING.

/oakpfdfs01/data/public08/jobdocs/04_10160001 Alaska 2016/Graphics/04_10160001 Plates 5-8 Schematic Test and Observation Wells.ai

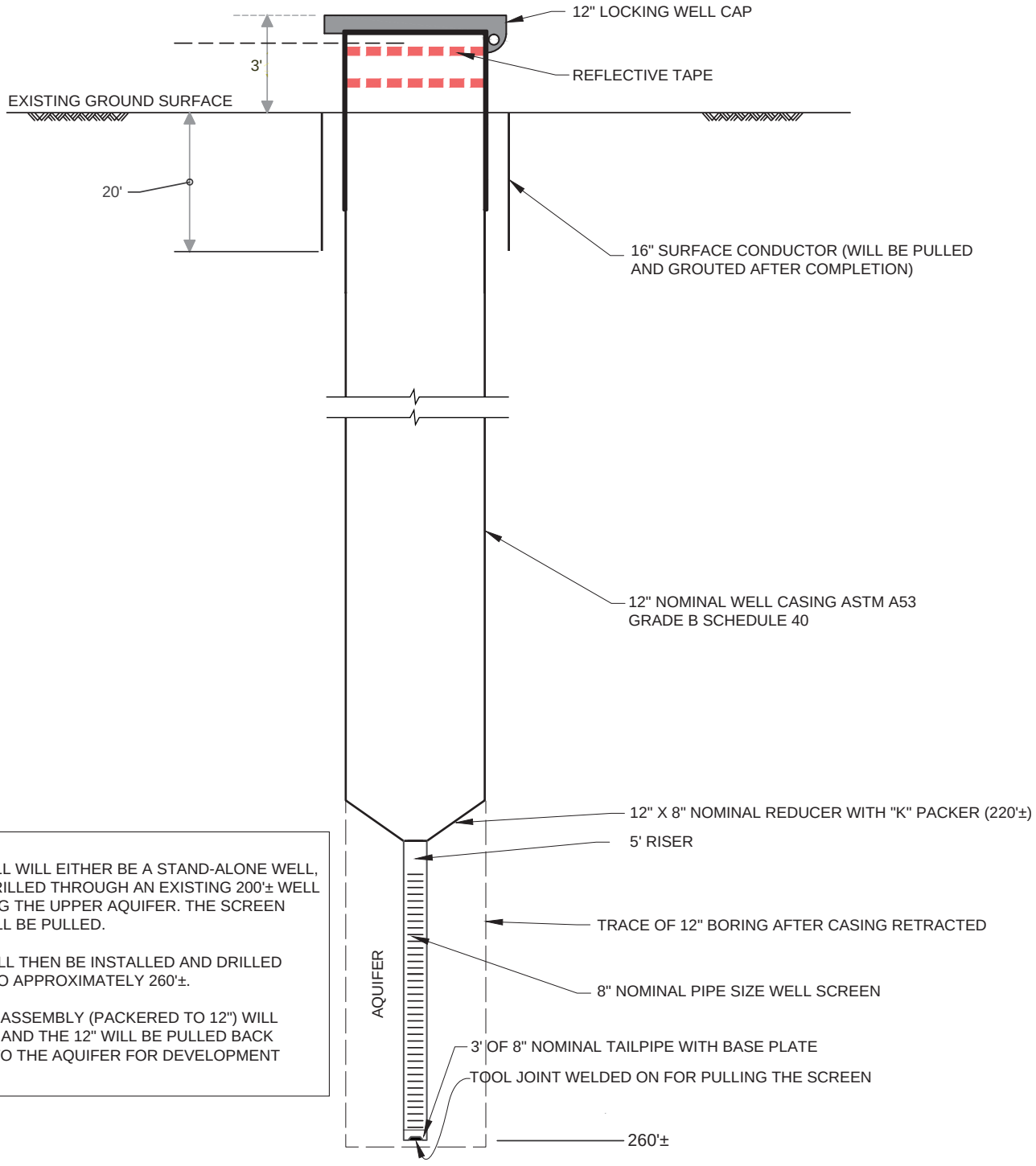
SCHEMATIC OF 200' TEST WELL (2)

2016 ONSHORE AND MARINE G&G PROGRAM
ALASKA LNG PROJECT
NIKISKI, ALASKA
(NOT TO SCALE)

PLATE 1

Alaska LNG Project
Project No. 04.10160001

DRILLER:				PROJECT:	04.10160001
DRILL RIG:	COORDINATES (NAD83)	ELEVATION (ft, NAVD88)		LOCATION:	
METHOD: Air rotary	N:	GROUND SURFACE:		DATE STARTED:	
LOGGER:	E:	PVC CASING (TOP):		DATE COMPLETED:	



NOTES:
THIS 260'± WELL WILL EITHER BE A STAND-ALONE WELL, OR WILL BE DRILLED THROUGH AN EXISTING 200'± WELL AFTER TESTING THE UPPER AQUIFER. THE SCREEN ASSEMBLY WILL BE PULLED.

12" CASING WILL THEN BE INSTALLED AND DRILLED AND DRIVEN TO APPROXIMATELY 260'±.

AN 8" SCREEN ASSEMBLY (PACKERED TO 12") WILL BE INSTALLED AND THE 12" WILL BE PULLED BACK EXPOSING IT TO THE AQUIFER FOR DEVELOPMENT AND TESTING

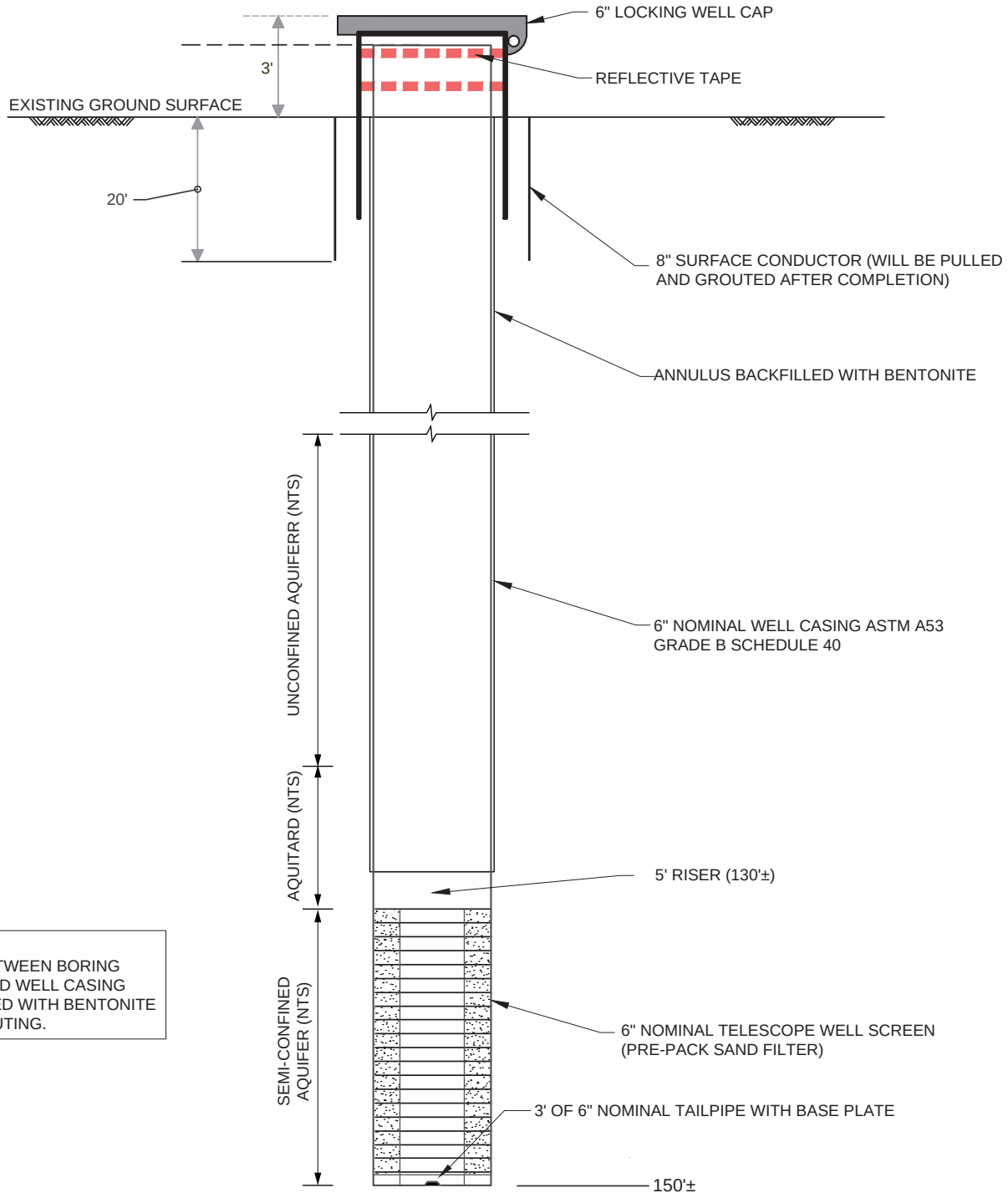
/oakpfdfs01/data/public08/jobdocs/04.10160001 Alaska 2016/Graphics/04_10160001 Plates 5-8 Schematic Test and Observation Wells.ai

SCHEMATIC OF 260' TEST WELL (1)
2016 ONSHORE AND MARINE G&G PROGRAM
ALASKA LNG PROJECT
NIKISKI, ALASKA
(NOT TO SCALE)

PLATE 2

Alaska LNG Project
Project No. 04.10160001

DRILLER:				PROJECT:	04.10160001
DRILL RIG:	COORDINATES (NAD83)	ELEVATION (ft, NAVD88)		LOCATION:	
METHOD: Air rotary	N:	GROUND SURFACE:		DATE STARTED:	
LOGGER:	E:	PVC CASING (TOP):		DATE COMPLETED:	



NOTE:
ANNULUS BETWEEN BORING SIDEWALL AND WELL CASING WILL BE FILLED WITH BENTONITE BY DRY GROUTING.

/oakpfdfs01/data/public/08/jobdocs/04_10160001 Alaska 2016/Graphics/04_10160001 Plates 5-8 Schematic Test and Observation Wells.ai

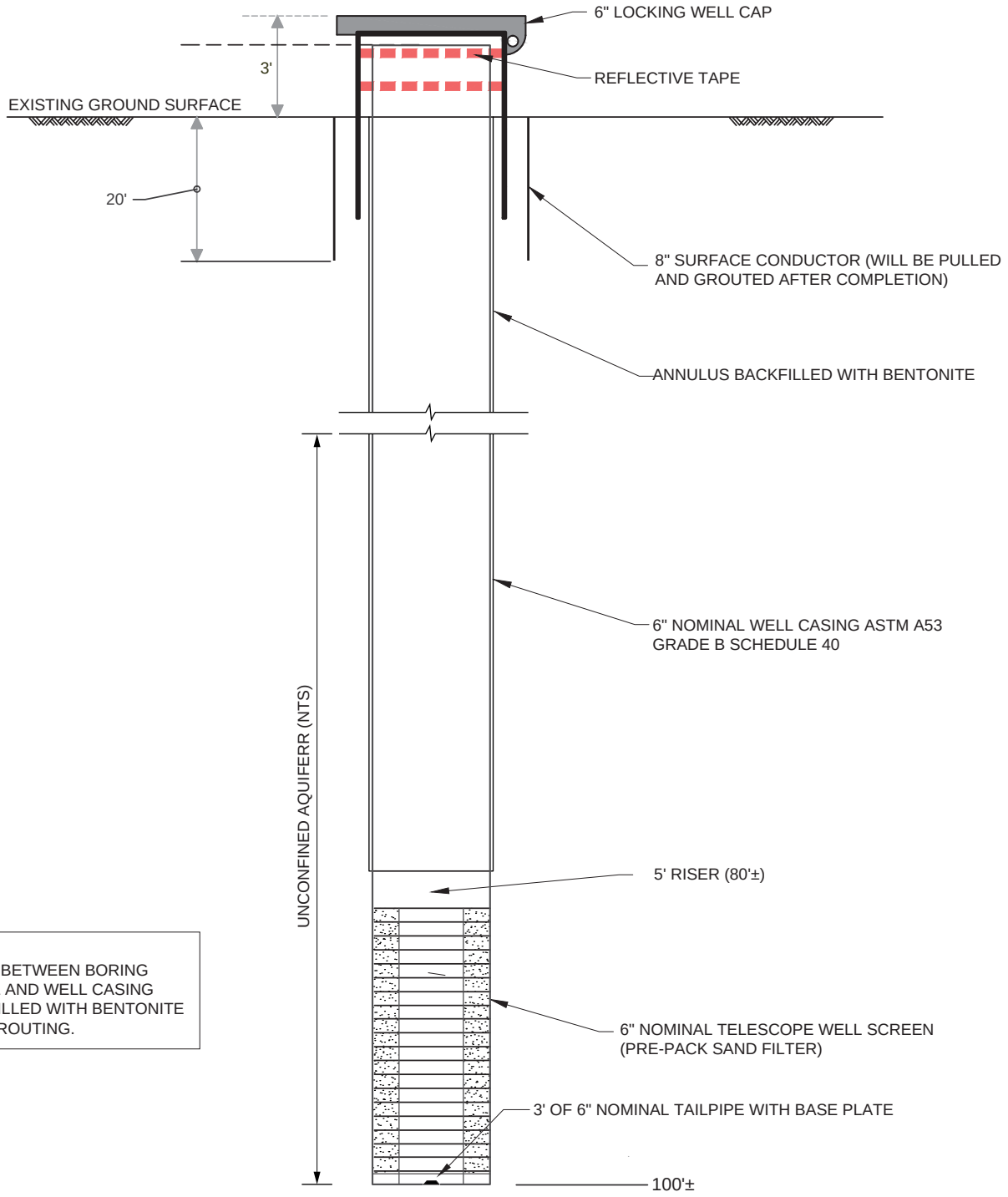
SCHEMATIC OF 150' OBSERVATION WELL

2016 ONSHORE AND MARINE G&G PROGRAM
ALASKA LNG PROJECT
NIKISKI, ALASKA
(NOT TO SCALE)

PLATE 3

Alaska LNG Project
Project No. 04.10160001

DRILLER:				PROJECT:	04.10160001
DRILL RIG:	COORDINATES (NAD83)	ELEVATION (ft, NAVD88)		LOCATION:	
METHOD: Air rotary	N:	GROUND SURFACE:		DATE STARTED:	
LOGGER:	E:	PVC CASING (TOP):		DATE COMPLETED:	



NOTE:
ANNULUS BETWEEN BORING SIDEWALL AND WELL CASING WILL BE FILLED WITH BENTONITE BY DRY GROUTING.

/oakpfdfs01/data/public08/jobdocs/04.10160001 Alaska 2016/Graphics/04_10160001 Plates 5-8 Schematic Test and Observation Wells.ai

SCHEMATIC OF 100' OBSERVATION WELL

2016 ONSHORE AND MARINE G&G PROGRAM
ALASKA LNG PROJECT
NIKISKI, ALASKA
(NOT TO SCALE)

PLATE 4

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ALASKA LNG (AKLNG) Aquifer and Observation Well Installations		Issue: 1 Rev 1
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APPENDIX 2
APT WELL INSTALLATION DRILL WASTE SCREENING AND DISCHARGING PROCEDURES

APT Well Installation Drill Waste Screening and Discharging Procedures

Seven wells will be drilled in support of planned aquifer pump testing. The area selected for the APT and observation wells was selected, in part, for its lack of anthropogenic interferences, and as such drilling waste materials are not likely to be impacted. However, drilling wastes will be screened and discharged in accordance with the following procedures to minimize potential adverse impacts to the environment. It is anticipated that drilling wastes will consist of approximately 10% water and 90% soil particles above the aquifer, and approximately 30% water and 70% soil particles within the aquifer.

Drill Waste Screening

- At the start of drilling at each well location, drill waste discharge will be directed onto plastic sheeting, downslope of the well location, to allow for visual and olfactory observations and monitoring with a photoionization detector. PID screening will occur a minimum of every 2 feet within the top 10 feet, and at a minimum of every 5 feet thereafter to the total drilled depth.
- If no conditions of concern are observed, the drilling wastes will be discharged as described below. Observations (visual, olfactory and PID) will be made a minimum of every 5 feet throughout the drilling activities. Should any indications of drill cutting/water potential contamination be observed (i.e., odorous or discolored materials); drilling activities will cease immediately.
    - AKLNG will be notified immediately and apprised of the observations.
    - Materials which are observed to have odor or discoloration will be containerized.
    - A path forward will be discussed with AKLNG.

Drill Waste Discharging

If there are no indications of drill cutting/water contamination, the following discharge procedures will be employed.

- Drill waste discharge will be directed toward downslope areas, away from the drilling pad in an area bordered by erosion mat rolls and away from existing drainage pathways.
- Spray pattern will aerate and disperse the materials within the mat roll delineated area to minimize surface erosion.
- Surface conditions in the area of discharge will be periodically monitored. If unsafe or adverse environmental conditions are observed; drilling activities will cease immediately.
    - AKLNG will be notified immediately and apprised of the observations.
    - A path forward will be discussed with AKLNG.
- Subsequent to termination of drilling activities, erosion mat rolls will be removed and cuttings spread evenly; surface conditions in the discharge area will be evaluated, and AKLNG will be contacted to discuss if additional measures are warranted.

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APPENDIX 3

LIFT AND SLINGS/RIGGING HANDLING PLANS

LIFT PLAN (PART 1)

Form HS-F20

(To be completed by the Competent Person)

Installation/Ship/Barge/Other:	Location (main deck, back deck, truck, yard):	
Permit to Work No:	Risk Assessment No:	Lift Plan No:
Weight of Load, Actual or Assessed (delete as applicable):		

DESCRIPTION OF LIFTING OPERATION

POSSIBLE CONSIDERATIONS (not exhaustive)

(Tick if relevant and address each point in 'Step-by-Step' section below)

	Weight not verified		Lifting of chemicals		Conflicting tasks in area
	High centre of gravity		Load on pallet requires securing		Dynamic factors involved
	Stability of load		Seafastening removed		Hazards to personnel in the area
	Awkward size/shape/sharp edges		Restricted headroom or confined work area		Communication requirements
	No dedicated lifting points on the load		No lifting point directly above the load		Adequate lighting and visibility
	No certified suspension points for the lifting equipment		Appropriate and correctly installed lifting equipment and accessories		Is the use of tag lines required? Then consider personnel positioning

ROUTE TO BE TRAVELLED AND LAYDOWN AREA

(If you can't answer either, address in the Step-by-Step section)	**Yes**	**N/A**
1) Are the route and laydown area clear of obstructions?		
2) Is the laydown/landing area adequate in terms of size and load-bearing ability?		
3) Is suitable packing available for protection of the load, lifting equipment, slings etc?		
4) Have barriers been positioned to prevent access by unauthorised personnel?		
5) Have you confirmed that the laydown area is within the operating limits/radius of the equipment?		
6) Have environmental conditions been considered with regards to the safety of the lifting operation?		
7) Will the Lifting Equipment Operator be able to see the Banksman throughout the operation, or has another suitable, risk-assessed means of communication been checked and made available (ie. radios)?		
8) Are there hazardous process plant or materials in the area?		

STEP-BY-STEP DETAILS OF THE LIFTING OPERATION	(person responsible)

LIFT PLAN (PART 2)

Form HS-F20

(To be completed by the Competent Person)
SKETCH DETAILING THE RIGGING UP OF THE LIFTING EQUIPMENT AND LIFTING ACCESSORIES
LIFTING EQUIPMENT AND LIFTING ACCESSORIES TO BE USED (Specify type and SWL)
DEBRIEF AND LEARNING POINTS (Did the lifting operation go as planned or are changes to the lift plan required?)

Competent Person	Print Name:	Signature:	Date:

SLINGS & RIGGING MATERIAL HANDLING
HS-R73

1.0 PURPOSE

This document covers use, inspection and maintenance of purchased slings and rigging hardware for attaching loads to hoists.

2.0 APPLICATION

The requirements of this document apply to all facilities that utilize slings and rigging materials.

3.0 MANUFACTURE

Slings and rigging hardware shall be manufactured to comply with the applicable sections of (American Society of Mechanical Engineers) ASME B30.20, ASME B30.26, and ASME B30.9.

Identification shall be a part of the manufacturing process.

Each sling shall be marked per ASME B30.9 to show the following:

- Name or trademark of manufacturer
- Rated loads for the type of hitch used and the angle upon which it is based
- Diameter or size of sling

Rigging hardware shall be marked per ASME B30.26, including manufacturer's name or trademark, size or rated load. See ASME B30.26 for marking requirements of specific hardware types.

Note: Hardware labeled with only country of origin does not comply with this standard.

4.0 USE

All slings and rigging hardware shall meet the requirement of and be used in accordance with the latest editions of ASME B30.20, ASME B30.26, ASME B30.9, and OSHA 1910.184.

Slings and rigging hardware that appear to be damaged will not be used for any reason. They are to be destroyed and discarded.

All slings shall be assigned unique identifying IDs by the responsible company/division to facilitate sling inspections. All slings shall legibly display the ID as well as the manufacturers load rating tag or be removed from service. All sling ID information shall be recorded on inspection documents.

The rigging qualified person/operator is responsible for ensuring the sling identification is legible and shows the rated capacities for each type of hitch (vertical, basket and choke), prior to each use.

Rigging equipment shall be inspected to ensure it is safe. Rigging equipment for material handling shall be inspected prior to use on each shift and as necessary during its use to ensure that it is safe.

Rigging equipment not in use shall be removed from the immediate work area.

All employees shall be kept clear suspended loads. Area where lift will take place should be cleared before lift is attempted.

5.0 RIGGING GUIDELINES

5.1 PLANNING

Know where the center of gravity is. The weight of the load must be known, calculated, estimated, or measured.

Know the sling angle. The smaller the sling angle, the greater the load on the rigging gear.

At 30 degrees horizontal sling angle, the forces are doubled.

The working load limit (WLL) of most equipment is based on in-line loading. If the sling pulls off at an angle, you must know if the manufacturer allows it, if the WLL is affected, and whether there are any special requirements.

Protect equipment from sharp edges. The strength of slings can be reduced dramatically.

Make sure the manufacturer has its name or logo on the hardware and on the sling, and that the size or working load limit is clearly marked. The capacity of all rigging must be known.

Rigging equipment shall not be loaded beyond its recommended safe working load and load identification shall be attached to the rigging.

Proper load control means the load lifts are level and stable. Placing the load hook over the center of gravity is an essential first step. Placing the slings around the center of gravity is the second step. Next, select a hitch that will attach to the load securely at the sling angle being used. Tag lines shall be used unless their use creates an unsafe condition.

Evaluate the rigging gear to make sure it is suitable for overheard lifting. The manufacturer must clearly indicate it is suitable for overhead lifting and must meet requirements for lifting gear. The condition of the gear must be acceptable to allow it to continue in service with the working load limit still valid. Do not use damaged gear.

Rigging gear that is unacceptable must be removed from service and discarded. Do not allow damaged gear to be used or taken home from the jobsite.

5.2 PRACTICES

- Shorten and adjust slings only by using methods approved by the manufacturer.
- Don't shorten or lengthen slings by knotting or twisting.
- Hitch the sling in a manner providing control of the load.
- Pad sharp edges that contact the sling.
- Avoid shock loading.
- Do not rest loads on the sling.
- Do not pull slings from under a load when the load is resting on the sling.
- Avoid twisting and kinking during lifting, with or without a load.
- Be alert for possible snagging.
- In a basket hitch, balance the load to prevent slippage.
- When using a basket hitch, the legs of the sling should contain or support the load from the sides and above the center of gravity, so the load remains under control.
- Do not drag slings on the floor or over an abrasive surface.
- The choke point of a choker hitch should only be on the sling body.
- Further reduce the load when a choker hitch has an angle of choke of less than 120 degrees.
- The load, hook, or any fitting should not constrict, bunch, or pinch the sling.
- Center the load applied to the hook in the base (bowl) of the hook.
- An object in the eye of a wire rope sling or synthetic webbing sling shouldn't be wider than 1/2 the length of the eye.
- Hooks shall be of a type that can be closed and locked, eliminating the hook throat opening.
- An alloy anchor type shackle with a bolt, nut and retaining pin may be used in place of a hook.

6.0 INSPECTIONS

Rigging degradation not only indicates that the rigging is becoming unsafe and requires replacement; it also often indicates problem(s) with the rigging setup, use, or maintenance. Evidence of failure is cause for replacement of the rigging. Rigging shall be inspected by a competent person and replaced in accordance with ANSI/ASME B30.9 and the manufacturer's recommendations. Rigging inspections are the responsibility of the company/division that owns/possesses the equipment.

6.1 INSPECTION FREQUENCIES

6.1.1 Initial Inspection

Prior to use, a designated person shall inspect new, altered, modified, or repaired slings and rigging equipment. Written records are not required.

6.1.2 Periodic inspection

A designated person should perform a complete inspection *annually*. The entire length--splices, attachments, and fittings should be inspected. Examine the sling to determine if it is hazardous. Keep records of the most recent periodic inspection, including the condition of the sling. Sling inspections shall be documented on HSE-F19 Sling Inspection form.

Note: All slings and rigging hardware that do not pass inspection and/or in questionable condition are to be placed out of service and disposed of. It may be pertinent to cut the sling in half so that it cannot be used accidentally. At the minimum, rigging shall be inspected for the following failure modes:

6.2 FAILURE MODES

6.2.1 Wire Rope

- Missing or illegible sling ID & load rating tag
- Broken wires: for strand laid and single part slings, ten randomly distributed broken wires in one rope or five broken wires in one strand of one rope lay; for cable laid and braided slings, see table below.
- Severe localized abrasion or scraping.
- Kinking, crushing, bird caging, protruding core or any other damage resulting in distortion of the rope structure.
- Severe corrosion of the rope or end fittings.
- Evidence of electric arc or heat damage.
- Excessive pitting or corrosion, or cracked, distorted, or broken fittings.
- Diameter reduction:
  - Reductions of 1/64 in (.04 cm) for diameters up to and including 5/16 in (.79 cm);
  - Reductions of 1/32 in (.08 cm) for diameters 3/8 in (.95 cm) up to and including 1/2 in (1.3 cm);
  - Reductions of 3/64 in (.12 cm) for diameters 9/16 in (1.4 cm) up to and including 3/4 in (1.9 cm);
  - Reductions of 1/16 in (.15 cm) for diameters 7/8 in (2.1 cm) diameter up to and including 1-1/8 in (2.8 cm);
  - Reductions of 3/32 in (.24 cm) for diameters 7/8 in (2.1 cm) up to and including 1-1/2 in (3.8 cm).
- Significant stretching of the wire rope beyond the initial construction stretch.
- Any sign of metal fatigue or other visible damage that causes doubt as to the strength of the wire rope.

6.2.2 Chain

Inspect chains on an individual link basis. Chains shall be cleaned before they are inspected, as dirt and grease can hide nicks and cracks.

- Missing or illegible sling ID & load rating tag
- Wear: Replacement shall be as scheduled in Table 2.
- Stretch: Compare the chain with its rated length or with a new length of chain. If the length is increased 3%, the chain must be thoroughly inspected. If the length is increased by 5% or more, the chain shall be replaced.
- Deformed links: Deformed (twisted or bent) links, or any chain in which a link assembly does not hinge freely with the adjoining link.
- Cuts, gouges, or nicks: If the depth of the cut or gouge exceeds the value shown in Table 2, the assembly shall be replaced.
- Cracks: Cracks and other visible damage that causes doubt as to the strength of the chain.

6.2.3 Synthetic Webbing Slings

- Missing or illegible sling ID & load rating tag
- Acid or caustic burns.
- Melting or charring of any part of the sling.
- Snags, holes, tears, or cuts.
- Broken or worn stitches.
- Excessive abrasive wear.
- Knots in any part of the sling.
- Wear or elongation exceeding the amount recommended by the manufacturer.
- Excessive pitting or corrosion, or cracked, distorted, or broken fittings.
- Other visible damage that causes doubt as to the strength of the sling.

6.2.4 Attachments

- Hooks that have been opened more than 15% of the normal throat opening (measured at the narrowest point) or twisted more than 10% from the plane of the unbent hook.
- Deformed master links and coupling links.
- Assemblies with cracked hooks or other end fittings.
- Excessive pitting or corrosion, or distorted or broken fittings.
- Other visible damage that causes doubt as to the strength of the attachment.
- Shackles: See the Fugro “Shackle Use and Inspection Procedure”.

7.0 MAINTENANCE

Slings and rigging hardware shall be stored in an area where they will not be subjected to mechanical damage, corrosive action, moisture, and extreme temperatures or kinking. Some slings, when stored in extreme temperatures will experience reduced performance. Further consideration should be made with regard to storage and use in extreme conditions. Complete HS-RF19 Equipment Maintenance for reporting sling and rigging hardware deficiencies. Slings and rigging hardware are not to be repaired. Once received by maintenance, slings and rigging hardware shall be made where they cannot be used and disposed of accordingly.

8.0 TRAINING

Training shall be conducted in accordance with HS-R72 Indoor Cranes.

9.0 APPLICABLE FORMS

HS-R72 Indoor Cranes

HS-F98 Sling Inspection

HS-RF19 Equipment Maintenance

10.0 REFERENCES

ASME B30.20, ASME B30.26, ASME B30.9

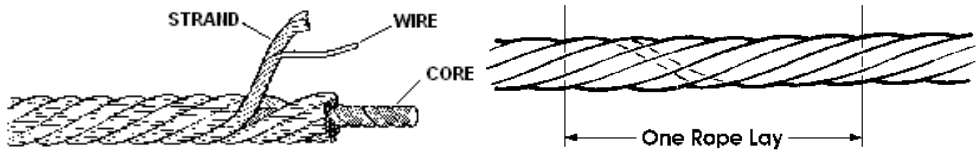
OSHA 1910.184

Rev. #	Date	DCR #	Approved By:	Description of Change:
0	5/2012	---		Initial Document Release

APPENDIX 1 - INSPECTING WIRE ROPE FOR BROKEN WIRES

Inspecting Wire Rope for Broken Wires

Sling Body	Allowable broken wires per lay or one braid	Allowable broken wires per sling length
Less than 8-part braid	20	1
Cable laid	20	1
8-part braid or more	40	1



Note: One rope lay is one complete wrap of a strand around the core

APPENDIX 2 - ALLOWABLE CHAIN WEAR

Allowable Chain Wear

Nominal Chain Size	Maximum Allowable Wear of Diameter
9/32 in (0.7 cm)	0.037 in (.09 cm)
3/8 in (0.9 cm)	0.052 in (.13 cm)
1/2 in (1.3 cm)	0.069 in (.18 cm)
5/8 in (1.5 cm)	0.084 in (.21 cm)
3/4 in (1.9 cm)	0.105 in (.27 cm)
7/8 in (2.1 cm)	0.116 in (.29 cm)
1 in (2.5 cm)	0.137 in (.35 cm)
1-1/4 in (3.1 cm)	0.169 in (.43 cm)

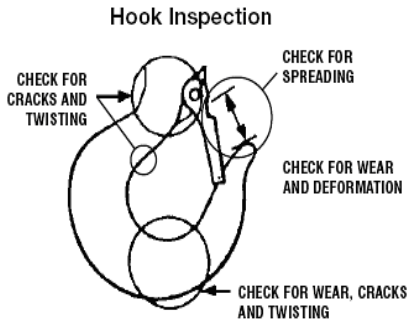

WORN LINKS

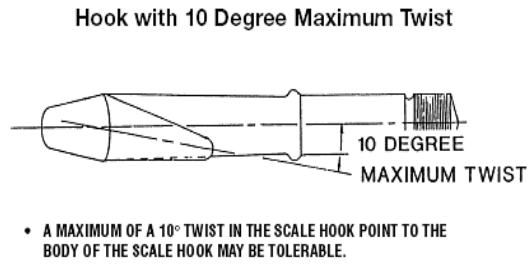

BENT LINKS

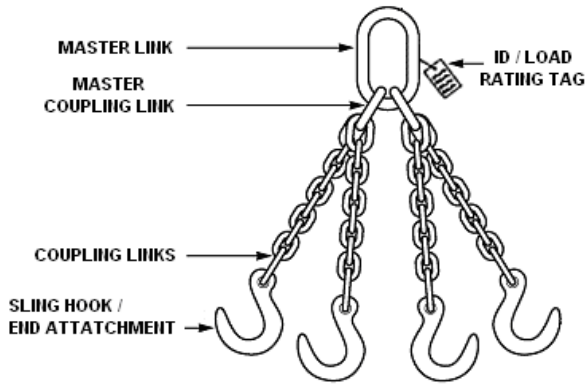

GOUGED LINKS


STRETCHED LINKS

APPENDIX 3 - ATTACHMENTS







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APPENDIX 4

PERMIT TO WORK HS-R72, HS-F15

PERMIT TO WORK
HS-R72

1.0 INTRODUCTION

1.1 SCOPE

This documented procedure is applicable to all FCL personnel as well as any client or subcontractor working at a FCL project or facility.

1.2 PURPOSE

The purpose of this procedure is to define the Fugro Consultants, Inc (FCL) Permit to Work (PTW) process. This procedure sets out the requirements for work involving high risk activities, which are to be controlled by a PTW. A PTW is an extension of a safe system of work and should not be seen as a replacement for it.

2.0 DEFINITIONS

- Hot Work
  Such as: welding, grinding, burning, torch-cutting, etc.

- Confined Space
  Work area that has limited or restricted means for entry or exit and is not designed for continuous employee occupancy. Such as: tanks, vessels, storage bins, excavations, etc.

- Electrical Work
  Work on electrical installations/equipment. All work involving possible contact with live electrical equipment, motors and/or conductors.

- Equipment Maintenance
  Work on mechanical installations/equipment. All work involving possible exposure to stored energy, and/or, where there is a risk of the equipment being started remotely, and/or, where there is a chance of entanglement, trapping or crushing, etc.

- Working At Height
  Work above 4' (general industry) and 6' (construction). Excluding work in guarded/protected work areas or platforms.

- PTW Recipient
  An employee planning a work activity that involves hot work, confined space entry, electrical work, equipment maintenance or work at height.

- PTW Approver
  The PTW Recipient's supervisor or another employee designated/competent to issue a PTW.

3.0 PROCEDURE

The PTW shall be completed by the person supervising or undertaking the work activity (PTW Recipient) and approved by the appropriate supervisor (PTW Approver) prior to undertaking the activity. In the event that the task to be performed is not covered by this PTW procedure, as defined above, a Jobsite Hazard Analysis (JHA) should be completed to document and mitigate the hazards of the task. The JHA should be approved by the appropriate supervisor prior to undertaking the activity. Implementation of the PTW system includes the following general principles:

1) Assessment of the work activity/task by the PTW Recipient and the PTW Approver.

2) Completion of the PTW (HS-F15) with detailed and accurate information:
   - The work activity/task to be undertaken.
   - Location of the work.
   - Identification of significant precautions/control measures including personal protective equipment (PPE).
   - Validity, e.g. date, start and completion time.
   - Associated risk assessment and method statements (if applicable).

3) Completed PTW forms must be filed and posted as follows:
   - Approved PTW shall be present at the location of the work.
   - If the work activity/task is not completed within a 12 hour period, the PTW Recipient shall inform the PTW Approver, who may, at their discretion, re-validate the permit for a further 12 hours. Any further extension shall require a new permit to be issued.
   - Once work activity/task(s) are completed, the PTW should be returned to the PTW Approver for review/filing.
   - When the work activity/task(s) are completed, the PTW Approver should inspect the location/work area ensuring that it is safe. The PTW will be closed out by the PTW Approver on completion of the inspection.

Rev. #	Date	DCR #	Approved By:	Description of Change:
0	2/2014	---	CM	Initial Document Release

PERMIT TO WORK

FORM HS-F15

24-Hour Emergency Safety Number
1-888-333-4577

Work to be completed:		**Location of Work:**	
Date of Work:		**Permit Recipient:**	
Permit Issue Time:		**Permit Approver:**	
Permit Expire Time:		**Permit Extended?**	☐ Yes ☐ No ☐ N/A
Permit Completion Time:		**Permit Extension Approval (approver's initials):**	

Risk Assessment Carried Out	☐ Yes ☐ No	**Emergency Procedures in Place** (ie Rescue Plan)	☐ Yes ☐ No ☐ N/A
Lock Out / Tag Out applicable?	☐ Yes ☐ No	**Toolbox Talk Conducted?**	☐ Yes ☐ No

Confined Space Entry ☐ N/A		**Work At Height** ☐ N/A	
Space thoroughly ventilated;	☐ Yes ☐ No ☐ N/A	Fall Protection to be utilized;	☐ Yes ☐ No ☐ N/A
Atmosphere tested and found to be safe; Clean certificate obtained (rail cars)	☐ Yes ☐ No ☐ N/A	Fall Protection inspected;	☐ Yes ☐ No ☐ N/A
Rescue and resuscitation equipment available at entrance; Rescue plan developed;	☐ Yes ☐ No ☐ N/A	Employee trained in fall protection use;	☐ Yes ☐ No ☐ N/A
Responsible person in attendance at entrance;	☐ Yes ☐ No ☐ N/A	Freefall less than 6 feet;	☐ Yes ☐ No ☐ N/A
Communication arrangements made between person at entrance and those entering;	☐ Yes ☐ No ☐ N/A	Fall distance / length of fall protection adequate;	☐ Yes ☐ No ☐ N/A
Access and illumination adequate;	☐ Yes ☐ No ☐ N/A	100 % Tie-Off;	☐ Yes ☐ No ☐ N/A
All equipment to be used is of approved type;	☐ Yes ☐ No ☐ N/A	Guardrail system in place / sufficient;	☐ Yes ☐ No ☐ N/A
When breathing apparatus is to be used: Familiarity of user with apparatus is confirmed; Apparatus has been tested and found to be satisfactory.	☐ Yes ☐ No ☐ N/A	Scaffolding inspected / tagged;	☐ Yes ☐ No ☐ N/A
Equipment Maintenance ☐ N/A		**Electrical Work** ☐ N/A	
Removed from service / isolated from source of power / energy source;	☐ Yes ☐ No ☐ N/A	Equipment fully de-energized;	☐ Yes ☐ No ☐ N/A
All relevant personnel informed;	☐ Yes ☐ No ☐ N/A	Lock/ Out Tag Out required;	☐ Yes ☐ No ☐ N/A
Warning notices displayed;	☐ Yes ☐ No ☐ N/A	Hazardous atmosphere assessed;	☐ Yes ☐ No ☐ N/A
Hot Work ☐ N/A			
Ventilation adequate;	☐ Yes ☐ No ☐ N/A	Fire extinguisher in good order;	☐ Yes ☐ No ☐ N/A
Equipment in good working order;	☐ Yes ☐ No ☐ N/A	Area clear of dangerous material and gas-free;	☐ Yes ☐ No ☐ N/A
Fire watch in place (To remain in place for a minimum of 30 minutes after completion of hot work); N/A			☐ Yes ☐ No ☐

Acknowledgement:

Permit Recipient Name:		Permit Recipient Signature:	
Permit Approver Name:		Permit Approver Signature:	

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APPENDIX 5
CRITICAL SPARES

CRITICAL SPARES

1: Casing hammer parts
- -spare lifting chains X 2
- -spare driver chain
- -spare connecting links for both lifting and driver chains
- -spare top seal

2. Top drive parts
- -spare swivel seals
- -spare drive motor
- -spare bottom seals

3. Drive line parts
- -All drive line parts including u-joints are readily available at Young's Gear

4. Hydraulic lines and air lines
- -All lines and hoses are readily available at Oil and Gas Supply in Nikiski

5. Oil and air filters
- -All filters are Napa brand and readily available In Kenai

6. Oil and lubricants
- -All oil and lubricants are Chevron brand and available in Kenai

7. Air Compressor
- -Available in Kenai

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APPENDIX 6
WATER QUALITY SAMPLING SCHEDULE

Well Id	April Sampling Event General Groundwater Quality Suite (Table 2) - Completed	APT Water Quality Sampling Event A (prior to Pumping Test 1)	Water Quality Parameter Monitoring Event A (APT 1 & 2)	APT Water Quality Sampling Event B (prior to Pumping Test 2)	Water Quality Parameter Monitoring Event B (APT 3)	July/August Sampling Event Water Supply Quality Suite (Table 3)	Notes
MW-27B	X1		Y		Y	X1	
MW-39A	X					X	
MW-39B	X					X	
MW-50A	X					X	
MW-50B	X					X	
MW-62A	X					X	
MW-74A	X		Y			X	
MW-74B	X		Y			X	
MW-82A	X		Y		Y	X	
MW-82B	X		Y		Y	X	
MW-87B	X1		Y		Y	X1	
MW-91A	X		Y			X	
MW-138B			Y		Y		
APT-1	not available	Z1	Y	Z	not available	not available	deepened to become APT3
APT-2	not available	Z1	Y	Z	Y	Z	
APT-3	not available	not available	not available	Z1	Y	Z	lab required prior to pumping
OW-1	not available	X	Y	X	Y		originally premised for Z analytes
OW-2	not available	Z	Y	Z	Y	Z	
OW-3	not available	X	Y	X	Y		originally premised for Z analytes
OW-4	not available	Z	Y	Z	Y	Z	
Third Party W-1	X1		Y	X1	Y	X1	originally premised for Z analytes
Third Party W-2 (Decker)	X1		Y	X1	Y	X1	originally premised for Z analytes
Third Party W-5		Z	Y		Y	Z	
Third Party Well (PQW-1)	X1		Y	X1	Y	X1	originally premised for Z analytes

Notes:

1 = Samples additionally analyzed and reported per ADEC requirements for TAH (BTEX) and TAqH (PAH).

X = initial basic suite of analytes

Z = comprehensive water supply suite of analytes

Y = monitoring with field WQ probe

? = lower priority/optional

Required for submittal to ADEC

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ALASKA LNG (AKLNG) Well Sampling		Issue: 1 Rev 1
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Originated from: **Jeriann Alexander, PE, REA**		Reviewed/authorized for issue by: Jeriann Alexander, PE, REA

A METHOD STATEMENT IS ONLY A SAFE METHOD OF WORKING IF IT IS DISCUSSED AND AGREED BEFORE WORK BEGINS AND THEN FOLLOWED BY THOSE CARRYING OUT THE WORK.

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ALASKA LNG (AKLNG) Well Sampling		Issue: 1 Rev 1
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1. Introduction

This Method Statement relates to groundwater monitoring activities.

2. Main Activity / Area of Work

Existing monitoring wells and 3rd party wells located within the AKLNG property boundary including the area of staging located at the ASRC. Groundwater sampling activities will include:

- Mobilizing and demobilizing to the staging area and each individual well location
- Data logger water level data retrieval, and removal of data logger equipment
- Use of down-hole water level indicators and water quality parameter meters
- Use of down-hole low-flow electric pumps to purge the wells and for sampling
- Pump power provided by gasoline powered generators
- Shipping of samples to the analytical laboratory
- Relocation of purge water to the temporary drum storage area
- Replacement of data logger equipment
- Re-securing of the wells
- Transportation and disposal of well purge water at an approved facility

3. Manpower and Supervision

The table below lists the manpower involved with groundwater monitoring activities and their responsibilities.

Nominated Person	Responsibility
Lead Hydrogeologic Services Manager	• Overall responsibility for all site activities • Advise hydrogeologic staff on the requirement to comply with this method statement in order to enable the work to be carried out safely and obtain the required quality

Field Hydrogeologist/ Engineer/Site Manager	• Overall responsibility for groundwater monitoring activities • Conducts water level retrieval from data loggers • Ensures subcontractors follow standard operating procedures and project requirements for site access and monitoring activities • Communications with the Lead Hydrogeologic Services Manager during the monitoring activities
SLR Lead Scientists and Scientists	• Conducts water level monitoring and sampling activities in accordance with project requirements • Facilitates water sample delivery to the laboratory • Secures wells after sampling • Relocates purge and sampling water to labelled, approved containers staged at a temporary storage area

4. Associated Documents (Drawings, Manuals, Method Statements, Plans, Permits)

The table below lists the other documents relevant to the groundwater sampling activities.

Document	**Reference Number**
Alaska LNG Project Execution Plan	Latest Issue
Alaska Emergency Response Plan	Latest Issue
Project Contact List	Latest Issue
Water Quality Monitoring Field and Data Collection Procedures	Latest Issue
Routing Maps	Latest Issue
Groundwater Sampling Form	Latest Issue
Meter Calibration Logs	Latest Issue

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5. Risk Assessments

Risk assessment and Field Standard Operating Procedures for data collection activities are listed in the following table and are held on site enclosed in the Project Execution Plan.

Risk Assessment	**HYD-TRA-001 Water Quality Testing, ON-GN-TRA-303 Thunder-Lightning Storms, ON-GN-TRA-311 Material Handling and Moving, ON-GN-TRA-349 Driving Off-Road**
SOP	**Water Quality Monitoring, Field Sample and Data Collection Procedures**

6. Security - Barriers/Fences/Warning Signs

Access to the well locations will be restricted to Fugro employees, Client Representatives and Land Agents, and SLR International, the sampling subcontractor.

Wells are to be re-secured following all monitoring and sampling activities.

7. Constraints/Restrictions/Special Conditions

Monitoring and sampling activities will take place during daylight hours only.

Water Quality tests will be conducted on a combination of AKLNG and privately owned properties. The AKLNG Land Agents are responsible for obtaining a right of entry permit for each property. The Lead Field Hydrogeologist will develop a look ahead schedule with the Site Manager, who will then relay this information on to the Land Agents with a request for notification of any special Right of Entry (RoE) restrictions for the upcoming (and adjacent) parcels. During daily logistics meetings, the Field Hydrogeologist will communicate with the Site Manager on areas where work will be performed on subsequent days to ensure any special RoE restrictions are understood.

Extra precautions should be implemented in inclement weather conditions such as heavy rain and thunder/lightning storms. The instrument and all cable connectors should be protected against rain and/or surface water. During thunder/lightning storms data collection activities should cease and all cables disconnected. Further information regarding general work activities during such inclement weather can be found in Task Risk Assessment ON-GN-TRA-303 Thunder and Lightning Storms.

8. Plant and Equipment

The following equipment will be used during sampling activities:

- Field transportation vehicle for staff, equipment and supplies
- Hunting cart or similar to enable transportation of equipment and supplies over difficult terrain, as necessary
- YSI 556 multi-parameter water meter equipped with a flow through cell
- LaMotte 2020e turbidimeter
- Low-flow electric pumps
- Gasoline powered generators
- Water Level Indicator
- Sampling containers
- Bailers

9. Materials (handling/storage/disposal)

Purge water will be collected and stored in buckets and pails with lids, pending transportation back to the staging area. At the staging area, the water will be transferred into 55-gallon drums which will be temporarily stored onsite pending review of the analytical data. The drums will be labelled to their content and generation data.

Disposal will be handled in coordination between the Field Hydrogeologist, Site Manager, and NRC staff.

10. Preparation of Works/Location of Services

The location of the wells to be sampled are shown on Plate 1, attached. Access routes to each well locations are depicted in following plates, attached. On a daily basis during tool box talks and JHA completion, the specific locations of the well sampling activities, along with ingress and egress routes will be discussed.

11. Emergency Procedures

Details of emergency response are incorporated in the project Specific Emergency Response Plan found in Appendix O.

The field crew will include a First Aid / CPR trained person and a first aid kit with saline eye wash will be available on site. Additionally, a roaming Wildlife Safety Specialist carrying an AED will be available to crews. Each field team will carry a card with contact numbers of key project personnel (site manager, SSHE contacts) and local facilities (fire / EMS departments, hospitals etc.). In

addition, at least one person per team will be registered with the Kenai Borough Council, Office of Emergency Response, Rapid Response Notification System, which provides reports of local emergency / heightened awareness situations / conditions (severe weather, earthquake, tsunami, etc.).

12. Personal Protective Equipment (PPE) & Safety Equipment

The following personal protective equipment shall be worn during operations:

Item	Description
Safety boots/shoes, hard hat and Hi-Viz vest or clothing, long-sleeved shirt and pants	Mandatory (for all site activities per Part D of the Project Execution Plan)
Gloves	As per risk assessment
Safety glasses	As per risk assessment
Ear defenders/ear plugs	Mandatory if noise above FAL 80dB(A)

Additional personal protective equipment to comply with the accompanying SDS guidelines and for unplanned site operations (such as vehicle maintenance or recovery) should be procured and readily available locally (i.e. at site office) or as deemed required by the Field Hydrogeologist and Lead Scientist, and/or Site Manager.

13. Methodology & Sequence of Work

- Open well lid
- Use a water level indicator to measure depth to water
- Remove data logger (if applicable)
- Use of down-hole water quality parameter meter
- Use of down-hole low-flow electric pumps to purge the wells and for sampling
- Generator used to power down hole pumps
- Relocation of purge water to the temporary drum storage area
- Replacement of data logger equipment (if applicable)
- Re-securing of the well head
- Transport water samples to the laboratory

24-Hour Emergency Safety Number
1-888-333-4577

TASK RISK ASSESSMENT (TRA)

WELL SAMPLING
FORM NO. HYD-TRA-001

ACTIVITY:	Well Sampling	Date:	4/11/2016
Department Involved:	Hydrogeology and Subcontractors	Client:	AKLNG
Title of Person Performing Task:	Field Technician	Location of Activity:	Field

Please Remember: All hazards are important. Make notice of all possible hazards. Detailed safe job procedures are necessary. Awareness, teamwork, communications, and alertness apply to every situation. Use complete recommendations to eliminate or reduce hazards. This Task Risk Assessment is a compilation of potential hazards that should be expected while conducting this task. If actual work conditions or hazards require deviations from this Task Risk Assessment the employee must take the appropriate safety measures and document any changes to the Sequence of basic job steps, potential accidents or hazards, and recommendations to eliminate or reduce potential hazards listed or not listed in this Task Risk Assessment. Changes should be documented on the Jobsite Hazard Analysis (JHA) form. In addition, hazards associated with jobsite conditions should be documented on the JHA and communicated to those involved in the task.

Description of Activity / Task: Purging and sampling of existing wells

PERSONAL PROTECTIVE EQUIPMENT:

	X		Hard Hats		X		Fire Extinguisher		X		Reflective Work Vest
	X		Safety Shoes				Safety Glasses w/ Side Shields				2- Life Rings w/ 90' Floating Line
	X		Hearing Protection (if>80dB)		X		Goggles				Tag Lines
			Cotton Gloves				Face Shield				Work Permit Required
			Leather Gloves				Back Belts				Lockout/Tagout
	X		Rubber Gloves				Safety Harness				Barricade
			Welder Gloves				Floor Mat				
			Welder Helmet				Dust Mask				

WELL SAMPLING

Job Steps	Hazards	Population At Risk	Initial Risk Rating	Control Measures	Residual Risk Rating	Risk Action
Mobilization	Trips and falls by crews Stuck vehicles/equipment Wildlife	Sampling personnel	C2	Walk locations prior to moving equipment onto location Wildlife safety specialist onsite during prewalk Use of buddy system Ground truthing Mark access route, as needed Address trip and fall hazards of location during toolbox talks/jobsite hazard analysis Use proper PPE	C1	1
Well Sampling	Remote well locations Removal and replacement of data logger Use of downhole field meters and pump Use of generators Electric shock Management of samples Relocation of purge water Re-securing wells	Sampling personnel Environment	C2	Use of environmentally and HSE trained practitioners Use of buddy system Follow Method Statements, SOPs, BMPs Take breaks as required Frequent Site Manager checks on staff in all locations Onsite contingency supplies and equipment to aid in retrieval of equipment downhole Generators to be placed in “duck ponds” Pump electrical cable not to be connected to electrical power until pump is in place downhole Electrical power source to be properly grounded Inspected fire extinguishers on-site	C1	1

WELL SAMPLING

Job Steps	Hazards	Population At Risk	Initial Risk Rating	Control Measures	Residual Risk Rating	Risk Action
				Spill Kits Available on-site Transportation of water only in sealed containers to secured drum staging area Provision of extra sampling containers in case of breakage		
Demobilization	Loss of Reputation Injury	Sampling personnel Fugro	C2	Clean site properly before leaving site. Ensure hazards removed from site	C1	1

WELL SAMPLING

Risk Matrix and Risk Actions

Hazard severity	Reputation	Assets	Environment	People	Likelihood: A - Very unlikely (a freak combination of factors required for incident to result)	B - Unlikely (a rare combination of factors would be required for an incident to result	C - Possible (could happen when additional factors are present but otherwise unlikely to occur)	D - Likely (not certain to happen but an additional factor may result in an accident)	E - Very Likely (almost inevitable that an incident would result)
1.Slight	Slight Impact	1- Slight damage, less than $25,000 U.S.	Little or no actual or potential for damage.	1 - Slight health effect/injury (First Aid)	A1	B1	C1	D1	E1
2.Minor	Limited Impact	2 - Minor damage, 25,000 - $100,000 U.S.	Within site boundary, short term impact recoverable by the work site	2 - Minor health effect/ injury (RWC MTO)	A2	B2	C2	D2	E2
3.Major	Considerable Impact	3 - Major damage, $100,000 - $500,000 U.S.	Beyond the site boundary unlikely to last beyond 1 month. Recovery may require external aid.	3 - Major health effect/ injury (DAWC)	A3	B3	C3	D3	E3
4.Severe	National Impact	4 - Severe damage, $500,000 - $1,000,000 U.S.	Beyond the site boundary unlikely to last beyond 12 months. Recovery requires external aid.	4 - Permanent Total Disability or single fatality	A4	B4	C4	D4	E4
5.Catastrophic	International Impact	5 - Extensive damage, greater than $1,000,000 U.S.	Massive uncontrolled release with significant impact extending well beyond the site boundary.	5 - Multiple serious injuries or fatalities	A5	B5	C5	D5	E5

Green (Low)	**Acceptable (When risk reduction / control measures have been implemented). Ensure controls are maintained and manage for continuous improvement.**
Yellow (Medium)	**Tolerable (When risk reduction / control measures have been implemented). Where possible, the work activity / task should be redefined to take account of the hazards involved or the risk should be reduced further prior to task commencement.**
Red (High)	**Intolerable (Work activity / task must not proceed). It should be redefined or further control measures put in place to reduce risk. The controls should be re-assessed for adequacy prior to task commencement.**

24-Hour Emergency Safety Number
1-888-333-4577

TASK RISK ASSESSMENT (TRA)

THUNDER/LIGHTNING STORMS
Form No. ON-GN-TRA-303

ACTIVITY:	Working near thunder & lightning storms	Date:	3/30/15
Department Involved:	Various	Client:	AKLNG
Title of Person Performing Task:	Various	Location of Activity:	Alaska

Please Remember: All hazards are important. Make notice of all possible hazards. Detailed safe job procedures are necessary. Awareness, teamwork, communications, and alertness apply to every situation. Use complete recommendations to eliminate or reduce hazards. This Task Risk Assessment is a compilation of potential hazards that should be expected while conducting this task. If actual work conditions or hazards require deviations from this Task Risk Assessment the employee must take the appropriate safety measures and document any changes to the Sequence of basic job steps, potential accidents or hazards, and recommendations to eliminate or reduce potential hazards listed or not listed in this Task Risk Assessment. Changes should be documented on the Jobsite Hazard Analysis (JHA) form. In addition, hazards associated with jobsite conditions should be documented on the JHA and communicated to those involved in the task.

Description of Activity / Task:

For more info see: NOAA
http://www.lightningsafety.noaa.gov/overview.htm and

The National Lightning Safety Institute
http://www.lightningsafety.com/nlsi_pls.html

For more information on tornadoes see:
http://www.spc.noaa.gov/faq/tornado/

PERSONAL PROTECTIVE EQUIPMENT:

	Hard Hats		Fire Extinguisher		Class 3 Reflective Work Vest
	Safety Shoes		Safety Glasses w/ Side Shields		2- Life Rings w/ 90' Floating Line
	Hearing Protection		Goggles		Tag Lines
	Cotton Gloves		Face Shield		Work Permit Required
	Leather Gloves		Back Belts		Lockout/Tagout
	Rubber Gloves		Safety Harness		Water for Hydration
	Welder Gloves		Floor Mat		
	Welder Helmet		Dust Mask		

THUNDER/LIGHTENING STORMS
GP-303

Job Steps	Hazards	Population At Risk	Initial Risk Rating	Controls Measures	Residual Risk Rating	Risk Action
Conducting fieldwork in areas with risk of developing thunderstorms.	Being struck by lightning	Employee	B5	Post a spotter to monitor developing weather and allow for enough lead time to safely shut down operations in advance of approaching storm. Consider utilizing a lightning detection device. If thunder or lightning are observed, immediately seek safe shelter. "If thunder roars, go indoors." The safest place is a fully enclosed building. The roof, walls, floor, plumbing and wiring of a fully enclosed building provide pathways for the electrical current to get to ground safely (so you don't become the path!). Once inside, avoid any path that may conduct electricity such as corded phones or radios, wires, TV cables, metal doors and window frames. Stay away from and don't use plumbing and electric appliances (even computers). Do not lie on concrete floors or lean against concrete walls. If a safe building is not available, seek shelter in a fully enclosed, metal topped vehicle. Do not touch any metal or use electronics, especially 2-way radios with external antennas, but also cell phones, lap top computers or GPS devices.	B2	LOW

THUNDER/LIGHTENING STORMS
GP-303

Job Steps	Hazards	Population At Risk	Initial Risk Rating	Controls Measures	Residual Risk Rating	Risk Action
Conducting fieldwork in areas with risk of developing thunderstorms. (continued)	Being struck by lightning (continued)	Employee	B5	If a safe building or vehicle is not available, move to the topographically lowest nearby location. Stay away from water, wet items, metal (esp. fences), ridgelines, and tall objects such as trees. Put your feet together, crouch down into a ball, tuck your head, and cover your ears to reduce hearing damage. Only your feet should touch the ground; the objective is to be as low as possible while at the same time minimizing your contact with the ground. Keep a distance of 15 ft between people. No place outside is safe from lightning! NOAA and the Lightning Safety Institute recommend to continue sheltering and the suspension of activities for 30 minutes after the last observed lightning or thunder because lightning can strike 10-25 miles away from thunderstorms (i.e. “Bolts from the blue”). Be sure the threat of lightning has passed before resuming activities. Using “Flash-to-bang” ratios may help estimate the proximity to lightning. For each 5 seconds from seeing lightning to hearing the associated thunder, lightning is 1 mi (1.6 km) away. (For example, a count of 10 sec = 2 miles (2.4 km); 15 sec = 3 miles; etc.) However, remember that lightning can unpredictably strike 10s of miles from a thunderstorm; move to shelter as soon as lightning is observed heading your way. If Lightning victims are not electrified; they may need immediate first aid or CPR. Administer CPR and seek trained medical help immediately (only touch the individual if the electrical charge has dissipated).	B2	LOW

THUNDER/LIGHTENING STORMS
GP-303

Job Steps	Hazards	Population At Risk	Initial Risk Rating	Controls Measures	Residual Risk Rating	Risk Action
Conducting fieldwork in areas with risk of developing thunderstorms. (continued)	Lightning starts a fire that spreads rapidly from thunderstorm-derived winds.	Employee	C2	Call 911 to report fire and evacuate area. Leave behind tools and equipment; they are not worth your life. If evacuation is not possible, retreat to a safety zone. Safety zones include areas with little to no flammable material or areas already burned over.	B2	LOW
	Injury from hail, including hail-induced vehicle accidents.	Employee	B4	Seek shelter from falling hail in stout building or fully enclosed vehicle. If driving, slow down and pull off road in safe location. Hail can reduce visibility and accumulate rapidly to depths that make driving dangerous.	B2	LOW
	Heavy rain and flash floods	Employee	B4	Heavy rain can reduce visibility and cause fast moving vehicles to hydroplane. Slow down and pull off road in a safe, topographically high location. Do not drive through standing water, even if looks shallow. Rain falling miles away may cause flash floods that arrive at your location with little to no warning. Immediately seek high ground at the first sign of rising waters or during heavy rain.	B2	LOW
Conducting fieldwork in areas with risk of developing thunderstorms. (continued)	High Winds and Tornados	Employee	B5	Discuss and decide on a plan of action before a tornado or high winds threaten. Post a spotter to monitor developing weather at your location and also the issuance of regional high wind or tornado watches and warnings via NOAA weather radio, local radio and TV, or the internet (www.weather.gov). Do not wait until you see the tornado: seek shelter as soon as a warning is issued. The safest shelter is a basement, storm cellar, or safe room. Next best is an interior room on the lowest floor having no windows. Mobile homes and construction office trailers are not safe; abandon them. If you cannot	B2	LOW

THUNDER/LIGHTENING STORMS
GP-303

Job Steps	Hazards	Population At Risk	Initial Risk Rating	Controls Measures	Residual Risk Rating	Risk Action
				quickly walk to sturdy shelter, drive to shelter (with seat belt on). If flying debris occurs while you are driving, pull over and park. Now you have the following options as a last resort: • Stay in the car with the seat belt on. Put your head down below the windows, covering with your hands and a blanket if possible. • If you can safely get noticeably lower than the level of the roadway, exit your car and lie in that area, covering your head with your hands.		

THUNDER/LIGHTENING STORMS
GP-303

Risk Matrix and Risk Actions

Hazard severity	Reputation	Assets	Environment	People	Likelihood: A - Very unlikely (a freak combination of factors required for incident to result)	B - Unlikely (a rare combination of factors would be required for an incident to result	C - Possible (could happen when additional factors are present but otherwise unlikely to occur)	D - Likely (not certain to happen but an additional factor may result in an accident)	E - Very Likely (almost inevitable that an incident would result)
1.Slight	Slight Impact	1- Slight damage, less than $25,000 U.S.	Little or no actual or potential for damage.	1 - Slight health effect/injury (First Aid)	A1	B1	C1	D1	E1
2.Minor	Limited Impact	2 - Minor damage, 25,000 - $100,000 U.S.	Within site boundary, short term impact recoverable by the work site	2 - Minor health effect/ injury (RWC MTO)	A2	B2	C2	D2	E2
3.Major	Considerable Impact	3 - Major damage, $100,000 - $500,000 U.S.	Beyond the site boundary unlikely to last beyond 1 month. Recovery may require external aid.	3 - Major health effect/ injury (DAWC)	A3	B3	C3	D3	E3
4.Severe	National Impact	4 - Severe damage, $500,000 - $1,000,000 U.S.	Beyond the site boundary unlikely to last beyond 12 months. Recovery requires external aid.	4 - Permanent Total Disability or single fatality	A4	B4	C4	D4	E4
5.Catastrophic	International Impact	5 - Extensive damage, greater than $1,000,000 U.S.	Massive uncontrolled release with significant impact extending well beyond the site boundary.	5 - Multiple serious injuries or fatalities	A5	B5	C5	D5	E5

Green (Low)	**Acceptable (When risk reduction / control measures have been implemented). Ensure controls are maintained and manage for continuous improvement.**
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24-Hour Emergency Safety Number
1-888-333-4577

TASK RISK ASSESSMENT(TRA)

MATERIAL HANDLING-MOVING AND STACKING MATERIALS
Form ON-GN-TRA-311

ACTIVITY:	Material Handling-Moving and Stacking Materials	Date:	3/30/15
Department Involved:	All	Client:	AKLNG
Title of Person Performing Task:	Technician	Location of Activity:	Alaska

Please Remember: All hazards are important. Make notice of all possible hazards. Detailed safe job procedures are necessary. Awareness, teamwork, communications, and alertness apply to every situation. Use complete recommendations to eliminate or reduce hazards. This TRA is a compilation of potential hazards that should be expected while conducting this task. If actual work conditions or hazards require deviations from this TRA, the employee must take the appropriate safety measures and document any changes to the Sequence of basic job steps, potential accidents or hazards, and recommendations to eliminate or reduce potential hazards listed or not listed in this TRA. Changes should be documented on the Jobsite Hazard Analysis (JHA) form. In addition, hazards associated with jobsite conditions should be documented on the JHA and communicated to those involved in the task.

Description of Activity / Task:

PERSONAL PROTECTIVE EQUIPMENT:

		Hard Hats			Fire Extinguisher		X		Reflective Work Vest (if applicable)
	X	Safety Shoes (if applicable)		X	Safety Glasses w/ Side Shields				2- Life Rings w/ 90' Floating Line
		Hearing Protection			Goggles				Tag Lines
	X	Cotton or Leather Gloves			Face Shield				Work Permit Required
		Leather Gloves		X	Back Belts (as needed)				Lockout/Tagout
		Rubber Gloves			Safety Harness		X		Barricades
		Welder Gloves			Floor Mat				
		Welder Helmet			Dust Mask				

MATERIAL HANDLING-MOVING AND STACKING MATERIALS
GP-311

Job Steps	Hazards	Population At Risk	Initial Risk Rating	Controls Measures	Residual Risk Rating	Risk Action
Preparing area where materials will be moved to	Hand Injuries	Employee	C2	Lift objects in a manner to avoid sharp or excess pressure on the hands. Wear leather or cotton gloves to prevent splinters while positioning pallet that will hold materials. Wear leather or cotton gloves while clearing area the materials will be placed to prevent cuts and scrapes.	B2	LOW
	Foot Injuries	Employee	C3	Keep feet/legs out of the drop zone of objects. Wear steel toed work boots while clearing area the materials will be placed to protect feet if objects are dropped.	B2	LOW
	Slips/Trips/Falls	Employee	C2	Clear path of travel involved in the moving of materials to prevent trips/falls. Check path of travel for liquid spills or granular material on the ground and clean up before moving materials to prevent slips. Check path of travel for uneven working surfaces before moving materials to prevent trips/falls. Cleanup or move any items that may become a hazard during the move. Select a different route if hazards cannot be mitigated. Make sure soles of shoes have appropriate non slip tread.	A2	LOW
	Other employees entering area where materials are being transferred	Employee	C2	Place a soft barricade around area, where applicable.	B2	LOW

MATERIAL HANDLING-MOVING AND STACKING MATERIALS
GP-311

Job Steps	Hazards	Population At Risk	Initial Risk Rating	Controls Measures	Residual Risk Rating	Risk Action
Preparing area where materials will be moved to (continued)	Inhalation/Eye Contamination	Employee	B3	Consult MSDS/SDS for all materials to be moved, if applicable. Wear a dust mask if bags are broken or materials may become airborne. Wear goggles if the potential exists for materials to be splashed/blown into eyes.	A2	LOW
	Materials not sufficiently supported causing failure	Employee	B2	Check the weight capacity of the storage area where the materials will be moved. Examples: shelves, tables, pallets, vehicle Stack materials on waist level shelves when possible	A2	LOW
Moving Materials	Back Strains/Injuries	Employee	C3	Refer to HS-R41 Lifting Guidelines before beginning lifting activity. Restrict single person manual lifts to < 50 lbs. Get help moving heavy, oversized, or odd shaped items. Avoid manually moving office furniture and equipment. A third party moving company shall be used to move / transport furniture / large equipment. When moving large objects on a dolly, secure object to dolly to prevent the object from falling/sliding off. If item begins to fall, do not attempt to stop the item from falling. Move out of the way to prevent injury. Report any pre-existing back related injuries to management before completing any lift. Perform stretching exercises prior to lifting. Wear back-belts (optional) for heavy or repetitive motions performed over a long period of time. Position yourself close to the object to be lifted. Use your legs to lift instead of your back. Do not bend or twist at the waist during the lift. Take breaks as necessary.	B2	LOW

MATERIAL HANDLING-MOVING AND STACKING MATERIALS
GP-311

Job Steps	Hazards	Population At Risk	Initial Risk Rating	Controls Measures	Residual Risk Rating	Risk Action
Moving Materials (continued)	Foot/Leg Injuries from falling materials	Employee	C3	Stack materials orderly and only as high as materials can be stacked safely. Wear cotton or leather gloves to increase grip on items being carried. Wear steel toed work boots while moving materials to protect feet if objects are dropped.	B2	LOW
	Hand Injuries	Employee	C3	Make sure hand, fingers, or other body parts are out of line of fire or pinch points before placing materials down. Wear leather or cotton gloves while moving materials to prevent cuts and scrapes.	B2	LOW
After Completing Move	Slips, Trips, Falls	Employee	C2	Clear and store all barricading devices. Perform housekeeping activities in the area that the materials were moved from, and area where materials were placed.	A2	LOW
	Potential hazards	Employee	C3	STOP and observe for potential hazards that can possibly be addressed before leaving.	B2	LOW

MATERIAL HANDLING-MOVING AND STACKING MATERIALS
GP-311

Job Steps	Hazards	Population At Risk	Initial Risk Rating	Controls Measures	Residual Risk Rating	Risk Action
Moving Materials (continued)	Hand Injuries	Employee	C3	Make sure hand, fingers, or other body parts are out of line of fire or pinch points before placing materials down. Wear leather or cotton gloves while moving materials to prevent cuts and scrapes.	B2	LOW
After Completing Move	Slips, Trips, Falls	Employee	C2	Clear and store all barricading devices. Perform housekeeping activities in the area that the materials were moved from and area where materials were placed.	A2	LOW
	Potential hazards	Employee	C3	STOP and observe for potential hazards that can possibly be addressed before leaving.	B2	LOW

MATERIAL HANDLING-MOVING AND STACKING MATERIALS
GP-311

Risk Matrix and Risk Actions

Hazard severity	Reputation	Assets	Environment	People	Likelihood: A - Very unlikely (a freak combination of factors required for incident to result)	B - Unlikely (a rare combination of factors would be required for an incident to result	C - Possible (could happen when additional factors are present but otherwise unlikely to occur)	D - Likely (not certain to happen but an additional factor may result in an accident)	E - Very Likely (almost inevitable that an incident would result)
1.Slight	Slight Impact	1- Slight damage, less than $25,000 U.S.	Little or no actual or potential for damage.	1 - Slight health effect/injury (First Aid)	A1	B1	C1	D1	E1
2.Minor	Limited Impact	2 - Minor damage, 25,000 - $100,000 U.S.	Within site boundary, short term impact recoverable by the work site	2 - Minor health effect/ injury (RWC MTO)	A2	B2	C2	D2	E2
3.Major	Considerable Impact	3 - Major damage, $100,000 - $500,000 U.S.	Beyond the site boundary unlikely to last beyond 1 month. Recovery may require external aid.	3 - Major health effect/ injury (DAWC)	A3	B3	C3	D3	E3
4.Severe	National Impact	4 - Severe damage, $500,000 - $1,000,000 U.S.	Beyond the site boundary unlikely to last beyond 12 months. Recovery requires external aid.	4 - Permanent Total Disability or single fatality	A4	B4	C4	D4	E4
5.Catastrophic	International Impact	5 - Extensive damage, greater than $1,000,000 U.S.	Massive uncontrolled release with significant impact extending well beyond the site boundary.	5 - Multiple serious injuries or fatalities	A5	B5	C5	D5	E5

Green (Low)	**Acceptable (When risk reduction / control measures have been implemented). Ensure controls are maintained and manage for continuous improvement.**
Yellow (Medium)	**Tolerable (When risk reduction / control measures have been implemented). Where possible, the work activity / task should be redefined to take account of the hazards involved or the risk should be reduced further prior to task commencement.**
Red (High)	**Intolerable (Work activity / task must not proceed). It should be redefined or further control measures put in place to reduce risk. The controls should be re-assessed for adequacy prior to task commencement.**

24-Hour Emergency Safety Number
1-888-333-4577

TASK RISK ASSESSMENT (TRA)

DRIVING OFF ROAD
ON-GN-TRA-349

ACTIVITY:	Driving off of paved roads	Date:	3/30/15
Department Involved:	Various	Client:	AKLNG
Title of Person Performing Task:	Approved Driver	Location of Activity:	Alaska

Please Remember: All hazards are important. Make notice of all possible hazards. Detailed safe job procedures are necessary. Awareness, teamwork, communications, and alertness apply to every situation. Use complete recommendations to eliminate or reduce hazards. This Task Risk Assessment is a compilation of potential hazards that should be expected while conducting this task. If actual work conditions or hazards require deviations from this Task Risk Assessment the employee must take the appropriate safety measures and document any changes to the Sequence of basic job steps, potential accidents or hazards, and recommendations to eliminate or reduce potential hazards listed or not listed in this Task Risk Assessment. Changes should be documented on the Jobsite Hazard Analysis (JHA) form. In addition, hazards associated with jobsite conditions should be documented on the JHA and communicated to those involved in the task.

Description of Activity / Task:

PERSONAL PROTECTIVE EQUIPMENT:

	Hard Hats		Fire Extinguisher		Reflective Work Vest
	Safety Shoes		Safety Glasses w/ Side Shields		2- Life Rings w/ 90' Floating Line
	Hearing Protection		Goggles		Tag Lines
	Cotton Gloves		Face Shield		Work Permit Required
	Leather Gloves		Back Belts		Lockout/Tagout
	Rubber Gloves		Safety Harness		Barricade
	Welder Gloves		Floor Mat	X	Seatbelt
	Welder Helmet		Dust Mask	X	Vehicle Recovery Gear (possible)

DRIVING OFF ROAD
GP-349

Job Steps	Hazards	Population At Risk	Initial Risk Rating	Control Measures	Residual Risk Rating	Risk Action
Drive to jobsite	Traffic accident Once on site potential accident with heavy equipment or pedestrian	Employee Public Asset	A5	Practice defensive driving. Review GP-310 Vehicle Usage. While on site particular care should be used by following the site specific speed limits and traffic signs. Obey all site posted warning and regulation signs.	C2	LOW
Pre start-up inspection	Vehicle failure	Employee Public Asset	A5	Check tire pressure, pedals, fluids, brakes, lights, suspension, horn, etc. in accordance with owner's manual instructions prior to starting the vehicle.	A3	LOW
Driving the vehicle	Losing control of the vehicle	Employee Asset	A5	Do not exceed speeds that are safe for the terrain. GO SLOW OFF ROAD. Drive on well defined trails or dirt roads whenever possible. Avoid off trail driving (i.e., "trailblazing") whenever possible. When going down hills keep the engine running and in gear, apply the brake and avoid sharp turns. Heavy loads affect the safety and stability of the vehicle. Always use caution when moving or towing heavy loads. Employees should be trained in off-road driving techniques, where available.	A3	LOW

DRIVING OFF ROAD
GP-349

Job Steps	Hazards	Population At Risk	Initial Risk Rating	Control Measures	Residual Risk Rating	Risk Action
Driving the vehicle (continued)	Colliding with vehicle, person or object	Employee Public Asset	A5	Observe local laws and regulations at all times. Be alert for obstacles - always look in the direction of travel. Maintain an adequate space cushion between yourself and other vehicles. Remember that pedestrians and animals are unpredictable in their movement.	A3	LOW
	Four Wheel Drive (4WD) Operation	Employee Public Asset	A5	Only use 4WD when needed. Consult vehicle owner's manual if driver is unfamiliar with vehicle specific steps for switching from 2WD to 4WD. Learn your vehicle. Follow all vehicle specific steps to switch from 2WD to 4WD. Operate vehicle in 4WD (high) for most off road driving conditions. Only operate in 4WD (low) when absolutely needed (e.g. climbing or descending steep hills). If driver anticipates needing 4WD (low) for the immediate section of road/trail ahead, make sure to switch into 4WD (low) prior to entering the difficult section. Absolutely no dry-pavement on road driving in 4WD (low). Use a relaxed and upright driving position with a loose grip on the steering wheel; keep thumbs out of the center section of the wheel, thus avoiding broken thumbs from steering wheel kickback. Check the area in which off-road travel is planned. Review local maps (if available). If in doubt, exit vehicle and scout the terrain ahead on foot. Does the vehicle have enough clearance for any obstacles in the path ahead?	A3	LOW

DRIVING OFF ROAD
GP-349

Job Steps	Hazards	Population At Risk	Initial Risk Rating	Control Measures	Residual Risk Rating	Risk Action
Driving the vehicle (continued)	Four Wheel Drive (4WD) Operation	Employee Public Asset	A5	Be aware of changing weather conditions. If heavy rain occurs move out of washes and low lying areas on the desert floor and head to high ground whenever possible. Avoid crossing flooded washes, wait for water flow to stop before deciding to move across a flooded wash. If you don't want to swim it, don't drive into it. Avoid stream crossings if possible. Do not drive across streams deeper than 12 inches. If a stream crossing is necessary, survey the crossing first: 1) What are the bottom conditions? Mud? Rocks? Traction or no traction? 2) What is the maximum water depth? 3) How fast is the water flowing? 4) Is there an accessible exit point across the stream? Do not drive against the current, cross at a right angle to the flow, or angle downstream to the opposite bank. Begin slowly and keep a steady speed while crossing. When in doubt, opt out.	A3	LOW
	Vehicle getting stuck	Employee Asset	B3	Avoid driving through areas where becoming stuck is a potential. Drive with another vehicle present, when possible. Carry a recovery bag with slings, shackles, and a shock arrestor if the chance of getting stuck is high. Only attempt to remove a vehicle if you are properly trained and risks have been adequately mitigated.	B2	LOW

DRIVING OFF ROAD
GP-349

Risk Matrix and Risk Actions

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					A - Very unlikely (a freak combination of factors required for incident to result)	**B - Unlikely** (a rare combination of factors would be required for an incident to result	**C - Possible** (could happen when additional factors are present but otherwise unlikely to occur)	**D - Likely** (not certain to happen but an additional factor may result in an accident)	**E - Very Likely** (almost inevitable that an incident would result)
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Water Quality Monitoring
Field and Data Collection Procedures
Alaska LNG Project
April 2016

Two groundwater sampling events will be conducted in 2016 following routine/standard operating procedures. The first event, in April 2016, will sampling twelve (12) existing monitoring wells and up to 3 3rd-party wells (if accessible), and the second sample event, in July/August 2016, will include sampling the original twelve (12) existing monitoring wells, plus seven (7) additional wells installed to support the Aquifer Pump Testing (APT) activities and up to five (5) samples collected from 3rd-party wells in the area. Existing monitoring and 3rd-party wells are shown on Plate 1. APT activity and 3rd-party wells are shown on Plate 2. Route maps to each well area are also attached.

Well water samples will be tested for various water quality analytes including those to assess general groundwater quality or water supply quality. Well locations are shown on the attached Plate 1. The attached Table 1 identifies the wells to be sampled during the two events and the suite of testing to be conducted. The attached Tables 2 and 3 present the analytical suites and quality assurance testing to be conducted.

Field staff involved with monitoring activities will include the field hydrogeologist of Fugro, and SLR International (SLR) environmental scientists. All field staff are considered trained environmental professionals well versed in water sampling. All staff will follow project required HSE practices and requirements.

Field well purging and sampling data will be collected on a daily basis and will document the activities conducted at each well location. Samples will remain iced or refrigerated following sampling and until delivery to the analytical laboratory. Chain of custody documents will accompany all samples to the analytical laboratory. Forms to be used during the events are attached.

Water level data recordation will be periodically downloaded by Fugro field staff and provided to the field hydrogeologist during 2016.

Details of well purging and sampling activities for existing and new wells are described below. Purging and sampling of Third-Party wells do differ from some of the details presented and notes will be added accordingly.

- Fugro will direct and oversee the activities of SLR International, a local environmental consulting firm which will conduct the field well purging and sampling activities. SLR will contract manage the sample delivery logistics with the analytical laboratory (SGS Anchorage). SLR will pick up the sample kits from SGS and transport them to the project site. After sampling, SLR will ship the samples via air freight to the laboratory with proper preservation and chain of custody (COC). SGS will pick up the samples at the airport (SLR will notify SGS of the shipment and anticipated timing of delivery).
- The field sampling team will consist of 2 to 3 SLR field scientists, 2 for the first event and 3 for the second event. The third scientist for the second event will be responsible for collecting fecal coliform samples, and transporting them to the airport for shipping each morning in order to meet an eight-hour post-sampling holding time. During afternoons or evenings, samples will be packaged for shipment, shipping paperwork (including COCs) completed, and sampling or logistics for the next day determined.

- Prior to starting each event, water level data will be collected by Fugro from all existing monitoring wells installed by Fugro that have dedicated dataloggers installed. Following data collection, Fugro will confer with AKLNG to confirm the wells to be sampled during each event. Should sufficient groundwater volume be observed within wells MW-77B or MW-91B; one of those wells may be considered for sampling, in lieu of well MW-14B.
- Industry-standard sampling protocol will be employed during purging and sampling of the monitoring, and pumped and observation wells in accordance with ASTMD 5903/4448 and ADEC guidelines. All equipment used down a well will be cleaned prior to each use. Prior to sampling, the depth to water will be measured in each well to be sampled and then the well will be purged at a rate of approximately 0.1 to 0.5 liters per minute using a variable speed, low-flow submersible impeller pump. Water levels will be checked periodically to monitor drawdown as a guide to manage flow rate. The objective will be to maintain a minimal drawdown (< 0.33 feet) during purging. Samples will be obtained using the low-flow pump.
- Water quality parameters [oxidation-reduction potential (ORP), pH, specific conductance, temperature, and dissolved oxygen (DO)] will be monitored during purging using a YSI 556 multi-parameter water meter equipped with a flow through cell. Turbidity will be measured using a LaMotte 2020e turbidimeter. The YSI multimeter and LaMotte turbidimeter will be calibrated daily, and calibration records retained and checked for verification of proper calibration. Field logs will be used to record field parameters, and document purging. Water quality measurements will be taken every three to five minutes. Purging will be considered complete once water quality parameters have stabilized. Parameters will be considered stable when three successive discrete measurements for at least three parameters (four if temperature is included), are within the following criteria (limits):
    - Temperature (°C), ±3% (minimum of ± 0.2 °C);
    - pH, ± 0.1 standard units;
    - Specific conductance, ±3% percent;
    - Dissolved oxygen (DO), ± 10%;
    - Oxidation/Reduction Potential (ORP), ± 10 millivolts; and
    - Turbidity, 10% for values greater than 5 NTU, if three values are less than 5 NTU, values are considered stabilized.
- If a well is low yield and purged dry, a sample will not collected until it has recharged to approximately 80% of its pre-purge volume, when practical. In this case, the well typically would be allowed to recharge and sampled the next day (without achieving stable parameters). Should they occur, these circumstances would be documented in field notes or logs.
- It is anticipated that purging will require approximately 30 minutes per well, pumping at 0.5 liters per minute, which equates to 15 liters per well (or 4 gallons). Total purge water

volume for 12 wells is anticipated to be 48 gallons (for the first event) and for 19 wells the volume is expected to be 76 gallons (for second event).

- For Third-Party wells, the wells will be purged by activating the well pumps and allowing water at the well head and prior to any treatment, for a period of 20 to 30 minutes while taking water quality parameter measurements. Once measurements appear to stabilize water samples will be obtained from the stream of water. If no pumps are present within the Third-Party wells, the wells will be sampled as per monitoring well procedures (described above).
- Samples will be analyzed on a standard turn-around basis. There are some analyses with short holding times (8 to 48 hours) which will require special handling in order to meet their respective holding times. Chlorophyll samples will be field filtered and frozen by SGS in Anchorage to extend the hold time from 48 hours to 3 weeks. Ortho-phosphate, turbidity and fecal coliform samples received on the weekends will be processed and analyzed to meet hold times, with other samples being stored in a cooler at the lab until analyses can be completed during standard business hours (Monday- Friday). As noted above, fecal coliform samples will be collected in the morning from wells purged and sampled the previous day, and shipped to the lab for analysis that afternoon to meet the 8 hour hold time. There is typically a flight about every 2 hours from Kenai to Anchorage and the flight takes about 30 minutes. There will be close coordination with the air carrier and lab to minimize any delays. However, it is possible flights will be delayed due to weather or other factors. In these cases, the samples can either be re-collected or qualified accordingly (AK LNG would be notified in any such case to determine the preferred approach).
- Quality assurance samples will be collected and analyzed as indicated on the attached tables. Duplicate samples will be collected at a frequency of 10% of the primary samples, and MS/MSDs at a frequency of 5% per sample event for spikeable parameters. Trip blanks will accompany each sample shipment (cooler) containing samples for VOC analysis. During the first sample event, an equipment blank will be collected and analyzed for total metals (e.g., tubing) and a filter blank (tubing and filter) will be collected and analyzed for dissolved metals. The same tubing and filter lots will be used for subsequent sample events (or additional blank(s) will be run for each lot used). Approximately 1 Liter of water/sample will be run through tubing and filters prior to blank and sample collection, as practical.

Data QC and submittals

The following documentation for a sampling event will be generated and included in the Groundwater Quality Monitoring Event Reports prepared for each event:

- Copies of field logs and notes.
- A data table (Excel spreadsheet) with field parameters (pH, specific conductance, DO, temperature, ORP, and turbidity).

- A data table with laboratory results, and data qualifiers. Results will be screened against Alaska Department of Environmental Conservation (ADEC) groundwater cleanup levels (18 AAC 75.345, Table C) and any exceedances noted (by color coding). Changes to these cleanup levels are proposed by ADEC and anticipated to take in the summer of 2016. Therefore, the data will be screened against the current and proposed groundwater cleanup levels.
- A data quality assurance summary report and checklist for each work order following ADEC guidance (http://dec.alaska.gov/spar/csp/guidance/amqa/lab-data-review-checklist.pdf) and http://dec.alaska.gov/spar/csp/guidance/tm_lab_qa.pdf)
- Laboratory data results package.

Water Quality Monitoring
Field and Data Collection Procedures
Alaska LNG Project
April 2016

Table 1: Groundwater Quality Sampling Schedule

Well Id	April Sampling Event General Groundwater Quality Suite (Table 2)	July/August Sampling Event Water Supply Quality Suite (Table 3)
MW-27B	X[1]	X[1]
MW-39A	X	X
MW-39B	X	X
MW-50A	X	X
MW-50B	X	X
MW-62A	X	X
MW-74A	X	X
MW-74B	X	X
MW-82A	X	X
MW-82B	X	X
MW-87B	X[1]	X[1]
MW-91A	X	X
APT-1		X[1]
APT-2		X[1]
APT-3		X[1]
OW-1		X[1]
OW-2		X[1]
OW-3		X[1]
OW-4		X[1]
Third Party W-1	X[1]	X[1]
Third Party W-2 (Decker)	X[1]	X[1]
Third Party W-5		X
Third Party Well (PQW-1)	X[1]	X[1]

Note: [1] = Samples additionally analyzed and reported per ADEC requirements for TAH (BTEX) and TAqH (PAH).

Water Quality Monitoring
Field and Data Collection Procedures
Alaska LNG Project
April 2016

Table 2: General Groundwater Quality Suite

Parameter	Method	Duplicates
Water Quality Suite		
Hardness	SM21 2340B	1/10
Alkalinity	SM21 2320B	1/10
Nitrate/Nitrite	SM21 4500NO3-F	1/10
Total Dissolved Solids (TDS)	2540C	1/10
Total Suspended Solids (TSS)	2540D	1/10
Turbidity	SM21 2130B	1/10
Chloride, Sulfate, Flouride	EPA 300.0	1/10
pH	4500-H	1/10
Metals (total and dissolved)		
Total Metals – As, Ba, Be, Ca, Cd, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Na, Ni, Tl, Sb, Se, V, Zn,	EPA 200.8	1/10
Total Mercury	EPA 1631E	1/10
Dissolved Metals – An, As, Ba, Be, Ca, Cd, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Na, Ni, Sb, Se, Tl, V, Zn	EPA 200.8	1/10
Dissolved Mercury	EPA 1631E	1/10
Organics		
Volatile Organic Compounds	EPA 8260B	1/10
Semi-Volatile Organic Compounds	EPA 8270D	1/10
Petroleum Hydrocarbons		
Gasoline Range Organics	AK 101	1/10
Diesel Range Organics	AK 102	1/10
Residual Range Organics	AK 103	1/10

Note: “1/10” indicates one duplicate for every 10 samples taken; 11 samples requires two duplicates.

Water Quality Monitoring
Field and Data Collection Procedures
Alaska LNG Project
April 2016

Table 3: Water Supply Quality Suite

Parameter	Method	Duplicates	MS	MSD	TB
Water Quality Suite					
Hardness	SM21 2340B	1/10	1/20	1/20	
Alkalinity	SM21 2320B	1/10	1/20	1/20	
Nitrate/Nitrite	SM21 4500NO3-F	1/10	1/20	1/20	
Ammonia as Nitrogen	SM21 4500NH3-F	1/10	1/20	1/20	
Total Kjeldahl Nitrogen (TKN)	SM21 4500N D	1/10	1/20	1/20	
Total Phosphorous	SM21 4500-PE/PB	1/10	1/20	1/20	
Ortho-phosphate	SM21 4500P-E	1/10	1/20	1/20	
Chlorophyll a	10300	1/10	1/20	1/20	
Total Dissolved Solids (TDS)	2540C	1/10	1/20	1/20	
Total Suspended Solids (TSS)	2540D	1/10	1/20	1/20	
Turbidity	SM21 2130B	1/10	1/20	1/20	
Total Organic Carbon (TOC)	SM 21 5310B	1/10	1/20	1/20	
Dissolved Organic Carbon (DOC)	SM21 5310B	1/10	1/20	1/20	
Chemical Oxygen Demand (COD)	EPA 410.4	1/10	1/20	1/20	
Chloride, Sulfate, Flouride	EPA 300.0	1/10	1/20	1/20	
pH	4500-H	1/10	1/20	1/20	
Total Residue	SM21 2540B	1/10	1/20	1/20	
Fecal Coliform	SM21 9222D	1/10	1/20	1/20	
Metals (total and dissolved)					
Total Metals – As, Ba, Be, Ca, Cd, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Na, Ni, Tl, Sb, Se, V, Zn	EPA 200.8	1/10	1/20	1/20	
Total Mercury	EPA 1631E	1/10	1/20	1/20	
Total Mercury Trip blank	EPA 1631E				1/8
Dissolved Metals – As, Ba, Be, Ca, Cd, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Na, Ni, Sb, Se, Tl, V, Zn	EPA 200.8	1/10	1/20	1/20	
Dissolved Mercury	EPA 1631E	1/10	1/20	1/20	
Dissolved Mercury Trip blank	EPA 1631E				1/8
Organics					
Volatile Organic Compounds	EPA 8260B	1/10	1/20	1/20	
VOCs Trip blank	EPA 8260B				1/8
Semi-Volatile Organic Compounds	EPA 8270D	1/10	1/20	1/20	

Water Quality Monitoring
Field and Data Collection Procedures
Alaska LNG Project
April 2016

Parameter	Method	Duplicates	MS	MSD	TB
Polychlorinated biphenyls	EPA 8082	1/10	1/20	1/20	
Pesticides	EPA 8270D SIMS	1/10	1/20	1/20	
Petroleum Hydrocarbons					
Gasoline Range Organics	AK 101	1/10	1/20	1/20	
GRO Trip blank	AK 101				1/8
Diesel Range Organics	AK 102	1/10	1/20	1/20	
Residual Range Organics	AK 103	1/10	1/20	1/20	

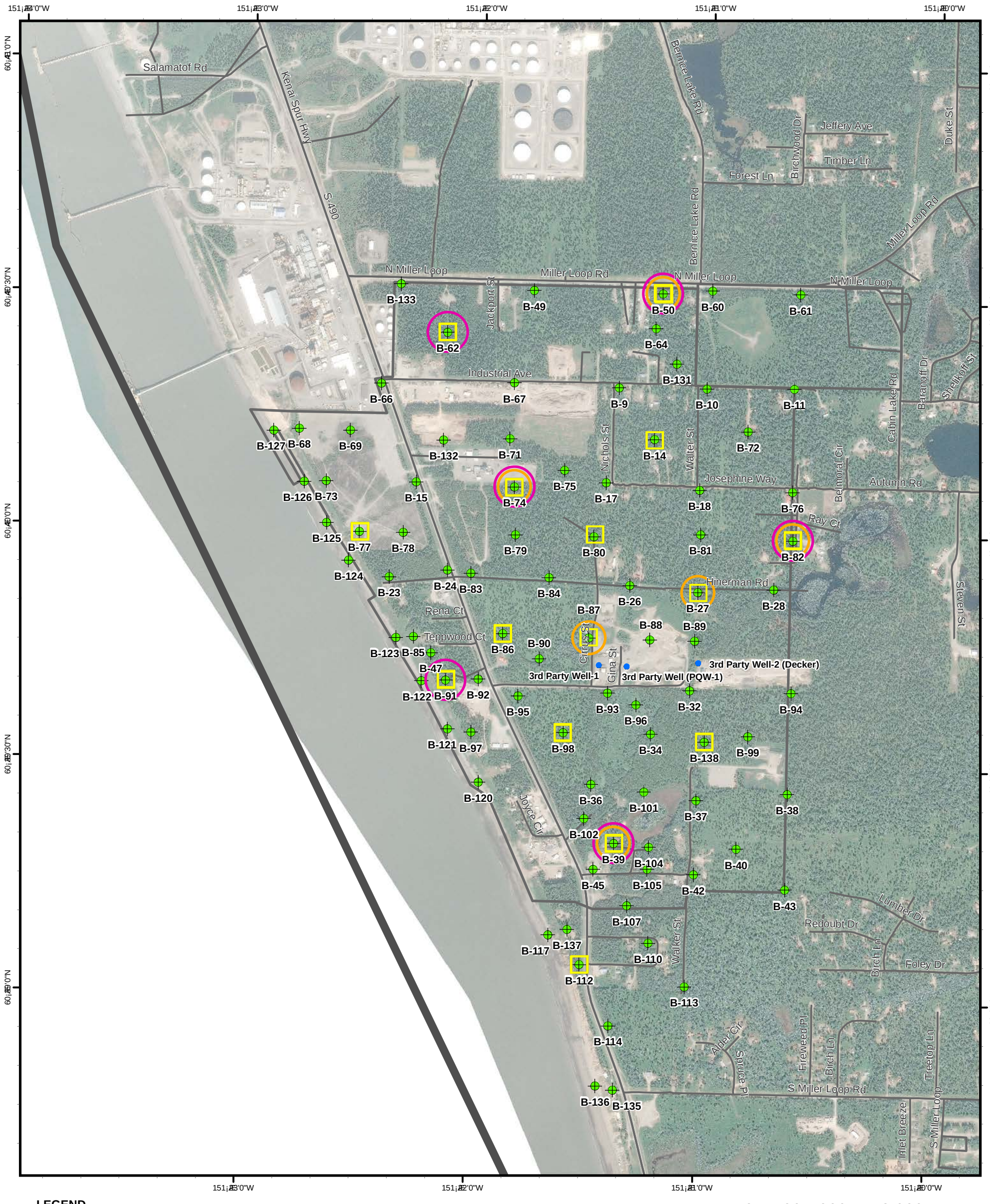
Notes:

MS refers to “Matrix Spike” and provides the number of samples required per the number of primary samples.

MSD refers to “Matrix Spike Duplicate” and provides the number of samples required per the number of primary samples.

TB refers to “Trip Blank” and provides the number of samples required per the number of primary samples.

Project No. 04.10160001



LEGEND

- Onshore borings (Completed)
- Well Locations
- New Facility Boundary
- Shallow Well
- Intermediate Well
- 3rd Party Well

0 500 1,000 2,000 Feet

WATER QUALITY WELL SAMPLING LOCATIONS

ONSHORE FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

PLATE 1

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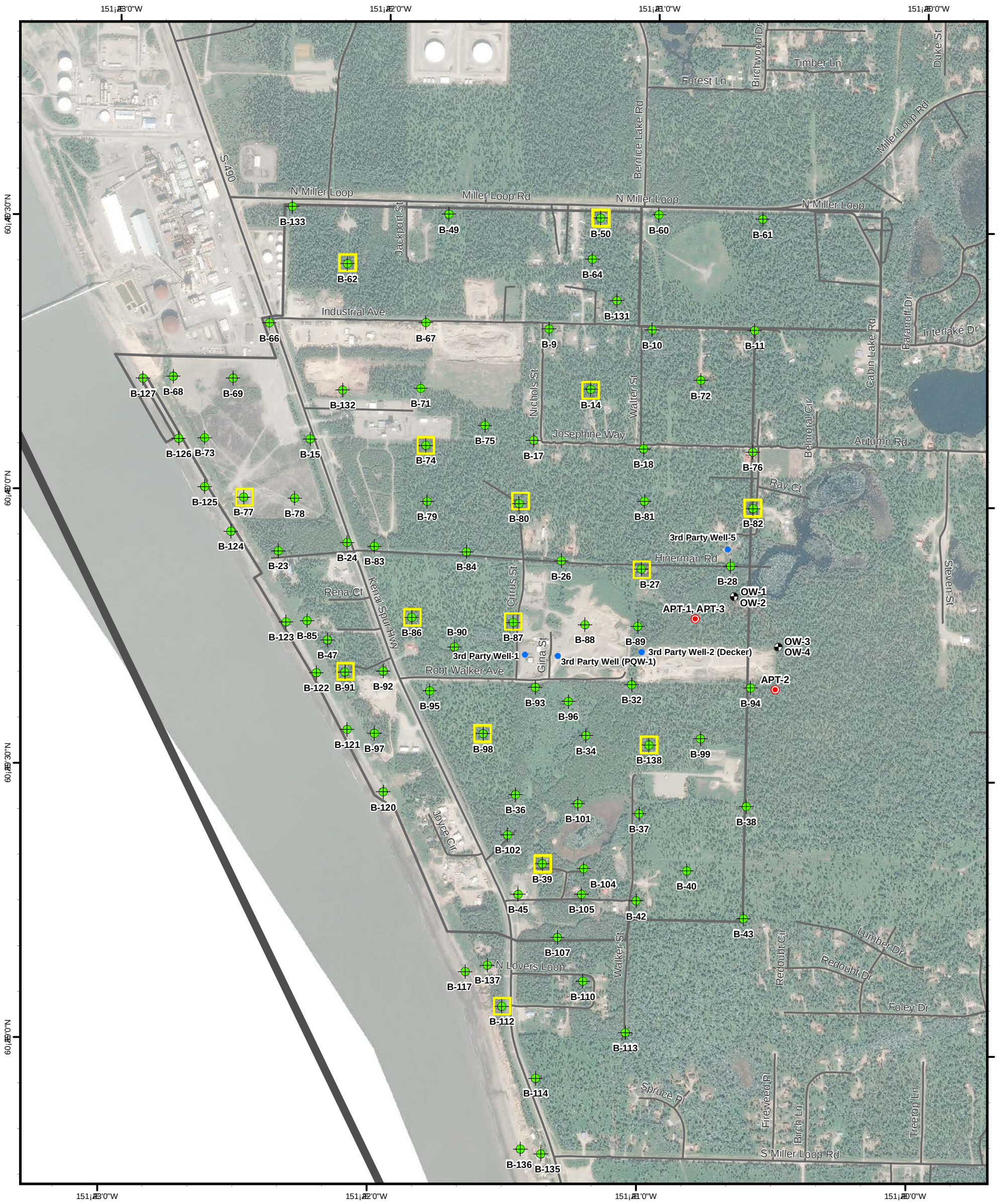
Project No. 04.10160001



LEGEND

- Onshore borings (Completed)
- Well Locations
- New Facility Boundary
- APT Well
- Observation Well Pair
- 3rd Party Well

0 500 1,000 2,000 Feet

APT WELL LOCATIONS
ONSHORE FACILITIES
ALASKA LNG PROJECT
NIKISKI, ALASKA

PLATE 2

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Project No. 04.10160001

Legend

- mw_20160411 selection
- AKLNG2014, Completed
- AKLNG2015, Completed
- AKLNG2016, Not Started

0 75 150 300 Feet

MONITORING WELL LOCATIONS
ALASKA LNG PROJECT
NIKISKI, ALASKA

PLATE 1

Project No. 04.10160001

Legend

- mw_20160411 selection
- AKLNG2014, Completed
- AKLNG2015, Completed
- AKLNG2016, Not Started

0 75 150 300 Feet

MONITORING WELL LOCATIONS
ALASKA LNG PROJECT
NIKISKI, ALASKA

PLATE 1

Project No. 04.10160001

Legend

- mw_20160411 selection
- AKLNG2014, Completed
- AKLNG2015, Completed
- AKLNG2016, Not Started

0 75 150 300
Feet

MONITORING WELL LOCATIONS
ALASKA LNG PROJECT
NIKISKI, ALASKA

PLATE 1

Project No. 04.10160001

Legend

- mw_20160411 selection
- AKLNG2014, Completed
- AKLNG2015, Completed
- AKLNG2016, Not Started

0 75 150 300
Feet

MONITORING WELL LOCATIONS
ALASKA LNG PROJECT
NIKISKI, ALASKA

PLATE 1

Project No. 04.10160001

Legend

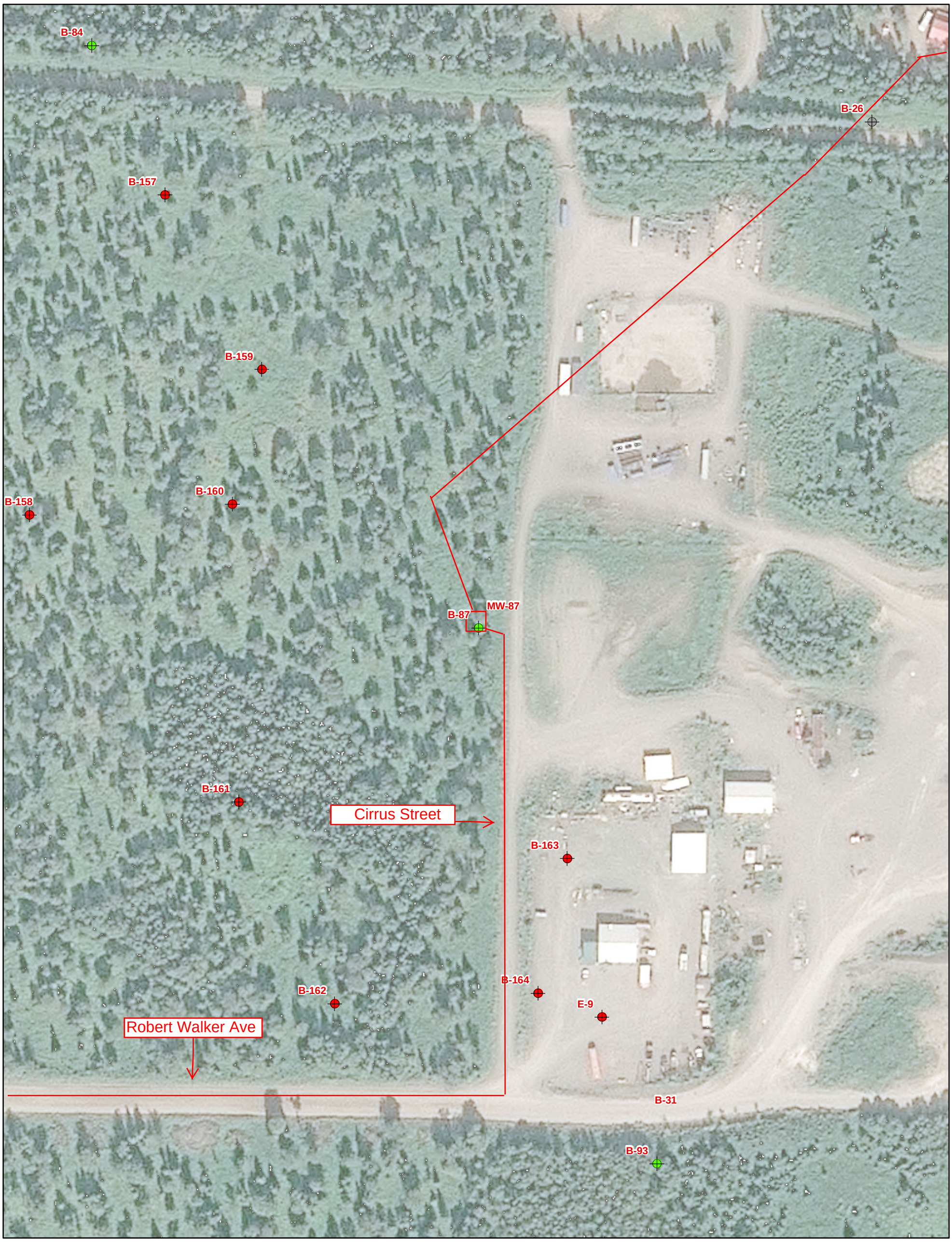
- mw_20160411 selection
- AKLNG2014, Completed
- AKLNG2015, Completed
- AKLNG2016, Not Started

0 75 150 300 Feet

MONITORING WELL LOCATIONS
ALASKA LNG PROJECT
NIKISKI, ALASKA

PLATE 1

Project No. 04.10160001



Legend

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- AKLNG2015, Completed
- AKLNG2016, Not Started

0 75 150 300 Feet

MONITORING WELL LOCATIONS
ALASKA LNG PROJECT
NIKISKI, ALASKA

PLATE 1

Project No. 04.10160001

Legend

- mw_20160411 selection
- AKLNG2014, Completed
- AKLNG2015, Completed
- AKLNG2016, Not Started

0 75 150 300 Feet

MONITORING WELL LOCATIONS
ALASKA LNG PROJECT
NIKISKI, ALASKA

PLATE 1

Project No. 04.10160001

Legend

- mw_20160411 selection
- AKLNG2014, Completed
- AKLNG2015, Completed
- AKLNG2016, Not Started

0 75 150 300 Feet

MONITORING WELL LOCATIONS
ALASKA LNG PROJECT
NIKISKI, ALASKA

PLATE 1

Groundwater Sampling Form

Site/Client Name: Nikiski, AK	**Well ID:**
Project # : Water Quality Monitoring (WQM), AK LNG	Sample ID:
Sampled By:	Sample Time: Sample Date:
Weather Conditions:	Duplicate ID:
Sampling Method: ☐ Low Flow ☐ Other_____	MS/MSD ☐ Yes ☐ No Trip Blank Required: ☐ Yes ☐ No

Well Information

Well Type: ☐ Permanent ☐ Temporary	Well Diameter _____ in.	Screen Interval: _____ ft BGS to _____ft BGS
Well Condition: ☐ Good ☐ Fair ☐ Poor (if fair or poor explain in Notes)		Stickup ☐ Yes ☐ No; If yes, _____ft above ground

Gauging/Purging Information

Depth to Water (ft BTOC):	Tubing/Pump Depth (ft. BTOC):
Total Depth (ft BTOC):	Purge Start Time (24-hr)
Depth to Product (ft. BTOC)	Purge End Time (24-hr)
Product Thickness (ft)	Total Purge Time (min)

LOW FLOW: **Max Draw Down** = (Tubing Depth – Top of Screen Depth)_____ X 0.25 = _____(ft); if screen interval is not known or water table is below top of screen, then use default value of 0.3 ft.;

Min. purge volume if required: purge volume (gal) = volume of water/ft_____(gal/ft) X Water column thickness_____(ft) X # of casing volumes_____ =_____gal

Well Diameter – gal/ft	1" – 0.041 gal/ft	2" – 0.163 gal/ft	4' – 0.653 gal/ft	6' – 1.469 gal/ft

Water Quality Parameters

(Achieve stable parameters for 3 consecutive reading, 4 parameters if practical [each reading taken after pumping a minimum of 1 flow through cell volume])

Time (24-hr)	Flow Rate (gal/ minute)	Purge Volume (gal)	Temp (°C) (± 3 %)	Specific Conductance (µS/cm^c) (± 3%)	DO (mg/L) (± 10%)	ORP (mV) (± 10mV)	pH (± 0.1)	Turbidity (NTU) (± 10%, or <5 NTU)	DTW (ft BTOC)	Drawdown (ft) (Max____ft)
Parameter Stable (Check applicable)										

Sample Color:	**Sample Odor:**	**Sheen:**

Analytical Sampling

Analyses	Check Applicable	Comments
WQM Method Statement Table 2: General Groundwater Quality Suite		
WQM Method Statement Table 3: Water Supply Quality Suite		

Notes:

Equipment: Pump Type_____ Tubing (Type/Length) _____ Bailer Type_____
Water Level Meter_____ Multi-Parameter Meter (Make/SN#)_____
Turbidity Meter (Make/SN#)_____ Filter Lot #_____

Purge Water Handling: ☐ Discharged to surface ☐Containerized ☐ Treated (how?)_____

BGS = Below Ground Surface, BTOC= Below Top of Casing, NA = Not Applicable

Water Parameter Meter Calibration Log

Date: ________________ Time: _____________ Calibration By: ______________________
Meter Manufacturer and Identification #: ____

Parameter	Standard	True Value	Lot #	Date Opened	Expiration Date	PreCalibration Reading	Reading After Calibration	Calibration Acceptance Criteria
pH	7.00							± 0.10
	4.00							± 0.10
	10.00							± 0.10
Sp Cond (mS/cm)	1.413							± 10%
ORP (mV)	240							---------
DO*								± 2%

If parameter not included in sampling event, fill in box with NA (not applicable)
* Note that the True Value for DO is dependent on pressure and altitude; reference the DO Calibration Table

Date: ________________ Time: _____________ Calibration By: ______________________
Meter Manufacturer and Identification #: ____

Parameter	Standard	True Value	Lot #	Date Opened	Expiration Date	PreCalibration Reading	Reading After Calibration	Calibration Acceptance Criteria
pH	7.00							± 0.10
	4.00							± 0.10
	10.00							± 0.10
Sp Cond (mS/cm)	1.413							± 10%
ORP (mV)	240							---------
DO*								± 2%

If parameter not included in sampling event, fill in box with NA (not applicable)
* Note that the True Value for DO is dependent on pressure and altitude; reference the DO Calibration Table

Date: ________________ Time: _____________ Calibration By: ______________________
Meter Manufacturer and Identification #: ____

Parameter	Standard	True Value	Lot #	Date Opened	Expiration Date	PreCalibration Reading	Reading After Calibration	Calibration Acceptance Criteria
pH	7.00							± 0.10
	4.00							± 0.10
	10.00							± 0.10
Sp Cond (mS/cm)	1.413							± 10%
ORP (mV)	240							---------
DO*								± 2%

If parameter not included in sampling event, fill in box with NA (not applicable)
* Note that the True Value for DO is dependent on pressure and altitude; reference the DO Calibration Table

SLR

Turbidimeter Calibration Log

Calibration Date	Calibration Time	Calibration By		
Instrument Make/Model	Serial #	Cal Fluid #1 ________ NTU	Cal Fluid #2 ________ NTU	Within Acceptable Range?
Bump Check ☐ or Calibration ☐ Notes:		Bump check result or post-calibration reading:	Bump check result or post-calibration reading:	yes no

Calibration Date	Calibration Time	Calibration By		
Instrument Make/Model	Serial #	Cal Fluid #1 ________ NTU	Cal Fluid #2 ________ NTU	Within Acceptable Range?
Bump Check ☐ or Calibration ☐ Notes:		Bump check result or post-calibration reading:	Bump check result or post-calibration reading:	yes no

Calibration Date	Calibration Time	Calibration By		
Instrument Make/Model	Serial #	Cal Fluid #1 ________ NTU	Cal Fluid #2 ________ NTU	Within Acceptable Range?
Bump Check ☐ or Calibration ☐ Notes:		Bump check result or post-calibration reading:	Bump check result or post-calibration reading:	yes no

Calibration Date	Calibration Time	Calibration By		
Instrument Make/Model	Serial #	Cal Fluid #1 ________ NTU	Cal Fluid #2 ________ NTU	Within Acceptable Range?
Bump Check ☐ or Calibration ☐ Notes:		Bump check result or post-calibration reading:	Bump check result or post-calibration reading:	yes no

Calibration Date	Calibration Time	Calibration By		
Instrument Make/Model	Serial #	Cal Fluid #1 ________ NTU	Cal Fluid #2 ________ NTU	Within Acceptable Range?
Bump Check ☐ or Calibration ☐ Notes:		Bump check result or post-calibration reading:	Bump check result or post-calibration reading:	yes no

Calibration Date	Calibration Time	Calibration By		
Instrument Make/Model	Serial #	Cal Fluid #1 ________ NTU	Cal Fluid #2 ________ NTU	Within Acceptable Range?
Bump Check ☐ or Calibration ☐ Notes:		Bump check result or post-calibration reading:	Bump check result or post-calibration reading:	yes no

Note: A bump check can verify the instrument is in proper calibration if the instrument reads an accurate value for a calibration solution (without performing a full calibration). In the event a bump check does not indicate the instrument is properly calibrated, a calibration will be performed, per manufacturer instructions.

APPENDIX B
TABLE B-1, SUMMARY OF ANALYTICAL RESULTS AND ANALYTICAL LABORATORY REPORTS, AQUIFER PUMP TEST WELL DEVELOPMENT WATER

Report No. 04.10160001-4

Table B-1
Summary of Analytical Results - APT Well Development Water for Waste Disposal Characterization
Alaska LNG. 2016
Nikiski, AK

Method	Compound in milligrams per Liter (mg/L)	Permit AKG003000 Table 6 [2]		Sample Identification					
				APT-1 Well Development Water		APT-2 Well Development Water		APT-3 Well Development Water	
				(Lab ID APT-1-DEV-TK-0916)		(Lab ID APT-2-DEV-TK-0916)		(Lab ID APT-3-DEV-TK-0916)	
		Effluent [2]	Water Quality Standards for Designated Uses [3]	09/12/2016 17:30		09/19/2016 16:50		09/06/2016 14:00	
				Conc.[1]	Flag	Conc.[1]	Flag	Conc.[1]	Flag
SW6020A Metals	Arsenic	0.01	0.01	**0.027**	=	**0.0369**	=	**0.0775**	=
	Barium	--	2	**0.0277**	=	**0.0917**	=	**0.361**	=
	Cadmium	0.005	0.01	[0.001]	ND	[0.001]	ND	[0.005]	ND
	Chromium	0.1	0.011	**0.00165**	J	**0.0208**	=	**0.101**	=
	Lead	0.05	0.0081	**0.000796**	J	**0.00412**	=	**0.0237**	=
	Mercury	0.002	0.00005	[0.0001]	ND	**0.000197**	J	[0.0005]	ND
	Selenium	0.01	0.005	[0.01]	ND	[0.01]	ND	[0.05]	ND
	Silver	--	0.0019	[0.001]	ND	[0.001]	ND	[0.005]	ND
SM21 4500-H B	pH	6.5 - 8.5	6.0 - 8.5	**8.3**	=	**8.3**	=	**8.8**	=
SW8260B VOC	1,1,1,2-Tetrachloroethane	--	--	[0.00025]	ND	[0.00025]	ND	[0.00025]	ND
	1,1,1-Trichloroethane	--	0.2	[0.0005]	ND	[0.0005]	ND	[0.0005]	ND
	1,1,2,2-Tetrachloroethane	--	0.0043	[0.00025]	ND	[0.00025]	ND	[0.00025]	ND
	1,1,2-Trichloroethane	--	0.005	[0.0005]	ND	[0.0005]	ND	[0.0005]	ND
	1,1-Dichloroethane	--	7.3	[0.0005]	ND	[0.0005]	ND	[0.0005]	ND
	1,1-Dichloroethene	--	0.007	[0.0005]	ND	[0.0005]	ND	[0.0005]	ND
	1,1-Dichloropropene	--	--	[0.0005]	ND	[0.0005]	ND	[0.0005]	ND
	1,2,3-Trichlorobenzene	--	--	[0.0005]	ND	[0.0005]	ND	[0.0005]	ND
	1,2,3-Trichloropropane	--	0.00012	[0.0005]	ND	[0.0005]	ND	[0.0005]	ND
	1,2,4-Trichlorobenzene	--	0.07	[0.0005]	ND	[0.0005]	ND	[0.0005]	ND
	1,2,4-Trimethylbenzene	--	1.8	[0.0005]	ND	[0.0005]	ND	**0.0023**	=
	1,2-Dibromo-3-Chloropropane	--	0.0002	[0.005]	ND	[0.005]	ND	[0.005]	ND
	1,2-Dibromoethane	--	0.00005	[0.0005]	ND	[0.0005]	ND	[0.0005]	ND
	1,2-Dichlorobenzene	--	0.6	[0.0005]	ND	[0.0005]	ND	[0.0005]	ND
	1,2-Dichloroethane	--	0.005	[0.00025]	ND	[0.00025]	ND	[0.00025]	ND
	1,2-Dichloropropane	--	0.005	[0.0005]	ND	[0.0005]	ND	[0.0005]	ND
	1,3,5-Trimethylbenzene	--	1.8	[0.0005]	ND	[0.0005]	ND	**0.00067**	J
	1,3-Dichlorobenzene	--	0.4	[0.0005]	ND	[0.0005]	ND	[0.0005]	ND
	1,3-Dichloropropane	--	--	[0.0005]	ND	[0.0005]	ND	[0.0005]	ND
	1,4-Dichlorobenzene	--	0.075	[0.00025]	ND	[0.00025]	ND	[0.00025]	ND
	2,2-Dichloropropane	--	--	[0.0005]	ND	[0.0005]	ND	[0.0005]	ND
	2-Butanone	--	22	[0.005]	ND	[0.005]	ND	[0.005]	ND
	2-Chlorotoluene	--	--	[0.0005]	ND	[0.0005]	ND	[0.0005]	ND
	2-Hexanone	--	--	[0.005]	ND	[0.005]	ND	[0.005]	ND
	4-Chlorotoluene	--	--	[0.0005]	ND	[0.0005]	ND	[0.0005]	ND
	4-Isopropyltoluene	--	--	[0.0005]	ND	[0.0005]	ND	[0.0005]	ND
	4-Methyl-2-pentanone	--	2.9	[0.005]	ND	[0.005]	ND	[0.005]	ND
	Benzene	--	0.005	[0.0002]	ND	[0.0002]	ND	[0.0002]	ND
	Bromobenzene	--	--	[0.0005]	ND	[0.0005]	ND	[0.0005]	ND
	Bromochloromethane	--	--	[0.0005]	ND	[0.0005]	ND	[0.0005]	ND
	Bromodichloromethane	--	0.014	[0.00025]	ND	[0.00025]	ND	[0.00025]	ND
	Bromoform	--	0.08	[0.0005]	ND	[0.0005]	ND	[0.0005]	ND
	Bromomethane	--	0.048	[0.005]	ND	[0.005]	ND	[0.005]	ND
	Carbon disulfide	--	3.7	[0.005]	ND	[0.005]	ND	[0.005]	ND
	Carbon tetrachloride	--	0.005	[0.0005]	ND	[0.0005]	ND	[0.0005]	ND
	Chlorobenzene	--	0.1	[0.00025]	ND	[0.00025]	ND	[0.00025]	ND
	Chloroethane	--	0.29	[0.0005]	ND	[0.0005]	ND	[0.0005]	ND
	Chloroform	--	0.08	[0.0005]	ND	[0.0005]	ND	[0.0005]	ND
	Chloromethane	--	0.066	[0.0005]	ND	**0.00031**	J	[0.0005]	ND
	cis-1,2-Dichloroethene	--	0.07	[0.0005]	ND	[0.0005]	ND	[0.0005]	ND
	cis-1,3-Dichloropropene	--	0.0085	[0.00025]	ND	[0.00025]	ND	[0.00025]	ND
	Dibromochloromethane	--	0.01	[0.00025]	ND	[0.00025]	ND	[0.00025]	ND
	Dibromomethane	--	0.37	[0.0005]	ND	[0.0005]	ND	[0.0005]	ND
	Dichlorodifluoromethane	--	7.3	[0.0005]	ND	[0.0005]	ND	[0.0005]	ND
	Ethylbenzene	--	0.7	[0.0005]	ND	[0.0005]	ND	[0.0005]	ND
	Freon-113	--	--	[0.005]	ND	[0.005]	ND	[0.005]	ND
	Hexachlorobutadiene	--	0.0073	[0.0005]	ND	[0.0005]	ND	[0.0005]	ND
	Isopropylbenzene	--	3.7	[0.0005]	ND	[0.0005]	ND	[0.0005]	ND
	Methylene Chloride	--	0.005	[0.0025]	ND	[0.0025]	ND	[0.0025]	ND
	Methyl tert-butyl ether	--	0.47	[0.005]	ND	[0.005]	ND	[0.005]	ND
	Naphthalene	--	0.73	[0.005]	ND	[0.005]	ND	[0.005]	ND
	n-Butylbenzene	--	0.37	[0.0005]	ND	[0.0005]	ND	[0.0005]	ND
	N-Propylbenzene	--	0.37	[0.0005]	ND	[0.0005]	ND	**0.0004**	J
	o-Xylene	--	10	[0.0005]	ND	[0.0005]	ND	[0.0005]	ND
	P & M -Xylene	--	--	[0.001]	ND	[0.001]	ND	[0.001]	ND
	sec-Butylbenzene	--	0.37	[0.0005]	ND	[0.0005]	ND	[0.0005]	ND
	Styrene	--	0.1	[0.0005]	ND	[0.0005]	ND	[0.0005]	ND
	t-Butylbenzene	--	0.37	[0.0005]	ND	[0.0005]	ND	[0.0005]	ND
	Tetrachloroethene	--	0.005	[0.0005]	ND	[0.0005]	ND	[0.0005]	ND
	Toluene	--	1	**0.00225**	=	**0.00088**	J	**0.00324**	=
	trans-1,2-Dichloroethene	--	0.1	[0.0005]	ND	[0.0005]	ND	[0.0005]	ND
	trans-1,3-Dichloropropene	--	0.0085	[0.0005]	ND	[0.0005]	ND	[0.0005]	ND
	Trichloroethene	--	0.005	**0.00158**	=	[0.0005]	ND	**0.00262**	=
	Trichlorofluoromethane	--	11	[0.0005]	ND	[0.0005]	ND	[0.0005]	ND
	Vinyl acetate	--	--	[0.005]	ND	[0.005]	ND	[0.005]	ND
	Vinyl chloride	--	0.002	[0.0005]	ND	[0.0005]	ND	[0.0005]	ND
	Xylenes (total)	--	--	[0.0015]	ND	[0.0015]	ND	[0.0015]	ND

Notes

1 - For detected results, the sample result is listed in this column. For results of non-detect, the LOD is listed in [ ] in this column.

2 - This screening level corresponds to ADEC Alaska General Permit for Hydrostatic and Aquifer Pump Testing, Permit No. AKG003000 Table 6: Effluent Limits and Monitoring equirements for Aquifer Pump Testing Discharges to Waters of the U.S. http://dec.alaska.gov/water/wnpspc/stormwater/docs/AKG003000_Hydrostatic_GP_Permit.pdf

3 - This screening level corresponds to the most conservative values within ADEC Water Quality Standards 18 AAC 70. Amended 2/19/2016. https://dec.alaska.gov/commish/regulations/pdfs/18%20AAC%2070.pdf

-- Not applicable or screening critieria does not exist for this compound

Detected concentrations shown in **Bold**

Data Flags

=	Analyte detected at concentration listed in column to the left.
J	Result is considered an estimated value because the level is below the laboratory LOQ, but above the DL.
ND	Non-detect, LOD is in brackets [ ] in the concentration column.

Abbreviations

DL	Detection Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
VOCs	Volatile Organic Compounds

Laboratory Report of Analysis

To: SLR Alaska-Anchorage
2700 Gambell St Suite 200
Anchorage, AK 99503
(907)222-1112

Report Number: **1165401**

Client Project: **105.00148.16001 Kenai Wells**

Dear Jason Gray,

Enclosed are the results of the analytical services performed under the referenced project for the received samples and associated QC as applicable. The samples are certified to meet the requirements of the National Environmental Laboratory Accreditation Conference Standards. Copies of this report and supporting data will be retained in our files for a period of ten years in the event they are required for future reference. All results are intended to be used in their entirety and SGS is not responsible for use of less than the complete report. Any samples submitted to our laboratory will be retained for a maximum of fourteen (14) days from the date of this report unless other archiving requirements were included in the quote.

If there are any questions about the report or services performed during this project, please call Justin at (907) 562-2343. We will be happy to answer any questions or concerns which you may have.

Thank you for using SGS North America Inc. for your analytical services. We look forward to working with you again on any additional analytical needs.

Sincerely,
SGS North America Inc.

SGS North America Inc.
Environmental Services – Alaska Division
Project Manager

Justin Nelson
2016.09.18
13:39:03 -08'00'

Justin Nelson Date
Project Manager
Justin.Nelson@sgs.com

Print Date: 09/18/2016 1:12:49PM

Case Narrative

SGS Client: **SLR Alaska-Anchorage**
SGS Project: **1165401**
Project Name/Site: **105.00148.16001 Kenai Wells**
Project Contact: **Jason Gray**

Refer to sample receipt form for information on sample condition.

*QC comments may be associated with the field samples found in this report. When applicable, comments will be applied to associated field samples.

SGS North America Inc.
200 West Potter Drive, Anchorage, AK 99518
t 907.562.2343 **f** 907.561.5301 www.us.sgs.com

Laboratory Qualifiers

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. This document is issued by the Company under its General Conditions of Service accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx>. Attention is drawn to the limitation of liability, indenmification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the context or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

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/ISO17025 (RCRA methods: 1020B, 1311, 3010A, 3050B, 3520C, 3550C, 5030B, 5035A, 6020A, 7470A, 7471B, 8021B, 8082A, 8260B, 8270D, 8270D-SIM, 9040C, 9045D, 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/CVA/CVB	Continuing Calibration Verification
CCCV/CVC/CVCA/CVCB	Closing 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
IB	Instrument Blank
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., 1/2 of the LOQ)
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.

Print Date: 09/18/2016 1:12:52PM

Sample Summary

Client Sample ID	Lab Sample ID	Collected	Received	Matrix
APT-1-DEV-TK-0916	1165401001	09/12/2016	09/13/2016	Water (Surface, Eff., Ground)
TB-5-0916	1165401002	09/12/2016	09/13/2016	Water (Surface, Eff., Ground)

Method	Method Description
SW6020A	Metals by ICP-MS
SM21 4500-H B	pH Analysis
SW8260B	Volatile Organic Compounds (W) FULL

SGS North America Inc.
200 West Potter Drive, Anchorage, AK 99518
t 907.562.2343 f 907.561.5301 www.us.sgs.com

Detectable Results Summary

Client Sample ID: **APT-1-DEV-TK-0916**
Lab Sample ID: 1165401001

	Parameter	Result	Units
Metals by ICP/MS	Arsenic	27.0	ug/L
	Barium	27.7	ug/L
	Chromium	1.65J	ug/L
	Lead	0.796J	ug/L
Volatile GC/MS	Toluene	2.25	ug/L
	Trichloroethene	1.58	ug/L
Waters Department	pH	8.30	pH units

Client Sample ID: **TB-5-0916**
Lab Sample ID: 1165401002

	Parameter	Result	Units
Volatile GC/MS	Styrene	0.320J	ug/L

SGS North America Inc.
200 West Potter Drive, Anchorage, AK 99518
t 907.562.2343 **f** 907.561.5301 www.us.sgs.com

Results of **APT-1-DEV-TK-0916**

Client Sample ID: **APT-1-DEV-TK-0916**
Client Project ID: **105.00148.16001 Kenai Wells**
Lab Sample ID: 1165401001
Lab Project ID: 1165401

Collection Date: 09/12/16 17:30
Received Date: 09/13/16 13:13
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Metals by ICP/MS**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Arsenic	27.0		5.00	1.50	ug/L	5		09/17/16 13:29
Barium	27.7		3.00	0.940	ug/L	5		09/17/16 13:29
Cadmium	1.00	U	2.00	0.620	ug/L	5		09/17/16 13:29
Chromium	1.65	J	4.00	1.30	ug/L	5		09/17/16 13:29
Lead	0.796	J	1.00	0.310	ug/L	5		09/17/16 13:29
Mercury	0.100	U	0.200	0.0620	ug/L	5		09/17/16 13:29
Selenium	10.0	U	20.0	6.20	ug/L	5		09/17/16 13:29
Silver	1.00	U	2.00	0.620	ug/L	5		09/17/16 13:29

Batch Information

Analytical Batch: MMS9536
Analytical Method: SW6020A
Analyst: VDL
Analytical Date/Time: 09/17/16 13:29
Container ID: 1165401001-E

Prep Batch: MXX30185
Prep Method: SW3010A
Prep Date/Time: 09/14/16 09:05
Prep Initial Wt./Vol.: 25 mL
Prep Extract Vol: 25 mL

Print Date: 09/18/2016 1:12:56PM

J flagging is activated

Results of **APT-1-DEV-TK-0916**

Client Sample ID: **APT-1-DEV-TK-0916**
Client Project ID: **105.00148.16001 Kenai Wells**
Lab Sample ID: 1165401001
Lab Project ID: 1165401

Collection Date: 09/12/16 17:30
Received Date: 09/13/16 13:13
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Volatile GC/MS**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
1,1,1,2-Tetrachloroethane	0.250	U	0.500	0.150	ug/L	1		09/13/16 23:34
1,1,1-Trichloroethane	0.500	U	1.00	0.310	ug/L	1		09/13/16 23:34
1,1,2,2-Tetrachloroethane	0.250	U	0.500	0.150	ug/L	1		09/13/16 23:34
1,1,2-Trichloroethane	0.500	U	1.00	0.310	ug/L	1		09/13/16 23:34
1,1-Dichloroethane	0.500	U	1.00	0.310	ug/L	1		09/13/16 23:34
1,1-Dichloroethene	0.500	U	1.00	0.310	ug/L	1		09/13/16 23:34
1,1-Dichloropropene	0.500	U	1.00	0.310	ug/L	1		09/13/16 23:34
1,2,3-Trichlorobenzene	0.500	U	1.00	0.310	ug/L	1		09/13/16 23:34
1,2,3-Trichloropropane	0.500	U	1.00	0.310	ug/L	1		09/13/16 23:34
1,2,4-Trichlorobenzene	0.500	U	1.00	0.310	ug/L	1		09/13/16 23:34
1,2,4-Trimethylbenzene	0.500	U	1.00	0.310	ug/L	1		09/13/16 23:34
1,2-Dibromo-3-chloropropane	5.00	U	10.0	3.10	ug/L	1		09/13/16 23:34
1,2-Dibromoethane	0.500	U	1.00	0.310	ug/L	1		09/13/16 23:34
1,2-Dichlorobenzene	0.500	U	1.00	0.310	ug/L	1		09/13/16 23:34
1,2-Dichloroethane	0.250	U	0.500	0.150	ug/L	1		09/13/16 23:34
1,2-Dichloropropane	0.500	U	1.00	0.310	ug/L	1		09/13/16 23:34
1,3,5-Trimethylbenzene	0.500	U	1.00	0.310	ug/L	1		09/13/16 23:34
1,3-Dichlorobenzene	0.500	U	1.00	0.310	ug/L	1		09/13/16 23:34
1,3-Dichloropropane	0.250	U	0.500	0.150	ug/L	1		09/13/16 23:34
1,4-Dichlorobenzene	0.250	U	0.500	0.150	ug/L	1		09/13/16 23:34
2,2-Dichloropropane	0.500	U	1.00	0.310	ug/L	1		09/13/16 23:34
2-Butanone (MEK)	5.00	U	10.0	3.10	ug/L	1		09/13/16 23:34
2-Chlorotoluene	0.500	U	1.00	0.310	ug/L	1		09/13/16 23:34
2-Hexanone	5.00	U	10.0	3.10	ug/L	1		09/13/16 23:34
4-Chlorotoluene	0.500	U	1.00	0.310	ug/L	1		09/13/16 23:34
4-Isopropyltoluene	0.500	U	1.00	0.310	ug/L	1		09/13/16 23:34
4-Methyl-2-pentanone (MIBK)	5.00	U	10.0	3.10	ug/L	1		09/13/16 23:34
Benzene	0.200	U	0.400	0.120	ug/L	1		09/13/16 23:34
Bromobenzene	0.500	U	1.00	0.310	ug/L	1		09/13/16 23:34
Bromochloromethane	0.500	U	1.00	0.310	ug/L	1		09/13/16 23:34
Bromodichloromethane	0.250	U	0.500	0.150	ug/L	1		09/13/16 23:34
Bromoform	0.500	U	1.00	0.310	ug/L	1		09/13/16 23:34
Bromomethane	5.00	U	10.0	3.10	ug/L	1		09/13/16 23:34
Carbon disulfide	5.00	U	10.0	3.10	ug/L	1		09/13/16 23:34
Carbon tetrachloride	0.500	U	1.00	0.310	ug/L	1		09/13/16 23:34
Chlorobenzene	0.250	U	0.500	0.150	ug/L	1		09/13/16 23:34
Chloroethane	0.500	U	1.00	0.310	ug/L	1		09/13/16 23:34

Print Date: 09/18/2016 1:12:56PM

J flagging is activated

Results of **APT-1-DEV-TK-0916**

Client Sample ID: **APT-1-DEV-TK-0916**
Client Project ID: **105.00148.16001 Kenai Wells**
Lab Sample ID: 1165401001
Lab Project ID: 1165401

Collection Date: 09/12/16 17:30
Received Date: 09/13/16 13:13
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Volatile GC/MS**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Chloroform	0.500 U		1.00	0.300	ug/L	1		09/13/16 23:34
Chloromethane	0.500 U		1.00	0.310	ug/L	1		09/13/16 23:34
cis-1,2-Dichloroethene	0.500 U		1.00	0.310	ug/L	1		09/13/16 23:34
cis-1,3-Dichloropropene	0.250 U		0.500	0.150	ug/L	1		09/13/16 23:34
Dibromochloromethane	0.250 U		0.500	0.150	ug/L	1		09/13/16 23:34
Dibromomethane	0.500 U		1.00	0.310	ug/L	1		09/13/16 23:34
Dichlorodifluoromethane	0.500 U		1.00	0.310	ug/L	1		09/13/16 23:34
Ethylbenzene	0.500 U		1.00	0.310	ug/L	1		09/13/16 23:34
Freon-113	5.00 U		10.0	3.10	ug/L	1		09/13/16 23:34
Hexachlorobutadiene	0.500 U		1.00	0.310	ug/L	1		09/13/16 23:34
Isopropylbenzene (Cumene)	0.500 U		1.00	0.310	ug/L	1		09/13/16 23:34
Methylene chloride	2.50 U		5.00	1.00	ug/L	1		09/13/16 23:34
Methyl-t-butyl ether	5.00 U		10.0	3.10	ug/L	1		09/13/16 23:34
Naphthalene	5.00 U		10.0	3.10	ug/L	1		09/13/16 23:34
n-Butylbenzene	0.500 U		1.00	0.310	ug/L	1		09/13/16 23:34
n-Propylbenzene	0.500 U		1.00	0.310	ug/L	1		09/13/16 23:34
o-Xylene	0.500 U		1.00	0.310	ug/L	1		09/13/16 23:34
P & M -Xylene	1.00 U		2.00	0.620	ug/L	1		09/13/16 23:34
sec-Butylbenzene	0.500 U		1.00	0.310	ug/L	1		09/13/16 23:34
Styrene	0.500 U		1.00	0.310	ug/L	1		09/13/16 23:34
tert-Butylbenzene	0.500 U		1.00	0.310	ug/L	1		09/13/16 23:34
Tetrachloroethene	0.500 U		1.00	0.310	ug/L	1		09/13/16 23:34
Toluene	2.25		1.00	0.310	ug/L	1		09/13/16 23:34
trans-1,2-Dichloroethene	0.500 U		1.00	0.310	ug/L	1		09/13/16 23:34
trans-1,3-Dichloropropene	0.500 U		1.00	0.310	ug/L	1		09/13/16 23:34
Trichloroethene	1.58		1.00	0.310	ug/L	1		09/13/16 23:34
Trichlorofluoromethane	0.500 U		1.00	0.310	ug/L	1		09/13/16 23:34
Vinyl acetate	5.00 U		10.0	3.10	ug/L	1		09/13/16 23:34
Vinyl chloride	0.500 U		1.00	0.310	ug/L	1		09/13/16 23:34
Xylenes (total)	1.50 U		3.00	1.00	ug/L	1		09/13/16 23:34
Surrogates								
1,2-Dichloroethane-D4 (surr)	97.3		81-118		%	1		09/13/16 23:34
4-Bromofluorobenzene (surr)	98.5		85-114		%	1		09/13/16 23:34
Toluene-d8 (surr)	103		89-112		%	1		09/13/16 23:34

Print Date: 09/18/2016 1:12:56PM

J flagging is activated

Results of **APT-1-DEV-TK-0916**

Client Sample ID: **APT-1-DEV-TK-0916**
Client Project ID: **105.00148.16001 Kenai Wells**
Lab Sample ID: 1165401001
Lab Project ID: 1165401

Collection Date: 09/12/16 17:30
Received Date: 09/13/16 13:13
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Volatile GC/MS**

Batch Information

Analytical Batch: VMS16184
Analytical Method: SW8260B
Analyst: TJT
Analytical Date/Time: 09/13/16 23:34
Container ID: 1165401001-A

Prep Batch: VXX29565
Prep Method: SW5030B
Prep Date/Time: 09/13/16 06:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

Print Date: 09/18/2016 1:12:56PM

J flagging is activated

Results of **APT-1-DEV-TK-0916**

Client Sample ID: **APT-1-DEV-TK-0916**
Client Project ID: **105.00148.16001 Kenai Wells**
Lab Sample ID: 1165401001
Lab Project ID: 1165401

Collection Date: 09/12/16 17:30
Received Date: 09/13/16 13:13
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Waters Department**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
pH	8.30		0.100	0.100	pH units	1		09/14/16 14:30

Batch Information

Analytical Batch: WTI4510
Analytical Method: SM21 4500-H B
Analyst: KBE
Analytical Date/Time: 09/14/16 14:30
Container ID: 1165401001-D

Print Date: 09/18/2016 1:12:56PM

J flagging is activated

Results of **TB-5-0916**

Client Sample ID: **TB-5-0916**
Client Project ID: **105.00148.16001 Kenai Wells**
Lab Sample ID: 1165401002
Lab Project ID: 1165401

Collection Date: 09/12/16 17:30
Received Date: 09/13/16 13:13
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Volatile GC/MS**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
1,1,1,2-Tetrachloroethane	0.250	U	0.500	0.150	ug/L	1		09/13/16 20:37
1,1,1-Trichloroethane	0.500	U	1.00	0.310	ug/L	1		09/13/16 20:37
1,1,2,2-Tetrachloroethane	0.250	U	0.500	0.150	ug/L	1		09/13/16 20:37
1,1,2-Trichloroethane	0.500	U	1.00	0.310	ug/L	1		09/13/16 20:37
1,1-Dichloroethane	0.500	U	1.00	0.310	ug/L	1		09/13/16 20:37
1,1-Dichloroethene	0.500	U	1.00	0.310	ug/L	1		09/13/16 20:37
1,1-Dichloropropene	0.500	U	1.00	0.310	ug/L	1		09/13/16 20:37
1,2,3-Trichlorobenzene	0.500	U	1.00	0.310	ug/L	1		09/13/16 20:37
1,2,3-Trichloropropane	0.500	U	1.00	0.310	ug/L	1		09/13/16 20:37
1,2,4-Trichlorobenzene	0.500	U	1.00	0.310	ug/L	1		09/13/16 20:37
1,2,4-Trimethylbenzene	0.500	U	1.00	0.310	ug/L	1		09/13/16 20:37
1,2-Dibromo-3-chloropropane	5.00	U	10.0	3.10	ug/L	1		09/13/16 20:37
1,2-Dibromoethane	0.500	U	1.00	0.310	ug/L	1		09/13/16 20:37
1,2-Dichlorobenzene	0.500	U	1.00	0.310	ug/L	1		09/13/16 20:37
1,2-Dichloroethane	0.250	U	0.500	0.150	ug/L	1		09/13/16 20:37
1,2-Dichloropropane	0.500	U	1.00	0.310	ug/L	1		09/13/16 20:37
1,3,5-Trimethylbenzene	0.500	U	1.00	0.310	ug/L	1		09/13/16 20:37
1,3-Dichlorobenzene	0.500	U	1.00	0.310	ug/L	1		09/13/16 20:37
1,3-Dichloropropane	0.250	U	0.500	0.150	ug/L	1		09/13/16 20:37
1,4-Dichlorobenzene	0.250	U	0.500	0.150	ug/L	1		09/13/16 20:37
2,2-Dichloropropane	0.500	U	1.00	0.310	ug/L	1		09/13/16 20:37
2-Butanone (MEK)	5.00	U	10.0	3.10	ug/L	1		09/13/16 20:37
2-Chlorotoluene	0.500	U	1.00	0.310	ug/L	1		09/13/16 20:37
2-Hexanone	5.00	U	10.0	3.10	ug/L	1		09/13/16 20:37
4-Chlorotoluene	0.500	U	1.00	0.310	ug/L	1		09/13/16 20:37
4-Isopropyltoluene	0.500	U	1.00	0.310	ug/L	1		09/13/16 20:37
4-Methyl-2-pentanone (MIBK)	5.00	U	10.0	3.10	ug/L	1		09/13/16 20:37
Benzene	0.200	U	0.400	0.120	ug/L	1		09/13/16 20:37
Bromobenzene	0.500	U	1.00	0.310	ug/L	1		09/13/16 20:37
Bromochloromethane	0.500	U	1.00	0.310	ug/L	1		09/13/16 20:37
Bromodichloromethane	0.250	U	0.500	0.150	ug/L	1		09/13/16 20:37
Bromoform	0.500	U	1.00	0.310	ug/L	1		09/13/16 20:37
Bromomethane	5.00	U	10.0	3.10	ug/L	1		09/13/16 20:37
Carbon disulfide	5.00	U	10.0	3.10	ug/L	1		09/13/16 20:37
Carbon tetrachloride	0.500	U	1.00	0.310	ug/L	1		09/13/16 20:37
Chlorobenzene	0.250	U	0.500	0.150	ug/L	1		09/13/16 20:37
Chloroethane	0.500	U	1.00	0.310	ug/L	1		09/13/16 20:37

Print Date: 09/18/2016 1:12:56PM

J flagging is activated

Results of **TB-5-0916**

Client Sample ID: **TB-5-0916**
Client Project ID: **105.00148.16001 Kenai Wells**
Lab Sample ID: 1165401002
Lab Project ID: 1165401

Collection Date: 09/12/16 17:30
Received Date: 09/13/16 13:13
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Volatile GC/MS**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Chloroform	0.500 U		1.00	0.300	ug/L	1		09/13/16 20:37
Chloromethane	0.500 U		1.00	0.310	ug/L	1		09/13/16 20:37
cis-1,2-Dichloroethene	0.500 U		1.00	0.310	ug/L	1		09/13/16 20:37
cis-1,3-Dichloropropene	0.250 U		0.500	0.150	ug/L	1		09/13/16 20:37
Dibromochloromethane	0.250 U		0.500	0.150	ug/L	1		09/13/16 20:37
Dibromomethane	0.500 U		1.00	0.310	ug/L	1		09/13/16 20:37
Dichlorodifluoromethane	0.500 U		1.00	0.310	ug/L	1		09/13/16 20:37
Ethylbenzene	0.500 U		1.00	0.310	ug/L	1		09/13/16 20:37
Freon-113	5.00 U		10.0	3.10	ug/L	1		09/13/16 20:37
Hexachlorobutadiene	0.500 U		1.00	0.310	ug/L	1		09/13/16 20:37
Isopropylbenzene (Cumene)	0.500 U		1.00	0.310	ug/L	1		09/13/16 20:37
Methylene chloride	2.50 U		5.00	1.00	ug/L	1		09/13/16 20:37
Methyl-t-butyl ether	5.00 U		10.0	3.10	ug/L	1		09/13/16 20:37
Naphthalene	5.00 U		10.0	3.10	ug/L	1		09/13/16 20:37
n-Butylbenzene	0.500 U		1.00	0.310	ug/L	1		09/13/16 20:37
n-Propylbenzene	0.500 U		1.00	0.310	ug/L	1		09/13/16 20:37
o-Xylene	0.500 U		1.00	0.310	ug/L	1		09/13/16 20:37
P & M -Xylene	1.00 U		2.00	0.620	ug/L	1		09/13/16 20:37
sec-Butylbenzene	0.500 U		1.00	0.310	ug/L	1		09/13/16 20:37
Styrene	0.320 J		1.00	0.310	ug/L	1		09/13/16 20:37
tert-Butylbenzene	0.500 U		1.00	0.310	ug/L	1		09/13/16 20:37
Tetrachloroethene	0.500 U		1.00	0.310	ug/L	1		09/13/16 20:37
Toluene	0.500 U		1.00	0.310	ug/L	1		09/13/16 20:37
trans-1,2-Dichloroethene	0.500 U		1.00	0.310	ug/L	1		09/13/16 20:37
trans-1,3-Dichloropropene	0.500 U		1.00	0.310	ug/L	1		09/13/16 20:37
Trichloroethene	0.500 U		1.00	0.310	ug/L	1		09/13/16 20:37
Trichlorofluoromethane	0.500 U		1.00	0.310	ug/L	1		09/13/16 20:37
Vinyl acetate	5.00 U		10.0	3.10	ug/L	1		09/13/16 20:37
Vinyl chloride	0.500 U		1.00	0.310	ug/L	1		09/13/16 20:37
Xylenes (total)	1.50 U		3.00	1.00	ug/L	1		09/13/16 20:37
Surrogates								
1,2-Dichloroethane-D4 (surr)	97.8		81-118		%	1		09/13/16 20:37
4-Bromofluorobenzene (surr)	98.6		85-114		%	1		09/13/16 20:37
Toluene-d8 (surr)	102		89-112		%	1		09/13/16 20:37

Print Date: 09/18/2016 1:12:56PM

J flagging is activated

Results of **TB-5-0916**

Client Sample ID: **TB-5-0916**
Client Project ID: **105.00148.16001 Kenai Wells**
Lab Sample ID: 1165401002
Lab Project ID: 1165401

Collection Date: 09/12/16 17:30
Received Date: 09/13/16 13:13
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Volatile GC/MS**

Batch Information

Analytical Batch: VMS16184
Analytical Method: SW8260B
Analyst: TJT
Analytical Date/Time: 09/13/16 20:37
Container ID: 1165401002-A

Prep Batch: VXX29565
Prep Method: SW5030B
Prep Date/Time: 09/13/16 06:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

Print Date: 09/18/2016 1:12:56PM

J flagging is activated

Method Blank

Blank ID: MB for HBN 1743088 [MXX/30185]
Blank Lab ID: 1351846

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1165401001

Results by **SW6020A**

Parameter	Results	LOQ/CL	DL	Units
Arsenic	2.50U	5.00	1.50	ug/L
Barium	1.50U	3.00	0.940	ug/L
Cadmium	1.00U	2.00	0.620	ug/L
Chromium	2.00U	4.00	1.30	ug/L
Lead	0.500U	1.00	0.310	ug/L
Mercury	0.100U	0.200	0.0620	ug/L
Selenium	10.0U	20.0	6.20	ug/L
Silver	1.00U	2.00	0.620	ug/L

Batch Information

Analytical Batch: MMS9536
Analytical Method: SW6020A
Instrument: Perkin Elmer Nexlon P5
Analyst: VDL
Analytical Date/Time: 9/17/2016 1:21:02PM

Prep Batch: MXX30185
Prep Method: SW3010A
Prep Date/Time: 9/14/2016 9:05:06AM
Prep Initial Wt./Vol.: 25 mL
Prep Extract Vol: 25 mL

Print Date: 09/18/2016 1:13:04PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1165401 [MXX30185]
Blank Spike Lab ID: 1351847
Date Analyzed: 09/17/2016 13:25

Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1165401001

Results by **SW6020A**

Blank Spike (ug/L)

Parameter	Spike	Result	Rec (%)	CL
Arsenic	1000	979	98	(84-116)
Barium	1000	1040	104	(86-114)
Cadmium	100	107	107	(87-115)
Chromium	400	397	99	(85-116)
Lead	1000	1030	103	(88-115)
Mercury	10	10.3	103	(70-124)
Selenium	1000	955	96	(80-120)
Silver	100	102	102	(85-116)

Batch Information

Analytical Batch: **MMS9536**
Analytical Method: **SW6020A**
Instrument: **Perkin Elmer Nexion P5**
Analyst: **VDL**

Prep Batch: **MXX30185**
Prep Method: **SW3010A**
Prep Date/Time: **09/14/2016 09:05**
Spike Init Wt./Vol.: 1000 ug/L Extract Vol: 25 mL
Dupe Init Wt./Vol.: Extract Vol:

Print Date: 09/18/2016 1:13:07PM

Matrix Spike Summary

Original Sample ID: 1351848
MS Sample ID: 1351849 MS
MSD Sample ID: 1351850 MSD

QC for Samples: 1165401001

Analysis Date: 09/17/2016 13:38
Analysis Date: 09/17/2016 13:43
Analysis Date: 09/17/2016 13:47
Matrix: Water (Surface, Eff., Ground)

Results by **SW6020A**

		Matrix Spike (ug/L)			Spike Duplicate (ug/L)					
Parameter	Sample	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Arsenic	2.50U	1000	998	100	1000	970	97	84-116	2.82	(< 20)
Barium	2.24J	1000	1050	105	1000	1050	105	86-114	0.09	(< 20)
Cadmium	1.00U	100	105	105	100	105	105	87-115	0.26	(< 20)
Chromium	2.00U	400	390	98	400	389	97	85-116	0.20	(< 20)
Lead	0.500U	1000	1000	100	1000	1010	101	88-115	0.32	(< 20)
Mercury	0.100U	10.0	10.2	102	10.0	10.1	101	70-124	0.57	(< 20)
Selenium	10.0U	1000	992	99	1000	973	97	80-120	1.93	(< 20)
Silver	1.00U	100	103	103	100	102	102	85-116	1.24	(< 20)

Batch Information

Analytical Batch: MMS9536
Analytical Method: SW6020A
Instrument: Perkin Elmer Nexlon P5
Analyst: VDL
Analytical Date/Time: 9/17/2016 1:43:25PM

Prep Batch: MXX30185
Prep Method: 3010 H20 Digest for Metals ICP-MS
Prep Date/Time: 9/14/2016 9:05:06AM
Prep Initial Wt./Vol.: 25.00mL
Prep Extract Vol: 25.00mL

Print Date: 09/18/2016 1:13:08PM

Method Blank

Blank ID: MB for HBN 1743178 [VXX/29565]
Blank Lab ID: 1352185

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1165401001, 1165401002

Results by **SW8260B**

Parameter	Results	LOQ/CL	DL	Units
1,1,1,2-Tetrachloroethane	0.250U	0.500	0.150	ug/L
1,1,1-Trichloroethane	0.500U	1.00	0.310	ug/L
1,1,2,2-Tetrachloroethane	0.250U	0.500	0.150	ug/L
1,1,2-Trichloroethane	0.500U	1.00	0.310	ug/L
1,1-Dichloroethane	0.500U	1.00	0.310	ug/L
1,1-Dichloroethene	0.500U	1.00	0.310	ug/L
1,1-Dichloropropene	0.500U	1.00	0.310	ug/L
1,2,3-Trichlorobenzene	0.500U	1.00	0.310	ug/L
1,2,3-Trichloropropane	0.500U	1.00	0.310	ug/L
1,2,4-Trichlorobenzene	0.500U	1.00	0.310	ug/L
1,2,4-Trimethylbenzene	0.500U	1.00	0.310	ug/L
1,2-Dibromo-3-chloropropane	5.00U	10.0	3.10	ug/L
1,2-Dibromoethane	0.500U	1.00	0.310	ug/L
1,2-Dichlorobenzene	0.500U	1.00	0.310	ug/L
1,2-Dichloroethane	0.250U	0.500	0.150	ug/L
1,2-Dichloropropane	0.500U	1.00	0.310	ug/L
1,3,5-Trimethylbenzene	0.500U	1.00	0.310	ug/L
1,3-Dichlorobenzene	0.500U	1.00	0.310	ug/L
1,3-Dichloropropane	0.250U	0.500	0.150	ug/L
1,4-Dichlorobenzene	0.250U	0.500	0.150	ug/L
2,2-Dichloropropane	0.500U	1.00	0.310	ug/L
2-Butanone (MEK)	5.00U	10.0	3.10	ug/L
2-Chlorotoluene	0.500U	1.00	0.310	ug/L
2-Hexanone	5.00U	10.0	3.10	ug/L
4-Chlorotoluene	0.500U	1.00	0.310	ug/L
4-Isopropyltoluene	0.500U	1.00	0.310	ug/L
4-Methyl-2-pentanone (MIBK)	5.00U	10.0	3.10	ug/L
Benzene	0.200U	0.400	0.120	ug/L
Bromobenzene	0.500U	1.00	0.310	ug/L
Bromochloromethane	0.500U	1.00	0.310	ug/L
Bromodichloromethane	0.250U	0.500	0.150	ug/L
Bromoform	0.500U	1.00	0.310	ug/L
Bromomethane	5.00U	10.0	3.10	ug/L
Carbon disulfide	5.00U	10.0	3.10	ug/L
Carbon tetrachloride	0.500U	1.00	0.310	ug/L
Chlorobenzene	0.250U	0.500	0.150	ug/L
Chloroethane	0.500U	1.00	0.310	ug/L
Chloroform	0.500U	1.00	0.300	ug/L

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t 907.562.2343 f 907.561.5301 www.us.sgs.com

Method Blank

Blank ID: MB for HBN 1743178 [VXX/29565]
Blank Lab ID: 1352185

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1165401001, 1165401002

Results by **SW8260B**

Parameter	Results	LOQ/CL	DL	Units
Chloromethane	0.500U	1.00	0.310	ug/L
cis-1,2-Dichloroethene	0.500U	1.00	0.310	ug/L
cis-1,3-Dichloropropene	0.250U	0.500	0.150	ug/L
Dibromochloromethane	0.250U	0.500	0.150	ug/L
Dibromomethane	0.500U	1.00	0.310	ug/L
Dichlorodifluoromethane	0.500U	1.00	0.310	ug/L
Ethylbenzene	0.500U	1.00	0.310	ug/L
Freon-113	5.00U	10.0	3.10	ug/L
Hexachlorobutadiene	0.500U	1.00	0.310	ug/L
Isopropylbenzene (Cumene)	0.500U	1.00	0.310	ug/L
Methylene chloride	2.50U	5.00	1.00	ug/L
Methyl-t-butyl ether	5.00U	10.0	3.10	ug/L
Naphthalene	5.00U	10.0	3.10	ug/L
n-Butylbenzene	0.500U	1.00	0.310	ug/L
n-Propylbenzene	0.500U	1.00	0.310	ug/L
o-Xylene	0.500U	1.00	0.310	ug/L
P & M -Xylene	1.00U	2.00	0.620	ug/L
sec-Butylbenzene	0.500U	1.00	0.310	ug/L
Styrene	0.500U	1.00	0.310	ug/L
tert-Butylbenzene	0.500U	1.00	0.310	ug/L
Tetrachloroethene	0.500U	1.00	0.310	ug/L
Toluene	0.500U	1.00	0.310	ug/L
trans-1,2-Dichloroethene	0.500U	1.00	0.310	ug/L
trans-1,3-Dichloropropene	0.500U	1.00	0.310	ug/L
Trichloroethene	0.500U	1.00	0.310	ug/L
Trichlorofluoromethane	0.500U	1.00	0.310	ug/L
Vinyl acetate	5.00U	10.0	3.10	ug/L
Vinyl chloride	0.500U	1.00	0.310	ug/L
Xylenes (total)	1.50U	3.00	1.00	ug/L
Surrogates				
1,2-Dichloroethane-D4 (surr)	97.5	81-118		%
4-Bromofluorobenzene (surr)	100	85-114		%
Toluene-d8 (surr)	101	89-112		%

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Method Blank

Blank ID: MB for HBN 1743178 [VXX/29565]
Blank Lab ID: 1352185

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1165401001, 1165401002

Results by **SW8260B**

Parameter	Results	LOQ/CL	DL	Units

Batch Information

Analytical Batch: VMS16184
Analytical Method: SW8260B
Instrument: VSA Agilent GC/MS 7890B/5977A
Analyst: TJT
Analytical Date/Time: 9/13/2016 4:35:00PM

Prep Batch: VXX29565
Prep Method: SW5030B
Prep Date/Time: 9/13/2016 6:00:00AM
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

Print Date: 09/18/2016 1:13:09PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1165401 [VXX29565]
Blank Spike Lab ID: 1352186
Date Analyzed: 09/13/2016 16:51

Spike Duplicate ID: LCSD for HBN 1165401 [VXX29565]
Spike Duplicate Lab ID: 1352187
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1165401001, 1165401002

Results by **SW8260B**

	Blank Spike (ug/L)			Spike Duplicate (ug/L)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
1,1,1,2-Tetrachloroethane	30	29.5	98	30	29.8	99	(78-124)	1.20	(< 20)
1,1,1-Trichloroethane	30	31.0	103	30	31.9	106	(74-131)	2.90	(< 20)
1,1,2,2-Tetrachloroethane	30	30.6	102	30	31.8	106	(71-121)	3.70	(< 20)
1,1,2-Trichloroethane	30	31.1	104	30	31.8	106	(80-119)	2.40	(< 20)
1,1-Dichloroethane	30	30.6	102	30	31.4	105	(77-125)	2.60	(< 20)
1,1-Dichloroethene	30	31.4	105	30	32.3	108	(71-131)	2.80	(< 20)
1,1-Dichloropropene	30	31.1	104	30	32.3	108	(79-125)	3.60	(< 20)
1,2,3-Trichlorobenzene	30	32.5	108	30	34.0	113	(69-129)	4.50	(< 20)
1,2,3-Trichloropropane	30	29.8	99	30	30.5	102	(73-122)	2.50	(< 20)
1,2,4-Trichlorobenzene	30	32.5	108	30	33.5	112	(69-130)	3.10	(< 20)
1,2,4-Trimethylbenzene	30	29.3	98	30	30.4	101	(79-124)	3.60	(< 20)
1,2-Dibromo-3-chloropropane	30	31.3	104	30	33.4	111	(62-128)	6.50	(< 20)
1,2-Dibromoethane	30	31.5	105	30	32.5	108	(77-121)	3.00	(< 20)
1,2-Dichlorobenzene	30	30.0	100	30	30.8	103	(80-119)	2.70	(< 20)
1,2-Dichloroethane	30	27.3	91	30	27.8	93	(73-128)	1.90	(< 20)
1,2-Dichloropropane	30	31.3	104	30	32.0	107	(78-122)	2.10	(< 20)
1,3,5-Trimethylbenzene	30	29.0	97	30	29.4	98	(75-124)	1.40	(< 20)
1,3-Dichlorobenzene	30	30.2	101	30	30.9	103	(80-119)	2.30	(< 20)
1,3-Dichloropropane	30	30.8	103	30	31.8	106	(80-119)	3.20	(< 20)
1,4-Dichlorobenzene	30	30.9	103	30	31.9	106	(79-118)	3.20	(< 20)
2,2-Dichloropropane	30	32.5	108	30	33.4	111	(60-139)	2.70	(< 20)
2-Butanone (MEK)	90	84.9	94	90	91.3	101	(56-143)	7.20	(< 20)
2-Chlorotoluene	30	30.4	101	30	31.3	104	(79-122)	3.00	(< 20)
2-Hexanone	90	84.9	94	90	90.5	101	(57-139)	6.30	(< 20)
4-Chlorotoluene	30	30.7	102	30	31.6	105	(78-122)	2.70	(< 20)
4-Isopropyltoluene	30	29.8	99	30	31.1	104	(77-127)	4.10	(< 20)
4-Methyl-2-pentanone (MIBK)	90	88.1	98	90	93.8	104	(67-130)	6.30	(< 20)
Benzene	30	30.7	102	30	31.8	106	(79-120)	3.60	(< 20)
Bromobenzene	30	30.2	101	30	30.9	103	(80-120)	2.30	(< 20)
Bromochloromethane	30	30.4	101	30	30.9	103	(78-123)	1.50	(< 20)
Bromodichloromethane	30	30.8	103	30	31.5	105	(79-125)	2.30	(< 20)
Bromoform	30	31.1	104	30	31.5	105	(66-130)	1.40	(< 20)
Bromomethane	30	27.1	90	30	27.8	93	(53-141)	2.50	(< 20)
Carbon disulfide	45	50.7	113	45	52.2	116	(64-133)	2.90	(< 20)

Print Date: 09/18/2016 1:13:10PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1165401 [VXX29565]
Blank Spike Lab ID: 1352186
Date Analyzed: 09/13/2016 16:51

Spike Duplicate ID: LCSD for HBN 1165401 [VXX29565]
Spike Duplicate Lab ID: 1352187
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1165401001, 1165401002

Results by **SW8260B**

	Blank Spike (ug/L)			Spike Duplicate (ug/L)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Carbon tetrachloride	30	31.1	104	30	32.1	107	(72-136)	3.10	(< 20)
Chlorobenzene	30	31.1	104	30	32.0	107	(82-118)	2.90	(< 20)
Chloroethane	30	24.9	83	30	23.4	78	(60-138)	6.30	(< 20)
Chloroform	30	28.2	94	30	28.8	96	(79-124)	2.00	(< 20)
Chloromethane	30	28.7	96	30	28.8	96	(50-139)	0.56	(< 20)
cis-1,2-Dichloroethene	30	30.7	102	30	31.7	106	(78-123)	3.10	(< 20)
cis-1,3-Dichloropropene	30	32.1	107	30	33.1	110	(75-124)	3.00	(< 20)
Dibromochloromethane	30	29.4	98	30	30.0	100	(74-126)	2.00	(< 20)
Dibromomethane	30	29.8	99	30	30.2	101	(79-123)	1.60	(< 20)
Dichlorodifluoromethane	30	25.3	84	30	26.0	87	(32-152)	2.80	(< 20)
Ethylbenzene	30	32.2	107	30	33.0	110	(79-121)	2.40	(< 20)
Freon-113	45	52.9	118	45	54.2	120	(70-136)	2.40	(< 20)
Hexachlorobutadiene	30	31.9	106	30	33.4	111	(66-134)	4.80	(< 20)
Isopropylbenzene (Cumene)	30	29.5	98	30	30.4	101	(72-131)	3.00	(< 20)
Methylene chloride	30	29.4	98	30	29.7	99	(74-124)	1.10	(< 20)
Methyl-t-butyl ether	45	49.4	110	45	50.2	111	(71-124)	1.50	(< 20)
Naphthalene	30	30.6	102	30	34.0	113	(61-128)	10.80	(< 20)
n-Butylbenzene	30	31.8	106	30	33.3	111	(75-128)	4.50	(< 20)
n-Propylbenzene	30	29.5	98	30	30.4	101	(76-126)	3.20	(< 20)
o-Xylene	30	32.5	108	30	33.5	112	(78-122)	3.00	(< 20)
P & M -Xylene	60	64.5	107	60	65.8	110	(80-121)	2.10	(< 20)
sec-Butylbenzene	30	29.9	100	30	30.7	102	(77-126)	2.70	(< 20)
Styrene	30	29.3	98	30	30.2	101	(78-123)	3.10	(< 20)
tert-Butylbenzene	30	30.1	100	30	31.1	104	(78-124)	3.20	(< 20)
Tetrachloroethene	30	32.2	107	30	32.5	108	(74-129)	1.20	(< 20)
Toluene	30	30.7	102	30	32.0	107	(80-121)	4.00	(< 20)
trans-1,2-Dichloroethene	30	30.0	100	30	32.2	107	(75-124)	7.30	(< 20)
trans-1,3-Dichloropropene	30	32.5	108	30	33.2	111	(73-127)	2.10	(< 20)
Trichloroethene	30	30.7	102	30	31.7	106	(79-123)	3.10	(< 20)
Trichlorofluoromethane	30	29.8	99	30	30.4	101	(65-141)	2.10	(< 20)
Vinyl acetate	30	33.0	110	30	33.9	113	(54-146)	2.60	(< 20)
Vinyl chloride	30	28.7	96	30	29.7	99	(58-137)	3.70	(< 20)
Xylenes (total)	90	97.0	108	90	99.4	110	(79-121)	2.40	(< 20)

Blank Spike Summary

Blank Spike ID: LCS for HBN 1165401 [VXX29565]
Blank Spike Lab ID: 1352186
Date Analyzed: 09/13/2016 16:51

Spike Duplicate ID: LCSD for HBN 1165401 [VXX29565]
Spike Duplicate Lab ID: 1352187
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1165401001, 1165401002

Results by **SW8260B**

	Blank Spike (%)			Spike Duplicate (%)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Surrogates									
1,2-Dichloroethane-D4 (surr)	30	95.6	96	30	95	95	(81-118)	0.59	
4-Bromofluorobenzene (surr)	30	96	96	30	96.3	96	(85-114)	0.24	
Toluene-d8 (surr)	30	102	102	30	101	101	(89-112)	0.92	

Batch Information

Analytical Batch: **VMS16184**
Analytical Method: **SW8260B**
Instrument: **VSA Agilent GC/MS 7890B/5977A**
Analyst: **TJT**

Prep Batch: **VXX29565**
Prep Method: **SW5030B**
Prep Date/Time: **09/13/2016 06:00**
Spike Init Wt./Vol.: 30 ug/L Extract Vol: 5 mL
Dupe Init Wt./Vol.: 30 ug/L Extract Vol: 5 mL

Print Date: 09/18/2016 1:13:10PM

Duplicate Sample Summary

Original Sample ID: 1165286001
Duplicate Sample ID: 1352151
QC for Samples:
1165401001

Analysis Date: 09/14/2016 13:12
Matrix: Drinking Water

Results by **SM21 4500-H B**

NAME	Original	Duplicate	Units	RPD (%)	RPD CL
pH	7.40	7.40	pH units	0.00	(< 5)

Batch Information

Analytical Batch: WTI4510
Analytical Method: SM21 4500-H B
Instrument: Titration
Analyst: KBE

Print Date: 09/18/2016 1:13:13PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1165401 [WTI4510]
Blank Spike Lab ID: 1352148
Date Analyzed: 09/14/2016 10:32

Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1165401001

Results by **SM21 4500-H B**

Blank Spike (pH units)

Parameter	Spike	Result	Rec (%)	CL
pH	7	7.03	100	(99-101)

Batch Information

Analytical Batch: **WTI4510**
Analytical Method: **SM21 4500-H B**
Instrument: **Titration**
Analyst: **KBE**

Prep Batch:
Prep Method:
Prep Date/Time:
Spike Init Wt./Vol.: 7 pH units Extract Vol: 1 mL
Dupe Init Wt./Vol.: Extract Vol:

Print Date: 09/18/2016 1:13:14PM

SGS

SGS North America Inc.
CHAIN OF CUSTODY RECORD

1165401

Page 1 of 1

Instructions: Sections 1 ... Omissions may delay th...

Cooler ID_____

Section 1

CLIENT: SLR International	
CONTACT: Jason Gray	PHONE #: 264-6965
PROJECT NAME: Kenai Wells	Project #: 105.00148.16001
REPORTS TO: Jason Gray	E-MAIL: jgray@slrconsulting.com
INVOICE TO: SLR International	QUOTE #: 332060 P.O. #:

Section 3 — Preservative

Section 2

RESERVED for lab use	SAMPLE IDENTIFICATION	DATE mm/dd/yy	TIME HH:MM	MATRIX	# CONTAINERS	Pres: Type: Comp / Grab / MI (Multi-incremental)	RCRA Metals, Total (HNO3)	VOC by 8260B (HCl)	pH by SM 4500H-B (none)	REMARKS/ LOC ID
01 AE	APT-1-DEV-TK-0916	9/12/16	1730	GW	5	G	X	X	X	
02 AC	TB-5-0916	↓	1730	—	3	—		X		

Section 5

	Date	Time	
Relinquished By: (1) Kyle Johnson	9/12/16	2200	Received By:
Relinquished By: (2)	Date	Time	Received By:
Relinquished By: (3)	Date	Time	Received By:
Relinquished By: (4)	9/13/16	13:13	Received For Laboratory By:

Section 4 — DOD Project? Yes No

Cooler ID: _____

Data Deliverable Requirements: LVL2

Requested Turnaround Time and/or Special Instructions:
5-day TAT
RCRA 8 metals = Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Selenium, and Silver

14 DZO
5-day TAT
or Ambient [ ]
(See attached Sample Receipt Form)

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

[ ] 200 W. Potter Drive Anchorage, AK 99518 Tel: (907) 562-2343 Fax: (907) 561-5301
[ ] 5500 Business Drive Wilmington, NC 28405 Tel: (910) 350-1903 Fax: (910) 350-1557

AIRPORT OF DEPARTURE ENA 09/13/16 07:51 095166 808 7137471 Frgt

SHIPPER'S NAME, ADDRESS & PHONE
FUGRO KYLE JOHNSON
KENAI AK 5208081220

SHIPPER'S ACCOUNT NUMBER

NOT AIR WAYBILL (AIR CONSIGNMENT NOTE)

Ravn ALASKA 4700 Old International Airport Road Anchorage, Alaska 99502

It is agreed that the goods described herein are accepted in apparent good order and condition (except as noted) for carriage SUBJECT TO THE CONDITIONS OF CONTRACT AS LISTED IN THE COMPANIES TARIFFS. THE SHIPPER'S ATTENTION IS DRAWN TO THE NOTICE CONCERNING CARRIERS' LIMITATION OF LIABILITY. Shipper may increase such limitation of liability by declaring a higher value for carriage and paying a supplemental charge if required.

CONSIGNEE'S NAME, ADDRESS & PHONE
SGS JUSTIN NELSON
200 WEST POTTER RD
ANCHORAGE AK 99518 9075503205

CONSIGNEE'S ACCOUNT NUMBER

Received in Good Condition
Place Date
TO EXPEDITE MOVEMENT, SHIPMENT MAY BE DIVERTED TO MOTOR OR OTHER CARRIER AS PER TARIFF RULE UNLESS SHIPPER GIVES OTHER INSTRUCTION HEREON

ISSUING CARRIER'S AGENT NAME, CITY & PHONE

ALSO NOTIFY NAME & ADDRESS

AGENT'S IATA CODE
ACCOUNT NO.

ACCOUNTING INFORMATION 7145141
Card VI 0927 Exp 0619

AIRPORT OF DEPARTURE
Kenai

Declared Value $ 0.00
Insured Amount $ 0.00

[redacted] BY FIRST

AIRPORT OF DESTINATION
Anchorage

COMMENTS
NOA
MIKE LIGHT 1:00PM 9/13 TW

No. Of Pieces Rcp	Gross Weight	kg lb	Rate Class	Commodity Item No.	Chargeable Weight	Rate/Charge	Total	Nature and Quantity of Goods
4	145	l..	M	CARGO	145	$0.37	$53.65	SAMPLES
4	145						$53.65	

1165401

PREPAID	WEIGHT CHARGE	COLLECT
$53.65		

VALUATION CHARGE
$0.00

FEDERAL EXCISE TAX
$3.35

TOTAL OTHER CHARGES DUE AGENT
$0.00

TOTAL OTHER CHARGES DUE CARRIER
$0.00

TOTAL PREPAID	TOTAL COLLECT
$57.00	

OTHER CHARGES AND DESCRIPTION

AMOUNT	DESCRIPTION

HAZMAT
No

Shipper certifies that the particulars on the face hereof are correct, agrees to the CONDITIONS AS LISTED IN THE COMPANIES TARIFFS, accepts that carrier's liability is limited as stated in the companies tariffs and accepts such value unless a higher value for carriage is declared on the face hereof subject to an additional charge and that insofar as any part of the consignment contains restricted articles, such part is described by name and is in proper condition for carriage by air according to applicable national governmental regulations, and for international shipments, the current International Air Transport Association's Restricted Articles Regulations.

Paid By Shipper

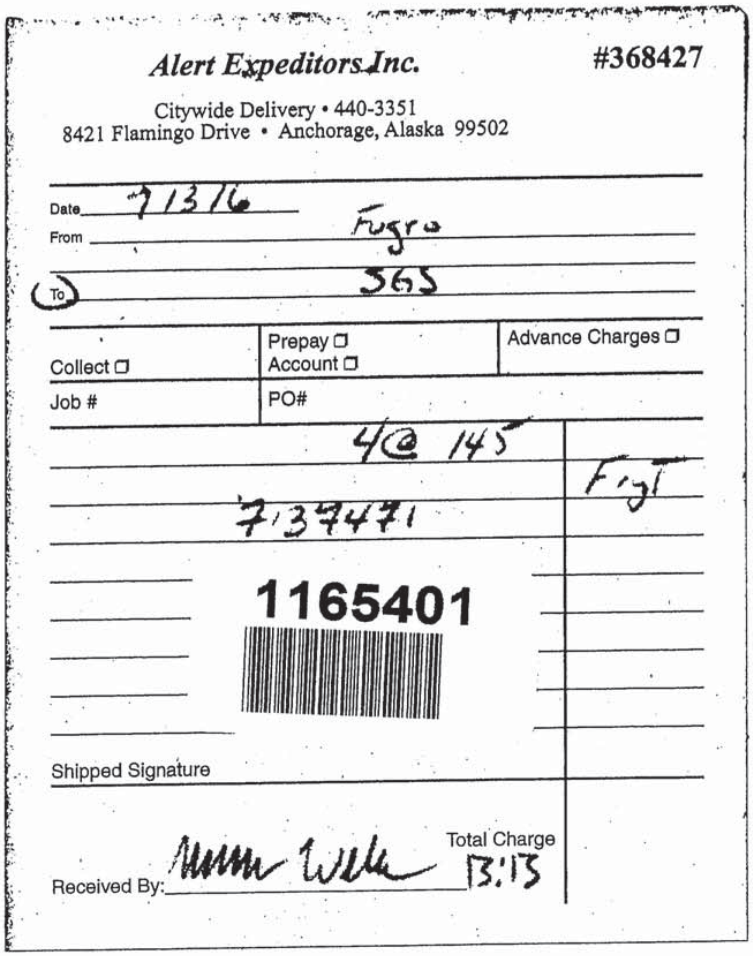
Printed Name and Title

Signature

STATION NUMBERS
ANCHORAGE - (907) 243-2761
ANIAK - (907) 675-4572
BARROW - (907) 852-5300
BETHEL -(907) 543-3825
DEADHORSE - (907) 659-9222
FAIRBANKS - (907) 450-7250
GALENA -(907) 656-1875
KOTZEBUE - (907) 442-3020
NOME - (907) 443-7595
ST. MARYS - (907) 438-2247
UNALAKLEET - (907) 624-3595

Printed at 13:00:37 on 9/13/2016 at ANC-FRT1 10.14.14.2

Customer Copy



Alert Expeditors Inc. #368427

Citywide Delivery • 440-3351
8421 Flamingo Drive • Anchorage, Alaska 99502

Date 7/13/16
From Fugro
To 565

Collect ☐ | Prepay ☐ Account ☐ | Advance Charges ☐
Job # | PO#

4@ 145
Fgt
7137471

1165401

Shipped Signature

Received By: [signature] Total Charge 13:15

SGS

e-SAMPLE RECEIPT FORM

1165401

Review Criteria	Y/N (yes/no)	Exceptions Noted below
		☐ exemption permitted if sampler hand carries/delivers.
Were Custody Seals intact? Note # & location	Y	1-F, 1-B
COC accompanied samples?	Y	
☐ **exemption permitted if chilled & collected <8hrs ago or chlling not required (i.e., waste, oil)		
Temperature blank compliant* (i.e., 0-6 °C after CF)?	Y	Cooler ID: 1 @ 1.4 °C Therm ID: D20
		Cooler ID: @ °C Therm ID:
		Cooler ID: @ °C Therm ID:
		Cooler ID: @ °C Therm ID:
		Cooler ID: @ °C Therm ID:
*If >6°C, were samples collected <8 hours ago?		
If <0°C, were sample containers ice free?		
If samples 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".		
Note: Identify containers received at non-compliant temperature . Use form FS-0029 if more space is needed.		
		Note: Refer to form F-083 "Sample Guide" for hold times.
Were samples received within hold time?	Y	
Do samples **match COC**** (i.e.,sample IDs,dates/times collected)?	Y	
**Note: If times differ <1hr, record details & login per COC.		
Were analyses requested unambiguous?	Y	
		☐ ***Exemption permitted for metals (e.g,200.8/6020A).
Were proper containers (type/mass/volume/preservative***)used?	Y	
IF APPLICABLE		
Were Trip Blanks (i.e., VOAs, LL-Hg) in cooler with samples?	Y	
Were all VOA vials free of headspace (i.e., bubbles ≤ 6mm)?	Y	
Were all soil VOAs field extracted with MeOH+BFB?		

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

Additional notes (if applicable):

Sample Containers and Preservatives

Container Id	Preservative	Container Condition	Container Id	Preservative	Container Condition
1165401001-A	HCL to pH < 2	OK			
1165401001-B	HCL to pH < 2	OK			
1165401001-C	HCL to pH < 2	OK			
1165401001-D	No Preservative Required	OK			
1165401001-E	HNO3 to pH < 2	OK			
1165401002-A	HCL to pH < 2	OK			
1165401002-B	HCL to pH < 2	OK			
1165401002-C	HCL to pH < 2	OK			

Container Condition Glossary

Containers for bacteriological, low level mercury and VOA vials are not opened prior to analysis and will be assigned condition code OK unless evidence indicates than an inappropriate container was submitted.

OK - The container was received at an acceptable pH for the analysis requested.
BU - The container was received with headspace greater than 6mm.
DM- The container was received damaged.
FR- The container was received frozen and not usable for Bacteria or BOD analyses.
PA - The container was received outside of the acceptable pH for the analysis requested. Preservative was added upon receipt and the container is now at the correct pH. See the Sample Receipt Form for details on the amount and lot # of the preservative added.
PH - The container was received outside of the acceptable pH for the analysis requested. Preservative was added upon receipt, but was insufficient to bring the container to the correct pH for the analysis requested. See the Sample Receipt Form for details on the amount and lot # of the preservative added.

Laboratory Report of Analysis

To: SLR Alaska-Anchorage
2700 Gambell St Suite 200
Anchorage, AK 99503
(907)222-1112

Report Number: **1165575**

Client Project: **105.00148.16001 Kenai Wells**

Dear Jason Gray,

Enclosed are the results of the analytical services performed under the referenced project for the received samples and associated QC as applicable. The samples are certified to meet the requirements of the National Environmental Laboratory Accreditation Conference Standards. Copies of this report and supporting data will be retained in our files for a period of ten years in the event they are required for future reference. All results are intended to be used in their entirety and SGS is not responsible for use of less than the complete report. Any samples submitted to our laboratory will be retained for a maximum of fourteen (14) days from the date of this report unless other archiving requirements were included in the quote.

If there are any questions about the report or services performed during this project, please call Justin at (907) 562-2343. We will be happy to answer any questions or concerns which you may have.

Thank you for using SGS North America Inc. for your analytical services. We look forward to working with you again on any additional analytical needs.

Sincerely,
SGS North America Inc.

SGS North America Inc.
Environmental Services – Alaska Division
Project Manager

Justin Nelson
2016.09.27
16:46:19 -08'00'

Justin Nelson Date
Project Manager
Justin.Nelson@sgs.com

Print Date: 09/27/2016 3:21:50PM

Case Narrative

SGS Client: **SLR Alaska-Anchorage**
SGS Project: **1165575**
Project Name/Site: **105.00148.16001 Kenai Wells**
Project Contact: **Jason Gray**

Refer to sample receipt form for information on sample condition.

LCS for HBN 1743673 [VXX/29611 (1353868) LCS

8260B - LCS recovery for several analytes does not meet QC criteria. These analytes were not detected above the LOQ in the associated samples.

LCSD for HBN 1743673 [VXX/2961 (1353869) LCSD

8260B - LCSD recovery for several analytes does not meet QC criteria. These analytes were not detected above the LOQ in the associated samples.

1165467004(1352351MS) (1352352) MS

6020A - Metals MS recoveries for silver (35.7%) and mercury (34%) do not meet QC criteria. The post digestion spike was successful.

1165467004(1352351MSD) (1352353) MSD

6020A - Metals MSD recoveries for silver (37.6%) and mercury (37.7%) do not meet QC criteria. The post digestion spike was successful.

*QC comments may be associated with the field samples found in this report. When applicable, comments will be applied to associated field samples.

SGS North America Inc.
200 West Potter Drive, Anchorage, AK 99518
t 907.562.2343 f 907.561.5301 www.us.sgs.com

Laboratory Qualifiers

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. This document is issued by the Company under its General Conditions of Service accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx>. Attention is drawn to the limitation of liability, indenmification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the context or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

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/ISO17025 (RCRA methods: 1020B, 1311, 3010A, 3050B, 3520C, 3550C, 5030B, 5035A, 6020A, 7470A, 7471B, 8021B, 8082A, 8260B, 8270D, 8270D-SIM, 9040C, 9045D, 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/CVA/CVB	Continuing Calibration Verification
CCCV/CVC/CVCA/CVCB	Closing 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
IB	Instrument Blank
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., 1/2 of the LOQ)
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.

Print Date: 09/27/2016 3:21:52PM

Sample Summary

Client Sample ID	Lab Sample ID	Collected	Received	Matrix
APT2-DEV-TK	1165575001	09/19/2016	09/20/2016	Water (Surface, Eff., Ground)

Method	Method Description
SW6020A	Metals by ICP-MS
SM21 4500-H B	pH Analysis
SW8260B	Volatile Organic Compounds (W) FULL

SGS North America Inc.
200 West Potter Drive, Anchorage, AK 99518
t 907.562.2343 f 907.561.5301 www.us.sgs.com

Detectable Results Summary

Client Sample ID: **APT2-DEV-TK**
Lab Sample ID: 1165575001

	Parameter	Result	Units
Metals by ICP/MS	Arsenic	36.9	ug/L
	Barium	91.7	ug/L
	Chromium	20.8	ug/L
	Lead	4.12	ug/L
	Mercury	0.197J	ug/L
Volatile GC/MS	Chloromethane	0.310J	ug/L
	Toluene	0.880J	ug/L
Waters Department	pH	8.30	pH units

SGS North America Inc.
200 West Potter Drive, Anchorage, AK 99518
t 907.562.2343 **f** 907.561.5301 www.us.sgs.com

Results of **APT2-DEV-TK**

Client Sample ID: **APT2-DEV-TK**
Client Project ID: **105.00148.16001 Kenai Wells**
Lab Sample ID: 1165575001
Lab Project ID: 1165575

Collection Date: 09/19/16 16:50
Received Date: 09/20/16 11:23
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Metals by ICP/MS**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Arsenic	36.9		5.00	1.50	ug/L	5		09/26/16 10:41
Barium	91.7		3.00	0.940	ug/L	5		09/26/16 10:41
Cadmium	1.00 U		2.00	0.620	ug/L	5		09/26/16 10:41
Chromium	20.8		4.00	1.30	ug/L	5		09/26/16 10:41
Lead	4.12		1.00	0.310	ug/L	5		09/26/16 10:41
Mercury	0.197 J		0.200	0.0620	ug/L	5		09/26/16 10:41
Selenium	10.0 U		20.0	6.20	ug/L	5		09/26/16 10:41
Silver	1.00 U		2.00	0.620	ug/L	5		09/26/16 10:41

Batch Information

Analytical Batch: MMS9548
Analytical Method: SW6020A
Analyst: VDL
Analytical Date/Time: 09/26/16 10:41
Container ID: 1165575001-A

Prep Batch: MXX30196
Prep Method: SW3010A
Prep Date/Time: 09/23/16 13:36
Prep Initial Wt./Vol.: 25 mL
Prep Extract Vol: 25 mL

Print Date: 09/27/2016 3:21:55PM

J flagging is activated

Results of **APT2-DEV-TK**

Client Sample ID: **APT2-DEV-TK**
Client Project ID: **105.00148.16001 Kenai Wells**
Lab Sample ID: 1165575001
Lab Project ID: 1165575

Collection Date: 09/19/16 16:50
Received Date: 09/20/16 11:23
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Volatile GC/MS**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
1,1,1,2-Tetrachloroethane	0.250	U	0.500	0.150	ug/L	1		09/20/16 23:27
1,1,1-Trichloroethane	0.500	U	1.00	0.310	ug/L	1		09/20/16 23:27
1,1,2,2-Tetrachloroethane	0.250	U	0.500	0.150	ug/L	1		09/20/16 23:27
1,1,2-Trichloroethane	0.500	U	1.00	0.310	ug/L	1		09/20/16 23:27
1,1-Dichloroethane	0.500	U	1.00	0.310	ug/L	1		09/20/16 23:27
1,1-Dichloroethene	0.500	U	1.00	0.310	ug/L	1		09/20/16 23:27
1,1-Dichloropropene	0.500	U	1.00	0.310	ug/L	1		09/20/16 23:27
1,2,3-Trichlorobenzene	0.500	U	1.00	0.310	ug/L	1		09/20/16 23:27
1,2,3-Trichloropropane	0.500	U	1.00	0.310	ug/L	1		09/20/16 23:27
1,2,4-Trichlorobenzene	0.500	U	1.00	0.310	ug/L	1		09/20/16 23:27
1,2,4-Trimethylbenzene	0.500	U	1.00	0.310	ug/L	1		09/20/16 23:27
1,2-Dibromo-3-chloropropane	5.00	U	10.0	3.10	ug/L	1		09/20/16 23:27
1,2-Dibromoethane	0.500	U	1.00	0.310	ug/L	1		09/20/16 23:27
1,2-Dichlorobenzene	0.500	U	1.00	0.310	ug/L	1		09/20/16 23:27
1,2-Dichloroethane	0.250	U	0.500	0.150	ug/L	1		09/20/16 23:27
1,2-Dichloropropane	0.500	U	1.00	0.310	ug/L	1		09/20/16 23:27
1,3,5-Trimethylbenzene	0.500	U	1.00	0.310	ug/L	1		09/20/16 23:27
1,3-Dichlorobenzene	0.500	U	1.00	0.310	ug/L	1		09/20/16 23:27
1,3-Dichloropropane	0.250	U	0.500	0.150	ug/L	1		09/20/16 23:27
1,4-Dichlorobenzene	0.250	U	0.500	0.150	ug/L	1		09/20/16 23:27
2,2-Dichloropropane	0.500	U	1.00	0.310	ug/L	1		09/20/16 23:27
2-Butanone (MEK)	5.00	U	10.0	3.10	ug/L	1		09/20/16 23:27
2-Chlorotoluene	0.500	U	1.00	0.310	ug/L	1		09/20/16 23:27
2-Hexanone	5.00	U	10.0	3.10	ug/L	1		09/20/16 23:27
4-Chlorotoluene	0.500	U	1.00	0.310	ug/L	1		09/20/16 23:27
4-Isopropyltoluene	0.500	U	1.00	0.310	ug/L	1		09/20/16 23:27
4-Methyl-2-pentanone (MIBK)	5.00	U	10.0	3.10	ug/L	1		09/20/16 23:27
Benzene	0.200	U	0.400	0.120	ug/L	1		09/20/16 23:27
Bromobenzene	0.500	U	1.00	0.310	ug/L	1		09/20/16 23:27
Bromochloromethane	0.500	U	1.00	0.310	ug/L	1		09/20/16 23:27
Bromodichloromethane	0.250	U	0.500	0.150	ug/L	1		09/20/16 23:27
Bromoform	0.500	U	1.00	0.310	ug/L	1		09/20/16 23:27
Bromomethane	5.00	U	10.0	3.10	ug/L	1		09/20/16 23:27
Carbon disulfide	5.00	U	10.0	3.10	ug/L	1		09/20/16 23:27
Carbon tetrachloride	0.500	U	1.00	0.310	ug/L	1		09/20/16 23:27
Chlorobenzene	0.250	U	0.500	0.150	ug/L	1		09/20/16 23:27
Chloroethane	0.500	U	1.00	0.310	ug/L	1		09/20/16 23:27

Print Date: 09/27/2016 3:21:55PM

J flagging is activated

Results of **APT2-DEV-TK**

Client Sample ID: **APT2-DEV-TK**
Client Project ID: **105.00148.16001 Kenai Wells**
Lab Sample ID: 1165575001
Lab Project ID: 1165575

Collection Date: 09/19/16 16:50
Received Date: 09/20/16 11:23
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Volatile GC/MS**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Chloroform	0.500	U	1.00	0.300	ug/L	1		09/20/16 23:27
Chloromethane	0.310	J	1.00	0.310	ug/L	1		09/20/16 23:27
cis-1,2-Dichloroethene	0.500	U	1.00	0.310	ug/L	1		09/20/16 23:27
cis-1,3-Dichloropropene	0.250	U	0.500	0.150	ug/L	1		09/20/16 23:27
Dibromochloromethane	0.250	U	0.500	0.150	ug/L	1		09/20/16 23:27
Dibromomethane	0.500	U	1.00	0.310	ug/L	1		09/20/16 23:27
Dichlorodifluoromethane	0.500	U	1.00	0.310	ug/L	1		09/20/16 23:27
Ethylbenzene	0.500	U	1.00	0.310	ug/L	1		09/20/16 23:27
Freon-113	5.00	U	10.0	3.10	ug/L	1		09/20/16 23:27
Hexachlorobutadiene	0.500	U	1.00	0.310	ug/L	1		09/20/16 23:27
Isopropylbenzene (Cumene)	0.500	U	1.00	0.310	ug/L	1		09/20/16 23:27
Methylene chloride	2.50	U	5.00	1.00	ug/L	1		09/20/16 23:27
Methyl-t-butyl ether	5.00	U	10.0	3.10	ug/L	1		09/20/16 23:27
Naphthalene	5.00	U	10.0	3.10	ug/L	1		09/20/16 23:27
n-Butylbenzene	0.500	U	1.00	0.310	ug/L	1		09/20/16 23:27
n-Propylbenzene	0.500	U	1.00	0.310	ug/L	1		09/20/16 23:27
o-Xylene	0.500	U	1.00	0.310	ug/L	1		09/20/16 23:27
P & M -Xylene	1.00	U	2.00	0.620	ug/L	1		09/20/16 23:27
sec-Butylbenzene	0.500	U	1.00	0.310	ug/L	1		09/20/16 23:27
Styrene	0.500	U	1.00	0.310	ug/L	1		09/20/16 23:27
tert-Butylbenzene	0.500	U	1.00	0.310	ug/L	1		09/20/16 23:27
Tetrachloroethene	0.500	U	1.00	0.310	ug/L	1		09/20/16 23:27
Toluene	0.880	J	1.00	0.310	ug/L	1		09/20/16 23:27
trans-1,2-Dichloroethene	0.500	U	1.00	0.310	ug/L	1		09/20/16 23:27
trans-1,3-Dichloropropene	0.500	U	1.00	0.310	ug/L	1		09/20/16 23:27
Trichloroethene	0.500	U	1.00	0.310	ug/L	1		09/20/16 23:27
Trichlorofluoromethane	0.500	U	1.00	0.310	ug/L	1		09/20/16 23:27
Vinyl acetate	5.00	U	10.0	3.10	ug/L	1		09/20/16 23:27
Vinyl chloride	0.500	U	1.00	0.310	ug/L	1		09/20/16 23:27
Xylenes (total)	1.50	U	3.00	1.00	ug/L	1		09/20/16 23:27
Surrogates								
1,2-Dichloroethane-D4 (surr)	105		81-118		%	1		09/20/16 23:27
4-Bromofluorobenzene (surr)	98.9		85-114		%	1		09/20/16 23:27
Toluene-d8 (surr)	101		89-112		%	1		09/20/16 23:27

Print Date: 09/27/2016 3:21:55PM

J flagging is activated

Results of **APT2-DEV-TK**

Client Sample ID: **APT2-DEV-TK**
Client Project ID: **105.00148.16001 Kenai Wells**
Lab Sample ID: 1165575001
Lab Project ID: 1165575

Collection Date: 09/19/16 16:50
Received Date: 09/20/16 11:23
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Volatile GC/MS**

Batch Information

Analytical Batch: VMS16209
Analytical Method: SW8260B
Analyst: TJT
Analytical Date/Time: 09/20/16 23:27
Container ID: 1165575001-B

Prep Batch: VXX29611
Prep Method: SW5030B
Prep Date/Time: 09/20/16 06:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

Print Date: 09/27/2016 3:21:55PM

J flagging is activated

Results of **APT2-DEV-TK**

Client Sample ID: **APT2-DEV-TK**
Client Project ID: **105.00148.16001 Kenai Wells**
Lab Sample ID: 1165575001
Lab Project ID: 1165575

Collection Date: 09/19/16 16:50
Received Date: 09/20/16 11:23
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Waters Department**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
pH	8.30		0.100	0.100	pH units	1		09/23/16 18:52

Batch Information

Analytical Batch: WTI4514
Analytical Method: SM21 4500-H B
Analyst: KBE
Analytical Date/Time: 09/23/16 18:52
Container ID: 1165575001-E

Print Date: 09/27/2016 3:21:55PM

J flagging is activated

Method Blank

Blank ID: MB for HBN 1743214 [MXX/30196]
Blank Lab ID: 1352349

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1165575001

Results by **SW6020A**

Parameter	Results	LOQ/CL	DL	Units
Arsenic	2.50U	5.00	1.50	ug/L
Barium	1.50U	3.00	0.940	ug/L
Cadmium	1.00U	2.00	0.620	ug/L
Chromium	2.00U	4.00	1.30	ug/L
Lead	0.500U	1.00	0.310	ug/L
Mercury	0.100U	0.200	0.0620	ug/L
Selenium	10.0U	20.0	6.20	ug/L
Silver	1.00U	2.00	0.620	ug/L

Batch Information

Analytical Batch: MMS9548
Analytical Method: SW6020A
Instrument: Perkin Elmer Nexlon P5
Analyst: VDL
Analytical Date/Time: 9/26/2016 9:47:24AM

Prep Batch: MXX30196
Prep Method: SW3010A
Prep Date/Time: 9/23/2016 1:36:00PM
Prep Initial Wt./Vol.: 25 mL
Prep Extract Vol: 25 mL

Analytical Batch: MMS9549
Analytical Method: SW6020A
Instrument: Perkin Elmer Nexlon P5
Analyst: VDL
Analytical Date/Time: 9/26/2016 3:08:24PM

Prep Batch: MXX30196
Prep Method: SW3010A
Prep Date/Time: 9/23/2016 1:36:00PM
Prep Initial Wt./Vol.: 25 mL
Prep Extract Vol: 25 mL

Print Date: 09/27/2016 3:21:56PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1165575 [MXX30196]
Blank Spike Lab ID: 1352350
Date Analyzed: 09/26/2016 09:51

Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1165575001

Results by **SW6020A**

Blank Spike (ug/L)

Parameter	Spike	Result	Rec (%)	CL
Arsenic	1000	1000	100	(84-116)
Barium	1000	999	100	(86-114)
Cadmium	100	101	101	(87-115)
Chromium	400	415	104	(85-116)
Lead	1000	990	99	(88-115)
Mercury	10	10.2	102	(70-124)
Selenium	1000	986	99	(80-120)
Silver	100	101	101	(85-116)

Batch Information

Analytical Batch: **MMS9548**
Analytical Method: **SW6020A**
Instrument: **Perkin Elmer Nexion P5**
Analyst: **VDL**

Prep Batch: **MXX30196**
Prep Method: **SW3010A**
Prep Date/Time: **09/23/2016 13:36**
Spike Init Wt./Vol.: 1000 ug/L Extract Vol: 25 mL
Dupe Init Wt./Vol.: Extract Vol:

Print Date: 09/27/2016 3:21:58PM

Matrix Spike Summary

Original Sample ID: 1352351
MS Sample ID: 1352352 MS
MSD Sample ID: 1352353 MSD

QC for Samples: 1165575001

Analysis Date: 09/26/2016 9:56
Analysis Date: 09/26/2016 10:00
Analysis Date: 09/26/2016 10:05
Matrix: Water (Surface, Eff., Ground)

Results by **SW6020A**

		Matrix Spike (ug/L)				Spike Duplicate (ug/L)					
Parameter	Sample	Spike	Result	Rec (%)		Spike	Result	Rec (%)		CL	RPD (%)	RPD CL
Arsenic	3.89J	1000	966	96		1000	955	95		84-116	1.10	(< 20)
Barium	10.2	1000	1060	105		1000	1050	104		86-114	0.24	(< 20)
Cadmium	1.00U	100	97.4	97		100	96.3	96		87-115	1.11	(< 20)
Chromium	2.70J	400	399	99		400	398	99		85-116	0.07	(< 20)
Lead	0.500U	1000	954	95		1000	956	96		88-115	0.21	(< 20)
Mercury	0.108J	10.0	3.51	34	*	10.0	3.88	38	*	70-124	10.10	(< 20)
Selenium	10.0U	1000	935	94		1000	931	93		80-120	0.41	(< 20)
Silver	1.00U	100	35.7	36	*	100	37.6	38	*	85-116	5.16	(< 20)

Batch Information

Analytical Batch: MMS9548
Analytical Method: SW6020A
Instrument: Perkin Elmer Nexlon P5
Analyst: VDL
Analytical Date/Time: 9/26/2016 10:00:52AM

Prep Batch: MXX30196
Prep Method: 3010 H20 Digest for Metals ICP-MS
Prep Date/Time: 9/23/2016 1:36:00PM
Prep Initial Wt./Vol.: 25.00mL
Prep Extract Vol: 25.00mL

Print Date: 09/27/2016 3:21:58PM

Matrix Spike Summary

Original Sample ID: 1354078
MS Sample ID: 1354079 MS
MSD Sample ID: 1354080 MSD

QC for Samples: 1165575001

Analysis Date: 09/26/2016 10:45
Analysis Date: 09/26/2016 10:50
Analysis Date: 09/26/2016 10:54
Matrix: Water (Surface, Eff., Ground)

Results by **SW6020A**

		Matrix Spike (ug/L)			Spike Duplicate (ug/L)					
Parameter	Sample	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Arsenic	2.48J	1000	1020	102	1000	992	99	84-116	2.84	(< 20)
Barium	28.1	1000	1080	105	1000	1060	104	86-114	1.39	(< 20)
Cadmium	1.00U	100	100	100	100	101	101	87-115	0.67	(< 20)
Chromium	2.00U	400	403	101	400	396	99	85-116	1.58	(< 20)
Lead	0.324J	1000	998	100	1000	991	99	88-115	0.74	(< 20)
Mercury	0.126J	10.0	10.2	101	10.0	10.2	101	70-124	0.42	(< 20)
Selenium	10.0U	1000	986	99	1000	973	97	80-120	1.41	(< 20)
Silver	1.00U	100	97.7	98	100	98.6	99	85-116	0.91	(< 20)

Batch Information

Analytical Batch: MMS9548
Analytical Method: SW6020A
Instrument: Perkin Elmer Nexlon P5
Analyst: VDL
Analytical Date/Time: 9/26/2016 10:50:18AM

Prep Batch: MXX30196
Prep Method: 3010 H20 Digest for Metals ICP-MS
Prep Date/Time: 9/23/2016 1:36:00PM
Prep Initial Wt./Vol.: 25.00mL
Prep Extract Vol: 25.00mL

Print Date: 09/27/2016 3:21:58PM

Bench Spike Summary

Original Sample ID: 1352351
MS Sample ID: 1352354 BND
MSD Sample ID:

QC for Samples: 1165575001

Analysis Date: 09/26/2016 9:56
Analysis Date: 09/26/2016 10:09
Analysis Date:
Matrix: Water (Surface, Eff., Ground)

Results by **SW6020A**

		Matrix Spike (ug/L)			Spike Duplicate (ug/L)					
Parameter	Sample	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Mercury	0.108J	25.0	25.1	100				80-120		
Silver	1.00U	25.0	22.8	91				80-120		

Batch Information

Analytical Batch: MMS9548
Analytical Method: SW6020A
Instrument: Perkin Elmer Nexlon P5
Analyst: VDL
Analytical Date/Time: 9/26/2016 10:09:49AM

Prep Batch: MXX30196
Prep Method: 3010 H20 Digest for Metals ICP-MS
Prep Date/Time: 9/23/2016 1:36:00PM
Prep Initial Wt./Vol.: 25.00mL
Prep Extract Vol: 25.00mL

Print Date: 09/27/2016 3:21:58PM

Method Blank

Blank ID: MB for HBN 1743673 [VXX/29611]
Blank Lab ID: 1353867

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1165575001

Results by **SW8260B**

Parameter	Results	LOQ/CL	DL	Units
1,1,1,2-Tetrachloroethane	0.250U	0.500	0.150	ug/L
1,1,1-Trichloroethane	0.500U	1.00	0.310	ug/L
1,1,2,2-Tetrachloroethane	0.250U	0.500	0.150	ug/L
1,1,2-Trichloroethane	0.500U	1.00	0.310	ug/L
1,1-Dichloroethane	0.500U	1.00	0.310	ug/L
1,1-Dichloroethene	0.500U	1.00	0.310	ug/L
1,1-Dichloropropene	0.500U	1.00	0.310	ug/L
1,2,3-Trichlorobenzene	0.500U	1.00	0.310	ug/L
1,2,3-Trichloropropane	0.500U	1.00	0.310	ug/L
1,2,4-Trichlorobenzene	0.500U	1.00	0.310	ug/L
1,2,4-Trimethylbenzene	0.500U	1.00	0.310	ug/L
1,2-Dibromo-3-chloropropane	5.00U	10.0	3.10	ug/L
1,2-Dibromoethane	0.500U	1.00	0.310	ug/L
1,2-Dichlorobenzene	0.500U	1.00	0.310	ug/L
1,2-Dichloroethane	0.250U	0.500	0.150	ug/L
1,2-Dichloropropane	0.500U	1.00	0.310	ug/L
1,3,5-Trimethylbenzene	0.500U	1.00	0.310	ug/L
1,3-Dichlorobenzene	0.500U	1.00	0.310	ug/L
1,3-Dichloropropane	0.250U	0.500	0.150	ug/L
1,4-Dichlorobenzene	0.250U	0.500	0.150	ug/L
2,2-Dichloropropane	0.500U	1.00	0.310	ug/L
2-Butanone (MEK)	5.00U	10.0	3.10	ug/L
2-Chlorotoluene	0.500U	1.00	0.310	ug/L
2-Hexanone	5.00U	10.0	3.10	ug/L
4-Chlorotoluene	0.500U	1.00	0.310	ug/L
4-Isopropyltoluene	0.500U	1.00	0.310	ug/L
4-Methyl-2-pentanone (MIBK)	5.00U	10.0	3.10	ug/L
Benzene	0.200U	0.400	0.120	ug/L
Bromobenzene	0.500U	1.00	0.310	ug/L
Bromochloromethane	0.500U	1.00	0.310	ug/L
Bromodichloromethane	0.250U	0.500	0.150	ug/L
Bromoform	0.500U	1.00	0.310	ug/L
Bromomethane	5.00U	10.0	3.10	ug/L
Carbon disulfide	5.00U	10.0	3.10	ug/L
Carbon tetrachloride	0.500U	1.00	0.310	ug/L
Chlorobenzene	0.250U	0.500	0.150	ug/L
Chloroethane	0.500U	1.00	0.310	ug/L
Chloroform	0.500U	1.00	0.300	ug/L

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Method Blank

Blank ID: MB for HBN 1743673 [VXX/29611]
Blank Lab ID: 1353867

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1165575001

Results by **SW8260B**

Parameter	Results	LOQ/CL	DL	Units
Chloromethane	0.390J	1.00	0.310	ug/L
cis-1,2-Dichloroethene	0.500U	1.00	0.310	ug/L
cis-1,3-Dichloropropene	0.250U	0.500	0.150	ug/L
Dibromochloromethane	0.250U	0.500	0.150	ug/L
Dibromomethane	0.500U	1.00	0.310	ug/L
Dichlorodifluoromethane	0.500U	1.00	0.310	ug/L
Ethylbenzene	0.500U	1.00	0.310	ug/L
Freon-113	5.00U	10.0	3.10	ug/L
Hexachlorobutadiene	0.500U	1.00	0.310	ug/L
Isopropylbenzene (Cumene)	0.500U	1.00	0.310	ug/L
Methylene chloride	2.50U	5.00	1.00	ug/L
Methyl-t-butyl ether	5.00U	10.0	3.10	ug/L
Naphthalene	5.00U	10.0	3.10	ug/L
n-Butylbenzene	0.500U	1.00	0.310	ug/L
n-Propylbenzene	0.500U	1.00	0.310	ug/L
o-Xylene	0.500U	1.00	0.310	ug/L
P & M -Xylene	1.00U	2.00	0.620	ug/L
sec-Butylbenzene	0.500U	1.00	0.310	ug/L
Styrene	0.500U	1.00	0.310	ug/L
tert-Butylbenzene	0.500U	1.00	0.310	ug/L
Tetrachloroethene	0.500U	1.00	0.310	ug/L
Toluene	0.500U	1.00	0.310	ug/L
trans-1,2-Dichloroethene	0.500U	1.00	0.310	ug/L
trans-1,3-Dichloropropene	0.500U	1.00	0.310	ug/L
Trichloroethene	0.500U	1.00	0.310	ug/L
Trichlorofluoromethane	0.500U	1.00	0.310	ug/L
Vinyl acetate	5.00U	10.0	3.10	ug/L
Vinyl chloride	0.500U	1.00	0.310	ug/L
Xylenes (total)	1.50U	3.00	1.00	ug/L
Surrogates				
1,2-Dichloroethane-D4 (surr)	118	81-118		%
4-Bromofluorobenzene (surr)	98.4	85-114		%
Toluene-d8 (surr)	93.2	89-112		%

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Method Blank

Blank ID: MB for HBN 1743673 [VXX/29611]
Blank Lab ID: 1353867

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1165575001

Results by **SW8260B**

Parameter	Results	LOQ/CL	DL	Units

Batch Information

Analytical Batch: VMS16209
Analytical Method: SW8260B
Instrument: VPA 780/5975 GC/MS
Analyst: TJT
Analytical Date/Time: 9/20/2016 3:42:00PM

Prep Batch: VXX29611
Prep Method: SW5030B
Prep Date/Time: 9/20/2016 6:00:00AM
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

Print Date: 09/27/2016 3:21:59PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1165575 [VXX29611]
Blank Spike Lab ID: 1353868
Date Analyzed: 09/20/2016 15:59

Spike Duplicate ID: LCSD for HBN 1165575 [VXX29611]
Spike Duplicate Lab ID: 1353869
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1165575001

Results by **SW8260B**

	Blank Spike (ug/L)			Spike Duplicate (ug/L)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
1,1,1,2-Tetrachloroethane	30	35.6	119	30	36.7	122	(78-124)	3.00	(< 20)
1,1,1-Trichloroethane	30	35.6	119	30	34.1	114	(74-131)	4.30	(< 20)
1,1,2,2-Tetrachloroethane	30	27.6	92	30	30.2	101	(71-121)	9.20	(< 20)
1,1,2-Trichloroethane	30	31.0	103	30	31.0	103	(80-119)	0.13	(< 20)
1,1-Dichloroethane	30	34.0	113	30	30.3	101	(77-125)	11.50	(< 20)
1,1-Dichloroethene	30	32.8	109	30	31.9	106	(71-131)	2.90	(< 20)
1,1-Dichloropropene	30	33.0	110	30	33.2	111	(79-125)	0.57	(< 20)
1,2,3-Trichlorobenzene	30	31.3	104	30	36.0	120	(69-129)	14.10	(< 20)
1,2,3-Trichloropropane	30	29.5	98	30	31.7	106	(73-122)	7.20	(< 20)
1,2,4-Trichlorobenzene	30	32.0	107	30	34.6	115	(69-130)	7.60	(< 20)
1,2,4-Trimethylbenzene	30	29.9	100	30	32.1	107	(79-124)	7.40	(< 20)
1,2-Dibromo-3-chloropropane	30	31.9	106	30	33.5	112	(62-128)	4.60	(< 20)
1,2-Dibromoethane	30	32.8	109	30	33.8	113	(77-121)	3.10	(< 20)
1,2-Dichlorobenzene	30	31.3	104	30	31.9	106	(80-119)	1.90	(< 20)
1,2-Dichloroethane	30	33.6	112	30	32.5	108	(73-128)	3.40	(< 20)
1,2-Dichloropropane	30	32.3	108	30	34.1	114	(78-122)	5.30	(< 20)
1,3,5-Trimethylbenzene	30	30.3	101	30	31.7	106	(75-124)	4.50	(< 20)
1,3-Dichlorobenzene	30	31.4	105	30	32.9	110	(80-119)	4.60	(< 20)
1,3-Dichloropropane	30	31.3	104	30	31.9	106	(80-119)	1.80	(< 20)
1,4-Dichlorobenzene	30	31.9	106	30	33.5	112	(79-118)	5.10	(< 20)
2,2-Dichloropropane	30	35.4	118	30	32.9	110	(60-139)	7.60	(< 20)
2-Butanone (MEK)	90	103	114	90	105	116	(56-143)	1.80	(< 20)
2-Chlorotoluene	30	30.6	102	30	33.0	110	(79-122)	7.50	(< 20)
2-Hexanone	90	96.1	107	90	100	111	(57-139)	4.00	(< 20)
4-Chlorotoluene	30	29.5	98	30	31.1	104	(78-122)	5.30	(< 20)
4-Isopropyltoluene	30	30.7	102	30	32.1	107	(77-127)	4.60	(< 20)
4-Methyl-2-pentanone (MIBK)	90	105	117	90	99.8	111	(67-130)	5.10	(< 20)
Benzene	30	31.2	104	30	31.7	106	(79-120)	1.70	(< 20)
Bromobenzene	30	31.2	104	30	32.5	108	(80-120)	4.10	(< 20)
Bromochloromethane	30	34.6	115	30	33.1	110	(78-123)	4.60	(< 20)
Bromodichloromethane	30	34.7	116	30	35.5	118	(79-125)	2.30	(< 20)
Bromoform	30	37.8	126	30	39.9	133	* (66-130)	5.30	(< 20)
Bromomethane	30	42.9	143 *	30	46.2	154	* (53-141)	7.40	(< 20)
Carbon disulfide	45	45.8	102	45	45.3	101	(64-133)	1.10	(< 20)

Print Date: 09/27/2016 3:22:00PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1165575 [VXX29611]
Blank Spike Lab ID: 1353868
Date Analyzed: 09/20/2016 15:59

Spike Duplicate ID: LCSD for HBN 1165575 [VXX29611]
Spike Duplicate Lab ID: 1353869
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1165575001

Results by **SW8260B**

	Blank Spike (ug/L)				Spike Duplicate (ug/L)					
Parameter	Spike	Result	Rec (%)		Spike	Result	Rec (%)		CL	RPD (%)	RPD CL
Carbon tetrachloride	30	36.1	120		30	34.3	114		(72-136)	5.00	(< 20)
Chlorobenzene	30	33.0	110		30	33.8	113		(82-118)	2.40	(< 20)
Chloroethane	30	33.2	111		30	33.6	112		(60-138)	1.00	(< 20)
Chloroform	30	34.4	115		30	32.4	108		(79-124)	5.90	(< 20)
Chloromethane	30	45.7	152	*	30	51.1	170	*	(50-139)	11.20	(< 20)
cis-1,2-Dichloroethene	30	31.5	105		30	29.0	97		(78-123)	8.20	(< 20)
cis-1,3-Dichloropropene	30	34.2	114		30	32.2	107		(75-124)	6.10	(< 20)
Dibromochloromethane	30	36.0	120		30	36.9	123		(74-126)	2.30	(< 20)
Dibromomethane	30	32.1	107		30	31.6	105		(79-123)	1.80	(< 20)
Dichlorodifluoromethane	30	31.3	104		30	31.8	106		(32-152)	1.60	(< 20)
Ethylbenzene	30	31.7	106		30	32.9	110		(79-121)	3.60	(< 20)
Freon-113	45	53.3	118		45	52.1	116		(70-136)	2.30	(< 20)
Hexachlorobutadiene	30	33.0	110		30	35.1	117		(66-134)	6.10	(< 20)
Isopropylbenzene (Cumene)	30	33.2	111		30	35.7	119		(72-131)	7.20	(< 20)
Methylene chloride	30	30.5	102		30	30.3	101		(74-124)	0.59	(< 20)
Methyl-t-butyl ether	45	59.8	133	*	45	56.1	125	*	(71-124)	6.50	(< 20)
Naphthalene	30	30.8	103		30	36.1	120		(61-128)	15.80	(< 20)
n-Butylbenzene	30	29.6	99		30	31.5	105		(75-128)	6.10	(< 20)
n-Propylbenzene	30	29.4	98		30	31.3	104		(76-126)	6.10	(< 20)
o-Xylene	30	33.2	111		30	35.7	119		(78-122)	7.20	(< 20)
P & M -Xylene	60	64.8	108		60	67.4	112		(80-121)	4.00	(< 20)
sec-Butylbenzene	30	29.7	99		30	31.5	105		(77-126)	5.70	(< 20)
Styrene	30	33.6	112		30	35.9	120		(78-123)	6.60	(< 20)
tert-Butylbenzene	30	30.2	101		30	31.9	106		(78-124)	5.50	(< 20)
Tetrachloroethene	30	35.0	117		30	35.6	119		(74-129)	1.70	(< 20)
Toluene	30	30.5	102		30	29.9	100		(80-121)	1.90	(< 20)
trans-1,2-Dichloroethene	30	34.4	115		30	31.6	105		(75-124)	8.60	(< 20)
trans-1,3-Dichloropropene	30	32.5	108		30	32.9	110		(73-127)	1.30	(< 20)
Trichloroethene	30	33.3	111		30	33.5	112		(79-123)	0.45	(< 20)
Trichlorofluoromethane	30	36.9	123		30	35.6	119		(65-141)	3.60	(< 20)
Vinyl acetate	30	35.4	118		30	33.4	111		(54-146)	5.80	(< 20)
Vinyl chloride	30	33.9	113		30	37.9	126		(58-137)	11.10	(< 20)
Xylenes (total)	90	98.0	109		90	103	115		(79-121)	5.10	(< 20)

Blank Spike Summary

Blank Spike ID: LCS for HBN 1165575 [VXX29611]
Blank Spike Lab ID: 1353868
Date Analyzed: 09/20/2016 15:59

Spike Duplicate ID: LCSD for HBN 1165575 [VXX29611]
Spike Duplicate Lab ID: 1353869
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1165575001

Results by **SW8260B**

	Blank Spike (%)			Spike Duplicate (%)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Surrogates									
1,2-Dichloroethane-D4 (surr)	30	108	108	30	105	105	(81-118)	3.50	
4-Bromofluorobenzene (surr)	30	92.9	93	30	96	96	(85-114)	3.40	
Toluene-d8 (surr)	30	99.4	99	30	96.3	96	(89-112)	3.20	

Batch Information

Analytical Batch: **VMS16209**
Analytical Method: **SW8260B**
Instrument: **VPA 780/5975 GC/MS**
Analyst: **TJT**

Prep Batch: **VXX29611**
Prep Method: **SW5030B**
Prep Date/Time: **09/20/2016 06:00**
Spike Init Wt./Vol.: 30 ug/L Extract Vol: 5 mL
Dupe Init Wt./Vol.: 30 ug/L Extract Vol: 5 mL

Print Date: 09/27/2016 3:22:00PM

Duplicate Sample Summary

Original Sample ID: 1165651001
Duplicate Sample ID: 1354465
QC for Samples:
1165575001

Analysis Date: 09/23/2016 22:43
Matrix: Water (Surface, Eff., Ground)

Results by **SM21 4500-H B**

NAME	Original	Duplicate	Units	RPD (%)	RPD CL
pH	8.40	8.40	pH units	0.00	(< 5)

Batch Information

Analytical Batch: WTI4514
Analytical Method: SM21 4500-H B
Instrument: Titration
Analyst: KBE

Print Date: 09/27/2016 3:22:01PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1165575 [WTI4514]
Blank Spike Lab ID: 1354462
Date Analyzed: 09/23/2016 18:05

Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1165575001

Results by **SM21 4500-H B**

Blank Spike (pH units)

Parameter	Spike	Result	Rec (%)	CL
pH	7	7.03	100	(99-101)

Batch Information

Analytical Batch: **WTI4514**
Analytical Method: **SM21 4500-H B**
Instrument: **Titration**
Analyst: **KBE**

Prep Batch:
Prep Method:
Prep Date/Time:
Spike Init Wt./Vol.: 7 pH units Extract Vol: 1 mL
Dupe Init Wt./Vol.: Extract Vol:

Print Date: 09/27/2016 3:22:02PM

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CHAIN OF CUSTODY RECORD

1165575

Instructions: Sections 1 ... Omissions may delay t... sheet of analysis.

Page 1 of 1

Cooler ID 9(a)

Section 1

CLIENT: SLR International	
CONTACT: Jason Gray	PHONE #: 264-6965
PROJECT NAME: Kenai Wells	Project #: 105.00148.16001
REPORTS TO: Jason Gray	E-MAIL: jgray@slrconsulting.com
INVOICE TO: SLR International	QUOTE #: 332060 P.O. #:

Section 3 — Preservative

Section 2

RESERVED for lab use	SAMPLE IDENTIFICATION	DATE mm/dd/yy	TIME HH:MM	MATRIX	# CONTAINERS	Pres: Type: Comp / Grab / MI (Multi-Incremental)	HNO3 RCRA Metals, Total	HCl VOC by 8260B	none pH by SM 4500H-B	REMARKS/ LOC ID
(1)-E	APTZ-DEV-TK~~-016~~	09/9/16	16:50	WATER	5	G	X	X	X	NO TB inc.

Section 5

	Date	Time	
Relinquished By: (1)	9/9/16	17:40	Received By: Jason Gray SLR
Relinquished By: (2)	9-20-16	08:00	Received By:
Relinquished By: (3)	Date	Time	~~Received By:~~
Relinquished By: (4)	9/20/16	11:23	Received For Laboratory By:

Section 4 — DOD Project? Yes No

Cooler ID: _____

Data Deliverable Requirements: LVL2

~~Requested~~ Turnaround Time and/or Special Instructions:
5-day TAT
RCRA 8 metals = Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Selenium, and Silver

5-day TAT
~~or Ambient~~ [ ] 39 DAC
(See attached Sample Receipt Form)

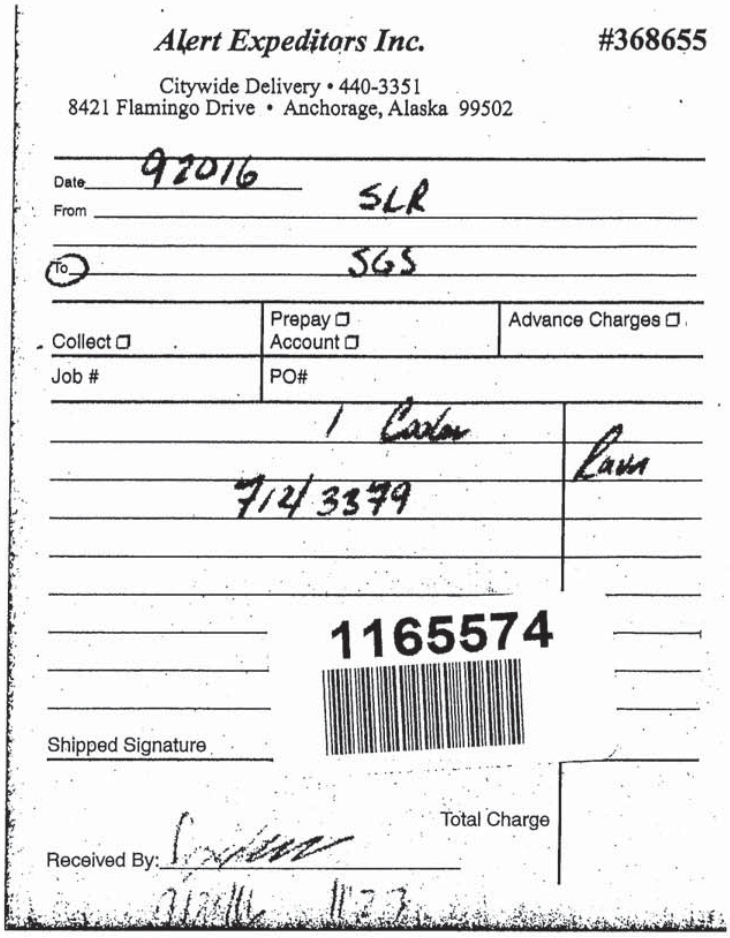
Chain of Custody Seal: (Circle)
1F18
INTACT BROKEN ABSENT
(See attached Sample Receipt Form)

24 of 28

[ ] 200 W. Potter Drive Anchorage, AK 99518 Tel: (907) 562-2343 Fax: (907) 561-5301
[ ] 5500 Business Drive Wilmington, NC 28405 Tel: (910) 350-1903 Fax: (910) 350-1557

http://www.sgs.com/terms-and-conditions

F083-Kit_Request_and_COC_Templates-Blank
Revised 2013-03-24



Alert Expeditors Inc. #368655

Citywide Delivery • 440-3351
8421 Flamingo Drive • Anchorage, Alaska 99502

Date 92016

From SLR

To SGS

Collect ☐ | Prepay ☐ Account ☐ | Advance Charges ☐

Job # | PO#

1 Cooler

7/4/3379

1165574

Shipped Signature

Total Charge

Received By:

AIRPORT OF DEPARTURE ENA 09/20/16 08:41 090363 **808 7143379** **Rush**

SHIPPER'S NAME, ADDRESS & PHONE	SHIPPER'S ACCOUNT NUMBER
SLR JASON GRAY KENAI AK 99611 9072238578	H7752

NOT AIR WAYBILL (AIR CONSIGNMENT NOTE) Ravn ALASKA 4700 Old International Airport Road Anchorage, Alaska 99502

It is agreed that the goods described herein are accepted in apparent good order and condition (except as noted) for carriage SUBJECT TO THE CONDITIONS OF CONTRACT AS LISTED IN THE COMPANIES TARIFFS. THE SHIPPER'S ATTENTION IS DRAWN TO THE NOTICE CONCERNING CARRIERS' LIMITATION OF LIABILITY. Shipper may increase such limitation of liability by declaring a higher value for carriage and paying a supplemental charge if required.

Received in Good Condition

Place Date

TO EXPEDITE MOVEMENT, SHIPMENT MAY BE DIVERTED TO MOTOR OR OTHER CARRIER AS PER TARIFF RULE UNLESS SHIPPER GIVES OTHER INSTRUCTION HEREON

CONSIGNEE'S NAME, ADDRESS & PHONE	CONSIGNEE'S ACCOUNT NUMBER
SGS LABS 200 WEST POTTER RD ANCHORAGE AK 99518 9075622343	

ISSUING CARRIER'S AGENT NAME, CITY & PHONE

ALSO NOTIFY NAME & ADDRESS

AGENT'S IATA CODE | ACCOUNT NO.

ACCOUNTING INFORMATION 7147795
Acc#: H7752 SLR INTERNATIONAL CORP.

AIRPORT OF DEPARTURE: Kenai | Declared Value: $ 0.00 | Insured Amount: $ 0.00

[redacted] BY FIRST

AIRPORT OF DESTINATION: Anchorage

COMMENTS
Rush depts 829 arvs 9:57am
po 105.00148.16001
10:25 9-20-16

No. Of Pieces Rcp	Gross Weight	kg lb	Rate Class	Commodity Item No.	Chargeable Weight	Rate/Charge	Total	Nature and Quantity of Goods
1	30	l..	F	rush	1	$54.59	$54.59	lab samples
1	30						$54.59	

1165574

PREPAID	WEIGHT CHARGE	COLLECT
$54.59		

OTHER CHARGES AND DESCRIPTION

AMOUNT	DESCRIPTION

VALUATION CHARGE	FEDERAL EXCISE TAX	TOTAL OTHER CHARGES DUE AGENT	TOTAL OTHER CHARGES DUE CARRIER	TOTAL PREPAID	TOTAL COLLECT
$0.00	$3.41	$0.00	$0.00	$58.00	

HAZMAT
No

Shipper certifies that the particulars on the face hereof are correct, agrees to the CONDITIONS AS LISTED IN THE COMPANIES TARIFFS, accepts that carrier's liability is limited as stated in the companies tariffs and accepts such value unless a higher value for carriage is declared on the face hereof subject to an additional charge and that insofar as any part of the consignment contains restricted articles, such part is described by name and is in proper condition for carriage by air according to applicable national governmental regulations, and for international shipments, the current International Air Transport Association's Restricted Articles Regulations.

Paid By Shipper

Printed Name and Title

Signature

STATION NUMBERS
ANCHORAGE - (907) 243-2761
ANIAK - (907) 675-4572
BARROW - (907) 852-5300
BETHEL -(907) 543-3825
DEADHORSE - (907) 659-9222
FAIRBANKS - (907) 450-7250
GALENA -(907) 656-1875
KOTZEBUE - (907) 442-3020
NOME - (907) 443-7595
ST. MARYS - (907) 438-2247
UNALAKLEET - (907) 624-3595

Printed at 08:44:53 on 9/20/2016 at ENA-FRTMGR 10.106.2.15

Consignee Copy

SGS

e-SAMPLE RECEIPT FORM

1165575

Review Criteria	Y/N (yes/no)	Exceptions Noted below
		☐ exemption permitted if sampler hand carries/delivers.
Were Custody Seals intact? Note # & location	Y	1F-1B
COC accompanied samples?	Y	
☐ **exemption permitted if chilled & collected <8hrs ago or chlling not required (i.e., waste, oil)		
Temperature blank compliant* (i.e., 0-6 °C after CF)?	Y	Cooler ID: 1 @ 3.9 °C Therm ID: D20
	Y	Cooler ID: @ °C Therm ID:
	Y	Cooler ID: @ °C Therm ID:
	Y	Cooler ID: @ °C Therm ID:
	Y	Cooler ID: @ °C Therm ID:
If >6°C, were samples collected <8 hours ago?	Y	
If <0°C, were sample containers ice free?	Y	
If samples 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".		
Note: Identify containers received at non-compliant temperature . Use form FS-0029 if more space is needed.		
		Note: Refer to form F-083 "Sample Guide" for hold times.
Were samples received within hold time?	Y	
Do samples **match COC**** (i.e.,sample IDs,dates/times collected)?	Y	
**Note: If times differ <1hr, record details & login per COC.		
Were analyses requested unambiguous?	Y	
		☐ ***Exemption permitted for metals (e.g,200.8/6020A).
Were proper containers (type/mass/volume/preservative***)used?	Y	
IF APPLICABLE		
Were Trip Blanks (i.e., VOAs, LL-Hg) in cooler with samples?	Y	
Were all VOA vials free of headspace (i.e., bubbles ≤ 6mm)?	Y	
Were all soil VOAs field extracted with MeOH+BFB?	Y	

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

Additional notes (if applicable):

Sample Containers and Preservatives

Container Id	Preservative	Container Condition	Container Id	Preservative	Container Condition
1165575001-A	HNO3 to pH < 2	OK			
1165575001-B	HCL to pH < 2	OK			
1165575001-C	HCL to pH < 2	OK			
1165575001-D	HCL to pH < 2	OK			
1165575001-E	No Preservative Required	OK			

Container Condition Glossary

Containers for bacteriological, low level mercury and VOA vials are not opened prior to analysis and will be assigned condition code OK unless evidence indicates than an inappropriate container was submitted.

OK - The container was received at an acceptable pH for the analysis requested.
BU - The container was received with headspace greater than 6mm.
DM- The container was received damaged.
FR- The container was received frozen and not usable for Bacteria or BOD analyses.
PA - The container was received outside of the acceptable pH for the analysis requested. Preservative was added upon receipt and the container is now at the correct pH. See the Sample Receipt Form for details on the amount and lot # of the preservative added.
PH - The container was received outside of the acceptable pH for the analysis requested. Preservative was added upon receipt, but was insufficient to bring the container to the correct pH for the analysis requested. See the Sample Receipt Form for details on the amount and lot # of the preservative added.

Laboratory Report of Analysis

To: SLR Alaska-Anchorage
2700 Gambell St Suite 200
Anchorage, AK 99503
(907)222-1112

Report Number: **1165243**

Client Project: **Kenai Wells AKLNG**

Dear Jason Gray,

Enclosed are the results of the analytical services performed under the referenced project for the received samples and associated QC as applicable. The samples are certified to meet the requirements of the National Environmental Laboratory Accreditation Conference Standards. Copies of this report and supporting data will be retained in our files for a period of ten years in the event they are required for future reference. All results are intended to be used in their entirety and SGS is not responsible for use of less than the complete report. Any samples submitted to our laboratory will be retained for a maximum of fourteen (14) days from the date of this report unless other archiving requirements were included in the quote.

If there are any questions about the report or services performed during this project, please call Justin at (907) 562-2343. We will be happy to answer any questions or concerns which you may have.

Thank you for using SGS North America Inc. for your analytical services. We look forward to working with you again on any additional analytical needs.

Sincerely,
SGS North America Inc.

SGS North America Inc.
Environmental Services – Alaska Division
Project Manager

Justin Nelson
2016.09.12
15:51:08 -08'00'

Justin Nelson Date
Project Manager
Justin.Nelson@sgs.com

Print Date: 09/12/2016 8:26:35AM

Case Narrative

SGS Client: **SLR Alaska-Anchorage**
SGS Project: **1165243**
Project Name/Site: **Kenai Wells AKLNG**
Project Contact: **Jason Gray**

Refer to sample receipt form for information on sample condition.

APT-3-DEV-TK-0916 (1165243001) PS

6020A - The metals LOQ for multiple analytes was elevated due to matrix interference.

*QC comments may be associated with the field samples found in this report. When applicable, comments will be applied to associated field samples.

SGS North America Inc.
200 West Potter Drive, Anchorage, AK 99518
t 907.562.2343 f 907.561.5301 www.us.sgs.com

Laboratory Qualifiers

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. This document is issued by the Company under its General Conditions of Service accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx>. Attention is drawn to the limitation of liability, indenmification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the context or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

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/ISO17025 (RCRA methods: 1020B, 1311, 3010A, 3050B, 3520C, 3550C, 5030B, 5035A, 6020A, 7470A, 7471B, 8021B, 8082A, 8260B, 8270D, 8270D-SIM, 9040C, 9045D, 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/CVA/CVB	Continuing Calibration Verification
CCCV/CVC/CVCA/CVCB	Closing 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
IB	Instrument Blank
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., 1/2 of the LOQ)
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.

Print Date: 09/12/2016 8:26:38AM

Sample Summary

Client Sample ID	Lab Sample ID	Collected	Received	Matrix
APT-3-DEV-TK-0916	1165243001	09/06/2016	09/07/2016	Water (Surface, Eff., Ground)
TB-1-0916	1165243002	09/06/2016	09/07/2016	Water (Surface, Eff., Ground)

Method	Method Description
SW6020A	Metals by ICP-MS
SM21 4500-H B	pH Analysis
SW8260B	Volatile Organic Compounds (W) FULL

SGS North America Inc.
200 West Potter Drive, Anchorage, AK 99518
t 907.562.2343 f 907.561.5301 www.us.sgs.com

Detectable Results Summary

Client Sample ID: **APT-3-DEV-TK-0916**
Lab Sample ID: 1165243001

	Parameter	Result	Units
Metals by ICP/MS	Arsenic	77.5	ug/L
	Barium	361	ug/L
	Chromium	101	ug/L
	Lead	23.7	ug/L
Volatile GC/MS	1,2,4-Trimethylbenzene	2.30	ug/L
	1,3,5-Trimethylbenzene	0.670J	ug/L
	n-Propylbenzene	0.400J	ug/L
	Toluene	3.24	ug/L
	Trichloroethene	2.62	ug/L
Waters Department	pH	8.80	pH units

Client Sample ID: **TB-1-0916**
Lab Sample ID: 1165243002

	Parameter	Result	Units
Volatile GC/MS	Chloromethane	0.570J	ug/L

SGS North America Inc.
200 West Potter Drive, Anchorage, AK 99518
t 907.562.2343 **f** 907.561.5301 www.us.sgs.com

Results of **APT-3-DEV-TK-0916**

Client Sample ID: **APT-3-DEV-TK-0916**
Client Project ID: **Kenai Wells AKLNG**
Lab Sample ID: 1165243001
Lab Project ID: 1165243

Collection Date: 09/06/16 14:00
Received Date: 09/07/16 08:00
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Metals by ICP/MS**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Arsenic	77.5		25.0	7.50	ug/L	5		09/09/16 10:40
Barium	361		15.0	4.70	ug/L	5		09/09/16 10:40
Cadmium	5.00 U		10.0	3.10	ug/L	5		09/09/16 10:40
Chromium	101		20.0	6.50	ug/L	5		09/09/16 10:40
Lead	23.7		5.00	1.55	ug/L	5		09/09/16 10:40
Mercury	0.500 U		1.00	0.310	ug/L	5		09/09/16 10:40
Selenium	50.0 U		100	31.0	ug/L	5		09/09/16 10:40
Silver	5.00 U		10.0	3.10	ug/L	5		09/09/16 10:40

Batch Information

Analytical Batch: MMS9529
Analytical Method: SW6020A
Analyst: VDL
Analytical Date/Time: 09/09/16 10:40
Container ID: 1165243001-D

Prep Batch: MXX30164
Prep Method: SW3010A
Prep Date/Time: 09/07/16 12:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 25 mL

Print Date: 09/12/2016 8:26:41AM

J flagging is activated

Results of **APT-3-DEV-TK-0916**

Client Sample ID: **APT-3-DEV-TK-0916**
Client Project ID: **Kenai Wells AKLNG**
Lab Sample ID: 1165243001
Lab Project ID: 1165243

Collection Date: 09/06/16 14:00
Received Date: 09/07/16 08:00
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Volatile GC/MS**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
1,1,1,2-Tetrachloroethane	0.250	U	0.500	0.150	ug/L	1		09/07/16 21:53
1,1,1-Trichloroethane	0.500	U	1.00	0.310	ug/L	1		09/07/16 21:53
1,1,2,2-Tetrachloroethane	0.250	U	0.500	0.150	ug/L	1		09/07/16 21:53
1,1,2-Trichloroethane	0.500	U	1.00	0.310	ug/L	1		09/07/16 21:53
1,1-Dichloroethane	0.500	U	1.00	0.310	ug/L	1		09/07/16 21:53
1,1-Dichloroethene	0.500	U	1.00	0.310	ug/L	1		09/07/16 21:53
1,1-Dichloropropene	0.500	U	1.00	0.310	ug/L	1		09/07/16 21:53
1,2,3-Trichlorobenzene	0.500	U	1.00	0.310	ug/L	1		09/07/16 21:53
1,2,3-Trichloropropane	0.500	U	1.00	0.310	ug/L	1		09/07/16 21:53
1,2,4-Trichlorobenzene	0.500	U	1.00	0.310	ug/L	1		09/07/16 21:53
1,2,4-Trimethylbenzene	2.30		1.00	0.310	ug/L	1		09/07/16 21:53
1,2-Dibromo-3-chloropropane	5.00	U	10.0	3.10	ug/L	1		09/07/16 21:53
1,2-Dibromoethane	0.500	U	1.00	0.310	ug/L	1		09/07/16 21:53
1,2-Dichlorobenzene	0.500	U	1.00	0.310	ug/L	1		09/07/16 21:53
1,2-Dichloroethane	0.250	U	0.500	0.150	ug/L	1		09/07/16 21:53
1,2-Dichloropropane	0.500	U	1.00	0.310	ug/L	1		09/07/16 21:53
1,3,5-Trimethylbenzene	0.670	J	1.00	0.310	ug/L	1		09/07/16 21:53
1,3-Dichlorobenzene	0.500	U	1.00	0.310	ug/L	1		09/07/16 21:53
1,3-Dichloropropane	0.250	U	0.500	0.150	ug/L	1		09/07/16 21:53
1,4-Dichlorobenzene	0.250	U	0.500	0.150	ug/L	1		09/07/16 21:53
2,2-Dichloropropane	0.500	U	1.00	0.310	ug/L	1		09/07/16 21:53
2-Butanone (MEK)	5.00	U	10.0	3.10	ug/L	1		09/07/16 21:53
2-Chlorotoluene	0.500	U	1.00	0.310	ug/L	1		09/07/16 21:53
2-Hexanone	5.00	U	10.0	3.10	ug/L	1		09/07/16 21:53
4-Chlorotoluene	0.500	U	1.00	0.310	ug/L	1		09/07/16 21:53
4-Isopropyltoluene	0.500	U	1.00	0.310	ug/L	1		09/07/16 21:53
4-Methyl-2-pentanone (MIBK)	5.00	U	10.0	3.10	ug/L	1		09/07/16 21:53
Benzene	0.200	U	0.400	0.120	ug/L	1		09/07/16 21:53
Bromobenzene	0.500	U	1.00	0.310	ug/L	1		09/07/16 21:53
Bromochloromethane	0.500	U	1.00	0.310	ug/L	1		09/07/16 21:53
Bromodichloromethane	0.250	U	0.500	0.150	ug/L	1		09/07/16 21:53
Bromoform	0.500	U	1.00	0.310	ug/L	1		09/07/16 21:53
Bromomethane	5.00	U	10.0	3.10	ug/L	1		09/07/16 21:53
Carbon disulfide	5.00	U	10.0	3.10	ug/L	1		09/07/16 21:53
Carbon tetrachloride	0.500	U	1.00	0.310	ug/L	1		09/07/16 21:53
Chlorobenzene	0.250	U	0.500	0.150	ug/L	1		09/07/16 21:53
Chloroethane	0.500	U	1.00	0.310	ug/L	1		09/07/16 21:53

Print Date: 09/12/2016 8:26:41AM

J flagging is activated

Results of **APT-3-DEV-TK-0916**

Client Sample ID: **APT-3-DEV-TK-0916**
Client Project ID: **Kenai Wells AKLNG**
Lab Sample ID: 1165243001
Lab Project ID: 1165243

Collection Date: 09/06/16 14:00
Received Date: 09/07/16 08:00
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Volatile GC/MS**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Chloroform	0.500 U		1.00	0.300	ug/L	1		09/07/16 21:53
Chloromethane	0.500 U		1.00	0.310	ug/L	1		09/07/16 21:53
cis-1,2-Dichloroethene	0.500 U		1.00	0.310	ug/L	1		09/07/16 21:53
cis-1,3-Dichloropropene	0.250 U		0.500	0.150	ug/L	1		09/07/16 21:53
Dibromochloromethane	0.250 U		0.500	0.150	ug/L	1		09/07/16 21:53
Dibromomethane	0.500 U		1.00	0.310	ug/L	1		09/07/16 21:53
Dichlorodifluoromethane	0.500 U		1.00	0.310	ug/L	1		09/07/16 21:53
Ethylbenzene	0.500 U		1.00	0.310	ug/L	1		09/07/16 21:53
Freon-113	5.00 U		10.0	3.10	ug/L	1		09/07/16 21:53
Hexachlorobutadiene	0.500 U		1.00	0.310	ug/L	1		09/07/16 21:53
Isopropylbenzene (Cumene)	0.500 U		1.00	0.310	ug/L	1		09/07/16 21:53
Methylene chloride	2.50 U		5.00	1.00	ug/L	1		09/07/16 21:53
Methyl-t-butyl ether	5.00 U		10.0	3.10	ug/L	1		09/07/16 21:53
Naphthalene	5.00 U		10.0	3.10	ug/L	1		09/07/16 21:53
n-Butylbenzene	0.500 U		1.00	0.310	ug/L	1		09/07/16 21:53
n-Propylbenzene	0.400 J		1.00	0.310	ug/L	1		09/07/16 21:53
o-Xylene	0.500 U		1.00	0.310	ug/L	1		09/07/16 21:53
P & M -Xylene	1.00 U		2.00	0.620	ug/L	1		09/07/16 21:53
sec-Butylbenzene	0.500 U		1.00	0.310	ug/L	1		09/07/16 21:53
Styrene	0.500 U		1.00	0.310	ug/L	1		09/07/16 21:53
tert-Butylbenzene	0.500 U		1.00	0.310	ug/L	1		09/07/16 21:53
Tetrachloroethene	0.500 U		1.00	0.310	ug/L	1		09/07/16 21:53
Toluene	3.24		1.00	0.310	ug/L	1		09/07/16 21:53
trans-1,2-Dichloroethene	0.500 U		1.00	0.310	ug/L	1		09/07/16 21:53
trans-1,3-Dichloropropene	0.500 U		1.00	0.310	ug/L	1		09/07/16 21:53
Trichloroethene	2.62		1.00	0.310	ug/L	1		09/07/16 21:53
Trichlorofluoromethane	0.500 U		1.00	0.310	ug/L	1		09/07/16 21:53
Vinyl acetate	5.00 U		10.0	3.10	ug/L	1		09/07/16 21:53
Vinyl chloride	0.500 U		1.00	0.310	ug/L	1		09/07/16 21:53
Xylenes (total)	1.50 U		3.00	1.00	ug/L	1		09/07/16 21:53
Surrogates								
1,2-Dichloroethane-D4 (surr)	97		81-118		%	1		09/07/16 21:53
4-Bromofluorobenzene (surr)	101		85-114		%	1		09/07/16 21:53
Toluene-d8 (surr)	99.4		89-112		%	1		09/07/16 21:53

Print Date: 09/12/2016 8:26:41AM

J flagging is activated

Results of **APT-3-DEV-TK-0916**

Client Sample ID: **APT-3-DEV-TK-0916**
Client Project ID: **Kenai Wells AKLNG**
Lab Sample ID: 1165243001
Lab Project ID: 1165243

Collection Date: 09/06/16 14:00
Received Date: 09/07/16 08:00
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Volatile GC/MS**

Batch Information

Analytical Batch: VMS16151
Analytical Method: SW8260B
Analyst: TJT
Analytical Date/Time: 09/07/16 21:53
Container ID: 1165243001-A

Prep Batch: VXX29519
Prep Method: SW5030B
Prep Date/Time: 09/07/16 06:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

Print Date: 09/12/2016 8:26:41AM

J flagging is activated

Results of **APT-3-DEV-TK-0916**

Client Sample ID: **APT-3-DEV-TK-0916**
Client Project ID: **Kenai Wells AKLNG**
Lab Sample ID: 1165243001
Lab Project ID: 1165243

Collection Date: 09/06/16 14:00
Received Date: 09/07/16 08:00
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Waters Department**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
pH	8.80		0.100	0.100	pH units	1		09/07/16 15:57

Batch Information

Analytical Batch: WTI4507
Analytical Method: SM21 4500-H B
Analyst: KBE
Analytical Date/Time: 09/07/16 15:57
Container ID: 1165243001-E

Print Date: 09/12/2016 8:26:41AM

J flagging is activated

Results of **TB-1-0916**

Client Sample ID: **TB-1-0916**
Client Project ID: **Kenai Wells AKLNG**
Lab Sample ID: 1165243002
Lab Project ID: 1165243

Collection Date: 09/06/16 14:00
Received Date: 09/07/16 08:00
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Volatile GC/MS**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
1,1,1,2-Tetrachloroethane	0.250	U	0.500	0.150	ug/L	1		09/07/16 17:30
1,1,1-Trichloroethane	0.500	U	1.00	0.310	ug/L	1		09/07/16 17:30
1,1,2,2-Tetrachloroethane	0.250	U	0.500	0.150	ug/L	1		09/07/16 17:30
1,1,2-Trichloroethane	0.500	U	1.00	0.310	ug/L	1		09/07/16 17:30
1,1-Dichloroethane	0.500	U	1.00	0.310	ug/L	1		09/07/16 17:30
1,1-Dichloroethene	0.500	U	1.00	0.310	ug/L	1		09/07/16 17:30
1,1-Dichloropropene	0.500	U	1.00	0.310	ug/L	1		09/07/16 17:30
1,2,3-Trichlorobenzene	0.500	U	1.00	0.310	ug/L	1		09/07/16 17:30
1,2,3-Trichloropropane	0.500	U	1.00	0.310	ug/L	1		09/07/16 17:30
1,2,4-Trichlorobenzene	0.500	U	1.00	0.310	ug/L	1		09/07/16 17:30
1,2,4-Trimethylbenzene	0.500	U	1.00	0.310	ug/L	1		09/07/16 17:30
1,2-Dibromo-3-chloropropane	5.00	U	10.0	3.10	ug/L	1		09/07/16 17:30
1,2-Dibromoethane	0.500	U	1.00	0.310	ug/L	1		09/07/16 17:30
1,2-Dichlorobenzene	0.500	U	1.00	0.310	ug/L	1		09/07/16 17:30
1,2-Dichloroethane	0.250	U	0.500	0.150	ug/L	1		09/07/16 17:30
1,2-Dichloropropane	0.500	U	1.00	0.310	ug/L	1		09/07/16 17:30
1,3,5-Trimethylbenzene	0.500	U	1.00	0.310	ug/L	1		09/07/16 17:30
1,3-Dichlorobenzene	0.500	U	1.00	0.310	ug/L	1		09/07/16 17:30
1,3-Dichloropropane	0.250	U	0.500	0.150	ug/L	1		09/07/16 17:30
1,4-Dichlorobenzene	0.250	U	0.500	0.150	ug/L	1		09/07/16 17:30
2,2-Dichloropropane	0.500	U	1.00	0.310	ug/L	1		09/07/16 17:30
2-Butanone (MEK)	5.00	U	10.0	3.10	ug/L	1		09/07/16 17:30
2-Chlorotoluene	0.500	U	1.00	0.310	ug/L	1		09/07/16 17:30
2-Hexanone	5.00	U	10.0	3.10	ug/L	1		09/07/16 17:30
4-Chlorotoluene	0.500	U	1.00	0.310	ug/L	1		09/07/16 17:30
4-Isopropyltoluene	0.500	U	1.00	0.310	ug/L	1		09/07/16 17:30
4-Methyl-2-pentanone (MIBK)	5.00	U	10.0	3.10	ug/L	1		09/07/16 17:30
Benzene	0.200	U	0.400	0.120	ug/L	1		09/07/16 17:30
Bromobenzene	0.500	U	1.00	0.310	ug/L	1		09/07/16 17:30
Bromochloromethane	0.500	U	1.00	0.310	ug/L	1		09/07/16 17:30
Bromodichloromethane	0.250	U	0.500	0.150	ug/L	1		09/07/16 17:30
Bromoform	0.500	U	1.00	0.310	ug/L	1		09/07/16 17:30
Bromomethane	5.00	U	10.0	3.10	ug/L	1		09/07/16 17:30
Carbon disulfide	5.00	U	10.0	3.10	ug/L	1		09/07/16 17:30
Carbon tetrachloride	0.500	U	1.00	0.310	ug/L	1		09/07/16 17:30
Chlorobenzene	0.250	U	0.500	0.150	ug/L	1		09/07/16 17:30
Chloroethane	0.500	U	1.00	0.310	ug/L	1		09/07/16 17:30

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J flagging is activated

Results of **TB-1-0916**

Client Sample ID: **TB-1-0916**
Client Project ID: **Kenai Wells AKLNG**
Lab Sample ID: 1165243002
Lab Project ID: 1165243

Collection Date: 09/06/16 14:00
Received Date: 09/07/16 08:00
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Volatile GC/MS**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Chloroform	0.500 U		1.00	0.300	ug/L	1		09/07/16 17:30
Chloromethane	0.570 J		1.00	0.310	ug/L	1		09/07/16 17:30
cis-1,2-Dichloroethene	0.500 U		1.00	0.310	ug/L	1		09/07/16 17:30
cis-1,3-Dichloropropene	0.250 U		0.500	0.150	ug/L	1		09/07/16 17:30
Dibromochloromethane	0.250 U		0.500	0.150	ug/L	1		09/07/16 17:30
Dibromomethane	0.500 U		1.00	0.310	ug/L	1		09/07/16 17:30
Dichlorodifluoromethane	0.500 U		1.00	0.310	ug/L	1		09/07/16 17:30
Ethylbenzene	0.500 U		1.00	0.310	ug/L	1		09/07/16 17:30
Freon-113	5.00 U		10.0	3.10	ug/L	1		09/07/16 17:30
Hexachlorobutadiene	0.500 U		1.00	0.310	ug/L	1		09/07/16 17:30
Isopropylbenzene (Cumene)	0.500 U		1.00	0.310	ug/L	1		09/07/16 17:30
Methylene chloride	2.50 U		5.00	1.00	ug/L	1		09/07/16 17:30
Methyl-t-butyl ether	5.00 U		10.0	3.10	ug/L	1		09/07/16 17:30
Naphthalene	5.00 U		10.0	3.10	ug/L	1		09/07/16 17:30
n-Butylbenzene	0.500 U		1.00	0.310	ug/L	1		09/07/16 17:30
n-Propylbenzene	0.500 U		1.00	0.310	ug/L	1		09/07/16 17:30
o-Xylene	0.500 U		1.00	0.310	ug/L	1		09/07/16 17:30
P & M -Xylene	1.00 U		2.00	0.620	ug/L	1		09/07/16 17:30
sec-Butylbenzene	0.500 U		1.00	0.310	ug/L	1		09/07/16 17:30
Styrene	0.500 U		1.00	0.310	ug/L	1		09/07/16 17:30
tert-Butylbenzene	0.500 U		1.00	0.310	ug/L	1		09/07/16 17:30
Tetrachloroethene	0.500 U		1.00	0.310	ug/L	1		09/07/16 17:30
Toluene	0.500 U		1.00	0.310	ug/L	1		09/07/16 17:30
trans-1,2-Dichloroethene	0.500 U		1.00	0.310	ug/L	1		09/07/16 17:30
trans-1,3-Dichloropropene	0.500 U		1.00	0.310	ug/L	1		09/07/16 17:30
Trichloroethene	0.500 U		1.00	0.310	ug/L	1		09/07/16 17:30
Trichlorofluoromethane	0.500 U		1.00	0.310	ug/L	1		09/07/16 17:30
Vinyl acetate	5.00 U		10.0	3.10	ug/L	1		09/07/16 17:30
Vinyl chloride	0.500 U		1.00	0.310	ug/L	1		09/07/16 17:30
Xylenes (total)	1.50 U		3.00	1.00	ug/L	1		09/07/16 17:30
Surrogates								
1,2-Dichloroethane-D4 (surr)	99.6		81-118		%	1		09/07/16 17:30
4-Bromofluorobenzene (surr)	101		85-114		%	1		09/07/16 17:30
Toluene-d8 (surr)	98.5		89-112		%	1		09/07/16 17:30

Print Date: 09/12/2016 8:26:41AM

J flagging is activated

Results of **TB-1-0916**

Client Sample ID: **TB-1-0916**
Client Project ID: **Kenai Wells AKLNG**
Lab Sample ID: 1165243002
Lab Project ID: 1165243

Collection Date: 09/06/16 14:00
Received Date: 09/07/16 08:00
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Volatile GC/MS**

Batch Information

Analytical Batch: VMS16151
Analytical Method: SW8260B
Analyst: TJT
Analytical Date/Time: 09/07/16 17:30
Container ID: 1165243002-A

Prep Batch: VXX29519
Prep Method: SW5030B
Prep Date/Time: 09/07/16 06:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

Print Date: 09/12/2016 8:26:41AM

J flagging is activated

Method Blank

Blank ID: MB for HBN 1742743 [MXX/30164]
Blank Lab ID: 1350305

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1165243001

Results by **SW6020A**

Parameter	Results	LOQ/CL	DL	Units
Arsenic	2.50U	5.00	1.50	ug/L
Barium	1.50U	3.00	0.940	ug/L
Cadmium	1.00U	2.00	0.620	ug/L
Chromium	2.00U	4.00	1.30	ug/L
Lead	0.500U	1.00	0.310	ug/L
Mercury	0.100U	0.200	0.0620	ug/L
Selenium	10.0U	20.0	6.20	ug/L
Silver	1.00U	2.00	0.620	ug/L

Batch Information

Analytical Batch: MMS9529
Analytical Method: SW6020A
Instrument: Perkin Elmer Nexlon P5
Analyst: VDL
Analytical Date/Time: 9/9/2016 8:52:22AM

Prep Batch: MXX30164
Prep Method: SW3010A
Prep Date/Time: 9/7/2016 12:00:59PM
Prep Initial Wt./Vol.: 25 mL
Prep Extract Vol: 25 mL

Print Date: 09/12/2016 8:26:42AM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1165243 [MXX30164]
Blank Spike Lab ID: 1350306
Date Analyzed: 09/09/2016 08:56

Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1165243001

Results by **SW6020A**

Blank Spike (ug/L)

Parameter	Spike	Result	Rec (%)	CL
Arsenic	1000	1020	102	(84-116)
Barium	1000	1000	100	(86-114)
Cadmium	100	101	101	(87-115)
Chromium	400	426	106	(85-116)
Lead	1000	1030	103	(88-115)
Mercury	10	10.7	107	(70-124)
Selenium	1000	1020	102	(80-120)
Silver	100	105	105	(85-116)

Batch Information

Analytical Batch: **MMS9529**
Analytical Method: **SW6020A**
Instrument: **Perkin Elmer Nexlon P5**
Analyst: **VDL**

Prep Batch: **MXX30164**
Prep Method: **SW3010A**
Prep Date/Time: **09/07/2016 12:00**
Spike Init Wt./Vol.: 1000 ug/L Extract Vol: 25 mL
Dupe Init Wt./Vol.: Extract Vol:

Print Date: 09/12/2016 8:26:44AM

Matrix Spike Summary

Original Sample ID: 1350307
MS Sample ID: 1350308 MS
MSD Sample ID: 1350309 MSD

Analysis Date: 09/09/2016 9:01
Analysis Date: 09/09/2016 9:05
Analysis Date: 09/09/2016 9:10
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1165243001

Results by **SW6020A**

		Matrix Spike (ug/L)			Spike Duplicate (ug/L)					
Parameter	Sample	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Arsenic	1.97J	1000	1030	103	1000	1010	101	84-116		
Barium	23.5	1000	1070	105	1000	1050	103	86-114		
Cadmium	1.00U	100	104	104	100	102	102	87-115		
Chromium	37.5	400	445	102	400	437	100	85-116		
Lead	3.38	1000	1040	103	1000	1020	102	88-115		
Mercury	0.125J	10.0	10.1	100	10.0	10.8	107	70-124		
Selenium	10.0U	1000	1000	100	1000	991	99	80-120		
Silver	1.00U	100	104	104	100	101	101	85-116		

Batch Information

Analytical Batch: MMS9529
Analytical Method: SW6020A
Instrument: Perkin Elmer Nexlon P5
Analyst: VDL
Analytical Date/Time: 9/9/2016 9:05:48AM

Prep Batch: MXX30164
Prep Method: 3010 H20 Digest for Metals ICP-MS
Prep Date/Time: 9/7/2016 12:00:59PM
Prep Initial Wt./Vol.: 25.00mL
Prep Extract Vol: 25.00mL

Print Date: 09/12/2016 8:26:45AM

Method Blank

Blank ID: MB for HBN 1742815 [VXX/29519]
Blank Lab ID: 1350648

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1165243001, 1165243002

Results by **SW8260B**

Parameter	Results	LOQ/CL	DL	Units
1,1,1,2-Tetrachloroethane	0.250U	0.500	0.150	ug/L
1,1,1-Trichloroethane	0.500U	1.00	0.310	ug/L
1,1,2,2-Tetrachloroethane	0.250U	0.500	0.150	ug/L
1,1,2-Trichloroethane	0.500U	1.00	0.310	ug/L
1,1-Dichloroethane	0.500U	1.00	0.310	ug/L
1,1-Dichloroethene	0.500U	1.00	0.310	ug/L
1,1-Dichloropropene	0.500U	1.00	0.310	ug/L
1,2,3-Trichlorobenzene	0.500U	1.00	0.310	ug/L
1,2,3-Trichloropropane	0.500U	1.00	0.310	ug/L
1,2,4-Trichlorobenzene	0.500U	1.00	0.310	ug/L
1,2,4-Trimethylbenzene	0.500U	1.00	0.310	ug/L
1,2-Dibromo-3-chloropropane	5.00U	10.0	3.10	ug/L
1,2-Dibromoethane	0.500U	1.00	0.310	ug/L
1,2-Dichlorobenzene	0.500U	1.00	0.310	ug/L
1,2-Dichloroethane	0.250U	0.500	0.150	ug/L
1,2-Dichloropropane	0.500U	1.00	0.310	ug/L
1,3,5-Trimethylbenzene	0.500U	1.00	0.310	ug/L
1,3-Dichlorobenzene	0.500U	1.00	0.310	ug/L
1,3-Dichloropropane	0.250U	0.500	0.150	ug/L
1,4-Dichlorobenzene	0.250U	0.500	0.150	ug/L
2,2-Dichloropropane	0.500U	1.00	0.310	ug/L
2-Butanone (MEK)	5.00U	10.0	3.10	ug/L
2-Chlorotoluene	0.500U	1.00	0.310	ug/L
2-Hexanone	5.00U	10.0	3.10	ug/L
4-Chlorotoluene	0.500U	1.00	0.310	ug/L
4-Isopropyltoluene	0.500U	1.00	0.310	ug/L
4-Methyl-2-pentanone (MIBK)	5.00U	10.0	3.10	ug/L
Benzene	0.200U	0.400	0.120	ug/L
Bromobenzene	0.500U	1.00	0.310	ug/L
Bromochloromethane	0.500U	1.00	0.310	ug/L
Bromodichloromethane	0.250U	0.500	0.150	ug/L
Bromoform	0.500U	1.00	0.310	ug/L
Bromomethane	5.00U	10.0	3.10	ug/L
Carbon disulfide	5.00U	10.0	3.10	ug/L
Carbon tetrachloride	0.500U	1.00	0.310	ug/L
Chlorobenzene	0.250U	0.500	0.150	ug/L
Chloroethane	0.500U	1.00	0.310	ug/L
Chloroform	0.500U	1.00	0.300	ug/L

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Method Blank

Blank ID: MB for HBN 1742815 [VXX/29519]
Blank Lab ID: 1350648

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1165243001, 1165243002

Results by **SW8260B**

Parameter	Results	LOQ/CL	DL	Units
Chloromethane	0.500U	1.00	0.310	ug/L
cis-1,2-Dichloroethene	0.500U	1.00	0.310	ug/L
cis-1,3-Dichloropropene	0.250U	0.500	0.150	ug/L
Dibromochloromethane	0.250U	0.500	0.150	ug/L
Dibromomethane	0.500U	1.00	0.310	ug/L
Dichlorodifluoromethane	0.500U	1.00	0.310	ug/L
Ethylbenzene	0.500U	1.00	0.310	ug/L
Freon-113	5.00U	10.0	3.10	ug/L
Hexachlorobutadiene	0.500U	1.00	0.310	ug/L
Isopropylbenzene (Cumene)	0.500U	1.00	0.310	ug/L
Methylene chloride	2.50U	5.00	1.00	ug/L
Methyl-t-butyl ether	5.00U	10.0	3.10	ug/L
Naphthalene	5.00U	10.0	3.10	ug/L
n-Butylbenzene	0.500U	1.00	0.310	ug/L
n-Propylbenzene	0.500U	1.00	0.310	ug/L
o-Xylene	0.500U	1.00	0.310	ug/L
P & M -Xylene	1.00U	2.00	0.620	ug/L
sec-Butylbenzene	0.500U	1.00	0.310	ug/L
Styrene	0.500U	1.00	0.310	ug/L
tert-Butylbenzene	0.500U	1.00	0.310	ug/L
Tetrachloroethene	0.500U	1.00	0.310	ug/L
Toluene	0.500U	1.00	0.310	ug/L
trans-1,2-Dichloroethene	0.500U	1.00	0.310	ug/L
trans-1,3-Dichloropropene	0.500U	1.00	0.310	ug/L
Trichloroethene	0.500U	1.00	0.310	ug/L
Trichlorofluoromethane	0.500U	1.00	0.310	ug/L
Vinyl acetate	5.00U	10.0	3.10	ug/L
Vinyl chloride	0.500U	1.00	0.310	ug/L
Xylenes (total)	1.50U	3.00	1.00	ug/L
Surrogates				
1,2-Dichloroethane-D4 (surr)	98.9	81-118		%
4-Bromofluorobenzene (surr)	101	85-114		%
Toluene-d8 (surr)	98.6	89-112		%

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Method Blank

Blank ID: MB for HBN 1742815 [VXX/29519]
Blank Lab ID: 1350648

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1165243001, 1165243002

Results by **SW8260B**

Parameter	Results	LOQ/CL	DL	Units

Batch Information

Analytical Batch: VMS16151
Analytical Method: SW8260B
Instrument: VSA Agilent GC/MS 7890B/5977A
Analyst: TJT
Analytical Date/Time: 9/7/2016 12:44:00PM

Prep Batch: VXX29519
Prep Method: SW5030B
Prep Date/Time: 9/7/2016 6:00:00AM
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

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Blank Spike Summary

Blank Spike ID: LCS for HBN 1165243 [VXX29519]
Blank Spike Lab ID: 1350649
Date Analyzed: 09/07/2016 13:00

Spike Duplicate ID: LCSD for HBN 1165243 [VXX29519]
Spike Duplicate Lab ID: 1350650
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1165243001, 1165243002

Results by **SW8260B**

	Blank Spike (ug/L)			Spike Duplicate (ug/L)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
1,1,1,2-Tetrachloroethane	30	30.0	100	30	29.9	100	(78-124)	0.23	(< 20)
1,1,1-Trichloroethane	30	33.1	110	30	33.6	112	(74-131)	1.60	(< 20)
1,1,2,2-Tetrachloroethane	30	31.2	104	30	31.8	106	(71-121)	2.00	(< 20)
1,1,2-Trichloroethane	30	31.4	105	30	31.7	106	(80-119)	0.86	(< 20)
1,1-Dichloroethane	30	32.1	107	30	32.6	109	(77-125)	1.60	(< 20)
1,1-Dichloroethene	30	33.8	113	30	34.4	115	(71-131)	1.80	(< 20)
1,1-Dichloropropene	30	33.4	111	30	33.8	113	(79-125)	1.20	(< 20)
1,2,3-Trichlorobenzene	30	32.3	108	30	33.6	112	(69-129)	3.70	(< 20)
1,2,3-Trichloropropane	30	30.6	102	30	31.4	105	(73-122)	2.70	(< 20)
1,2,4-Trichlorobenzene	30	32.6	109	30	33.2	111	(69-130)	1.70	(< 20)
1,2,4-Trimethylbenzene	30	29.6	99	30	30.2	101	(79-124)	2.00	(< 20)
1,2-Dibromo-3-chloropropane	30	33.9	113	30	35.0	117	(62-128)	3.10	(< 20)
1,2-Dibromoethane	30	32.4	108	30	32.6	109	(77-121)	0.58	(< 20)
1,2-Dichlorobenzene	30	30.6	102	30	30.9	103	(80-119)	1.00	(< 20)
1,2-Dichloroethane	30	28.9	96	30	29.3	98	(73-128)	1.40	(< 20)
1,2-Dichloropropane	30	32.3	108	30	32.6	109	(78-122)	0.71	(< 20)
1,3,5-Trimethylbenzene	30	29.3	98	30	30.0	100	(75-124)	2.40	(< 20)
1,3-Dichlorobenzene	30	30.3	101	30	31.0	103	(80-119)	2.20	(< 20)
1,3-Dichloropropane	30	31.4	105	30	31.6	105	(80-119)	0.44	(< 20)
1,4-Dichlorobenzene	30	31.4	105	30	31.5	105	(79-118)	0.35	(< 20)
2,2-Dichloropropane	30	35.2	117	30	35.6	119	(60-139)	1.20	(< 20)
2-Butanone (MEK)	90	99.2	110	90	104	115	(56-143)	4.40	(< 20)
2-Chlorotoluene	30	30.7	102	30	31.3	104	(79-122)	1.80	(< 20)
2-Hexanone	90	98.4	109	90	102	113	(57-139)	3.40	(< 20)
4-Chlorotoluene	30	31.6	105	30	31.9	106	(78-122)	0.98	(< 20)
4-Isopropyltoluene	30	30.7	102	30	31.1	104	(77-127)	1.40	(< 20)
4-Methyl-2-pentanone (MIBK)	90	104	116	90	109	121	(67-130)	4.90	(< 20)
Benzene	30	32.6	109	30	33.7	112	(79-120)	3.50	(< 20)
Bromobenzene	30	30.4	101	30	30.6	102	(80-120)	0.79	(< 20)
Bromochloromethane	30	31.4	105	30	31.8	106	(78-123)	1.20	(< 20)
Bromodichloromethane	30	32.3	108	30	32.4	108	(79-125)	0.46	(< 20)
Bromoform	30	32.2	107	30	32.2	107	(66-130)	0.16	(< 20)
Bromomethane	30	28.4	95	30	29.1	97	(53-141)	2.50	(< 20)
Carbon disulfide	45	50.1	111	45	51.0	113	(64-133)	1.60	(< 20)

Print Date: 09/12/2016 8:26:48AM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1165243 [VXX29519]
Blank Spike Lab ID: 1350649
Date Analyzed: 09/07/2016 13:00

Spike Duplicate ID: LCSD for HBN 1165243 [VXX29519]
Spike Duplicate Lab ID: 1350650
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1165243001, 1165243002

Results by **SW8260B**

	Blank Spike (ug/L)			Spike Duplicate (ug/L)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Carbon tetrachloride	30	33.6	112	30	34.1	114	(72-136)	1.70	(< 20)
Chlorobenzene	30	31.7	106	30	31.7	106	(82-118)	0.00	(< 20)
Chloroethane	30	28.4	95	30	26.5	89	(60-138)	6.80	(< 20)
Chloroform	30	29.5	98	30	29.8	99	(79-124)	0.84	(< 20)
Chloromethane	30	28.6	95	30	29.2	97	(50-139)	1.90	(< 20)
cis-1,2-Dichloroethene	30	31.9	106	30	32.5	108	(78-123)	1.90	(< 20)
cis-1,3-Dichloropropene	30	34.1	114	30	34.5	115	(75-124)	0.99	(< 20)
Dibromochloromethane	30	30.1	100	30	30.2	101	(74-126)	0.30	(< 20)
Dibromomethane	30	31.0	103	30	31.3	104	(79-123)	0.87	(< 20)
Dichlorodifluoromethane	30	28.2	94	30	28.6	95	(32-152)	1.10	(< 20)
Ethylbenzene	30	32.6	109	30	32.7	109	(79-121)	0.37	(< 20)
Freon-113	45	52.4	117	45	53.4	119	(70-136)	1.80	(< 20)
Hexachlorobutadiene	30	32.6	109	30	33.7	112	(66-134)	3.40	(< 20)
Isopropylbenzene (Cumene)	30	30.4	101	30	30.2	101	(72-131)	0.49	(< 20)
Methylene chloride	30	30.5	102	30	32.2	107	(74-124)	5.20	(< 20)
Methyl-t-butyl ether	45	49.6	110	45	50.4	112	(71-124)	1.70	(< 20)
Naphthalene	30	31.6	105	30	33.6	112	(61-128)	6.30	(< 20)
n-Butylbenzene	30	32.6	109	30	33.2	111	(75-128)	1.80	(< 20)
n-Propylbenzene	30	30.0	100	30	30.2	101	(76-126)	0.80	(< 20)
o-Xylene	30	33.5	112	30	33.5	112	(78-122)	0.03	(< 20)
P & M -Xylene	60	65.4	109	60	66.1	110	(80-121)	0.97	(< 20)
sec-Butylbenzene	30	30.4	101	30	30.9	103	(77-126)	1.80	(< 20)
Styrene	30	30.2	101	30	30.3	101	(78-123)	0.17	(< 20)
tert-Butylbenzene	30	30.2	101	30	31.0	103	(78-124)	2.90	(< 20)
Tetrachloroethene	30	33.1	110	30	33.2	111	(74-129)	0.24	(< 20)
Toluene	30	31.7	106	30	31.7	106	(80-121)	0.13	(< 20)
trans-1,2-Dichloroethene	30	33.4	111	30	33.9	113	(75-124)	1.50	(< 20)
trans-1,3-Dichloropropene	30	34.0	113	30	34.3	114	(73-127)	1.10	(< 20)
Trichloroethene	30	32.3	108	30	32.8	109	(79-123)	1.40	(< 20)
Trichlorofluoromethane	30	31.6	105	30	31.7	106	(65-141)	0.38	(< 20)
Vinyl acetate	30	33.7	112	30	34.4	115	(54-146)	1.80	(< 20)
Vinyl chloride	30	30.6	102	30	31.2	104	(58-137)	2.00	(< 20)
Xylenes (total)	90	98.9	110	90	99.5	111	(79-121)	0.63	(< 20)

SGS North America Inc.
200 West Potter Drive Anchorage, AK 95518
t 907.562.2343 f 907.561.5301 www.us.sgs.com

Blank Spike Summary

Blank Spike ID: LCS for HBN 1165243 [VXX29519]
Blank Spike Lab ID: 1350649
Date Analyzed: 09/07/2016 13:00

Spike Duplicate ID: LCSD for HBN 1165243 [VXX29519]
Spike Duplicate Lab ID: 1350650
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1165243001, 1165243002

Results by **SW8260B**

	Blank Spike (%)			Spike Duplicate (%)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Surrogates									
1,2-Dichloroethane-D4 (surr)	30	95.1	95	30	95.9	96	(81-118)	0.84	
4-Bromofluorobenzene (surr)	30	95.5	96	30	96.3	96	(85-114)	0.90	
Toluene-d8 (surr)	30	99.4	99	30	98.2	98	(89-112)	1.20	

Batch Information

Analytical Batch: **VMS16151**
Analytical Method: **SW8260B**
Instrument: **VSA Agilent GC/MS 7890B/5977A**
Analyst: **TJT**

Prep Batch: **VXX29519**
Prep Method: **SW5030B**
Prep Date/Time: **09/07/2016 06:00**
Spike Init Wt./Vol.: 30 ug/L Extract Vol: 5 mL
Dupe Init Wt./Vol.: 30 ug/L Extract Vol: 5 mL

Print Date: 09/12/2016 8:26:48AM

Duplicate Sample Summary

Original Sample ID: 1165043001
Duplicate Sample ID: 1350562
QC for Samples:
1165243001

Analysis Date: 09/07/2016 14:58
Matrix: Drinking Water

Results by **SM21 4500-H B**

NAME	Original	Duplicate	Units	RPD (%)	RPD CL
pH	8.20	8.20	pH units	0.00	(< 5)

Batch Information

Analytical Batch: WTI4507
Analytical Method: SM21 4500-H B
Instrument: Titration
Analyst: KBE

Print Date: 09/12/2016 8:26:49AM

Duplicate Sample Summary

Original Sample ID: 1165076001
Duplicate Sample ID: 1350563
QC for Samples:
1165243001

Analysis Date: 09/07/2016 15:17
Matrix: Water (Surface, Eff., Ground)

Results by **SM21 4500-H B**

NAME	Original	Duplicate	Units	RPD (%)	RPD CL
pH	7.90	7.90	pH units	0.00	(< 5)

Batch Information

Analytical Batch: WTI4507
Analytical Method: SM21 4500-H B
Instrument: Titration
Analyst: KBE

Print Date: 09/12/2016 8:26:49AM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1165243 [WTI4507]
Blank Spike Lab ID: 1350559
Date Analyzed: 09/07/2016 10:14

Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1165243001

Results by **SM21 4500-H B**

Blank Spike (pH units)

Parameter	Spike	Result	Rec (%)	CL
pH	7	6.96	99	(99-101)

Batch Information

Analytical Batch: **WTI4507**
Analytical Method: **SM21 4500-H B**
Instrument: **Titration**
Analyst: **KBE**

Prep Batch:
Prep Method:
Prep Date/Time:
Spike Init Wt./Vol.: 7 pH units Extract Vol: 1 mL
Dupe Init Wt./Vol.: Extract Vol:

Print Date: 09/12/2016 8:26:50AM

SGS

SGS North America Inc.
CHAIN OF CUSTODY RECORD

1165243

Locations Nationwide
aska — Maryland
ew Jersey — New York
orth Carolina — Indiana
'est Virginia — Kentucky
www.us.sgs.com

Instructions: Sections 1 - 5 must be filled out. Omissions may delay the onset of analysis.

Page 1 of 1

Section 1

CLIENT: Fugro Consultants
CONTACT: Kyle Johnson PHONE NO: 916 ~~409~~ 407 8700
PROJECT NAME: Kenai Wells AKLNG PROJECT/ PWSID/ PERMIT#:
REPORTS TO: KEJohnson@Fugro.com Jgray@SLRconsulting E-MAIL: Kyle Johnson Fugro Jason Grey SLR
INVOICE TO: Kenai Wells SLR QUOTE #: P.O. #:

Section 3

RESERVED for lab use	SAMPLE IDENTIFICATION	DATE mm/dd/yy	TIME HH:MM	MATRIX/ MATRIX CODE	# CONTAINERS	Type C = COMP G = GRAB MI = Multi Incremental Soils	Preservative: RCRA Metals total	Preservative: VOC 8260B	Preservative: pH by SM4500H-B	REMARKS/ LOC ID
					~~5~~ KT					
					+ KT					
					~~3~~ KT					
(1) A-E	APT-3-DEV-TK-0916	9/6/16	1400	Water	5	Grab	X	X	X	Poly tank Sample #245262
(2) A-L	TB-1-0916	9/6/16	1400	—	3	—		X		

Section 5

	Date	Time	
Relinquished By: (1) Kyle Johnson	9/6/16	1430	Received By:
Relinquished By: (2)	Date	Time	Received By:
Relinquished By: (3)	Date	Time	Received By:
Relinquished By: (4)	Date 9/7/16	Time 08:00	Received For Laboratory By:

Section 4

DOD Project? Yes No

Data Deliverable Requirements:

Cooler ID:

Requested Turnaround Time and/or Special Instructions:
5 Day TAT Silver, Selenium, lead, Mercury, Metals (to include Arsenic, Barium, Cadmium, Chromium,

Temp Blank °C: 4.3 #07
or Ambient [ ]
(See attached Sample Receipt Form)

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

[ ] 200 W. Potter Drive Anchorage, AK 99518 Tel: (907) 562-2343 Fax: (907) 561-5301
[ ] 5500 Business Drive Wilmington, NC 28405 Tel: (910) 350-1903 Fax: (910) 350-1557

http://www.sgs.com/terms-and-conditions

F083-Kit_Request_and_COC_Templates-Blank
Revised 2013-03-24

AIRPORT OF DEPARTURE ENA 09/06/16 14:59 | 090363 | 808 7132222 | Frgt

SHIPPER'S NAME, ADDRESS & PHONE
FUGRO KYLE JOHNSON
KENAI AK

SHIPPER'S ACCOUNT NUMBER
5208081220

NOT AIR WAYBILL (AIR CONSIGNMENT NOTE)
Ravn ALASKA
4700 Old International Airport Road
Anchorage, Alaska 99502

It is agreed that the goods described herein are accepted in apparent good order and condition (except as noted) for carriage SUBJECT TO THE CONDITIONS OF CONTRACT AS LISTED IN THE COMPANIES TARIFFS. THE SHIPPER'S ATTENTION IS DRAWN TO THE NOTICE CONCERNING CARRIERS' LIMITATION OF LIABILITY. Shipper may increase such limitation of liability by declaring a higher value for carriage and paying a supplemental charge if required.

Received in Good Condition
Place Date
TO EXPEDITE MOVEMENT, SHIPMENT MAY BE DIVERTED TO MOTOR OR OTHER CARRIER AS PER TARIFF RULE UNLESS SHIPPER GIVES OTHER INSTRUCTION HEREON

CONSIGNEE'S NAME, ADDRESS & PHONE
SGS LABS
200 WEST POTTER RD
ANCHORAGE AK 99518

CONSIGNEE'S ACCOUNT NUMBER
9075622343

ISSUING CARRIER'S AGENT NAME, CITY & PHONE

ALSO NOTIFY NAME & ADDRESS

AGENT'S IATA CODE | ACCOUNT NO.

ACCOUNTING INFORMATION 7142773
Card VI 5866 Exp 1118

AIRPORT OF DEPARTURE
Kenai

Declared Value $ 0.00 | Insured Amount $ 0.00

BY FIRST

AIRPORT OF DESTINATION
Anchorage

COMMENTS

No. Of Pieces Rcp	Gross Weight	kg lb	Rate Class	Commodity Item No.	Chargeable Weight	Rate/Charge	Total	Nature and Quantity of Goods
1	8	l..	M		1	$29.18	$29.18	lab water samples
1	8						$29.18	

1165243

PREPAID	WEIGHT CHARGE	COLLECT
$29.18		

OTHER CHARGES AND DESCRIPTION

AMOUNT	DESCRIPTION

VALUATION CHARGE
$0.00

FEDERAL EXCISE TAX
$1.82

TOTAL OTHER CHARGES DUE AGENT
$0.00

TOTAL OTHER CHARGES DUE CARRIER
$0.00

TOTAL PREPAID
$31.00

TOTAL COLLECT

HAZMAT
No

Shipper certifies that the particulars on the face hereof are correct, agrees to the CONDITIONS AS LISTED IN THE COMPANIES TARIFFS, accepts that carrier's liability is limited as stated in the companies tariffs and accepts such value unless a higher value for carriage is declared on the face hereof subject to an additional charge and that insofar as any part of the consignment contains restricted articles, such part is described by name and is in proper condition for carriage by air according to applicable national governmental regulations, and for international shipments, the current International Air Transport Association's Restricted Articles Regulations.

Paid By Shipper

Printed Name and Title

Signature

STATION NUMBERS
ANCHORAGE - (907) 243-2761
ANIAK - (907) 675-4572
BARROW - (907) 852-5300
BETHEL -(907) 543-3825
DEADHORSE - (907) 659-9222
FAIRBANKS - (907) 450-7250
GALENA -(907) 656-1875
KOTZEBUE - (907) 442-3020
NOME - (907) 443-7595
ST. MARYS - (907) 438-2247
UNALAKLEET - (907) 624-3595

Printed at 15:03:23 on 9/6/2016 at ENA-FRTMGR 10.106.215

Consignee Copy

Alert Expeditors Inc. #368828

Citywide Delivery • 440-3351
8421 Flamingo Drive • Anchorage, Alaska 99502

Date 9 7 16

From Fugro

To 565

Collect ☐	Prepay ☐ Account ☐	Advance Charges ☐
Job #	PO#	

1 cooler @ 8 lbs RAVN

7132227

1165243

Shipped Signature

Received By: 0800

Total Charge

SGS

e-SAMPLE RECEIPT FORM

1165243

Review Criteria	Y/N (yes/no)	Exceptions Noted below
		☐ exemption permitted if sampler hand carries/delivers.
Were Custody Seals intact? Note # & location	Y	1-F, 1-B
COC accompanied samples?	Y	
☐ **exemption permitted if chilled & collected <8hrs ago or chlling not required (i.e., waste, oil)		
Temperature blank compliant* (i.e., 0-6 °C after CF)?	Y	Cooler ID: 1 @ 4.3 °C Therm ID: D7
		Cooler ID: @ °C Therm ID:
		Cooler ID: @ °C Therm ID:
		Cooler ID: @ °C Therm ID:
		Cooler ID: @ °C Therm ID:
*If >6°C, were samples collected <8 hours ago?		
If <0°C, were sample containers ice free?		
If samples 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".		
Note: Identify containers received at non-compliant temperature . Use form FS-0029 if more space is needed.		
		Note: Refer to form F-083 "Sample Guide" for hold times.
Were samples received within hold time?	Y	
Do samples **match COC**** (i.e.,sample IDs,dates/times collected)?	Y	
**Note: If times differ <1hr, record details & login per COC.		
Were analyses requested unambiguous?	Y	
		☐ ***Exemption permitted for metals (e.g,200.8/6020A).
Were proper containers (type/mass/volume/preservative***)used?	Y	
IF APPLICABLE		
Were Trip Blanks (i.e., VOAs, LL-Hg) in cooler with samples?	Y	
Were all VOA vials free of headspace (i.e., bubbles ≤ 6mm)?	Y	
Were all soil VOAs field extracted with MeOH+BFB?		

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

Additional notes (if applicable):

Sample Containers and Preservatives

Container Id	Preservative	Container Condition	Container Id	Preservative	Container Condition
1165243001-A	HCL to pH < 2	OK			
1165243001-B	HCL to pH < 2	OK			
1165243001-C	HCL to pH < 2	OK			
1165243001-D	HNO3 to pH < 2	OK			
1165243001-E	No Preservative Required	OK			
1165243002-A	HCL to pH < 2	OK			
1165243002-B	HCL to pH < 2	OK			
1165243002-C	HCL to pH < 2	OK			

Container Condition Glossary

Containers for bacteriological, low level mercury and VOA vials are not opened prior to analysis and will be assigned condition code OK unless evidence indicates than an inappropriate container was submitted.

OK - The container was received at an acceptable pH for the analysis requested.
BU - The container was received with headspace greater than 6mm.
DM- The container was received damaged.
FR- The container was received frozen and not usable for Bacteria or BOD analyses.
PA - The container was received outside of the acceptable pH for the analysis requested. Preservative was added upon receipt and the container is now at the correct pH. See the Sample Receipt Form for details on the amount and lot # of the preservative added.
PH - The container was received outside of the acceptable pH for the analysis requested. Preservative was added upon receipt, but was insufficient to bring the container to the correct pH for the analysis requested. See the Sample Receipt Form for details on the amount and lot # of the preservative added.

APPENDIX C
INVESTIGATION-DERIVED WASTE DISPOSAL MANIFESTS

CHAIN OF CUSTODY

Project Name:	Alaska LNG Site Investigation	Client:	Alaska LNG LLC	Project Engineer:	
Project Number:	04.10160001	Project Location:	APT-1 Development Water located on Sirrus and Hinerman	Sheet	1 of 1

No.	Sample Identification		Depth	Sample Container (Size/Material)	Sample Type	USDA Regulated Yes or No*	Test Type						Remarks
	Description of contents	Sample No.	( )				A	B	C	D	E	F	
1	**Fugro APT-1 Development Water from Well**	APT-1	0-140ft	Bulk Water approximately 6900 gallons	Water	No							Water
2				6456									
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													

NOTES: NRC will vaccum water with vac truck 6900 gallon tank located at the Peterkin Quarry concrete pad nearest Hinerman Road

Relinquished By					Received By			Test Type
Print Name	Signature	Phone No.	Date	Time	Print Name	Signature	Phone No.	A
R. Mosher		2816589841	9/21/16	10:30				B
								C
								D
								E
								F

*** IN CASE OF EMERGENCY CALL 1-800-899-4672 ***

107308 (LW)

NON-HAZARDOUS WASTE MANIFEST

Please print or type (Form designed for use on elite (12 pitch) typewriter)

NON-HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No. EXEMPT

Manifest Document No. 107308A

2. Page 1 of 1

FUGRO CONSULTANTS LLC
6100 HILLCROFT AVE
HOUSTON, TX 77081

FUGRO CONSULTANTS LLC
PETERKIN QUARRY
NIKISKI, AK 99635

4. Generator's Phone ( )

5. Transporter 1 Company Name: NRC ALASKA LLC

6. US EPA ID Number: AKR000004184

A. State Transporter's ID

B. Transporter 1 Phone (907) 258-1558

7. Transporter 2 Company Name

8. US EPA ID Number

C. State Transporter's ID

D. Transporter 2 Phone

9. Designated Facility Name and Site Address
NRC ALASKA LLC
2020 VIKING DRIVE
ANCHORAGE, AK 99501

10. US EPA ID Number: AKR000004184

E. State Facility's ID

F. Facility's Phone (907) 258-1558

11. WASTE DESCRIPTION	Containers No.	Containers Type	13. Total Quantity	14. Unit Wt./Vol.
HM				
a. Material Not Regulated by DOT		TT	6456	P
b.				
c.				
d.				

GENERATOR

NON-HAZARDOUS WASTE

G. Additional Descriptions for Materials Listed Above
EA0301 CONTAMINATED WATERS APT-1

H. Handling Codes for Wastes Listed Above
D83

15. Special Handling Instructions and Additional Information
Shipper's Certification: This is to certify that the above-named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation

16. GENERATOR'S CERTIFICATION: I hereby certify that the contents of this shipment are fully and accurately described and are in all respects in proper condition for transport. The materials described on this manifest are not subject to federal hazardous waste regulations.

Printed/Typed Name	Signature	Date (Month Day Year)
R. Mosher		9 12 16

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Date (Month Day Year)
TONY WEESE	for WEESE	9 12 16

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Date (Month Day Year)

FACILITY

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of the waste materials covered by this manifest, except as noted in item 19.

Printed/Typed Name	Signature	Date (Month Day Year)

CHAIN OF CUSTODY

Project Name:	Alaska LNG Site Investigation	Client:	Alaska LNG LLC	Project Engineer:	
Project Number:	04.10160001	Project Location:	APT-1 Development Water located on Sirrus and Hinerman	Sheet	1 of 1

No.	Sample Identification		Depth	Sample Container (Size/Material)	Sample Type	USDA Regulated Yes or No*	Test Type						Remarks
	Description of contents	Sample No.	( )				A	B	C	D	E	F	
1	**Fugro APT-1 Development Water from Well**	APT-1	0-140ft	Bulk Water approximately 1046 gallons	Water	No							Water
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													

NOTES: NRC will vaccum water with vac truck 1200 gallon tank located at the NRC facility on the Kenai Spur

Relinquished By					Received By			Test Type
Print Name	Signature	Phone No.	Date	Time	Print Name	Signature	Phone No.	A
R. Mosher		281 65[redacted]41	9/20/16	1340	M. Williams	Michael Williams		B
								C
								D
								E
								F

*** IN CASE OF EMERGENCY CALL 1-800-899-4672 ***

107195 (LW

NON-HAZARDOUS WASTE MANIFEST

Please print or type (Form designed for use on elite (12 pitch) typewriter)

NON-HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No. EXEMPT

Manifest Document No. 107195A

2. Page 1 of 1

3. Generator's Name and Mailing Address
FUGRO CONSULTANTS LLC
6100 HILLCROFT AVE
HOUSTON, TX 77081

FUGRO CONSULTANTS LLC
PETERKIN QUARRY
NIKISKI, AK 99635

4. Generator's Phone ( )

5. Transporter 1 Company Name | 6. US EPA ID Number | A. State Transporter's ID | B. Transporter 1 Phone

7. Transporter 2 Company Name | 8. US EPA ID Number | C. State Transporter's ID | D. Transporter 2 Phone

9. Designated Facility Name and Site Address
NRC ALASKA LLC
44066 KENAI SPUR HIGHWAY
KENAI, AK 99611

10. US EPA ID Number
AKR000203984

E. State Facility's ID

F. Facility's Phone (907) 395-4500

11. WASTE DESCRIPTION	Containers No.	Containers Type	13. Total Quantity	14. Unit Wt./Vol.
HM a. Material Not Regulated by DOT	1	TT	1,046	G
b.				
c.				
d.				

GENERATOR

G. Additional Descriptions for Materials Listed Above
1) EA0301 CONTAMINATED WATERS

H. Handling Codes for Wastes Listed Above
D5344

15. Special Handling Instructions and Additional Information
Shipper's Certification: This is to certify that the above-named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation

NON-HAZARDOUS WASTE

16. GENERATOR'S CERTIFICATION: I hereby certify that the contents of this shipment are fully and accurately described and are in all respects in proper condition for transport. The materials described on this manifest are not subject to federal hazardous waste regulations.

K. Mosher

Printed/Typed Name | Signature | Date: Month 9 Day 20 Year 16

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name | Signature | Date: Month Day Year

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name | Signature | Date: Month Day Year

FACILITY

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of the waste materials covered by this manifest, except as noted in item 19.

Printed/Typed Name | Signature | Date: Month Day Year

CHAIN OF CUSTODY

Project Name:	Alaska LNG Site Investigation	Client:	Alaska LNG LLC	Project Engineer:	
Project Number:	04.10160001	Project Location:	APT-2 Development Water located on Sirrus and Hinerman	Sheet	1 of 1

No.	Sample Identification		Depth	Sample Container (Size/Material)	Sample Type	USDA Regulated Yes or No*	Test Type						Remarks
	Description of contents	Sample No.	( )				A	B	C	D	E	F	
1	Fugro APT-1 Development Water from Well	APT-2	0-140ft	Bulk Water approximately 6518 gallons	Water	No							Water
2				6411									
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													

NOTES: NRC will vaccum water with vac truck from 6900 gallon tank located at the Peterkin Quarry concrete pad nearest Hinerman Road

Relinquished By					Received By			Test Type
Print Name	Signature	Phone No.	Date	Time	Print Name	Signature	Phone No.	A
R Mac Lv	R	2816589841	9/27	1330	Tex Vees	Tex Vees	7476685	B
								C
								D
								E
								F

*** IN CASE OF EMERGENCY CALL 1-800-898-4672 ***

107308 (ILW)

NON-HAZARDOUS WASTE MANIFEST

Please print or type (Form designed for use on elite (12 pitch) typewriter)

NON-HAZARDOUS WASTE

NON-HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No. EXEMPT

Manifest Document No. 1073080

2. Page 1 of 1

GENERATOR

3. Generator's Name and Mailing Address
FUGRO CONSULTANTS LLC
6100 HILLCROFT AVE
HOUSTON, TX 77081

FUGRO CONSULTANTS LLC
PETERKIN QUARRY
NIKISKI, AK 99635

4. Generator's Phone ( )

5. Transporter 1 Company Name: NRC ALASKA LLC

6. US EPA ID Number: AKR000004184

A. State Transporter's ID

B. Transporter 1 Phone (907) 258-1558

7. Transporter 2 Company Name

8. US EPA ID Number

C. State Transporter's ID

D. Transporter 2 Phone

9. Designated Facility Name and Site Address
NRC ALASKA LLC
2020 VIKING DRIVE
ANCHORAGE, AK 99501

10. US EPA ID Number: AKR000004184

E. State Facility's ID

F. Facility's Phone (907) 258-1558

11. WASTE DESCRIPTION (M)	Containers No.	Containers Type	13. Total Quantity	14. Unit Wt./Vol.
a. Material Not Regulated by DOT	1	TT	411	G
b.				
c.				
d.				

G. Additional Descriptions for Materials Listed Above
EA0301 CONTAMINATED WATERS APT-2

H. Handling Codes for Wastes Listed Above
D855

15. Special Handling Instructions and Additional Information
Shipper's Certification This is to certify that the above-named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation

16. **GENERATOR'S CERTIFICATION:** I hereby certify that the contents of this shipment are fully and accurately described and are in all respects in proper condition for transport. The materials described on this manifest are not subject to federal hazardous waste regulations.

Printed/Typed Name	Signature	Date: Month	Day	Year
K Mosher		9	27	16

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Date: Month	Day	Year
TOMY Weese	Tomy Weese	9	27	16

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Date: Month	Day	Year

FACILITY

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of the waste materials covered by this manifest, except as noted in item 19.

Printed/Typed Name	Signature	Date: Month	Day	Year

CHAIN OF CUSTODY

Project Name:	Alaska LNG Site Investigation	Client:	Alaska LNG LLC	Project Engineer:	
Project Number:	04.10160001	Project Location:	APT-2 Development Water located on Sirrus and Hinermen	Sheet	1 of 1

No.	Sample Identification		Depth	Sample Container (Size/Material)	Sample Type	USDA Regulated Yes or No*	Test Type						Remarks
	Description of contents	Sample No.	( )				A	B	C	D	E	F	
1	**Fugro APT-1 Development Water from Well**	APT-2	0-140ft	Bulk Water approximately 800 gallons	Water	No							Water
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													

NOTES: NRC will vaccum water with vac truck from 1200 gallon tank located at NRC facility pending results

Relinquished By					Received By			Test Type
Print Name	Signature	Phone No.	Date	Time	Print Name	Signature	Phone No.	A
R. Mosher		281 658-9841	9/27/16	13:00	[illegible]		907 351-5215	B
								C
								D
								E
								F

*** IN CASE OF EMERGENCY CALL 1-800-893-4672 ***

10719

NON-HAZARDOUS WASTE MANIFEST

Please print or type (Form designed for use on elite 12 pitch typewriter)

NON-HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No. EXEMPT

Manifest Document No 107195B

2. Page 1 of 1

3. Generator's Name and Mailing Address
FUGRO CONSULTANTS LLC
6100 HILLCROFT AVE
HOUSTON, TX 77081

FUGRO CONSULTANTS LLC
PETERKIN QUARRY
NIKISKI, AK 99635

4. Generator's Phone ( )

5. Transporter 1 Company Name | 6. US EPA ID Number | A. State Transporter's ID | B. Transporter 1 Phone

7. Transporter 2 Company Name | 8. US EPA ID Number | C. State Transporter's ID | D. Transporter 2 Phone

9. Designated Facility Name and Site Address
NRC ALASKA LLC
44066 KENAI SPUR HIGHWAY
KENAI, AK 99611

10. US EPA ID Number
AKR000203934

E. State Facility's ID

F. Facility's Phone (907) 395-4600

GENERATOR

HM	11. WASTE DESCRIPTION	12. Containers No	Type	13. Total Quantity	14. Unit Wt./Vol.
a.	Material Not Regulated by DOT		1 TT	800	G
b.					
c.					
d.					

G. Additional Descriptions for Materials Listed Above
) EA0301 CONTAMINATED WATERS

H. Handling Codes for Wastes Listed Above
D8710

15. Special Handling Instructions and Additional Information
Shipper's Certification: This is to certify that the above-named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation

NON-HAZARDOUS WASTE

16. GENERATOR'S CERTIFICATION: I hereby certify that the contents of this shipment are fully and accurately described and are in all respects in proper condition for transport. The materials described on this manifest are not subject to federal hazardous waste regulations.

SIGN HERE

Printed/Typed Name | Signature | Date: Month 10 Day 5 Year 16

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials
Printed/Typed Name | Signature | Date: Month Day Year

18. Transporter 2 Acknowledgement of Receipt of Materials
Printed/Typed Name | Signature | Date: Month Day Year

FACILITY

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of the waste materials covered by this manifest, except as noted in item 19
Printed/Typed Name: Michael Williams | Signature: Michael Williams | Date: Month 10 Day 5 Year 16

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CHAIN OF CUSTODY

Project Name:	Alaska LNG Site Investigation	Client:	Alaska LNG LLC	Project Engineer:	
Project Number:	04.10160001	Project Location:	APT-3 Development Water located on Sirrus and Hinerman	Sheet	1 of 1

No.	Sample Identification		Depth	Sample Container (Size/Material)	Sample Type	USDA Regulated Yes or No*	Test Type						Remarks
	Description of contents	Sample No.	( )				A	B	C	D	E	F	
1	**Fugro APT-3 Development Water from Well**	APT-3	0-ft	Bulk Water approximately 1800 gallons	Water	No							Water
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													

NOTES: NRC will vaccum water with vac truck from 6900 gallon bulk storage tank located on Hinerman and Sirrus in the Peterkin Quarry

Relinquished By				
Print Name	Signature	Phone No.	Date	Time
Randy Lukasik		907-306-3997	9/15/2016	

Received By		
Print Name	Signature	Phone No.
Thomas Robinson		398-5346

Test Type
A
B
C
D
E
F

*** IN CASE OF EMERGENCY CALL 1-800-899-4672 ***

107173 (LW

NON-HAZARDOUS WASTE MANIFEST

Please print or type (Form designed for use on elite (12 pitch) typewriter)

NON-HAZARDOUS WASTE

GENERATOR

NON-HAZARDOUS WASTE MANIFEST | 1. Generator's US EPA ID No. EXEMPT | Manifest Document No. 107173A | 2. Page 1 of 1

3. Generator's Name and Mailing Address
FUGRO CONSULTANTS LLC
6100 HILLCROFT AVE
HOUSTON, TX 77081

FUGRO CONSULTANTS LLC
PETERKIN QUARRY
NIKISKI, AK 99635

4. Generator's Phone ( )

5. Transporter 1 Company Name: NRC ALASKA LLC | 6. US EPA ID Number: AKR000041584 | A. State Transporter's ID | B. Transporter 1 Phone (907) 258-1558

7. Transporter 2 Company Name | 8. US EPA ID Number | C. State Transporter's ID | D. Transporter 2 Phone

9. Designated Facility Name and Site Address
NRC ALASKA LLC
44066 KENAI SPUR HIGHWAY
KENAI, AK 99811

10. US EPA ID Number: AKR000203984

E. State Facility's ID

F. Facility's Phone (907) 395-4600

11. WASTE DESCRIPTION	Containers No.	Containers Type	13. Total Quantity	14. Unit Wt./Vol.
a. Material Not Regulated by DOT	1	TT	1678	G
b.				
c.				
d.				

G. Additional Descriptions for Materials Listed Above
EA0301 CONTAMINATED WATERS APT-3 DISCHARGE

H. Handling Codes for Wastes Listed Above
D5217

15. Special Handling Instructions and Additional Information
Shipper's Certification: This is to certify that the above-named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation

16. GENERATOR'S CERTIFICATION: I hereby certify that the contents of this shipment are fully and accurately described and are in all respects in proper condition for transport. The materials described on this manifest are not subject to federal hazardous waste regulations.

Printed/Typed Name	Signature	Date (Month Day Year)
Randy Lukasik		9 15 16

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Date (Month Day Year)
Thomas Robinson		9 15 16

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Date (Month Day Year)

FACILITY

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of the waste materials covered by this manifest, except as noted in item 19.

Printed/Typed Name	Signature	Date (Month Day Year)

APPENDIX D
MANUFACTURER'S SPECIFICATION (CUT) SHEETS

WESTERN RUBBER AND MANUFACTURING

SINCE 1977

Prices Effective May 15, 2008

K – Packers

"K" PACKERS (TRI-SEALS)

BLANK
*(FOR PVC PIPE—
Not Included)

COUPLING

WELD-ON

- Available in the three (3) types, COUPLING (Right by Right/Right by Left) BLANK (for gluing to PVC pipe) WELD ON
- Designed to seal in Schedule 40 pipe unless stated otherwise.
- Can be Furnished in STAINLESS STEEL
- Provides a "sand tight" seal between screen and casing
- Used for many applications in WATER WELL, CONSTRUCTION, AND ENVIRONMENTAL industry.
- Constructed from neoprene rubber being vulcanized and bonded under heat and pressure to coupling or pipe
- Available in two (2) rubber hardnesses
  70 durometer—STANDARD
  50 durometer—SOFT
- CUSTOM K-PACKERS AVAILABLE to 24", please call with your requirements.

		RIGHT BY RIGHT			RIGHT BY LEFT		BLANK		WELD ON	
PIPE SIZE	CASING SIZE	NOTES	PART NUMBER	PRICE / WT.	PART NUMBER	PRICE / WT.	PART NUMBER	PRICE / WT.	PART NUMBER	PRICE / WT.
4"	6"								KPWO46	/ 8.05
10"	12"								KPWO1012	/ 34.10

Distributed By:

PQ Products, Inc. 923 E Farwell Road, Spokane, WA 99208
509-624-6820 Paul 509-939-1612 Perry 509-991-2993
www.pqproducts.com paul@pqproducts.com

Alloy Machine Works, Inc. - Well Screens
1-800-577-5068

WELL SCREEN SUBMITTAL DATA

CUSTOMER: **PQ Products** **3/16/2016**
ATTN:
PROJECT: **4" PS x 6" Telescope PrePack**

4" PS----------X----------6" Tel

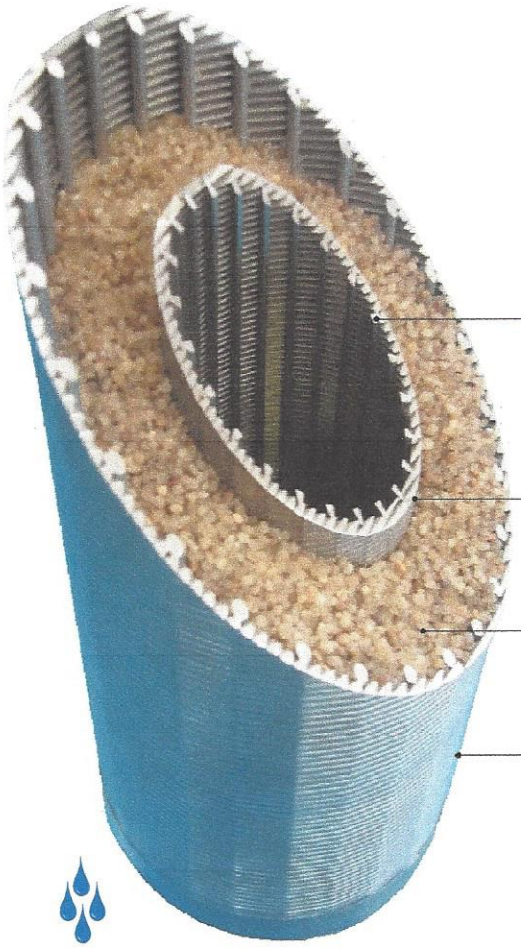
	304 SS		304SS	
Material				
Nominal Size	**4 PS**	102 mm	**6 Tel**	152 mm
Estimated Well Depth	100 ft	30 meters	100 ft	30 meters
Estimated Feet of Screen	10 ft	3 meters	10 ft	3 meters
Slot Size	0.020 in	0.51 mm	0.020 in	0.51 mm
Outside Diameter Approx.	4.5 in	114 mm	5.625 in	143 mm
Inside Diameter Rod Base Screen	4 in	102 mm	5 in	127 mm
Inside Diameter at Fittings Approx.	4 in	102 mm	5 in	127 mm
Weight Per Foot Approx.	3.78 lbs.	1.7 kg	4.73 lbs.	2.1 kg
Wire Width	0.060 in	1.5 mm	0.060 in	1.5 mm
Wire Height	0.100 in	2.5 mm	0.100 in	2.5 mm
Collapse Strength Combined*	1855.49 PSI	130.441 kg/sq.cm	1855.5 PSI	130.442 kg/sq.cm
Open Area	25 %	25 %	25 %	25 %
Intake Area	42.97 sq.in./ft.	910 sq.cm./meter	54.16 sq.in./ft.	1147 sq.cm./meter
Transmitting Capacity @ 0.1 ft/sec	13.32 GPM/ft.	2.76 lps/meter	16.79 GPM/ft.	3.47 lps/meter
Support Rod Diameter	0.125 in	3.18 mm	0.125 in	3.18 mm
Number of Support Rods	26	26	32	32
Cross Sectional Support Rod Area	0.3172 sq.in	2.05 sq.cm.	0.3904 sq.in	2.52 sq.cm.
Design Yield Strength	30,000 PSI	2109 kg/sq.cm	30,000 PSI	2109 kg/sq.cm
Calculated Tensile Strength*	6,661 lbs.	3024.094 kg	11,712 lbs.	5317.248 kg
Maximum Recommended Hanging Weight*	3,330 lbs.	1511.820 kg	4,099 lbs.	1860.946 kg
Critical Compression Load**	9,599 lbs.	4358.159 kg	12,111 lbs.	5498.394 kg

Distributed By: PQ Products, Inc. Contact Paul or Perry
509-624-6820 Fax 509-467-4515
www.pqproducts.com paul@pqproducts.com perry@pqproducts.com

ROD-BASED PRE-PACK™

Rod-based, wire-wrapped sand control screen

The rod-based Pre-Pack, wire-wrapped, all-welded screen eliminates the need to under-ream and gravel pack a well. It consists of two concentric V-shaped wire screens and a 0.25-in. thick (or thicker if required) integral gravel pack. The gauge of the inner and outer jackets is determined by the size and type of gravel pack used. The size and type of gravel pack used is dependent on the formation sands that are to be controlled. The aggregate gravel pack is non-resin coated. The dual screen provides built-in sand control when gravel packing is not feasible.



Rib wire
the unique structure of the inner rib wire combined with the swaging process of the design provides tensile and collapse strength The rib wire supports the screen wrap wire.

Inner screen wrap wire
V-shaped wire gauge opening size is determined by the selected aggregate in the screen annulus (alloy and dimensions per customer specs).

Aggregate gravel pack:
custom designed and selected to suit the pay zone formation materials of the well

Outer screen wrap wire
V-shaped wire provides a self-cleaning action for greater flow and less chance of plugging (alloy and dimensions per customer specs).

Applications

- Built-in sand control when gravel packing is not feasible or too costly
- Shallow wells with thin pay zones
- Numerous workover applications
- Cased or open hole horizontal completions.

Distributed By:
PQ Products, Inc. 923 E Farwell Road, Spokane, WA 99208
509-624-6820 Fax: 509-467-4515
www.pqproducts.com paul@pqproducts.com
Contact: Paul Querna, PE or Perry Querna

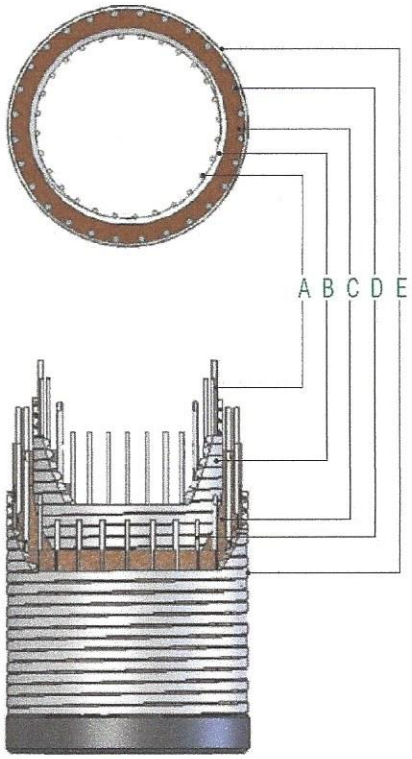
ALLOY SCREEN WORKS
A division of Alloy Machine Works, Inc.

ROD-BASED PRE-PACK™

Rod-based, wire-wrapped sand control screen

Advantages

- Economical solution when gravel packing is not feasible
- Eliminates the need to under-ream and gravel pack a well
- Choice of wrap wire and alloys as well as type and thickness of aggregate gravel pack allows for custom engineering to match specific production environments
- Due to the large array of sizes, materials and connections, our Rod-Based Pre-Pack screens provide a variety of options for multiple applications.
- Aggregate Gravel Pack can be composed of Carbolite, glass beads or other materials per application.
- Purpose built for water producing wells
- Can be supplied with 304 or 316 riser pipe.
- Options include Flush Joint, NPT, or Weld Ring Fittings.



A. Rib wire (to specs)
B. Inner screen wrap wire (alloy and dimensions per customer specs)
C. Aggregate gravel pack (non- resin coated)
D. Rib wire (to specs)
E. Outer screen wrap wire jacket +/- 0.016 (alloy and dimensions per customer specs)

Screen			Gravel Pack
Size (in.)	OD (in.)	Cylinder Area (sq in./ft)	Thickness (in.)
1.900	3.102	166.88	0.250
2.063	3.265	123.03	0.250
2.375	3.577	134.78	0.250
2.875	4.077	153.62	0.250
3.500	4.702	177.17	0.250
4.000	5.202	196.01	0.250
4.500	5.702	214.85	0.250
5.000	6.202	233.69	0.250

Distributed By:

PQ Products, Inc. 923 E Farwell Road, Spokane, WA 99208

509-624-6820 Fax: 509-467-4515

www.pqproducts.com paul@pqproducts.com

Contact: Paul Querna, PE or Perry Querna

ALLOY SCREEN WORKS

A division of Alloy Machine Works, Inc.

18102 East Hardy Road
Houston, Texas 77073 USA
Phone: 281.233.0214
Toll-free: 800.577.5068
Fax: 281.233.0487
Email: info@alloyscreenworks.com
www.alloyscreenworks.com

ISO 9001:2000 Registered QMS