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Flint Hills Resources Alaska, LLC

2015 ANNUAL GROUNDWATER MONITORING SUMMARY REPORT

Port of Anchorage Terminal

Anchorage, Alaska

January 5, 2016

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Port of Anchorage Terminal

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ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
AK	Alaska Method
Arcadis	Arcadis U.S., Inc.
ARRC	Alaska Railroad Corporation
AST	aboveground storage tank
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
CUL	cleanup level
DQO	data quality objective
DRO	diesel range organics
ETF	East Tank Farm
FHRA	Flint Hills Resources Alaska, LLC
GRO	gasoline range organics
HEM	Hexane Extractable Material
LCS	laboratory control sample
LCSD	laboratory control sample duplicates
LNAPL	light nonaqueous phase liquid
LOQ	limit of quantification
mg/L	milligrams per liter
NTF	North Tank Farm
POA	Port of Anchorage
QC	quality control
RPD	relative percent differences
RRO	residual range organics
site	FHRA Anchorage Terminal, located at 1076 Ocean Dock Road, in the Port of Anchorage, Anchorage, Alaska
USEPA	United States Environmental Protection Agency
WO	work order
WTF	West Tank Farm
°C	degrees Centigrade

1 INTRODUCTION

On behalf of Flint Hills Resources Alaska, LLC (FHRA), Arcadis U.S., Inc. (Arcadis) prepared this 2015 Annual Groundwater Monitoring Summary Report (report) for the FHRA Anchorage Terminal, located at 1076 Ocean Dock Road, in the Port of Anchorage (POA), Anchorage, Alaska (site; Figure 1-1). This report summarizes groundwater monitoring events and light nonaqueous phase liquid (LNAPL) recovery conducted at the site during the second, third, and fourth quarters 2015. Groundwater monitoring was conducted in accordance with Alternative 2 in the Revised Draft Feasibility Study (Arcadis 2009a), which was approved by the Alaska Department of Environmental Conservation (ADEC) on May 5, 2010, and modified to include new monitoring wells installed in 2014 and 2015. First quarter 2015 monitoring results are discussed in the Release Investigation Report (Arcadis 2015).

FHRA's consulting team includes Arcadis and Shannon & Wilson, Inc. FHRA engaged these consulting firms to perform various tasks for the project, including data collection, analyses, and reporting. Pursuant to 18 Alaska Administrative Code (AAC) 75.335(c) (1), this report was prepared and submitted by a Qualified Environmental Professional. Samples were collected and analyzed in accordance with 18 AAC 75.355(a).

2 SITE SETTING AND BACKGROUND

The site is an active fuel distribution terminal located on property that is leased from the Alaska Railroad Corporation (ARRC). Approximate site boundaries are shown on Figure 2-1. The area east of Ocean Dock Road is occupied by the East Tank Farm (ETF). The area west of Ocean Dock Road is occupied by the North Tank Farm (NTF), West Tank Farm (WTF), warehouse/office building, truck loading rack, rail car loading rack, and inactive asphalt facilities (asphalt storage tanks, topping plant located east of the asphalt storage tanks, and loading rack; Figure 2-1). Directly northeast of the site is a bulk petroleum facility operated by other entities. A bluff is located along the eastern edge of the ETF. A residential neighborhood known as Government Hill is located on top of the bluff.

The site receives and stores fuel oils, diesel, jet fuel, and unleaded gasoline in aboveground storage tanks (ASTs) located in earthen and/or concrete containment dikes that provide secondary containment. Products are brought to the site via rail cars and pipeline, and are shipped from the site in rail cars transferred by ARRC, tanker trucks, and pipeline. Product is loaded into railcars via the rail car loading rack, and tanker trucks are loaded via the truck loading rack (Arcadis 2012).

A complex network of buried pipelines and utilities are present onsite. The pipelines distribute various fuels to and from the rail car loading rack, ASTs, and truck loading rack to the POA docks north of the site and to the airport. No underground storage tanks are located onsite.

3 SITE GEOLOGY AND HYDROGEOLOGY

The site is located on the eastern margin of the tectonic Cook Inlet Forearc Basin, bounded by the Alaska Range to the north and west and the Chugach Mountains to the east. Several major fault zones lie within and cut across the basin.

The site is covered by Tertiary-aged unconsolidated sediment consisting of gray sand, silt, and clays ranging from very soft to medium stiffness. Historically, organics consisting of woody debris and peat have been used to distinguish the contact between the overlying silt, sand, and gravel fill material used to level and raise the ground surface.

Boring logs for the site indicate that overlying fill material generally consists of gray to brown silty to sandy gravels, with medium stiffness ranging from 5 to 8 feet thick. Borings north and west of the three large ASTs at the NTF show the underlying lithology consisting of very soft to medium stiff gray gravelly silt, sandy silt, and silty gravels to depth. Within the confinement and south of the three large ASTs, the underlying lithology is generally gray gravelly silt to sandy silt. Lenses of gravelly clay, silty clay, and clayey silt were observed at varying depths starting at the surface (mainly in borings advanced between the WTF and the NTF) and throughout the depth of boring at several other locations. Organics are observed in all areas, at depths ranging from approximately 5 to 12 feet below ground surface (bgs). A low conductivity silt/clay layer is present at variable depths at the site. Attempts to install a monitoring well north of the west tank farm (MW-200) were unsuccessful; groundwater did not accumulate in this well (Arcadis 2015).

Regional hydrogeology consists of two shallow water table aquifers, a deep confined aquifer, and surface water drainage. Groundwater occurs beneath the site at a depth of approximately 2 to 13 feet bgs; groundwater elevations are primarily affected by season and precipitation events. Tidal influence is unlikely because the shallow aquifer is higher in elevation than the high tide water elevation (RETEC 2008). The nearby sea wall constructed along the seaward edge of the site may limit the influence of tidal fluctuations in the nearby Knik Arm. The groundwater gradient direction is west near the ETF area, west-southwest for the WTF area, and northwesterly for the NTF and the Knik Arm areas, as further discussed in Section 5.1.

4 GROUNDWATER MONITORING METHODS

This section describes the methods followed in conducting groundwater monitoring activities during 2015. Sample logs from field activities are included in Appendix A.

4.1 Groundwater Elevation and Light Nonaqueous Phase Liquid Monitoring Measurements

Groundwater elevation measurements were collected on April 13 and 23 and May 4, 22, and 26 for second quarter 2015; July 10 and August 11 for third quarter 2015; and October 1 and November 3 for fourth quarter 2015. LNAPL thickness measurements were recorded if LNAPL was present in any of the wells during these gauging events. Additional groundwater elevation data are collected using data loggers deployed in observation wells located within the WTF. Hydrographs were prepared for wells with deployed data loggers and are included in Appendix B.

4.2 Groundwater Monitoring Well Sampling

Groundwater sampling was conducted on May 26 through 29 for second quarter 2015, August 11 through 14 for third quarter 2015, and November 10 through 13 for fourth quarter 2015. Groundwater samples were collected using low-flow techniques: approximately three volumes of water were purged and samples were collected after field parameters were stabilized. Groundwater in each well was allowed to recover to at least 80 percent of the pre-purge well volume. Field parameters including depth to water, LNAPL thickness, temperature, specific conductivity, dissolved oxygen, pH, oxidation reduction potential, and turbidity were recorded on field sampling logs during the purging process (Appendix A). Groundwater samples were collected with submersible pumps once the field parameters were stabilized.

Groundwater samples, including field duplicates, were submitted to SGS for analytical testing. The groundwater samples were analyzed for gasoline range organics (GRO) by Alaska Method (AK) 101; diesel range organics (DRO) by AK 102; residual range organics (RRO) by AK 103; and benzene, toluene, ethylbenzene, and xylenes (BTEX) by United States Environmental Protection Agency (USEPA) Method 8021B. The laboratory analytical reports are provided in Appendix C.

5 GROUNDWATER MONITORING RESULTS

The following sections discuss the results of the 2015 groundwater monitoring program.

5.1 Groundwater Elevation

Groundwater elevation data are summarized in Tables 5-1 through 5-5. Site-wide groundwater elevations with potentiometric contours for the second, third, and fourth quarters of 2015 are presented on Figures 5-1, 5-2, and 5-3, respectively. The site-wide contours show that groundwater flows to the west near the ETF, with a west-southwest gradient near the WTF and a northwesterly gradient near the NTF and the Knik Arm. Groundwater gradients at the site were 0.004 and 0.005 foot per foot in the southwestern and northwestern directions, respectively, during the second and third quarter 2015 monitoring events and 0.003 and 0.002 for the southwestern and northwestern directions, respectively, for the fourth quarter 2015 monitoring event.

Groundwater elevation data were collected from data loggers placed in observation wells OW-1, OW-2t, OW-3, OW-4, OW-5t, and OW-6. Hydrographs produced from these observation wells (Appendix B) show the fluctuation in groundwater levels and reflect the influence of active LNAPL recovery in the collection trenches during the second and third quarters of 2015. Groundwater potentiometric maps for the area around the collection trench from third and fourth quarter are presented on figures included in Appendix B.

Groundwater flow at the site is affected by multiple factors, including precipitation, topography, and soil stratigraphy due to fill material that has been placed incrementally throughout the operational history of the site. Tidal effects appear to have an influence within 150 to 200 feet of Cook Inlet.

Site-specific groundwater velocity has not been calculated during historical investigations at the site. However, lithology of the site is silty, and in some areas the lithology has a low enough conductivity that groundwater does not accumulate in a screened monitoring well (Arcadis 2015). Based on the silty lithology and the shallow gradient of the site, dissolved-phase impacts from the recent releases are not expected to migrate far from the source areas. Groundwater data collected during the second, third, and fourth quarters of 2015 show little evidence of migration of constituents, as further discussed in Section 5.3.

5.2 Light Nonaqueous Phase Liquid Monitoring Results

LNAPL measurements were collected monthly from observation wells and are summarized in Table 5-2. During the second quarter 2015, LNAPL thickness was measured in OW2t and OW5t at 0.01 and 0.03 foot, respectively. During the third quarter 2015, measurable LNAPL thickness was noted in OW3 and OW5t at 0.23 and 0.02 foot, respectively. Additionally, sheen was observed in OW-1 and OW-2t. During fourth quarter 2015, a measurable LNAPL thickness of 0.01 foot was noted in OW2t and OW5t. Additionally, sheen was observed in OW-1 and OW-3.

Figure 5-4 shows an LNAPL thickness plot of measurements collected from observation wells. This plot shows that LNAPL thicknesses peaked in January 2015, with a declining trend to date. LNAPL presence since third quarter 2015 has been limited to the presence of sheen in most observation wells. Furthermore, LNAPL has not been detected in any new monitoring wells during this reporting period, which indicates a limited and declining extent of LNAPL impacts near the 2014 jet fuel release location.

5.3 Monitoring Well Sampling Results

The analytical results for the 2015 quarterly events are discussed below. The final set of field parameters for each quarter recorded after each well had stabilized are summarized in Tables 5-3, 5-4, and 5-5. Analytical results for the 2015 quarterly events are summarized in Tables 5-6, 5-7, and 5-8. Results are also displayed on Figures 5-5 through 5-7. The 18 AAC 75.345 Table C migration to groundwater cleanup levels (CULs) are used for comparison in this section, but may not apply for all constituents based on the results of the 2009 human health risk assessment (Arcadis 2009b). Monitoring wells exceeding the CULs are primarily located in the ETF and WTF, except MW-4, which is located in the area between the NTF and ETF, and B36MW, which is located near the NTF.

5.3.1 Gasoline Range Organics

The GRO CUL of 2.2 milligrams per liter (mg/L) was exceeded in two wells (MW-5 and MW-206) during the second, third, and fourth quarters of 2015, as described below:

- GRO exceeded the CUL at MW-206 at concentrations of 7.56, 37.5, and 20.2 mg/L during the second, third, and fourth quarters of 2015, respectively.
- GRO exceeded the CUL at MW-5 during fourth quarter 2015 at a concentration of2.61 mg/L.

5.3.2 Diesel Range Organics

The DRO CUL of 1.5 mg/L was exceeded in 10 wells during the second, third, and fourth quarters of 2015, which included MW-4, MW-5, MW-203, MW-205, MW-206, B36MW, B31MW-R, OW-4, OW-6, and OW-7. The DRO concentration ranges during the quarterly monitoring events are summarized below:

- DRO exceeded the CUL in eight wells, at concentrations ranging from 1.55 mg/L (OW-6) to 7.55 mg/L (B31MW-R) during the second quarter 2015 monitoring event.
- DRO CUL exceedances were noted in eight wells, at concentrations ranging from 1.51 mg/L (MW-203) to 11.5 mg/L (MW-206) during the third quarter 2015 monitoring event.
- DRO exceeded the CUL in six wells at concentrations ranging from 2 mg/L (MW-4) to 3.85 mg/L (B31MW-R) during the fourth quarter 2015 monitoring event.

5.3.3 Residual Range Organics

The RRO CUL of 1.1 mg/L was exceeded in four wells during the second, third, and fourth quarters of 2015, including MW-4, MW-202, MW-205, and MW-206. The RRO concentration ranges exceeding the CUL during the quarterly monitoring events are summarized below:

- RRO exceeded the CUL in three wells, at concentrations ranging from 1.11 mg/L (MW-205) to 1.19 mg/L (MW-206) during the second quarter 2015 monitoring event.
- RRO exceedances were noted in two wells, at concentrations ranging from 1.16 mg/L (MW-4) to 1.75 (MW-206) during the third quarter 2015 monitoring event.
- RRO exceeded the CUL in one well (MW-202), at a concentration of 1.29 mg/L during the fourth quarter 2015 monitoring event.

5.3.4 Benzene

Benzene exceeded the CUL of 0.005 mg/L in eight wells during the second, third, and fourth quarters of 2015, including MW-4, MW-5, MW-205, MW-206, MW-207, OW-1, OW-4, and OW-7. The benzene exceedances during the quarterly monitoring events are summarized below:

- Benzene exceeded the CUL in five wells, at concentrations ranging from 0.0308 mg/L (MW-4) to 0.482 mg/L (MW-206) during the second quarter 2015 monitoring event.
- Benzene exceeded the CUL in eight wells, at concentrations ranging from 0.019 mg/L (OW-4) to 1.18 (MW-206) during the third quarter 2015 monitoring event.
- Benzene exceeded the CUL in six wells, at concentrations ranging from 0.0168 mg/L (MW-207) to 0.308 mg/L (MW-5) during the fourth quarter 2015 monitoring event.

5.3.5 Toluene

The toluene CUL of 1 mg/L was only exceeded in one well (MW-206) during the second, third, and fourth quarters of 2015, at concentrations of 2.34, 13.7, and 4.84 mg/L, respectively.

5.3.6 Ethylbenzene

The ethylbenzene CUL of 0.7 mg/L was not exceeded in any of the site monitoring wells during the second, third, and fourth quarters of 2015.

5.3.7 Xylenes

The xylene CUL of 10 mg/L was not exceeded in any of the site monitoring wells during the second, third, and fourth quarters of 2015.

5.4 Trend Analyses

Historical groundwater analytical data are provided in Appendix D. Concentration trend plots showing historical data trends for monitoring wells MW-1, MW-4, MW-5, MW-9, and B31MW-R are included in Appendix E.

GRO, DRO and RRO concentrations at monitoring well MW-1, which is located upgradient of the ETF, have remained below the CULs since this well was first sampled in 1987. BTEX constituents were not detected above the detection limit with the exception of two recent events in 2014 and 2015, when toluene was detected at low level concentrations (below 0.001 mg/L).

Monitoring well MW-4 is located between the ETF and NTF areas and GRO, DRO, RRO and benzene concentrations in this well appear to have peaked in the 2008 to 2010 timeframe. Concentrations in 2015 are generally consistent with historic concentrations detected at this location.

Monitoring well MW-5, which is located downgradient of the ETF, shows declining trends for BTEX constituents and GRO and DRO in comparison to the pre-2000 concentrations. RRO in MW-5 appears to have peaked in the 2005 to 2010 timeframe, with the highest concentration only slightly above the CUL of 1.1 mg/L.

The trend plot for MW-9, which is located cross-gradient of the 2014 ETF release area, shows that DRO and RRO have been below the CULs since 1988. GRO and BTEX have not been detected in MW-9 since 1988, except two low-level detections in 2008 (benzene of 0.00042 mg/L) and 2014 (total xylenes at 0.00133 J mg/L).

Monitoring well B31MW and replacement well B31MW-R are located downgradient of the WTF and near the Asphalt Tank Farm, where historical releases have been documented. This area has shown peak concentrations of GRO and DRO in 2013 and 2010, respectively. RRO concentrations have declined overall since 2005. BTEX constituents in this well remain relatively low in concentration. The concentrations observed in 2015 are within the historical range of concentrations observed at this well.

Monitoring well MW-206 was sampled in 2015 (the well was installed in 2015) and has no prior data. Concentrations were above the CULs for most of 2015 for GRO, DRO, RRO, benzene and toluene. Concentrations have been fluctuating throughout the year, with generally steady or declining concentrations.

These data suggest that the dissolved-phase plume is relatively stable.

6 LIGHT NONAQUEOUS PHASE LIQUID RECOVERY

FHRA conducted active LNAPL recovery in 2015 through two collection trenches installed in 2014 in the jet fuel release area. Groundwater and accumulated LNAPL were recovered via periodic vacuum removal of fluids from the two recovery sumps in each trench, as presented in Appendix A of the Release Investigation Report (Arcadis 2015). LNAPL within each sump was removed five days per week from January through June 2015, and twice per week from June through October 2015, with very limited amounts of LNAPL accumulation between pumping events. FHRA discontinued active recovery and began passive LNAPL recovery methods after receipt of ADEC approval in a letter dated October 21, 2015.

Water levels in the trenches and surrounding area were monitored using data loggers deployed in observation wells. During each data logger data collection event, water levels and LNAPL thicknesses in the observation wells were documented and presented in Table 5-1.

Passive recovery using sorbent pads and booms is currently in place. Terminal operators check the sorbents weekly and replace them as needed. Only recovery sump 2, nearest the jet fuel release location, has accumulated measurable product in the booms, with the booms becoming partially saturated over 3-4 weeks of deployment. The other three sumps have shown only staining on the booms, and they have been replaced periodically due to becoming water-logged. Ice is forming in the sumps during the winter, which may seasonally impact the passive recovery efforts. Groundwater levels remained relatively high into December 2015.

7 INVESTIGATION-DERIVED WASTE

Purge water from the monitoring wells was contained in labeled 55-gallon drums, sampled, and temporarily stored onsite. This water was then processed through the onsite separator and treated effluent was discharged to the POA's publicly owned treatment works facility in accordance with National Pollution Discharge Elimination System Permit AKS-05255-8.

8 QUALITY ASSURANCE SUMMARY

Data quality for the second, third, and fourth quarters of 2015 was assessed using field quality control (QC) samples and internal laboratory procedures. Field QC samples included two field duplicate samples per quarterly event and a minimum of one trip blank per sample shipment. Results for field duplicates are included in Tables 5-6, 5-7, and 5-8. Trip blank results are included in the analytical laboratory reports included in Appendix C. Internal QC procedures employed by the laboratory included analyzing surrogate spikes, method blanks, laboratory control sample (LCS)/laboratory control sample duplicates (LCSDs), and matrix spike samples to assess precision, accuracy, and matrix bias.

Further, the laboratory evaluates conformance to applicable ADEC data quality objectives (DQOs) by following internal quality assurance/QC procedures. A brief narrative is included in the laboratory report (Appendix C) wherever a DQO is not met. Laboratory packages for the second, third, and fourth quarters of 2015 were reviewed and ADEC laboratory review checklists were completed, which are included in Appendix F. The DQOs were met during the second, third, and fourth quarters of 2015 with the exceptions noted below.

Second Quarter 2015:

- Estimated (J-flagged) concentrations of oil and grease hexane extractable material (HEM) and GRO were detected in the method blank associated with purge water sample PS and sample MW-4, respectively. Oil and grease HEM was flagged "B" for PS and GRO was flagged "B" for MW-4. The data usability is considered acceptable for work order (WO) 1152441.
- The DRO and RRO relative percent differences (RPDs) exceeded the DQO of 30 percent for the duplicate pair for MW-202 and MW-402 in WO 1152441. Results for these analytes are considered estimates and are flagged "J" in the MW-202 and MW-402 duplicate pair.

Third Quarter 2015:

- The temperature blank was measured at 6.9 degrees Centigrade (°C), which is above the DQO of 4 ± 2 °C; however, the samples were submitted to the laboratory within 1 hour of sample collection and therefore, data quality and usability were considered unaffected in WO 1153803.
- Estimated (J-flagged) concentrations of DRO, o-xylene, and p- & m-xylenes were detected in the method blank associated with WO 1153803. Sample OW4G and the trip blank WTB were considered affected by the xylenes method blank detections because concentrations in these samples were less than five times the method blank concentration. Sample OW4G was considered unaffected by the DRO method blank detection because the DRO concentration in this sample was greater than 10 times the method blank concentration. O-xylene and p- & m-xylenes were flagged "B" for sample OW4G and trip blank WTB. The data usability is considered acceptable for this project.

- Estimated (J-flagged) concentrations of o-xylene, p- & m-xylenes, and toluene were detected in the trip blank submitted with WO 1153803. O-xylene and p-&m-xylenes were flagged "B" for the trip blank WTB as a result of the method blank detections. The only other sample collected with this WO (OW4G) did not contain a detectable concentration of toluene; therefore, no flags were necessary after adjusting for the method blank detection. The data quality is unaffected by the trip blank detections.
- An estimated (J-flagged) concentration of oil and grease HEM was detected in the method blank associated with purge water sample PS for WO 1154517. The sample is considered affected by the method blank detection and is flagged 'UB' because the sample had an estimated detection of oil and grease HEM below the limit of quantification (LOQ).
- LCS recoveries for benzene, o-xylene, and toluene and the LCSD recovery for benzene were outside QC criteria for multiple analytes for WO 1154517. These analytes were not detected in the associated samples; therefore, samples within this WO were considered unaffected.
- An estimated (J-flagged) concentration of p- & m-xylenes was detected in trip blank WTB2 in WO 1154517. The sample results were not considered affected by the trip blank detection because sample concentrations were either greater than 10 times the reported trip blank concentration or p- & m xylenes were not detected in the sample.

Fourth Quarter 2015:

- An estimated (J-flagged) concentration of oil and grease HEM was reported in the method blank associated with sample 16864-018-DRUM at 3.60J mg/L in WO 1156725_rev1. The sample concentration is reported as not detected at the LOQ and is flagged 'UB' due to a detection in the associated method blank.
- The toluene RPD for MW4 and MW400 and the DRO RPD for MW5 and MW500 exceeded the DQO of 30 percent. Results for these analytes in the respective duplicate pair are considered estimates and flagged 'J.' All other RPDs, where calculable (both results above the LOQ), were less than the DQO of 30 percent.

9 CONCLUSIONS

The overall decreasing trend in LNAPL recovery supports the conclusion that the overall LNAPL footprint has been decreasing at the site and the change to passive LNAPL recovery techniques continue to be warranted.

Groundwater analytical data show concentrations above the CULs for GRO, DRO, RRO, and BTEX constituents in monitoring wells located within the ETF and WTF. With the exception of the DRO exceedance in B36MW, the remaining analytical data are generally consistent with historical ranges for each well. A DRO exceedance of 3.29 mg/L was noted in B36MW during third quarter 2015, where the well has previously had only nondetects or low-level detections. This well is located along the site boundary west of the NTF and near the Knik Arm. The DRO concentration in this well was below the CUL during fourth quarter 2015, indicating that the third quarter 2015 concentration is most likely an outlier and potentially the result of a field sampling error.

Trend analyses using historical concentrations show that dissolved-phase concentrations in monitoring wells MW-206 (GRO, DRO, and benzene) and B31MW-R (DRO) continue to exceed the CULs. These wells showed initial spikes during the first quarter 2015 monitoring event, but have decreased in subsequent sampling events (third and fourth quarter 2015 sampling events). The concentration of benzene in monitoring well MW-5 is generally consistent with historical detections in this monitoring well and results continue to support that this monitoring well was not affected by the 2014 releases.

The observed lithology in areas of the site has been very low conductivity and in some cases groundwater does not accumulate in screened wells. Because of the low conductivity soil and the shallow gradient of the site, dissolved-phase impacts from the recent releases are not expected to migrate offsite from the source areas. Groundwater data collected during 2015 show little evidence of migration. Groundwater sampling of all site wells is recommended to be conducted semiannually through 2016 to continue to evaluate trends.

10 REFERENCES

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TABLES

Table 5-1
Groundwater Elevation Data

2015 Annual Groundwater Monitoring Summary Report
Flint Hills Resources Alaska, LLC
Port of Anchorage Terminal

	Observation Well Number							Product Recovery Sump Number			
	OW1	**OW2t**	**OW3**	**OW4**	**OW5t**	**OW6**	**OW7**	**RS1**	**RS2**	**RS3**	**RS4**
Water Level Measurement Data											
Surveyed Measuring Point Elevation (feet)	21.38	20.12	19.99	22.43	20.47	20.03	19.81	20.24	21.06	21.25	20.83
Total Depth (feet below TOC)	8.53	7.51	7.45	8.63	7.58	7.15	7.02	7.70	7.42	8.35	7.73
Depth to Top of Well Screen (feet below TOC)	2.73	1.71	1.65	2.83	1.78	1.35	1.22	-	-	-	-
Top of Well Screen Elevation (feet)	18.65	18.41	18.34	19.60	18.69	18.68	18.59	-	-	-	-
Bottom of Well Screen Elevation (feet)	13.35	13.11	13.04	14.30	13.39	13.38	13.29	-	-	-	-
Bottom of Well/Sump Elevation (feet)	12.85	12.61	12.54	13.80	12.89	12.88	12.79	12.54	13.64	12.90	13.10
10/22/2014											
Time Water Level Measured	13:10	13:15	13:20	13:30	13:36	14:25	14:35	-	-	-	-
Measured Depth to NAPL (feet below TOC)	Sheen present	Sheen present	Sheen present	-	4.39	Sheen present	Sheen present	-	-	-	-
Measured Depth to Water (feet below TOC)	5.11	4.28	2.56	6.11	4.41	2.90	2.37	-	-	-	-
Product Thickness (feet)	-	-	-	-	0.02	-	-	-	-	-	-
Water Level Elevation (feet)	16.27	15.84	17.43	16.32	16.06	17.13	17.44	-	-	-	-
10/27/2014											
Time Water Level Measured	16:05	16:20	16:33	16:47	16:56	17:06	17:14	17:22	17:25	17:27	17:28
Measured Depth to NAPL (feet below TOC)	5.38	5.57	2.73	-	3.92	Sheen present	Sheen present	5.65	6.47	4.70	4.29
Measured Depth to Water (feet below TOC)	5.40	5.58	2.84	5.93	3.96	2.87	2.59	5.67	6.49	4.72	4.31
Product Thickness (feet)	0.02	0.01	0.11	-	0.04	-	-	0.02	0.02	0.02	0.02
Water Level Elevation (feet)	15.98	14.54	17.25*	16.50	16.51	17.16	17.22	14.57	14.57	16.53	16.52
11/4/2014											
Time Water Level Measured	15:11	15:29	15:38	15:49	15:57	16:09	16:12	-	-	-	-
Measured Depth to NAPL (feet below TOC)	5.56	6.35	2.98	-	6.42	Sheen present	Sheen present	-	-	-	-
Measured Depth to Water (feet below TOC)	5.58	6.37	3.30	7.74	6.49	3.46	3.02	-	-	-	-
Product Thickness (feet)	0.02	0.02	0.32	-	0.07	-	-	-	-	-	-
Water Level Elevation (feet)	15.80	13.75	16.97*	14.69	14.04*	16.57	16.79	-	-	-	-
11/10/2014											
Time Water Level Measured	13:12	13:21	13:30	13:38	13:48	14:09	14:24	-	-	-	-
Measured Depth to NAPL (feet below TOC)	5.72	6.31	3.19	-	6.43	Sheen present	Sheen present	-	-	-	-
Measured Depth to Water (feet below TOC)	5.76	6.33	3.58	7.97	6.51	3.72	3.34	-	-	-	-
Product Thickness (feet)	0.04	0.02	0.39	-	0.08	-	-	-	-	-	-
Water Level Elevation (feet)	15.62	13.79	16.75*	14.46	14.03*	16.31	16.47	-	-	-	-
11/24/2014											
Time Water Level Measured	12:45	13:02	13:09	13:22	13:33	13:49	13:59	12:52	13:15	13:28	13:40
Measured Depth to NAPL (feet below TOC)	5.94	6.31	3.45	-	6.54	Sheen present	Sheen present	6.43	7.24	8.28	7.52
Measured Depth to Water (feet below TOC)	5.99	6.32	3.89	8.16	6.61	4.05	3.72	6.45	7.25	8.29	7.53
Product Thickness (feet)	0.05	0.01	0.44	-	0.07	-	-	0.02	0.01	0.01	0.01
Water Level Elevation (feet)	15.39	13.80	16.49*	14.27**	13.92*	15.98	16.09	13.79	13.81	12.96	13.30
12/4/2014											
Time Water Level Measured	14:45	15:01	15:20	15:29	15:39	15:51	16:01	-	-	-	-
Measured Depth to NAPL (feet below TOC)	6.19	6.27	3.79	-	6.59	Sheen present	Sheen present	-	-	-	-
Measured Depth to Water (feet below TOC)	6.24	6.30	4.29	8.26	6.71	4.45	4.11	-	-	-	-
Product Thickness (feet)	0.05	0.03	0.50	-	0.12	-	-	-	-	-	-
Water Level Elevation (feet)	15.14	13.82	16.14*	14.17**	13.87*	15.58	15.70	-	-	-	-

Notes:

Field Personnel: Randy Hessong and Katie Nolan
All other notes on page 4.

Table 5-1
Groundwater Elevation Data

2015 Annual Groundwater Monitoring Summary Report
Flint Hills Resources Alaska, LLC
Port of Anchorage Terminal

	Observation Well Number							Product Recovery Sump Number			
	OW1	OW2t	OW3	OW4	OW5t	OW6	OW7	RS1	RS2	RS3	RS4
12/11/2014											
Time Water Level Measured	11:02	10:54	10:39	10:50	10:44	11:12	11:21	-	-	-	-
Measured Depth to NAPL (feet below TOC)	6.19	5.78	3.96	-	6.62	Sheen present	Sheen present	-	-	-	-
Measured Depth to Water (feet below TOC)	6.25	5.82	4.51	8.28	6.72	4.65	4.28	-	-	-	-
Product Thickness (feet)	0.06	0.04	0.55	-	0.10	-	-	-	-	-	-
Water Level Elevation (feet)	15.18*	14.30	15.96*	14.15**	13.84*	15.38	15.53	-	-	-	-
1/2/2015											
Time Water Level Measured	13:40	13:51	13:56	14:04	14:10	14:16	14:22	-	-	-	-
Measured Depth to NAPL (feet below TOC)	6.81	6.51	4.72	-	6.63	Sheen present	Sheen present	-	-	-	-
Measured Depth to Water (feet below TOC)	6.84	6.54	5.37	8.46	6.76	5.28	4.92	-	-	-	-
Product Thickness (feet)	0.03	0.03	0.65	-	0.13	-	-	-	-	-	-
Water Level Elevation (feet)	14.54	13.58	15.19*	13.97**	13.82*	14.75	14.89	-	-	-	-
1/22/2015											
Time Water Level Measured	12:51	13:05	13:12	13:22	13:35	13:45	13:53	-	-	-	-
Measured Depth to NAPL (feet below TOC)	7.18	6.61	5.14	-	6.81	Sheen present	Sheen present	-	-	-	-
Measured Depth to Water (feet below TOC)	7.20	6.64	5.75	-	6.96	5.86	5.46	-	-	-	-
Product Thickness (feet)	0.02	0.03	0.61	-	0.15	-	-	-	-	-	-
Water Level Elevation (feet)	14.18	13.48	14.78*	Dry Well**	13.64	14.17	14.35	-	-	-	-
2/17/2015											
Time Water Level Measured	15:53	16:12	16:44	15:39	16:19	15:31	15:23	-	-	-	-
Measured Depth to NAPL (feet below TOC)	7.90	6.85	6.92	-	7.09	-	Sheen present	-	-	-	-
Measured Depth to Water (feet below TOC)	7.93	6.93	7.25	-	7.15	6.82	6.55	-	-	-	-
Product Thickness (feet)	0.03	0.08	0.33	-	0.06	-	-	-	-	-	-
Water Level Elevation (feet)	13.45	13.26	13.03**	Dry Well**	13.37**	13.21**	13.26**	-	-	-	-
3/12/2015											
Time Water Level Measured	13:48	14:05	14:52	13:37	13:57	13:24	13:15	-	-	-	-
Measured Depth to NAPL (feet below TOC)	7.77	6.80	7.13	-	-	-	Sheen present	-	-	-	-
Measured Depth to Water (feet below TOC)	7.78	6.85	7.41	-	-	6.06	6.36	-	-	-	-
Product Thickness (feet)	0.01	0.05	0.28	-	-	-	-	-	-	-	-
Water Level Elevation (feet)	13.60	13.27	12.83**	Dry Well**	Frozen	13.97	13.45	-	-	-	-
4/13/2015											
Time Water Level Measured	14:24	14:39	14:47	14:08	14:32	14:16	14:03	-	-	-	-
Measured Depth to NAPL (feet below TOC)	Sheen present	6.35	Sheen present	-	6.51	-	-	-	-	-	-
Measured Depth to Water (feet below TOC)	7.03	6.36	3.34	-	6.52	4.87	6.18	-	-	-	-
Product Thickness (feet)	-	0.01	-	-	0.01	-	-	-	-	-	-
Water Level Elevation (feet)	14.35	13.76	16.65	Dry Well**	13.95	15.16	13.63	-	-	-	-

Notes:

Field Personnel: Katie Nolan
All other notes found on page 4.

Table 5-1
Groundwater Elevation Data

2015 Annual Groundwater Monitoring Summary Report
Flint Hills Resources Alaska, LLC
Port of Anchorage Terminal

	Observation Well Number							Product Recovery Sump Number			
	OW1	**OW2t**	**OW3**	**OW4**	**OW5t**	**OW6**	**OW7**	**RS1**	**RS2**	**RS3**	**RS4**
4/23/2015											
Time Water Level Measured	11:28	-	11:15	11:06	-	-	11:01	-	-	-	-
Measured Depth to NAPL (feet below TOC)	-	-	-	-	-	-	-	-	-	-	-
Measured Depth to Water (feet below TOC)	6.10	-	3.31	8.47	-	-	4.34	-	-	-	-
Product Thickness (feet)	-	-	-	-	-	-	-	-	-	-	-
Water Level Elevation (feet)	15.28	-	16.68	13.96**	-	-	15.47	-	-	-	-
5/4/2015											
Time Water Level Measured	15:03	15:30	15:16	14:54	15:40	14:46	14:35	-	-	-	-
Measured Depth to NAPL (feet below TOC)	Sheen present	Sheen present	Sheen present	-	6.41	-	-	-	-	-	-
Measured Depth to Water (feet below TOC)	6.04	6.20	3.46	7.98	6.44	3.59	3.52	-	-	-	-
Product Thickness (feet)	-	-	-	-	0.03	-	-	-	-	-	-
Water Level Elevation (feet)	15.34	13.92	16.53	14.45	14.03	16.44	16.29	-	-	-	-
5/22/2015											
Time Water Level Measured	12:00	12:18	12:11	11:39	12:24	11:52	11:46	-	-	-	-
Measured Depth to NAPL (feet below TOC)	Sheen present	6.42	Sheen present	-	6.41	-	-	-	-	-	-
Measured Depth to Water (feet below TOC)	6.07	6.43	3.53	8.06	6.43	3.93	3.74	-	-	-	-
Product Thickness (feet)	-	0.01	-	-	0.02	-	-	-	-	-	-
Water Level Elevation (feet)	15.31	13.69	16.46	14.37	14.04	16.10	16.07	-	-	-	-
5/26/2015											
Time Water Level Measured	11:49	11:54	12:00	12:04	12:07	12:11	12:14	-	-	-	-
Measured Depth to NAPL (feet below TOC)	Sheen present	Sheen present	Sheen present	-	6.41	Sheen present	Sheen present	-	-	-	-
Measured Depth to Water (feet below TOC)	5.91	6.23	3.41	7.88	6.43	3.82	3.78	-	-	-	-
Product Thickness (feet)	-	-	-	-	0.02	-	-	-	-	-	-
Water Level Elevation (feet)	15.47	13.89	16.58	14.55	14.04	16.21	16.03	-	-	-	-
7/10/2015											
Time Water Level Measured	11:35	11:51	11:45	11:13	11:59	11:27	11:19	-	-	-	-
Measured Depth to NAPL (feet below TOC)	Sheen present	Heavy Sheen	3.74	-	6.42	-	-	-	-	-	-
Measured Depth to Water (feet below TOC)	6.11	5.67	3.97	8.14	6.44	4.37	4.25	-	-	-	-
Product Thickness (feet)	-	-	0.23	-	0.02	-	-	-	-	-	-
Water Level Elevation (feet)	15.27	14.45	16.22*	14.29**	14.03	15.66	15.56	-	-	-	-
8/11/2015											
Time Water Level Measured	12:41	12:47	12:56	11:26	12:51	11:14	11:21	-	-	-	-
Measured Depth to NAPL (feet below TOC)	Sheen present	Sheen present	Heavy Sheen	-	Sheen present	-	-	-	-	-	-
Measured Depth to Water (feet below TOC)	4.91	5.51	2.85	5.97	3.93	3.11	3.07	-	-	-	-
Product Thickness (feet)	-	-	-	-	-	-	-	-	-	-	-
Water Level Elevation (feet)	16.47	14.61	17.14	16.46	16.54	16.92	16.74	-	-	-	-

Notes:

Field Personnel: Katie Nolan and Laura Coulson
All other notes found on page 4.

Table 5-1
Groundwater Elevation Data

2015 Annual Groundwater Monitoring Summary Report
Flint Hills Resources Alaska, LLC
Port of Anchorage Terminal

	Observation Well Number							Product Recovery Sump Number			
	OW1	**OW2t**	**OW3**	**OW4**	**OW5t**	**OW6**	**OW7**	**RS1**	**RS2**	**RS3**	**RS4**
10/1/2015											
Time Water Level Measured	14:43	15:03	15:01	14:38	15:12	14:29	14:20	-	-	-	-
Measured Depth to NAPL (feet below TOC)	Heavy Sheen	Heavy Sheen	Heavy Sheen	-	Sheen present	-	-	-	-	-	-
Measured Depth to Water (feet below TOC)	3.05	1.97	1.73	4.35	2.17	1.63	1.25	-	-	-	-
Product Thickness (feet)	-	-	-	-	-	-	-	-	-	-	-
Water Level Elevation (feet)	18.33	18.15	18.26	18.08	18.30	18.40	18.56	-	-	-	-
11/3/2015											
Time Water Level Measured	16:07	16:18	16:41	15:54	16:23	15:45	15:40	-	-	-	-
Measured Depth to NAPL (feet below TOC)	Heavy Sheen	Heavy Sheen	Heavy Sheen	-	Sheen present	-	-	-	-	-	-
Measured Depth to Water (feet below TOC)	3.45	2.13	1.88	4.39	2.37	1.90	1.79	-	-	-	-
Product Thickness (feet)	-	-	-	-	-	-	-	-	-	-	-
Water Level Elevation (feet)	17.93	17.99	18.11	18.04	18.10	18.13	18.02	-	-	-	-
12/4/2015											
Time Water Level Measured	11:56	11:46	12:09	11:24	11:34	11:10	11:00	-	-	-	-
Measured Depth to NAPL (feet below TOC)	Sheen present	2.47	Heavy Sheen	-	2.78	-	-	-	-	-	-
Measured Depth to Water (feet below TOC)	3.84	2.48	2.40	4.78	2.79	2.40	2.41	-	-	-	-
Product Thickness (feet)	-	0.01	-	-	0.01	-	-	-	-	-	-
Water Level Elevation (feet)	17.54	17.64	17.59	17.65	17.68	17.63	17.40	-	-	-	-

Notes:
Survey conducted by SurvBase, LLC on October 27 through October 29, 2014. Basis of vertical control is GAAB 72 Adjustment, benchmark "B 75".
Field Personnel: Katie Nolan

*	=	water level elevation corrected for product thickness when greater than 0.05 foot; specific gravity of jet fuel is assumed to be 0.88
**	=	water level is below well screen therefore water level elevation is unknown
^	=	screen length is measured from the bottom of the end cap to the top of the first 0.030 slot (see typical observation well construction log for details)
-	=	not applicable or not measured
TOC	=	Top of casing
NAPL	=	Non-aqueous phase liquid

Table 5-2
LNAPL Thickness Data

2015 Annual Groundwater Monitoring Summary Report
Flint Hills Resources Alaska, LLC
Port of Anchorage Terminal

Well ID	DATE	Depth to LNAPL (ft. btoc)	Depth to Groundwater (ft. btoc)	LNAPL Thickness (ft.)
OW1	10/22/14	SHEEN PRESENT	5.11	0.00
OW1	10/27/14	5.38	5.40	0.02
OW1	11/4/14	5.56	5.58	0.02
OW1	11/10/14	5.72	5.76	0.04
OW1	11/24/14	5.94	5.99	0.05
OW1	12/4/14	6.19	6.24	0.05
OW1	12/11/14	6.19	6.25	0.06
OW1	1/2/15	6.81	6.84	0.03
OW1	1/22/15	7.18	7.20	0.02
OW1	2/17/15	7.90	7.93	0.03
OW1	3/12/15	7.77	7.78	0.01
OW1	4/13/15	SHEEN PRESENT	7.73	0.00
OW1	4/23/15	--	6.10	0.00
OW1	5/4/15	SHEEN PRESENT	6.04	0.00
OW1	5/22/15	SHEEN PRESENT	6.07	0.00
OW1	5/26/15	SHEEN PRESENT	5.91	0.00
OW1	7/10/15	SHEEN PRESENT	6.11	0.00
OW1	8/11/15	SHEEN PRESENT	4.91	0.00
OW1	10/1/15	HEAVY SHEEN	3.05	0.00
OW1	11/3/15	HEAVY SHEEN	3.45	0.00
OW1	12/4/15	SHEEN PRESENT	3.84	0.00
OW2t	10/22/14	SHEEN PRESENT	4.28	0.00
OW2t	10/27/14	5.57	5.58	0.01
OW2t	11/4/14	6.35	6.37	0.02
OW2t	11/10/14	6.31	6.35	0.04
OW2t	11/24/14	6.31	6.32	0.01
OW2t	12/4/14	6.27	6.30	0.03
OW2t	12/11/14	5.78	5.82	0.04
OW2t	1/2/15	6.51	6.54	0.03
OW2t	1/22/15	6.61	6.64	0.03
OW2t	2/17/15	6.85	6.93	0.08
OW2t	3/12/15	6.80	6.85	0.05
OW2t	4/13/15	6.35	6.36	0.01
OW2t	5/4/15	SHEEN PRESENT	6.20	0.00
OW2t	5/22/15	6.42	6.43	0.01
OW2t	5/26/15	SHEEN PRESENT	6.23	0.00
OW2t	7/10/15	HEAVY SHEEN	5.67	0.00
OW2t	8/11/15	SHEEN PRESENT	5.51	0.00
OW2t	10/1/15	HEAVY SHEEN	1.97	0.00
OW2t	11/3/15	HEAVY SHEEN	2.13	0.00
OW2t	12/4/15	2.47	2.48	0.01
OW3	10/22/14	SHEEN PRESENT	2.56	0.00
OW3	10/27/14	2.73	2.84	0.11
OW3	11/4/14	2.98	3.30	0.32
OW3	11/10/14	3.19	3.58	0.39
OW3	11/24/14	3.45	3.89	0.44
OW3	12/4/14	3.79	4.29	0.50
OW3	12/11/14	3.96	4.51	0.55
OW3	1/2/15	4.72	5.37	0.65
OW3	1/22/15	5.14	5.75	0.61

Table 5-2
LNAPL Thickness Data

2015 Annual Groundwater Monitoring Summary Report
Flint Hills Resources Alaska, LLC
Port of Anchorage Terminal

Well ID	DATE	Depth to LNAPL (ft. btoc)	Depth to Groundwater (ft. btoc)	LNAPL Thickness (ft.)
OW3	2/17/15	6.92	7.25	0.33
OW3	3/12/15	7.13	7.41	0.28
OW3	4/13/15	SHEEN PRESENT	3.34	0.00
OW3	4/23/15	--	3.31	0.00
OW3	5/4/15	SHEEN PRESENT	3.46	0.00
OW3	5/22/15	SHEEN PRESENT	3.53	0.00
OW3	5/26/15	SHEEN PRESENT	4.41	0.00
OW3	7/10/15	3.74	3.97	0.23
OW3	8/11/15	HEAVY SHEEN	2.85	0.00
OW3	10/1/15	HEAVY SHEEN	1.73	0.00
OW3	11/3/15	HEAVY SHEEN	1.88	0.00
OW3	12/4/15	HEAVY SHEEN	2.40	0.00
OW5t	10/22/14	4.39	4.41	0.02
OW5t	10/27/14	3.92	3.96	0.04
OW5t	11/4/14	6.42	6.49	0.07
OW5t	11/10/14	6.43	6.51	0.08
OW5t	11/24/14	6.54	6.61	0.07
OW5t	12/4/14	6.59	6.71	0.12
OW5t	12/11/14	6.62	6.72	0.1
OW5t	1/2/15	6.63	6.76	0.13
OW5t	1/22/15	6.81	6.96	0.15
OW5t	2/17/15	7.09	7.15	0.06
OW5t	3/12/15	--	FROZEN	--
OW5t	4/13/15	6.51	6.52	0.01
OW5t	5/4/15	6.41	6.44	0.03
OW5t	5/22/15	6.41	6.43	0.02
OW5t	5/26/15	6.41	6.43	0.02
OW5t	7/10/15	6.42	6.44	0.02
OW5t	8/11/15	SHEEN PRESENT	3.93	0
OW5t	10/1/15	SHEEN PRESENT	2.17	0
OW5t	11/3/15	SHEEN PRESENT	2.37	0
OW5t	12/4/15	2.78	2.79	0.01

Notes:

ft	feet
BTOC	below top of casing
LNAPL	light non-aqueous-phase liquid
--	not available

Table 5-3
Second Quarter Field Parameter Data

2015 Annual Groundwater Monitoring Summary Report
Flint Hills Resources Alaska, LLC
Port of Anchorage Terminal

Sample Date	Location	Sample	Analysis	Depth to Water (ft) Groundwater Elevation Check 5/26/2015	Depth to Water (ft.) Prior to Sampling	Temperature (°C)	DO (mg/L)	Conductivity (µS/cm)	pH
5/27/2015	MW-1	MW-1	B, D, G, R	9.76	9.76	6.80	5.78	515	6.79
5/28/2015	MW-201	MW-201	B, D, G, R	7.84	7.84	7.62	4.76	502	6.39
5/28/2015	MW-202	MW-202	B, D, G, R	2.88	2.88	8.56	1.56	1,496	7.79
5/28/2015	MW-402	MW-402	B, D, G, R	2.88	2.88	8.56	1.56	1,496	7.79
5/29/2015	MW-203	MW-203	B, D, G, R	3.52	3.52	6.18	0.76	391	6.57
5/27/2015	MW-204	MW-204	B, D, G, R	3.37	3.37	8.16	3.91	375	7.49
5/26/2015	MW-205	MW-205	B, D, G, R	7.63	7.63	5.14	1.20	708	7.37
5/26/2015	MW-305	MW-305	B, D, G, R	7.63	7.63	5.14	1.20	708	7.37
5/26/2015	MW-206	MW-206	B, D, G, R	3.71	3.71	6.59	1.64	720	7.53
5/28/2015	MW-207	MW-207	B, D, G, R	3.46	3.46	11.2	1.53	2,625	8.65
5/27/2015	MW-4	MW-4	B, D, G, R	5.19	5.19	5.46	1.15	1,046	6.40
5/28/2015	MW-5	MW-5	B, D, G, R	4.56	4.56	10.8	1.44	285	6.25
5/26/2015	MW-9	MW-9	B, D, G, R	7.78	7.78	6.14	1.66	1,370	6.44
5/27/2015	B31MW-R	B31MW-R	B, D, G, R	6.81	6.81	8.97	1.23	550	6.85
5/27/2015	B34MW	B34MW	B, D, G, R	9.31	9.31	7.86	6.82	268	7.05
5/27/2015	B35MW	B35MW	B, D, G, R	8.89	8.89	5.18	2.07	397	6.24
5/27/2015	B36MW	B36MW	B, D, G, R	9.21	9.21	6.29	3.96	491	6.94
5/29/2015	OW-6	OW-6	B, D, G, R	3.82	3.94	6.85	5.04	951	6.82
5/29/2015	OW-7	OW-7	B, D, G, R	3.78	3.84	5.16	6.58	704	6.64

Notes on page 2.

Table 5-3
Second Quarter Field Parameter Data

2015 Annual Groundwater Monitoring Summary Report
Flint Hills Resources Alaska, LLC
Port of Anchorage Terminal

Sample Date	Location	Sample	ORP (mV)	Turbidity (NTU)	Water Clarity	Sample Collection Notes	Additional Notes
5/27/2015	MW-1	MW-1	49.7	0.0	CLEAR	Parameters stabilized	
5/28/2015	MW-201	MW-201	57.1	326	CLOUDY	> 3 well volumes purged	Slight hydrocarbon odor
5/28/2015	MW-202	MW-202	13.3	8.15	CLEAR	Parameters stabilized	
5/28/2015	MW-402	MW-402	13.3	8.15	CLEAR	Parameters stabilized	
5/29/2015	MW-203	MW-203	-10.1	2.65	CLEAR	Parameters stabilized	Slight hydrocarbon odor
5/27/2015	MW-204	MW-204	73.5	43.7	CLOUDY	Parameters stabilized	
5/26/2015	MW-205	MW-205	-38.2	3.95	CLEAR	Parameters stabilized	Hydrocarbon odor
5/26/2015	MW-305	MW-305	-38.2	3.95	CLEAR	Parameters stabilized	Hydrocarbon odor
5/26/2015	MW-206	MW-206	-28.3	4.46	CLEAR	Parameters stabilized	Hydrocarbon odor
5/28/2015	MW-207	MW-207	-42.7	38.8	CLEAR TO REDDISH	Parameters stabilized	Slight hydrocarbon odor
5/27/2015	MW-4	MW-4	3.4	2.15	CLEAR	Parameters stabilized	Hydrocarbon odor
5/28/2015	MW-5	MW-5	-67.7	114	BROWN	Well purged dry, allowed to recover to 80% DTW then sampled	Hydrocarbon/Sulfur odor
5/26/2015	MW-9	MW-9	-45.4	46.7	TURBID	> 3 well volumes purged	
5/27/2015	B31MW-R	B31MW-R	-42.9	1.57	CLEAR	Parameters stabilized	Slight hydrocarbon odor
5/27/2015	B34MW	B34MW	77.8	81.2	CLEAR TO BROWN	Parameters stabilized	Slight hydrocarbon odor
5/27/2015	B35MW	B35MW	71.0	10.5	CLEAR	Parameters stabilized	
5/27/2015	B36MW	B36MW	90.4	77.1	CLEAR	Parameters stabilized	
5/29/2015	OW-6	OW-6	14.8	9.42	CLEAR, YELLOW TINGE	Parameters stabilized	Hydrocarbon odor
5/29/2015	OW-7	OW-7	72.1	7.47	CLEAR TO YELLOW	Parameters stabilized	Hydrocarbon odor

Notes:

DO	dissolved oxygen
°C	degrees Celsius
ft	feet
BTOC	below top of casing
ORP	oxidation-reduction potential
NTU	nephelometric turbidity units
LNAPL	light non-aqueous-phase liquid
µS/cm	microsiemens per centimeter
mV	millivolts
B	benzene, toluene, ethylbenzene, and xylenes (BTEX)
D	diesel range organics
G	gasoline range organics
R	residual range organics

Table 5-4
Third Quarter Field Parameter Data

2015 Annual Groundwater Monitoring Summary Report
Flint Hills Resources Alaska, LLC
Port of Anchorage Terminal

Sample Date	Location	Sample	Analysis	Depth to Water (ft) Groundwater Elevation Check 8/11/2015	Depth to Water (ft.) Prior to Sampling	Temperature (°C)	DO (mg/L)	Conductivity (µS/cm)	pH
8/13/2015	MW-1	MW-1	B, D, G, R	9.82	9.84	10.60	6.86	405	6.66
8/12/2015	MW-201	MW-201	B, D, G, R	7.06	7.19	16.8	0.41	503	6.09
8/12/2015	MW-202	MW-202	B, D, G, R	2.34	2.54	20.2	1.7	1,521	6.8
8/12/2015	MW-203	MW-203	B, D, G, R	2.52	2.65	17.5	0.58	272	6.39
8/12/2015	MW-204	MW-204	B, D, G, R	2.38	2.44	20.1	4.24	363	7.13
8/14/2015	MW-205	MW-205	B, D, G, R	6.84	6.99	19.1	0.20	470	6.51
8/14/2015	MW-206	MW-206/MW-306	B, D, G, R	3.19	3.35	17.4	1.11	571	6.33
8/12/2015	MW-207	MW-207/MW-307	B, D, G, R	3.05	3.17	20.4	4.90	2963	6.51
8/13/2015	MW-4	MW-4	B, D, G, R	4.68	4.98	14.8	1.07	819	6.32
8/13/2015	MW-5	MW-5	B, D, G, R	4.25	4.41	18.1	1.02	195	6.09
8/13/2015	MW-9	MW-9	B, D, G, R	7.04	7.19	14	0.57	1,682	7.16
8/12/2015	B31MW-R	B31MW-R	B, D, G, R	5.75	5.85	17.2	2.00	405	6.50
8/11/2015	B34MW	B34MW	B, D, G, R	8.05	8.05	17.1	6.24	221	6.19
8/11/2015	B35MW	B35MW	B, D, G, R	8.01	8.01	14.7	2.60	372	6.41
8/11/2015	B36MW	B36MW	B, D, G, R	8.64	8.64	14.7	4.26	350	6.40
8/13/2015	OW-1	OW-1	B, D, G, R	4.91	5.29	19.1	0.31	859	6.66
8/13/2015	OW-4	OW-4	B, D, G, R	5.97	7.41	13.7	1.41	834	6.24
8/13/2015	OW-6	OW-6	B, D, G, R	3.11	3.44	16.5	0.76	895	6.16
8/13/2015	OW-7	OW-7	B, D, G, R	3.07	3.18	14	0.54	728	6.39

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Table 5-4
Third Quarter Field Parameter Data

2015 Annual Groundwater Monitoring Summary Report
Flint Hills Resources Alaska, LLC
Port of Anchorage Terminal

Sample Date	Location	Sample	ORP (mV)	Turbidity (NTU)	Water Clarity	Sample Collection Notes	Additional Notes
8/13/2015	MW-1	MW-1	75.7	2.7	CLEAR	Parameters stabilized	
8/12/2015	MW-201	MW-201	20.3	10	CLEAR	Parameters stabilized	
8/12/2015	MW-202	MW-202	-34	19	CLEAR	Parameters stabilized	
8/12/2015	MW-203	MW-203	-33.2	14.6	CLEAR	Parameters stabilized	
8/12/2015	MW-204	MW-204	31.2	16.40	CLEAR	Parameters stabilized	
8/14/2015	MW-205	MW-205	-38.6	5.1	CLEAR	Parameters stabilized	
8/14/2015	MW-206	MW-206/MW-306	-31.0	5.00	CLEAR, YELLOW TINGE & SHEEN IN PURGE WATER	Parameters stabilized	Hydrocarbon odor; bubbles and frothing at sample collection
8/12/2015	MW-207	MW-207/MW-307	-28.4	2.20	CLEAR	Parameters stabilized	Hydrocarbon odor
8/13/2015	MW-4	MW-4	13.7	2.46	CLEAR	Parameters stabilized	Sulfur odor
8/13/2015	MW-5	MW-5	12.5	93.5	CLOUDY, TURBID	Parameters stabilized	Hydrocarbon odor
8/13/2015	MW-9	MW-9	-59.7	17.00	CLEAR	Parameters stabilized	
8/12/2015	B31MW-R	B31MW-R	-8.9	3	CLEAR	Parameters stabilized	Slight hydrocarbon odor
8/11/2015	B34MW	B34MW	106.0	23.5	CLEAR TO TURBID	Parameters stabilized	Turbidity increased at sample collection due to pump controller failure
8/11/2015	B35MW	B35MW	147.0	7.77	CLEAR	Parameters stabilized	
8/11/2015	B36MW	B36MW	163.4	8.1	CLEAR	Parameters stabilized	
8/13/2015	OW-1	OW-1	-70.4	29.9	CLEAR, SHEEN IN PURGE WATER	Parameters stabilized	Hydrocarbon odor; well not developed
8/13/2015	OW-4	OW-4	18	2.68	CLEAR, YELLOW TINGE IN PURGE WATER	Parameters stabilized	Hydrocarbon odor; well not developed
8/13/2015	OW-6	OW-6	63.3	0.48	CLEAR, YELLOW TINGE IN PURGE WATER	Parameters stabilized	Hydrocarbon odor
8/13/2015	OW-7	OW-7	-24	2.14	CLEAR, SHEEN IN PURGE WATER	Parameters stabilized	

Notes:

DO	dissolved oxygen
°C	degrees Celsius
ft	feet
BTOC	below top of casing
ORP	oxidation-reduction potential
NTU	nephelometric turbidity units
LNAPL	light non-aqueous-phase liquid
µS/cm	microsiemens per centimeter
mV	millivolts
B	benzene, toluene, ethylbenzene, and xylenes (BTEX)
D	diesel range organics
G	gasoline range organics
R	residual range organics

Table 5-5
Fourth Quarter Field Parameter Data

2015 Annual Groundwater Monitoring Summary Report
Flint Hills Resources Alaska, LLC
Port of Anchorage Terminal

Sample Date	Location	Sample^	Analysis	Depth to Water (ft BTOC) Groundwater Elevation Check 11/9/2015	Temperature (°C)	DO (mg/L)	Conductivity (µS/cm)	pH
11/11/2015	MW-1	MW1	B, D, G, R	9.74	4.09	6.54	398	6.69
11/11/2015	MW-201	MW201	B, D, G, R	5.97	2.93	6.33	326	7.17
11/12/2015	MW-202	MW202	B, D, G, R	1.56	3.35	1.07	1,078	6.95
11/11/2015	MW-203	MW203	B, D, G, R	1.54	3.80	0.55	232	6.74
11/11/2015	MW-204	MW204	B, D, G, R	1.25	4.12	2.14	253	7.23
11/13/2015	MW-205	MW205	B, D, G, R	6.63	6.42	0.29	394	6.52
11/13/2015	MW-206	MW206	B, D, G, R	3.00	5.60	0.32	665	6.42
11/12/2015	MW-207	MW207	B, D, G, R	2.18	5.40	1.06	1956	6.40
11/13/2015	MW-4	MW4/MW400	B, D, G, R	3.99	5.06	0.39	636	6.49
11/13/2015	MW-5	MW5/MW500	B, D, G, R	3.32	7.38	0.41	287	5.85
11/11/2015	MW-9	MW9	B, D, G, R	6.62	4.70	0.51	1,548	6.90
11/12/2015	B31MW-R	B31MW-R	B, D, G, R	4.55	4.83	0.41	328	6.65
11/10/2015	B34MW	B34MW	B, D, G, R	6.58	4.09	7.48	99	6.88
11/10/2015	B35MW	B35MW	B, D, G, R	6.14	3.94	5.67	277	7.09
11/12/2015	B36MW	B36MW	B, D, G, R	6.33	4.21	6.35	272	6.92
11/13/2015	OW-4	OW4	B, D, G, R	4.42	5.35	0.57	630	6.52
11/12/2015	OW-6	OW6	B, D, G, R	1.95	4.63	0.31	909	6.71
11/12/2015	OW-7	OW7	B, D, G, R	1.96	4.13	0.38	948	6.45

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Table 5-5
Fourth Quarter Field Parameter Data

2015 Annual Groundwater Monitoring Summary Report
Flint Hills Resources Alaska, LLC
Port of Anchorage Terminal

Sample Date	Location	Sample^	Turbidity (NTU)	Water Clarity	Sample Collection Notes	Additional Notes
11/11/2015	MW-1	MW1	0.1	CLEAR	Parameters stabilized	
11/11/2015	MW-201	MW201	120.0	LIGHT BROWN	One well volume purged; allowed to recover to 80% pre-purge volume then sampled	
11/12/2015	MW-202	MW202	6.9	CLEAR	Parameters stabilized	
11/11/2015	MW-203	MW203	220.0	CLEAR	Parameters stabilized	
11/11/2015	MW-204	MW204	155.8	LIGHT BROWN	One well volume purged and 1 hour expended; allowed to recover to 80% pre-purge volume then sampled	
11/13/2015	MW-205	MW205	3.5	CLEAR	Parameters stabilized	Hydrocarbon odor
11/13/2015	MW-206	MW206	5.0	CLEAR	Parameters stabilized	Hydrocarbon odor
11/12/2015	MW-207	MW207	1.5	CLEAR	Parameters stabilized	Hydrocarbon odor
11/13/2015	MW-4	MW4/MW400	0.9	CLEAR	Parameters stabilized	Sulfur/hydrocarbon odor
11/13/2015	MW-5	MW5/MW500	5.3	CLEAR	Parameters stabilized; allowed to recover to 80% pre-purge volume then sampled	Hydrocarbon odor
11/11/2015	MW-9	MW9	1.0	CLEAR	Parameters stabilized	
11/12/2015	B31MW-R	B31MW-R	0.4	CLEAR	Parameters stabilized	Hydrocarbon odor
11/10/2015	B34MW	B34MW	175.9	LIGHT BROWN	Parameters stabilized	
11/10/2015	B35MW	B35MW	2.5	CLEAR	Parameters stabilized	
11/12/2015	B36MW	B36MW	8.9	CLEAR	Parameters stabilized	
11/13/2015	OW-4	OW4	7.0	CLEAR	Parameters stabilized	Sulfur odor
11/12/2015	OW-6	OW6	2.8	CLEAR	Parameters stabilized	Hydrocarbon odor
11/12/2015	OW-7	OW7	2.7	CLEAR	Parameters stabilized	

Notes:

^	Sample ID No. preceded by "16864-018-" on the chain-of-custody form
DO	dissolved oxygen
°C	degrees Celsius
ft	feet
BTOC	below top of casing
NTU	nephelometric turbidity units
LNAPL	light non-aqueous-phase liquid
µS/cm	microsiemens per centimeter
mV	millivolts
B	benzene, toluene, ethylbenzene, and xylenes (BTEX)
D	diesel range organics
G	gasoline range organics
R	residual range organics

Table 5-6

Second Quarter Analytical Data

2015 Annual Groundwater Monitoring Summary Report

Flint Hills Resources Alaska, LLC

Port of Anchorage Terminal

Analyte	MW-1	MW-201	MW-202	MW-402	MW-203
Sample Date	5/27/2015 10:32 AM	5/28/2015 9:40 AM	5/28/2015 11:11 AM	5/28/2015 11:15 AM	5/29/2015 10:12 AM
Duplicate	--	--	--	DUP	--
Matrix	Water	Water	Water	Water	Water
Location	MW-1	MW-201	MW-202	MW-202	MW-203
Gasoline Range Organics - mg/L	<0.0500	<0.0500	<0.0500	<0.0500	0.0335J
Diesel Range Organics - mg/L	0.206J	0.432J	0.827J*	0.528J*	2.15
Residual Range Organics - mg/L	0.215J	0.362J	0.755J*	0.371J*	0.620
Oil & Grease HEM - mg/L	--	--	--	--	--
Benzene - mg/L	<0.000250	<0.000250	0.000170J	0.000160J	<0.000250
Ethylbenzene - mg/L	<0.000500	<0.000500	<0.000500	<0.000500	<0.000500
o-Xylene - mg/L	<0.000500	<0.000500	<0.000500	<0.000500	0.000600J
P & M -Xylene - mg/L	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100
Toluene - mg/L	0.000440J	<0.000500	<0.000500	<0.000500	<0.000500

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Table 5-6

Second Quarter Analytical Data

2015 Annual Groundwater Monitoring Summary Report

Flint Hills Resources Alaska, LLC

Port of Anchorage Terminal

Analyte	MW-204	MW-205	MW-305	MW-206	MW-207
Sample Date	5/27/2015 5:34 PM	5/26/2015 3:47 PM	5/26/2015 3:50 PM	5/26/2015 5:50 PM	5/28/2015 12:58 PM
Duplicate	--	--	DUP	--	--
Matrix	Water	Water	Water	Water	Water
Location	MW-204	MW-205	MW-205	MW-206	MW-207
Gasoline Range Organics - mg/L	<0.0500	1.11	1.11	7.56	0.138
Diesel Range Organics - mg/L	0.435J	7.11	5.79	5.92	1.23
Residual Range Organics - mg/L	0.537	1.10	1.11	1.19	0.387J
Oil & Grease HEM - mg/L	--	--	--	--	--
Benzene - mg/L	<0.000250	0.125	0.126	0.482	0.0342
Ethylbenzene - mg/L	<0.000500	0.0557	0.0557	0.120	0.0125
o-Xylene - mg/L	<0.000500	0.00334	0.00327	0.379	0.000750J
P & M -Xylene - mg/L	<0.00100	0.178	0.178	0.801	0.00182J
Toluene - mg/L	<0.000500	0.00437	0.00432	2.34	0.00101

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Table 5-6

Second Quarter Analytical Data

2015 Annual Groundwater Monitoring Summary Report

Flint Hills Resources Alaska, LLC

Port of Anchorage Terminal

Analyte	MW-4	MW-5	MW-9	B31MW-R	B34MW
Sample Date	5/27/2015 9:28 AM	5/28/2015 4:47 PM	5/26/2015 2:42 PM	5/27/2015 5:34 PM	5/27/2015 3:43 PM
Duplicate	--	--	--	--	--
Matrix	Water	Water	Water	Water	Water
Location	MW-4	MW-5	MW-9	B31MW-R	B34MW
Gasoline Range Organics - mg/L	<0.100B*	0.962	<0.0500	0.133	<0.0500
Diesel Range Organics - mg/L	3.84	3.36	0.751	7.55	<0.300
Residual Range Organics - mg/L	1.15	0.670	<0.250	0.942	<0.250
Oil & Grease HEM - mg/L	--	--	--	--	--
Benzene - mg/L	0.0308	0.0832	<0.000250	0.000490J	<0.000250
Ethylbenzene - mg/L	<0.000500	0.0132	<0.000500	0.00161	<0.000500
o-Xylene - mg/L	0.000330J	0.117	<0.000500	0.00102	<0.000500
P & M -Xylene - mg/L	<0.00100	0.214	<0.00100	0.00371	<0.00100
Toluene - mg/L	0.000370J	0.00634	<0.000500	<0.000500	<0.000500

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Table 5-6

Second Quarter Analytical Data

2015 Annual Groundwater Monitoring Summary Report

Flint Hills Resources Alaska, LLC

Port of Anchorage Terminal

Analyte	B35MW	B36MW	OW-6	OW-7	PS*
Sample Date	5/27/2015 3:28 PM	5/27/2015 4:42 PM	5/29/2015 12:55 PM	5/29/2015 11:18 AM	5/29/2015 1:00 PM
Duplicate	--	--	--	--	--
Matrix	Water	Water	Water	Water	Water
Location	B35MW	B36MW	OW-6	OW-7	Purge Water Sample
Gasoline Range Organics - mg/L	<0.0500	<0.0500	0.0405J	0.129	--
Diesel Range Organics - mg/L	<0.300	0.202J	1.55	5.48	--
Residual Range Organics - mg/L	0.195J	0.225J	0.851	0.856	--
Oil & Grease HEM - mg/L	--	--	--	--	<7.67B*
Benzene - mg/L	<0.000250	<0.000250	0.000230J	0.00257	0.00434
Ethylbenzene - mg/L	<0.000500	<0.000500	0.00117	0.00166	--
o-Xylene - mg/L	<0.000500	<0.000500	0.00311	0.000500J	--
P & M -Xylene - mg/L	<0.00100	<0.00100	0.00134J	0.0145	--
Toluene - mg/L	<0.000500	<0.000500	<0.000500	<0.000500	--

Notes:

DUP field duplicate
mg/L milligrams per liter
J detected above the
< Not detected; limit of detection (LOD) or limit of quantitation (LOQ; for older data) listed. Flag applied by the laboratory.
B* Result is considered estimated (no direction of bias), due to a method blank detection. Flag applied by Shannon & Wilson, Inc.
J* Result is considered estimated (no direction of bias), due to field duplicate QC failures. Flag applied by Shannon & Wilson, Inc.
-- not analyzed
* Sample PS is a purge water sample collected from the investigation derived water drum.
Gasoline, diesel and residual range organics analyzed by AK101, AK102 and AK103 methods, respectively.
Oil and Grease HEM is analyzed by EPA 1664A and BTEX is analyzed by SW8021B

Table 5-7

Third Quarter Analytical Data

2015 Annual Groundwater Monitoring Summary Report

Flint Hills Resources Alaska, LLC

Port of Anchorage Terminal

Analyte	MW-1	MW-201	MW-202	MW-203	MW-204
Sample Date	8/13/2015 11:16 AM	8/12/2015 12:56 PM	8/12/2015 11:42 AM	8/12/2015 4:31 PM	8/12/2015 2:19 PM
Duplicate	--	--	--	--	--
Matrix	Water	Water	Water	Water	Water
Location	MW-1	MW-201	MW-202	MW-203	MW-204
Gasoline Range Organics - mg/L	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Diesel Range Organics - mg/L	<0.288	<0.278	1.16	1.51	0.176J
Residual Range Organics - mg/L	<0.240	<0.232	0.358J	0.237J	<0.240
Oil & Grease HEM - mg/L					
Benzene - mg/L	<0.000250	<0.000250	<0.000250	<0.000250	<0.000250
Ethylbenzene - mg/L	<0.000500	<0.000500	<0.000500	<0.000500	<0.000500
o-Xylene - mg/L	<0.000500	<0.000500	<0.000500	<0.000500	<0.000500
P & M -Xylene - mg/L	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100
Toluene - mg/L	<0.000500	<0.000500	<0.000500	<0.000500	<0.000500

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Table 5-7

Third Quarter Analytical Data

2015 Annual Groundwater Monitoring Summary Report

Flint Hills Resources Alaska, LLC

Port of Anchorage Terminal

Analyte	MW-205	MW-206	MW-306	MW-207	MW-307
Sample Date	8/14/2015 10:57 AM	8/14/2015 10:26 AM	8/14/2015 10:36 AM	8/12/2015 5:27 PM	8/12/2015 5:37 PM
Duplicate	--	--	DUP	--	DUP
Matrix	Water	Water	Water	Water	Water
Location	MW-205	MW-206	MW-206	MW-207	MW-207
Gasoline Range Organics - mg/L	0.821	36.8	37.5	0.146	0.144
Diesel Range Organics - mg/L	5.12	9.48	11.5	1.47	1.40
Residual Range Organics - mg/L	0.633	1.63	1.75	0.358J	0.341J
Oil & Grease HEM - mg/L	--	--	--	--	--
Benzene - mg/L	0.123	1.14	1.18	0.0498	0.0482
Ethylbenzene - mg/L	0.0531	0.203	0.210	0.0153	0.0147
o-Xylene - mg/L	0.00464	2.79	2.89	0.000500J	0.000520J
P & M -Xylene - mg/L	0.147	3.43	3.56	0.00220	0.00231
Toluene - mg/L	0.00277	13.4	13.7	0.000850J	0.000860J

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Table 5-7

Third Quarter Analytical Data

2015 Annual Groundwater Monitoring Summary Report

Flint Hills Resources Alaska, LLC

Port of Anchorage Terminal

Analyte	B31MW-R	B34MW	B35MW	B36MW	MW-4
Sample Date	8/12/2015 3:49 PM	8/11/2015 2:35 PM	8/11/2015 3:49 PM	8/11/2015 4:47 PM	8/13/2015 4:20 PM
Duplicate	--	--	--	--	--
Matrix	Water	Water	Water	Water	Water
Location	B31MW-R	B34MW	B35MW	B36MW	MW-4
Gasoline Range Organics - mg/L	0.112	<0.0500	<0.0500	<0.0500	0.320
Diesel Range Organics - mg/L	8.52	<0.300	<0.288	3.29	4.95
Residual Range Organics - mg/L	0.938	<0.250	<0.240	0.577	1.16
Oil & Grease HEM - mg/L	--	--	--	--	--
Benzene - mg/L	0.000670	<0.000250	<0.000250	<0.000250	0.185
Ethylbenzene - mg/L	0.000570J	<0.000500	<0.000500	<0.000500	0.000320J
o-Xylene - mg/L	0.000870J	<0.000500	<0.000500	<0.000500	0.000350J
P & M -Xylene - mg/L	0.00194J	<0.00100	<0.00100	<0.00100	<0.00100
Toluene - mg/L	<0.000500	<0.000500	<0.000500	<0.000500	0.000380J

Notes on page 5.

Table 5-7

Third Quarter Analytical Data

2015 Annual Groundwater Monitoring Summary Report

Flint Hills Resources Alaska, LLC

Port of Anchorage Terminal

Analyte	MW-5	MW-9	OW-1	OW4G^	OW-4
Sample Date	8/13/2015 5:21 PM	8/13/2015 10:04 AM	8/13/2015 3:09 PM	7/21/2015 1:29 PM	8/13/2015 1:48 PM
Duplicate	--	--	--	--	--
Matrix	Water	Water	Water	Water	Water
Location	MW-5	MW-9	OW-1	OW-4	OW-4
Gasoline Range Organics - mg/L	0.379	<0.0500	0.472	0.109	0.121
Diesel Range Organics - mg/L	0.936	1.29	<0.278	7.49	4.40
Residual Range Organics - mg/L	0.233J	0.156J	<0.232	1.60	0.260J
Oil & Grease HEM - mg/L	--	--	--	--	--
Benzene - mg/L	0.0440	<0.000250	0.0261	0.00702	0.0190
Ethylbenzene - mg/L	0.00240	<0.000500	0.0154	0.000630J	0.00220
o-Xylene - mg/L	0.0366	<0.000500	0.122	<0.00100B*	0.00123
P & M -Xylene - mg/L	0.0641	<0.00100	0.0197	<0.00239B*	0.00468
Toluene - mg/L	0.00487	<0.000500	0.00152	<0.000500	0.00114

Notes on page 5.

Table 5-7

Third Quarter Analytical Data

2015 Annual Groundwater Monitoring Summary Report

Flint Hills Resources Alaska, LLC

Port of Anchorage Terminal

Analyte	OW-6	OW-7	PS*
Sample Date	8/13/2015 12:30 PM	8/13/2015 12:40 PM	8/14/2015 11:30 AM
Duplicate	--	--	--
Matrix	Water	Water	Water
Location	OW-6	OW-7	Purge Water Sample
Gasoline Range	<0.0500	0.558	--
Diesel Range	0.711	6.01	--
Residual Range	<0.232	0.766	--
Oil & Grease HEM -	--	--	<4.00B*
Benzene - mg/L	0.00306	0.0463	0.0245
Ethylbenzene - mg/L	<0.000500	0.0256	--
o-Xylene - mg/L	0.000880J	0.00288	--
P & M -Xylene - mg/L	0.000850J	0.106	--
Toluene - mg/L	0.000780J	0.00102	--

Notes:

-- not available
DUP field duplicate
mg/L milligrams per liter
J detected above the
< Not detected; limit of detection (LOD) or limit of quantitation (LOQ; for older data) listed. Flag applied by the laboratory.
B* Result is considered estimated (no direction of bias), due to a method blank detection. Flag applied by Shannon & Wilson.
^ Grab sample collected by bailer
* Sample PS is a purge water sample collected from the investigation derived water drum.
Gasoline, diesel and residual range organics analyzed by AK101, AK102 and AK103 methods, respectively.
Oil and Grease HEM is analyzed by EPA 1664A and BTEX is analyzed by SW8021B

Table 5-8

Fourth Quarter Analytical Data

2015 Annual Groundwater Monitoring Summary Report

Flint Hills Resources Alaska, LLC

Port of Anchorage Terminal

Analyte	MW1	MW201	MW202	MW203	MW204
Sample Date	11/11/2015 11:30 AM	11/11/2015 2:30 PM	11/12/2015 11:00 AM	11/11/2015 5:40 PM	11/11/2015 4:20 PM
Duplicate	--	--	--	--	--
Matrix	Water	Water	Water	Water	Water
Location	MW-1	MW-201	MW-202	MW-203	MW-204
Gasoline Range Organics - mg/L	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Diesel Range Organics - mg/L	<0.288	0.424J	1.43	0.813	<0.288
Residual Range Organics - mg/L	<0.240	0.623	1.29	0.631	<0.240
Oil & Grease HEM - mg/L	--	--	--	--	--
Benzene - mg/L	<0.000250	<0.000250	<0.000250	<0.000250	<0.000250
Ethylbenzene - mg/L	<0.000500	<0.000500	<0.000500	<0.000500	<0.000500
o-Xylene - mg/L	<0.000500	<0.000500	<0.000500	<0.000500	<0.000500
P & M -Xylene - mg/L	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100
Toluene - mg/L	<0.000500	<0.000500	<0.000500	<0.000500	<0.000500

Notes on page 4.

Table 5-8

Fourth Quarter Analytical Data

2015 Annual Groundwater Monitoring Summary Report

Flint Hills Resources Alaska, LLC

Port of Anchorage Terminal

Analyte	MW205	MW206	MW207	B31MW-R	B34MW
Sample Date	11/13/2015 2:20 PM	11/13/2015 3:30 PM	11/12/2015 2:20 PM	11/12/2015 1:20 PM	11/10/2015 3:55 PM
Duplicate	--	--	--	--	--
Matrix	Water	Water	Water	Water	Water
Location	MW-205	MW-206	MW-207	B31MW-R	B34MW
Gasoline Range Organics - mg/L	1.02	20.2	0.0796J	0.153	<0.0500
Diesel Range Organics - mg/L	3.01	3.14	0.982	3.85	<0.288
Residual Range Organics - mg/L	0.749	0.584	0.693	0.938	<0.240
Oil & Grease HEM - mg/L	--	--	--	--	--
Benzene - mg/L	0.119	0.218	0.0168	0.000560	0.000150J
Ethylbenzene - mg/L	0.0641	0.201	0.00402	0.00105	<0.000500
o-Xylene - mg/L	0.00384	2.31	<0.000500	0.00133	<0.000500
P & M -Xylene - mg/L	0.175	3.04	0.000700J	0.00354	<0.00100
Toluene - mg/L	0.00161	4.84	0.000310J	<0.000500	<0.000500

Notes on page 4.

Table 5-8

Fourth Quarter Analytical Data

2015 Annual Groundwater Monitoring Summary Report

Flint Hills Resources Alaska, LLC

Port of Anchorage Terminal

Analyte	B35MW	B36MW	MW4	MW400	MW5
Sample Date	11/10/2015 12:45 PM	11/12/2015 12:10 PM	11/13/2015 11:40 AM	11/13/2015 12:00 PM	11/13/2015 1:05 PM
Duplicate	--	--	--	DUP	--
Matrix	Water	Water	Water	Water	Water
Location	B35MW	B36MW	MW-4	MW-4	MW-5
Gasoline Range Organics - mg/L	<0.0500	<0.0500	0.124	0.121	2.61
Diesel Range Organics - mg/L	<0.288	0.200J	1.57	2.00	1.25J*
Residual Range Organics - mg/L	<0.240	<0.240	0.951	0.989	0.485
Oil & Grease HEM - mg/L	--	--	--	--	--
Benzene - mg/L	0.000980	<0.000250	0.0505	0.0525	0.297
Ethylbenzene - mg/L	<0.000500	<0.000500	0.000530J	0.000430J	0.0259
o-Xylene - mg/L	<0.000500	<0.000500	0.000510J	<0.000500	0.240
P & M -Xylene - mg/L	<0.00100	<0.00100	0.000820J	<0.00100	0.408
Toluene - mg/L	<0.000500	<0.000500	0.000690J*	0.000350J*	0.0919

Notes on page 4.

Table 5-8

Fourth Quarter Analytical Data

2015 Annual Groundwater Monitoring Summary Report

Flint Hills Resources Alaska, LLC

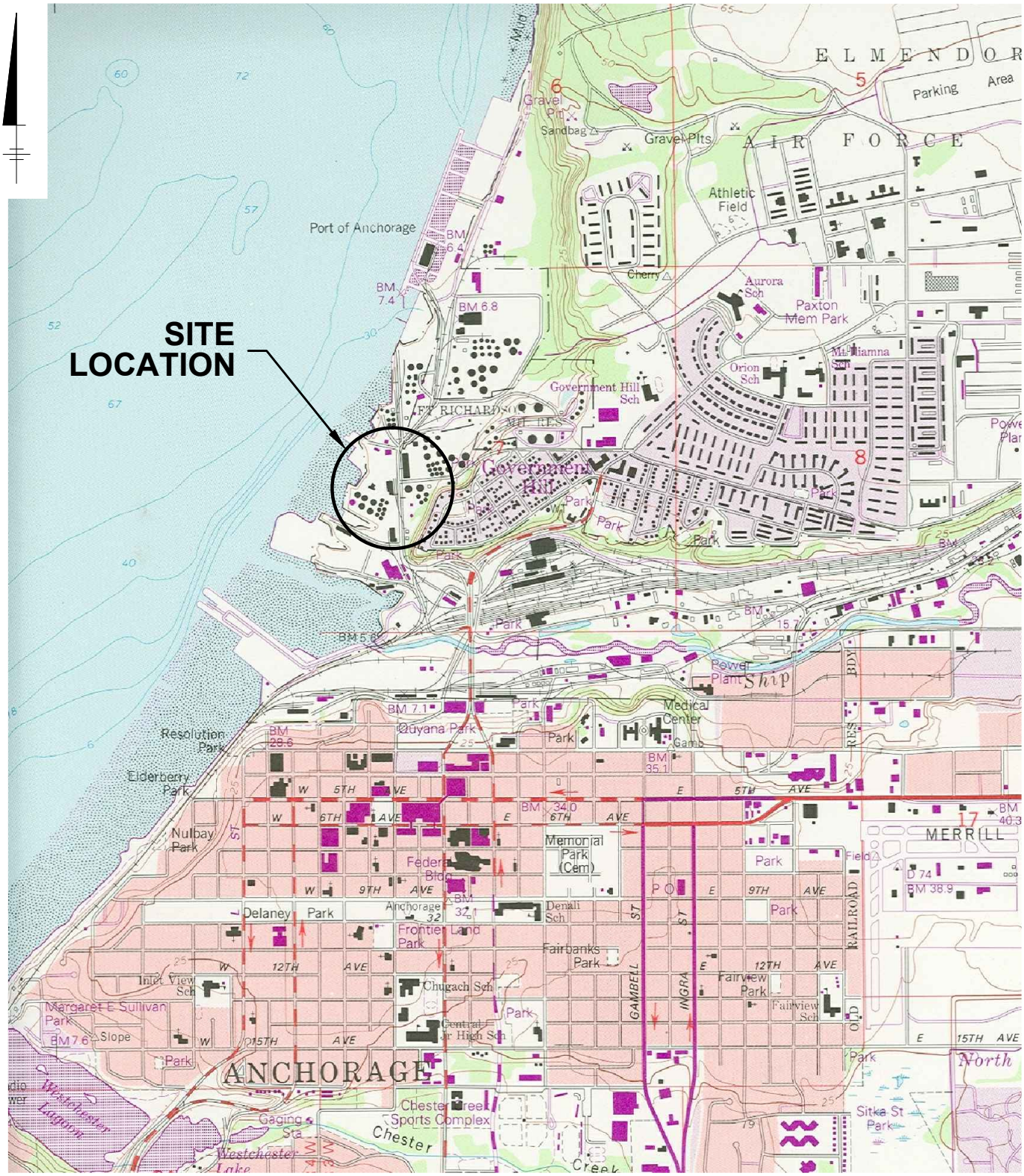
Port of Anchorage Terminal

Analyte	MW500	MW9	OW4	OW6	OW7	DRUM*
Sample Date	11/13/2015 1:25 PM	11/11/2015 12:45 PM	11/13/2015 10:10 AM	11/12/2015 5:05 PM	11/12/2015 3:45 PM	11/13/2015 4:00 PM
Duplicate	DUP	--	--	--	--	--
Matrix	Water	Water	Water	Water	Water	Water
Location	MW-5	MW-9	OW-4	OW-6	OW-7	Purge Water Sample
Gasoline Range Organics - mg/L	2.28	<0.0500	0.0570J	0.0537J	0.583	--
Diesel Range Organics - mg/L	0.801J*	1.08	2.31	1.31	2.25	--
Residual Range Organics - mg/L	<0.240	0.280J	0.476J	0.874	0.693	--
Oil & Grease HEM - mg/L	--	--	--	--	--	<4.00B*
Benzene - mg/L	0.308	<0.000250	0.00338	0.000830	0.0499	0.0913
Ethylbenzene - mg/L	0.0209	<0.000500	0.000430J	0.000570J	0.0241	--
o-Xylene - mg/L	0.255	<0.000500	<0.000500	0.000840J	0.00217	--
P & M -Xylene - mg/L	0.430	<0.00100	0.00141J	0.00175J	0.104	--
Toluene - mg/L	0.0782	<0.000500	<0.000500	<0.000500	0.000490J	--

Notes:

-- not available
DUP field duplicate
mg/L milligrams per liter
J Estimated concentration, detected above the detection limit (DL) and below the limit of quantitation (LOQ). Flag applied by the laboratory.
< Not detected; limit of detection (LOD) or limit of quantitation (LOQ; for older data) listed. Flag applied by the laboratory.
J* Result is considered estimated (no direction of bias), due to field duplicate quality control failures. Flag applied by Shannon & Wilson
B* Result is considered estimated (no direction of bias), due to a method blank detection. Flag applied by Shannon & Wilson, Inc.
^ Sample ID No. preceded by "16864-018-" on the chain-of-custody form
* Sample DRUM is a purge water sample collected from the investigation derived water drum.
Gasoline, diesel and residual range organics analyzed by AK101, AK102 and AK103 methods, respectively.
Oil and Grease HEM is analyzed by EPA 1664A and BTEX is analyzed by SW8021B

FIGURES



SOURCE: USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE: ANCHORAGE (A-8) NW, AK., 1979 (REVISED: 1994), ANCHORAGE BOROUGH, SECTION: 19, TOWNSHIP: 13N, RANGE: 3W

0 2000' 4000'

APPROXIMATE GRAPHIC SCALE

FLINT HILLS RESOURCES ALASKA, LLC
PORT OF ANCHORAGE TERMINAL

2015 ANNUAL GROUNDWATER MONITORING SUMMARY REPORT

SITE LOCATION MAP

ARCADIS Design & Consultancy for natural and built assets

FIGURE **1-1**

CITY: SAN RAFAEL, CA DIV/GROUP: ENVCAD DB: R. OBERLANDER, J. HARRIS
C:\Users\jharris\Desktop\ENVCAD\B0081986\0002\00005\2Q-4Q15 GWMR\DWG\81986N01.dwg LAYOUT: 1-1 SAVED: 12/21/2015 4:15 PM ACADVER: 19.1S (LMS TECH) PAGESETUP: SETUP1 PLOTSTYLETABLE: ARCADIS.CTB PLOTTED: 1/5/2016 12:00 PM BY: HARRIS, JESSICA
XREFS: IMAGES: ALASKA.jpg ANCHORAGE-NWN.jpg PROJECTNAME: ---

COOK INLET

B34MW
B35MW
B36MW

T-1001
T-1002
T-1003
NORTH TANK FARM

MW-4

WAREHOUSE
RAIL CAR LOADING RACK
OCEAN DOCK ROAD
OFFICE

MW-201
OW-7
MW-202
MW-207
MW-5
OW-6
RS4
OW-5
RS3
OW-4
RS2
OW-21
OW-3
RS1
OW-1

4214
4213
4319
WEST TANK FARM
4210
4212
MW-203
4211
MW-204

4235
4225
3112
4260
4261
4268
ASPHALT TANK FARM
4234
3297
4136
4135
B31MW-R
4262

ASPHALT TRUCK LOADING RACK
ASPHALT TOPPING PLANT
TRUCK LOADING RACK

SHOP
PUMPHOUSE
WAREHOUSE YARD
TRUCK LOADING RACK
WAREHOUSE
OFFICE
BLUFF ROAD

4236
4215
EAST TANK FARM
4216
MW-1
4217
MW-206
MW-205
4218
4219
3577
4220
3108
3578
3296
MW-9

LEGEND:
- ANCHORAGE TERMINAL BOUNDARIES
- MONITORING WELL LOCATION
- OBSERVATION WELL LOCATION
- RECOVERY SUMP LOCATION (SURVBASE 10/2014)

NOTES:
1. SELECT WELL LOCATIONS AND SITE FEATURES SURVEYED BY SURVBASE 2-20-2015. VERTICAL DATUM NAVD88. HORIZONTAL DATUM CONVERTED FROM PMRAIL GRS80 TO NAD83 ALASKA STATE PLANE, ZONE 4, US FOOT. ALL OTHER SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
2. IMAGERY FROM GOOGLE™ EARTH DATED 4/14/2011.

0 80' 160'
GRAPHIC SCALE

FLINT HILLS RESOURCES ALASKA, LLC
PORT OF ANCHORAGE TERMINAL
2015 ANNUAL GROUNDWATER MONITORING SUMMARY REPORT

SITE PLAN

ARCADIS Design & Consultancy for natural and built assets

FIGURE
2-1

COOK INLET

B34MW (11.27)

B35MW (12.65)

B36MW (13.07)

12.0

13.0

14.0

15.0

16.0

17.0

18.0

19.0

20.0

0.004 FT/FT

NORTH TANK FARM

WEST TANK FARM

ASPHALT TANK FARM

EAST TANK FARM

MW-201 (15.53)

OW-7 (16.03)

MW-202 (16.95)

OW-6 (16.21)

OW-3 (16.58)

OW-5t (14.04)*

OW-4 (14.55)

OW-2t (13.89)*

OW-1 (15.47)

MW-203 (14.90)

MW-204 (14.92)

B31MW-R (14.94)

MW-4 (17.66)

MW-5 (17.35)

MW-207 (16.97)

MW-205 (17.51)

MW-206 (18.23)

MW-9 (17.95)

MW-1 (20.47)

0.005 FT/FT

WAREHOUSE

RAIL CAR LOADING RACK

OFFICE

ASPHALT TRUCK LOADING RACK

ASPHALT TOPPING PLANT

TRUCK LOADING RACK

OCEAN DOCK RD

SHOP

PUMPHOUSE

WAREHOUSE YARD

TRUCK LOADING RACK

WAREHOUSE

OFFICE

BLUFF ROAD

LEGEND:

- ANCHORAGE TERMINAL BOUNDARIES
- MONITORING WELL LOCATION
- OBSERVATION WELL LOCATION
- (14.90) GROUNDWATER ELEVATION IN FEET ABOVE MEAN SEA LEVEL (FT AMSL)
- 16.0 GROUNDWATER ELEVATION CONTOUR (FT AMSL, DASHED WHERE INFERRED)
- 0.004 FT/FT GROUNDWATER FLOW DIRECTION AND GRADIENT (FOOT PER FOOT)
- * WELL IS LOCATED BETWEEN SUMPS AND DOES NOT REPRESENT GROUNDWATER ELEVATION OUTSIDE OF TRENCHES; NOT USED FOR CONTOURING

NOTES:

1. SELECT WELL LOCATIONS AND SITE FEATURES SURVEYED BY SURVBASE 2-20-2015. VERTICAL DATUM NAVD88. HORIZONTAL DATUM CONVERTED FROM PMRAIL GRS80 TO NAD83 ALASKA STATE PLANE, ZONE 4, US FOOT. ALL OTHER SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
2. IMAGERY FROM GOOGLE™ EARTH DATED 4/14/2011.
3. WELLS GAUGED MAY 26-29, 2015.

0 80' 160'
GRAPHIC SCALE

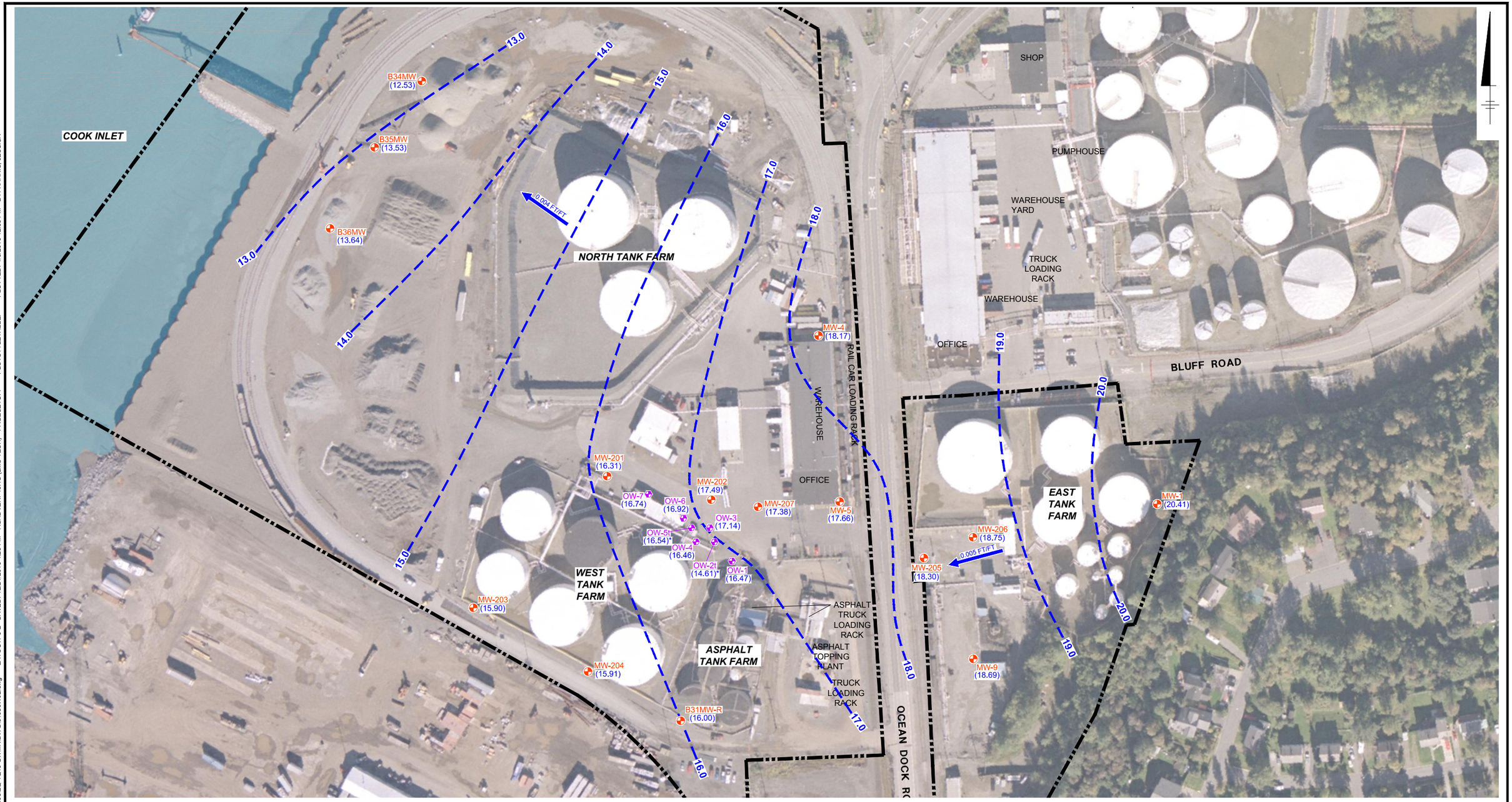
FLINT HILLS RESOURCES ALASKA, LLC
PORT OF ANCHORAGE TERMINAL

2015 ANNUAL GROUNDWATER MONITORING SUMMARY REPORT

SECOND QUARTER 2015 GROUNDWATER ELEVATION MAP

ARCADIS Design & Consultancy for natural and built assets

FIGURE 5-1



LEGEND:

- ANCHORAGE TERMINAL BOUNDARIES
- MONITORING WELL LOCATION
- OBSERVATION WELL LOCATION
- (15.91) GROUNDWATER ELEVATION IN FEET ABOVE MEAN SEA LEVEL (FT AMSL)
- 16.0 GROUNDWATER ELEVATION CONTOUR (FT AMSL, DASHED WHERE INFERRED)
- 0.004 FT/FT GROUNDWATER FLOW DIRECTION AND GRADIENT (FOOT PER FOOT)
- * WELL IS LOCATED BETWEEN SUMPS AND DOES NOT REPRESENT GROUNDWATER ELEVATION OUTSIDE OF TRENCHES; NOT USED FOR CONTOURING

NOTES:

1. SELECT WELL LOCATIONS AND SITE FEATURES SURVEYED BY SURVBASE 2-20-2015. VERTICAL DATUM NAVD88. HORIZONTAL DATUM CONVERTED FROM PMRAIL GRS80 TO NAD83 ALASKA STATE PLANE, ZONE 4, US FOOT. ALL OTHER SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
2. IMAGERY FROM GOOGLE™ EARTH DATED 4/14/2011.
3. WELLS GAUGED AUGUST 11-14, 2015.

0 80' 160'
GRAPHIC SCALE

FLINT HILLS RESOURCES ALASKA, LLC
PORT OF ANCHORAGE TERMINAL

2015 ANNUAL GROUNDWATER MONITORING SUMMARY REPORT

THIRD QUARTER 2015 GROUNDWATER ELEVATION MAP

ARCADIS Design & Consultancy for natural and built assets

FIGURE 5-2

CITY: SAN RAFAEL, CA (MINNEAPOLIS, MN) DIV/GROUP: ENV/CAD DB: R. OBERLANDER, J. HARRIS
C:\Users\jharris\Desktop\ENV\CADIB00\81986\0002\0005\2Q-4Q15 GWMR\DWG\81986W02.dwg LAYOUT: 5-2 SAVED: 12/21/2015 4:28 PM ACADVER: 19.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ---- PLOTTED: 1/5/2016 12:03 PM BY: HARRIS, JESSICA
XREFS: IMAGES: PROJECTNAME: ----
81986X01 81986X02.jpg
81986X00
2015-02-2200thra Survey

B34MW (14.00)
B35MW (15.40)
B36MW (15.95)
MW-201 (17.40)
OW-7 (18.02)
MW-202 (18.27)
OW-6 (18.13)
OW-3 (18.11)
OW-5I (18.10)*
OW-4 (18.04)
OW-2I (17.99)*
OW-1 (17.93)
MW-207 (18.25)
MW-5 (18.59)
MW-4 (18.86)
MW-203 (16.88)
MW-204 (17.04)
B31MW-R (17.20)
MW-206 (18.94)
MW-205 (18.51)
MW-9 (19.11)
MW-1 (20.49)

14.0 15.0 16.0 17.0 18.0 19.0 20.0

0.003 FT/FT
0.002 FT/FT

NORTH TANK FARM
WEST TANK FARM
ASPHALT TANK FARM
EAST TANK FARM

SHOP
PUMPHOUSE
WAREHOUSE YARD
TRUCK LOADING RACK
WAREHOUSE
OFFICE
RAIL CAR LOADING RACK
WAREHOUSE
OFFICE
ASPHALT TRUCK LOADING RACK
ASPHALT TOPPING PLANT
TRUCK LOADING RACK
BLUFF ROAD
OCEAN DOCK RD

LEGEND:

- ANCHORAGE TERMINAL BOUNDARIES
- MONITORING WELL LOCATION
- OBSERVATION WELL LOCATION
- (17.04) GROUNDWATER ELEVATION IN FEET ABOVE MEAN SEA LEVEL (FT AMSL)
- 18.0 GROUNDWATER ELEVATION CONTOUR (FT AMSL, DASHED WHERE INFERRED)
- 0.003 FT/FT GROUNDWATER FLOW DIRECTION AND GRADIENT (FOOT PER FOOT)
- * WELL IS LOCATED BETWEEN SUMPS AND DOES NOT REPRESENT GROUNDWATER ELEVATION OUTSIDE OF TRENCHES; NOT USED FOR CONTOURING

NOTES:

1. SELECT WELL LOCATIONS AND SITE FEATURES SURVEYED BY SURVBASE 2-20-2015. VERTICAL DATUM NAVD88. HORIZONTAL DATUM CONVERTED FROM PMRAIL GRS80 TO NAD83 ALASKA STATE PLANE, ZONE 4, US FOOT. ALL OTHER SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
2. IMAGERY FROM GOOGLE™ EARTH DATED 4/14/2011.
3. WELLS GAUGED NOVEMBER 3 AND NOVEMBER 10-15, 2015.

0 80' 160'
GRAPHIC SCALE

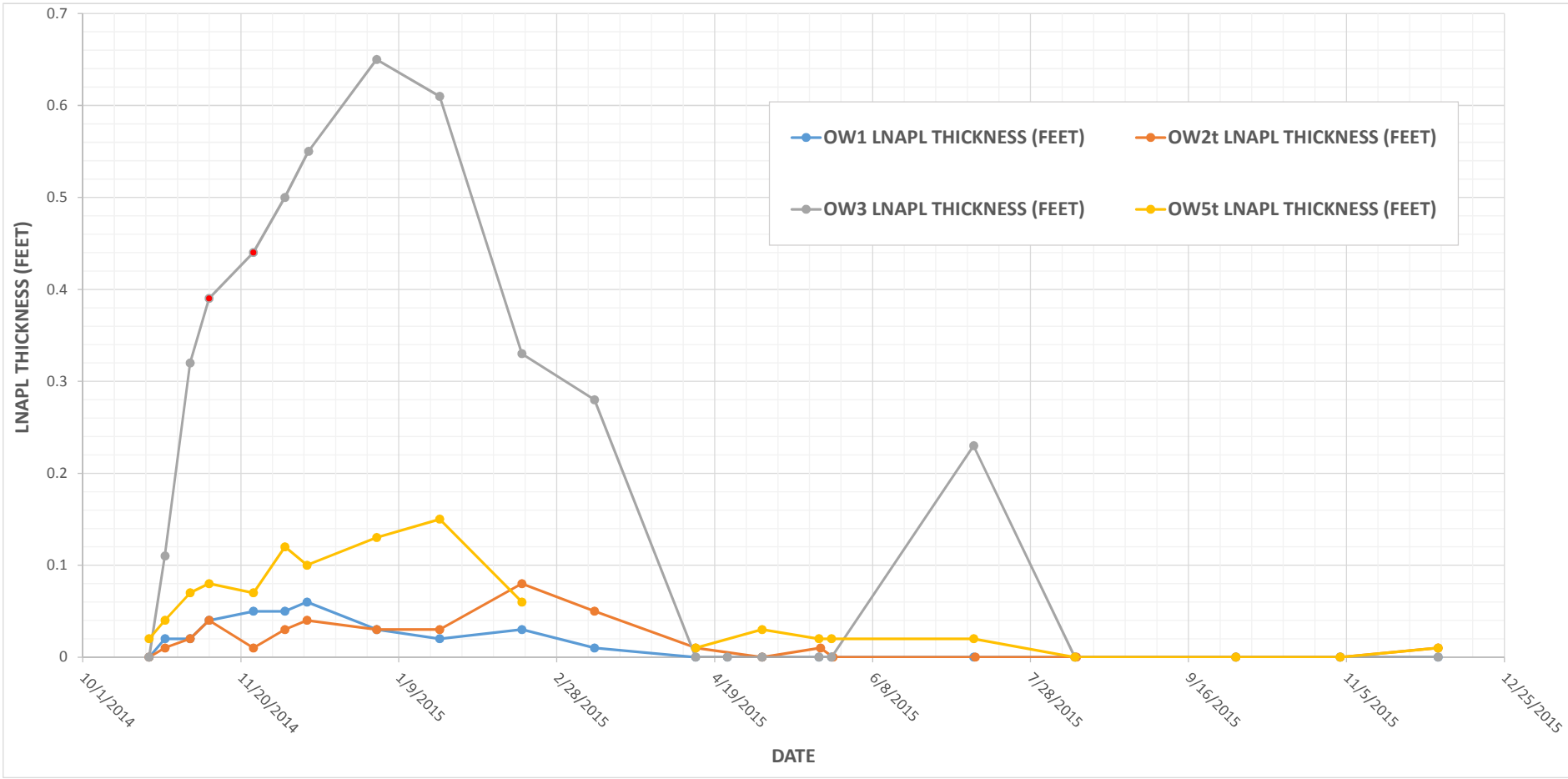
FLINT HILLS RESOURCES ALASKA, LLC
PORT OF ANCHORAGE TERMINAL

2015 ANNUAL GROUNDWATER MONITORING SUMMARY REPORT

FOURTH QUARTER 2015 GROUNDWATER ELEVATION MAP

ARCADIS Design & Consultancy for natural and built assets

FIGURE
5-3



LEGEND:
Data gaps = wells were not gauged or water in well was frozen
LNAPL = Light non-aqueous phase liquid
OW# = Observation well
= Depth of water at OW-3 is below bottom of screen when depth to water and LNAPL measurements were collected

NOTE:
All depth to water and LNAPL measurements used in preparation for this chart were collected by Shannon & Wilson Inc..

FLINT HILLS RESOURCES ALASKA, LLC

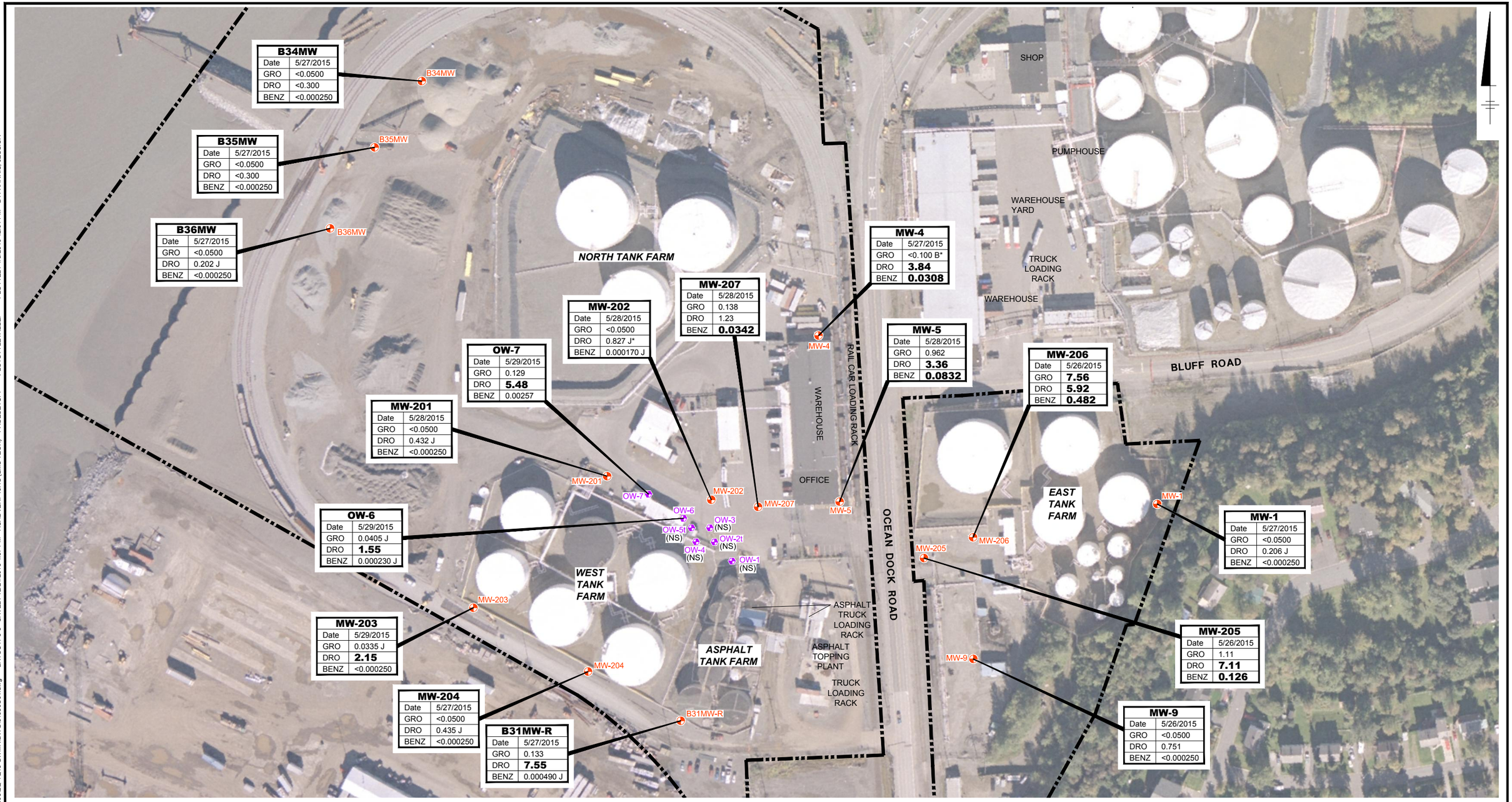
PORT OF ANCHORAGE TERMINAL

2015 ANNUAL GROUNDWATER MONITORING SUMMARY REPORT

LNAPL THICKNESSES PLOT
WEST TANK FARM OBSERVATION WELLS

ARCADIS Design & Consultancy for natural and built assets

FIGURE
5-4



LEGEND:

- ANCHORAGE TERMINAL BOUNDARIES
- MONITORING WELL LOCATION
- OBSERVATION WELL LOCATION

MW-1	
Date	5/27/2015
GRO	<0.0500
DRO	0.206 J
BENZ	<0.000250

- SAMPLE LOCATION
- DATE COLLECTED
- ANALYTICAL RESULTS (mg/L)

CLEANUP LEVELS	
GRO	2.2 mg/L
DRO	1.5 mg/L
BENZ	0.005 mg/L

ANALYTICAL RESULTS IN ***BOLD*** *EXCEED CLEANUP LEVELS SHOWN.*

CLEANUP LEVELS ARE DERIVED FROM ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION TABLE C- GROUNDWATER CLEANUP LEVELS.

GRO	GASOLINE RANGE ORGANICS
DRO	DIESEL RANGE ORGANICS
BENZ	BENZENE
mg/L	MILLIGRAMS PER LITER
J	ESTIMATED CONCENTRATION, DETECTED ABOVE THE DETECTION LIMIT AND BELOW THE LIMIT OF QUANTITATION
B*	RESULT IS CONSIDERED ESTIMATED (NO DIRECTION OF BIAS), DUE TO A METHOD BLANK DETECTION
J*	RESULT IS CONSIDERED ESTIMATED (NO DIRECTION OF BIAS), DUE TO FIELD DUPLICATE QC FAILURES
<	LESS THAN LABORATORY REPORTING LIMIT SHOWN
(NS)	NOT SAMPLED

NOTES:

1. SELECT WELL LOCATIONS AND SITE FEATURES SURVEYED BY SURVBASE 2-20-2015. VERTICAL DATUM NAVD88. HORIZONTAL DATUM CONVERTED FROM PMRAIL GRS80 TO NAD83 ALASKA STATE PLANE, ZONE 4, US FOOT. ALL OTHER SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
2. IMAGERY FROM GOOGLE™ EARTH DATED 4/14/2011.
3. WELLS SAMPLED MAY 26-29, 2015.
4. HIGHEST RESULT OF PRIMARY AND DUPLICATE SAMPLE RESULTS FOR EACH ANALYTE ARE SHOWN WHERE A DUPLICATE SAMPLE WAS COLLECTED.

0 80' 160'
GRAPHIC SCALE

FLINT HILLS RESOURCES ALASKA, LLC
PORT OF ANCHORAGE TERMINAL

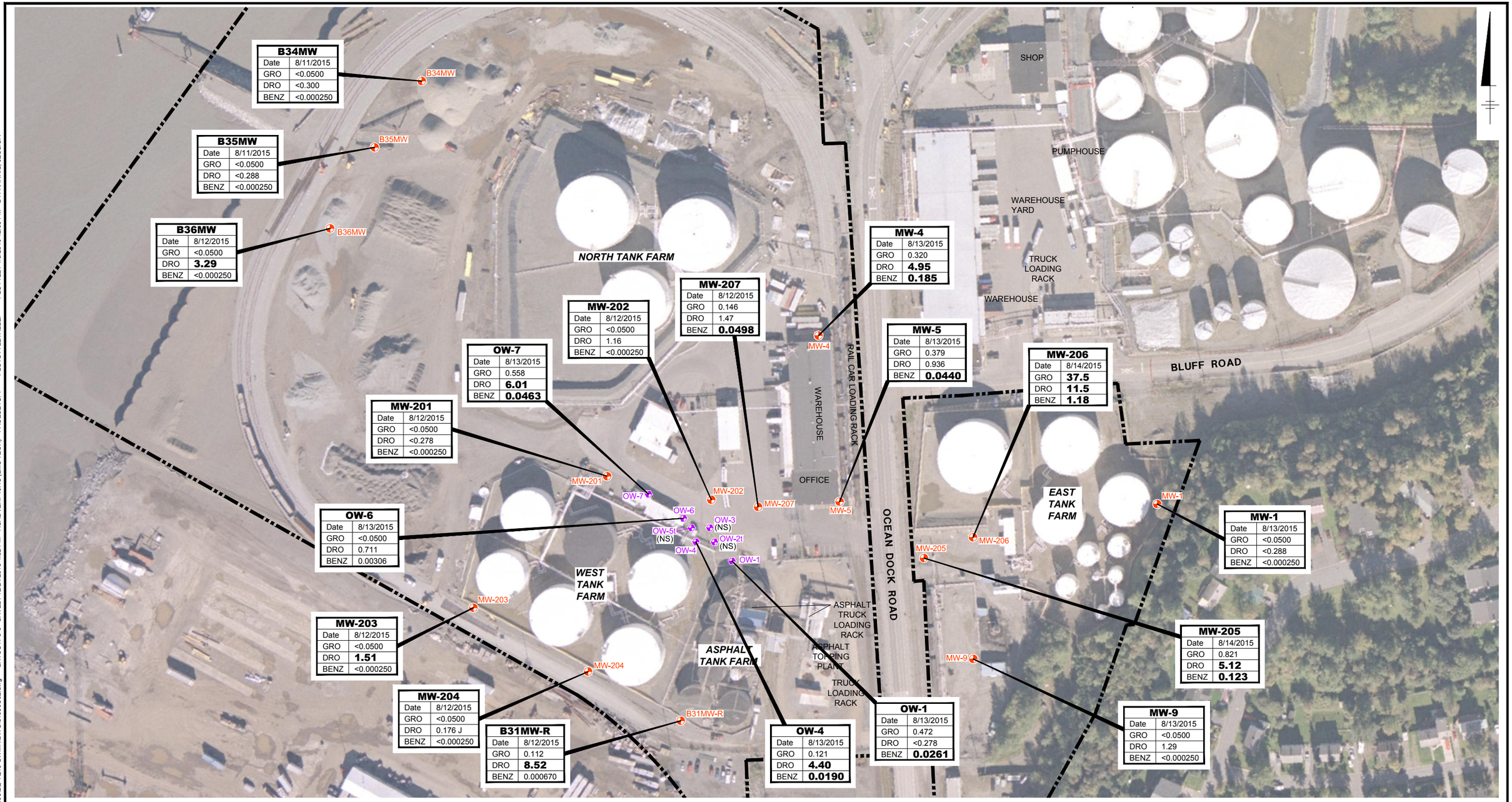
2015 ANNUAL GROUNDWATER MONITORING SUMMARY REPORT

SECOND QUARTER 2015 GROUNDWATER ANALYTICAL RESULTS

ARCADIS Design & Consultancy for natural and built assets

FIGURE 5-5

CITY: SAN RAFAEL, CA (MINNEAPOLIS, MN) DIV/GROUP: ENV/CAD DB: R. OBERLANDER, J. HARRIS
C:\Users\jharris\Desktop\ENV\CAD\B0081986\0002\0000\5\2Q-4Q15 GWMR\DWG\81986C01.dwg LAYOUT: 5-5 SAVED: 12/21/2015 4:37 PM ACADVER: 19.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ---- PLOTTED: 1/5/2016 12:04 PM BY: HARRIS, JESSICA
XREFS: IMAGES: PROJECTNAME: ----
81986X01 81986X02.jpg
81986X00
2015-02-2200thra Survey



LEGEND:

- ANCHORAGE TERMINAL BOUNDARIES
- MONITORING WELL LOCATION
- OBSERVATION WELL LOCATION

MW-1	
Date	8/13/2015
GRO	<0.0500
DRO	<0.288
BENZ	<0.000250

- SAMPLE LOCATION
- DATE COLLECTED
- ANALYTICAL RESULTS (mg/L)

CLEANUP LEVELS	
GRO	2.2 mg/L
DRO	1.5 mg/L
BENZ	0.005 mg/L

*ANALYTICAL RESULTS IN **BOLD** EXCEED CLEANUP LEVELS SHOWN.*

CLEANUP LEVELS ARE DERIVED FROM ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION TABLE C- GROUNDWATER CLEANUP LEVELS.

GRO	GASOLINE RANGE ORGANICS
DRO	DIESEL RANGE ORGANICS
BENZ	BENZENE
mg/L	MILLIGRAMS PER LITER
J	ESTIMATED CONCENTRATION, DETECTED ABOVE THE DETECTION LIMIT AND BELOW THE LIMIT OF QUANTITATION
<	LESS THAN LABORATORY REPORTING LIMIT SHOWN
(NS)	NOT SAMPLED

NOTES:

1. SELECT WELL LOCATIONS AND SITE FEATURES SURVEYED BY SURVBASE 2-20-2015. VERTICAL DATUM NAVD88. HORIZONTAL DATUM CONVERTED FROM PMRAIL GRS80 TO NAD83 ALASKA STATE PLANE, ZONE 4, US FOOT. ALL OTHER SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
2. IMAGERY FROM GOOGLE™ EARTH DATED 4/14/2011.
3. WELLS SAMPLED AUGUST 11-14, 2015.
4. HIGHEST RESULT OF PRIMARY AND DUPLICATE SAMPLE RESULTS FOR EACH ANALYTE ARE SHOWN WHERE A DUPLICATE SAMPLE WAS COLLECTED.

0 80' 160'
GRAPHIC SCALE

FLINT HILLS RESOURCES ALASKA, LLC
PORT OF ANCHORAGE TERMINAL

2015 ANNUAL GROUNDWATER MONITORING SUMMARY REPORT

THIRD QUARTER 2015 GROUNDWATER ANALYTICAL RESULTS

ARCADIS Design & Consultancy for natural and built assets

FIGURE 5-6

CITY: SAN RAFAEL, CA (MINNEAPOLIS, MN) DIV/GROUP: ENV/CAD DB: R. OBERLANDER, J. HARRIS
C:\Users\jharris\Desktop\ENVCAD\B0081986\0002\0005\2Q-4Q15 GWMR\DWG\81986C02.dwg LAYOUT: 5-6 SAVED: 12/21/2015 4:32 PM ACADVER: 19.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ---- PLOTTED: 1/5/2016 12:05 PM BY: HARRIS, JESSICA
XREFS: 81986X01 81986X02.jpg 81986X00 2015-02-2200thra Survey IMAGES: PROJECTNAME: ----

B34MW	
Date	11/10/2015
GRO	<0.0500
DRO	<0.288
BENZ	0.000150 J

B35MW	
Date	11/10/2015
GRO	<0.0500
DRO	<0.288
BENZ	0.000980

B36MW	
Date	11/12/2015
GRO	<0.0500
DRO	0.200 J
BENZ	<0.000250

OW-7	
Date	11/12/2015
GRO	0.583
DRO	**2.25**
BENZ	**0.0499**

MW-202	
Date	11/12/2015
GRO	<0.0500
DRO	1.43
BENZ	<0.000250

MW-207	
Date	11/12/2015
GRO	0.0796 J
DRO	0.982
BENZ	**0.0168**

MW-4	
Date	11/13/2015
GRO	0.124
DRO	**2.00**
BENZ	**0.0525**

MW-5	
Date	11/13/2015
GRO	**2.61**
DRO	1.25 J*
BENZ	**0.308**

MW-206	
Date	11/13/2015
GRO	**20.2**
DRO	**3.14**
BENZ	**0.218**

MW-201	
Date	11/11/2015
GRO	<0.0500
DRO	0.424 J
BENZ	<0.000250

OW-6	
Date	11/12/2015
GRO	0.0537 J
DRO	1.31
BENZ	0.000830

MW-1	
Date	11/11/2015
GRO	<0.0500
DRO	<0.288
BENZ	<0.000250

MW-203	
Date	11/11/2015
GRO	<0.0500
DRO	0.813
BENZ	<0.000250

MW-205	
Date	11/13/2015
GRO	1.02
DRO	**3.01**
BENZ	**0.119**

MW-204	
Date	11/11/2015
GRO	<0.0500
DRO	<0.288
BENZ	<0.000250

B31MW-R	
Date	11/12/2015
GRO	0.153
DRO	**3.85**
BENZ	0.000560

OW-4	
Date	11/13/2015
GRO	0.0570 J
DRO	**2.31**
BENZ	0.00338

MW-9	
Date	11/11/2015
GRO	<0.0500
DRO	1.08
BENZ	<0.000250

SHOP
PUMPHOUSE
WAREHOUSE YARD
TRUCK LOADING RACK
WAREHOUSE
NORTH TANK FARM
WAREHOUSE
RAIL CAR LOADING RACK
OFFICE
BLUFF ROAD
EAST TANK FARM
OCEAN DOCK ROAD
WEST TANK FARM
ASPHALT TRUCK LOADING RACK
ASPHALT TOPPING PLANT
ASPHALT TANK FARM
TRUCK LOADING RACK

LEGEND:

- ANCHORAGE TERMINAL BOUNDARIES
- MONITORING WELL LOCATION
- OBSERVATION WELL LOCATION

MW-1	
Date	11/11/2015
GRO	<0.0500
DRO	<0.288
BENZ	<0.000250

SAMPLE LOCATION
DATE COLLECTED
ANALYTICAL RESULTS (mg/L)

CLEANUP LEVELS	
GRO	2.2 mg/L
DRO	1.5 mg/L
BENZ	0.005 mg/L

ANALYTICAL RESULTS IN ***BOLD*** *EXCEED CLEANUP LEVELS SHOWN.*

CLEANUP LEVELS ARE DERIVED FROM ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION TABLE C- GROUNDWATER CLEANUP LEVELS.

GRO	GASOLINE RANGE ORGANICS
DRO	DIESEL RANGE ORGANICS
BENZ	BENZENE
mg/L	MILLIGRAMS PER LITER
J	ESTIMATED CONCENTRATION, DETECTED ABOVE THE DETECTION LIMIT AND BELOW THE LIMIT OF QUANTITATION
J*	RESULT IS CONSIDERED ESTIMATED (NO DIRECTION OF BIAS), DUE TO FIELD DUPLICATE QC FAILURES
<	LESS THAN LABORATORY REPORTING LIMIT SHOWN
(NS)	NOT SAMPLED

NOTES:

1. SELECT WELL LOCATIONS AND SITE FEATURES SURVEYED BY SURVBASE 2-20-2015. VERTICAL DATUM NAVD88. HORIZONTAL DATUM CONVERTED FROM PMRAIL GRS80 TO NAD83 ALASKA STATE PLANE, ZONE 4, US FOOT. ALL OTHER SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
2. IMAGERY FROM GOOGLE™ EARTH DATED 4/14/2011.
3. WELLS SAMPLED NOVEMBER 10-13, 2015.
4. HIGHEST RESULT OF PRIMARY AND DUPLICATE SAMPLE RESULTS FOR EACH ANALYTE ARE SHOWN WHERE A DUPLICATE SAMPLE WAS COLLECTED.

0 80' 160'
GRAPHIC SCALE

FLINT HILLS RESOURCES ALASKA, LLC
PORT OF ANCHORAGE TERMINAL

2015 ANNUAL GROUNDWATER MONITORING SUMMARY REPORT

FOURTH QUARTER 2015 GROUNDWATER ANALYTICAL RESULTS

ARCADIS Design & Consultancy for natural and built assets

FIGURE 5-7