ARCADIS Design & Consultancy for natural and built assets

Flint Hills Resources Alaska, LLC

REVISED ONSITE CLEANUP PLAN

North Pole Terminal

North Pole, Alaska

ADEC File Number: 100.38.090

Feburary 2, 2017

REVISED ONSITE CLEANUP PLAN

North Pole Terminal
North Pole, Alaska
ADEC File Number: 100.38.090

Gina Withy
Project Engineer

Rebecca Andresen
Vice President

Prepared for:

Flint Hills Resources Alaska, LLC

Prepared by:

Arcadis U.S., Inc.
1100 Olive Way
Suite 800
Seattle
Washington 98101

Tel 206 325 5254
Fax 206 325 8218

Our Ref.:

B0081981.0072

Date:

January 30, 2017

CONTENTS

Acronyms and Abbreviations iii

1 Introduction 1

1.1 Background 1

1.2 Community Role in the Remedy Selection Process 2

1.3 Purpose and Scope 2

2 Site Setting and Background 3

2.1 Property Description 3

2.2 Physical Setting 3

2.3 Constituents of Concern 4

2.4 Conceptual Site Model – Distribution of Constituents of Concern 6

2.4.1 Soil 6

2.4.2 Groundwater 6

2.4.2.1 Petroleum Hydrocarbons 6

2.4.2.2 Sulfolane 7

2.4.3 Light Nonaqueous Phase Liquid 7

2.4.4 Vapor Intrusion 8

3 Cleanup Objectives 9

3.1 Institutional Controls 9

3.2 Soil 9

3.3 Groundwater 9

3.4 Light Nonaqueous Phase Liquid 9

3.5 Vapor Intrusion 9

4 Revised Cleanup Actions 10

4.1 Institutional Controls 10

4.2 Soil 10

4.3 Groundwater 11

4.4 Light Nonaqueous Phase Liquid 12

4.5 Vapor Intrusion 13

4.5.1 Laboratory 14

4.5.2 Terminal Building 14
4.5.3 Fire Training House 14
5 Waste Management Plan 15
6 Implementation Schedule 16
7 References 17

TABLE (IN TEXT)

Table 2-1. Constituents of Concern in Soil and Groundwater 4
Table 6-1. Implementation Schedule 16

FIGURES

Figure 2-1 Site Location
Figure 2-2 Site Features
Figure 2-3 Site Plan – Onsite

APPENDIX

Appendix A Long-Term Monitoring Plan – 2017 Update

ACRONYMS AND ABBREVIATIONS

2014 OCP	Final Onsite Cleanup Plan (Arcadis, 2014)
AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
Arcadis	Arcadis U.S., Inc.
Barr	Barr Engineering Company
bgs	below ground surface
cfm	cubic feet per minute
city	North Pole, Alaska
COC	constituent of concern
CSM	Conceptual Site Model
CU #1 Wash Area	Crude Unit #1 Wash Area
CU #2 EU	Crude Unit #2 Extraction Unit
Revised OCP	Revised Onsite Cleanup Plan
Earth Resources	Earth Resources Corporation of Alaska
EC	engineering control
ECA	Energy Corporation of Alaska
FHRA	Flint Hills Resources Alaska, LLC
GAC East	Granular Activated Carbon East
GAC West	Granular Activated Carbon West
GVEA	Golden Valley Electric Association
HVAC	heating, ventilation, and air conditioning
IC	institutional control
LNAPL	light nonaqueous phase liquid
LTM Plan	Long-Term Monitoring Plan – 2017 Update
NSZD	natural source zone depletion
offsite	area located outside the property boundary, primarily in the downgradient north-northwest direction
onsite	area that is located within the property boundary of the FHRA North Pole Terminal
Onsite SCR	Onsite Site Characterization Report – 2013 Addendum

Onsite SMP	Onsite Soil Management Plan
POC	point of compliance
power plant	electrical generating facility
site	Flint Hills Resources Alaska, LLC North Pole Terminal, located on H and H Lane in North Pole, Alaska
SWA	Southwest Former Wash Area
VI	vapor intrusion
VOC	volatile organic compound
VPT	vertical profile transect
Williams	Williams Alaska Petroleum, Inc.
WWTP	wastewater treatment plant
µg/L	micrograms per liter

1 INTRODUCTION

On behalf of Flint Hills Resources Alaska, LLC (FHRA), Arcadis U.S., Inc. (Arcadis) prepared this Revised Onsite Cleanup Plan (Revised OCP) for the FHRA North Pole Terminal, located on H and H Lane in North Pole, Alaska (site). This Revised OCP is part of a negotiated settlement to Case #4-FA-14-01544 CI Consolidated and presents the final permanent remedial solution for onsite.

1.1 Background

A refinery was built onsite in 1976 and 1977 by Energy Corporation of Alaska (ECA) and refinery operations began in August 1977. ECA changed its name to Earth Resources Company of Alaska (Earth Resources) in 1977. Earth Resources leased the refinery property from the State of Alaska, which owned the refinery land. Since 1980, the name of the refinery operator has changed from time to time, including MAPCO Alaska, Inc. (1981-1983), MAPCO Petroleum, Inc. (1983-1987), MAPCO Alaska Petroleum, Inc. (1987-1998), and Williams Alaska Petroleum, Inc. (Williams; 1998-2004). Under these various names, Williams operated the refinery on state-owned land for more than 25 years, until 2004. FHRA purchased the refinery assets from Williams effective April 1, 2004, along with the refinery land, which Williams acquired from the State of Alaska shortly before the transaction with FHRA. FHRA has owned the site property since April 1, 2004 and operated the refinery onsite from April 1, 2004 until May 2014 when the refinery was idled and operated only as a petroleum product terminal. In July 2016, a determination was made to demolish the refinery process equipment located above grade while the terminal continues to operate.

Because the onsite contamination is located in an industrial facility, the previously selected corrective actions outlined in the 2014 Final Onsite Cleanup Plan (Arcadis 2014) focused on targeted soil removal, containment and treatment of groundwater affected by historical releases to prevent off-site migration of groundwater above approved cleanup levels and a selected performance standard for sulfolane, and institutional controls (ICs) to limit future use to industrial operations and prevent use of groundwater for human consumption. Groundwater in the area located outside the property boundary, primarily in the downgradient north-northwest direction (offsite) was impacted due to the migration of sulfolane from historical releases onsite; hydrocarbons have not migrated offsite. Offsite receptors are currently protected by an interim water supply. A permanent offsite remedial solution is expected in the near future.

The entire site has undergone significant characterization and monitoring activities, as reflected in a series of site characterization reports and subsequent monitoring reports. Collectively, these reports present information that was gathered to ascertain the physical characteristics of the site, define the sources of contamination, determine the nature and extent of contamination present at the site, and confirm the investigatory conclusions and conceptual site model. Some of the relevant site characterization reports include:

- Site Characterization and Corrective Action Plan, Williams Alaska Petroleum, Inc., North Pole Refinery (Shannon and Wilson), submitted in June 2002
- Report on Well Installation, Maintenance Activities and Data Review, Flint Hills Resources Alaska, Inc., North Pole Refinery (Shannon and Wilson), submitted in December 2005

- Site Characterization Report – Through 2011 (Barr Engineering Company [Barr] 2012a), submitted in December 2012
- Site Characterization Report – 2012 Addendum (Arcadis 2013b), submitted in January 2013
- Onsite Site Characterization Report – 2013 Addendum (Onsite SCR; Arcadis 2013b)
- Onsite quarterly and/or semiannual groundwater monitoring reports (2013 to present).

Constituents of concern (COCs) for the site were identified in the 2014 Final Onsite Cleanup Plan (2014 OCP, Arcadis 2014) by comparing detected concentrations with ADEC cleanup levels presented in 18 Alaska Administrative Code (AAC) 75.345 Table C (groundwater). COCs were updated as part of this Revised OCP as discussed in Section 2.3. Sulfolane is not listed in Table C.

1.2 Community Role in the Remedy Selection Process

The community will have the opportunity to review and comment on this Revised OCP.

1.3 Purpose and Scope

The final remedies set out in this Revised OCP are intended to be protective of human health and the environment in an industrial setting. The remedies are based on investigations, sampling and analysis during the site characterizations listed above, and routine site sampling.

2 SITE SETTING AND BACKGROUND

2.1 Property Description

The 240-acre site is located inside the city limits of North Pole, Alaska (city). The city is located approximately 13 miles southeast of Fairbanks, Alaska, within the Fairbanks North Star Borough (Figure 2-1).

The history and operational layout of the former refinery operations are documented in the various site characterization reports. Contamination at the site due to numerous leaks and spills reflects the historical refinery practices primarily during the refinery's first 25 years of operation. As currently configured as a refined products terminal, tank farms are located in the central portion of the site. Truck-loading racks are located immediately north of the tank farms and a railcar-loading rack is located west of the tank farms. Rail lines and access roads are located in the northernmost portion of the site.

Along the southern site boundary, partially surrounded by the North Pole Terminal, is an electrical generating facility (power plant) operated by Golden Valley Electric Association (GVEA). The property south of the site and the GVEA power plant is occupied by the Petro Star, Inc. Refinery. Site features are presented on Figure 2-2.

North of the site are residential properties and the city's wastewater treatment plant (WWTP). The North Pole High School is located immediately north and west of the WWTP and residential properties. An undeveloped parcel, owned by the Alaska Department of Natural Resources, lies between the site and the WWTP. The Tanana River is located to the south and west, flowing in a northwesterly direction toward Fairbanks. Surrounding the site is property that is residential or undeveloped. East of the site and crossing the offsite area running southeast to northwest are the Old Richardson Highway and the Alaska Railroad right-of-way. An onsite site plan is presented on Figure 2-3.

The City of North Pole operates a public water supply system that serves the community immediately north of the North Pole Terminal. Currently some residence and businesses in the City and in the area outside the City (in the sulfolane plume area) receive their water from wells. As an interim remedy, where well water is used for potable water, FHRA has installed point of entry carbon filtration systems or supplied bulk water or bottled water. See Alternative Water Solutions Management Plan, October 2014, Barr Engineering located on the ADEC web page at dec.alaska.gov/spar/csp/sites/north-pole-refinery/documents.htm.

2.2 Physical Setting

The site and the surrounding North Pole area are located on a relatively flat-lying alluvial plain that is situated between the Tanana River and the Chena River. The site is located on the Tanana River floodplain. Up to 2 feet of organic soil are typically found in the undeveloped portions of the site. Silt and silty sand layers varying in thickness from 0 to 10 feet typically occur beneath the organic soil. Alluvial sand and gravel associated with the Tanana River are present below the organic soil and silty layers. Depth to bedrock is estimated to be 400 to 600 feet below ground surface (bgs).

The city is located within an area of Alaska characterized by discontinuous permafrost (Ferrians 1965). Permafrost tends to act as a confining unit, impeding and redirecting the flow direction of groundwater

(Glass et al. 1996). Based on regional information (Williams 1970, Miller et al. 1999), permafrost is assumed to be absent beneath the Tanana River.

The aquifer beneath the alluvial plain between the Tanana River and the Chena River generally consists of highly transmissive sand and gravel under water table conditions (Cederstrom 1963, Glass et al. 1996). The Tanana River has a drainage area of approximately 20,000 square miles upstream of Fairbanks (Glass et al. 1996). Near the site, this aquifer is reportedly greater than 600 feet thick (at least 616 feet thick near Moose Creek Dam) (Glass et al. 1996). Beyond the zones of influence of the site's historical groundwater remediation system, groundwater flow directions are controlled by discharge from the Tanana River to the aquifer and from the aquifer to the Chena River (Glass et al. 1996). Variations in river stage through time are believed to be the primary cause of variations in groundwater flow direction in the aquifer between the rivers (Lilly et al. 1996, Nakanishi and Lilly 1998). Based on data from U.S. Geological Survey water table wells, the groundwater flow direction generally varies from a north-northwesterly direction to a few degrees east of north. The groundwater flow direction trends to the north-northwest in spring and more northerly in the summer and fall (Glass et al. 1996).

2.3 Constituents of Concern

Extensive sampling of groundwater and soil was completed for numerous constituents of potential concern to develop a list of COCs for the site. Soil COCs were addressed in the Final Onsite Cleanup Plan (Arcadis 2014) by implementing soil removal and ICs. Residual hydrocarbons in soil will continue to be addressed with ICs. As part of this revision, the 2014 COCs were updated based on a comparison of site maximum concentrations to Method 2 cleanup levels for soil (Table B1 of 18 AAC 75.341 (c)) and maximum concentrations over the last two years of monitoring for groundwater (Table C of 18AAC 75.341 (b)(1)) for those constituents listed in Table 2-1.

FHRA studies of onsite groundwater characteristics and modeling of the groundwater all indicate that sulfolane in groundwater will not migrate offsite above 400 micrograms per liter (µg/L). Currently offsite receptors are protected from sulfolane in the groundwater by the interim groundwater remedy (the Alternative Water Supply). Onsite receptors are protected from exposure to sulfolane by the Equitable Servitude. Because potentially exposed receptors are protected both onsite and offsite, and because groundwater modeling indicates that offsite migration will be limited and decreasing in the future, the threshold action level for offsite migration is 400 µg/L. ADEC's acceptance of this level is predicated on the protection of onsite and offsite receptors through the provision of an alternative water supply to the affected community and enforcing the Equitable Servitude on the Site.

Table 2-1. Constituents of Concern in Soil and Groundwater

Soil COC	Maximum Concentration (mg/kg)	Soil Cleanup Level[1] (mg/kg)
1,2,4-TMB	205	0.16
1,3,5-TMB	81.1	1.3
1,2,3 Trichloropropane	0.374	0.000031
Benzene	438	0.022
Cumene	41.6	5.6

Soil COC	Maximum Concentration (mg/kg)	Soil Cleanup Level[1] (mg/kg)
Ethylbenzene	392	0.13
n-Butylbenzene	107	20
n-Propylbenzene	72.7	9.1
Toluene	1,330	6.7
Xylenes	2,510	1.5
1-Methylnaphthalene	88.5	0.41
2-Methylnaphthalene	240	1.3
Naphthalene	125	0.038
Sulfolane	1,620	TBD
PFOS	3	0.003
PFOA	0.048	0.0017
GRO	7,730	300
DRO	32,000	250
Groundwater COC	**Maximum Concentration* (µg/L)**	**Groundwater Cleanup Level[2] (µg/L)**
Benzene	16,900	4.6
Ethylbenzene	1,960	15
Toluene	10,600	1,100
Xylenes	15,100	190
1,2,4-TMB	614	15
1,3,5-TMB	510	120
1-Methylnaphthalene	90	11
Sulfolane	22,500	TBD
Perfluorooctane sulfonate (PFOS)**	1.3	0.4
Perfluorooctanoic acid (PFOA)**	7.65	0.4
GRO	115,000	2,200
DRO	16,000	1,500

Notes:
1,3,5-TMB = 1,3,5-trimethylbenzene
1,2,4-TMB = 1,2,4-trimethylbenzene GRO = gasoline range organics
DRO = diesel range organics RRO = residual range organics
* Maximum concentration detected within the last two years of monitoring for each COC
**Most recent PFOS/PFOA results from MW-321-15 (2013)

[1] Soil cleanup level set at the minimum value of the direct contact, outdoor inhalation and migration to groundwater value in 18 AAC 75 Table B1 and B2 for the under 40-inch zone.
[2] Groundwater cleanup level set at 18 AAC 75 Table C value.

2.4 Conceptual Site Model – Distribution of Constituents of Concern

The Conceptual Site Model (CSM) was presented as Appendix A to the Onsite SCR (Arcadis 2013c). The CSM (Arcadis 2013c) summarizes COCs and sources, release mechanisms, impacted media, transport mechanisms, geology, permafrost, hydrogeology, exposure routes, and potential receptors.

At ADEC's direction, environmental impacts onsite and in areas downgradient from the site were extensively characterized and the nature and extent of impacts were previously submitted to ADEC (Arcadis 2013c). In addition to traditional soil and groundwater sampling, site characterization efforts have included investigations to assess light nonaqueous phase liquid (LNAPL), soil gas, surface water, soil and aquifer characteristics, permafrost, and geophysical subsurface data. Other focused studies have included tracer tests, pumping tests, isotope studies, and biostudies. Many of the past, relevant studies can be found at the ADEC web page: (http://dec.alaska.gov/spar/csp/sites/north-pole-refinery/documents.htm).

2.4.1 Soil

The nature and extent of soil impacts onsite were characterized through the collection of more than 1,000 soil samples during site characterization activities conducted in 2011 (Barr 2012a), 2012 (Arcadis 2013b), and 2013 (Arcadis 2013c). In 2015, soil was excavated from Lagoon B, the Fire Training Area and the Southwest Former Wash Area (SWA) and removed from the site for disposal in accordance with the 2014 OCP (Arcadis 2014).

2.4.2 Groundwater

The nature and extent of groundwater impacts have been characterized via numerous sampling events and numerous onsite groundwater studies. The lateral and vertical extents of petroleum hydrocarbons and sulfolane impacts continue to be documented in groundwater reports provided to ADEC (Arcadis 2016b).

Petroleum hydrocarbon COC concentrations in groundwater are generally co-located with LNAPL impacts. Sulfolane concentrations in groundwater are consistent with identified sulfolane source areas including Lagoon B, Sump 908, Crude Unit #2 Extraction Unit (CU #2 EU), Crude Unit #1 Wash Area (CU #1 Wash Area), and SWA. Generally, onsite sulfolane concentrations in groundwater upgradient and downgradient of the extraction wells are stable or decreasing, indicating that source mass is decreasing through time and has been effectively captured by the historical groundwater remediation system.

2.4.2.1 Petroleum Hydrocarbons

The benzene plume is largely confined to the developed portion of the site and does not extend to the northern property boundary. Benzene is an indicator of petroleum impacts; benzene concentrations greater than 4.6 µg/L were most often detected in areas where LNAPL is present in soil. Wells with other petroleum COC detections are generally located within the footprint of the benzene plume. The benzene plume is delineated laterally and vertically to the water table and has been captured by the historical groundwater remediation system that began operating in 1987.

As documented in previous site characterization and groundwater monitoring reports (Arcadis 2013c and Arcadis 2016b, respectively), LNAPL and dissolved hydrocarbons in groundwater continue to naturally attenuate across the site, to the point that passive and natural processes result in significantly more residual hydrocarbon removal than active recovery processes. The site monitoring results and groundwater modeling support the conclusion that hydrocarbon migration beyond the site boundary is not expected to occur regardless of whether the remediation system is operating.

2.4.2.2 Sulfolane

The most significant sulfolane source areas at the site are CU #2 EU, CU #1 Wash Area, SWA, Sump 908, and Lagoon B. In first quarter 2014, detectable sulfolane concentrations in groundwater extended from the source areas to the northern site boundary at a depth of up to 90 feet bgs (at well MW-364-90).

The majority of the sulfolane plume at the water table results from three of the identified source areas (CU #2 EU, CU #1 Wash Area, and Lagoon B [well MW-110-20]) and extends north to include the Sump 908 area (MW-176A-15). Optimization of the original groundwater remediation system (Granular Activated Carbon East [GAC East]) has been ongoing since 2009, improving the overall performance of the system. However, groundwater modeling indicated that the western portion of the sulfolane plume was not being captured by GAC East (Barr 2012b, included as Appendix C of Arcadis 2013a). In June 2014, FHRA installed two additional recovery wells and an additional groundwater remediation system west of the current line of recovery wells to provide capture across the entire width of the plume in accordance with the 2014 OCP (Arcadis 2014). After additional sampling and review of the modeling of the plume, ADEC agreed that the Granular Activated Carbon West (GAC West) system could be shut down (ADEC, 2016). By August 31, 2016, the GAC West system was shut down.

2.4.3 Light Nonaqueous Phase Liquid

The nature and extent of LNAPL onsite was thoroughly characterized through 26 years of LNAPL recovery and data collection, along with intense efforts to assess LNAPL composition, mobility, and recoverability during the past 5 years. Key studies that have analyzed the data include the Site Characterization Report – 2012 Addendum (Arcadis 2013b) and the Onsite SCR (Arcadis 2013c). The First Semiannual 2016 Onsite Groundwater Monitoring Report (Arcadis 2016b) includes an evaluation of current extent of LNAPL and Natural Source Zone Depletion (NSZD) assessment results.

The LNAPL present onsite was characterized by forensic analysis as diesel #2, naphtha, Jet A, mixtures of these fuels, and mixtures with gasoline in some locations. Additional information regarding LNAPL impacts at the site is summarized below (and found in detail in the above referenced studies):

- The extent of the LNAPL impact is known.
- LNAPL is not a significant source of sulfolane to groundwater (Arcadis 2013c).
- The LNAPL and dissolved-phase benzene, toluene, ethylbenzene, and xylenes plumes are stable with the groundwater remediation system operating, and modeling indicates they will continue to be stable onsite after groundwater recovery ceases.
- Natural processes are depleting the LNAPL at a significant rate.

2.4.4 Vapor Intrusion

As natural processes continue to degrade hydrocarbons in the subsurface, the potential exists for compounds to volatilize from source areas and move throughout the surrounding soil pore spaces as soil gas. Soil gas source areas may include shallow dissolved-phase volatile organic compounds (VOCs) in groundwater, impacted soil in the vadose zone, or LNAPL above or near the water table.

Indoor vapor intrusion (VI) may be a potentially complete exposure pathway (see Section 3.5).

3 CLEANUP OBJECTIVES

This section discusses cleanup objectives with the primary goal of protection of human health and the environment at an industrial facility.

3.1 Institutional Controls

ICs are an essential part of this Revised OCP to protect human health and environment. The ICs in place at the site are identified in the Equitable Servitude (FHRA, 2015)).

3.2 Soil

The soil cleanup objective is to protect onsite workers from unacceptable exposure to COCs in impacted soil.

3.3 Groundwater

Cleanup objectives for groundwater are summarized below:

- Protect onsite workers and future receptors from unacceptable exposure to COCs in impacted groundwater.
- Groundwater shall not exceed 400 µg/L sulfolane at the property line (point of compliance or “POC”) and shall meet 18 AAC 75.345 Table C cleanup for other COCs.

3.4 Light Nonaqueous Phase Liquid

The LNAPL cleanup objective is:

- LNAPL is not present at or beyond the POC monitoring locations.

3.5 Vapor Intrusion

The VI cleanup objective is to protect onsite workers from unacceptable exposure to COCs resulting from indoor VI into occupied buildings.

4 REVISED CLEANUP ACTIONS

Various cleanup actions have been executed at the site since the discovery of COCs in the subsurface, including soil excavation, groundwater recovery and treatment, manual and automated LNAPL recovery, air sparging, and emplacement of ICs. See generally http://dec.alaska.gov/spar/csp/sites/north-pole-refinery/documents.htm.

This section discusses the final cleanup actions that will be implemented onsite. The final cleanup remedies established in this Revised OCP are consistent with the previous remedial alternatives evaluated for the site (Arcadis 2012b), and consider potential exposure, practicability, implementability, and cost. This section discusses the following proposed cleanup actions for the onsite area:

4.1 Institutional Controls

An Equitable Servitude (FHRA 2015) is in place for the property which:

- Limits the property use to industrial.
- Prohibits use of groundwater for drinking water purposes.
- Requires the maintenance of fencing, which restricts the general public's access and potential exposure to any residual COCs onsite.
- Requires protective measures for excavation of soil in the defined contamination area.
- Requires protective measures to limit groundwater vapor exposures in buildings currently used onsite and requirements applicable to construction of new buildings onsite to protect building occupants.

Sections 4.2 through 4.5 discuss how these ICs support the final cleanup actions.

4.2 Soil

Current and future onsite workers will continue to be protected from unacceptable exposure to residual COCs in soil by sustained implementation of ICs, engineering controls (ECs), and best work practices, as required by the Equitable Servitude (FHRA 2015). In addition, as required in the Equitable Servitude, the property is currently fenced and access is restricted.

An Onsite Soil Management Plan (Onsite SMP), provided as Attachment A to the Long-Term Monitoring Plan (LTM Plan – 2017 Update), is included in Appendix A. The Onsite SMP serves as a guidance document to protect onsite workers from exposure to impacted soil encountered during any future ground-disturbing activities. The Onsite SMP will be used by the property owner or any other party performing work onsite to manage earth-moving activities.

To supplement the Onsite SMP, project-specific soil plans may be developed to describe roles, responsibilities, and procedures based on the scope and extent of a specific project. The Onsite SMP provides general guidance on roles and responsibilities for emergency or routine maintenance, or short lead-time projects that may arise.

4.3 Groundwater

The final remedy for onsite groundwater includes establishment of a POC at the site boundary, implementation of ICs, and monitoring of the plume behavior through time with a commitment to develop contingency actions if monitoring indicates COC concentrations will likely exceed cleanup levels at the POC. Prior to revising any action set out in this Revised OCP or proposing any revision to cleanup level, FHRA will submit a written proposal to ADEC. ADEC will respond to any proposal within 30 days. Note that the groundwater remediation system (including GAC East and GAC West), will be kept in place in a mothball condition reasonably suitable for resuming operation if necessary through the first periodic remedy review, which will occur five years after shutdown of the GRTS, after which time FHRA may determine to demolish the system without notice to ADEC. The ICs will be an effective remedy to prevent current and future onsite workers from unacceptable exposure to COCs in impacted groundwater.

A line of groundwater monitoring wells near the downgradient site boundary were selected for the POC monitoring network and are defined in the LTM Plan – 2017 Update (Appendix A). Groundwater monitoring will be performed for sulfolane and benzene at POC wells on a schedule that will be based on historical sample results and current trends. In addition, upgradient monitoring wells are included in the LTM Plan – 2017 Update (Appendix A) for trend analysis. Monitoring details are provided in the LTM Plan – 2017 Update (Appendix A) and include the following:

- Description of the POC and supporting monitoring well network.
- Sampling program objectives and schedule.
- Lists of all monitoring wells to be included in long-term monitoring (POC wells and selected upgradient wells for trend analysis).
- Provisions for modifying the LTM Plan – 2017 Update and monitoring network contingent on groundwater data trends.
- A sampling and analysis plan that will include sampling for selected COCs, on a frequency that is appropriate for the COC detection frequency and concentration.

ICs are in place via the Equitable Servitude (FHRA 2015) to protect onsite workers from unacceptable exposure to COCs. The Onsite SMP requires appropriate air monitoring during soil-disturbing activities. Air monitoring will protect workers from potential inhalation of volatile COCs from groundwater while working in a trench.

FHRA will conduct long-term groundwater monitoring to verify that the cleanup objectives identified in this Revised OCP have been met. The cleanup verification will include:

- Groundwater monitoring as described in the LTM Plan – 2017 Update (Appendix A) will continue for 10 years from the date of this Revised OCP. The protections provided by the Equitable Servitude (FHRA 2015) will continue beyond the 10-year monitoring period. In addition to the standard semiannual monitoring report, the following reviews will be performed:
    - FHRA will prepare a review analysis after conclusion of the one-year short-term monitoring program (Short Term Monitoring Evaluation), including a discussion of contaminant rebound, horizontal and vertical groundwater gradients, updated benzene and sulfolane trends, BTEX

assimilative capacity, mass flux, and current nature and extent of contamination. The analysis will note any unexpected conditions, such as groundwater flow patterns substantially different from current conditions (outside of the area influenced by the GRTS), different from model predictions, or unexpectedly high levels of contaminant rebound. If conditions differ significantly from pre-shutdown expectations and indicate the Cleanup Objectives will likely not be achieved, any appropriate contingencies should be proposed.

- FHRA will prepare periodic reviews twice during the proposed 10-year monitoring time period (Five and Ten Year Evaluations), including a discussion of contaminant trends, source area depletion, BTEX assimilative capacity, and a comparison of actual results with modeling predictions. If conditions differ significantly from pre-shutdown expectations and indicate the Cleanup Objectives will likely not be achieved, any appropriate contingencies should be proposed. Conversely, the need for extended monitoring beyond the 10-year time period will be assessed based on actual data trends generated over the 10-year monitoring period and compared against predicted outcomes. If monitoring trends are consistent with expected outcomes, then onsite monitoring could be terminated with ADEC approval which approval will not be unreasonably withheld if groundwater cleanup objectives have been met.

- If it is determined that cleanup objectives are not met at the POC (or if based on the above reviews the analysis indicates that the cleanup objectives will likely not be met), then additional remedial actions will be considered and evaluated. FHRA will schedule a meeting with ADEC (within 60 days of such determination) to discuss an appropriate alternative response. In addition to the POC wells, the current monitoring plan requires monitoring of select vertical profile transect (VPT) monitoring locations that are located significantly upgradient of the POC wells. If sulfolane is detected above 400 µg/L in any of the VPT wells, ADEC will be notified and quarterly monitoring of the 15 VPT wells will be initiated until all concentrations are below 400 µg/L for one year. If three or more of the 15 VPT wells monitored during a sampling event have sulfolane concentrations at or exceeding 400 µg/L then the existing air sparge system will be turned on and FHRA will schedule a meeting with ADEC to discuss any other appropriate responses. If, in one year, a single VPT well has three detections of sulfolane concentrations at or exceeding 400 µg/L then the existing air sparge system will be turned on and FHRA will schedule a meeting with ADEC to discuss any other appropriate responses. If triggered by three or more detections, once groundwater concentrations of sulfolane no longer exceed 400 µg/L in three or more VPT wells, the existing air sparge system and any other agreed-to remedial actions will be terminated. If triggered by three detections in one VPT well, once groundwater concentrations of sulfolane no longer exceed 400 µg/L in the target well for a year, the existing air sparge system and any other agreed-to remedial actions will be terminated.

4.4 Light Nonaqueous Phase Liquid

The cleanup objective for residual LNAPL onsite will be achieved by monitoring NSZD processes that continue to remediate and reduce the presence of LNAPL at the site and by sustaining the protections afforded in the Equitable Servitude (FHRA 2015).

Based on previously submitted quantitative evaluations of the chemical composition of groundwater and soil gas, LNAPL is being depleted through ongoing natural processes including dissolution, volatilization, and biodegradation in the saturated and unsaturated zones (Arcadis 2013c and 2016a). LNAPL that is

present in areas beyond the control of the historical groundwater remediation system is not migrating. NSZD will continue to reduce the volume and mobility of LNAPL onsite. Monitoring defined in the LTM Plan – 2017 Update (Appendix A) will also be used to document that any residual LNAPL onsite does not extend beyond the POC and to qualitatively document the NSZD conditions.

Administrative controls and ICs will be implemented in accordance with the Equitable Servitude (FHRA 2015) to protect receptors from potential exposure to LNAPL as a result of soil excavation activities (Onsite SMP -Appendix A) and to soil gas associated with the presence of LNAPL (Section 4.5). The Equitable Servitude (FHRA 2015) also protects workers during potential future construction of buildings over the LNAPL plume.

FHRA will conduct long-term groundwater monitoring to verify that the cleanup objectives identified in this Revised OCP have been met for LNAPL. The cleanup verification will include:

- Groundwater monitoring for LNAPL as described in the LTM Plan – 2017 Update (Appendix A) will continue for 10 years from the date of this Revised OCP. At the end of that time period, assuming cleanup objectives are still being met, the LNAPL monitoring work under this Revised OCP and any subsequent amendments will be considered completed. The protections provided by the Equitable Servitude (FHRA 2015) will continue beyond the 10-year monitoring period. In addition to the standard semiannual monitoring reports, the following reviews will be performed:
    - FHRA will prepare a review analysis after conclusion of the one-year short-term monitoring program (Short Term Monitoring Evaluation), including a discussion of NSZD and the current extent of LNAPL. The analysis will note any unexpected conditions, such as unexpectedly high levels of LNAPL migration. If conditions differ significantly from pre-shutdown expectations and indicate the Cleanup Objectives will likely not be achieved, any appropriate contingencies should be proposed.
    - FHRA will prepare periodic reviews twice during the proposed 10-year monitoring time period (Five and Ten Year Evaluations), including a discussion of source area depletion and NSZD. If conditions differ significantly from pre-shutdown expectations and indicate the Cleanup Objectives will likely not be achieved, any appropriate contingencies should be proposed. Conversely, the need for extended monitoring beyond the 10-year time period will be assessed based on actual data trends generated over the 10-year monitoring period and compared against predicted outcomes. If monitoring trends are consistent with expected outcomes, then on-site monitoring could be terminated.
- If it is determined that cleanup objectives for LNAPL are not met at the POC (or if based on the above reviews the analysis indicates that the cleanup objectives will likely not be met), then additional remedial actions should be considered and evaluated. FHRA will schedule a meeting with ADEC (within 60 days of such determination) to discuss an appropriate alternative response.

4.5 Vapor Intrusion

The process of volatilization during NSZD creates soil gas, which could potentially represent a risk for indoor VI. By the end of 2016, only one occupied building (the terminal building) will be located near an area with LNAPL present in the subsurface. Two other buildings (the laboratory and fire house) have

been or will be vacated by the end of 2016; both buildings are scheduled to be demolished in 2017. The requirements set out in the Equitable Servitude (FHRA 2015) achieve VI cleanup objectives through implementation of ECs and administrative controls.

Currently, three buildings are located above the LNAPL plume: laboratory, fire training house, and terminal building. FHRA contracted Holaday-Parks Inc. to review ventilation of the laboratory and the terminal building in 2008 (both buildings) and 2013 (laboratory only); results are discussed in Sections 4.5.1, 4.5.2, and 4.5.3.

4.5.1 Laboratory

A review of the ventilation report for the laboratory indicates that the laboratory spaces were designed to be under negative pressure, as is standard for chemical laboratory construction. The calculated air exchange rate for the laboratory averaged 6.1 air exchanges per hour. This air exchange rate was based only on the mechanically supplied outside air and did not account for the influence of the laboratory hood system. The total building air exchange rate based on exhausting of the fume hoods is 18.3 air exchanges per hour. The fume hoods are an EC that serve as a protective measure for the daily work with petroleum samples conducted in the laboratory. While the negative pressurization could induce some VI, the majority of the makeup air for the hoods is likely delivered through the mechanically supplied air and leakage through the walls, doors, windows, and/or roof systems.

FHRA maintains a daily monitoring program of indoor air for VOCs and percent lower explosive limit in the laboratory. The high rate of air exchange provides some protection against the potential effects of VI and was in place until building occupation ended in 2016; building demolition is scheduled for 2017.

4.5.2 Terminal Building

A review of the ventilation report for the terminal building indicates that this building is positively pressurized as long as the heating, ventilation, and air conditioning (HVAC) system is operating, because the mechanical flow is 960 cubic feet per minute (cfm) of air, of which 460 cfm is outside air. The total capacity of the exhaust systems in the utility room and bathroom is 215 cfm. Therefore, the supplied air considerably exceeds the exhausted air. This air flow rate is expected to provide protection against VI, per ADEC guidance (ADEC 2012). FHRA maintains a daily monitoring program of indoor air for VOCs and percent lower explosive limit in the terminal building.

4.5.3 Fire Training House

A ventilation audit was also conducted in the fire training house in 2008. The office space was provided with 1,725 cfm of outside air with an air handler. It is reasonable to conclude that the main portion of the fire training house is under positive pressure when the HVAC system is operating. If the HVAC system is operated continuously, it will provide a protective benefit with regard to VI.

Normal occupancy or access to the fire training house ended in 2016; building demolition is scheduled for 2017.

5 WASTE MANAGEMENT PLAN

Purge water generated during groundwater monitoring will be treated via the facility process wastewater treatment system or at an offsite disposal facility.

6 IMPLEMENTATION SCHEDULE

FHRA's proposed implementation schedule for the activities described in this Revised OCP is included in the table below. Progress reports will be included in semi-annual groundwater monitoring reports, as described in the LTM Plan – 2017 Update (Appendix A).

Table 6-1. Implementation Schedule

Activity	Proposed Date
Shutdown groundwater remediation system	July 2017
Implement LTM Plan – 2017 Update	Third quarter 2017
LTM Reporting	July 2017 and January 2018 (semi-annual thereafter)
Short-Term Monitoring Program Evaluation	August 2018
Five Year Evaluation	August 2022
Ten Year Evaluation	August 2027
ICs	In place

7 REFERENCES

Alaska Department of Environmental Conservation (ADEC). 2012. Vapor Intrusion Guidance for Contaminated Sites. October.

ADEC. 2016. Approval to Modify the Final Onsite Cleanup Plan with GAC West Groundwater Treatment System Shutdown Plan, FHR North Pole Terminal. August 17, 2016.

Arcadis. 2012b. Draft Final Onsite Feasibility Study. May 25.

Arcadis. 2013a. Interim Remedial Action Plan Addendum. January 18.

Arcadis. 2013b. Site Characterization Report – 2012 Addendum. January 25.

Arcadis. 2013c. Onsite Site Characterization Report – 2013 Addendum. December 20.

Arcadis. 2014. Final Onsite Cleanup Plan, North Pole Refinery, North Pole, Alaska. October.

Arcadis. 2016a. Second Semiannual 2015 Onsite Groundwater Monitoring Report. January 29.

Arcadis. 2016b. First Semiannual 2016 Onsite Groundwater Monitoring Report. July 29.

Barr. 2012a. Site Characterization Report – Through 2011. December.

Barr. 2012b. Technical Memorandum: Proposed Replacement Recovery Wells. Revised January 18 (included as Appendix B of Arcadis 2013c).

Cederstrom, D.J. 1963. Ground-Water Resources of the Fairbanks Area Alaska: U.S. Govt. Print. Off., U.S. Geological Survey Water-Supply. 84 Paper 1590p.

Ferrians, O.J. 1965. Permafrost Map of Alaska. U.S. Geological Survey Miscellaneous Investigations Series Map I-445. 1 plate.

Flint Hills Resources, LLC. 2015. Equitable Servitude made between Flint Hills Resources Alaska, LLC and the State of Alaska. October 1, 2015.

Glass, R.L., M.R. Lilly, and D.F. Meyer. 1996. Ground-water levels in an alluvial plain between the Tanana and Chena Rivers near Fairbanks, Alaska, 1986-93: U.S. Geological Survey Water-Resources Investigations Report 96-4060, 39 p. + 2 appendices. p. 5.

Lilly, M.R., K.A. McCarthy, A.T. Kriegler, J. Vohden, and G.E. Burno. 1996. Compilation and Preliminary Interpretations of Hydrologic and Water-Quality Data from the Railroad Industrial Area, Fairbanks, Alaska, 1993-94. U.S. Geological Survey Water-Resources Investigations Report 96-4049. 75 p.

Miller, J.A., R.L. Whitehead, D.S. Oki, S.B. Gingerich, and P.G. Olcott. 1999. Ground Water Atlas of the United States: Segment 13, Alaska, Hawaii, Puerto Rico, and the U.S. Virgin Islands. U.S. Geological Survey Hydrologic Atlas Number 730-N. 36 p.

Nakanishi, A.S., and M.R. Lilly. 1998. Estimate of aquifer properties by numerically simulating ground-water/surface-water interactions, Fort Wainwright, Alaska: U.S. Geological Survey Water-Resources Investigations Report 98-4088, 35 p.

Shannon and Wilson, Inc. 2002. Site Characterization and Corrective Action Plan, Williams Alaska Petroleum, Inc., North Pole Refinery. June 2002

Shannon and Wilson, Inc. 2005. Report on Well Installation, Maintenance Activities and Data Review, Flint Hills Resources Alaska, Inc., North Pole Refinery. December 2005

Williams, J.R. 1970. Ground Water in the Permafrost Regions of Alaska. U.S. Geological Survey Professional Paper 696. U.S. Government Printing Office, Washington, D.C. 83 p.

FIGURES

LEGEND:

FHRA PROPERTY BOUNDARY

0 0.5 Miles

GRAPHIC SCALE

Note:
Image provided courtesy of Pictometry International 2012

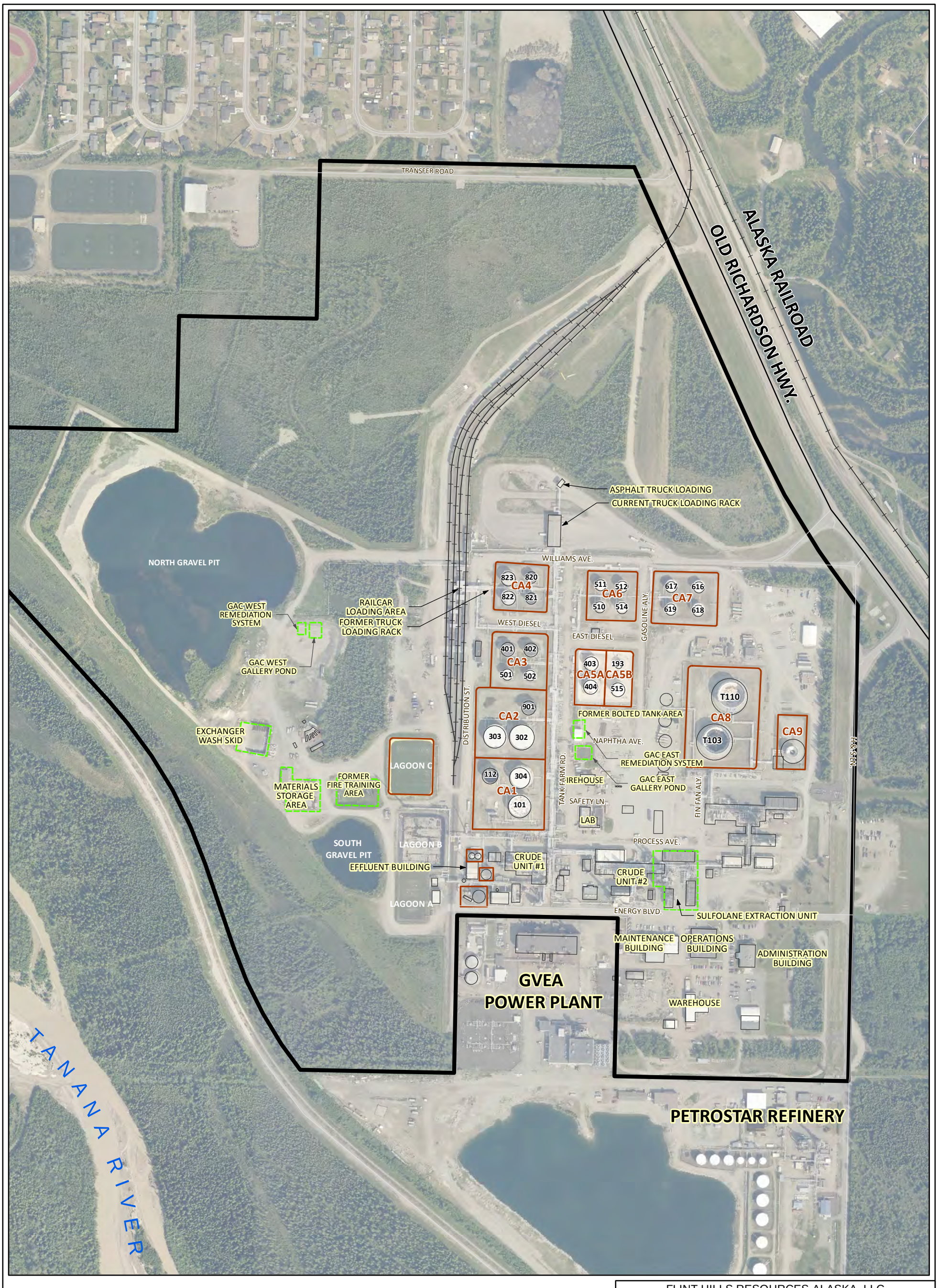
FLINT HILLS RESOURCES ALASKA, LLC
NORTH POLE TERMINAL, NORTH POLE, ALASKA

FINAL ONSITE CLEANUP PLAN

SITE LOCATION

ARCADIS

FIGURE
1-1



Legend

- Bermed Containment Areas (CA)
- Approximate Area
- FHRA Property Boundary

Notes:

GAC: Granular Activated Carbon
GVEA: Golden Valley Electrical Authority
-Image provided courtesy of Pictometry International 2012

0 400 800

SCALE IN FEET

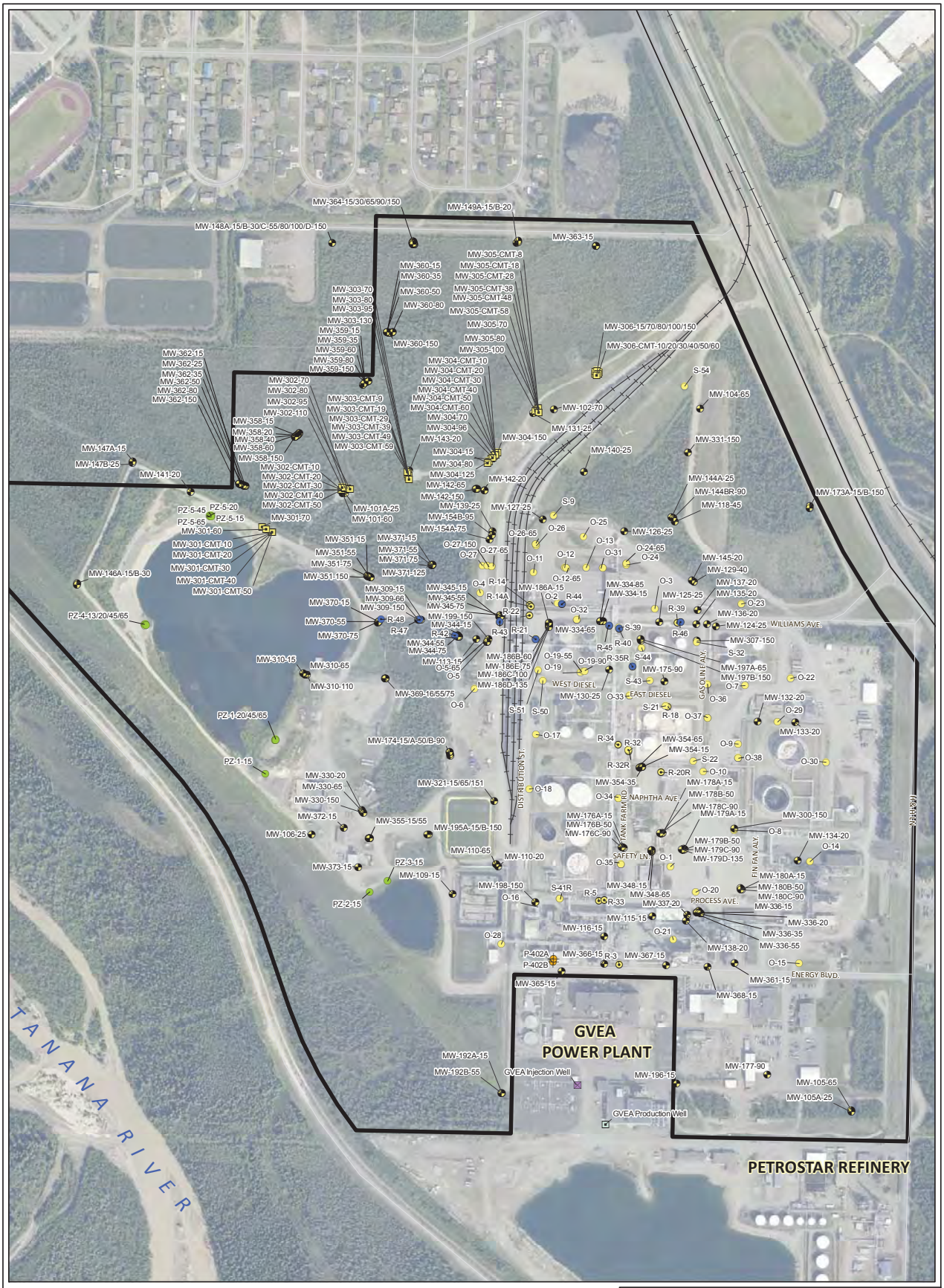
FLINT HILLS RESOURCES ALASKA, LLC
NORTH POLE TERMINAL, NORTH POLE, ALASKA

FINAL ONSITE CLEANUP PLAN

SITE FEATURES

ARCADIS

FIGURE
1-2



Legend

- Monitoring Well
- Observation Well
- Vertical Profile Transect Well
- Recovery Well
- Recovery Well
- GVEA Injection Well (Approximate)
- GVEA Production Well (Approximate)
- Production Wells (Approximate)
- Piezometer
- FHRA Property Boundary
- Major Road
- Local Road
- RAIL LINE

0 400 800

SCALE IN FEET

Notes:
GVEA = Golden Valley Electrical Authority
-Image provided courtesy of Pictometry International 2012

FLINT HILLS RESOURCES ALASKA, LLC
NORTH POLE TERMINAL, NORTH POLE, ALASKA

FINAL ONSITE CLEANUP PLAN

SITE PLAN - ONSITE

ARCADIS

FIGURE
1-3

APPENDIX A

Long-Term Monitoring Plan – 2017 Update

ARCADIS Design & Consultancy for natural and built assets

Flint Hills Resources Alaska, LLC

LONG-TERM MONITORING PLAN – 2017 UPDATE

North Pole Terminal

North Pole, Alaska

ADEC File Number: 100.38.090

Feburary 2, 2017

LONG-TERM MONITORING PLAN – 2017 UPDATE

North Pole Terminal
North Pole, Alaska
ADEC File Number: 100.38.090

Gina Withy
Project Environmental Engineer

Rebecca Andresen
Vice President

Prepared for:

Flint Hills Resources Alaska, LLC

Prepared by:

Arcadis U.S., Inc.
1100 Olive Way
Suite 800
Seattle
Washington 98101
Tel 206 325 5254
Fax 206 325 8218

Our Ref.:

B0081981.0078

Date:

February 2, 2017

CONTENTS

Acronyms and Abbreviations iii

1 Introduction 1

2 Groundwater Sampling Program Objectives 1

3 Groundwater Sampling Frequency and Schedule 1

4 Points of Compliance and Monitoring Networks 2

5 Monitoring Well Networks and Modifications 2

5.1 Groundwater Elevation Monitoring 2

5.2 Light Nonaqueous Phase Liquid 3

5.3 Sulfolane 3

5.4 Other Constituents of Concern 3

5.5 Natural Source Zone Depletion 4

6 Monitoring Data Analysis 5

7 Soil Management 5

8 Reporting Schedule 5

9 Monitoring Well Decommissioning 5

10 References 5

TABLE (IN TEXT)

Table 1. Groundwater Monitoring Frequency and Schedule 2

TABLES (ATTACHED)

Table 3-1. Groundwater Elevation Monitoring Well Network

Table 3-2. LNAPL Migration Monitoring Well Network

Table 3-3. Sulfolane Monitoring Well Network – Onsite

Table 3-4. BTEX Monitoring Well Network

Table 3-5. PFC Monitoring Well Network

Table 3-6. Natural Source Zone Depletion Monitoring

ATTACHMENT

Attachment A – Onsite Soil Management Plan

ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
Arcadis	Arcadis U.S., Inc.
COC	constituent of concern
CSM	conceptual site model
Revised OCP	Revised Onsite Cleanup Plan
DRO	diesel-range organics
FHRA	Flint Hills Resources Alaska, LLC
GRO	gasoline-range organics
ITRC	Interstate Technology & Regulatory Council
LNAPL	light nonaqueous phase liquid
LTM Plan	Long-Term Monitoring Plan – 2017 Update
NSZD	natural source zone depletion
Onsite RSAP	Onsite Revised Sampling and Analysis Plan
Onsite SMP	Onsite Soil Management Plan
PFC	Perfluorinated Compound
POC	point of compliance
site	Flint Hills Resources Alaska, LLC North Pole Terminal, located on H and H Lane in North Pole, Alaska
µg/L	micrograms per liter

1 INTRODUCTION

On behalf of Flint Hills Resources Alaska, LLC (FHRA), Arcadis U.S., Inc. (Arcadis) prepared this Long-Term Monitoring Plan – 2017 Update (LTM Plan), as Appendix A to the Revised Onsite Cleanup Plan (Revised OCP), for the FHRA North Pole Terminal, located on H and H Lane in North Pole, Alaska (site). This LTM Plan includes the following items:

- Groundwater sampling program objectives and schedule.
- Groundwater sampling and analysis plan, including constituents of concern (COCs) and the appropriate sampling frequencies.
- List of monitoring wells to be included in long-term monitoring, including point of compliance wells and selected upgradient and downgradient wells for trend analysis.
- Onsite Soil Management Plan (Onsite SMP; Attachment A).

Groundwater COCs for the site are defined in the 2014 Final Onsite Cleanup Plan (2014 OCP, Arcadis 2014) and updated in the 2017 Revised OCP. This LTM Plan adopts and references information, work, and analysis that are further described in the Onsite Revised Sampling and Analysis Plan (Onsite RSAP; Arcadis 2016a).

2 GROUNDWATER SAMPLING PROGRAM OBJECTIVES

Periodic monitoring of site monitoring wells has been ongoing since 1987. The groundwater concentration data have been integral in developing the conceptual site model (CSM) and documenting current site groundwater conditions. The objectives of the scope of monitoring summarized in this LTM Plan are to:

- Monitor the nature and extent of COCs onsite.
- Evaluate the potential exposure to COCs.
- Evaluate contaminant trends and groundwater modeling predictions.

3 GROUNDWATER SAMPLING FREQUENCY AND SCHEDULE

The groundwater monitoring schedules and frequencies outlined in this LTM Plan supersede those presented in all previous work plans and sampling plans; however, procedures for conducting the activities included in this LTM Plan, such as groundwater level gauging and monitoring well purging, remain the same as outlined in the Onsite RSAP (Arcadis 2016a). The groundwater elevation monitoring network is summarized in Table 3-1. The revised sampling schedule is summarized in Tables 3-2 through 3-6. The following annual schedule is proposed for monitoring based on the monitoring frequencies identified in Table 1.

Table 1. Groundwater Monitoring Frequency and Schedule

Monitoring Frequency	Monitoring Schedule
Semiannual	First and third quarters
Annual	Third quarter

Annual monitoring for light nonaqueous phase liquid (LNAPL) will target the water table minima (typically in late October). Semiannual groundwater monitoring will be completed in the first and third quarters. Annual monitoring will be completed in the third quarter to allow the greatest chance for thawed conditions and to minimize cold weather limitations.

Due to the extreme seasonal cold occasionally preventing field work in the winter months, field staff may not be able to complete the scope of work. If the scope of work identified for the first quarter cannot be completed in the first quarter, it will continue into the second quarter.

4 POINTS OF COMPLIANCE AND MONITORING NETWORKS

The point of compliance (POC) is established as the downgradient property line in the Revised OCP. Monitoring wells at the POC will be monitored to document that applicable cleanup levels (defined in the Final OCP) are being achieved at the site boundary. The POC wells are:

- MW-149A-15
- MW-364
- MW-360
- MW-359
- MW-358
- MW-362.

Not all COCs will be monitored at all depths in the POC wells.

Monitoring wells retained for long-term monitoring and the monitoring networks are summarized in Tables 3-1 through 3-6.

5 MONITORING WELL NETWORKS AND MODIFICATIONS

The following frameworks determined the appropriate monitoring frequencies for individual wells within the monitoring networks.

5.1 Groundwater Elevation Monitoring

The groundwater elevation monitoring well network will be monitored on a semiannual monitoring frequency. Historical gauging data indicate that the overall groundwater gradient and flow direction are

generally consistent. The network for semiannual gauging was selected based on key well locations and to minimize redundancy. Monitoring will include placement of dataloggers in select monitoring wells for a 12-month period starting after shut down of the Groundwater Water Remediation Treatment System (GRTS). The datalogger network and evaluation of the data will follow the networks and procedures detailed in the Hydraulic Gradient Evaluations, included as Appendix J of the First Semiannual 2016 Onsite Groundwater Monitoring Report (Arcadis, 2016b). The monitoring well network is summarized in Table 3-1.

5.2 Light Nonaqueous Phase Liquid

Periodic LNAPL monitoring will be used in conjunction with annual natural source zone depletion (NSZD) monitoring (Section 5.5) to confirm that the LNAPL plume will not migrate to the property boundary. Annual monitoring will be conducted at select wells located at the downgradient extent of the LNAPL plume. The LNAPL monitoring program is shown on Table 3-2.

5.3 Sulfolane

In accordance with the Revised OCP the onsite cleanup objective for sulfolane in groundwater will be measured at the POC wells listed in Section 4. Monitoring well locations were selected based on the following:

- Establishing monitoring points at the POC (the site boundary) at multiple depths.
- Continuing monitoring at wells located within the core of the sulfolane plume to document plume decay.
- Establishing a monitoring well network that is spatially distributed across the site to reasonably document the vertical and horizontal distribution of sulfolane concentrations across the site upgradient of the POC monitoring wells. The locations and sampling frequencies were determined based on the extensive monitoring performed to date, understanding of the past effect of the hydraulic control systems on groundwater and COC transport, groundwater modeling and predicted COC transport patterns subsequent to shutdown of the groundwater treatment systems.

Wells selected for sulfolane monitoring and the monitoring frequency are shown in Table 3-3.

5.4 Other Constituents of Concern

Other COCs in groundwater are identified in the 2017 Revised OCP (Table 2-1). Benzene, toluene, ethylbenzene, and total xylenes (BTEX) monitoring will be conducted to monitor hydrocarbon-related impacts. Additionally, select monitoring wells will be analyzed for 1,2,4-Trimethylbenzene, 1,3,5-Trimethylbenzene, and 1-Methylnaphthalene annually for three years. BTEX, gasoline-range organics (GRO) and diesel-range organics (DRO) monitoring will be conducted annually in conjunction with NSZD monitoring, described in Section 5.5.

A BTEX monitoring network was selected that is spatially distributed across the site to reasonably document the horizontal distribution of hydrocarbon concentrations across the site upgradient of the POC monitoring wells. The locations and sampling frequencies were determined based on the extensive

monitoring performed to date, understanding of the past effect of the hydraulic control systems on groundwater and COC transport, groundwater modeling and predicted COC transport patterns subsequent to shutdown of the groundwater treatment systems. Wells selected for BTEX monitoring and the monitoring frequency are shown in Table 3-4.

Because of the historical use of a fire training area in the southwest portion of the NPT, previous soil and groundwater investigations and monitoring events were completed for the characterization of perfluorinated compounds (PFCs) in soil and groundwater. Detections of PFCs were identified generally in the southwest part of the NPT (Arcadis 2013). Upon the implementation of the Revised OCP two annual groundwater monitoring events for PFCs will be completed by sampling a select number of monitoring wells to document groundwater conditions. This sampling approach considers the length of time since the last use of the fire training area (2009), rate of groundwater movement, limited historical detections, and subsequent excavation in the fire training area. Wells selected for PFC monitoring are shown in Table 3-5.

5.5 Natural Source Zone Depletion

Annual NSZD monitoring in the saturated zone will be conducted following protocols outlined in the Technology Overview for Evaluating Natural Source Zone Depletion at Sites with LNAPL (Interstate Technology & Regulatory Council [ITRC] 2009). This monitoring will be performed for 10 years unless cleanup objectives for LNAPL are not being met. NSZD rates will be calculated using a mass balance approach. LNAPL attenuation through dissolution and biodegradation will be quantified by assessing groundwater quality upgradient, downgradient, and within the LNAPL plume. BTEX assimilative capacity calculations will be performed. A summation of the mass flux of electron acceptors into and out of the plume combined with mass flux of dissolved-phase petroleum constituents out of the plume will be used to quantify dissolved-phase NSZD rates (ITRC 2009).

Twelve monitoring wells will be sampled annually for the NSZD parameters during the third quarter to evaluate the potential for NSZD to occur at the site. NSZD groundwater samples will be collected in accordance with the Onsite RSAP (Arcadis 2016a).

For quantifying dissolution and biodegradation in the saturated zone, the required data include:

- Hydraulic parameters such as hydraulic gradient and groundwater flow direction. These parameters will be estimated based on routine gauging data collected at the site.
- Horizontal and vertical dimensions of the LNAPL source zone. The LNAPL source zone dimensions will be determined based on GRO and DRO concentrations in groundwater within, upgradient, and downgradient of the source zone.
- Source Zone BTEX concentrations.
- Presence of dissolved electron acceptors (e.g., oxygen and sulfate) and reaction products (e.g., ferrous iron, manganese (II), and methane) in groundwater within, upgradient, and downgradient of the source zone. This can be accomplished by collecting groundwater samples and analyzing for these parameters using appropriate analytical methods. Nitrate monitoring is not included as an NSZD monitoring parameter because it has been consistently nondetect at the site.

Monitoring wells and analytical parameters for NSZD monitoring are summarized in Table 3-6.

6 MONITORING DATA ANALYSIS

The proposed groundwater monitoring network and sampling frequencies are based on the extensive investigation efforts and resulting data that characterized the nature and extent of COCs at the NPT. The monitoring network is designed to support sufficient data trend analysis to track the COC attenuation at the site relative to the Cleanup Objectives established in the Revised OCP. Sulfolane and benzene concentration trends will be prepared and evaluated in semiannual reports.

7 SOIL MANAGEMENT

Site workers, contractors, and other third parties performing ground-disturbing activities within the site boundary will properly manage soil potentially contaminated with COCs (or “impacted soil”). The Onsite SMP (Attachment A) provides guidance for potential ground-disturbing activities to protect workers from exposure to impacted soil associated with former site operations.

8 REPORTING SCHEDULE

Monitoring results will continue to be reported in semiannual groundwater monitoring reports on or before July 31 and January 31 of each year. Groundwater monitoring as described in this LTM Plan will continue for 10 years from the date of the Final OCP. At the end of that time period, assuming cleanup objectives are still being met, the groundwater monitoring work under this LTM Plan and any subsequent amendments could be considered completed.

9 MONITORING WELL DECOMMISSIONING

Monitoring wells not used for monitoring or sampling, as identified in this LTM Plan, will be decommissioned after an evaluation of at least one year of data collected from the updated sampling networks. Wells that are no longer required will be decommissioned in accordance with the ADEC Monitoring Well Guidance (ADEC 2013). Planned well decommissioning will be presented in the semiannual groundwater monitoring reports.

10 REFERENCES

ADEC. 2013. Monitoring Well Guidance. ADEC Division of Spill Prevention and Response, Contaminated Sites Program. September.

Arcadis. 2013. Perflourinated Compounds Investigation Report, North Pole Refinery, North Pole, Alaska. February 15.

Arcadis. 2014. Final Onsite Cleanup Plan, North Pole Refinery, North Pole, Alaska. October.

Arcadis. 2015. Long-Term Monitoring Plan – 2015 Update. December.

Arcadis. 2016a. Onsite Revised Sampling and Analysis Plan. January 29.

Arcadis. 2016b. First Semiannual 2016 Onsite Groundwater Monitoring Report. July 29.

ITRC. 2009. Technology Overview for Evaluating Natural Source Zone Depletion at Sites with LNAPL. Washington, D.C.: Interstate Technology & Regulatory Council, LNAPLs Team. April.

TABLES

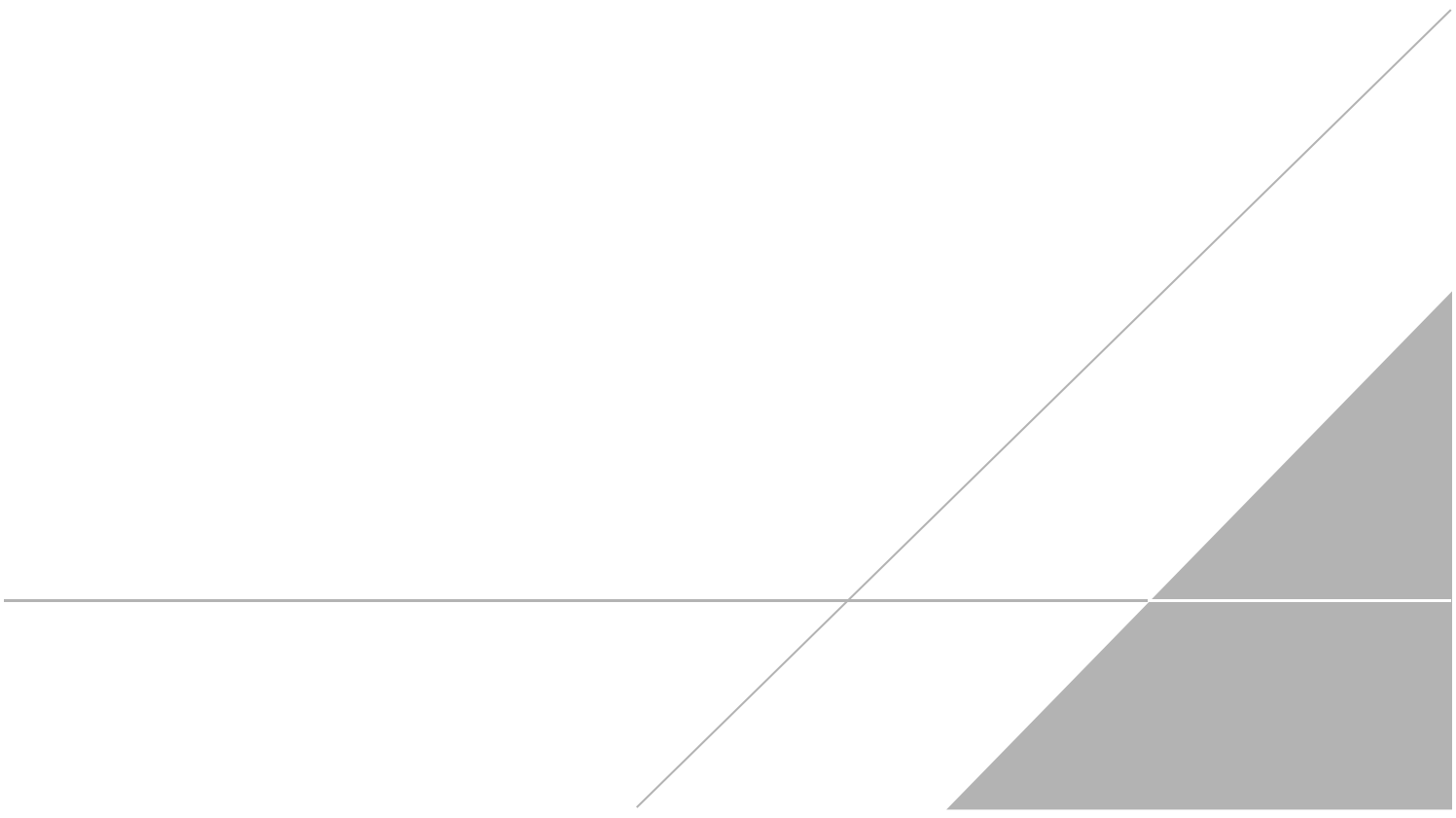


Table 3-1

Groundwater Elevation Monitoring Well Network
Long-Term Monitoring Plan
Flint Hills Resources Alaska, LLC
North Pole Terminal, North Pole, Alaska

Well	Monitoring Frequency	Zone
MW-104-65	Semiannual	10-55
MW-142-20	Semiannual	Water Table
MW-144BR-90	Semiannual	55-90
MW-145-20	Semiannual	Water Table
MW-149A-15	Semiannual	Water Table
MW-173B-150	Semiannual	90-160
MW-174-15	Semiannual	Water Table
MW-174A-50	Semiannual	10-55
MW-174B-90	Semiannual	55-90
MW-176A-15	Semiannual	Water Table
MW-176B-50	Semiannual	10-55
MW-186A-15	Semiannual	Water Table
MW-186B-60	Semiannual	10-55
MW-192A-15	Semiannual	Water Table
MW-192B-55	Semiannual	10-55
MW-198-150	Semiannual	90-160
MW-300-150	Semiannual	90-160
MW-301-60	Semiannual	10-55
MW-302-CMT-50	Semiannual	10-55
MW-302-80	Semiannual	55-90
MW-303-80	Semiannual	55-90
MW-303-CMT-59	Semiannual	10-55
MW-306-80	Semiannual	55-90
MW-309-15	Semiannual	Water Table
MW-310-15	Semiannual	Water Table
MW-310-110	Semiannual	90-160
MW-321-15	Semiannual	Water Table
MW-334-15	Semiannual	Water Table
MW-336-20	Semiannual	Water Table
MW-358-20	Semiannual	Water Table
MW-358-40	Semiannual	10-55
MW-358-60	Semiannual	10-55
MW-359-15	Semiannual	Water Table
MW-359-60	Semiannual	10-55
MW-359-80	Semiannual	55-90
MW-360-15	Semiannual	Water Table
MW-360-50	Semiannual	10-55
MW-360-80	Semiannual	55-90
MW-360-150	Semiannual	90-160
MW-362-15	Semiannual	Water Table
MW-362-50	Semiannual	10-55
MW-362-150	Semiannual	90-160
MW-364-15	Semiannual	Water Table
MW-364-65	Semiannual	10-55
MW-364-90	Semiannual	55-90
MW-366-15	Semiannual	Water Table
North Gravel Pit	Semiannual	Gravel Pit

Table 3-1

Groundwater Elevation Monitoring Well Network
Long-Term Monitoring Plan
Flint Hills Resources Alaska, LLC
North Pole Terminal, North Pole, Alaska

Well	Monitoring Frequency	Zone
O-34	Semiannual	Water Table

General Notes:
GRTS - Groundwater Remediation Treatment System

Table 3-2

LNAPL Migration Monitoring Well Network
Long-Term Monitoring Plan
Flint Hills Resources Alaska, LLC
North Pole Terminal, North Pole, Alaska

Well	Frequency	Notes
MW-139-25	Annual	
MW-142-20	Annual	
MW-145-20	Annual	
MW-334-15*	Monthly (3 events) then Quarterly (3 events)	One Year Monitoring, to be initiated upon GRTS shutdown
MW-345-15*	Quarterly (4 events)	One Year Monitoring, to be initiated upon GRTS shutdown
O-2*	Quarterly (4 events)	One Year Monitoring, to be initiated upon GRTS shutdown
O-11	Annual	
O-12	Annual	
O-24	Annual	
O-25	Annual	
O-26	Annual	
O-27	Annual	
O-31*	Monthly (3 events), Quarterly (3 events), then Annual	
O-4	Annual	
O-5	Annual	
O-7	Annual	
R-21*	Monthly (3 events) then Quarterly (3 events)	One Year Monitoring, to be initiated upon GRTS shutdown
R-35R*	Quarterly (4 events)	One Year Monitoring, to be initiated upon GRTS shutdown
R-40*	Monthly (3 events) then Quarterly (3 events)	One Year Monitoring, to be initiated upon GRTS shutdown

Acronyms and Abbreviations:
LNAPL = light nonaqueous phase liquids
* Monitoring schedule for one year following GRTS shutdown.
GRTS - Groundwater Remediation Treatment System
Annual gauging to be conducted in late October

Table 3-3

Sulfolane Monitoring Well Network - Onsite
Long-Term Monitoring Plan
Flint Hills Resources Alaska, LLC
North Pole Terminal, North Pole, Alaska

Well	Zone	Routine Frequency	12 Month Post-GRTS Shutoff Sampling*
MW-127-25	10-55	Annual	Quarterly
MW-130-25	10-55	---	Quarterly
MW-139-25	10-55	Annual	Quarterly
MW-142-20	WT	Annual	Semiannual
MW-145-20	WT	Every 2 years	---
MW-148A-15	WT	Semiannual	
MW-148B-30	10-55	Semiannual	
MW-148C-55	10-55	Semiannual	
MW-148-80	55-90	Semiannual	
MW-149A-15	WT	Every 4 years	---
MW-154B-95	55-90	Annual	Quarterly
MW-176A-15	WT	Semiannual	---
MW-186A-15	WT	Semiannual	Quarterly
MW-186B-60	10-55	Annual	---
MW-186E-75	55-90	---	Quarterly
MW-301-CMT-20	WT	Every 4 years	Quarterly
MW-301-60	10-55	Every 4 years	Quarterly
MW-302-CMT-20	WT	Annual	Quarterly
MW-302-CMT-50	10-55	Every 2 years	Quarterly
MW-302-80	55-90	Every 2 years	Quarterly
MW-303-CMT-19	WT	Semiannual	Quarterly
MW-303-CMT-39	10-55	Annual	Quarterly
MW-303-CMT-59	10-55	Annual	Quarterly
MW-303-80	55-90	Every 2 years	Quarterly
MW-304-CMT-20	WT	Semiannual	Quarterly
MW-304-CMT-40	10-55	Annual	Quarterly
MW-304-CMT-60	10-55	Annual	Quarterly
MW-304-80	55-90	Every 2 years	Quarterly
MW-305-CMT-28	10-55	Annual	Quarterly
MW-305-CMT-48	10-55	Every 2 years	Quarterly
MW-309-15	WT	Annual	---
MW-310-15	WT	Annual	---
MW-330-20	WT	Semiannual	
MW-334-15	WT	Semiannual	Monthly (3 events) then Quarterly (3 events)
MW-334-65	10-55	---	Quarterly
MW-334-85	55-90	---	If needed based on shallow results
MW-336-20	WT	Semiannual	---
MW-344-15	WT	---	Monthly (3 events) then Quarterly (3 events)
MW-344-55	10-55	---	If needed based on shallow results
MW-344-75	55-90	---	If needed based on shallow results
MW-345-15	WT	Semiannual	Monthly (3 events) then Quarterly (3 events)
MW-345-55	10-55	Annual	Quarterly
MW-345-75	55-90	---	If needed based on shallow results
MW-354-35	10-55	Semiannual	---
MW-358-20	WT	Every 2 years	---
MW-358-40	10-55	Every 2 years	---
MW-358-60	10-55	Every 2 years	---
MW-359-15	WT	Annual	---
MW-359-35	10-55	Annual	---
MW-359-60	10-55	Annual	---
MW-359-80	55-90	Every 2 years	---

Table 3-3

Sulfolane Monitoring Well Network - Onsite
Long-Term Monitoring Plan
Flint Hills Resources Alaska, LLC
North Pole Terminal, North Pole, Alaska

Well	Zone	Routine Frequency	12 Month Post-GRTS Shutoff Sampling*
MW-360-15	WT	Annual	---
MW-360-35	10-55	Annual	---
MW-360-50	10-55	Annual	---
MW-360-80	55-90	Every 2 years	---
MW-362-15	WT	Every 4 years	---
MW-362-50	10-55	Every 4 years	---
MW-364-15	WT	Every 2 years	---
MW-364-30	10-55	Every 2 years	---
MW-364-65	10-55	Every 2 years	---
MW-364-90	55-90	Every 2 years	---
MW-371-15	WT	Annual	---
MW-372-15	WT	Semiannual	---
O-1	WT	Semiannual	---
O-2	WT	Semiannual	Monthly (3 events) then Quarterly (3 events)
O-11	WT	---	Quarterly
O-12	WT	---	Quarterly
O-13	WT	---	Quarterly
O-19	WT	---	Quarterly
O-19-90	55-90	---	Quarterly
O-24	WT	Semiannual	
O-26	WT	Semiannual	---
O-26-65	10-55	Annual	---
O-27	WT	Semiannual	Quarterly
O-27-65	10-55	Annual	---
O-31	WT	---	Quarterly
O-34	WT	Semiannual	---
R-21	WT	---	Monthly (3 events) then Quarterly (3 events)
R-35R	WT	---	Monthly (3 events) then Quarterly (3 events)
R-40	WT	---	Quarterly
S-51	WT	Annual	Quarterly

General Notes:

* One year sampling program to be initiated following GRTS shutdown. Sampling to revert to Routine Frequency at the conclusion of the one year program.
GRTS - Groundwater Remediation Treatment System
--- - No monitoring planned
Semiannual wells will be sampled during the first and third quarters of the year.
Annual wells will be sampled during the third quarter of the year.

Table 3-4

BTEX Monitoring Well Network
Long-Term Monitoring Plan
Flint Hills Resources Alaska, LLC
North Pole Terminal, North Pole, Alaska

Well	Routine Frequency	12 Month Post-GRTS Shutdown Sampling
MW-101A-25	Annual	---
MW-130-25*	Annual	Quarterly
MW-131-25	Annual	---
MW-135-20*	Annual	Monthly (3 events) then Quarterly (3 events)
MW-137-20**	Annual	Additional COCs annually for three years
MW-139-25**	Semiannual	Quarterly, additional COCs annually for three years
MW-140-25	Semiannual	---
MW-142-20**	Semiannual	Semiannual, additional COCs annually for three years
MW-143-20	Annual	---
MW-144A-25	Every 2 years	---
MW-145-20**	Annual	Additional COCs annually for three years
MW-149A-15	Every 2 years	---
MW-176A-15	Annual	---
MW-303-CMT-19	---	Annual
MW-304-CMT-20	---	Annual
MW-305-CMT-28	---	Annual
MW-321-15	Every 2 years	---
MW-334-15	---	Quarterly
MW-344-15	---	Semiannual
MW-344-55	---	If needed based on shallow results
MW-344-75	---	If needed based on shallow results
MW-345-15	---	Quarterly
MW-351-15	Every 2 years	---
MW-358-15	Every 2 years	---
MW-360-15	Every 2 years	---
O-2*	Annual	Quarterly
O-3	Annual	---
O-4	Annual	---
O-24	Annual	---
R-21	---	Quarterly
R-35R	---	Quarterly
R-39	---	Monthly (3 events) then Quarterly (3 events)
R-40	---	Quarterly
S-9	Semiannual	---

Acronyms and Abbreviations:
BTEX = benzene, toluene, ethylbenzene, and total xylenes

* One year sampling program to be initiated following GRTS shutdown. Sampling to revert to Routine Frequency at the conclusion of the one year program.
**Annual analysis to include 1,2,4-Trimethylbenzene, 1,3,5-Trimethylbenzene, and 1-Methylnaphthalene, third quarter for three years
GRTS - Groundwater Remediation Treatment System
--- - No monitoring planned

Table 3-5

PFC Monitoring Well Network
Long-Term Monitoring Plan
Flint Hills Resources Alaska, LLC
North Pole Terminal, North Pole, Alaska

Well	Zone
MW-309-15	WT
MW-321-15	WT
MW-358-20	WT
MW-359-15	WT
MW-359-35	10-55
MW-362-15	WT
MW-362-25	10-55
MW-364-15	WT
MW-364-30	10-55

Acronyms and Abbreviations:
PFC = Perfluorinated Compounds
WT - Water Table

Table 3-6

Natural Source Zone Depletion Monitoring Network
Long-Term Monitoring Plan
Flint Hills Resources Alaska, LLC
North Pole Terminal, North Pole, Alaska

Location	Well ID	BTEX	TPH - GRO	TPH - DRO	E- acceptors		Biodegradation Products		
					Oxygen	Sulfate	Ferrous Iron	Manganese (II)	Methane
Upgradient	MW-192-15	X	X	X	X	X	X	X	X
Upgradient	O-15	X	X	X	X	X	X	X	X
Background	MW-369-16	X	X	X	X	X	X	X	X
Downgradient	MW-145-20	X	X	X	X	X	X	X	X
Downgradient	MW-142-20	X	X	X	X	X	X	X	X
Downgradient	MW-101A-25	X	X	X	X	X	X	X	X
Source Zone	MW-116-15	X	X	X	X	X	X	X	X
Source Zone	MW-125-25	X	X	X	X	X	X	X	X
Source Zone	MW-130-25	X	X	X	X	X	X	X	X
Source Zone	MW-135-20	X	X	X	X	X	X	X	X
Source Zone	MW-180A-15	X	X	X	X	X	X	X	X
Source Zone[1]	MW-348-15	X	X	X	X	X	X	X	X
Source Zone	MW-321-15	X	X	X	X	X	X	X	X
Source Zone	MW-336-20	X	X	X	X	X	X	X	X
Source Zone[2]	MW-138-20	X	X	X	X	X	X	X	X

General Notes:

NSZD monitoring will be conducted quarterly for one year following GRTS shutdown, and then will revert to annual in the third quarter

[1] Monitoring well MW-348-15 is a backup well in the event that monitoring well MW-180A-15 is frozen and cannot be sampled.

[2] Monitoring well MW-138-20 is a backup well in the event that monitoring well MW-336-20 is frozen and cannot be sampled.
In the event a well is frozen and cannot be sampled, an alternate well should be selected (if not already identified)
If LNAPL is present, the LNAPL will be removed and the well sampled per the Sampling and Analysis Plan.

Acronyms and Abbreviations:
TPH = total petroleum hydrocarbons
GRO = gasoline range organics
DRO = diesel range organics

ATTACHMENT A

Onsite Soil Management Plan

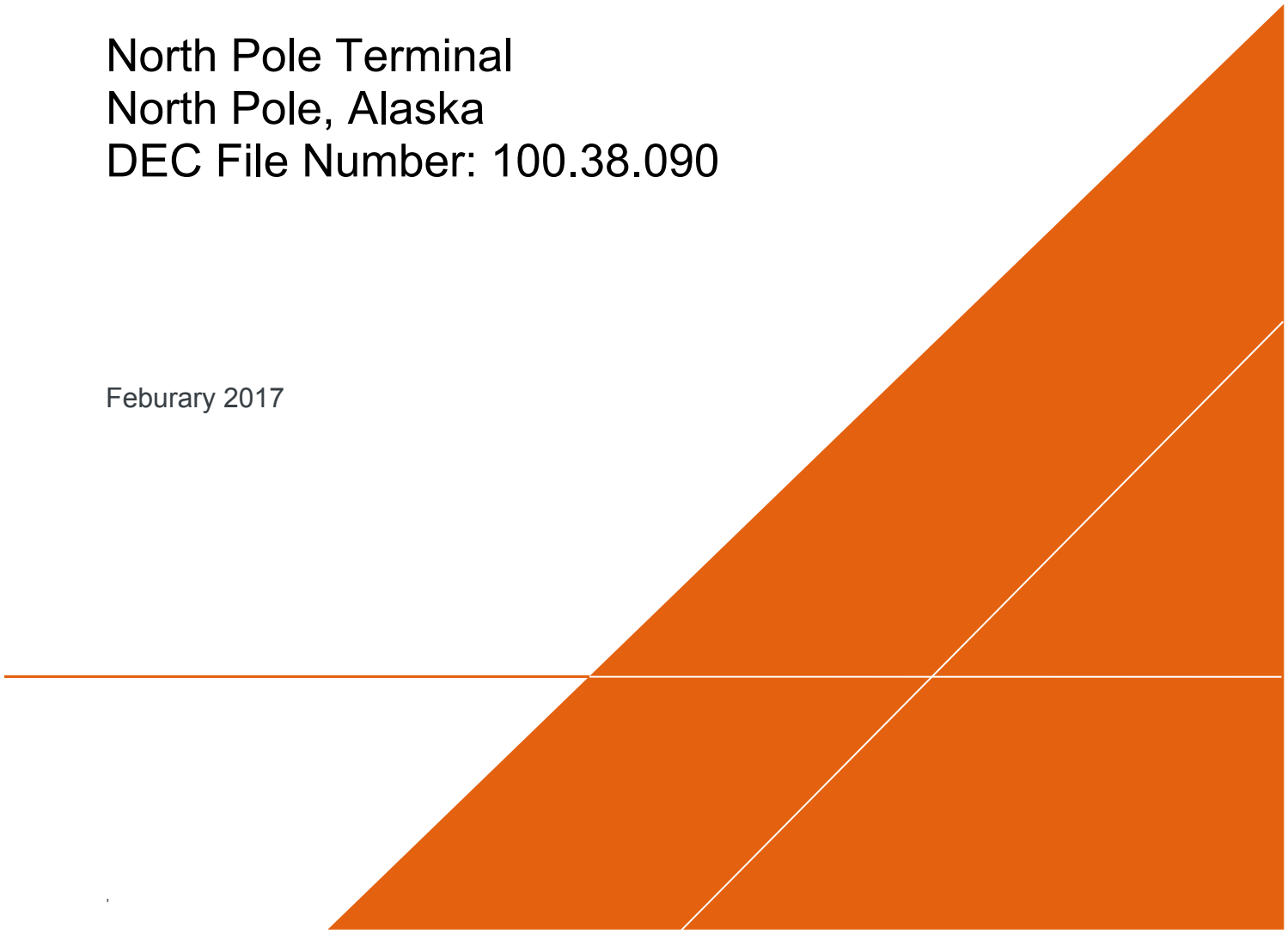
ARCADIS Design & Consultancy for natural and built assets

Flint Hills Resources Alaska, LLC

ONSITE SOIL MANAGEMENT PLAN

North Pole Terminal
North Pole, Alaska
DEC File Number: 100.38.090

Feburary 2017



ONSITE SOIL MANAGEMENT PLAN

North Pole Terminal

North Pole, Alaska

Gina Withy
Project Engineer

Rebecca Andresen
Vice President

Prepared for:

Flint Hills Resources Alaska, LLC

Prepared by:

Arcadis U.S., Inc.

1100 Olive Way

Suite 800

Seattle

Washington 98101

Tel 206.726.4717

Our Ref.:

B0081981.0072.0001

Date:

Feburary 2017

CONTENTS

1 Introduction 1
2 Background 1
2.1 Site Characterization Background 1
2.2 Constituents of Concern 1
3 Compliance with Soil Management Requirements 2
3.1 Contaminated Soils Management Requirements 3
4 Health and Safety Plan 3
5 Worker Health and Safety Training 4
6 Soil Management Plan Amendments 5
7 References 5

TABLE

Table 2-1. Constituents of Concern in Soil 2

ATTACHMENT

A. Map of Potential Contamination

1 INTRODUCTION

On behalf of Flint Hills Resources Alaska, LLC (FHRA), Arcadis U.S., Inc. (Arcadis) prepared this Onsite Soil Management Plan (Onsite SMP) for the FHRA North Pole Terminal (NPT), an idled petroleum refinery located on H and H Lane in North Pole, Alaska (site). Future land use of the property will remain consistent with an industrial manufacturing setting given its significant infrastructure and capabilities. The purpose of this Onsite SMP is to provide guidance for potential ground-disturbing activities to protect workers from exposure to impacted soil associated with former site operations. This Onsite SMP applies to ground-disturbing activities by the Property Owner and operators, on-site contractors, and future Property Owners and operators, and should be used in conjunction with existing NPT health and safety policies for excavation.

To supplement this Onsite SMP, project-specific soil plans may be developed to identify responsibilities and procedures for onsite soil management based on the scope and extent of a specific project. This Onsite SMP provides general guidance on the roles and responsibilities for emergency, routine maintenance, or short lead-time ground-disturbing activities.

2 BACKGROUND

The 240-acre site is located inside the city limits of North Pole, Alaska (the city). The city is located approximately 13 miles southeast of Fairbanks, Alaska, within the Fairbanks North Star Borough. The physical setting for the site is described in the Onsite Site Characterization Report – 2013 Addendum (Arcadis 2013b).

2.1 Site Characterization Background

A series of site characterization reports collectively present an extensive body of information that has been gathered to ascertain the physical characteristics of the site, define the sources of contamination, and determine the nature and extent of contamination present at the site. These reports are listed below:

- Site Characterization Report – Through 2011 (Barr Engineering Company 2012)
- Site Characterization Report – 2012 Addendum (Arcadis 2013a)
- Onsite Site Characterization Report – 2013 Addendum (Arcadis 2013b)

For this Onsite SMP, the term “onsite” is the area that is located within the property boundary of the FHRA NPT. This Onsite SMP only applies to excavations that occur more than 12 inches below the soil surface, although all contaminated soil must be properly managed per Alaska Department of Environmental Conservation (ADEC) regulations.

2.2 Constituents of Concern

Extensive sampling of soil was completed for numerous constituents of potential concern (COPCs) to develop a list of constituents of concern (COCs) for the site. COCs were identified based on a comparison of site maximum concentrations to Method 2 cleanup levels for soil (Table B1 and B2 of 18 AAC 75.341(c)) for those constituents listed in Table 2-1.

Table 2-1. Constituents of Concern in Soil

Soil COC	Maximum Concentration (mg/kg)	Soil Cleanup Level[1] (mg/kg)
1,2,4-Trimethylbenzene	205	0.16
1,3,5-Trimethylbenzene	81.1	1.3
1,2,3 Trichloropropane	0.374	3.1×10^{-5}
Benzene	438	0.022
Cumene	41.6	5.6
Ethylbenzene	392	0.13
n-Butylbenzene	107	20
n-Propylbenzene	72.7	9.1
Toluene	1,330	6.7
Xylenes	2,510	1.5
1-Methylnaphthalene	88.5	0.41
2-Methylnaphthalene	240	1.3
Naphthalene	125	0.038
Sulfolane	1,620	TBD
Perfluorooctane sulfonate (PFOS)	3	0.003
Perfluorooctanoic acid (PFOA)	0.048	0.0017
Gasoline range organics	7,730	300
Diesel range organics	32,000	250

Notes:

1 Soil cleanup level set at the minimum value of the direct contact, outdoor inhalation and migration to groundwater value in 18 AAC 75 Table B1 and B2 for the under 40-inch zone (November 6, 2016).

mg/kg = milligrams per kilogram

TBD = to be determined

3 COMPLIANCE WITH SOIL MANAGEMENT REQUIREMENTS

NPT workers, contractors, and other third parties performing ground-disturbing activities within the site boundary will properly manage soil potentially contaminated with COCs (or “impacted soil”). Ground-disturbing activities include any man-made cut, boring, cavity, trench or depression in an earth surface, formed by earth removal. FHRA considers any dig of 12 inches or more an Excavation.

This Onsite SMP will be used in conjunction with existing NPT policies for Excavation activities. Soil management requirements for contaminated soils are defined below. Excavated soil will be properly characterized. Soil will be properly managed, transported, and disposed of in accordance with all state, federal and international laws and regulations.

3.1 Contaminated Soils Management Requirements

The area of the facility where soil may be found that is contaminated is identified in Attachment A. Pursuant to the FHRA Excavation Procedure, any excavation for the purpose of remediation that will take place will be subject to an excavation permit and will be supervised by the qualified person assigned to the excavation project.

For excavation that involves repair and replacement of existing infrastructure, excavated contaminated soil appropriate for use as fill material will be placed back in the excavation where it originated. For new construction or demolition activities, excavated contaminated soil may be used as backfill with prior ADEC approval. Obviously contaminated soils containing saturated levels of hydrocarbons or other COC will not be replaced unless a suitable replacement is not available and an unacceptable safety condition would result.

Basic requirements for handling contaminated soils excavated from the subsurface are as follows:

- Notify FHRA personnel and obtain an Excavation Permit pursuant to FHRA's procedures prior to any excavation.
- Do not transfer, remove, or otherwise move contaminated soils from a contaminated area to a non-contaminated area, or from one contaminated area to another contaminated area without properly emplacing engineering controls to mitigate potentially spreading contamination. Directions will be provided by FHRA regarding the handling, management, and transport of any excess contaminated soils that will not be returned to the excavation for re-use.
- Avoid mixing contaminated and uncontaminated soils during excavation or repeated handling to minimize potential waste generation.
- Excavation equipment that comes in contact with contaminated soils must be properly decontaminated before transport offsite or to an uncontaminated area of the property.

If new areas of contamination are discovered while excavation is occurring in areas previously believed to be uncontaminated, it will be necessary to halt work in these areas. Under these circumstances, excavation activities will stop to ensure appropriate FHRA personnel and ADEC have been notified that actual or potential contaminated soils have been encountered. This work delay will allow FHRA to ensure that the appropriate health and safety and soil management procedures are in place before continuing.

4 HEALTH AND SAFETY PLAN

A site-specific Health and Safety Policy (HSP-06, Alaska Excavation Procedure) has been and will continue to be used to protect the health and safety of subsurface workers when subsurface work is conducted at the site. The HSP conforms to the requirements established under 29 Code of Federal Regulations (CFR) 1910.120, including the use of appropriately trained workers, monitoring and

identification of contaminated media, site health and safety officer's authorities and responsibilities, and health and safety meetings for applicable site personnel.

The Excavation Procedure requires anyone involved with subsurface work to use a minimum level of personal protective equipment (PPE) (e.g., protective clothing, work-appropriate gloves and boots, etc.) to protect against the COCs identified at the site. HSP-06 defines appropriate air monitoring protocols, PPE requirements, and worker decontamination.

Hazards associated with the site and the content of the Excavation Procedure are communicated to site workers prior to commencing Excavation work and during daily tailgate safety meetings. Site-specific hazards, changes in site conditions, safe work practices, PPE requirements, emergency procedures, and notification protocols will be discussed with the site workers as part of the Safe Work Permitting process.

The map included in Attachment A is also included in the Excavation Procedure and identifies areas containing COCs. In order to excavate in the areas identified on the map, employees, contractors and other third parties must obtain an Excavation Permit from trained FHRA employee. That employee's training will include identification of areas located within the map so that persons undertaking the excavation can undertake appropriate precautions.

The primary hazard relevant to this Onsite SMP is soil impacted by COCs identified in Table 2-1. The majority of the COCs are related to petroleum hydrocarbons. As the site operations directly involve the handling and storage of petroleum hydrocarbons, the site is very familiar and experienced with the health and safety requirements necessary to ensure workers are properly protected. The primary routes of exposure include inhalation of volatilized constituents in trench air. However, direct contact with soil impacted by other constituents associated with historical operations, including sulfolane, is also considered. Excavation work conducted at the NPT in areas of impacted soil, or areas with soil suspected to be impacted, requires the issuance of a Safe Work Permit prior to commencing work. This includes, but is not limited to, permission by operations personnel to work in an area, a discussion of potential hazards and associated risk mitigation activities, completion of an Excavation checklist, and designation of only authorized workers to be performing work within the work area.

Appropriate worker hygiene is required so that individuals will not inadvertently ingest or inhale impacted soil particles adhering to gloves or clothing, or ingest impacted groundwater. Work within the Excavation areas containing impacted soil is anticipated to require modified Level D PPE for workers who could potentially come into contact with impacted soil and/or groundwater. Modified Level D PPE includes: steel-toed boots, hard hat, and protective eyewear. Chemical-resistant gloves and/or respirators, as well as decontamination requirements, would be required if hazards are identified by the Excavation Competent Person or as part of the Safe Work Permitting Process.

5 WORKER HEALTH AND SAFETY TRAINING

The Alaska Occupational Safety and Health Program generally follows federal Occupational Safety and Health Administration (OSHA) requirements. According to OSHA 29 CFR 1910.120(e), workers and field supervisors that are engaged in hazardous substance removal as part of cleanup operations are required to have received either 24- or 40-hour Hazardous Waste Operations and Emergency Response training from a qualified vendor.

6 SOIL MANAGEMENT PLAN AMENDMENTS

This Onsite SMP may be amended and approved by the Property Owner as necessary to address changes in ownership, NPT operations, regulatory changes, or other requirements. A project-specific soil management plan may be prepared based on the proposed scope of future work.

7 REFERENCES

Arcadis U.S., Inc. 2013a. Site Characterization Report – 2012 Addendum. January 25, 2013.

Arcadis U.S., Inc. 2013b. Onsite Site Characterization Report – 2013 Addendum. December 20, 2013.

Barr Engineering Company. 2012. Site Characterization Report – Through 2011. December 2012.

ATTACHMENT A

Map of Potential Contamination

Legend

Soil potentially contaminated with BTEX or Sulfolane

FHRA Property Boundary

0 600 1,200

SCALE IN FEET

FLINT HILLS RESOURCES ALASKA, LLC
NORTH POLE TERMINAL, NORTH POLE, ALASKA

ONSITE SOIL MANAGEMENT PLAN

MAP OF POTENTIALLY CONTAMINATED SOIL

ARCADIS

Appendix
A

Arcadis U.S., Inc.

1100 Olive Way

Suite 800

Seattle, Washington 98101

Tel 206 325 5254

Fax 206 325 8218

www.arcadis.com