U.S. Army Corps of Engineers
Alaska District

SECOND PERIODIC REVIEW REPORT FOR MULTIPLE SITES

NORTHEAST CAPE FUDS
ST. LAWRENCE ISLAND, ALASKA

Formerly Used Defense Site No. F10AK0969-03

FINAL
SEPTEMBER 2020

F10AK096903_07.11_0512_a
1200C PERM

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APPROVED BY: **DATE:**

________________________________ ____________________

Damon A. Delarosa
Colonel, Corps of Engineers
District Commander

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APPENDICES

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ACRONYMS AND ABBREVIATIONS

µg/kg	micrograms per kilogram
µg/L	micrograms per liter
°F	degrees Fahrenheit
AAC	Alaska Administrative Code
AC&WS	Aircraft Control and Warning Station
ACAT	Alaska Community Action on Toxics
ADEC	Alaska Department of Environmental Conservation
ANCSA	Alaska Native Claims Settlement Act
ARAR	applicable or relevant and appropriate requirements
AST	aboveground storage tank
ATSDR	Agency for Toxic Substances and Disease Registry
bgs	below ground surface
Bristol	Bristol Environmental Remediation Services, LLC
BTEX	benzene, toluene, ethylbenzene, and xylenes
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	contaminant of concern
COPC	contaminant of potential concern
DD	Decision Document
DERP	Defense Environmental Restoration Program
DL	detection limit
DO	dissolved oxygen
DRO	diesel-range organics
DU	decision unit
EB	equipment blank
ECC	Environmental Compliance Consultants, Inc.
EPA	U.S. Environmental Protection Agency
FRMD	FUDS Record Management Database
FS	feasibility study
FUDS	Formerly Used Defense Site
FYR	Five-Year Review
GPS	global positioning system
GRO	gasoline-range organics
HPAH	high-molecular weight polycyclic aromatic hydrocarbon
HTRW	hazardous, toxic, and radioactive waste
HWAP	hazardous waste accumulation point
IC	institutional control

ACRONYMS AND ABBREVIATIONS (Continued)

IRIS	Integrated Risk Information System
ISCO	in situ chemical oxidation
ISM	incremental sampling methodology
Jacobs	Jacobs Engineering Group Inc.
LDU	lower decision unit
LOAEL	lowest observed adverse effect level
LPAH	low-molecular weight polycyclic aromatic hydrocarbon
LTM	long-term monitoring
LUC	land use control
MDU	middle decision unit
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MNA	monitored natural attenuation
MOC	Main Operations Complex
MW	Montgomery Watson
ND	nondetect
NEC	Northeast Cape
NFA	No Further Action
NOAA	National Oceanic and Atmospheric Administration
NOAEL	no observed adverse effects level
NPL	National Priorities List
O&M	operations and maintenance
ORP	oxidation reduction potential
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCE	tetrachloroethylene
POL	petroleum, oil, and lubricants
QAR	Quality Assurance Representative
QC	quality control
RAB	Restoration Advisory Board
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
ROD	Record of Decision
RRO	residual-range organics
RTK	real-time kinematic

ACRONYMS AND ABBREVIATIONS (Continued)

SARA	Superfund Amendments and Reauthorization Act
SQuiRT	Screening Quick Reference Table
SSCL	site-specific cleanup level
Suqi River	Suqitughneq River
SVOC	semivolatile organic compound
TAH	total aromatic hydrocarbon
TAqH	total aqueous hydrocarbon
TB	trip blank
TBC	to be considered
TCE	trichloroethene
UDU	upper decision unit
UECA	Uniform Environmental Covenants Act
USACE	U.S. Army Corps of Engineers
UST	underground storage tank
UVOST	Ultra Violet Optical Screening Tool
VOC	volatile organic compound
WAC	Washington Administrative Code
WACS	White Alice Communications System

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ANALYTICAL DATA QUALIFIERS

The following data qualifiers are applicable to the 2018 NEC analytical data:

J The analyte was positively identified; however, the associated result was less than the limit of quantitation but greater than or equal to the DL.

B The analyte was detected in the method blank, the TB, or EB above the DL and the concentration in the sample did not exceed the blank concentration by a factor of five (factor of 10 for common laboratory contaminants acetone, toluene, and methylene chloride).

H Result has a potentially high bias.

M A matrix effect was present

QH Analyte result was considered an estimated value (biased high) due to a QC failure.

QL Analyte result was considered an estimated value (biased low) due to a QC failure.

QN Analyte result was considered an estimated value (unknown bias) due to a QC failure.

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EXECUTIVE SUMMARY

The U.S. Army Corps of Engineers (USACE) contracted Environmental Compliance Consultants, Inc. and Jacobs Engineering Group Inc. to conduct the second Periodic Review for Sites 3, 6, 8, 9, 10, 11, 13, 15, 16, 19, 27, 28, and 32 at the Northeast Cape (NEC) Formerly Used Defense Site (FUDS) on St. Lawrence Island, Alaska. The purpose of this review is to ensure that remedies selected in the hazardous, toxic, and radioactive waste (HTRW) Decision Document (DD) (USACE 2009a), Project No. F10AK0969-03, have been implemented, are performing effectively, and continue to be protective of human health and the environment. This review evaluates the site remedies as selected in the DD and each remedy's implementation status and provides recommendations for resolving the identified discrepancies and improving remedy performance.

Remedial investigations conducted at the NEC FUDS between 1994 and 2004 identified 34 contaminated sites. Two DDs were signed in January and September of 2009 that addressed the contaminated sites (USACE 2009a, 2009b). The Containerized HTRW DD (USACE 2009b) presented the selected remedy for Site 7. The HTRW DD (USACE 2009a) presented the selected remedies for the remaining 33 NEC sites. Both 2009 DDs were signed after the effective date of the Superfund Amendments and Reauthorization Act of 1986 (SARA), which requires Five-Year Reviews (FYRs) for Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sites where there are remaining hazardous substances, pollutants, and/or contaminants above levels that allow for unlimited use and unrestricted exposure.

Under CERCLA, the terms hazardous substance, pollutant, and/or contaminant do not include petroleum or substances found in petroleum, at levels which do not exceed those normally found in such fractions (U.S. Environmental Protection Agency [EPA] 1987). Petroleum and substances which are normally found in petroleum are the only remaining contaminants at Sites 3, 6, 8, 9, 10, 11, 13, 15, 16, 19, 27, 28, and 32 and are therefore excluded from CERCLA.

The Defense Environmental Restoration Program (DERP) provides authority for cleanup activities at former U.S. Department of Defense sites. In accordance with the DERP, U.S. Code, Title 10, Section 2701, et seq., sites where environmental damage creates "an imminent and substantial endangerment to public health or welfare or to the environment" are included under the DERP authority. Although petroleum sites are not regulated under CERCLA and do not follow the FYR process, non-CERCLA sites under this project have followed the CERCLA process as a matter of administrative consistency (USACE 2009a). Under DERP and with the oversight of Alaska Department of Environmental Conservation (ADEC), petroleum sites on NEC do undergo Periodic Reviews. This is the second Periodic Review for these sites and the first Periodic Review conducted under a separate cover. The prior Periodic Review for these sites was presented under the *First Five-Year Review Report* (USACE 2015b).

This Periodic Review summarizes current conditions at 13 sites at the NEC FUDS as follows:

- Fourteen sites at the NEC FUDS are required to undergo Periodic Review due to petroleum contamination above cleanup levels, but only 13 are included in this report. The Periodic Review for Site 7 is addressed under a separate cover (USACE 2020b):

Site 3	Site 10	Site 16	Site 32
Site 6	Site 11	Site 19	Site 7 (USACE 2020a)
Site 8	Site 13	Site 27	
Site 9	Site 15	Site 28	

- Two sites (Sites 21 and 28) were required to undergo a second FYR per CERCLA and SARA regulations as hazardous substances, pollutants, or contaminants remained at the sites above levels that allowed for unlimited use and unrestricted exposure; the FYRs for these sites were included under a separate cover (USACE 2020a).
    - Although Site 28 was required to undergo a second FYR (USACE 2020a), only petroleum, oil, and lubricants (POL) (non-CERCLA regulated) contamination remains at the site. As such, Site 28 is also included within this Periodic Review. ADEC did not concur with USACE's determinations and path forward recommendations in the Second FYR Report for Site 28. The ADEC letter of non-concurrence has been included with this document (Appendix J).
- Two sites (Sites 1 and 31) were recommended to be No Further Action (NFA) in the First FYR Report (USACE 2015b) and are therefore not included in this report.
- Two sites (Sites 13 and 16) were previously included as CERCLA contaminated sites; however, the only remaining contamination consists of POL and therefore these sites are included in this document as Periodic Review sites.

- Site 30 is not included within this Periodic Review as the site is not contaminated and was created to provide a site for background analytical comparison.

The remaining sites at NEC were determined to be NFA in the HTRW DD (USACE 2009a), indicating that no additional action was required. These sites are not included in this Periodic Review and are as follows:

Site 2	Site 14	Site 22	Site 26
Site 4	Site 17	Site 23	Site 29
Site 5	Site 18	Site 24	Site 33
Site 12	Site 20	Site 25	Site 34

Protectiveness statements for the NEC sites listed above are summarized in the Periodic Review summary form. Protectiveness was evaluated for these sites in accordance with EPA guidance (EPA 2012c). Protectiveness was determined through the evaluation of remedial action performance in meeting human health based remedial action objectives stated in the DD (USACE 2009a).

This Periodic Review recommends NFA for Site 32. Following remedial actions performed in 2014, no contamination remained at Site 32, which was confirmed by samples collected following excavation activities.

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PERIODIC REVIEW SUMMARY FORM

The summary form below provides a brief synopsis of the issues, recommendations and protectiveness statements that were developed during this review period. The historical documents, data, and community concerns reviewed prior to the development of these items are included in Section 5. Remedial actions that have occurred since the publication of the Decision Document (DD) for these sites (U.S. Army Corps of Engineers [USACE] 2009a) are presented in Section 3.

SITE IDENTIFICATION		
Site Name: Northeast Cape (St. Lawrence Island) **FUDS ID:** F10AK096903		
EPA ID: AK9799F2999		
Region: 10	**State:** Alaska	**City/County:** St. Lawrence Island
SITE STATUS		
NPL Status: Non-National Priorities List (NPL) site		
Multiple Operable Units? No	**Has the site achieved construction completion?** Yes	
REVIEW STATUS		
Lead agency: Other Federal Agency **If "Other Federal Agency" was selected above, enter Agency name:** USACE		
Author name (Federal or State Project Manager): Environmental Compliance Consultants, Inc./Jacobs Engineering Group Inc. on behalf of USACE, Alaska District Federal Project Manager Bob Glascott		
Author affiliation: Contractor		
Review period: May 2014 – December 2018		
Date of site inspection: 01 August 2018 – 03 August 2018		
Type of review: Statutory; Post-SARA Policy Review		
Review number: Two		
Triggering action date: 24 February 2015		
Due date *(five years after triggering action date)*: Approximately 24 February 2020		

<table>
<tr><th colspan="5">ISSUES/RECOMMENDATIONS</th></tr>
<tr><td rowspan="3">Site(s): 3</td><td colspan="4">Issue Category: Remedy Implementation</td></tr>
<tr><td colspan="4">Issue: A one-quart plastic motor oil container was observed at the site during the 2018 site inspections. Sheen on an ephemeral surface water feature and a plastic motor oil cap were observed at the site during the 2013 site inspections.</td></tr>
<tr><td colspan="4">Recommendation: Discontinue Site 3 inspections based on non-FUDS activities which are occurring at Site 3 and the lack of post-remedy soil contamination.</td></tr>
<tr><td>Affect Current Protectiveness</td><td>Affect Future Protectiveness</td><td>Implementing Party</td><td>Regulatory Party</td><td>Milestone Date[1]</td></tr>
<tr><td>No</td><td>No</td><td>USACE</td><td>ADEC</td><td>2025</td></tr>
<tr><td rowspan="3">Site(s): 3, 6, 8, 9, 10, 11, 13, 16, 19, 27, 28</td><td colspan="4">Issue Category: Remedy Implementation</td></tr>
<tr><td colspan="4">Issue: The following Land Use Controls (LUCs) have not been fully implemented:
Limit future drinking water uses of groundwater at the Main Operations Complex (MOC) until cleanup levels are met.
Designate areas unsuitable for drinking water at Sites 3, 6, and 9.
Prevent construction of buildings on top of the landfill at Site 9.
Designate areas unsuitable for residential land use without additional investigation and/or cleanup at Site 8.
Inform potential future landowners of the nature and extent of residual sediment contamination at Site 28.</td></tr>
<tr><td colspan="4">Recommendation: Complete the implementation of LUCs by filing a deed notice anticipated to be in the form of an Environmental Covenant in accordance with the Uniform Environmental Covenants Act (UECA), to record the areas identified with residual contamination above DD cleanup levels (USACE 2009a). LUCs at Site 8 should not be implemented until a supplemental investigation occurs.</td></tr>
<tr><td>Affect Current Protectiveness</td><td>Affect Future Protectiveness</td><td>Implementing Party</td><td>Regulatory Party</td><td>Milestone Date[1]</td></tr>
<tr><td>Yes</td><td>Yes</td><td>USACE</td><td>ADEC</td><td>2025</td></tr>
</table>

ISSUES/RECOMMENDATIONS				
Site(s): 3, 6, 8, 9, 10, 11, 13, 16, 19, 27, 28	**Issue Category:** Remedy Implementation			
	Issue: Clarification for components of the LUC remedy is needed due to a newly promulgated ADEC regulation.			
	Recommendation: The anticipated change from LUC and deed notices to UECA and Environmental Covenants should be addressed in an Explanation of Significant Differences (ESD) document.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Regulatory Party**	**Milestone Date[1]**
No	No	USACE	ADEC	2025
Site(s): 8	**Issue Category:** Remedy Implementation			
	Issue: Data from 2016 soil sampling at Site 8 identified the lateral and vertical extent of diesel-range organics (DRO) contamination in soil east of the 2016 sampling area is not delineated.			
	Recommendation: Complete a supplemental investigation to delineate the lateral and vertical extent of soil contamination east of the 2016 sampling area and revise the location of the historic pipeline spill currently estimated based on 2016 sample data. Further evaluate exposure risk and protectiveness as part of the next Periodic Review.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Regulatory Party**	**Milestone Date[1]**
No	Yes	USACE	ADEC	2025
Site(s): 8	**Issue Category:** Remedy Implementation			
	Issue: Based on changes in site conditions over time (e.g., lack of continuously submerged sediment), sufficient material that met the DD definition of sediment could not be found in any of the three Site 8 decision units (DUs) in 2018. Therefore, the 2018 monitored natural attenuation (MNA) sampling at Site 8 did not occur. Additionally, data from the 2016 sampling event suggest undelineated soil contamination is present outside of the DUs used to monitor Site 8.			
	Recommendation: Discontinue MNA sediment sampling at Site 8 until the supplemental soil investigation is complete.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Regulatory Party**	**Milestone Date[1]**
No	No	USACE	ADEC	2025

ISSUES/RECOMMENDATIONS				
Site(s): 10, 11, 13, 16, 15, 19, 27	**Issue Category:** Monitoring Network			
	Issue: Three monitoring wells require maintenance. Monitoring wells 14MW05 and MW88-1 are frost-jacked and the manhole cover is not secure. Monitoring well MW88-3 well lid threads are rusted, and the lid cannot be secured. Also, one partially decommissioned well was observed at Site 19 which may be acting as a direct conduit to groundwater.			
	Recommendation: Conduct maintenance on the listed monitoring wells and re-survey the top of casing elevations following maintenance. Abandon the partially decommissioned well at Site 19.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Regulatory Party**	**Milestone Date[1]**
Yes	Yes	USACE	ADEC	2025
Site(s): 10	**Issue Category:** Remedy Implementation			
	Issue: Three groundwater sampling events have occurred in response to recommendations in the First Five-Year Review Report (FYR) (USACE 2015b) to address a data gap regarding ethylene glycol in groundwater downgradient of Site 10. DRO, residual-range organics (RRO), PAHs, polychlorinated biphenyls (PCBs), volatile organic compound (VOCs), metals, and attenuation parameters have been monitored in groundwater in the downgradient wells (MW10-1 and 14MW06) from Site 10. Contaminants of potential concern (COPCs) identified during removal actions in soil such as tetrachloroethylene (PCE), 1,1-dichloroethene, 1,2-dibromoethane, 1,1,2,2 tetrachloroethane, 1,2-dichloropropane, and trichloroethene (TCE) have been removed and have not been identified in groundwater.			
	Recommendation: Discontinue groundwater sample analysis for ethylene glycol and VOCs downgradient of Site 10 (monitoring wells MW10-1 and 14MW06) because the previously identified data gap is closed.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Regulatory Party**	**Milestone Date[1]**
No	No	USACE	ADEC	2025

<table>
<tr><th colspan="5">ISSUES/RECOMMENDATIONS</th></tr>
<tr><td rowspan="3">Site(s): 15</td><td colspan="4">Issue Category: Remedy Implementation</td></tr>
<tr><td colspan="4">Issue: DRO-contaminated soil above the site-specific cleanup level (SSCL) remains at the Site 15 G Plume excavation: contamination along the excavation floor at 12 feet below ground surface (bgs), which was two feet below groundwater in 2012, as well as contamination along the excavation sidewall that was not removed during the 2012 excavation. Although the 2013 excavation of the west sidewall reached 15 feet bgs, the contaminated soil along the excavation floor was not removed during the 2013 excavation activity. Current protectiveness is not affected due to the lack of a complete exposure pathway to receptors and as a result of the depth of contamination.</td></tr>
<tr><td colspan="4">Recommendation: Complete the implementation of the remedy (remove residual DRO-contaminated soil that is above the SSCL).</td></tr>
<tr><td>Affect Current Protectiveness</td><td>Affect Future Protectiveness</td><td>Implementing Party</td><td>Regulatory Party</td><td>Milestone Date[1]</td></tr>
<tr><td>No</td><td>Yes</td><td>USACE</td><td>ADEC</td><td>2025</td></tr>
<tr><td rowspan="3">Site(s): 28</td><td colspan="4">Issue Category: Remedy Implementation</td></tr>
<tr><td colspan="4">Issue: Subsurface soil petroleum, oil, and lubricants (POL)-contamination is suspected to be present in several areas along the southern end of Site 28, within the Ultra Violet Optical Screening Tool (UVOST) delineated plumes D2, D3, I2, J1B, and between UVOST plumes D and I. This POL-contamination originated from Site 11.</td></tr>
<tr><td colspan="4">Recommendation: The contamination remaining at the southern end of Site 28 associated with Site 11 should be documented in an ESD. In addition, formally document in the ESD why continued remedy implementation (excavation) at the site is not feasible due to the presence of shallow groundwater and anticipated significant impacts to wetlands.</td></tr>
<tr><td>Affect Current Protectiveness</td><td>Affect Future Protectiveness</td><td>Implementing Party</td><td>Regulatory Party</td><td>Milestone Date[1]</td></tr>
<tr><td>No</td><td>No</td><td>USACE</td><td>ADEC</td><td>2025</td></tr>
<tr><td rowspan="3">Site(s): 28</td><td colspan="4">Issue Category: Remedy Implementation</td></tr>
<tr><td colspan="4">Issue: Installation of a sedimentation pond, as described in the DD (USACE 2009a) has not occurred at Site 28.</td></tr>
<tr><td colspan="4">Recommendation: Complete an ESD for Site 28 to document that construction of a sedimentation pond in Site 28 is not necessary to prevent migration of contaminants above risk-based cleanup levels into the Suqitughneq River (Suqi River).[2]</td></tr>
<tr><td>Affect Current Protectiveness</td><td>Affect Future Protectiveness</td><td>Implementing Party</td><td>Regulatory Party</td><td>Milestone Date[1]</td></tr>
<tr><td>No</td><td>No</td><td>USACE</td><td>ADEC</td><td>2025</td></tr>
</table>

<table>
<tr><th colspan="5">ISSUES/RECOMMENDATIONS</th></tr>
<tr><td rowspan="3">Site(s): 28</td><td colspan="4">Issue Category: Remedy Implementation</td></tr>
<tr><td colspan="4">Issue: Sediment contamination above DD cleanup levels remains in Removal Areas 2 through 9 for DD contaminants of concern (COCs) (DRO, RRO, 2-methylnapthalene, and naphthalene). An estimated 196 of the 281 cubic yards of sediment contains compounds at levels above their respective SSCLs.</td></tr>
<tr><td colspan="4">Recommendation: Continue remedy implementation (removal of contaminated sediment) until cleanup levels are met. Conduct pilot testing to assess if effectiveness of remedy implementation (dredging) can be improved.</td></tr>
<tr><td>Affect Current Protectiveness</td><td>Affect Future Protectiveness</td><td>Implementing Party</td><td>Regulatory Party</td><td>Milestone Date[1]</td></tr>
<tr><td>No</td><td>Yes</td><td>USACE</td><td>ADEC</td><td>2025</td></tr>
</table>

Notes:

[1] Milestone Date reflects the date by which the recommendation/follow-up action should be completed.

[2] The purpose of a constructed sedimentation pond would have been to control downgradient migration of suspended sediments. Due to the lack of contaminated sediment downgradient from the natural stilling area (Figure A-16), the construction of a sedimentation pond is not necessary to prevent migration of contaminants above risk-based cleanup levels into the Suqi River.

PROTECTIVENESS STATEMENT(S)		
Site: Site 3 Fuel Pump House	*Protectiveness Determination:* Will be Protective	*Addendum Due Date (if applicable):*

Protectiveness Statement: The remedy at Site 3 is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas. Full implementation of the remedy currently affecting protectiveness, which includes the filing of a deed notice, is anticipated to occur by 2021.

PROTECTIVENESS STATEMENT(S)		
Site: Site 6 Gravel Pad	*Protectiveness Determination:* Will be Protective	*Addendum Due Date (if applicable):*
Protectiveness Statement: The remedy at Site 6 is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas. Full implementation of the remedy currently affecting protectiveness, which includes the filing of a deed notice, is anticipated to occur by 2021.		
Site: Site 8 POL Spill	*Protectiveness Determination:* Short-Term Protective	*Addendum Due Date (if applicable):*
Protectiveness Statement: The remedy at Site 8 currently protects human health and the environment because there is no direct exposure pathway between the contaminated material and the receptor. However, for the remedy to be protective in the long-term, the following action needs to be taken to ensure protectiveness: • Delineate the lateral and vertical extent of DRO contamination east of 2016 sample locations to further evaluate exposure risk and whether or not additional action is necessary to achieve protectiveness. This effort is anticipated to occur by 2025.		
Site: Site 9 Housing and Operations Landfill	*Protectiveness Determination:* Will be Protective	*Addendum Due Date (if applicable):*
Protectiveness Statement: The remedy at Site 9 is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas. Full implementation of the remedy currently affecting protectiveness, which includes the filing of a deed notice, is anticipated to occur by 2021.		

PROTECTIVENESS STATEMENT(S)		
Site: Site 10 Buried Drums	*Protectiveness Determination:* Will be Protective	*Addendum Due Date (if applicable):*
Protectiveness Statement: The remedy at Site 10 is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas. Full implementation of the remedy currently affecting protectiveness, which includes the filing of a deed notice, is anticipated to occur by 2021.		
Site: Site 11 Fuel Tanks	*Protectiveness Determination:* Will be Protective	*Addendum Due Date (if applicable):*
Protectiveness Statement: The remedy at Site 11 is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas. Full implementation of the remedy currently affecting protectiveness, which includes the filing of a deed notice, is anticipated to occur by 2021.		
Site: Site 13 Heat and Power Plant	*Protectiveness Determination:* Will be Protective	*Addendum Due Date (if applicable):*
Protectiveness Statement: The remedy at Site 13 is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas. Full implementation of the remedy currently affecting protectiveness, which includes the filing of a deed notice, is anticipated to occur by 2021.		
Site: Site 15 Fuel Pipeline	*Protectiveness Determination:* Will be Protective	*Addendum Due Date (if applicable):*
Protectiveness Statement: The remedy at Site 15 is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas. Full implementation of the remedy currently affecting protectiveness, which includes the filing of a deed notice, is anticipated to occur by 2021.		
Site: Site 16 Paint and Dope Storage	*Protectiveness Determination:* Will be Protective	*Addendum Due Date (if applicable):*

PROTECTIVENESS STATEMENT(S)		
Protectiveness Statement: The remedy at Site 16 is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas. Full implementation of the remedy currently affecting protectiveness, which includes the filing of a deed notice, is anticipated to occur by 2021.		
Site: Site 19 Auto Maintenance	*Protectiveness Determination:* Will be Protective	*Addendum Due Date (if applicable):*
Protectiveness Statement: The remedy at Site 19 is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas. Full implementation of the remedy currently affecting protectiveness, which includes the filing of a deed notice, is anticipated to occur by 2021.		
Site: Site 27 Diesel Fuel Pump	*Protectiveness Determination:* Will be Protective	*Addendum Due Date (if applicable):*
Protectiveness Statement: The remedy at Site 27 is expected to be protective of human health and the environment upon completion. In the interim, no exposure pathways that could result in unacceptable risks have been noted. Remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas. Full implementation of the remedy currently affecting protectiveness, which includes the filing of a deed notice, is anticipated to occur by 2021.		
Site: Site 28 Drainage Basin	*Protectiveness Determination:* Will be Protective	*Addendum Due Date (if applicable):*
Protective Statement: The remedy at Site 28 currently protects human health and the environment because there is no direct exposure pathway between the contaminated material and the receptor. However, for the remedy to be protective in the long-term, the following actions need to be taken: • Continue remedy implementation (removal of contaminated sediment) where 2018 sediment sample results indicated COCs are present in sediment above DD-established cleanup levels. • Conduct pilot testing to assess if effectiveness of sediment remedy implementation (removal via dredging) can be improved. • Inform potential future landowners of the nature and extent of residual sediment contamination at Site 28 through the filing of an informational LUC. Continued effort of remedy implementation is anticipated to occur by 2025.		
Site: Site 32 Lower Tramway	*Protectiveness Determination:* Protective	*Addendum Due Date (if applicable):*

PROTECTIVENESS STATEMENT(S)
Protectiveness Statement: The remedy at Site 32 is protective of human health and the environment and is complete. Remedial activities are complete and have adequately addressed all exposure pathways that could result in unacceptable risk..

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1.0 INTRODUCTION

The U.S. Army Corps of Engineers (USACE) contracted Environmental Compliance Consultants, Inc. (ECC) and Jacobs Engineering Group Inc. (Jacobs) to conduct the second Periodic Review of the selected remedies for Sites 3, 6, 8, 9, 10, 11, 13, 15, 16, 19, 27, 28 and 32 presented in the DD (USACE 2009a) at Northeast Cape (NEC) on St. Lawrence Island, Alaska (Figure A-1). This report presents the results of the second Periodic Review for 13 sites at NEC.

Under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the terms hazardous substance, pollutant, and/or contaminant do not include petroleum or substances found in petroleum at levels which do not exceed those normally found in such fractions (U.S. Environmental Protection Agency [EPA] 1987). Petroleum and substances which are normally found in petroleum are the only remaining contaminants at Sites 3, 6, 8, 9, 10, 11, 13, 15, 16, 19, 27, 28 and 32 and are therefore excluded from CERCLA.

The Defense Environmental Restoration Program (DERP) provides authority for cleanup activities at former U.S. Department of Defense sites. In accordance with the DERP, U.S. Code, Title 10, Section 2701, et seq., sites where environmental damage creates "an imminent and substantial endangerment to public health or welfare or to the environment" are included under the DERP authority. Although petroleum sites are not regulated under CERCLA and do not follow the FYR process, non-CERCLA sites under this project have followed the CERCLA process as a matter of administrative consistency (USACE 2009a). Under DERP and with the oversight of the Alaska Department of Environmental Conservation (ADEC), petroleum sites on NEC undergo Periodic Reviews. This is the second Periodic Review for these sites and the first Periodic Review conducted under a separate cover. The prior Periodic Review for these sites was presented under the *First Five-Year Review Report* (USACE 2015b).

If an actual or threatened release of a CERCLA hazardous substance, pollutant, and/or contaminant is identified during remedy performance, the situation will need to be assessed to determine if the project needs to transition to a CERCLA response action. An evaluation will be made in accordance with CERCLA and the National Contingency Plan to determine what action is warranted, if any, to protect human health and the environment. During remedy performance, if a CERCLA site no longer contains hazardous substances, pollutants, and/or contaminants above levels that allow for unlimited use and unrestricted exposure, but petroleum contamination remains, a CERCLA site can be transferred from the FYR process to the Periodic Review process.

The NEC Formerly Used Defense Site (FUDS) project number is F10AK0969-03. ADEC Contaminated Sites Hazard ID number for the facility wide NEC FUDS is 207. The file number is 475.38.013. Individual sites within the NEC FUDS are also tracked with individual Hazard IDs. Table 1-1 provides the ADEC Hazard ID and review status for each of the sites described in this report.

Table 1-1
NEC FUDS

Site Name	Hazard ID	Review Status
Site 3: Fuel Pump House	209	ADEC Periodic Review
Site 6: Cargo Beach Road Drum Field Site	212	ADEC Periodic Review
Site 8: POL Spill	214	ADEC Periodic Review
Site 9: Housing and Operations Landfill	215	ADEC Periodic Review
Site 10: Buried Drums Site	216	ADEC Periodic Review
Site 11: Fuel Tanks	217	ADEC Periodic Review
Site 13: Heat and Power Plant	219	ADEC Periodic Review
Site 15: Fuel Pipeline	219	ADEC Periodic Review
Site 16: Paint and Dope Storage	219	ADEC Periodic Review
Site 19: Auto Maintenance	219	ADEC Periodic Review
Site 27: Diesel Fuel Pump	219	ADEC Periodic Review
Site 28: Drainage Basin	219	ADEC Periodic Review
Site 32: Lower Tramway	577	ADEC Periodic Review

Note:
For definitions, refer to the Acronyms and Abbreviations section.

The EPA site ID number is AK9799F2999. The NEC FUDS is not listed on the National Priorities List (NPL).

1.1 PHYSICAL CHARACTERISTICS AT NEC

The NEC FUDS is located on St. Lawrence Island, Alaska in the western portion of the Bering Sea, approximately 135 air-miles southwest of Nome (Figure A-1). It is located at latitude 63.310278 and longitude -168.965272. The NEC property originally encompassed approximately 4,800 acres (7.5 square miles).

The NEC FUDS consists mainly of rolling tundra, extending from the Bering Sea toward the base of the Kinipaghulghat Mountains. The Kinipaghulghat Mountains rise abruptly to an elevation of approximately 1,800 feet above sea level, approximately three miles from the coastline. The NEC FUDS is only accessible by air, water, or all-terrain vehicle trails. The Village of Savoonga, the closest community, is located approximately 60 miles to the northwest (Figure A-1).

St. Lawrence Island has a subarctic maritime climate with continental influences during the winter. Summer temperatures at NEC average between 42- and 52-degrees Fahrenheit (°F) and winter temperatures average between -3 and 27°F (Western Regional Climate Center 2009).

1.1.1 Geology

St. Lawrence Island consists of isolated bedrock highlands of igneous, metamorphic, and older sedimentary rocks surrounded by unconsolidated alluvium overlying a relatively shallow erosional bedrock surface. The main area of operation, known as the MOC is located at approximately 100 feet in elevation. Around the MOC, shallow unconsolidated surficial materials overlie quartz monzonitic rocks of the Kinipaghulghat Pluton (Patton and Csejtey 1980). The pluton forms the mountainous area south of the NEC FUDS, which includes Kangukhsam Mountain. The Suqi River drainage in the Kinipaghulghat Pluton has created an erosional valley and alluvial fan of unconsolidated sediments. The NEC FUDS is located on this alluvial fan, which protrudes north from the mountain front toward the Bering Sea. Granitic bedrock materials are exposed at the coast north of the site at Kitnagak Bay, which suggests that the quartz monzonitic bedrock underlies the unconsolidated materials at a relatively shallow depth on a wave-cut erosional platform.

In general, the native soil stratigraphy at NEC is characterized by silts near the surface, overlying more sand-dominated soil at depth. The silt contains varying quantities of clay/sand/gravel and varies from zero to 10 feet in thickness. The silt is dark brown to dark green, and sometimes exhibits a mottled texture. The sand at depth contains varying degrees of silt/gravel/cobbles that ranges from 2 feet to greater than 20 feet thickness. These deeper, coarse-grained materials are generally unsorted and are likely to be of glaciofluvial origin. The depth to bedrock at the NEC FUDS is unknown (USACE 2009a, 2009b).

1.1.2 Land and Resource Use at NEC

St. Lawrence Island residents from the villages of Gambell and Savoonga engage in subsistence fishing, hunting, and gathering in the NEC FUDS area year-round. Local subsistence hunting camp structures are located adjacent to Site 3 and are occupied seasonally. There are not currently any permanent residents of the NEC area; however, representatives of the Native Village of Savoonga have indicated a desire to re-establish a permanent residential community at the site in the future.

St. Lawrence Island supports habitats for the following endangered or threatened species: the polar bear (threatened), spectacled eider (threatened), Steller's eider (threatened), and the Western Distinct Population Segment of Stellar sea lion (endangered). Walrus are protected under the Marine Mammal Protection Act. The area of NEC FUDS is used for the collection of berries and subsistence hunting of reindeer. The Suqi River (Site 29), located within the NEC FUDS, is used for subsistence fishing. The ocean surrounding the NEC FUDS is used extensively for subsistence activities including fishing and hunting of whales, walrus, seals, and sea birds.

1.1.3 Site History

The NEC FUDS was constructed as an Aircraft Control and Warning Station (AC&WS) during 1950 and 1951 to provide radar coverage and surveillance for the Alaskan Air Command, and later for the North American Air Defense Command, as part of the Alaska Early Warning System. The site was activated in 1952 and a White Alice Communications System (WACS) station was added to the site in 1954. The AC&WS and WACS operations were supported by 212 personnel and terminated in 1969 and 1972, respectively. Most military personnel were removed from the site by the end of 1969.

The NEC FUDS included areas for housing site personnel, power plant facilities, fuel storage tanks, distribution lines, maintenance shops, wastewater treatment facilities, and landfills. The buildings and majority of furnishings and equipment related to the AC&WS were abandoned in place initially due to the high cost of off-island transport.

In 1971, the villages of Gambell and Savoonga opted out of the Alaska Native Claims Settlement Act (ANCSA), which allowed for title to 1.136 million acres of land in the former St. Lawrence Island Reindeer Reserve established in 1903. The Gambell Native Corporation and Savoonga Native Corporation (known as Sivuqaq, Inc. and Kukulget, Inc. respectively) received titles to all of St. Lawrence Island (except U.S. Surveys 4235, 4237, 4340, 4369, and 3728) by Interim Conveyance No. 203 dated 21 June 1979 (ANCSA 1979). In 1982, the Navy obtained approximately 26 acres of land containing the former WACS. The land transfer was later deemed invalid and property ownership was reverted to Sivuqaq, Inc. and Kukulget, Inc.

Demolition of the buildings and most of the other structures has been completed under multiple USACE contracts. The runway, improved gravel roads, and concrete slabs of some of the former structures remain intact. Investigations have been performed since the early 1990s and are described in further detail in subsequent sections.

1.2 HISTORY OF CONTAMINATION AT NEC

The primary sources of contamination at the NEC FUDS are attributed to spills and leaks of fuel products associated with aboveground storage tanks (ASTs), underground storage tanks (USTs), and associated piping. The largest known spill at NEC occurred in 1967 when a plow truck accidentally hit POL Tank #2 and released approximately 30,000 gallons of fuel. Interviews with former personnel suggest that there were several undocumented incidents of spills greater than 30,000 gallons from the large ASTs.

Other sources of contamination include electrical transformers, waste stored in 55-gallon drums, metal debris, and organic chemicals from paint, solvents, and other miscellaneous facility activities. Four remedial investigations (RIs) were conducted at the NEC FUDS between 1994 and 2004, during which the environmental concerns at NEC were divided among 34 individual sites.

1.2.1 Initial Response at NEC

Initial response actions were conducted at some of the NEC sites prior to DD preparation and signature; brief descriptions of these response actions are listed below:

- In 1990, transformers, drums, tanks, fire extinguishers, and other containerized hazardous wastes were removed from Site 31.
- In 1996, a radiological survey was conducted and public disclosure of potential asbestos hazards was initiated.
- In 2000, 6,099 fifty-five-gallon drums; approximately 60 tons of antenna poles, lines, and other miscellaneous nonhazardous debris; a fuel pipeline; and hazardous wastes from buildings were removed. An additional 19 ASTs were cleaned.
- During the 2001 field season, 17 additional tanks were cleaned, three USTs were decommissioned, and 3,303 tons of building demolition debris was demolished and packaged, including steel beams, asbestos-containing materials, and Toxic Substances Control Act-regulated materials. Twenty-five tons of PCB-contaminated soil and 1,643 tons of POL-contaminated soil were excavated, and four potable water wells were decommissioned.
- In 2003, the remaining 30 buildings, other structures, and the utilidor system were demolished and removed. Over 300 drums and tanks of hazardous wastes, including a large septic tank at the MOC and 12 ASTs were removed or decommissioned. More than 500 power and communications poles and 60 miles of wires and cables were gathered for disposal; 650 feet of fuel lines were transported off-island. More than 5,000 tons of waste and debris were shipped off-island for disposal.
- In 2005, the tramway towers and wire were demolished and removed. Additionally, more than 200 metal and wooden poles, approximately 25 miles of power and communications wire and cable, 26 tons of debris from two debris fields located on Kangukhsam Mountain, more than 160 tons of PCB-contaminated concrete, and 290 tons of PCB-contaminated soil were removed. Approximately 1,500 tons of waste was sorted and packaged for transport off-island; 370 tons of non-creosote treated and unpainted wood were burned on-island, with the ash removed for disposal off-island.

Remedial actions following the 2009 DDs (USACE 2009a, 2009b) are summarized in Section 3. Site 7 remedial actions are described in the *Second Periodic Review Report* (USACE 2020b) and are not included under this cover.

1.3 BASIS FOR TAKING ACTION AT NEC

The primary environmental contaminants remaining at the NEC sites at the time of the DD were petroleum hydrocarbons (DRO/RRO), VOCs, PCBs, and metals. These contaminants remained in soil, sediment, and groundwater across the installation. The risk assessments performed at the individual sites determined the human and/or ecological risks exceeded EPA's risk range at some of the NEC sites. Site COCs, and their respective media-specific sitewide cleanup levels promulgated at the time of the DD are presented in Table 1-2.

Soil cleanup levels were developed based on the human health and ecological risk assessment (USACE 2004) to be protective of future residential use of the site. Sediment cleanup levels are only applicable to continuously submerged sediments. Sediments that are intermittently submerged are considered soil. The cleanup levels for continuously submerged sediments are risk-based concentrations that are protective of ecological receptors and are assumed to be low enough to represent no significant health risk to humans. Soil and groundwater cleanup levels are based on levels from 18 Alaska Administrative Code (AAC) 75, Table C (ADEC 2018b). Surface water cleanup levels are based on State of Alaska regulation 18 AAC 70 and include total aromatic hydrocarbons (TAHs), total aqueous hydrocarbons (TAqHs), and sheen for non-drinking water sources (ADEC 2018a).

Table 1-2
NEC COCs and Cleanup Levels

Site	Soil		Groundwater		Sediment		Surface Water	
	COCs	DD Cleanup Level[1] (mg/kg)	COCs	DD Cleanup Level[1] (mg/L)	COCs	DD Cleanup Level[1] (mg/kg)	COCs	DD Cleanup Level[2] (mg/L)
3	DRO	9,200	DRO RRO	1.5 1.1	RRO	3,500		
6	DRO	9,200	Lead	0.015				
8	--		--		DRO	3,500		
9	DRO Arsenic	9,200 11	DRO RRO Arsenic Lead	1.5 1.1 0.01 0.015			DRO RRO TAH TAqH	No Sheen No Sheen 0.01 0.015
MOC: 10, 11, 13, 15, 19, 27	--		DRO GRO RRO Benzene Lead	1.5 1.3 1.1 0.005 0.015	--			
10	DRO	9,200	--		--			
11	DRO	9,200	--		--			
13	DRO Benzene PCBs	9,200 2 1	--		--			
15	DRO	9,200	--		--			
16	PCBs	1	--		--			
19	DRO	9,200	--		--			
27	DRO Benzene Naphthalene	9,200 2 120	--		--			
28	--	--	--	--	DRO RRO Chromium Lead Zinc PCBs Acenaphthene Fluoranthene Fluorene Naphthalene Phenanthrene 2-Methylnaphthalene	3,500 3,500 270 530 960 0.7 0.5 2.0 0.8 1.7 4.8 0.6	--	--
32	DRO	9,200	--		--			

Notes:
[1] General sitewide cleanup levels presented in the DD (USACE 2009a).
[2] Applicable surface water criteria were determined from the SSCLs for a non-drinking water source, as stated in the 2009 DD (USACE 2009a)
-- No COCs for the site in the specified media
GRO = gasoline-range organics; mg/kg = milligrams per kilogram; mg/L = milligrams per liter
For additional definitions, refer to the Acronyms and Abbreviations section.

1.3.1 Purpose of this Review

The purpose of this Periodic Review is to evaluate the implementation and performance of the remedial actions selected for 13 of the 34 NEC sites and to determine whether these actions are functioning as designed. The methods, findings, and conclusions of this report document potential issues with the remedy, as defined in the DD (USACE 2009a), identified through an examination of the data collected over the past five years, if any, and provide recommendations to address these issues. This is the second Periodic Review for Sites 3, 6, 8, 9, 10, 11, 13, 15, 16, 19, 27, 28 and 32 at NEC. The first Periodic Review for Site 7, which was completed in combination with the first FYR, was completed in 2015 (USACE 2015b).

Two DDs were developed and signed for the original 34 sites at the NEC FUDS: *Decision Document: Hazardous, Toxic, and Radioactive Waste (HTRW) Project #F10AK096903* (USACE 2009a) and *Decision Document: Site 7 Cargo Beach Road Landfill, Containerized Hazardous, Toxic, and Radioactive Waste (CON-HTRW) Project #F10AK096905* (USACE 2009b). This review evaluates only the site remedies selected in the HTRW DD (USACE 2009a) for non-CERCLA contaminants (e.g., POL). Site remedies selected in the HTRW DD (USACE 2009a) for CERCLA contaminants were most recently evaluated under separate cover as part of the Second FYR (USACE 2020a). Site 7 is evaluated in a separate Periodic Review document (USACE 2020b). The triggering action that began this Periodic Review process was the signing of the first FYR on 24 February 2015 (USACE 2015b).

Site Status

Table 1-3 presents all 34 NEC sites with their remedial status.

Table 1-3
Individual Site Status

Site Number[1]	Name	Included in this Review?	Status
1	Airstrip	No	RRO contamination identified in soil during the 2004 RI was not measured during follow-up sampling in 2010. Confirmation soil samples were collected and RRO was detected at concentrations below cleanup levels. Site is recommended for NFA (USACE 2015b).
2	Airport Terminal and Landing Strip	No	Site 2 is not included in this review because it was determined to be NFA in the 2009 DD (USACE 2009a).
3	Fuel Pump House	Yes	Historical RRO contamination identified in sediment was confirmed to be related to biogenic interference in 2010. Historical DRO contamination measured in soil in 2004 was measured at concentrations below cleanup levels during follow-up sampling in 2010. Confirmation soil samples indicated DRO was detected at concentrations below cleanup levels. Additional DRO contamination not described in the DD was identified in a nearby stockpile and removed in 2010. Remedy is not complete. The LUC to designate areas not suitable for drinking water has not been fully implemented; a deed notice anticipated to be in the form of an Environmental Covenant in accordance with the UECA is needed.
4	Native Fishing and Hunting Camp	No	Site 4 is not included in this review because it was determined to be NFA in the 2009 DD (USACE 2009a). The LUC to designate areas not suitable for drinking water has not been fully implemented; a deed notice anticipated to be in the form of an Environmental Covenant in accordance with the UECA is needed.
5	Cargo Beach	No	Site 5 is not included in this review because it was determined to be NFA in the 2009 DD (USACE 2009a).
6	Gravel Pad	Yes	Excavation of POL-contaminated soil was completed in 2010. Remedy is not complete. The LUC to designate areas not suitable for drinking water has not been fully implemented; a deed notice anticipated to be in the form of an Environmental Covenant in accordance with the UECA is needed.

Table 1-3 (Continued)
Individual Site Status

Site Number[1]	Name	Included in this Review?	Status
7	Cargo Beach Road Landfill	No	Site 7 is not included in this review. A Periodic Review of Site 7 is provided as a separate report (USACE 2020b).
8	POL Spill	Yes	Remedy is not complete. Contamination in soil is not delineated. The LUC to designate Site 8 as an area not suitable for residential land use without additional investigation and/or cleanup has not been fully implemented; a deed notice anticipated to be in the form of an Environmental Covenant in accordance with the UECA is needed.
9	Housing and Operations Landfill	Yes	Surface debris was removed and a landfill cap and diversion trench were constructed in 2010. Surface water and groundwater monitoring are ongoing. Remedy is not complete. LUCs to designate areas not suitable for drinking water and prevent buildings on top of landfills have not been fully implemented; a deed notice anticipated to be in the form of an Environmental Covenant in accordance with the UECA is needed.
10, 11, 13 15, 16, 19, and 27	MOC	Yes	Groundwater monitoring for petroleum-related contaminants is ongoing. The remedy is not complete. The LUC to limit future drinking water use has not been fully implemented; a deed notice anticipated to be in the form of an Environmental Covenant in accordance with the UECA is needed. For the purposes of ongoing site evaluations and final site closure, there is not currently an effort to manage the individual sites under the MOC as a whole. However, due to the proximity of the sites and the nature of groundwater, the LUC, as documented in the anticipated Environmental Covenant, has been developed to encompass all MOC sites. This was also done to provide the most clarity to the spatial boundary to which the same LUCs apply, rather than issuing individual deed notices in the form of Environmental Covenants per site within the MOC.

Table 1-3 (Continued)
Individual Site Status

Site Number[1]	Name	Included in this Review?	Status
10	Buried Drums	Yes	Four excavations were conducted to remove contaminated soil in 2011, 2012, and 2013. Soil contaminated with DRO, RRO, and arsenic was successfully removed, and confirmation samples were below cleanup levels. Ethylene glycol-contaminated soil was removed to the maximum extent practicable. The excavation was terminated at 4 feet below fractured bedrock at a total depth of 12 feet bgs. Soil samples could no longer be collected. Groundwater monitoring for petroleum-related contaminants is ongoing. Glycols have been added to the analyte suite for the Site 10 downgradient well(s) since 2014. Remedy is not complete. The LUC to limit future drinking water uses has not been fully implemented; a deed notice anticipated to be in the form of an Environmental Covenant in accordance with the UECA is needed.
11	Fuel Tanks	Yes	Excavation of contaminated soil occurred in 2011, 2013, and 2014. Groundwater monitoring is ongoing. Remedy is not complete. The LUC to limit future drinking water uses has not been fully implemented; a deed notice anticipated to be in the form of an Environmental Covenant in accordance with the UECA is needed.
12	Gasoline Tank Area	No	Site 12 is not included in this review because it was determined to be NFA in the 2009 DD (USACE 2009a).
13	Heat and Power Plant	Yes	Excavation of contaminated soil was conducted from 2010 to 2014. Groundwater monitoring is ongoing. Remedy is not complete. The LUC to limit future drinking water uses has not been fully implemented; a deed notice anticipated to be in the form of an Environmental Covenant in accordance with the UECA is needed.
14	Emergency Power/ Operations Building	No	Site 14 is not included in this review because it was determined to be NFA in the 2009 DD (USACE 2009a).

Table 1-3 (Continued)
Individual Site Status

Site Number[1]	Name	Included in this Review?	Status
15	Fuel Pipeline	Yes	Excavation of contaminated soil began in 2012 and was completed in 2013. Groundwater monitoring is ongoing. Remedy is not complete. The LUC to limit future drinking water uses has not been implemented; a deed notice anticipated to be in the form of an Environmental Covenant in accordance with the UECA is needed.
16	Paint and Dope Storage	Yes	PCB-contaminated soil removal was completed in 2010. Remedy is not complete. The LUC to limit future drinking water use has not been implemented; a deed notice anticipated to be in the form of an Environmental Covenant in accordance with the UECA is needed.
17	General Supply Warehouse and Mess Hall Warehouse	No	Site 17 is not included in this review because it was determined to be NFA in the 2009 DD (USACE 2009a).
18	Housing Facilities and Squad Headquarters	No	Site 18 is not included in this review because it was determined to be NFA in the 2009 DD (USACE 2009a).
19	Auto Maintenance	Yes	Excavation was completed for POL-contaminated soil in 2012 (Area H). Groundwater monitoring is ongoing. The remedy is not complete. The LUC to limit future drinking water uses has not been fully implemented; a deed notice anticipated to be in the form of an Environmental Covenant in accordance with the UECA is needed.
20	Air Force Aircraft Control Warning Building	No	Site 20 is not included in this review because it was determined to be NFA in the 2009 DD (USACE 2009a).
21	Wastewater Tank	No	Site 21 is not included in this review. The most recent CERCLA FYR of Site 21 is provided under a separate cover (USACE 2019).
22	Water Wells and Water Supply Building	No	Site 22 is not included in this review because it was determined to be NFA in the 2009 DD (USACE 2009a).
23	Power and Communication Line Corridors	No	Site 23 is not included in this review because it was determined to be NFA in the 2009 DD (USACE 2009a).
24	Receiver Building Area	No	Site 24 is not included in this review because it was determined to be NFA in the 2009 DD (USACE 2009a).
25	Direction Finder Area	No	Site 25 is not included in this review because it was determined to be NFA in the 2009 DD (USACE 2009a).

Table 1-3 (Continued)
Individual Site Status

Site Number[1]	Name	Included in this Review?	Status
26	Former Construction Camp	No	Site 26 is not included in this review because it was determined to be NFA in the 2009 DD (USACE 2009a).
27	Diesel Fuel Pump	Yes	Excavation of contaminated soil occurred in 2012, 2013, and 2014. Groundwater monitoring is ongoing. Remedy is not complete. The LUC to limit future drinking water use has not been fully implemented; a deed notice anticipated to be in the form of an Environmental Covenant in accordance with the UECA is needed.
28	Drainage Basin	Yes	Remedy is not complete. A manhole and culverts were removed or capped in 2010. The extent and nature of sediment contamination was further investigated in 2011 and 2012 and petroleum, PCB, and metals contamination were identified. Sediment removal activities occurred in 2012 and 2013. Additional sediment mapping and sampling occurred in 2018. DRO, RRO, and PAHs remain in sediment above the SSCLs. The informational LUC to inform potential future landowners of the nature and extent of residual sediment contamination at Site 28 has not been fully implemented; a deed notice anticipated to be in the form of an Environmental Covenant in accordance with the UECA is needed. The most recent CERCLA FYR discusses the CERCLA related contaminants at Site 28 and is provided under separate cover (USACE 2020a).
29	Suqi River and Estuary	No	Although Site 29 was determined to be NFA, the 2009 DD (USACE 2009a) included a remedy. The remedy is complete. Incidental debris located in the stream channel that poses an inherent hazard was recommended for removal in the 2009 DD (USACE 2009a) and subsequently removed in 2010.
30	Sitewide (created to provide site background levels)	No	Site 30 is not included in this review because it is not a contaminated site.
31	WACS	No	Remedy is complete. Excavation of PCB-contaminated soil was conducted in 2010, 2011, 2012, and 2013. All soil confirmation samples indicated PCBs below the cleanup level. Site was recommended for NFA in the first FYR (USACE 2015b).
32	Lower Tramway	Yes	Remedy is complete. Excavation of DRO and RRO occurred in 2014. Site is recommended for NFA.

Table 1-3 (Continued)
Individual Site Status

Site Number[1]	Name	Included in this Review?	Status
33	Upper Tram Terminal	No	Site 33 is not included in this review because it was determined to be NFA in the 2009 DD (USACE 2009a).
34	Upper Camp	No	Site 34 is not included in this review because it was determined to be NFA in the 2009 DD (USACE 2009b).

Note:
[1] Sites 10 through 22, 26, and 27 are collectively referred to as the MOC.
For definitions, refer to the Acronyms and Abbreviations section.

The status of recommendations provided in the previous FYR (USACE 2015b) are listed in Table 1-4 below, as well as the status of the implementation of the recommendation, and the date the recommendation was completed or is anticipated to be completed. The issue pertaining to Site 21 has not been included in this Periodic Review Report; however, the status of the recommendation can be found in the Second FYR Report (USACE 2020a).

Table 1-4
Status of Recommendations from the 2014 FYR

Issue	Recommendation	Current Status	Current Implementation Status Description	Completion Date (if applicable)
Site 3: The 2013 site inspection identified a large area of surface water at Site 3 not evaluated as an exposure pathway at the time of the risk assessment.	Evaluate surface water as an exposure pathway at Site 3.	Complete	The surface water body observed during the 2013 site inspection was not observed again in 2018. The outline of the surface water body was identified; however, the feature appeared to be ephemeral (Photo No. 1 [Appendix C]).	2018
Site 3: An apparent petrogenic sheen, limited in size, was observed in surface water at Site 3. A small plastic motor oil container cap was also observed near the sheen.	Determine whether the sheen continues to be present at the Site 3 pond and if non-FUDS activities are a contributing factor. If sheen is observed, collect samples to determine the nature of the sheen.	Complete	The surface water body observed during the 2013 site inspection was not observed again in 2018. The outline of the ephemeral surface water feature was filled with miscellaneous debris including metal, a tire, and wood (Photo No. 2 [Appendix C]). A plastic one-quart oil container was also observed at the site (Photo No. 3 [Appendix C]).	2018
Sites 3, 6, 8, 9, 10, 11, 13, 15, 16, 19, 21, 27: The following LUCs have not been formally implemented: • Prevent the use of the aquifer for drinking water purposes until cleanup levels are met at Sites 10, 11, 13, 15, 16, 19, 21, and 27. • Designate areas unsuitable for drinking water at Sites 3, 6, and 9. • Prevent construction of buildings on top of the landfill at Site 9. • Designate areas unsuitable for residential land use without additional investigation and/or cleanup at Site 8.	Implement LUCs, as described in the DD, following completion of the remedial action fieldwork.	Ongoing	Deed notices, anticipated to be prepared in the form of Environmental Covenants in accordance with the UECA, are in progress. LUCs at Site 8 should not be implemented until a supplemental soil investigation occurs.	Anticipated 2021

Table 1-4 (Continued)
Status of Recommendations from the 2014 FYR

Issue	Recommendation	Current Status	Current Implementation Status Description	Completion Date (if applicable)
Site 6: Pre-construction soil samples identified one surface soil sample with a PCB concentration of 2.2 mg/kg. Excavations were performed as part of the remedial action for DRO at the site and may have removed the PCBs. Post-excavation samples were not tested for PCBs. It is not known if PCBs remain onsite at the location of the previous detection.	Confirm the presence or absence of PCBs in soil at the location of the previous detection.	Complete	In 2014, Bristol was scoped to address this data gap by investigating the location of the pre-construction sample containing 2.2 mg/kg PCBs and collecting soil samples via test pits to determine if PCB-contaminated soil remained at Site 6 (Figure A-4) (USACE 2016b). PCBs were not detected in any of the 2014 soil samples.	2014
Site 8: Site 8 sediment sampling, composite sampling completed in 2010, 2011, and 2012 identified 2-methylnaphthalene at concentrations greater than the SSCL.	Continue monitoring natural attenuation in sediment.	Ongoing	Due to the recommendation in this periodic review to complete a supplemental soil investigation at Site 8, it was also recommended to discontinue MNA sediment sampling until the supplemental soil investigation is complete.	Anticipated 2025
Site 8: Established DUs may not include the most heavily impacted area.	Ensure the most heavily impacted area is included within the DU boundaries.	Ongoing	In 2018, an attempt to modify the existing DUs using the data collected in 2016 was made (Figure A-5) prior to performing a site inspection (refer to Section 5.4.3). However, sediment samples were not collected as anticipated. Sediment samples were not collected due to an insufficient volume of sediment, which is defined in the DD as “continuously submerged” to provide enough sampling and analytical data to perform representative monitoring. A supplemental soil investigation is recommended, after which, the DU boundaries will be re-evaluated.	Anticipated 2025

Table 1-4 (Continued)
Status of Recommendations from the 2014 FYR

Issue	Recommendation	Current Status	Current Implementation Status Description	Completion Date (if applicable)
Site 8: Water quality and natural attenuation parameters are measured in surface water.	Evaluation of natural attenuation parameters and water quality should be conducted in pore water to more accurately assess natural attenuation in contaminated sediment.	Ongoing	It is recommended in this periodic review to complete a supplemental soil investigation to delineate the lateral and vertical extent of soil contamination east of the 2016 sampling area and revise the location of the historic pipeline spill currently estimated based on 2016 sample data. The exposure risk and protectiveness will be further evaluated in the next periodic review. This evaluation will include determination of an appropriate monitoring program for the site.	Anticipated 2025
Site 10: Ethylene glycol was identified and removed to the extent practicable in soil. Currently there is not enough information to evaluate the presence or potential risk presented by the leaching of ethylene glycol to groundwater.	Add ethylene glycol to the suite of analytes evaluated in Site 10 groundwater.	Completed	Three groundwater sampling events have occurred in response to recommendations in the first FYR (USACE 2015b) to address this data gap. All groundwater samples collected from the two wells (MW10-1 and 14MW06) downgradient from Site 10 have been nondetect for glycol and this data gap is now closed. Additional sampling for glycols is not recommended for this site, including diethylene, ethylene, propylene, and triethylene glycol.	2018
MOC Sites (10, 11, 13, 15, 19, 27): As of 2012, elevated levels of DRO and RRO were found in surface water during excavation activities. TAH and TAqH were not included as test parameters.	If GRO, DRO, or RRO is suspected, add VOCs and PAHs to surface water samples to allow TAH/TAqH evaluation. These were included in the 2013 Work Plan.	Completed	TAH and TAqH were included as test parameters in surface water during excavation activities in 2013 and 2014.	2014

Table 1-4 (Continued)
Status of Recommendations from the 2014 FYR

Issue	Recommendation	Current Status	Current Implementation Status Description	Completion Date (if applicable)
MOC Sites (10, 11, 13, 15, 19, 27): The well network does not provide sufficient downgradient coverage of the site. Existing monitoring wells have been damaged by frost jacking and utilization of locking caps is not currently possible.	When the excavation remedy is complete, install new wells, or repair/refurbish existing wells downgradient of MOC Sites 10, 11, 13, 15, 19, and 27. The location and quantity of wells should take into account the hydraulic gradient and duration of the groundwater remedy.	Completed	In 2014, following this recommendation, Bristol installed and developed seven groundwater monitoring wells, 14MW01 through 14MW07, at the MOC gravel pad. Wells MW10-1, MW88-1, MW88-10, 17MW1, 20MW1, 22MW2, and 26MW1 were repaired. MW88-3, scoped for decommissioning, was repaired, re-developed, and sampled. This resulted in a monitoring well network consisting of 15 wells.	2014
MOC Sites (10, 11, 13, 15, 19, 27): The locations of monitoring wells with historic contamination (MW88-10 and MW88-1) appear to be upgradient of source areas identified as part of the MOC. The source of DRO in the wells is unclear.	Install a monitoring well upgradient of MW88-10 and MW88-1. The well location should take into account the anticipated hydraulic gradient at the site.	Complete	A monitoring well, 14MW07, was installed upgradient of MW88-10 and MW88-1 in 2014.	2014

Table 1-4 (Continued)
Status of Recommendations from the 2014 FYR

Issue	Recommendation	Current Status	Current Implementation Status Description	Completion Date (if applicable)
Site 27: Previous sampling detected the site COC naphthalene in soil above the cleanup level (up to 191 mg/kg) but naphthalene is not included in the analyte list for excavation confirmation sampling. Attainment of soil cleanup levels for naphthalene cannot be confirmed.	Collect soil samples to verify that naphthalene does not persist above cleanup levels at this site.	Complete	In 2014, the 2001 sample location that contained naphthalene at 191 mg/kg was relocated by a survey crew. The historical sample location appeared to be in an area of the E plume where soil had previously been excavated and removed. A test pit was advanced to the depth of the original sample, approximately 16 feet bgs. One primary soil sample and duplicate sample were collected from 12.5 to 13.5 feet bgs and analyzed for DRO and RRO, and naphthalene. The sample results did not contain DRO, RRO, or naphthalene in concentrations that exceeded the cleanup levels. The soil associated with the historical sample location was determined to have likely been removed during previous excavation activities at the MOC.	2014

Note:
For definitions, refer to the Acronyms and Abbreviations section.

1.3.2 Responsibilities

USACE Alaska District, is the lead agency for remedial actions at the NEC FUDS. USACE contracted ECC/Jacobs to conduct and prepare this Periodic Review report. The selected final remedial actions for the NEC sites were chosen in accordance with State of Alaska regulations governing the protection of human health and the environment from hazardous substances (18 AAC 75 and the Alaska Water Quality Standards [18 AAC 70]).

POL-contaminated sites at NEC fall under the CERCLA petroleum exclusion rule and were therefore addressed under the authority of the DERP, U.S. Code, Title 10, Section 2701, et seq. The petroleum contamination remedies were consistent with Alaska's Site Cleanup Rules (18 AAC 75.3).

1.3.3 Overview

This Periodic Review was conducted with data available as of September 2018. The project team consisted of the USACE Project Manager, technical representatives, and contracted environmental engineering support. This effort included a review of the DD requirements and work that has been done to satisfy those requirements, current and past monitoring data, and the status of the remedies and the physical condition of the sites. The public was notified of the Periodic Review with notices placed in the *Nome Nugget* on 29 March 2018 (Appendix D). In addition, a flyer containing the same information was mailed to select community members and ADEC on 21 March 2018 (Appendix D). Visits were made to each active site based on whether an action had been performed, is still in progress, or is planned for future completion. This Periodic Review addresses 13 of the 34 NEC sites selected for remedial action under the HTRW DD (USACE 2009a), shown on Figure A-2.

NEC sites designated as No Further Action (NFA) at the time of the DD or the first FYR were not included in this review. Refer to Table 1-3 for a brief description and the status of all 34 NEC sites.

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2.0 SITE CHRONOLOGY

Important events, the associated document reference, and relevant dates for the NEC sites covered in this Periodic Review are shown in Table 2-1.

Table 2-1
Chronology of Site Events

Event	Date
NEC site acquired by the U.S. Air Force	1952
AC&WS constructed	1951 – 1952
WACS constructed	1954
AC&WS operations terminated	1969
WACS operations terminated	1972
Bureau of Land Management obtained ownership of NEC	August 1975
ANCSA transferred land ownership to Sivuqaq, Inc. and Kukulget, Inc. (ANCSA 1979)	June 1979
Ecological assessment conducted (Pennack 1989)	1989
Site inventory and preliminary assessment conducted (URS Corporation 1992; Ecology and Environment 1992)	1991 and 1992
Phase I RI conducted (MW 1995b)	1994
All electrical transformers removed (MW 1995a)	1994
Phase II RI conducted (MW 1999)	1996-1998
Remedial action conducted to remove communications wire and cable on the tundra (MW 1997)	1997
Additional investigation supplementing the Phase II RI conducted (MW 2000)	1999
Site assessment conducted (U.S. Army Engineer District 1999)	1999
Debris, hazardous waste, ASTs, and fuel pipeline removed	2000
RAB comprised of community members and other interested parties formed	January 2000
USTs, PCB, and POL-contaminated soil removed, buildings demolished	2001
Phase III RI conducted (MWH Global 2003)	2001 – 2002
30 buildings and utilidor demolished; drums, communication poles, and wire removed	2003
Phase IV RI conducted (Shannon & Wilson, Inc. 2005)	August 2004
Human health and environmental risk assessment conducted (USACE 2004)	2004
Agency for Toxic Substances and Disease Registry (ATSDR) performed a health consultation of PAHs and PCBs in fish from the Suqi River (ATSDR 2005)	2005
Demolition and removal of the tram line and the associated line support towers, debris removal, and excavation at Site 31, Site 7, and the MOC, Sites 10 through 22, 26, and 27 (USACE 2006)	July 2005
Feasibility Study (FS) prepared (USACE 2007a)	2007
Groundwater Use Determination (18 AAC 350) submitted to ADEC for Sites 3, 4, 6, 7, and 9 (USACE 2007b)	April 2007

Table 2-1 (Continued)
Chronology of Site Events

Event	Date
ADEC responds on the NEC 350 Determination request: ADEC stated that before the determination can be approved, the landowner must be willing to record and be responsible for implementing the institutional controls (ICs) preventing groundwater use at the site (ADEC 2007)	May 2007
Proposed Plan published (USACE 2007c) and public comment period opened	July 2007
Proposed Plan public comment period closed	August 2007
Geophysical survey completed at Sites 7 and 10 (USACE 2007d)	August 2007
Responsiveness summary prepared (USACE 2008)	February 2008
DD selecting the remedy for Site 7 approved by USACE (USACE 2009b)	June 2009
Remedial action began to implement the remedy for Site 7 (USACE 2010a)	June 2009
Phase I in situ chemical oxidation (ISCO) at the MOC (USACE 2010b)	July 2009
DD selecting the remedy for Sites 1 through 6 and Sites 8 through 34 approved by USACE (USACE 2009a)	September 2009
Bristol requested landfill closure by ADEC for Site 7 (Bristol 2009)	November 2009
ACAT requests EPA oversight at Gambell and NEC FUDS and the inclusion of NEC FUDS on the NPL (ACAT 2009)	November 2009
EPA requests that the USACE details the cleanup efforts to date and addresses the issues identified by ACAT to re-evaluate EPA involvement and the listing of NEC on the NPL (EPA 2010)	March 2010
ADEC determined Site 7 closure was premature and denied the site closure request (ADEC 2009b)	December 2009
Remedial action began to implement the DD-selected remedies at Sites 1, 3, 6, 8, 13, 16, 21, 31, 32, and the MOC (USACE 2011)	July 2010
Remedial action performed at Sites 7, 8, 9, 13, 21, 28, 31 and the MOC (USACE 2012)	July 2011
The President of the Native Village of Savoonga requested that the ATSDR conduct a Public Health Assessment or Health Consultation on the FUDS of Gambell and NEC	October 2011
Public meeting on St. Lawrence Island regarding environmental health and cleanup Issues (EPA 2012a)	December 2011
Sediment mapping and sampling effort at Site 28 (USACE 2013a)	July 2012
Remedial action performed at Sites 8, 10, 13, 21, 31, Radar Dome (Radome) Road, and the MOC (USACE 2013c)	July 2012
St. Lawrence Island RAB and Public meeting via teleconference (RAB 2012a)	June 27, 2012
Sediment removal effort at Site 28 (USACE 2013b)	September 2012
EPA evaluated USACE cleanup of FUDS at NEC and Gambell and determined USACE Cleanup of NEC was consistent with CERCLA and the National Contingency Plan (EPA 2012d)	November 2012
St. Lawrence Island RAB and Public meeting at City Hall, Savoonga, Alaska (RAB 2012b)	December 5, 2012
Remedial action performed at Sites 8, 10, 13, 21, 28, and 31 (USACE 2015a)	July 2013
Public notice of FYR published and public comment period opened	August 2013

Table 2-1 (Continued)
Chronology of Site Events

Event	Date
First FYR site visit	September 2013
Surface water and groundwater sampling at Sites 7, 9 and a Kangukhsam Mountain Spring (USACE 2014)	September 2013
Final RAB meeting	15 and 16 January 2014
Public comment period closed for the first FYR	February 2014
Remedial action performed at Sites 6, 7, 8, 10, 11, 21, 27, 31, 32 (USACE 2016b)	July 2014
CERCLA FYR training	January 2015
First FYR completed for all sites (USACE 2015b, 2015c)	February 2015
Groundwater samples collected from the MOC (USACE 2016a)	August 2015
Long Term Management Plan Public Information Meeting in Savoonga	July 2016
Long-term management plan prepared (USACE 2016c)	August 2016
Groundwater samples collected from the MOC (USACE 2017a)	August 2016
Surface water and sediment samples collected from Site 8 (USACE 2017b)	August 2016
Public Comment release of the ATSDR Health Consultation	July 2017
Public notice of second FYR and Periodic Reviews, public comment period opened	March 2018
Second FYR and Periodic Reviews site visit	August 2018
Groundwater samples collected from the MOC (Appendix E)	August 2018
Surface water samples collected from Site 9 (Appendix G)	August 2018
Sediment mapped and samples collected from Site 28 (Appendix F)	August 2018
Second FYR for Sites 21 and 28 finalized (USACE 2020a)	February 2020
Second Periodic Review for Site 7 finalized (USACE 2020b)	August 2020

Note:
For definitions, refer to the Acronyms and Abbreviations section.

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3.0 REMEDIAL ACTIONS

Remedial action objectives (RAOs) and selected remedy descriptions associated with each NEC site included in this review are presented in this section. Details regarding the initial plans, remedy implementation, and status of the remedies are provided for the sites. Costs for operations and maintenance (O&M) are summarized in Section 3.3.

3.1 REMEDY SELECTION

The HTRW DD, which addressed 33 NEC sites, received final signature from the lead regulatory agency, ADEC, on 31 December 2009 (USACE 2009a). The DD presented the evaluation of specific remediation alternatives and identified COCs at the NEC sites. The RAOs described in the DD are presented in Sections 3.1.1 and 3.1.2.

3.1.1 Sitewide RAOs

RAOs for multiple NEC sites are as follows:

- Prevent current and future exposure to humans by ingestion, inhalation, and dermal contact with contaminated soil at levels above applicable or relevant and appropriate requirements (ARARs) for PCBs or pertinent risk-based standards for petroleum hydrocarbons.
- Prevent exposure to ecological receptors by direct contact with contaminated soil/sediment above risk-based cleanup levels.
- Prevent ingestion of groundwater containing contaminants at levels above state drinking water standards and pertinent risk-based standards for petroleum hydrocarbons.

3.1.2 MOC (Sites 10, 11, 13, 15, 16, 19, and 27) RAOs

RAOs for the MOC are as follows:

- Prevent ingestion of groundwater containing contaminants at levels above state drinking water standards and pertinent risk-based standards for petroleum hydrocarbons.
- Mitigate potential future risk to human health from the ingestion, inhalation, and dermal contact with soil exposure pathways. Meet risk-based cleanup levels in soil to a depth of 15 feet. Reduce concentrations of petroleum hydrocarbons and other contaminants to below pertinent risk-based standards.

3.1.3 Drainage Basin (Site 28) RAOs

RAOs for Site 28 are as follows:

- Mitigate potential future risk to human health from the ingestion, inhalation, and dermal contact with soil/sediment exposure pathways. Meet pertinent risk-based cleanup levels in sediment.
- Prevent migration of contaminants into the Suqi River above risk-based cleanup levels.

3.2 REMEDY IMPLEMENTATION

A brief description of each site, selected remedy, remedy implementation history, status, O&M plans (where applicable), and land use controls (LUCs) are presented by site in Sections 3.4 through 3.17.

3.3 SYSTEM O&M

The selected remedies for the NEC sites included in this Periodic Review, have been fully implemented at Site 32 only; however, the majority of remedial actions described in the DD have taken place (refer to Table 1-3 and Table 2-1). As of February 2019, anticipated maintenance costs for remaining monitoring, FYR, and Periodic Reviews (five remaining events over 25 years) are estimated to be $3,387,815.

3.4 SITE 3: FUEL PUMP HOUSE

The Fuel Pump House (Site 3) is located just south of Cargo Beach on Kitnagak Bay. Site 3 is located immediately adjacent to local subsistence hunting camp structures; it is occupied seasonally by individuals from Savoonga and Gambell (Figure A-3).

The former fuel pump house was constructed on a gravel pad. The topography slopes toward the beach to the north-northeast. The area to the south of the fuel pump house contains unconsolidated deposits with a thick tundra mat cover underlain by permafrost and ice-rich soil. Site 3 was historically used to transfer diesel fuel across the NEC FUDS to the bulk storage facilities (Site 11) via a 4-inch welded fuel pipeline. The fuel pipeline route followed Cargo

Beach Road to the west and turned south at the intersection of the Airport Access Road (Figure A-2). A major break in the pipeline is known to have occurred and is the location of the POL Spill (Site 8) described in Section 3.6.

Identified COCs at Site 3 include DRO in soil near the former pump house, RRO in outlying sediments, and DRO and RRO in shallow groundwater downgradient of the pump house along the former fuel pipeline (USACE 2009a). Sampling in 2004 identified DRO concentrations exceeding cleanup levels in soil at the former pump house at 20,500 mg/kg and RRO concentration in tundra soil/sediment near the former pump house at 28,500 mg/kg. Sediment from the area was noted in the DD as being highly organic and suggests RRO exceedances may have been attributed to naturally occurring organic compounds. Shallow groundwater sampled in 2004 contained concentrations of DRO up to 3.4 mg/L and RRO up to 3.4 mg/L. Groundwater remediation was not included in the selected remedy because groundwater at Site 3 was not considered a current or reasonably expected future drinking water source in the DD (USACE 2009a).

3.4.1 Site 3 Fuel Pump House Remedy Implementation and Status

The selected remedies listed in the DD, RAOs, and implementation status for Site 3 are presented in Table 3-1.

Table 3-1
Site 3 Remedy, RAOs, and Status

Selected Remedy to Achieve RAO	RAO	Implementation Status
Excavation and removal of petroleum-contaminated soil to established cleanup levels.[1]	Prevent current and future exposure to humans by ingestion, inhalation, and dermal contact with contaminated soil at levels above ARARs for PCBs or pertinent risk-based standards for petroleum hydrocarbons.	Complete
LUC to record a deed notice to designate areas not suitable for drinking water.[2,3]	Prevent ingestion of groundwater containing contaminants at levels above state drinking water standards and pertinent risk-based standards for petroleum hydrocarbons.	Incomplete

Notes:
[1] Results of sediment resampling, performed in accordance with ADEC Technical Memorandum 06-001 (ADEC 2006), did not exceed the RRO SSCL, so additional excavation was not performed. There was not a source of POL-related contamination discernible from potential biogenic contributions and additional disturbance to the site would cause unnecessary damage to the tundra ecosystem.
[2] The shallow groundwater at low-lying tundra areas of NEC Sites 3, 6, and 9 is not a current or reasonably expected potential future drinking water source (USACE 2009a).
[3] It is anticipated LUCs will be recorded as a deed notice in the form of an Environmental Covenant in accordance with the UECA.
For definitions, refer to the Acronyms and Abbreviations section.

The selected remedy was initiated in 2010. The historical soil sample locations from 2004 (04NE03SB105/04NE03SB106) containing DRO concentrations greater than cleanup levels (shown on Figure A-3) were located by survey and investigated in 2010 (USACE 2011). Four test pits measuring approximately 5 feet by 5 feet were excavated at the location of the historical samples and a confirmation sample was collected from the floor and sidewall of each test pit for analysis of DRO and RRO. Confirmation samples submitted to an analytical laboratory indicated that DRO and RRO were below SSCLs (Figure A-3) and the test pits were backfilled and graded. The maximum confirmation soil sample results from the test pits are presented in Table 3-2.

Table 3-2
Site 3 Soil Sample Test Pit Results

Analyte	Cleanup Level[a]	Unit	DD Maximum Concentration	2010 Maximum Concentration
DRO	9,200	mg/kg	**20,500**	3,700 M,J
DRO (silica gel)	9,200	mg/kg	--	3,400 J
RRO	9,200	mg/kg	6,120	7,000 QH,J
RRO (silica gel)	9,200	mg/kg	--	2,300 J

Notes:
[a] Cleanup level recorded in the DD (USACE 2009a)
BOLD = Sample result exceeds cleanup level
-- Data not reported in the DD (USACE 2009a)
J – The analyte was positively identified; however, the associated result was less than the limit of quantitation but greater than or equal to the detection limit (DL).
M – A matrix effect was present.
QH – Analyte result was considered an estimated value (biased high) due to a quality control (QC) failure.
For definitions, refer to the Acronyms and Abbreviations section.

Historical sediment sample locations were identified by survey and resampled (Figure A-3). At the time of sampling, no water was present and samples were subject to silica gel cleanup according to the ADEC Technical Memorandum 06-001, *Biogenic Interference and Silica Gel Cleanup* (ADEC 2006). Sediment samples were submitted to an analytical laboratory for analysis. Sediment sample 10NC01SB02 exceeded the sediment SSCL for RRO; however, following silica gel treatment sediment concentrations at Site 3 were reduced by approximately 60 percent from 5000 mg/kg to 2100 mg/kg. RRO contamination exceeding the cleanup level in sediment was confirmed to be attributed to biogenic interference. All other sediment sample results were below SSCLs and no additional excavation and/or sampling was required to address sediment contamination at Site 3. Maximum concentrations of DRO and RRO detections are shown in Table 3-3.

Table 3-3
Site 3 Sediment Sample Results

Analyte	Cleanup Level[a]	Unit	Maximum DD Concentration	Maximum 2010 Concentration	Corresponding 2010 Concentration After Silica Gel
DRO	3,500	mg/kg	**3,720**	550 J	300 J
RRO	3,500	mg/kg	**28,500**	**5,000 QH,J**	2,100 J

Notes:
[a] Cleanup level reported in the DD (USACE 2009a)
BOLD = Sample exceeds cleanup level
J – The analyte was positively identified; however, the associated result was less than the limit of quantitation but greater than or equal to the DL.
QH – Analyte result was considered an estimated value (biased high) due to a QC failure.
For definitions, refer to the Acronyms and Abbreviations section.

A mound of soil adjacent to the soil test pits, believed to have originated as the pump house gravel pad, was suspected to contain POL contamination. In 2010, soil samples were collected from the mound and the presence of DRO above cleanup levels was confirmed. The onsite Quality Assurance Representative (QAR) was notified and field efforts at Site 3 shifted to the mound. Soil from the mound was transported to a mechanical screen plant at Site 6, where it was screened and loaded into container express units and bulk bags for shipment offsite. Approximately 197 tons of DRO-contaminated soil were removed from the mound at Site 3 in 2010 (USACE 2011). Confirmation soil samples collected from beneath the location of the former mound were confirmed below SSCLs. The extent of the removal effort and the subsequent confirmation sample locations are shown on Figure A-3. The maximum confirmation soil sample results from beneath the former mound are presented in Table 3-4.

Table 3-4
Site 3 Mound Confirmation Results

Analyte	Cleanup Level[a]	Unit	DD Maximum Concentration	2010 Maximum Concentration
DRO	9,200	mg/kg	--	6,100 M,J
RRO	9,200	mg/kg	--	3,900 QH,M,J

Notes:
[a] Cleanup level recorded in the DD (USACE 2009a)
-- Data not reported in the DD (USACE 2009a)
J – The analyte was positively identified; however, the associated result was less than the limit of quantitation but greater than or equal to the DL.
M – A matrix effect was present.
QH – Analyte result was considered an estimated value (biased high) due to a QC failure.
For definitions, refer to the Acronyms and Abbreviations section.

At the time of this review, the LUC at Site 3 to designate the area as not suitable for drinking water has not been fully implemented. Two signs, indicating where groundwater use for drinking water or ground disturbing activities are not recommended have been installed at the air field and at the fish camp. Each sign was two-sided and contained both Yupik and English transcriptions.

3.4.2 Site 3 Fuel Pump House O&M

In 2007, ADEC reviewed the USACE request for a groundwater use determination (18 AAC 75.350) for Site 3 (ADEC 2007). ADEC determined that before approval, there needs to be documentation that the landowner is willing to record and be responsible for implementing LUCs preventing groundwater use at Site 3. Additionally, Periodic Reviews are required at Site 3 until all selected remedies are complete. Full implementation of the remedy currently affecting protectiveness, which includes the filing of a deed notice, is anticipated to occur by 2021.

3.5 SITE 6: GRAVEL PAD

Gravel Pad (Site 6), also known as the Cargo Beach Road Drum Field site, is located west of Cargo Beach Road, approximately 0.6 miles south of Site 3 (Figure A-4). Site 6 consists of relatively fine-grained soil with exposed cobbles. During facility operation, Site 6 was used to dispose of empty drums containing POL products. More than 1,500 drums, an empty 500-gallon water storage tank, battery, and miscellaneous metal debris were removed in 2000 and 2001 (USACE 2009a).

Several metals including arsenic, lead, nickel, and zinc were detected in unfiltered groundwater samples to the west and northwest of the gravel pad in 2001. Groundwater remediation was not included in the remedy at Site 6 because shallow groundwater was not considered a current or reasonably expected future drinking water source in the DD (USACE 2009a).

Sediment samples contained DRO at a maximum concentration of 4,660 mg/kg due west of the gravel pad in 1994, as described in the FS (USACE 2007a). The FS identified DRO, RRO, and arsenic as COPCs in soil at Site 6. The primary COC identified in the DD is DRO in surface soil (0 to 2 feet) with a maximum concentration of 102,000 mg/kg. Sampling in 1994 identified two areas of DRO-contaminated soil. One area was approximately 400 square feet and was located at the eastern edge of the gravel pad. The larger area identified was located on the western portion of the pad.

As described in the DD (USACE 2009a), RRO and arsenic were eliminated as COCs. RRO was detected below the cleanup level of 9,200 mg/kg with a maximum concentration of 8,500 mg/kg in 2001. Arsenic was detected below site-specific background levels with a maximum concentration of 9.9 mg/kg in 2004.

3.5.1 Site 6: Gravel Pad Remedy Implementation and Status

The selected remedies listed in the DD, RAOs, and implementation status for Site 6 are presented in Table 3-5.

Table 3-5
Site 6 Remedy, RAOs, and Status

Selected Remedy to Achieve RAO	RAO	Implementation Status
Excavation and removal of petroleum-contaminated soil to established cleanup levels.	Prevent current and future exposure to humans by ingestion, inhalation, and dermal contact with contaminated soil at levels above ARARs for PCBs or pertinent risk-based standards for petroleum hydrocarbons.	Complete
	Prevent exposure to ecological receptors by direct contact with contaminated soil/sediment above risk-based cleanup levels.	Complete
LUC to record a deed notice to designate areas not suitable for drinking water.[1,2]	Prevent ingestion of groundwater containing contaminants at levels above state drinking water standards and pertinent risk-based standards for petroleum hydrocarbons.	Incomplete

Notes:
[1] The shallow groundwater at low-lying tundra areas of NEC Sites 3, 6, and 9 is not a current or reasonably expected potential future drinking water source (USACE 2009a).
[2] It is anticipated LUCs will be recorded as a deed notice in the form of an Environmental Covenant in accordance with the UECA.
For definitions, refer to the Acronyms and Abbreviations section.

Approximately 2,514 tons of contaminated soil were excavated and removed from Site 6 in 2010. Historical soil sampling locations from 1994 were located by survey and investigated by excavating trenches and test pits to delineate the outermost extent of contamination. Although the DD specified DRO as the primary COC, initial sampling efforts in 2010 indicated that RRO was the predominant COC at Site 6. Excavation efforts were guided by RRO contamination and continued until field laboratory results indicated that both RRO and DRO concentrations were below cleanup levels or until groundwater was encountered (USACE 2011).

Following initial excavation efforts, confirmation soil samples were collected from soil above the groundwater table. Two areas were identified to contain RRO concentrations above cleanup levels and were further excavated. Confirmation results indicated that cleanup levels had been achieved for one of the two identified areas within the excavation (USACE 2011). The second area of contamination encountered groundwater during excavation efforts and was therefore not resampled. Excavation pits were backfilled and graded with clean fill obtained from the borrow area located south of Site 31. Excavation extents and confirmation sample locations are shown on Figure A-4.

Excavation efforts extended west to a nearby surface water body. To further characterize Site 6, two sediment samples and two surface water samples were collected in 2010 from a pond adjacent to the excavation activities. Samples were analyzed for gasoline-range organics (GRO); DRO/RRO; benzene, toluene, ethylbenzene, and xylenes (BTEX); and polycyclic aromatic hydrocarbons (PAHs). Contaminant concentrations in sediment samples were below SSCLs for all analyses. DRO was detected at a concentration of 160 mg/kg in sediment, which is well below the established sediment SSCL.

Surface water did not exhibit a sheen and sample results were below SSCLs for TAHs and TAqHs established in the DD (USACE 2009a). DRO and RRO were detected in the surface water sample with a maximum concentration of 1.5 mg/L and 1.3 mg/L, respectively; however, the DD did not establish a cleanup concentration for DRO and RRO in surface water, and no further action was taken (USACE 2011). Sediment and surface water sampling locations are shown on Figure A-4.

Soil samples were collected on two occasions in 2009, before work started (pre-construction) and after work was completed (post-construction), from three locations at the Site 6 hazardous waste accumulation point (HWAP). The same three locations were sampled pre- and post-construction. One of the pre-construction soil samples (09NC007SB03) collected in 2009 at Site 6 contained PCBs at an estimated concentration of 2.2 mg/kg (M, L, J-flagged), which was above the cleanup level of 1 mg/kg. The sample was collected as part of a sampling program meant to evaluate the effects of field activities on soil at the Site 6 HWAP. The estimated result failed one or more QC criteria and was a duplicate of sample 09NC007SB02. Sample 09NC007SB02 contained a PCB concentration (Aroclor 1254) of 0.670 mg/kg (M, L, J-flagged). The post-construction samples collected from the same location, 09NC007SB05 and 09NC007SB06, did not contain PCBs in concentrations exceeding the cleanup level.

The HWAP was located at Site 6 and served as the location where drums from the Site 7 landfill were emptied, washed, containerized, and staged. Subsequent petroleum-contaminated soil excavation activities at Site 6 were conducted in 2010, but soil confirmation samples were not analyzed for PCBs to verify whether PCBs were present at the site. Bristol Environmental Remediation Services, LLC (Bristol) was scoped to address this data gap in 2014 by investigating this location and collecting soil samples to determine if PCB-contaminated soil exists (USACE 2016b). PCBs were not detected in any of the soil samples.

At the time of this review, the LUC at Site 6 to designate the area as not suitable for drinking water has not been fully implemented. Two signs, indicating where groundwater use for drinking water or ground disturbing activities are not recommended have been installed at the air field and at the fish camp. Each sign was two-sided and contained both Yupik and English transcriptions.

3.5.2 Site 6: Gravel Pad House O&M

In 2007, ADEC reviewed the USACE request for a groundwater use determination (18 AAC 75.350) for Site 6 (ADEC 2007). ADEC determined that before approval, there needs to be documentation that the landowner is willing to record and be responsible for implementing

LUCs preventing groundwater use at Site 6. Additionally, Periodic Reviews are required at Site 6 until all selected remedies are complete. The next Periodic Review is due five years from the final publication of this document (refer to Section 10). Full implementation of the remedy currently affecting protectiveness, which includes the filing of a deed notice, is anticipated to occur by 2021.

3.6 SITE 8: POL SPILL

POL Spill (Site 8), also known as the Pipeline Break Site, is located southwest of the intersection of Cargo Beach Road and the Airport Access Road (Figure A-5). The site is a wetland with thick surface vegetation that slopes southward toward the Suqi River. The wetland is approximately 40 feet wide and narrows as it approaches the river.

Contamination at Site 8 is believed to have resulted from a reported break in the fuel pipeline that previously extended from the pump house at Site 3 to the bulk storage tanks at Site 11. The fuel pipeline was drained and removed in 2000 (USACE 2009a).

In 2004, two sediment samples and one surface water sample were collected at Site 8 to assess the potential fuel impacts to the area. Sediment samples were collected at locations 50 and 100 feet downgradient of the reported pipeline break. DRO was identified above cleanup levels in sediment (at concentrations of 6,700 and 19,500 mg/kg) and no exceedances were identified in surface water (USACE 2009a). The potential for significant adverse effects to human and ecological receptors at Site 8 is considered low because of the high organic content of the sediment, which promotes fuel component binding minimizing the potential for contaminant migration (USACE 2009a).

3.6.1 Site 8 POL Spill Remedy Implementation and Status

The selected remedies listed in the DD, RAOs, and implementation status for Site 8 are presented in Table 3-6.

Table 3-6
Site 8 Remedy, RAOs, and Status

Selected Remedy to Achieve RAO	RAO	Implementation Status
MNA of petroleum-contaminated sediment for a period of three years.	Prevent exposure to ecological receptors by direct contact with contaminated soil/sediment above risk-based cleanup levels.	Complete
Periodic review of petroleum-only contaminated sites with residual contamination performed approximately every five years from the date of final signature of the DD (USACE 2009a) until cleanup levels are met.[1]		Incomplete
LUC to record a deed notice that this area should not be used for residential land use without additional investigation and/or cleanup.[2]	Prevent ingestion of groundwater containing contaminants at levels above state drinking water standards and pertinent risk-based standards for petroleum hydrocarbons.	Incomplete

Notes:
[1] The landowner will be requested to provide confirmation of existing land use at the time of review, and any change in land use will trigger a review of the remedy protectiveness.
[2] It is anticipated LUCs will be recorded as a deed notice in the form of an Environmental Covenant in accordance with the UECA.
For definitions, refer to the Acronyms and Abbreviations section.

Annual monitoring of contaminant levels in sediment occurred in 2010, 2011, and 2012. The MNA remedy was initiated in 2010 by creating three DUs: an upper DU (UDU), middle DU (MDU), and lower DU (LDU) based on field observations and the approximate location of the pipeline break (Figure A-5). Composited sediment samples were collected from each DU to establish site trends and possibly degradation rates. In 2010, DRO, RRO, 2-methylnaphthalene, and fluorene were detected at concentrations greater than SSCLs. In 2011, no analytes were identified at concentrations greater than SSCLs. In 2012, 2-methylnaphthalene was identified above SSCLs within the LDU (USACE 2013c).

In 2010-2012, sediment samples were composited from eight different locations within each DU. However, composited samples were not collected from the same locations each year and are therefore not able to accurately establish contaminant degradation trends. Results indicated contaminated sediment continues to persist at concentrations above SSCLs. Figure A-5 presents the locations of composited samples for each DU by year.

During each monitoring event, water quality parameters were also evaluated in surface water. Field results for manganese, ferrous iron, sulfate, and nitrate were near or less than the method DLs stated by the manufacturer of the field water test kits; therefore, the results for these parameters were not definitive for assessing MNA. The dissolved oxygen (DO) and oxidation reduction potential (ORP) levels measured suggested that conditions are amenable for oxidative degradation of hydrocarbons and natural organic materials at the site.

In 2014, the two historical surface water locations (12NC08SWA01 and 12NC08SWA02/03) were relocated and additional surface water samples were collected and analyzed for GRO, DRO, RRO, BTEX, and PAHs (Figure A-5) (USACE 2016b). Sample 14NC08SWA02 and field duplicate sample 14NC08SWA03, located approximately 200 feet from the suspected pipeline break location (non-revised location), exceeded the TAqH cleanup level stated in the 2009 DD (USACE 2009a) of 0.015 mg/L. The TAqH value for surface water sample 14NC08SWA02 totaled 0.0193 mg/L (QN-flagged) and sample 14NC08SWA03 had a TAqH value of 0.0329 mg/L (QN-flagged). No sheen was observed. No other analytes exceeded evaluation criteria. Surface water samples collected in 2014 were not analyzed for MNA parameters as completed in previous years' efforts.

On the 17^{th}, 18^{th}, and 22^{nd} of August 2016, a total of 83 samples (44 soil and 39 sediment) were collected from 75 sample locations at Site 8 (USACE 2017b). Sample locations were the center point of either 20-foot or 10-foot sample grids that spanned across the three historical DUs and adjacent areas. Soil samples were not collected beneath the gravel road. Samples were collected from 1 to 2 feet bgs from depths immediately below the vegetative mat. Target analytes exceeding DD-based SSCLs at Site 8 were present downgradient of the suspected pipeline break and along the western toe of the road shoulder in soil and sediment samples. Target analytes did not exceed DD-specified SSCLs within or adjacent to the UDU.

Sediment samples exceeded the SSCLs of 3,500 mg/kg for DRO, 3,500 mg/kg for RRO, and 0.6 mg/kg for 2-methylnaphthalene. For analytes with sediment SSCLs, sample concentrations of DRO ranged from 190 to 11,000 mg/kg, RRO ranged from 1,800 to 11,000 mg/kg, 2-methylnaphthalene ranged from nondetect (ND) to 6.8 mg/kg, fluorene ranged from nondetect to 0.41 mg/kg (qualified J), naphthalene ranged from nondetect to 0.69 mg/kg (qualified J), and phenanthrene ranged from nondetect to 0.25 mg/kg (qualified J); acenaphthene, benzo(g,h,i)perylene, fluoranthene, and indeno(1,2,3-cd)pyrene were also nondetect. Although RRO exceeded the sediment SSCL from 22 of the sample locations, there is no record of anthropogenic RRO sources at Site 8 and all RRO detections are likely to be biogenic in nature. Comparison of 2016 sample chromatograms to chromatograms of instrument calibration standards indicated that the chromatographic patterns in most samples were not consistent with patterns of typical middle distillate or residual-range fuel products.

Soil samples exceeded the SSCL of 9,200 mg/kg for DRO. For analytes with soil SSCLs, sample concentrations of DRO ranged from 11 mg/kg (qualified J,B) to 19,000 mg/kg, RRO ranged from 130 mg/kg (qualified QL) to 8,500 mg/kg, and naphthalene ranged from nondetect to 3.2 mg/kg (qualified J,QH). In 2016, DRO exceeded the sediment SSCL in S08-SD-026 and S08-SD-068 at 11,000 and 7,600 mg/kg, respectively. Both samples were silty, fine sand, near the historical sediment samples collected in 2004 and within the boundaries of the DUs. DRO exceeded the soil SSCL in S08-SS-013, S08-SS-0139, and S08-SS-030 at 19,000, 17,000, and 14,000 mg/kg, respectively. While a notable fuel odor was present during the collection of both samples, a visible sheen was observed on water that accumulated within the sample boring during the collection of S08-SS-013. Location S08-SS-013 was slightly east of the LDU and approximately 20 feet downgradient of the 2004 DRO exceedance of 19,500 mg/kg. Composite samples were collected in 2010 and 2012 nearby S08-SS-013. Location S08-SS-030 was east of the LDU along the toe of Cargo Beach Road and upgradient of a 2004 DRO exceedance of 6,700 mg/kg.

In 2018, a site inspection was performed (refer to Section 5.4.3); however sediment samples were not collected as anticipated. An attempt to modify the existing Decision Units (DUs) using the data collected in 2016 was made (Figure A-5). Sediment samples were not collected due to an insufficient volume of sediment, which is defined in the DD as “continuously submerged” to provide enough sampling and analytical data to perform representative monitoring. Intermittently submerged sediments (e.g., ephemeral ponds, wet tundra) are considered soil. Soil is not currently considered a media of concern in the DD at Site 8 (USACE 2009a).

At the time of this review, the LUCs presented in Table 3-6 to designate areas not suitable for residential land use without additional investigation and/or cleanup have not been fully implemented. A deed notice has not been prepared because implementation of LUCs has not been completed. Additionally, contaminated soil remains on site above the NEC SSCLs.

3.6.2 Site 8 POL Spill O&M

Delineate the lateral and vertical extent of DRO contamination in soil east of the 2016 sample locations is needed in order to further evaluate exposure risk and whether or not further action is necessary to achieve protectiveness. This effort is anticipated to occur by 2025.

Periodic Reviews are required at Site 8 until all selected remedies are complete. The next Periodic Review is due five years from the final publication of this document (refer to Section 10). Full implementation of the remedy currently affecting protectiveness, which includes the filing of a deed notice, is anticipated to occur by 2021.

3.7 SITE 9: HOUSING AND OPERATIONS LANDFILL

The Housing and Operations Landfill (Site 9) is located approximately 500 feet northeast of the MOC in a marshy area east of Cargo Beach Road (Figure A-6). The site covers an estimated 1.9 acres and contains several surface water drainages that enter the Suqi River approximately 0.25 miles to the north. Between 1952 and 1965, Site 9 served as a waste disposal area for miscellaneous metal debris, drums, and other trash.

Metals and DRO were initially identified as soil COPCs at Site 9. The maximum concentration of DRO in soil was 375 mg/kg, which did not exceed SSCLs. Arsenic was detected in site soil between 3.6 and 30 mg/kg, and the 95 percent upper confidence limit of the mean was determined to be 17 mg/kg; therefore, detections were determined to be within the concentration range of naturally occurring arsenic in Alaska soil and arsenic was eliminated as a soil COC (USACE 2009a).

Shallow groundwater COCs at Site 9 include DRO, RRO, and lead. In 1994 and 1998, elevated levels of DRO were detected in monitoring well MW9-3 ranging between 0.51 to 7.7 mg/L. In 2001, resampling of MW9-3 did not detect fuels in shallow groundwater. In 2001, RRO was detected at 4.2 mg/L in monitoring well WP102 and lead was detected above cleanup levels at all Site 9 groundwater sampling locations. Lead contamination ranged between 0.019 to 0.30 mg/L in 1994 and 2001 (USACE 2007a). Groundwater remediation was not included in the remedy at Site 9 because shallow groundwater was not considered a current or reasonably expected future drinking water source in the DD (USACE 2009a).

Surface water samples collected at Site 9 did not detect COCs above cleanup levels. All exposed drums, debris, and batteries were removed from the site in 2001 and 2005 (USACE 2009a).

3.7.1 Site 9 Housing and Operations Landfill Remedy Implementation and Status

The selected remedies listed in the DD, RAOs, and implementation status for Site 9 are presented in Table 3-7. The anticipated completion date for listed incomplete remedies is the pending milestone date of 2025.

Table 3-7
Site 9 Remedy, RAOs, and Status

Selected Remedy to Achieve RAO	RAO	Implementation Status
Removal of partially submerged or exposed debris from flowing streams.	Prevent current and future exposure to humans by ingestion, inhalation, and dermal contact with contaminated soil at levels above ARARs (for PCBs) or pertinent risk-based standards for petroleum hydrocarbons.	Complete
LTM for three events to verify that COCs in shallow groundwater are not migrating downgradient and impacting surface water.		Complete
Additional six LTM events spaced five years apart to demonstrate that shallow groundwater meets RAOs for non-drinking water sources.		Incomplete/ Ongoing[3]
Periodic visual monitoring of the cap for settlement and erosion for five years.[1]		Complete
LUC to prevent construction of buildings on top of landfills.[2]		Incomplete
LUC to record a deed notice to document the debris site capped boundaries including a detailed map of the site to the landowner.[2]		Incomplete
LUC to record a deed notice to designate areas not suitable for drinking water.[2,3]	Prevent ingestion of groundwater containing contaminants at levels above state drinking water standards and pertinent risk-based standards for petroleum hydrocarbons.	Incomplete

Notes:
[1] Additional visual monitoring, up to 30 years, may be conducted if deemed necessary based on the results of the site inspections.
[2] It is anticipated LUCs will be recorded as a deed notice in the form of an Environmental Covenant in accordance with the UECA.
[3] The shallow groundwater at low-lying tundra areas of the NEC site (Sites 3, 6, and 9) is not a current or reasonably expected potential future drinking water source (USACE 2009a).
For definitions, refer to the Acronyms and Abbreviations section.

Remedy implementation at Site 9 began in 2010 (USACE 2011). One of the primary features considered while designing the landfill cap for Site 9 was a pond located on the southeast side of the landfill (USACE 2011). The outflow from this pond travelled to the north-northwest directly across the surface of the landfill. To minimize the flow of water through the landfill, a diversion trench was incorporated into the landfill cap design to create a preferential pathway for the pond. Three locations for the diversion trench were proposed during the application for Nationwide Permit No. 38 authorization. The selected diversion trench was constructed during the 2010 field season using a track hoe and working from the northeast to the southwest. The trench is approximately 15 feet wide by 160 feet long and is lined with rocks larger than 2 inches in diameter (Figure A-6). The lower elevation of the trench is approximately 25 feet from an adjacent native stream channel. Water from the pond diverted through the trench is required to flow over land to connect to the adjacent stream channel. As an erosion control measure, straw wattles were placed at the end of the trench to reduce water flow (USACE 2011).

Construction of the landfill cap was initiated by determining the outer boundaries of the historical landfill using test pits in areas of visible debris. If the test pits did not encounter additional underground debris, the surface debris was considered an anomaly and relocated to a central location within the landfill. More than 30 test pits were advanced in 2010 to establish the landfill boundaries (USACE 2011). Approximately 9,960 cubic yards of borrow material was spread over the delineated landfill to achieve the minimum 2-foot cap. A surface grade was established to promote surface runoff and prevent erosion. Approximately 90 linear feet of fill on the northern edge and 250 feet on the eastern edge of the landfill cap were placed into water bodies in accordance with Nationwide Permit 38, *Cleanup of Hazardous and Toxic Waste* (EPA 2012b). Figure A-6 presents the location of the landfill cap on top of the landfill at Site 9.

The additional component of the remedy, including periodic visual monitoring of the cap for settling and erosion, was initiated in 2011 following the construction of the landfill cap. In 2011, the landfill cap was re-seeded and fertilized (USACE 2012). A stabilization analysis was conducted by Bristol and it was determined that the landfill cap met non-vegetative permanent stabilization requirements established in the 2011 Alaska Construction General Permit (USACE 2012). Visual monitoring of the landfill cap was also conducted by a USACE QAR in September 2011, July 2012, and August 2013. Observations were noted on the 2011, 2012, and 2013 site inspection checklists (USACE 2011, 2012, 2013c). During all site inspections, ponded water was observed against the north and east sides of the landfill cap. Vegetative cover was estimated at 70 to 80 percent on the cap surface and on the side slopes. Vegetative cover was noted as being short but with good coverage. The cap appeared structurally sound and stable with no evidence of leaching or erosion (USACE 2011, 2012, 2013c).

Monitoring to evaluate downgradient migration of contaminants and a steady-state plume was performed in 2010 (USACE 2011), as part of the first Periodic Review in 2013 (USACE 2014), and as part of this Periodic Review. Three surface water sampling events occurred at the drainage that flowed through the landfill in 2010. Samples were analyzed for GRO, DRO, RRO, VOCs, PAHs, PCBs, and metals. During the third sampling event, laboratory error resulted in VOC analyses outside of the required holding time. Additional sampling was conducted in 2011 to fill this data gap. In 2013, surface water was collected from three locations adjacent to the landfill cap and submitted to an offsite analytical laboratory for analysis of GRO, DRO, RRO, BTEX, PAH, PCBs, and both dissolved phase and total Resource Conservation and Recovery Act (RCRA) metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver) plus zinc. A single groundwater grab sample was also collected east of the landfill cap. Sufficient volume of groundwater was obtained for analysis of GRO, BTEX, and dissolved RCRA metals plus zinc. No analytes were detected above the project screening levels in surface water or groundwater. In 2018, additional surface water sampling and a site and landfill cap visual inspection were performed. The observations noted during the site and landfill cap inspection are presented in Section 5.4.4. Surface water was collected from three locations adjacent to the landfill cap and submitted to an offsite analytical laboratory for analysis of DRO, RRO, BTEX, PAHs, and lead. No contaminants have been detected above the site-specific TAH and TAqH cleanup levels established in the DD (USACE 2009a).

At the time of this review, LUCs to designate areas not suitable for drinking water and prevent construction of buildings on top of the landfill have not been fully implemented. Two signs, indicating where groundwater use for drinking water or ground disturbing activities are not recommended have been installed at the air field and at the fish camp. Each sign was two-sided and contained both Yupik and English transcriptions.

3.7.2 Site 9 Housing and Operations Landfill O&M

In 2007, ADEC reviewed the USACE request for a groundwater use determination (18 AAC 75.350) for Site 9 (ADEC 2007). ADEC determined that before approval, there needs to be documentation that the landowner is willing to record and be responsible for implementing

LUCs preventing groundwater use at Site 9. Additionally, Periodic Reviews are required at Site 9 until all selected remedies, as noted in Table 3-7, are complete. The next Periodic Review is due five years from the final publication of this document (See Section 10). Full implementation of the remedy currently affecting protectiveness, which includes the filing of a deed notice, is anticipated to occur by 2021.

3.8 MAIN OPERATIONS COMPLEX

During operation of the NEC installation, the MOC encompassed most of the site infrastructure, including buildings, heat and power supply, fuel storage tanks, maintenance, and housing quarters. Six sites (Sites 10, 11, 13, 15, 19, and 27) on the northeast portion of the MOC gravel pad were grouped together to evaluate an overall response action for known contamination.

RIs were conducted at the MOC in 1994, 1996, 1998, 2001, 2002 and 2004 and are summarized in the DD and site-specific descriptions (USACE 2009a). Sampling results indicated that soil and groundwater contained petroleum compounds at elevated levels. At Site 13, PCBs were also found in the soil. The remedy for fuel-contaminated soil at these sites included chemical oxidation to achieve the cleanup levels and treat soil and groundwater contamination in the short-term. In the event chemical oxidation was determined to be ineffective at these sites, a contingency remedy of MNA for groundwater and excavation of soil was planned. The remedy for the PCB-contaminated soil at Site 13 was excavation and removal.

In 2009, ISCO field and bench testing were conducted (USACE 2010b). One finding of the field investigation was that a shallow water-bearing zone (approximately 3 to 8 feet bgs) contained higher groundwater concentrations of DRO than a deeper water-bearing zone (approximately 13 to 14 feet bgs). Test pitting and soil boring results indicated that contaminated soil in the shallow water-bearing zones contained fill material along with peat and/or organic silt layers underlain by intermittent frozen soil layers. The relatively shallow depth, high organic carbon content, and porosity of these materials means that this soil would likely serve as an ongoing source of groundwater contamination.

The bench testing consisted of two parts: a total oxidant demand test conducted prior to the ISCO injections, and a treatability study using additional oxidant and activator combinations not tested in the field. Due to project schedules and limitations on the ability to collect representative samples prior to the summer field season, bench testing was performed while ISCO-related site characterization and baseline sampling was underway (USACE 2010b). The total oxidant demand test used three different soil/groundwater combinations and three different treatment combinations for a total of nine test vessels. The oxidant demand results were used to inform the treatability study as well as the field ISCO application. The subsequent bench-scale treatability study was performed on two different chemical oxidation approaches: activated sodium persulfate and catalyzed hydrogen peroxide. Overall results showed that the naturally occurring organic compounds present in the soil competed with the oxidation of the target contamination and contaminants showed increased short-term mobilization into water. In the field, a pilot study was conducted by injecting hydrogen peroxide and iron-activated sodium persulfate into injection wells, but the target volume could not be injected due to preferential pathways in soil leading to surface releases of the oxidant materials (USACE 2010b). Field-testing could not confirm a decrease in overall fuel-related contamination and groundwater contaminant concentrations appeared to stabilize back to original concentrations toward the end of the 28-day monitoring period. Due to the peat and organic silts in the soil, the presence of permafrost and/or frozen zones, and the observation of preferential flow zones, the primary selected remedy did not appear capable of meeting target cleanup levels for COCs.

To implement the contingency remedy of excavation, soil contamination was further delineated through direct-sensing UVOST technology in 2010 (USACE 2011). A total of 198 probe locations were advanced around the MOC to final depths between 10 and 24 feet. The areas corresponding to DRO concentrations of 9,200 mg/kg or greater were mapped and 10 plumes were labeled A through J across the MOC (Figure A-14). The plumes extended into Site 28. These plume locations correspond with site contamination identified in previous investigations for Sites 13, 15, 19, 27, and an additional subsurface location to the west (A1 plume). Plume locations were used to guide subsequent soil excavations to the extent practicable.

Site 11 had surface staining in addition to the subsurface J1A plume delineated by the UVOST. A contaminant plume at Site 10 was not included in the delineation by UVOST, but soil at this site was excavated based on discovery of additional drums and is described in further detail in Section 3.10.

MNA of the groundwater is ongoing at the MOC. During the first Periodic Review (USACE 2015b), it was determined that the well network did not sufficiently cover all areas of the site. In 2014, following this recommendation, Bristol installed and developed seven groundwater monitoring wells, 14MW01 through 14MW07, at the MOC gravel pad. Wells MW10-1, MW88-1, MW88-10, 17MW1, 20MW1, 22MW2, and 26MW1 were repaired. MW88-3, scoped for decommissioning, was repaired, re-developed, and sampled. The well had been classified as damaged due to a blockage located above the screened interval discovered during a monitoring well survey in early July 2010. The blockage was no longer present when investigated in late August. The blockage may have been due to early season ice above the water column as observed in other wells at the MOC (USACE 2016b).

At the time of monitoring well installation, two soil samples were collected prior to setting each well. Soil samples were evaluated against 18 AAC 75 Tables B1 and B2 (migration to groundwater). Analytes 1-methylnaphthalene and 2-methylnaphthalene exceeded the cleanup levels in the soil sample collected from 14MW6 (Figure A-14). These analytes are not COCs in the DD (USACE 2009a) in soil.

In 2018, two of the wells (MW10-1 and 14MW04) were re-developed prior to sampling activities with the intent to improve water yield and reduce turbidity in subsequent groundwater samples. Based on the production rates and field parameters collected during the prior two groundwater monitoring efforts (USACE 2016b, 2017a), no other wells are noted to have issues with water production or high turbidity.

3.8.1 MOC Groundwater Remedy Implementation and Status

MNA of the groundwater at the MOC began in 2010 and is ongoing. In 2010, nine wells were selected for inclusion in the monitoring program based on historical results, their physical proximity to the MOC, and their ability to monitor groundwater that passes under the MOC and other known contaminant areas. These monitoring wells included MW88-1, MW88-4, MW88-5, MW88-10, MW10-1, 17MW1, 20MW1, 22MW2, and 26MW1 (USACE 2013b) until 2014. In 2014, monitoring wells 14MW01 through 14MW07 were installed and developed. In 2014, 2015, 2016, and 2018 the monitoring well network included the previously sampled wells and wells 14MW01, 14MW02, 14MW03, 14MW04, 14MW05, and 14MW06 for a total of 15 wells. Wells MW88-4 and MW88-5 were decommissioned in 2012 due to their locations within POL-contaminated soil removal areas. Monitoring well MW10-1, which is downgradient of Site 10, was also sampled and analyzed for ethylene and propylene glycol, as well as VOCs in 2014, and diethylene, ethylene, propylene, and triethylene glycol in 2015. In 2016, monitoring wells MW10-1 and 14MW06 were analyzed for ethylene and propylene glycol and VOCs. In 2018, monitoring wells MW10-1 and 14MW06 were analyzed for ethylene glycol and VOCs. Additional MNA parameters (manganese, ferrous iron, sulfate, nitrate, and alkalinity) were also measured. Water quality parameters (temperature, pH, DO, conductivity, ORP, and turbidity) were collected using field instruments.

DRO levels may reach the SSCL by 2020 or 2022 with attenuation complete by 2023 or 2030 at wells 14MW04 and 14MW05, respectively. The cleanup timeframes are based on a small data set comprised of 2014, 2015, 2016, and 2018 results. Other in-plume monitoring wells at the MOC (14MW01, 14MW02) indicate DRO concentrations continue to increase based on statistical trends. Downgradient well 14MW06 was measured below SSCLs in 2016. In 2018, DRO was measured at the SSCL (1.5 mg/L). All other analytes were measured below the SSCL. No estimate of predicted completion of attenuation at the MOC can be provided until DRO concentrations are observed as declining at all source area wells.

Additional monitoring data are needed to assess COC concentrations in groundwater, provide higher confidence for the predicted cleanup timeframes at individual wells, and establish an estimated cleanup timeframe sitewide.

3.9 SITE 10: BURIED DRUMS

Site 10 Buried Drums consists of a wide gravel area along the access road directly east of the former ASTs at Site 11 (Figure A-14). An area of surface soil contamination was documented in 1994 along the western edge of the gravel pad when the maximum concentration of DRO was 26,500 mg/kg. Additional surface soil samples were collected in 1996 when the maximum DRO result was 17,000 mg/kg. Soil borings completed in 2004 demonstrated that subsurface soil was not significantly affected; the maximum DRO result was 619 mg/kg.

3.9.1 Site 10: Buried Drums Remedy Implementation and Status

The selected remedies listed in the DD, RAOs, and implementation status for Site 10 are presented in Table 3-8. Anticipated completion dates of listed "incomplete" remedies are unknown at this time and are dependent upon achieving cleanup levels for identified COCs and LUC implementation.

Table 3-8
Site 10 Remedy, RAOs, and Status

Selected Remedy to Achieve RAO	RAO	Implementation Status
Excavation and removal of petroleum-contaminated soil to established cleanup levels.[1]	Mitigate potential future risk to human health from the ingestion, inhalation, and dermal contact with soil exposure pathways. Meet risk-based cleanup levels in soil to a depth of 15 feet. Reduce concentrations of petroleum hydrocarbons and other contaminants to below pertinent risk-based standards.	Complete
MNA of groundwater.	Prevent ingestion of groundwater containing contaminants at levels above state drinking water standards and pertinent risk-based standards for petroleum hydrocarbons.	Incomplete/ Ongoing
Periodic Reviews as necessary until cleanup levels are met.	Mitigate potential future risk to human health from the ingestion, inhalation, and dermal contact with soil exposure pathways. Meet risk-based cleanup levels in soil to a depth of 15 feet. Reduce concentrations of petroleum hydrocarbons and other contaminants to below pertinent risk-based standards. Prevent ingestion of groundwater containing contaminants at levels above state drinking water standards and pertinent risk-based standards for petroleum hydrocarbons.	Ongoing
LUC to record a deed notice to limit groundwater use at MOC until cleanup levels are achieved.[2]	Prevent ingestion of groundwater containing contaminants at levels above state drinking water standards and pertinent risk-based standards for petroleum hydrocarbons.	Incomplete

Notes:
[1] Selected contingency remedy because implementation and use of chemical oxidation technology was determined ineffective at the MOC after an initial evaluation period (USACE 2009a).
[2] It is anticipated LUCs will be recorded as a deed notice in the form of an Environmental Covenant in accordance with the UECA.
For definitions, refer to the Acronyms and Abbreviations section.

The contingency remedy of soil excavation was initiated in 2011 (USACE 2012). The 2010 UVOST investigation delineated the J plume adjacent to Site 10 (J1 through J5) but did not indicate DRO contamination exceeded the SSCL of 9,200 mg/kg within Site 10. During the 2011 excavation at the J1A plume, approximately 10 drums were encountered on the excavation border with Site 10. These drums and their respective contents were removed and disposed of (USACE 2012).

In 2012, a metal detector was used to delineate the extent of buried drums, and the locations appeared to coincide with the magnetometer survey and electromagnetic data (EM-31) acquired at the site during the RI/FS (USACE 2007d). Some of the drums recovered from the site contained liquids classified as hazardous (USACE 2013c). Contaminated soil was excavated, and the soil confirmation sampling suite was expanded to include GRO, DRO, RRO, VOCs, semivolatile organic compounds (SVOCs), PCBs, ethylene glycol, and RCRA metals plus nickel, vanadium, and zinc. Results indicated that DRO and arsenic exceeded SSCLs. Ethylene glycol, PCE, and arsenic exceeded project screening levels, 18AAC 75 Table B2, migration to groundwater under 40-inch zone (ADEC 2018b).

In 2013, four excavations were opened to address the 2012 confirmation sample locations where concentrations of DRO, ethylene glycol, PCE, and arsenic exceeded cleanup levels. PCE was not an identified COC in the DD and, therefore, the cleanup level of 0.024 mg/kg defined in the ARAR for soil (18 AAC 75.341) was used. Areas surrounding DRO, PCE, and arsenic were excavated and subsequent confirmation samples were below cleanup levels (USACE 2015a). The location of the historic ethylene glycol exceedances was excavated, and the lateral extent of contamination was identified. Confirmation samples collected from the excavation floor continued to exceed cleanup levels. Excavation and sampling continued until bedrock was encountered and the excavation was terminated at 4 feet below fractured bedrock at a total depth of 12 feet bgs. Excavation sidewalls did not exceed the cleanup level for ethylene glycol (USACE 2014). An area of identified metallic anomalies was excavated and approximately 0.29 tons of empty drums and metal debris were removed. All confirmation samples indicated analytes were below the SSCL (USACE 2014).

Excavations completed in 2011, 2012, and 2013 did not remove all areas of known contamination at Site 10. During the last Periodic Review (USACE 2015b), there was no indication that stained surface soil or the five surface soil sample locations with the highest DRO concentrations indicated in the DD (up to 26,500 mg/kg DRO in 1994) were removed; these locations were further north and east than the excavations completed in 2011, 2012, or 2013. Therefore, excavation of DRO-contaminated soil was planned for 2014.

In 2014, four samples from the first round of investigative sampling contained concentrations of DRO and/or RRO above the SSCLs. Excavation A was created to remove soil from three of the sample locations, which were grouped together on a slope at the western boundary of Site 10. Excavation B was created to remove RRO-contaminated soil at the remaining sample location, located several yards to the north of Excavation A. Bristol excavated 84.04 tons of contaminated soil from Excavations A and B into thirteen 5-cubic-yard bulk bags on August 3 and 4, 2014.

On August 3, 2014, the excavator was preparing an area to safely access the slope where Excavation A was located when a group of drums was encountered. Further investigation revealed five drums that contained a total of approximately 20 gallons of tar. Tar-contaminated soil was clearly visible near the drums.

Of the confirmation samples collected from Excavations A and B on August 4, 2014, four contained contaminant concentrations that exceeded cleanup levels or evaluation criteria. Confirmation samples from Excavation A contained exceedances of the criteria for DRO, RRO, 1,2-dibromoethene, and PCE. Confirmation samples from Excavation B contained exceedances of RRO. Following evaluation of the sample results, the decision was made, in consultation with the onsite QAR, to excavate all visibly stained soil and collect additional soil samples. A floor sample was collected from Excavation A and additional soil was excavated to the west. Two floor samples were collected from Excavation B and these locations were excavated an additional 1 to 2 feet bgs. A total of six bulk bags were filled with 110.49 tons of soil from Excavations A and B during this round of excavation. Confirmation soil sample results from Excavation A did not exceed cleanup levels or evaluation criteria. Following receipt of the sample results, Excavation A was backfilled, track-walked, and seeded.

A confirmation sample from Excavation B contained concentrations of 1,1,2,2-tetrachlorethane, 1,2-dichloropropane, and TCE exceeding evaluation criteria. An additional 26.13 tons of soil from the sample location was excavated and confirmation soil samples were collected. The samples were only analyzed for VOCs since concentrations of all other potential contaminants (fuels, SVOCs, and metals) had not exceeded cleanup levels or evaluation criteria. TCE concentrations in two confirmation samples exceeded the TCE evaluation criterion. Bristol excavated 31.98 tons of soil from these two sample locations and collected confirmation soil samples.

Two subsequent samples exceeded the evaluation criterion for TCE and were targeted for additional excavation. The final round of excavation removed 12.96 tons of soil. Prior to closing the excavation, three confirmation soil samples were collected and submitted to TestAmerica for analysis of VOCs. The excavation occurred just prior to the final demobilization from the site, and the excavation was lined with a geotextile liner, backfilled, and seeded.

The final confirmation sample results indicated that 1,1-dichloroethene remained at one location at a concentration that exceeded the evaluation criterion. Sample 14NC10SS045 and duplicate sample 14NC10SS046 contained 1,1-dichloroethene at concentrations of 0.058 mg/kg (J-, B-flagged) and 0.110 mg/kg, respectively, exceeding the 18 AAC 75 migration to groundwater cleanup level of 0.030 mg/kg at that time. Soil from this one sample location (14NC10SS045 and duplicate 14NC10SS046) was not excavated and remains in situ. These concentrations are below the ADEC 2018 migration to groundwater criterion of 1.2 mg/kg (ADEC 2018b).

At the time of this review, the LUC at Site 10 to designate the area as not suitable for drinking water has not been fully implemented. Two signs, indicating where groundwater use for drinking water or ground disturbing activities are not recommended have been installed at the air field and at the fish camp. Each sign was two-sided and contained both Yupik and English transcriptions.

3.9.2 Site 10: Buried Drums O&M

Documentation of an agreement between the landowner and USACE for implementation of LUCs is still required for this site. Additionally, Periodic Reviews are required at Site 10 until all selected remedies are complete. The next Periodic Review is due five years from the final publication of this document (See Section 10). Full implementation of the remedy currently affecting protectiveness, which includes the filing of a deed notice, is anticipated to occur by 2021.

3.10 SITE 11: FUEL TANKS

Site 11 included three large ASTs located between the perimeter access road and Site 10 (Figure A-14). The tanks were on a constructed gravel pad, which drops to shallow tundra drainage to the northeast (the eastern drainage of Site 28). The center tank released a large amount of fuel in the 1960s. The tanks were removed in 2000 and the area was re-seeded with grass in 2005 (USACE 2009a). Visibly stained soil existed within the footprint of each of the ASTs in a circle approximately 50 feet in diameter. Outside of the tank footprints, DRO contamination ranged from 358 mg/kg at 4 feet bgs to 22,000 mg/kg at 11.5 feet bgs. Downgradient of the tank footprints, DRO was detected in surface soil up to 69,100 mg/kg.

3.10.1 Site 11: Fuel Tanks Remedy Implementation and Status

The selected remedies listed in the DD, RAOs, and implementation status for Site 11 are presented in Table 3-9.

Table 3-9
Site 11 Remedy, RAOs, and Status

Selected Remedy to Achieve RAO	RAO	Implementation Status
Excavation and removal of petroleum-contaminated soil to established cleanup levels.[1]	Mitigate potential future risk to human health from the ingestion, inhalation, and dermal contact with soil exposure pathways. Meet risk-based cleanup levels in soil to a depth of 15 feet. Reduce concentrations of petroleum hydrocarbons and other contaminants to below pertinent risk-based standards.	Complete
MNA of groundwater.	Prevent ingestion of groundwater containing contaminants at levels above state drinking water standards and pertinent risk-based standards for petroleum hydrocarbons.	Incomplete/ Ongoing
Periodic Reviews as necessary until cleanup levels are met.	Mitigate potential future risk to human health from the ingestion, inhalation, and dermal contact with soil exposure pathways. Meet risk-based cleanup levels in soil to a depth of 15 feet. Reduce concentrations of petroleum hydrocarbons and other contaminants to below pertinent risk-based standards. Prevent ingestion of groundwater containing contaminants at levels above state drinking water standards and pertinent risk-based standards for petroleum hydrocarbons.	Ongoing
LUC to record a deed notice to limit groundwater use at MOC until cleanup levels are achieved.[2]	Prevent ingestion of groundwater containing contaminants at levels above state drinking water standards and pertinent risk-based standards for petroleum hydrocarbons.	Incomplete

Notes:
[1] Selected contingency remedy because implementation and use of chemical oxidation technology was determined ineffective at the MOC after an initial evaluation period (USACE 2009a).
[2] It is anticipated LUCs will be recorded as a deed notice in the form of an Environmental Covenant in accordance with the UECA.
For definitions, refer to the Acronyms and Abbreviations section.

The contingency remedy of soil excavation was initiated in 2011 after the 2010 UVOST investigation delineated the J and I plumes downgradient from Site 11 (USACE 2012). Although the 2010 UVOST investigation did not indicate DRO contamination exceeded 9,200 mg/kg within the tank footprint area of Site 11, visibly stained soil was removed to a depth of approximately 1.5 feet bgs from each of the tank footprints in 2011. The waste characterization sample for the excavated soil did not exceed the SSCL for DRO or RRO. The soil remaining in the tank footprints was screened using the field laboratory, and no additional excavation was completed (USACE 2012).

The location of the J1A plume coincides with the highest surface contamination indicated in the DD (up to 69,000 mg/kg DRO) (USACE 2009a). The J1A plume was excavated to 2 feet below the groundwater surface, which was encountered at approximately 8 feet bgs (USACE 2012). In order to avoid the migration of materials into the Site 28 wetland, a silt fence was erected at the northern boundary of the planned excavation. The excavation was guided by field screening results and when these results indicated the boundary had been reached, excavation confirmation samples were collected. Five sidewall samples (11NCMOCSS012, 11NCMOCSS014, 11NCMOCSS015, 11NCMOCSS016, and 11NCMOCSS017) on the northern boundary exceeded the SSCL for DRO with results ranging from 9,200 to 29,000 mg/kg (Figure A-14) (USACE 2012). The maximum RRO result was 800 mg/kg, which does not exceed the cleanup level. The USACE considers soil removal at Plume J complete.

Excavation activities at Plume I1 were initiated in 2013. To mitigate impact to the Site 28 wetland, USACE and Bristol determined that the northern boundary of Plume I1 would be the limit of excavation. Soil was excavated to a final depth of 15 feet bgs, as measured from the south sidewall, and 9 feet bgs, as measured from the north sidewall; groundwater infiltrated the excavation to 2 feet bgs, as measured from the north sidewall. One duplicate and 14 primary confirmation samples were collected from the sidewalls of the excavation, and two primary samples were collected from the floor. Confirmation samples 13NCMOCSS060, 13NCMOCSS067, and 13NCMOCSS089 contained DRO in concentrations exceeding the SSCL at 10,000 mg/kg, 9,900 mg/kg, and 13,000 mg/kg, respectively. Sample 13NCMOCSS060 is a sidewall sample located at the boundary of Site 28, so no further excavation occurred at this sample location. Sample location 13NCMOCSS067 was a floor sample submerged in greater than two feet of water, thus no additional excavation was conducted at this location. Sample 13NCMOCSS089 is a sidewall sample located on the south side of the excavation that was not further excavated and was targeted for removal in 2014.

The 2013 confirmation sample 13NCMOCSS089 was relocated by the survey and excavated in 2014. Soil was excavated to a final depth of 15 feet bgs, as measured from the south sidewall, and water infiltrated the excavation to 9 feet bgs. Two confirmation sidewall soil samples and one duplicate were collected from soil directly above the groundwater interface; one confirmation soil sample was collected from the excavation floor. None of the confirmation samples contained DRO or RRO in concentrations that exceeded cleanup levels. The USACE considers soil removal at Plume I complete.

At the time of this review, the LUC to limit future drinking water use has not been fully implemented. All locations where soil was identified with contamination remaining above the SSCLs are depicted on Figure A-14.

At the time of this review, the LUC at Site 11 to designate the area as not suitable for drinking water has not been fully implemented. Two signs, indicating where groundwater use for drinking water or ground disturbing activities are not recommended have been installed at the air field and at the fish camp. Each sign was two-sided and contained both Yupik and English transcriptions.

3.10.2 Site 11: Fuel Tanks O&M

Documentation of an agreement between the landowner and USACE for implementation of LUCs is still required for this site. Additionally, Periodic Reviews are required at Site 11 until all selected remedies are complete. The next Periodic Review is due five years from the final publication of this document (See Section 10). Full implementation of the remedy currently affecting protectiveness, which includes the filing of a deed notice, is anticipated to occur by 2021.

3.11 SITE 13: HEAT AND POWER PLANT

Site 13, encompassing former Building 110, historically contained the heat and power facilities for the installation (Figure A-14). Sources of contamination from this site consisted of transformers, diesel generators, ASTs, USTs, and piping. The site was investigated and sampled multiple times since 1994 and contained DRO and PCBs in subsurface soil with concentrations that exceeded cleanup levels. The maximum DRO concentration in subsurface soil was 13,000 mg/kg. GRO, RRO, benzene, and naphthalene concentrations were elevated but did not exceed SSCLs. PCBs were detected at concentrations up to 37.1 mg/kg near the building (USACE 2009a).

3.11.1 Site 13: Heat and Power Plant Remedy Implementation and Status

The selected remedies listed in the DD, RAOs, and implementation status for Site 13 are presented in Table 3-10.

Table 3-10
Site 13 Remedy, RAOs, and Status

Selected Remedy to Achieve RAO	RAO	Implementation Status
Excavation and removal of petroleum-contaminated soil to established cleanup levels.[1]	Mitigate potential future risk to human health from the ingestion, inhalation, and dermal contact with soil exposure pathways. Meet risk-based cleanup levels in soil to a depth of 15 feet. Reduce concentrations of petroleum hydrocarbons and other contaminants to below pertinent risk-based standards.	Complete
Excavation and removal of PCB-contaminated soils to established cleanup levels.	Prevent current and future exposure to humans by ingestion, inhalation, and dermal contact with contaminated soil at levels above ARARs for PCBs.	Complete
MNA of groundwater.	Prevent ingestion of groundwater containing contaminants at levels above state drinking water standards and pertinent risk-based standards for petroleum hydrocarbons.	Incomplete/ Ongoing
FYRs as necessary until cleanup levels are met.	Mitigate potential future risk to human health from the ingestion, inhalation, and dermal contact with soil exposure pathways. Meet risk-based cleanup levels in soil to a depth of 15 feet. Reduce concentrations of petroleum hydrocarbons and other contaminants to below pertinent risk-based standards Prevent ingestion of groundwater containing contaminants at levels above state drinking water standards and pertinent risk-based standards for petroleum hydrocarbons.	Complete – Periodic Reviews Ongoing
LUC to record a deed notice to limit groundwater use at MOC until cleanup levels are achieved.[2]	Prevent ingestion of groundwater containing contaminants at levels above state drinking water standards and pertinent risk-based standards for petroleum hydrocarbons.	Incomplete

Notes:
[1] Selected contingency remedy because implementation and use of chemical oxidation technology was determined ineffective at the MOC after an initial evaluation period (USACE 2009a).
[2] It is anticipated LUCs will be recorded as a deed notice in the form of an Environmental Covenant in accordance with the UECA.
For definitions, refer to the Acronyms and Abbreviations section.

At the time of this review, the LUC at Site 13 to designate the area as not suitable for drinking water has not been fully implemented. Two signs, indicating where groundwater use for drinking water or ground disturbing activities are not recommended have been installed at the air field and at the fish camp. Each sign was two-sided and contained both Yupik and English transcriptions.

PCB-Contaminated Soil

The remedy was initiated in 2010 by excavating PCB-contaminated soil. PCB field sampling and laboratory analysis on confirmation samples guided the excavation; groundwater was not encountered. The PCB excavation expanded over the location of the petroleum-contaminated B1 plume, B2 plume, and part of A2 plume, which were identified during the UVOST investigation (Figure A-14). One location above the PCB cleanup level remained at the end of 2012 (USACE 2013c). In 2013, sample 12NC13SS231 was located by survey and excavated. The excavation extended to approximately 1.5 to 2.0 feet bgs and confirmation samples were collected. All confirmation samples results were below the cleanup level for PCBs (USACE 2015a). The USACE considers soil removal at plumes B1, B2, and A2 complete.

In 2011, a stockpile was constructed south of the Site 13 excavations. Prior to stockpile construction, the area was sampled and locations containing PCB concentrations above cleanup levels were excavated, then the stockpile with a liner was constructed. In 2013, post-construction samples were collected following stockpile decommissioning. Results indicated that PCBs existed in the soil at concentrations exceeding the cleanup level. Excavation efforts were guided by field laboratory screening samples. When field screening samples indicated samples results below 0.8 mg/kg, confirmation samples were collected. All analytical samples results were below the cleanup level for PCBs (USACE 2015a).

POL-Contaminated Soil Within the A2 Plume

Excavation of petroleum-contaminated soil within the A2 plume was initiated in 2013 (USACE 2015a). Clean overburden was removed to a depth of 8 feet bgs and stockpiled on a liner. Soil was further excavated to a depth of 15 feet bgs; 90 percent of the floor of the excavation was submerged with water. The lateral extent of the excavation was guided by field laboratory results for DRO and RRO. The excavation extended southwest into the former 2011 and 2012 A1 plume excavations and was considered complete in all areas where liner and backfill from the historical A1 plume excavation was visible (USACE 2015a). Confirmation samples were collected from the excavation floor and sidewalls. All analytical samples were below SSCLs for DRO and RRO (USACE 2015a). The excavation was backfilled and compacted. The USACE considers soil removal at Plume A2 complete.

POL-Contaminated Soil Within the B1 and B2 Plumes

Excavation of petroleum-contaminated soil within the B1 and B2 plumes was initiated in 2013 (USACE 2015a). Clean overburden was removed to a depth of 11 feet at B1 and 7 feet at B2 and stockpiled on a liner. Soil was excavated to a final depth of 15 feet bgs; 80 percent of the floor of the excavation was submerged in water. The lateral extent of the excavation was guided by field laboratory screening samples; when screening results indicated that DRO and RRO concentrations were less than SSCLs, confirmation samples were collected from the floor and sidewalls of the excavation. One confirmation sample (13NCMOCSS094) exceeded the cleanup level for DRO and was excavated and resampled. All analytical samples were below the SSCLs for DRO and RRO (USACE 2015a). The excavation was backfilled and compacted. The USACE considers soil removal at Plume B complete.

POL-Contaminated Soil Within the E1 Plume

Excavation and removal activities in 2014 occurred within the E1 excavation units. Approximately 7 feet of overburden was removed from the E1 excavation footprint and stockpiled on liners. Overburden with strong fuel odor was segregated from overburden without fuel odor. Liner left in place along the sidewall of the 2012 excavation extent provided a field reference for the northern extent of the historical E1 excavation. Bristol was able to reach 15 feet bgs at E1 due to the low groundwater table, which rose over time and reached a depth of approximately 8 feet below the ground surface. No floor samples exceeded the DRO or RRO cleanup criteria. Confirmation sidewall sample 14NCMOCESS07 contained RRO at 9,400 mg/kg, exceeding the cleanup level of 9,200 mg/kg. This sidewall location was excavated and sampled. The subsequent confirmation samples did not contain DRO or RRO in concentrations that exceeded the SSCL of 9,200 mg/kg. Stockpiled soil with DRO and RRO concentrations below 9,200 mg/kg were used as backfill; any soil exceeding the cleanup level was containerized. The USACE considers soil removal at Plume E1 complete. Additional excavation of Plume E occurred within E2 at Site 27, which is discussed within Section 3.15.1.

POL-Contaminated Soil Within the C Plume

The C plume is located to the northwest of the E1 excavation. The UVOST laser-induced fluorescence responses from 2010 indicated that the contaminated zone was located between 10 and 14 feet bgs. Strong fuel odor was encountered at 7 feet bgs, and the interval between 6 and 10 feet bgs was segregated separately from other overburden material. Each of the overburden stockpiles were sampled in accordance with ADEC guidance. Soil was excavated to a final depth of 14 feet bgs, where the excavation was submerged beneath 2 feet to 5 feet of water. Sidewall confirmation samples were collected from soil directly above the groundwater interface. Floor confirmation samples were collected from beneath 2 feet to 5 feet of standing water using an excavator bucket. Twelve confirmation soil samples and two duplicate samples were collected from the sidewalls of the excavation; three confirmation soil samples were collected from the floor. No floor confirmation samples contained DRO or RRO in concentrations above cleanup levels. One sidewall confirmation sample (14NCMOCCSS001) contained DRO at a concentration that exceeded the cleanup level. Following receipt of this sample result, the location of 14NCMOCCSS001 was excavated and confirmation samples 14NCMOCCSS016 and 14NCMOCCSS017 were collected. Final confirmation soil sample results indicated that DRO and RRO concentrations did not exceed SSCLs.

All soil from the C plume that was presumed to be below the SSCLs for DRO/RRO was stockpiled on a lined clean overburden area. All clean overburden soil was sampled following ADEC guidelines for stockpiles and analyzed in the field laboratory for DRO and RRO analysis. Stockpiles with DRO and RRO results below the 9,200 mg/kg cleanup level were used as backfill; soil with concentrations above the cleanup level was containerized and shipped off site for disposal. The USACE considers soil removal at Plume C complete.

3.11.2 Site 13: Heat and Power Plant O&M

Documentation of an agreement between the landowner and USACE for implementation of LUCs is still required for this site. Additionally, Periodic Reviews are required at Site 13 until all selected remedies are complete. The next Periodic Review is due five years from the final publication of this document (See Section 10). Full implementation of the remedy currently affecting protectiveness, which includes the filing of a deed notice, is anticipated to occur by 2021.

3.12 SITE 15: FUEL PIPELINE

Site 15 is adjacent to Site 13 and included the pipeline corridor connecting to the diesel fuel pump island at Site 27 (Figure A-14). A break in this fuel line resulted in a diesel fuel spill (USACE 2009a). A 2,000-gallon UST, the pipeline, and surrounding stained soil were removed in 2001 (USACE 2009a). Investigation in 2002 detected DRO at a maximum concentration of 16,000 mg/kg at 6 to 8 feet bgs.

3.12.1 Site 15: Fuel Pipeline Remedy Implementation and Status

The selected remedies listed in the DD, RAOs, and implementation status for Site 15 are presented in Table 3-11.

Table 3-11
Site 15 Remedy, RAOs, and Status

Selected Remedy to Achieve RAO	RAO	Implementation Status
Excavation and removal of petroleum-contaminated soil to established cleanup levels.[1]	Mitigate potential future risk to human health from the ingestion, inhalation, and dermal contact with soil exposure pathways. Meet risk-based cleanup levels in soil to a depth of 15 feet. Reduce concentrations of petroleum hydrocarbons and other contaminants to below pertinent risk-based standards.	Complete
MNA of groundwater.	Prevent ingestion of groundwater containing contaminants at levels above state drinking water standards and pertinent risk-based standards for petroleum hydrocarbons.	Incomplete/ Ongoing
Periodic Reviews as necessary until cleanup levels are met.		Ongoing
LUC to record a deed notice to limit groundwater use at MOC until cleanup levels are achieved.[2]		Incomplete

Notes:
[1] Selected contingency remedy because implementation and use of chemical oxidation technology was determined ineffective at the MOC after an initial evaluation period (USACE 2009a).
[2] It is anticipated LUCs will be recorded as a deed notice in the form of an Environmental Covenant in accordance with the UECA.
For definitions, refer to the Acronyms and Abbreviations section.

The contingency remedy of soil excavation was initiated in 2011 after the 2010 UVOST investigation delineated the F and G plumes near historic contamination at Site 15. The locations of the F and G plumes coincide with the highest DRO contamination indicated in the DD (USACE 2009a) and FS (USACE 2007a). The DD and the UVOST investigation stated the contamination was expected to be 8 to 15 feet bgs in this area.

In 2011, an attempt to excavate the G plume was unsuccessful when groundwater was encountered at 7 feet bgs before the excavation could advance to the target depth of contamination at 8 to 9 feet bgs. No contaminated soil was excavated in 2011 (USACE 2012). In 2012, groundwater levels were lower and soil was excavated in the F and G plumes to a depth of approximately 12 feet bgs, which was 2 feet below the groundwater surface. The excavation was guided by field screening results; when these results indicated that the boundary had been reached, excavation confirmation samples were collected. The location of three confirmation samples below the groundwater surface that contained DRO concentrations ranging from 10,000 to 40,000 mg/kg will not be excavated (USACE 2014). These historic samples include 12NCMOCSS033, 12NCMOCSS037, and 12NCMOCSS039 (Figure A-14).

At the conclusion of the 2012 field season, there were six locations at the G excavation that exceeded the SSCL for DRO (three floor and three sidewall). The floor samples ranged from 10,000 to 40,000 mg/kg and the sidewall samples ranged from 9,200 to 12,000 mg/kg. In 2013, the clean overburden was removed and the locations of the three sidewall confirmation sample exceedances were located by survey. DRO-contaminated soil was excavated from approximately 8 feet bgs to the target depth of 15 feet bgs. The excavation extended to the west and south into the footprint of the F plume along the southern sidewall. The excavation also extended east 10 to 12 feet. Confirmation samples were collected and submitted to an analytical laboratory for analysis. Sidewall confirmation sample 13NMOCSS022/033 was above the DRO SSCL of 9,200 mg/kg at 13,000 mg/kg (USACE 2014). The sidewall location was excavated and subsequent field screening results were less than 80 percent of the cleanup level; however, Bristol and the QAR determined that no additional soil would be removed within the historical excavations that extended two feet below groundwater. However, based on a review of the confirmation sample data there appears to be three floor sample locations where DRO remains above the SSCL at 12 feet bgs (Figure A-14).

At the time of this review, the LUC at Site 15 to designate the area as not suitable for drinking water has not been fully implemented. Two signs, indicating where groundwater use for drinking water or ground disturbing activities are not recommended have been installed at the air field and at the fish camp. Each sign was two-sided and contained both Yupik and English transcriptions.

3.12.2 Site 15: Fuel Pipeline O&M

Documentation of an agreement between the landowner and USACE for implementation of LUCs is still required for this site. Additionally, Periodic Reviews are required at Site 15 until all selected remedies are complete. The next Periodic Review is due five years from the final publication of this document (See Section 10). Full implementation of the remedy currently affecting protectiveness, which includes the filing of a deed notice, is anticipated to occur by 2021.

3.13 SITE 16: PAINT AND DOPE STORAGE

This site consisted of a wood-framed building located on the north side of the perimeter access road surrounding the MOC (Figure A-14). The site was originally a flammable liquids storage facility. The building, miscellaneous debris, 3 tons of stained soil, and an AST were removed in 2001 (USACE 2009a).

Soil samples from 1994, 2001, and 2007 indicated that PCBs, arsenic, antimony, and lead were COCs in soil for this site:

- PCBs were detected at 1.4 mg/kg in one surface soil location adjacent to the building foundation in 1994; all seven other sampling results were less than 1 mg/kg (USACE 2009a).
- Arsenic was detected at concentrations ranging from 3.4 to 12 mg/kg and was the primary risk driver in the human health risk estimates (USACE 2007a). However, ADEC has agreed that the arsenic is attributable to naturally occurring background levels (USACE 2009a).
- Antimony concentrations ranged from nondetect to 21 mg/kg, which exceeds the ADEC migration to groundwater cleanup level of 3.6 mg/kg but not the direct contact level of 33 mg/kg. Antimony was not detected in groundwater and no additional action was planned to address antimony in soil.
- Lead in soil ranged from 18 to 822 mg/kg in eight surface soil samples and exceeded the cleanup level (400 mg/kg) in two locations in 1994 immediately adjacent to the building. These locations were presumed to have been removed with the stained soil in 2001 (as cited in the DD [USACE 2009a]). Subsurface soil samples collected from three locations ranged from 18 to 157 mg/kg in 1994. Additional surface samples collected in 2001 detected lead at 42 mg/kg and 240 mg/kg, which does not exceed the cleanup level.

The primary COCs in groundwater in 1994 were cadmium (0.06 mg/L) and TCE (0.0033 mg/L). However, metals were not detected in the dissolved phase, so metals were attributed to suspended particles in the water column and were not retained as COCs for groundwater. During follow-up sampling in 1998, TCE was not detected (USACE 2009a). In 2004, additional groundwater sampling was attempted but insufficient water was in the monitoring wells

(USACE 2009a). Because TCE was not detected in follow-up sampling and the groundwater is intermittent at this location, no groundwater COCs were included in the DD for this site.

3.13.1 Site 16: Paint and Dope Storage Remedy Implementation and Status

The selected remedies listed in the DD, RAOs, and implementation status for Site 16 are presented in Table 3-12.

Table 3-12
Site 16 Remedy, RAOs, and Status

Selected Remedy to Achieve RAO	RAO	Implementation Status
Excavation and removal of PCB-contaminated soil to established cleanup levels.[1]	Prevent current and future exposure to humans by ingestion, inhalation, and dermal contact with contaminated soil at levels above ARARs for PCBs.	Complete
FYRs as necessary until cleanup levels are met.	Prevent ingestion of groundwater containing contaminants at levels above state drinking water standards and pertinent risk-based standards for petroleum hydrocarbons.	Complete – Periodic Reviews Ongoing
LUC to record a deed notice to limit groundwater use at MOC until cleanup levels are achieved.[2]		Incomplete

Notes:
[1] Selected contingency remedy because implementation and use of chemical oxidation technology was determined ineffective at the MOC after an initial evaluation period (USACE 2009a).
[2] It is anticipated LUCs will be recorded as a deed notice in the form of an Environmental Covenant in accordance with the UECA.
For definitions, refer to the Acronyms and Abbreviations section.

Excavation of PCB-contaminated soil was initiated and completed in 2010 when 5 tons of soil were excavated and removed for disposal (USACE 2011). Final excavation sample results are included on Figure A-15.

At the time of this review, the LUC at Site 16 to designate the area as not suitable for drinking water has not been fully implemented. Two signs, indicating where groundwater use for drinking water or ground disturbing activities are not recommended have been installed at the air field and at the fish camp. Each sign was two-sided and contained both Yupik and English transcriptions.

3.13.2 Site 16: Paint and Dope Storage O&M

Documentation of an agreement between the landowner and USACE for implementation of LUCs is still required for this site. Additionally, Periodic Reviews are required at Site 16 until all selected remedies are complete. The next Periodic Review is due five years from the final publication of this document (See Section 10). Full implementation of the remedy currently affecting protectiveness, which includes the filing of a deed notice, is anticipated to occur by 2021.

3.14 SITE 19: AUTO MAINTENANCE

Site 19 consisted of the Auto Maintenance and Auto Storage buildings within the MOC (Figure A-14). The buildings were constructed with concrete floors and floor drains; the buildings were demolished in 2003 (USACE 2007a, 2009a). Previous remedial actions at this site removed PCB-contaminated concrete from the building floors and no PCB contamination was detected in the underlying concrete or soil (USACE 2007a). DRO was detected at a maximum concentration of 1,240 mg/kg in surface soil and 13,300 mg/kg in subsurface soil (9.5 to 11.5 feet bgs). One soil boring also contained GRO at a maximum concentration of 6,650 mg/kg at 4 to 6 feet bgs. Subsequent soil borings completed in 2002 indicated that the maximum concentration of DRO was 5,000 mg/kg and GRO was 51 mg/kg. One additional soil boring was completed in 2004; the maximum concentration of DRO was 3,590 mg/kg and GRO was 91.6 mg/kg.

3.14.1 Site 19: Auto Maintenance Remedy Implementation and Status

The selected remedies listed in the DD, RAOs, and implementation status for Site 19 are presented in Table 3-13.

Table 3-13
Site 19 Remedy, RAOs, and Status

<table>
<tr><th>Selected Remedy to Achieve RAO</th><th>RAO</th><th>Implementation Status</th></tr>
<tr><td>Excavation and removal of petroleum-contaminated soil to established cleanup levels.[1]</td><td>Mitigate potential future risk to human health from the ingestion, inhalation, and dermal contact with soil exposure pathways. Meet risk-based cleanup levels in soil to a depth of 15 feet. Reduce concentrations of petroleum hydrocarbons and other contaminants to below pertinent risk-based standards.</td><td>Complete</td></tr>
<tr><td>MNA of groundwater.</td><td rowspan="3">Prevent ingestion of groundwater containing contaminants at levels above state drinking water standards and pertinent risk-based standards for petroleum hydrocarbons.</td><td>Incomplete/ Ongoing</td></tr>
<tr><td>Periodic Reviews as necessary until cleanup levels are met.</td><td>Ongoing</td></tr>
<tr><td>LUC to record a deed notice to limit groundwater use at MOC until cleanup levels are achieved.[2]</td><td>Incomplete</td></tr>
</table>

Notes:
[1] Selected contingency remedy because implementation and use of chemical oxidation technology was determined ineffective at the MOC after an initial evaluation period (USACE 2009a).
[2] It is anticipated LUCs will be recorded as a deed notice on the form of an Environmental Covenant in accordance with the UECA.
For definitions, refer to the Acronyms and Abbreviations section.

The contingency remedy of soil excavation was initiated in 2011 after the 2010 UVOST investigation delineated the H plume near historic contamination at Site 19 (USACE 2012). In 2011, an attempt to excavate the H plume was unsuccessful when groundwater was encountered at 5 feet bgs before the excavation could advance to the target depth of 7.5 feet bgs. No soil was excavated in 2011 (USACE 2012). In 2012, groundwater levels were lower and soil was excavated in the H plume to depths ranging from 11 to 14 feet bgs, which was 2 feet below the groundwater surface. The excavation was guided by field screening results; when these results indicated the boundary had been reached, excavation confirmation samples were collected. All final sidewall and floor confirmation samples were less than the SSCLs for DRO and RRO (USACE 2013c).

At the time of this review, the LUC at Site 19 to designate the area as not suitable for drinking water has not been fully implemented. Two signs, indicating where groundwater use for drinking water or ground disturbing activities are not recommended have been installed at the air field and at the fish camp. Each sign was two-sided and contained both Yupik and English transcriptions.

3.14.2 Site 19: Auto Maintenance O&M

Documentation of an agreement between the landowner and USACE for implementation of LUCs is still required for this site. Additionally, Periodic Reviews are required at Site 19 until all selected remedies are complete. The next Periodic Review is due five years from the final publication of this document (See Section 10). Full implementation of the remedy currently affecting protectiveness, which includes the filing of a deed notice, is anticipated to occur by 2021.

3.15 SITE 27: DIESEL FUEL PUMP

Site 27 includes the diesel fuel pump island originally used to refuel heavy equipment and vehicles (Figure A-14). The site comprised a small shed and cement valve box and a buried pipeline from the bulk fuel storage tanks at Site 11. The pump house shed, pipeline, and surrounding stained soil were removed in 2001 (USACE 2009a).

As discussed in the DD, surface soil sampling in 1994 indicated DRO was present at a maximum concentration of 37,900 mg/kg (USACE 2009a). In 2001, confirmation samples collected from the bottom of the tank and piping excavations indicated petroleum contamination remained in the subsurface where concentrations of DRO (up to 36,500 mg/kg) and naphthalene (191 mg/kg) exceeded the SSCL. In 2002, soil borings found DRO at concentrations up to 51,000 mg/kg at 7 to 9 feet bgs, but the maximum naphthalene concentration of 81 mg/kg did not exceed the cleanup level (USACE 2009a).

3.15.1 Site 27: Diesel Fuel Pump Remedy Implementation and Status

The selected remedies listed in the DD, RAOs, and implementation status for Site 27 are presented in Table 3-14. Full implementation of the remedy currently affecting protectiveness, which includes the filing of a deed notice, is anticipated to occur by 2021.

Table 3-14
Site 27 Remedy, RAOs, and Status

Selected Remedy to Achieve RAO	RAO	Implementation Status
Excavation and removal of petroleum-contaminated soil to established cleanup levels.[1]	Mitigate potential future risk to human health from the ingestion, inhalation, and dermal contact with soil exposure pathways. Meet risk-based cleanup levels in soil to a depth of 15 feet. Reduce concentrations of petroleum hydrocarbons and other contaminants to below pertinent risk-based standards.	Complete
MNA of groundwater.	Prevent ingestion of groundwater containing contaminants at levels above state drinking water standards and pertinent risk-based standards for petroleum hydrocarbons.	Incomplete/ Ongoing
Periodic Reviews as necessary until cleanup levels are met.		Ongoing
LUC to record a deed notice to limit groundwater use at MOC until cleanup levels are achieved.[2]		Incomplete

__Notes:__
[1] Selected contingency remedy because implementation and use of chemical oxidation technology was determined ineffective at the MOC after an initial evaluation period (USACE 2009a).
[2] It is anticipated LUCs will be recorded as a deed notice in the form of an Environmental Covenant in accordance with the UECA.
For definitions, refer to the Acronyms and Abbreviations section.

The contingency remedy of soil excavation was initiated in 2012 after the 2010 UVOST investigation delineated the E plume near historic contamination at Site 27. The E plume (E1 through E4) was one of the larger plumes delineated by the UVOST in 2010, with an estimated area of 17,500 square feet and contamination depths ranging from 2 to 15 feet bgs (USACE 2011). Excavation activities began in the northern portion of the E plume (E4) where it is adjacent to downgradient Site 28. Excavation then progressed south into E3 and portions of E2 and E1 before the 2012 season ended (USACE 2013c). The excavation was guided by field screening results, but groundwater dictated the ultimate depth of excavation. When field results or groundwater indicated the depth of excavation had been reached, excavation confirmation samples were collected. Excavation reached the target of 2 feet below groundwater across the entirety of the E4 and E3 plumes and equated to depths ranging from approximately 3 to 10 feet bgs (USACE 2013c). The E2 area was excavated to depths ranging from 7 to 11 feet bgs and was 2 feet below groundwater in all areas except the dry southeast portion where excavation stopped at 8 feet bgs when the limit of contamination was reached (USACE 2013c).

At the conclusion of 2012 excavation activities, DRO concentrations at five locations on the excavation floor exceeded the cleanup level with results ranging from 13,000 to 110,000 mg/kg. In 2013, the location of three of the five confirmation samples were excavated as water levels dropped in the E4 plume (USACE 2015a). The excavation extents of the E4 plume expanded into the D2 plume and proceeded westward. Along the northern sidewall, nine confirmation samples were collected, four of which contained DRO at concentrations exceeding the SSCL. No further excavation occurred at these sample locations due to their proximity to the Site 28 wetland (USACE 2015a).

The excavation of the western portion of the E3 plume was expanded in 2013. Three confirmation samples were collected, while the western extent was not defined (USACE 2015a). Sample 13NCMOCSS077 exceeded the SSCL for DRO with a concentration of 29,000 mg/kg (USACE 2015a). Confirmation samples from the E plume have not been analyzed for naphthalene, so the removal cannot be confirmed.

In 2014, the 2001 sample that contained naphthalene at 191 mg/kg was relocated by a survey crew. The historical sample location appeared to be in an area of the E plume where soil had previously been excavated and removed. A test pit was advanced to the depth of the original sample, approximately 16 feet bgs. Fill material was present to approximately 12 feet bgs and native soil was present from 12 to 16 feet bgs. One primary soil sample and duplicate sample were collected from 12.5 to 13.5 feet bgs and analyzed for DRO and RRO, and naphthalene. The sample results did not contain DRO, RRO, or naphthalene in concentrations that exceeded the cleanup levels. The soil associated with the historical sample location was likely removed during previous excavation activities at the MOC.

Approximately 4 feet of overburden was removed from the E2 excavation footprint and stockpiled on liners. Overburden with strong fuel odor was segregated from overburden without fuel odor. Bristol excavated soil to 11 feet bgs at E2. Confirmation sidewall samples 14NCMOCESS003 (duplicate 14NCMOCESS012) and 14NCMOCESS04 contained DRO concentrations of 16,000 mg/kg (duplicate concentration of 22,000 mg/kg) and 20,000 mg/kg, respectively; above the cleanup level of 9,200 mg/kg. These sidewall locations were excavated and sampled. The subsequent confirmation samples did not contain DRO or RRO in concentrations that exceeded the SSCL of 9,200 mg/kg.

A total of 20 primary and three duplicate sidewall samples were collected from the E1 and E2 plume footprint. Seven primary soil samples and one duplicate soil sample was collected from the excavation floor. No floor samples exceeded the DRO or RRO cleanup criteria. Backfill was placed in 1-foot lifts and track-walked with a bulldozer for compaction. Seed and fertilizer were spread across the disturbed areas. Excavation of the E1 footprint is discussed in Section 3.11.2, as the E1 footprint is within Site 13. The USACE considers the excavation of UVOST plume E complete.

At the time of this review, the LUC at Site 27 to designate the area as not suitable for drinking water has not been fully implemented. Two signs, indicating where groundwater use for drinking water or ground disturbing activities are not recommended have been installed at the air field and at the fish camp. Each sign was two-sided and contained both Yupik and English transcriptions.

3.15.2 Site 27: Diesel Fuel Pump O&M

Documentation of an agreement between the landowner and USACE for implementation of LUCs is still required for this site. Additionally, Periodic Reviews are required at Site 27 until all selected remedies are complete. The next Periodic Review is due five years from the final publication of this document (See Section 10). Full implementation of the remedy currently affecting protectiveness, which includes the filing of a deed notice, is anticipated to occur by 2021.

3.16 SITE 28: DRAINAGE BASIN

The Site 28 Drainage Basin is located north of the MOC and drains north into the Suqi River (Figure A-2). The site has been affected by fuel releases from the bulk fuel storage tanks (Site 11) and other spills and releases discussed in the DD (USACE 2009a). The site contains wetlands, rolling tundra, ponds, and flowing streams.

Water in the Site 28 Drainage Basin originates from surface water runoff (overland flow) from the MOC, three drainages at the head of the site near the MOC, and two sub-drainages further north. Overland flow can contribute significant amounts of water to the basin during rainfall events. The two distinct sub-drainages contain feeder streams originating as seeps and drain into the main stream approximately one-quarter of the way down the drainage (USACE 2013b). Three distinct headwater drainages originate from the upgradient MOC gravel pad and contribute flow to Site 28 (USACE 2009a). The eastern drainage flows from the vegetated area adjacent to Sites 10 and 11, which are located north of the former fuel tanks; the middle drainage originates from a small swale where a former culvert directed flow from Site 27, and the western drainage is located downgradient of Site 13 (USACE 2013b). The western drainage originated from a manhole and a small, concrete supporting structure just north of the perimeter access road, which emptied into an artificially created swale. The manhole likely served as the drain leading from Building 110 (Heat and Electrical Power Building) at the MOC (USACE 2009a). The manhole and concrete supporting structure were removed in 2010. Since 1994, soil, sediment, surface water, and shallow groundwater samples have been collected and analyzed.

Sediment

Stained sediments were observed in each of the three main drainage basins, and they produced a sheen when disturbed (USACE 2009a). The primary COCs in soil and sediment at the time of the DD were DRO, RRO, PAHs, PCBs, chromium, lead, and zinc (USACE 2009a). The highest concentrations of contaminants were located near the edge of the MOC gravel pad.

Surface Water

As summarized by the DD (USACE 2009a), surface water samples were collected from the drainage basin in 1994, 1996, and 2001. Concentrations of DRO, total recoverable petroleum hydrocarbons, PCBs, and lead exceeded surface water cleanup levels in 1994. In 2001, DRO was detected at concentrations ranging from 0.39 to 2.3 mg/L. RRO and PCBs were not detected and lead samples were not collected. The most heavily contaminated surface waters of the drainage basin were found at the head of the western and middle drainages, located at the terminus of the former culverts.

Groundwater

Groundwater samples collected in 1994 indicated the potential for DRO and lead contamination, but subsequent sampling in 2001 demonstrated the concentrations were below cleanup levels. No groundwater COCs were retained for Site 28 (USACE 2009a).

3.16.1 Site 28: Drainage Basin Remedy Implementation and Status

The RAO for Site 28 are as listed in Table 3-15.

Table 3-15
Site 28 Remedy, RAOs, and Status

Selected Remedy to Achieve RAO	RAO	Implementation Status
Construct a sedimentation pond or other appropriate controls. The ends of the culverts would also be cleaned out and removed or plugged to prevent direct outflows of upgradient residual sources of contamination (USACE 2009a).	Prevent migration of contaminants into the Suqi river above risk-based cleanup levels.	Complete[1]
Excavation and removal of petroleum-, PCB-, and metals-contaminated sediment, including the removal of near-surface sediments from the narrow channel upgradient of the Suqi River.		Ongoing
Periodic Reviews as necessary until cleanup levels are met.	Mitigate potential future risk to human health from the ingestion, inhalation and dermal contact with soil/sediment exposure pathways. Meet pertinent risk-based cleanup levels in sediment.	Ongoing

Notes:
[1] The purpose of a constructed sedimentation pond would have been to control downgradient migration of suspended sediments. Due to the lack of contaminated sediment downgradient from the natural stilling area (Figure A-16), the construction of a sedimentation pond is not necessary to prevent migration of contaminants above risk-based cleanup levels into the Suqi River.
For definitions, refer to the Acronyms and Abbreviations section.

In 2010, approximately 95 feet of culvert was removed, and one culvert was capped (USACE 2011). The concrete manhole structure in the western drainage was also cleaned and removed. Sludge inside the manhole contained concentrations of DRO up to 68,000 mg/kg, PCB Aroclor 1254 up to 20 mg/kg, arsenic at 41 mg/kg, barium at 820 mg/kg, cadmium at 18 mg/kg, lead up to 5,000 mg/kg, mercury up to 15 mg/kg, and silver up to 16 mg/kg (USACE 2011). A 12-inch corrugated metal pipe that attached to the manhole and continued upgradient toward the MOC was cut, and 63 feet of the pipe was removed. The open end of the pipe was then filled with bentonite and welded shut. In the middle drainage, another 12-inch corrugated metal pipe measuring 32 feet in length was completely removed (USACE 2011).

In 2011, sediment and soil sampling were conducted to further delineate the extent and magnitude of contamination at Site 28. Transects were located between the upper end of Site 28 and its confluence with the Suqi River; to include areas where contamination was noted in the DD (USACE 2009a) to gain a better understanding of contaminant distribution throughout the drainage. Sediment results were compared to the criteria specified in the DD when applicable. If sediment criteria were not listed in the DD for a particular analyte, evaluation criteria were based on the National Oceanic and Atmospheric Administration (NOAA) Screening Quick Reference Tables (SQuiRTs) for freshwater sediment at the probable effect level (Buchman 2008). Some of the samples collected in 2011 did not meet the project definition of sediment, so soil cleanup levels were used for screening purposes. The results indicated five potential COPCs: toluene, ethylbenzene, total xylenes, cadmium, and selenium (USACE 2012).

In 2012, additional sediment mapping and sampling was conducted. Streams and ponds in the drainage basin were inspected to define the horizontal boundaries of the sediment accumulation areas and probing was conducted to determine the thickness of the sediment (USACE 2013a). The mapping efforts identified a total of approximately 400 cubic yards of sediment in 22 locations along the drainage (USACE 2013a).

In September 2012, following the mapping and sampling effort, Phase I of the sediment removal remedy was initiated in three areas. Two removal methods were evaluated for efficacy and implementability: excavation and a combination of a Venturi dredge and geotextile dewatering tube:

- An excavator removed sediment in Areas 1 and 2, just north of the MOC gravel pad (Figure A-17). This method allowed removed sediment to be dewatered in place but is limited to areas with firm ground such as the MOC gravel pad or a road. The excavator removed approximately 5 cubic yards of sediment from Area 1 in the western drainage and 16 cubic yards from Area 2 near the middle drainage. In Area 1, DRO, acenaphthylene, naphthalene, and 2-methylnaphthalene exceeded cleanup criteria in both confirmation samples. In Area 2, the same analytes plus RRO, acenaphthene, fluorene, and phenanthrene exceeded cleanup levels.
- The Venturi dredge was used in Area 4 located in the main channel of the drainage (Figure A-17). This method can be used where the excavator cannot travel but requires large volumes of water to remove the sediment. Following removal, the sediment must be separated from the water and the water must be confirmed to meet discharge requirements before release. The dredge removed approximately 18 cubic yards of sediment from Area 4 in 2012. No confirmation samples were collected from Area 4. Approximately 135 cubic yards of contaminated sediment remained at Area 4 at the conclusion of the 2012 field season (USACE 2013b).

In 2013, sediment removal continued within Areas 3 through 11 (USACE 2015a) (Figure A-17):

- At Areas 5, 6, and 7, vegetative material routinely clogged the in-line pumps. Sediment and vegetative material were removed by hand instead of using the dredge. Personnel donned dry suits, entered the shallow ponds, and rolled/scooped up the sediment/decaying plant material in large pieces. Material was placed at the edge of each pond and an excavator was used to place the material in bulk bags for disposal (USACE 2013b).
- Removal Area 8 was a small pond in 2012; however, it was dry in 2013. Material from this area was removed by excavator and placed directly into a bulk bag for disposal.
- Sediment was removed from Areas 3, 4, 7, 9, 10, and 11 using the Venturi dredge and geotextile dewatering system.
- At the conclusion of the 2013 field season, several analytes, including DRO, RRO, low-molecular weight PAHs (LPAHs), arsenic, chromium, 2-methylnaphthalene, acenaphthene, fluorene, naphthalene, and phenanthrene, remained at concentrations greater than cleanup levels. Analytes exceeding cleanup levels remained within all 11 sediment removal areas. In addition, acenaphthylene, 1-methylnaphthalene, and selenium were identified in sediment.
- During the 2014 field season, sediment dewatering tubes and water containments were removed from the Site 28 work pad.

Water Treatment

Water and sediment removed using the dredge system was moved to a water processing area west of Site 28. The processing area consisted of two 20,000-gallon-capacity lined containment cells approximately 60 by 30 feet and 1.5 feet deep. The primary containment area consisted of a geotextile dewatering tube for sediment dewatering designed to contain the sediment while allowing water to pass through the pore spaces. The pore size ranged from 59 to 350 microns. Water was then treated through a scrubber – a natural cellulose fiber that selectively absorbs hydrocarbons inside high-density polyethylene containers with an inlet at the top. Water then flowed to the second set of containment cells to await analytical results prior to discharge. In 2012, samples collected from the treated water did not meet discharge criteria for TAH and TAqH identified in the State of Alaska Wastewater General Permit 2009DB0004-0216 (USACE 2013b). No water was discharged. Excavated sediment and treated water from Area 4 remained within the lined containments over the winter of 2012/2013.

Following the 2012 field activities, changes to the sediment/water treatment system were made to implement this remedy effectively. In 2013, a SPINPRO HydroMizer polymer feed system with injection pump was introduced into the piping line prior to sediment capture in the geotextile tube to facilitate coagulation and settling (USACE 2013b). The water filtration system was modified to consist of two sock filters (water first flowed through a 25-micron-filter, and then through a 5-micron-filter), followed by a scrubber containing hydrocarbon-absorbent cellulose fibers (USACE 2015a). After the first batch of water was processed in 2013, analytical results indicated water was still above TAqH criterion (USACE 2015a). A granular-activated carbon system was added as the last treatment step and the hydrocarbon scrubber was eliminated. Analytical results from the first batch using the modified treatment system were below discharge criteria presented in the State of Alaska Wastewater General Permit 2009DB0004-0216 and 18 AAC 70. ADEC and USACE agreed that pre-treated water containment samples were no longer needed and treated water was discharged to the ground (USACE 2015a).

Control Measures

Two methods were used to control and minimize downstream sediment migration during removal activities: silt fencing and an in-stream sediment trap. Silt fencing was used where there was no direct flow to the main channel of the Suqi River and was placed on the north side of the ponded area. The sediment trap was placed downstream of sediment Removal Area 4. The trap was a steel box, 8 feet wide by 4 feet deep, with the rear (downstream) height extending approximately 6 feet high and tapering to a front section approximately 4 feet high. Rectangular slots allowed water to flow down and through the box. Unrolled jute mats were placed inside the trap, upstream, and downstream of the trap (USACE 2015a).

Surface Water Sampling

Surface water samples were collected at three locations before, during, and after sediment removal and at one location downstream of the sediment trap. Samples were analyzed for DRO, RRO, BTEX, PAHs, PCBs, and total and dissolved metals (RCRA metals plus nickel, vanadium, and zinc). All surface water samples were below applicable surface water criteria and no sheen was observed (USACE 2015a).

2018 Sediment Mapping and Sampling

In 2018, field activities included the mapping of sediment and surface water and the collection of sediment samples (Figures A-17 through A-20). The surface water bodies measured at Site 28 extended from the border of the MOC to the confluence with the Suqi River. The lateral and vertical extent of the surface water bodies were measured if they appeared greater than 30 feet in diameter. A real-time kinematic (RTK) global positioning system (GPS) was used to collect survey positions around the edge of major water bodies at Site 28. The depth of the water body was collected during the sediment mapping activities.

During the sediment mapping effort, submerged areas were characterized as sediment or vegetative mat within the surveyed water bodies. For this evaluation, sediment was defined as all continuously submerged loose material and organic material, except that which is actively growing vegetation and is part of the vegetative mat. If no material that met the project definition of sediment was identified (e.g., only vegetative mat present) was identified, the lack of sediment was documented and no further evaluation occurred in that water body. When sediment was identified, the vertical extent of sediment was measured. For discrete water bodies containing sediment, north/south and east/west transects were established. Transects crossed approximately at the center of the sediment area in the water body to measure thickness. A graduated hand probe was used to measure sediment thickness to the nearest 0.1 foot starting from the edge of the sediment area and at intervals not exceeding 10 feet.

A total of 54 sediment samples were collected from 0 to 2 feet bgs or until refusal was met with the hand tool (Figures A-17 through A-20). Forty-five samples were collected from surveyed locations based on the 2012 sediment mapping effort (USACE 2013a). Seven additional locations (locations S28- 04, -11, -25, -38, -42, -43, and -51) were staked and surveyed in either vegetative mat or on dry land. These seven locations were relocated to suitable sample locations because the original staked survey locations did not contain sediment as defined by the project. Three sediment samples of opportunity were collected from water bodies that contained a fuel odor or sheen (locations S28-51, 52, and 53). Sediment samples collected from Site 28 were analyzed for DRO by method AK102, DRO by method AK102 with silica gel cleanup, RRO by method AK103, RRO by method AK103 with silica gel cleanup, total organic carbon, PAHs, PCBs, and metals (arsenic, chromium, lead, selenium, and zinc). Analytical results of analytes exceeding the DD SSCLs are shown on Figures A-17 through A-20. DRO and RRO results from the silica gel cleanup method are presented. PAHs, PCBs, and metals concentrations were below the SSCLs. Exceedances of DRO and RRO did not occur beyond the natural stilling area. This distribution of contamination indicates the existing wetland is preventing contaminants above risk-based cleanup levels from moving downgradient from the natural stilling area to the Suqi River.

3.16.2 Site 28: Drainage Basin O&M

Site 28 has reached construction completion; however, contaminated sediment remains above the SSCLs and further remedy implementation is recommended. This includes continuation of remedy implementation (removal of contaminated sediment) where 2018 sediment results indicated COCs are present above DD-established cleanup levels, conducting pilot testing to assess if effectiveness of sediment removal (dredging) can be improved, and formally documenting the contamination remaining at the southern end of Site 28 is associated with Site 11 and why continued remedy implementation (excavation) at the site is not feasible due to the presence of shallow groundwater and anticipated significant impacts to wetlands. These efforts are anticipated to be completed by 2025.

The next Periodic Review is due five years from the final publication of this document (refer to Section 10). The filing of a deed notice is anticipated to occur by 2021.

3.17 SITE 32: LOWER TRAMWAY

The Lower Tramway (Site 32) is located south of Site 31 at the northern base of Kangukhsam Mountain (Figures A-2, A-21). Site 32 consisted of a tram terminal building, substation transformer bank, two ASTs, a water well, and an anchor pit for the aerial tramline. In 2001, soil samples collected from Site 32 identified DRO as the primary COC. DRO concentrations ranged between 230 and 13,000 mg/kg. RRO concentrations were not detected above SSCLs; the maximum RRO concentration detected was 3,600 mg/kg (USACE 2009b).

The buildings, ASTs, and tram structures at Site 32 were demolished and removed in 2003 and 2005. Additional soil samples were collected in 2003 following the building demolition activities. DRO concentrations ranged between 1,150 and 10,400 mg/kg in the area near the former AST. No other contaminants were identified above cleanup levels (USACE 2009b).

3.17.1 Site 32: Lower Tramway Remedy Implementation and Status

The selected remedy listed in the DD, RAOs, and implementation status for Site 32 is presented in Table 3-16.

Table 3-16
Site 32 Remedy, RAOs, and Status

Selected Remedy	RAO	Implementation Status
Excavation and removal of petroleum-contaminated soil to established cleanup levels.	Mitigate potential future risk to human health from the ingestion, inhalation, and dermal contact with soil exposure pathways. Meet risk-based cleanup levels in soil to a depth of 15 feet. Reduce concentrations of petroleum hydrocarbons and other contaminants to below pertinent risk-based standards.	Complete
	Prevent exposure to ecological receptors by direct contact with contaminated soil/sediment above risk-based cleanup levels.	Complete

Note:
For definitions, refer to the Acronyms and Abbreviations section.

In 2010, approximately 20 tons of soil was excavated from Site 32 (USACE 2011). Field-screening samples were collected from the excavation floor and sidewalls and indicated that DRO contamination was not present above cleanup levels. Sixteen confirmation samples were collected from the excavations at Site 32 for DRO/RRO analyses and all were found to be below cleanup levels. The excavation pits were backfilled and graded with clean fill obtained from the borrow source.

During the first FYR, it was identified that the remedy for Site 32 was not complete. Excavation efforts in 2010 (USACE 2011) were conducted north of the DRO-contaminated area identified in the DD. In 2014, Bristol relocated three historical soil samples which contained DRO above

9,200 mg/kg (01NE32SS102, 01NE32SS122, and 03NEC32SS07) using the onsite professional land surveying team. The QAR verified that the sample locations appeared to be in the correct location. Investigative soil samples were collected from the same locations (horizontally and vertically) and analyzed in the field laboratory for DRO and RRO concentrations.

The primary confirmation soil sample and duplicate sample contained DRO concentrations above the SSCL of 9,200 mg/kg, with both samples having concentrations of 14,000 mg/kg. Soil from the location of the samples was excavated on August 6, 2014. The excavation was approximately 10.5 feet long by 11 feet wide and extended to approximately 3 to 4 feet bgs. Bristol excavated 32.19 tons of contaminated soil into bulk bags and collected four primary confirmation soil samples and one duplicate sample. One primary confirmation soil sample and duplicate sample contained DRO concentrations of 18,000 mg/kg. Bristol excavated an additional 20.94 tons of contaminated soil from this location on August 9, 2014. The sidewall sample location was excavated to the same depth as the rest of the floor and to the south an additional 3 to 4 feet. One primary confirmation soil sample and one duplicate sample were collected. Both samples contained DRO and RRO concentrations that did not exceed SSCLs. Following receipt of sample results, the excavation was backfilled, graded, and seeded. All DRO-contaminated soil exceeding the SSCL were excavated and removed. The USACE considers soil removal at Site 32 complete.

3.17.2 Site 32: Lower Tramway O&M

Site 32 has reached construction completion.

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4.0 PROGRESS SINCE THE LAST REVIEW

Table 4-1 below describes the activities that have occurred since the first FYR (USACE 2015b) to address issues identified in the first FYR and outstanding issues from the DD. In the first FYR, it was determined that the remedies were expected to be protective of human health and the environment upon completion for all sites.

Table 4-1
Actions Since First FYR

Site	Year	Action
NEC Site	2014	Debris, including wire, antenna components, and rusted drums were removed from NEC Sites and from the vicinity of and on top of the Site 7 landfill cap. The debris removal totaled 10.97 tons.
Site 6	2014	As identified in the first FYR, a data gap existed regarding a 2009 pre-construction sample containing an estimated PCB concentration of 2.2 mg/kg. The sample location was relocated using a professional land surveyor and a Trimble GPS unit. Due to a discrepancy between the two located points, both points were test-pitted and sampled (Test Pit 1 and Test Pit 2 in Figure A-4). PCBs were not detected in any of the soil samples.
Site 8	2018	An attempt to complete MNA sampling occurred at revised Dus (Figure A-5). Incremental sediment MNA samples were not collected at Site 8 due to the lack of sediment which met the DD definition of “continuously submerged” and above the vegetative mat.
	2016	A total of 83 discrete samples were collected from 75 sample locations at Site 8. This sampling effort was completed to assess sediment distribution across the DD-established DUs.
	2014	Two historical surface water locations (12NC08SWA01 and 12NC08SWA02/03) were relocated and additional surface water samples were collected and analyzed for GRO, DRO, RRO, BTEX, and PAHs. Sample 14NC08SWA02 and field duplicate sample 14NC08SWA03, located approximately 20 feet from the revised pipeline break location, exceeded the TAqH cleanup level stated in the DD of 0.015 mg/L, no sheen was observed.
MOC	2018	The monitoring well network of 15 wells was sampled for GRO, DRO, RRO, BTEX, PAHs, PCB, and methane, sulfate, alkalinity, and metals (both total and dissolved arsenic, barium, cadmium, chromium, lead, mercury, nickel, selenium, silver, vanadium, and zinc), Monitoring wells MW10-1 and 14MW06, downgradient of Site 10, were also sampled for ethylene glycol. Additional MNA parameters nitrate and ferrous iron were measured using field test kits.
	2016	The monitoring well network of 15 wells was sampled for GRO, DRO, RRO, BTEX, PCB, PAHs, methane, sulfate, alkalinity, and metals (both total and dissolved arsenic, barium, cadmium, chromium, lead, mercury, nickel, selenium, silver, vanadium, and zinc). Monitoring wells MW10-1 and 14MW06, downgradient of Site 10, were also sampled for ethylene and propylene glycol. Additional MNA parameters nitrate and ferrous iron were measured using field test kits.

Table 4-1 (Continued)
Actions Since First FYR

Site	Year	Action
	2015	The monitoring well network of 15 wells was sampled for GRO, DRO, RRO, BTEX, PAHs, PCBs, methane, and metals (both total and dissolved arsenic, barium, cadmium, chromium, lead, mercury, nickel, selenium, silver, vanadium, and zinc). Monitoring well MW10-1, downgradient of Site 10, was also sampled for diethylene, ethylene, propylene, and triethylene glycol. MNA parameters manganese, ferrous iron, sulfate, nitrate and alkalinity were measured using field test kits.
	2014	Seven groundwater monitoring wells (14MW01 through 14MW07) were installed at the MOC gravel pad.
		Compromised existing wells 22MW3 and 18MW1 were decommissioned in accordance with applicable ADEC guidance (ADEC 2009a).
		MW88-3 was re-developed and added to the monitoring network. The well had been classified as damaged due to a blockage located above the screened interval identified in 2010; however, the blockage was no longer present when inspected in 2014.
		Wells MW10-1, MW88-1, MW88-10, 17MW1, 20MW1, 22MW2, and 26MW1 were repaired.
		Groundwater samples were collected from eight existing and seven newly installed monitoring wells within the MOC. Analyses included GRO, DRO, RRO, BTEX, and metals (total and dissolved). MW10-1 was also analyzed for ethylene and propylene glycol, and full-suite VOCs.
		Excavation and removal were completed within the E1 and E2 units. Twenty primary and three duplicate samples were collected from the excavation sidewalls. Seven primary and one duplicate soil samples were collected from the excavation floor. All final confirmation samples of DRO and RRO were below the SSCL of 9,200 mg/kg. The USACE considers soil removal at Plume E complete.
		Excavation and removal were completed at Plume C. Twelve primary and two duplicate samples were collected from the excavation sidewalls. Three soil samples were collected from the excavation floor. All final confirmation samples of DRO and RRO were below the SSCL of 9,200 mg/kg. The USACE considers soil removal at Plume C complete.
		Excavation and removal were completed at Plume I1. Two confirmation sidewall samples and one duplicate were collected from soil directly above the groundwater interface; one confirmation soil sample was collected from the excavation floor. All final confirmation samples of DRO and RRO were below the SSCL of 9,200 mg/kg. The USACE considers soil removal at Plume I complete.
		Before, during and after soil removal activities at the MOC, surface water samples were collected from three locations in Site 28 (MOCSW01, MOCSW02, MOCSW03) to assess the impact of removal activities on surface water. Analyses included GRO, DRO, RRO, BTEX, and PAHs. Analytical results were used to calculate TAH and TAqH results. TAH and TAqH did not exceed DD criteria in any sample.
		After excavations were backfilled, the MOC was regraded to prevent ponding of water and erosion at the site.

Table 4-1 (Continued)
Actions Since First FYR

Site	Year	Action
		A total of 107.35 tons of arsenic-contaminated waste was removed from Site 21. Thirty-one primary and four duplicate confirmation samples were collected during excavation. One sample, 14NC21S004 contained arsenic at a concentration of 13 mg/kg, which exceeded the SSCL of 11 mg/kg but was below the targeted removal concentration of 17 mg/kg. No further excavation occurred at this location.
MOC/ Cargo Beach	2014	In 2014, three bag staging areas at the MOC were sampled after all bulk bags were removed from the MOC, and Cargo Beach received a post-construction round of incremental sampling methodology (ISM) soil sampling after all bulk bags were removed from the island. ISM samples collected from the bag storage areas at the MOC and Cargo Beach were analyzed for GRO, DRO, RRO and BTEX. ISM samples collected from the fuel containment area at the MOC were analyzed for GRO, DRO, and RRO. No ISM samples contained contaminant concentrations greater than the SSCLs.
Site 10	2014	Excavation activities occurred following up on a recommendation from the first FYR to investigate five historic samples that contained concentrations of DRO greater than 9,200 mg/kg (94NE10SS104, 94NE10SS107, 94NE10SS125, 94NE10SS126, and 94NESS127). Forty-two primary and five duplicate samples were collected from the Site 10 excavations. Forty bulk bags were filled with 265.5 tons of contaminated soil and shipped offsite for disposal. Final soil confirmation sample results indicated that 1,1-dichloroethene remained at one location at a concentration that exceeded the evaluation criterion. DRO did not exceed the SSCL in any final confirmation sample results. Sample 14NC10SS045 and duplicate sample 14NC10SS046 contained 1,1-dichloroethene at concentrations of 0.058 mg/kg (J-, B-flagged) and 0.110 mg/kg, respectively, which exceeded the 18 AAC 75 migration to groundwater cleanup level of 0.030 mg/kg at that time. These soil concentrations are below the ADEC 2018 migration to groundwater criterion of 1.2 mg/kg.
Site 21	2014	At the completion of removal in 2013, arsenic remained at seven locations in concentrations that exceeded the SSCL of 11 mg/kg: samples 13NC21SS023 (25 mg/kg), 13NC21SS026 (79 mg/kg), 13NC21SS043 (17 mg/kg), 13NC21SS045 (19 mg/kg), 13NC21SS046 (21 mg/kg), and 13NC21SS047 (29 mg/kg). Additional delineation was requested to further characterize the extent of arsenic contamination. During Phase I, 120 soil samples were collected from 40 borings at 1-foot up to 3-foot intervals. An additional nine borings were advanced to depths between 3 and 4 feet Twenty-seven primary samples and three duplicate samples were collected from these borings. Following the analysis of the data collected, it was decided that arsenic greater than 17 mg/kg was targeted for removal.
Site 27	2014	In the DD, a single soil confirmation sample (UST-CS-27_EN-04-01) was identified as having naphthalene above the SSCL of 120 mg/kg at a concentration of 191 mg/kg. The sample was relocated by a survey crew and appeared to be within an area of the E plume where soil had previously been excavated and removed. A test pit was advanced to the depth of the original sample and samples collected from 12.5 to 13.5 feet bgs and analyzed for DRO, RRO, and naphthalene. No analytes were detected above the SSCLs

Table 4-1 (Continued)
Actions Since First FYR

Site	Year	Action
		and the previous exceedance was likely excavated during previous remedial actions.
Site 28	2018	Field activities included sediment thickness measurement, surveying the extent of surface water bodies, and the collection of sediment samples. A total of 54 sediment samples were collected from 0 to 2 feet bgs. The drainage was mapped with a combination of RTK GPS and sediment probe measurements. Applying the analytical results from the sediment samples to the estimated sediment volumes, approximately 196 of the 281 cy of mapped sediment contained POL-compounds at levels above their respective SSCLs.
Site 29	2016	A total of 11 sediment and five surface water samples were collected from the Suqi River and estuary. Collocated sediment and surface water samples were collected from four locations along the Suqi River. Stream depth and velocity measurements were also collected from these four locations. Surface water samples were analyzed for BTEX and PAHs. Sediment samples were analyzed for DRO, RRO, PAHs, PCBs, and metals, including arsenic, chromium, lead, and zinc. Results for surface water and sediment in the Suqi River and estuary did not exceed SSCLs. Although RRO exceeded the sediment SSCL of 3,500 mg/kg at three sample locations collected from the Suqi River estuary, elevated RRO concentrations were likely the result of biogenic interference.
Site 32	2014	Excavation activities occurred following the relocation and resampling of historic sample locations with known contamination that had not been adequately addressed through previous remedial actions. Historic locations 01NE32SS102, 01NE32SS122, and 03NEC32SS07 were found to have remaining DRO concentrations ranging from 14,000 mg/kg to 18,000 mg/kg. Approximately 50 tons of contaminated soil were removed and five primary confirmation samples and two duplicate samples were collected. Final confirmation samples did not contain DRO or RRO exceeding SSCLs. Following receipt of sample results, the excavation was backfilled, graded, and seeded. The USACE considers soil removal at Site 32 complete.

Note:
For definitions, refer to the Acronyms and Abbreviations section.

5.0 PERIODIC REVIEW PROCESS

The Periodic Review team consisted of individuals from USACE with technical support provided by ECC/Jacobs. The Periodic Review included the following components: document reviews, site inspection, interviews with the state regulatory agency and community members, an assessment of protectiveness of the remedies, community notification and involvement, and development of this Periodic Review report. Site inspection documentation is located in Attachment C-4.

5.1 COMMUNITY NOTIFICATION AND INVOLVEMENT

Public participation has been an important component of the remedial process at the NEC FUDS. A Restoration Advisory Board (RAB), comprised of community members and other interested parties, was established in January of 2000. RAB meetings were held two times per year to keep the public informed of ongoing project activities. In the past, RAB meetings were held more frequently, as needed. Detailed meeting minutes are recorded and distributed after each meeting. Under the Technical Assistance for Public Participation program, the RAB was served by a technical advisor to provide technical guidance and comments on work plans, reports, proposed remedies, and potential environmental and human health impacts.

The community was notified of and given opportunity to have input on the Periodic Reviews and the FYR. The general public was notified of the reviews with public notices placed in the *Nome Nugget* newspaper on 29 March 2018. In addition, a flyer containing the same information was mailed to select community members and ADEC in March 2018 (Appendix D).

A public meeting was held on 11 April 2018 in Savoonga, Alaska to describe the start of the periodic and FYRs and to solicit public feedback. ECC/Jacobs staff were available for public comment on 12 April 2018. Additional phone interviews were conducted by Jacobs personnel following the meeting and are included in Attachment C-3 with the complete interview record The public notice and flyer are provided in Appendix D.

The DD indicated project documentation, reports, and other materials are available at four Information Repositories: the Sivuqaq Lodge in Gambell, the Savoonga City Hall in Savoonga, the University of Alaska Fairbanks Northwest Campus Library in Nome, and the Alaska Resource Library and Information Services in Anchorage. The Information Repository at the University of Alaska Fairbanks Northwest Campus Library in Nome is no longer maintained.

5.2 DOCUMENT REVIEW

The DD (USACE 2009a) associated with 33 of the NEC sites was reviewed for site histories and to identify RAOs, COPCs, COCs, and cleanup levels. The potential for changes to standards identified as ARARs in the DD and/or newly promulgated standards which may affect the protectiveness of the remedies are evaluated in Appendix B and discussed for each site in Section 6. The following documents were reviewed for updates to ARARs and new toxicity information:

- ADEC 18 AAC 70, *Water Quality Standards*, amended as of 6 April 2018 (ADEC 2018a)
- ADEC 18 AAC 75, *Oil and Other Hazardous Substances Pollution Control*, amended as of 27 October 2018 (ADEC 2018b)
- ADEC *Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances*, amended as of 12 December 2008 (ADEC 2008b)
- EPA Integrated Risk Information System (IRIS) (EPA 2018b)
- Washington Administrative Code (WAC) Chapter 173-204, *Sediment Management Standards* (WAC 2013)

In addition to the documents mentioned above, the following documents were also reviewed to assess the protectiveness of the remedies:

- RI/FS reports (when necessary to clarify information in the DDs)
- The human health and ecological risk assessment (USACE 2004)
- Remedial action reports
- Annual remedial action and monitoring reports

Key documents utilized during this Periodic Review are listed in Section 11 of this report.

5.3 DATA REVIEW

Contaminant confirmation sample and monitoring results from soil/sediment samples, groundwater monitoring wells, and surface water sampling locations were reviewed for this Periodic Review. Natural attenuation-indicator parameter results were also reviewed when available. Data collected and reported was the primary source of information utilized in the data review.

In addition to the data collected during remedial actions and long-term monitoring (LTM), the ATSDR released a public comment version of the Health Consultation at NEC in July 2017 (ATSDR 2017), which was evaluated as part of this Periodic Review. The ATSDR Health Consultation included the following general conclusions regarding NEC:

- Conclusion 1: Eating Fish from NEC in the summer (three months) is not expected to harm human health.
- Conclusion 2: Based on available (limited) data, eating greens and berries from NEC year-round is not expected to harm human health.
- Conclusion 3: Accidentally ingesting soil for half of the year and drinking Suqi River surface water year-round are not expected to harm human health.
- Conclusion 4: There is not enough contact with site contaminants to suggest that exposures are contributing to cancer and birth defect rates.

5.3.1 Site 3: Fuel Pump House

The remedy at Site 3 is excavation and removal of petroleum-contaminated soil, resampling two historical sediment sample locations according to the ADEC Technical Memorandum 06:001: *Biogenic Interference and Silica Gel Cleanup* (ADEC 2006) to evaluate biogenic interference, and implementation of LUCs. Excavation efforts and sediment sampling was initiated and completed in 2010. Soil confirmation samples from the excavation test pits, sediment sample results before and after silica treatment, and soil confirmation samples from beneath the former mound were reviewed for expectations of meeting cleanup levels and RAOs. Results before and after silica treatment indicated DRO and RRO concentrations were below SSCLs.

Groundwater

DRO and RRO have previously been detected in shallow groundwater above ADEC drinking water standards as documented in the DD. The maximum concentrations of DRO and RRO were 14.0 mg/L and 8.1 mg/L, respectively in 1998 (USACE 2009a). The DD did not include a remedy for groundwater contamination at Site 3 because shallow groundwater within Site 3 was not a current or reasonably expected potential future drinking water source (USACE 2009a). Two signs, indicating where groundwater use for drinking water or ground disturbing activities are not recommended have been installed at the air field and at the fish camp. Each sign was two-sided and contained both Yupik and English transcriptions. At the time of this report, the LUC designating areas not suitable for drinking water has not been fully implemented because a deed notice anticipated to be in the form of an Environmental Covenant in accordance with the UECA has not been recorded. No additional groundwater data for Site 3 was available for review.

Recommendations

The Site 3 recommendations consist of the following:

- Complete the implementation of the LUC to designate areas not suitable for drinking water by recording a deed notice anticipated to be in the form of an Environmental Covenant in accordance with UECA.
- Continue conducting Periodic Reviews until all selected remedies are complete. Any change in land use will trigger a review.

5.3.2 Site 6: Gravel Pad

The remedy at Site 6 is excavating and removing petroleum-contaminated soil and implementing LUCs. Prior to initiation of the remedy Site 6 was used as an HWAP in 2009 for contaminants encountered during Site 7 drum removal. Pre- and post-construction samples were collected from the gravel pad at Site 6 in 2009 (USACE 2009a). In 2010, the selected remedy for Site 6 was initiated and considered complete (USACE 2011). In 2012, the gravel pad at Site 6 was used to store bulk bags filled with contaminated soil. To ensure the contaminants from the bulk bags were not being spread to the site, pre- and post-construction

ISM was conducted (USACE 2013c). The DUs covered an area of approximately 28,700 square feet. ISM samples were collected from surface soil in cells measuring 12 feet wide by 12 feet long. One sample was analyzed per DU for DRO and PCBs, for a total of four samples. No samples exceeded SSCLs for either analyte. The maximum detection from ISM samples was 60 mg/kg for DRO and 0.034 mg/kg for PCBs (USACE 2013c). In 2013, the DUs were resampled and four ISM samples were collected from surface soil and submitted for analysis of DRO, RRO, and PCBs. No samples exceeded SSCLs. The maximum DRO, RRO, and PCB detections were 34 mg/kg, 250 mg/kg, and 0.034 mg/kg, respectively (USACE 2015a).

In the first FYR, it was identified that post-construction samples in 2009 verify that HWAP activities did not contribute to contaminants at Site 6; however, pre-construction samples indicated the presence of DRO, RRO, and PCB Aroclor 1254 above SSCLs at Site 6 (USACE 2011). DRO and RRO are known COCs in soil at Site 6 (USACE 2009a). Pre-construction sample results indicate that RRO concentrations were higher than previously detected (8,500 mg/kg versus 130,000 mg/kg). The presence of PCBs in soil at Site 6 had not previously been reported and was therefore not included as a COC in the DD (USACE 2009a). The PCBs exceedance was not replicated in post-construction samples and excavation efforts conducted in 2010 (described below) did not collect samples for analysis of PCBs. In 2014, Bristol was scoped to address this data gap by investigating the location of the pre-construction sample containing 2.2 mg/kg PCBs and collecting soil samples via test pits to determine if PCB-contaminated soil remained at Site 6 (Figure A-4) (USACE 2016b). PCBs were not detected in any of the soil samples.

Pre- and post-construction samples from 2009, soil confirmation samples from 2010, and pre- and post-construction ISM samples from 2011 and 2013, and additional samples collected in 2014 were reviewed for expectations of meeting cleanup levels and RAOs.

Maximum detected concentrations from pre- and post-construction, as well as the 2014 supplemental sampling are presented in Table 5-1.

Table 5-1
Site 6 Maximum Pre- and Post-Construction Sample Results

Analyte	Cleanup Level	Unit	Maximum Pre-Construction Concentration	Maximum Post-Construction Concentration	2014 Additional Sampling Results
Benzene	2,000[a]	µg/kg	ND [2.8]	ND [2.9]	--
Toluene	6,700[b]	µg/kg	4.8 J	16 B	--
Ethylbenzene	130[b]	µg/kg	ND [4.2]	ND [4.8]	--
Total xylenes	1,500[b]	µg/kg	12 J	ND [10]	--
Methyl tert-butyl ether	400[b]	µg/kg	ND [2.0]	--	--
All other Aroclors	1[a]	mg/kg	ND [0.0084]	ND [0.0084]	ND [0.011]
Aroclor 1254	1[a]	mg/kg	2.2	0.026	ND [0.011]
GRO	300[c]	mg/kg	20 J	94	--
DRO	9,200[a]	mg/kg	14,000 J,H	9,500	--
RRO	9,200[a]	mg/kg	130,000	80,000	--
Arsenic	11[a]	mg/kg	--	6	--
Barium	2,100[b]	mg/kg	91	63	--
Cadmium	9.1[b]	mg/kg	ND [0.086]	ND [0.085]	--
Chromium	100,000[b]	mg/kg	12	9.5	--
Lead	400[b]	mg/kg	22 J	19	--
Selenium	510[d]	mg/kg	21	19	--
Silver	510[d]	mg/kg	ND [0.049]	ND [0.048]	--
Mercury	18[b]	mg/kg	0.015 J	0.017 J	--

Notes:
-- Data not reported
[a] Cleanup level reported in the DD (USACE 2009a)
[b] 18 AAC 75, Table B1 Method Two, Migration to Groundwater cleanup level (ADEC 2018b)
[c] 18 AAC 75, Table B2 Method Two, Migration to Groundwater cleanup level, Under 40 Inch Zone (ADEC 2018b)
[d] 18 AAC 75, Table B1 Method Two, Human Health cleanup level, Under 40 Inch Zone (ADEC 2018b)
J – The analyte was positively identified; however, the associated result was less than the limit of quantitation but greater than or equal to the DL.
H – Result has a potentially high bias.
For definitions, refer to the Acronyms and Abbreviations section.

Petroleum-Contaminated Soil

In 2010, approximately 2,513 tons of petroleum-contaminated soil was excavated from Site 6 (USACE 2011). Excavation efforts were guided by RRO concentrations and continued until field laboratory results indicated analyte concentrations below cleanup levels or until groundwater was encountered. Confirmation samples were collected from soil that was above the groundwater table and submitted for analysis of DRO and RRO. Maximum detected concentrations in confirmation samples at Site 6 are presented in Table 5-2.

Table 5-2
Site 6 Soil Confirmation Results

Analyte	Cleanup Level[a]	Unit	DD Maximum Concentration	2010 Maximum Concentration
DRO	9,200	mg/kg	**102,000**	3,300
RRO	9,200	mg/kg	--	8,800

Notes:
-- Data not reported in the DD (USACE 2009a)
[a] Cleanup level reported in the DD (USACE 2009a)
BOLD = Sample concentration exceeded the cleanup level
For definitions, refer to the Acronyms and Abbreviations section.

During excavation efforts, two confirmation samples (10NC06SB26 and 10NC06SB41) contained RRO concentrations above cleanup levels (10,000 and 15,000 mg/kg, respectively). The location of sample 10NC06SB41 was re-excavated, and an additional confirmation sample was collected. Subsequent confirmation sample (10NC06SB55) indicated the location was below cleanup levels at 540 mg/kg. Further excavation at the location of sample 10NC06SB26 encountered groundwater and therefore a second confirmation sample was not collected (USACE 2011).

Sediment

The excavation efforts at Site 6 extended west to a nearby pond. Two sediment samples were collected and analyzed for GRO, DRO, RRO, BTEX, and PAHs. Results indicate that concentrations in sediment were below cleanup levels for all analytes (USACE 2011).

Surface Water

Two surface water samples were collected from the same location as the sediment samples and were submitted for analysis of GRO, DRO, RRO, BTEX, and PAHs. Cleanup levels for surface water at NEC have only been established for TAH and TAqH. The maximum detected concentrations in surface water are presented in Table 5-3.

Table 5-3
Site 6 Surface Water Confirmation Results

Analyte	Cleanup Level[a]	Unit	DD Maximum Concentration	2010 Maximum Concentration
Benzene	--	µg/L	--	ND [0.45]
Ethylbenzene	--	µg/L	--	ND [0.45]
Total Xylenes	--	µg/L	--	ND [1.35]
Toluene	--	µg/L	--	0.098 J
TAH	10	µg/L	--	2.348
1-Methylnaphthalene	--	µg/L	--	0.022 J
2-Methylnaphthalene	--	µg/L	--	ND [0.049]
Acenaphthene	--	µg/L	--	ND [0.049]
Acenaphthylene	--	µg/L	--	0.019 J
Anthracene	--	µg/L	--	0.019 J
Benzo[a]anthracene	--	µg/L	--	ND [0.049]
Benzo[a]pyrene	--	µg/L	--	ND [0.049]
Benzo[b]fluoranthene	--	µg/L	--	ND [0.049]
Benzo[g,h,i]perylene	--	µg/L	--	0.13 J
Benzo[k]fluoranthene	--	µg/L	--	ND [0.049]
Chrysene	--	µg/L	--	ND [0.049]
Dibenz(a,h)anthracene	--	µg/L	--	0.025 J
Fluoranthene	--	µg/L	--	ND [0.049]
Fluorene	--	µg/L	--	ND [0.049]
Indeno[1,2,3-cd]pyrene	--	µg/L	--	0.052 J
Naphthalene	--	µg/L	--	ND [0.049]
Phenanthrene	--	µg/L	--	ND [0.02]
Pyrene	--	µg/L	--	ND [0.049]
TAqH	15	µg/L	--	3.44
GRO	--	mg/L	--	ND [0.44]
DRO	no sheen	mg/L	--	1.5 M
RRO	no sheen	mg/L	--	1.3 QH

Notes:
-- Data not reported in the DD (USACE 2009a)
[a] Cleanup level reported in the DD (USACE 2009a)
J – The analyte was positively identified; however, the associated result was less than the limit of quantitation but greater than or equal to the DL.
M – A matrix effect was present.
QH – Analyte result was considered an estimated value (biased high) due to a QC failure.
For definitions, refer to the Acronyms and Abbreviations section.

Surface water must meet water quality standards as promulgated by the State of Alaska in 18 AAC 70. Water quality criteria for petroleum hydrocarbons, oil, and grease stipulate these compounds may not cause a visible sheen upon the surface of the water [18 AAC 70.020(b)]. In addition, as described in the DD, surface water quality levels of 0.010 mg/L TAH and 0.015 mg/L TAqH must be met. Surface water samples did not show any indications of sheen and contained concentrations below established cleanup levels of TAH or TAqH.

Groundwater

DRO, aluminum, arsenic, lead, nickel, and zinc have previously been detected in shallow groundwater above ADEC drinking water standards at Site 6. The DD did not include a remedy for groundwater contamination at Site 6 because shallow groundwater at Site 6 was not a current or reasonably expected potential future drinking water source (USACE 2009b). Two signs, indicating where groundwater use for drinking water or ground disturbing activities are not recommended have been installed at the air field and at the fish camp. Each sign was two-sided and contained both Yupik and English transcriptions. At the time of this report, the LUC designating areas not suitable for drinking water had not been implemented because a deed notice anticipated to be in the form of an Environmental Covenant in accordance with the UECA has not been recorded.

Recommendations for Site 6

The Site 6 recommendations consist of the following:

- Complete the implementation of the LUC to designate areas not suitable for drinking water by recording a deed notice anticipated to be in the form of an Environmental Covenant in accordance with UECA.
- Continue conducting Periodic Reviews until all selected remedies are complete. Any change in land use will trigger a review.

5.3.3 Site 8: POL Spill

The current remedy at Site 8 is MNA of petroleum-contaminated sediment and implementing LUCs. MNA was initiated in 2010 and continued in 2011 and 2012. Follow-on sampling was conducted in 2014 and 2016. Natural attenuation parameters, soil samples, sediment samples and surface water samples were reviewed for expectations of meeting cleanup levels and RAOs.

DUs and Sampling Methods

Three DUs were created in 2010 to monitor the natural attenuation at Site 8 (USACE 2011). The UDU is upgradient of the reported pipeline break and was intended to provide background information. The MDU encompasses the area of the pipeline break, and the LDU is downgradient of the break. Each DU was divided into 40 grid squares (four sections wide by ten sections long) measuring approximately 10 feet by 10 feet (Figure A-5). In 2010, 2011, and 2012, a random number generator was used to select eight grid squares from each DU for collection of water and sediment samples. If a randomly selected grid square did not contain surface water, the next randomly selected grid square was used (USACE 2011, 2012, 2013b).

Soil and Sediment

Historical sample exceedances identified in the DD included two discrete sediment samples that were not bounded by samples below the cleanup level. The selected remedy of MNA was implemented through the collection of composite samples in 2010, 2011, and 2012. As described previously, each DU was divided into 40 grid squares and a random number generator was used to select eight grid squares from each DU for sample collection. Eight subsamples were collected from each DU, placed in a stainless-steel bowl, and composited by hand prior to analysis. Composite samples were intended to evaluate the average contaminant concentration within each DU; however, current results may be underestimating the level of contamination in sediment due to the limited number of subsamples per DU and potential bias introduced by composite sampling. An incremental sampling approach using ADEC recommended subsampling procedures would provide a superior basis for monitoring remedy performance. Incremental sampling would incorporate the entire area covered by each DU during each sampling event and can account for contaminant variability within each DU.

In 2016, soil and sediment were collected to determine if the historical Site 8 DUs encompassed the lateral extent of POL contamination. At Site 8, POL contamination exceeding SSCLs is present downgradient of the suspected pipeline break and along the eastern edge of both the

MDU and LDU and the western toe of the road. 2016 sediment samples exceeded the SSCLs for DRO, RRO, and 2-methylnaphthalene. 2016 soil samples exceeded the SSCL for DRO only. Although sediment exceeded the RRO SSCL, there is no record of anthropogenic sources of RRO at Site 8. Based on chromatogram interpretation, RRO is likely the result of biogenic interference of naturally occurring organic material.

Although a sediment monitoring effort was planned for 2018, no sampling occurred due to the lack of sediment (as defined in the DD as "continuously submerged") in the DUs to provide enough sampling and analytical data to perform representative monitoring. Due to the lack of sediment in the DUs, it is recommended the use of an ISM approach as described in the DD be discontinued until a supplemental soil investigation is completed and the approach to future monitoring is re-evaluated. The purpose of the supplemental soil investigation would be to delineate the lateral and vertical extent of contamination east of the 2016 sampling area and evaluate the location of the historic pipeline spill, which was based on 2016 sample data. After which, exposure risk and whether or not additional action is necessary to achieve protectiveness should be further evaluated.

Sediment results from the 2010, 2011, 2012, and 2016 sampling events are shown in Table 5-4 and on Figure A-5.

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Table 5-4
Site 8 Maximum Concentration Detected During Monitoring Efforts

Analyte	Cleanup Level[a]	Unit	LDU			MDU			UDU			Soil	Sediment
			2010	2011	2012	2010	2011	2012	2010	2011	2012	2016	2016
1-Methylnaphthalene	--	mg/kg	1.200	0.300 QN	2.400	5.100	0.300	0.330	0.004 J	0.0023 J	ND [0.0039]	15	5.3
2-Methylnaphthalene	0.600	mg/kg	1.200	0.210 QN	1.900	7.600	0.150	0.300	0.0068 J	0.0035 J	ND [0.0039]	14	6.8
Acenaphthene	0.500	mg/kg	0.072	0.020	0.130	0.240	ND [0.0042]	ND [0.0042]	ND [0.0017]	ND [0.0034]	ND [0.0039]	0.83	0.39
Acenaphthylene	--	mg/kg	0.056 J QN	0.0089 J	ND [0.0047]	.100 J	ND [0.0042]	ND [0.0042]	0.0034 J	ND [0.0034]	ND [0.0039]	0.93	0 [0.24]
Anthracene	--	mg/kg	ND [0.0017] J	0.006 J	0.027 QH,QN	0.180 J	0.0052 J	ND [0.0042]	ND[0.0068] J	ND [0.0034]	ND [0.0039]	0 [0.27]	0 [0.24]
Benzo(a)anthracene	--	mg/kg	ND [0.0043]	ND [0.0047]	0.0083 J	0.0071 J	ND [0.0042]	ND [0.0042]	0.0024 J	ND [0.0034]	ND [0.0039]	0 [0.27]	0 [0.24]
Benzo(a)pyrene	--	mg/kg	ND [0.0417] J	ND [0.0047]	0.0066 J	0.0066 J	ND [0.0042]	ND [0.0042]	ND [0.0068] J	ND [0.0034]	ND [0.0039]	0 [0.27]	0 [0.24]
Benzo(b)fluoranthene	--	mg/kg	ND [0.0043]	ND [0.0047]	0.0082 J	0.013	ND [0.0042]	ND [0.0042]	ND [0.0017]	ND [0.0034]	ND [0.0039]	0 [0.27]	0 [0.24]
Benzo(g,h,i)perylene	1.700	mg/kg	ND [0.0043]	ND [0.0047]	0.0046 J	ND [0.002]	ND [0.0042]	ND [0.0042]	ND [0.0017]	ND [0.0034]	0.0031 J	0 [0.31]	0 [0.28]
Benzo[k]fluoranthene	--	mg/kg	ND [0.0043]	ND [0.0047]	ND [0.0047]	0.014	ND [0.0042]	ND [0.0042]	ND [0.0017]	ND [0.0034]	ND [0.0039]	0 [0.27]	0 [0.24]
Chrysene	--	mg/kg	ND [0.0043]	0.010	0.019	0.026	0.011	ND [0.0042]	0.0064 J	ND [0.0034]	ND [0.0039]	0 [0.16]	0 [0.14]
Dibenz(a,h)anthracene	--	mg/kg	ND [0.0043]	ND [0.0047]	ND [0.0047]	ND [0.002]	ND [0.0042]	ND [0.0042]	ND [0.0017]	ND [0.0034]	ND [0.0039]	0 [0.27]	0 [0.24]
Fluoranthene	2.000	mg/kg	0.011 J	0.009	0.011	0.037	0.012	ND [0.0042]	0.0032 J	ND [0.0034]	ND [0.0039]	0 [0.27]	0 [0.24]
Fluorene	0.800	mg/kg	0.200	0.053	0.230	0.820	0.048	ND [0.0042]	0.013	0.0061 J	0.0054 J	2.4 [0.27]	0.41
Indeno(1,2,3-cd)pyrene	3.200	mg/kg	ND [0.0043]	ND [0.0047]	ND [0.0047]	0.0029 J	ND [0.0042]	ND [0.0042]	0.0018 J	ND [0.0034]	ND [0.0039]	0 [0.62]	0 [0.56]
Naphthalene	1.700	mg/kg	0.340	0.240 QN	0.710	1.600	0.046	0.140	ND [0.0085]	ND [0.0034]	ND [0.0039]	3.2	0.69
Phenanthrene	4.800	mg/kg	0.120	0.042	0.180	0.520	0.045	ND [0.0042]	ND [0.0017]	0.0035 J	0.0038 J	2.3	0.25
Pyrene	--	mg/kg	0.019 J	0.011 B,QN	0.018	0.042	0.013 B	ND [0.0042]	0.0039 J	0.0032 JB	ND [0.0039]	0 [0.27]	0 [0.24]
Total LPAH	7.800	mg/kg	0.788	0.364	1.240	3.220	0.144	0.140	0.016	0.010	0.009	--	--
Total HPAH	9.600	mg/kg	0.030	0.030	0.068	0.140	0.036	ND [0.0042]	0.018	0.003	0.003	--	--
Total organic carbon	--	mg/kg	130,000	140,000	120,000	100,000	110,000	80,000	100,000	81,000 J	63,000	--	--
DRO	3,500	mg/kg	2,800	1,500 QN	2,900	9,300	1,800	960 MH	660	58	290	19,000	11,000
RRO	3,500	mg/kg	1,600	820	2,400	5,300 QH	1,100 MH	2,100 J,MH	6,300 QH	380	2,700 QH	9,100	11,000
DRO with Silica Gel	3,500	mg/kg	3,100 QL	1,600 QN	2,700	8,500 QL	1,800	940 J,MH	310 QL	36	220	--	--
RRO with Silica Gel	3,500	mg/kg	1,000 QL	1,300 MH	680	2,100 QL	1,800 MH	1,500 J	3,000 QH,QL	320 J,MH	1,900	--	--

Notes:
-- Cleanup level not established in the DD (USACE 2009a)
Shaded values = Concentration exceeds the SSCLs established in the DD (USACE 2009a)
[a] Cleanup Level applies to sediment only. Soil is not a DD media of concern for Site 8.
J – The analyte was positively identified; however, the associated result was less than the limit of quantitation but greater than or equal to the DL.
B – The analyte was detected in the method blank, the trip blank (TB), or equipment blank (EB) above the DL and the concentration in the sample did not exceed the blank concentration by a factor of five (factor of 10 for common laboratory contaminants acetone, toluene, and methylene chloride).
QH – Analyte result was considered an estimated value (biased high) due to a QC failure.
QL – Analyte result was considered an estimated value (biased low) due to a QC failure.
QN – Analyte result was considered an estimated value (unknown bias) due to a QC failure.
For definitions, refer to the Acronyms and Abbreviations section.

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Results from the analytical laboratory in 2010 identified analytes as exceeding cleanup levels in the LDU and MDU. In the LDU and MDU, 2-methylnaphthalene was detected above SSCLs. In the MDU, DRO following silica treatment, 2-methylnaphthalene, and fluorene were detected above SSCLs (USACE 2011). Contaminants exceeding cleanup levels in the MDU and LDU were consistent with the location of the reported pipeline break. In 2011, no exceedances were detected in any of the DUs at Site 8 (USACE 2012). In 2012, 2-methylnaphthalene was detected at a concentration of 1.9 mg/kg with the LDU, which is above the SSCL of 0.6 mg/kg (USACE 2013b).

Composite samples collected in 2010, 2011, and 2012 may not be representative of each exposure area and may not be sufficient for monitoring natural attenuation. Results from 2010, 2011, and 2012 indicate additional petroleum-related contaminants persist in sediment at Site 8. Current data is variable between sampling years and is not sufficient to establish degradation trends.

Surface Water

In 2010, 2011, and 2012, surface water samples were collected from eight locations within each DU using a peristaltic pump. Samples were analyzed on site for water quality using a YSI 556 multi-parameter meter and a Hach portable spectrophotometer. Methane water samples were simultaneously collected and shipped to an analytical laboratory for analysis. Surface water samples were collected in 2010, 2011, and 2012 and submitted to an analytical laboratory for analysis of DRO, RRO, and PAHs.

The intent of surface water sampling was to determine if natural attenuation was occurring in sediment. Surface water is not a media of concern at Site 8. Water quality parameters obtained in 2010, 2011, 2012 did not reveal any apparent trends. Several parameters collected for analysis of anaerobic respiration (manganese and ferrous iron) were near or below the method DLs stated by the manufacturer; therefore, these parameters are not definitive for assessing MNA at Site 8. Methane analysis completed during each monitoring event provided data with high variability. In general, surface water sampling has not provided sufficient data to assess MNA of sediment at Site 8. Surface water samples collected in 2014 were analyzed for GRO, DRO, RRO, BTEX, and PAHs. 2014 samples were not analyzed for MNA parameters. The maximum concentrations detected during each sampling event are provided in Table 5-5.

Table 5-5
Site 8 Analytes Detected in Surface Water

Analyte	Cleanup Level	Unit	2010 Maximum Concentration[a]	2011 Maximum Concentration[b]	2012 Maximum Concentration[c]	2014 Maximum Concentration[d]
1-Methylnaphthalene	--	µg/L	ND [0.019]	ND [0.075]	1.7	6.2 QN
2-Methylnaphthalene	--	µg/L	ND [0.049]	ND [0.075]	1.0 QN	7.3 QN
Acenaphthene	--	µg/L	ND [0.049]	ND [0.075]	0.074 J	ND [0.31]
Acenaphthylene	--	µg/L	ND [0.019]	ND [0.075]	0.033 J	ND [0.31]
Anthracene	--	µg/L	ND [0.019]	ND [0.075]	ND [0.072]	ND [0.31]
Benzo(a)anthracene	--	µg/L	0.029 J	ND [0.075]	ND [0.072]	0.085 J
Benzo(a)pyrene	--	µg/L	0.037 J	ND [0.075]	ND [0.072]	0.065 J
Benzo(b)fluoranthene	--	µg/L	0.039 J	ND [0.075]	ND [0.072]	0.081 J
Benzo(g,h,i)perylene	--	µg/L	ND [0.049]	ND [0.075]	ND [0.072]	0.044 J
Benzo(k)fluoranthene	--	µg/L	ND [0.049]	ND [0.075]	ND [0.072]	0.074 J
Chrysene	--	µg/L	0.036 J	ND [0.075]	ND [0.072]	0.011 J
Dibenzo(a,h)anthracene	--	µg/L	ND [0.049]	ND [0.075]	ND [0.072]	ND [0.15]
Fluoranthene	--	µg/L	ND [0.049]	ND [0.075]	ND [0.072]	0.11 J
Fluorene	--	µg/L	ND [0.049]	ND [0.075]	0.19 QN	1.1 QN
Ideno(1,2,3-cd)pyrene	--	µg/L	ND [0.049]	ND [0.075]	ND [0.072]	ND [0.15]
Naphthalene	--	µg/L	ND [0.049]	ND [0.075]	0.82 QN	1.6 QN
Phenanthrene	--	µg/L	ND [0.019]	ND [0.075]	ND [0.072]	0.33
Pyrene	--	µg/L	ND [0.049]	ND [0.075]	ND [0.072]	0.30
TAH	0.01	mg/L	*	*	*	0.0088
TAqH	0.015	mg/L	*	*	*	**0.0329 QN**
GRO	--	mg/L	--	--	--	0.084
DRO	no sheen	mg/L	0.44	0.28	0.37	1.6 QN
RRO	no sheen	mg/L	0.56	0.44	0.48	0.45 QN

Notes:
BOLD exceeds DD SSCLs (USACE 2009a)
-- Cleanup level was not established in the 2009 DD (USACE 2009a)
[a] Maximum concentration detected during the 2010 field season (USACE 2011)
[b] Maximum concentration detected during the 2011 field season (USACE 2012)
[c] Maximum concentration detected during the 2012 field season (USACE 2013c)
[d] Maximum concentration detected during the 2014 field season (USACE 2015a)
* TAH and TAqH calculations could not be performed because BTEX results were not available.
J – The analyte was positively identified; however, the associated result was less than the limit of quantitation but greater than or equal to the DL.
QN – Analyte result was considered an estimated value (unknown bias) due to a QC failure.
For definitions, refer to the Acronyms and Abbreviations section.

Recommendations for Site 8

The Site 8 recommendations consist of the following:

- Complete a supplemental investigation to delineate the lateral and vertical extent of soil contamination east of the 2016 sampling area and revise the location of the historic pipeline spill based on 2016 sample data and supplemental data. Discontinue use of the ISM sampling methodology approach described in the DD until the supplemental soil investigation is complete.
- Implement the following LUCs as described in the DD (USACE 2009a):
  - Record a deed notice anticipated to be in the form of an Environmental Covenant in accordance with the UECA that this area should not be used for residential land use without additional investigation and/or cleanup.
- Continue conducting Periodic Reviews until all selected remedies are complete. Any change in land use will trigger a review.

5.3.4 Site 9: Housing and Operations Landfill

The selected remedy at Site 9 is as follows:

- Capping the landfill
- Conducting LTM
  - Three monitoring events to verify that the COCs in shallow groundwater are not migrating downgradient and impacting surface waters
  - Six LTM events spaced five years apart to demonstrate the shallow groundwater meets the RAOs for a non-drinking water source
- Implement the following LUCs (USACE 2009a):
  - Designate areas not suitable for drinking water
  - Prevent construction of buildings on top of landfills

Due to the shallow nature of groundwater at Site 9, monitoring of surface water has occurred in order to verify that contaminant migration is not occurring from the landfill and impacting surface water or groundwater. The first surface water monitoring event was conducted in 2010 (USACE 2011). Surface water samples collected from ponds adjacent to the landfill cap were reviewed for expectations of meeting cleanup levels and RAOs (Figure A-6). Samples were analyzed for GRO, DRO, RRO, VOCs, PAHs, PCBs, and metals; no analytes were detected above the cleanup levels established for surface water in the DD (USACE 2009a).

The second surface water monitoring event occurred in 2013. Surface water was collected from three locations adjacent to the landfill cap (Figure A-6) and submitted to an offsite analytical laboratory for analysis of GRO, DRO, RRO, BTEX, PAHs, PCBs, and both dissolved phase and total RCRA metals plus zinc. No contaminants were detected above the cleanup levels established for surface water or groundwater in the DD (USACE 2015a).

The third surface water monitoring event occurred in 2018. Surface water was collected from three locations adjacent to the landfill cap (Figure A-6) and submitted to an offsite analytical laboratory for analysis of DRO, RRO, BTEX, PAHs, and lead.

The maximum detected concentrations in surface water at Site 9 are presented in Table 5-6.

Table 5-6
Site 9 Maximum Surface Water Results

Analyte	Cleanup Level (mg/L)	2010 Maximum Concentration Detected (mg/L)	2013 Maximum Concentration Detected (mg/L)	2018 Maximum Concentration Detected (mg/L)
Arsenic-dissolved	0.01[2]	ND [0.0004]	0.0018 J	--
Arsenic-total	0.01[2]	0.00086	0.00032 J	--
Barium-dissolved	--	0.018	0.0132	--
Barium-total	--	0.018	0.0127	--
Cadmium-dissolved	--	ND [0.0004]	0.000101	--
Cadmium-total	--	ND [0.0004]	0.000042	--
Chromium-dissolved	--	ND [0.0004]	0.0002	--
Chromium-total	--	0.00056	0.00022	--
Lead-dissolved	0.015[2]	0.0004	0.000051 QN	--
Lead-total	0.015[2]	0.00076	0.000211	0.00081 [0.0004] J,B
Selenium-dissolved	--	ND [0.0004]	ND [0.0005]	--
Selenium-total	--	ND [0.0004]	ND [0.0005]	--
Silver-dissolved	--	ND [0.0004]	0.00001 J	--
Silver-total	--	ND [0.0004]	0.000009 J	--
Mercury-dissolved	--	ND [0.0001]	ND [0.00005]	--
Mercury-total	--	ND [0.0001]	ND [0.00005]	--
Aroclor 1016	--	ND [0.000077]	ND [0.000002]	--
Aroclor 1221	--	ND [0.00006]	ND [0.000008]	--
Aroclor 1232	--	ND [0.000048]	ND [0.000002]	--
Aroclor 1242	--	ND [0.000058]	ND [0.000002]	--
Aroclor 1248	--	ND [0.000058]	ND [0.000002]	--

Table 5-6 (Continued)
Site 9 Maximum Surface Water Results

Analyte	Cleanup Level (mg/L)	2010 Maximum Concentration Detected (mg/L)	2013 Maximum Concentration Detected (mg/L)	2018 Maximum Concentration Detected (mg/L)
Aroclor 1254	--	ND [0.000058]	ND [0.000002]	--
Aroclor 1260	--	ND [0.000077]	0.0000015 J	--
Benzene	0.005[2]	ND [0.00015]	ND [0.0001]	ND [0.0003]
Ethylbenzene	0.7[2]	ND [0.00015]	ND [0.0001]	ND [0.0005]
Total Xylenes	--	ND [0.0005]	ND [0.0001]	ND [0.0003]
Toluene	--	ND [0.0002]	0.00018 J	ND [0.0003]
1-Methylnaphthalene	--	ND [0.00002]	0.0000048 J	ND [0.0001]
2-Methylnaphthalene	--	ND [0.000049]	0.0000026 J	ND [0.0001]
Acenaphthene	--	ND [0.000049]	0.0000053 J	ND [0.0001]
Acenaphthylene	--	ND [0.00002]	0.0000059 J	ND [0.0001]
Anthracene	--	ND [0.00002]	ND [0.000005]	ND [0.0001]
Benzo[a]anthracene	--	ND [0.000049]	0.0000038 J	ND [0.0001]
Benzo[b]fluoranthene	--	ND [0.000049]	0.0000026 J, QN	ND [0.0001]
Benzo[g,h,i]perylene	--	ND [0.000049]	0.0000059 J	ND [0.0001]
Benzo[k]fluoranthene	--	ND [0.000049]	ND [0.000005]	ND [0.0001]
Chrysene	--	ND [0.000095]	ND [0.000005]	ND [0.0001]
Dibenz[a,h]anthracene	--	ND [0.000049]	0.0000027 J, QN	ND [0.0001]
Fluoranthene	--	ND [0.000049]	ND [0.000005]	ND [0.0001]
Fluorene	--	ND [0.000049]	0.0000087 J, QN	ND [0.0001]
Indeno[1,2,3-cd]pyrene	--	ND [0.000049]	0.0000052 J	ND [0.0001]
Naphthalene	--	ND [0.000049]	0.000094 QN	ND [0.0001] QN
Phenanthrene	--	ND [0.00002]	0.0000087 J, QN	ND [0.0001]
Pyrene	--	ND [0.000049]	ND [0.000005]	ND [0.0001]
TAH	0.01[1]	0.001	0.00048	0.0014 [0.0014]
TAqH	0.015[1]	0.0017	0.000179	0.0032 [0.0032]
GRO	1.3[2]	ND [0.044]	ND [0.025]	--
DRO	--	0.12	0.031 J	ND [0.05]
RRO	1.1[2]	0.13 QH	0.057 J,B	ND [0.2]

Notes:
-- Cleanup level not established in the DD (USACE 2009a)
[1] Cleanup level established for surface water in the 2009 DD (USACE 2009a)
[2] Cleanup level established for groundwater in the 2009 DD (USACE 2009a)
J – The analyte was positively identified; however, the associated result was less than the limit of quantitation but greater than or equal to the DL.
B – The analyte was detected in the method blank, the TB, or EB above the DL and the concentration in the sample did not exceed the blank concentration by a factor of five (factor of 10 for common laboratory contaminants acetone, toluene, and methylene chloride).
QN – Analyte result was considered an estimated value (unknown bias) due to a QC failure.
For definitions, refer to the Acronyms and Abbreviations section.

Groundwater

DRO in 1994 and 1998, RRO in 2001, and lead in 1994 and 2001 have been detected in shallow groundwater above ADEC drinking water standards at Site 9. The remedy to monitor groundwater to demonstrate shallow groundwater meets RAOs for a non-drinking water source was initiated in 2013 in conjunction with the first FYR. In 2013, one groundwater sample was collected east of the landfill cap. Groundwater sampling efforts experienced refusal northeast of the cap at approximately 48 inches bgs. Limited water was collected from approximately 33 inches bgs (USACE 2015a). Sufficient volume of groundwater was obtained for analysis of GRO, BTEX, and dissolved RCRA metals plus zinc. No contaminants were detected at concentrations greater than cleanup levels in groundwater at Site 9 (USACE 2014).

Shallow groundwater at Site 9 was not considered a current or reasonably expected future drinking water source in the DD (USACE 2009a). Two signs, indicating where groundwater use for drinking water or ground disturbing activities are not recommended have been installed at the air field and at the fish camp. Each sign was two-sided and contained both Yupik and English transcriptions. At the time of this report, LUCs to designate areas not suitable for drinking water and prevent construction of buildings on top of landfills have not been fully implemented because a deed notice anticipated to be in the form of an Environmental Covenant in accordance with the UECA has not been recorded.

Recommendations for Site 9

The Site 9 recommendations consist of the following:

- Implement the following LUCs by recording a deed notice anticipated to be in the form of an Environmental Covenant in accordance with UECA:
  - Designate areas not suitable for drinking water
  - Prevent construction of building on top of landfills
- Continue visually monitoring landfill cap on a five-year basis for signs of erosion.
- Continue monitoring shallow groundwater by sampling surface water adjacent to the landfill cap (three additional LTM events spaced five years apart) to demonstrate shallow groundwater meets the RAOs for a non-drinking water source.

- Continue conducting Periodic Reviews until LUCs are implemented and all monitoring events and visual inspections have been completed.

5.3.5 MOC Groundwater

The contingency remedy for groundwater at the MOC is MNA and implementing a LUC to limit future drinking water use. Annual monitoring began in 2010 in nine onsite wells. In 2012, two of the wells (MW88-4 and MW88-5) were abandoned due to their locations within POL-contaminated soil removal areas. The seven remaining wells were sampled in 2013 (USACE 2015a). In 2014, monitoring wells 14MW01, 14MW02, 14MW03, 14MW04, 14MW05, 14MW06, and 14MW07 were added to the monitoring well network. The 15 well network was sampled in 2014, 2015, 2016, and 2018. Beginning in 2018, the monitoring will network will be sampled in conjunction with ongoing FYRs. Groundwater data were reviewed for expectations of meeting cleanup levels and RAOs.

Groundwater samples are analyzed for GRO, DRO, RRO, BTEX, PAHs, PCBs, methane, and metals (total and dissolved). Additional MNA parameters (manganese, ferrous iron, sulfate, nitrate, and alkalinity) and water quality parameters (temperature, pH, DO, conductivity, ORP, and turbidity) are collected in the field. In 2016 and 2018, MNA parameters methane, sulfate, and alkalinity were analyzed in the laboratory. In 2014, 2015, 2016, and 2018 groundwater from monitoring well MW10-1 was analyzed for ethylene glycol and VOCs. In 2015, 2016, and 2019 groundwater from monitoring well 14MW06 was analyzed for ethylene glycol and VOCs.

COCs have exceeded cleanup levels for DRO, RRO, benzene, arsenic, and lead at times over the eight-year monitoring period. The results are presented on Figures A-7 through A-13. For some wells, additional results from historic sampling events are presented for comparison. The contaminant concentrations have not all exhibited the same trend over time. Groundwater results for these analytes are presented in Table 5-7 below.

Table 5-7
Groundwater Results from the MOC Monitoring Well Network

Monitoring Well	Analyte	Benzene	DRO	RRO	Arsenic	Dissolved Arsenic	Lead
	Cleanup Level/ Monitoring Year	0.005 mg/L	1.5 mg/L	1.1 mg/L	0.010 mg/L	0.010 mg/L	0.015 mg/L
Upgradient Wells							
26MW1	2014	ND (0.0004)	ND (0.050)	ND (0.050)	ND (0.004)	ND (0.004)	ND (0.00025)
	2015	ND (0.001)	ND (0.01 QN)	ND (0.072)	ND (0.0040)	ND (0.0040)	ND (0.00050)
	2016	ND (0.0001)	0.11 J, B, QL	0.79 QL	ND (0.00025)	ND (0.00025)	0.000474
	2018	ND (0.0003)	ND (0.05)	ND (0.2)	ND (0.001)	ND (0.001)	0.00033 J, B
22MW2	2014	ND (0.0004)	ND (0.049)	ND (0.049)	ND (0.004)	ND (0.004)	ND (0.00025)
	2015	ND (0.001)	ND (0.10 QN)	ND (0.074)	ND (0.0040)	ND (0.0040)	0.00066 J
	2016	ND (0.0001)	0.1 J, B,QL	0.36 J, QL	ND (0.00025)	ND (0.00025)	0.000085
	2018	ND (0.0003)	0.13 QN	0.12 J, QN	ND (0.001)	ND (0.001)	0.0017 J, QN
	2018	ND (0.0003)	ND (0.05)	ND (0.2)	ND (0.001)	ND (0.001)	0.0029 J, QN
20MW-1	2014	ND (0.0004)	0.023 J	ND (0.052)	ND (0.004)	ND (0.004)	0.00045 J
	2015	ND (0.001)	ND (0.10 QN)	ND (0.071)	0.0014 J	ND (0.0040)	0.0057
	2016	ND (0.0001)	0.09 J, B,QL	0.13 J, B,QL	ND (0.00025)	ND (0.00025)	0.000866
	2018	ND (0.0003)	0.15 QL	ND (0.2)	ND (0.001)	ND (0.001)	0.0036
14MW07	2014	0.00072 J	0.15 B	0.043 J	0.0092	ND (0.004)	ND (0.00025)
	2015	ND (0.001)	ND (0.10 QN)	ND (0.073)	ND (0.0040)	ND (0.0040)	0.00069 J
	2016	ND (0.0001)	0.12 J, B, QL	0.093 J, B, QL	ND (0.00025)	ND (0.00025)	0.000338
	2018	ND (0.0003)	ND (0.05)	ND (0.2)	ND (0.001)	ND (0.001)	0.00043 J, B
Crossgradient Wells							
17MW1	2014	ND (0.0004)	0.021 J	ND (0.049)	ND (0.004)	ND (0.004)	ND (0.00025)
	2015	ND (0.001)	ND (0.10 QN)	ND (0.071)	ND (0.0040)	ND (0.0040)	0.00021 J
	2016	ND (0.0001)	0.092 J, B,QL	0.13 J, B,QL	ND (0.00025)	ND (0.00025)	0.00025
	2018	ND (0.0003)	ND (0.05)	ND (0.2)	ND (0.001)	ND (0.001)	0.00051 J, B

Table 5-7 (Continued)
Groundwater Results from the MOC Monitoring Well Network

Monitoring Well	Analyte	Benzene	DRO	RRO	Arsenic	Dissolved Arsenic	Lead
	Cleanup Level/ Monitoring Year	0.005 mg/L	1.5 mg/L	1.1 mg/L	0.010 mg/L	0.010 mg/L	0.015 mg/L
MW10-1	2014	ND (0.0004)	0.8	0.37	ND (0.004)	ND (0.004)	0.0011 J
	2015	ND (0.001)	0.39	0.14	0.0014 J	ND (0.0040)	0.004
	2016	ND (0.0001)	0.49 J, QL	0.32 J, QL	ND (0.00025)	ND (0.00025)	0.000558
	2018	ND (0.0003)	1	0.58	0.00054 J	0.0004 J	0.0023 J
	2018	ND (0.0003)	0.98	0.56	0.00065 J	0.000034 J	0.0023 J
Source Area and Downgradient Wells							
MW88-1	2014	ND (0.0004)	0.26	0.049 J	ND (0.004)	ND (0.004)	0.0027
	2014	ND (0.0004)	0.21	0.043 J	ND (0.004)	ND (0.004)	0.003
	2015	ND (0.001)	0.1 B	ND (0.071)	ND (0.0040)	ND (0.0040)	ND (0.00050)
	2016	ND (0.0001)	0.52 J, QL	0.23 J, QL	ND (0.00025)	ND (0.00025)	0.000301
	2018	ND (0.0003)	0.42	ND (0.2)	ND (0.001)	ND (0.001)	0.0024 J
MW88-3	2014	ND (0.0004)	0.46	0.030 J	ND (0.004)	ND (0.004)	0.0010 J
	2015	ND (0.001)	0.38	ND (0.073)	ND (0.0040)	ND (0.0040)	0.00019 J
	2016	ND (0.0001)	0.49 J, QL	0.15 J, QL	ND (0.00025)	ND (0.00025)	0.000383
	2018	ND (0.0003)	0.85	ND (0.2)	ND (0.001)	ND (0.001)	0.0046
MW88-10	2014	ND (0.0004)	0.66	0.041 J	ND (0.004)	ND (0.004)	0.0011 J
	2015	ND (0.001)	0.43	ND (0.071)	ND (0.0040)	ND (0.0040)	0.00069 J
	2016	ND (0.0001)	0.3 J, QL	0.16 J, QL	0.00022 J	0.00023 J	0.00143
	2018	ND (0.0003)	0.54	ND (0.2)	ND (0.001)	ND (0.001)	0.00031 J, B
14MW01	2014	ND (0.0004)	0.51 B	0.067 J	0.0061	0.0041 J	0.011
	2015	ND (0.001)	0.51	ND (0.071)	0.0042 J	0.0040 J	0.00021 J
	2016	ND (0.0001)	0.92	0.12 J,B	0.0046	0.00439	0.00153
	2018	ND (0.0003) QN	**1.8**	ND (0.2) QL	0.0039 J	0.0043 J	0.0006 J, B, QN
	2018	ND (0.0003)	**2**	ND (0.2)	0.0038 J	0.0044 J	0.00086 J, B, QN

Table 5-7 (Continued)
Groundwater Results from the MOC Monitoring Well Network

Monitoring Well	Analyte	Benzene	DRO	RRO	Arsenic	Dissolved Arsenic	Lead
	Cleanup Level/ Monitoring Year	0.005 mg/L	1.5 mg/L	1.1 mg/L	0.010 mg/L	0.010 mg/L	0.015 mg/L
14MW02	2014	0.00014 J	1.2	0.092 J	0.0058	0.0043 J	0.0054
	2014	ND (0.0004)	1.3	0.094 J	0.0056	0.0046 J	0.006
	2015	ND (0.001)	**1.6**	0.13	0.0056	0.0056	0.0010 J
	2016	ND (0.0001)	**1.6**	0.18 J	0.00244	0.00241	0.000496
	2016	ND (0.0001)	**1.5**	0.17 J	0.00235	0.00237	0.00045
	2018	ND (0.0003)	**2.8**	ND (0.2)	0.0017 J	0.0018 J	0.00074 J, B
14MW03	2014	0.001	**2.4**	0.21	0.0055	ND (0.004)	**0.062**
	2015	ND (0.001)	1.3	0.41 J	0.0034 J	0.0024 J	0.015
	2016	ND (0.0001)	0.99 QL	0.16 J,QL	0.00194	0.00186	0.00318
	2018	ND (0.0003)	1.3	ND (0.2)	0.0022 J	0.0019 J	0.0023 J
14MW04	2014	ND (0.0004)	**2.5**	0.54	ND (0.004)	ND (0.004)	0.0064
	2015	ND (0.001)	**1.6 QL, QN**	0.18 QL, QN	0.0024 J	0.0014 J	0.0063
	2015	ND (0.001)	**2.8 QN**	0.37 QN	0.0022 J	0.0014 J	0.0064
	2016	0.00013 J, QH	**2.2 QL**	0.61 QL	0.00524	0.00387	**0.0582**
	2018	0.00018 J	**1.8**	ND (0.2)	0.00054 J	0.00033 J	ND (0.0004)
14MW05	2014	ND (0.0004)	**4.9**	0.55	0.0042 J	ND (0.004)	0.01
	2015	ND (0.001)	**12**	0.48	0.0031 J	0.0028 J	0.012
	2015	ND (0.001)	**11**	0.51	0.0032 J	0.0026 J	0.013
	2016	ND (0.0001)	**3.2 QL**	0.61 QL	0.00207	0.00194	0.00165
	2018	ND (0.0003)	**3.1**	ND (0.2)	0.0029 J	0.0028 J	0.0023 J

Table 5-7 (Continued)
Groundwater Results from the MOC Monitoring Well Network

Monitoring Well	Analyte	Benzene	DRO	RRO	Arsenic	Dissolved Arsenic	Lead
	Cleanup Level/ Monitoring Year	0.005 mg/L	1.5 mg/L	1.1 mg/L	0.010 mg/L	0.010 mg/L	0.015 mg/L
14MW06	2014	0.00070 J	**5.2 QL**	0.28	0.0068	0.0062	0.0027
	2015	ND (0.001)	**2.3**	0.27	0.0026 J	0.0024 J	0.00064 J
	2016	ND (0.0001)	1.4 QL	0.55 QL	0.00203	0.00203	0.000861
	2016	ND (0.0001)	1.4 QL	0.47 QL	0.00197	0.00197	0.000817
	2018	ND (0.003)	**1.5**	ND (0.2)	0.00089 J	0.00098 J	0.00058 J, B, QL

Notes:
-- Data was not reported
Bold = Concentration exceeds SSCLs established in the DD (USACE 2009a).
J – The analyte was positively identified; however, the associated result was less than the limit of quantitation but greater than or equal to the DL.
B – The analyte was detected in the method blank, the TB, or EB above the DL and the concentration in the sample did not exceed the blank concentration by a factor of five (factor of 10 for common laboratory contaminants acetone, toluene, and methylene chloride).
QL – Analyte result was considered an estimated value (biased low) due to a QC failure.
QN – Analyte result was considered an estimated value (unknown bias) due to a QC failure.
For definitions, refer to the Acronyms and Abbreviations section.

DRO levels may reach the SSCL by 2020 or 2022 with attenuation complete by 2023 or 2030 at wells 14MW04 and 14MW05, respectively; refer to Appendix E for the analysis and prediction of the provided cleanup timeframes. The cleanup timeframes are based on a small data set comprised of 2014, 2015, 2016, and 2018 results. Other in-plume monitoring wells at the MOC (14MW01, 14MW02) indicate DRO concentrations continue to increase based on statistical trends. No estimate of predicted completion of attenuation at the MOC can be provided until DRO concentrations are observed as declining at all source area wells.

Although arsenic and lead are not COCs for the MOC, arsenic and lead have been monitored at the site and compared to the Table 1 cleanup levels in the DD (USACE 2009a). Arsenic has not exceeded the DD cleanup levels since the monitoring program began in 2014 and is therefore not a concern for the site. Total lead concentrations have exceeded in 2014 at 14MW03 and in 2016 at 14MW04. Exceedances of total lead are caused by suspended solids within the groundwater sample, as evident by no exceedances of the cleanup level in the dissolved samples in 14MW03. Monitoring well location 14MW04 did contain exceedances of lead in the dissolved and total sample in 2016; however, it was re-developed in 2018 due to high turbidity and low yield from the well. Samples collected in 2018, following re-development, were nondetect in the dissolved samples and below the cleanup level in the total samples. Arsenic and lead are not a concern at the MOC.

Additional monitoring data are needed to assess COC concentrations in groundwater, provide higher confidence for the predicted cleanup timeframes at individual wells, and establish an estimated cleanup timeframe sitewide.

In 2014, ethylene glycol and propylene glycol were added to the analysis suite for monitoring well MW10-1, downgradient of Site 10, where ethylene glycol was found in soil. In 2015, diethylene, ethylene, propylene, and triethylene glycol, were added to the analysis suite for monitoring well MW10-1. The investigation of ethylene glycol was identified as a data gap in the first Periodic Review. In 2016, 14MW06 and MW10-1 were analyzed for ethylene and propylene glycol. In 2018, 14MW06 and MW10-1 were analyzed for ethylene glycol. All wells have been nondetect for glycol and this data gap is now closed. Additional sampling for glycols is not recommended for this site, including diethylene, ethylene, propylene, and triethylene glycol.

Recommendations for MOC Groundwater

MOC recommendations consist of the following:

- Discontinue groundwater sampling for glycols downgradient of Site 10 at monitoring wells MW10-1 and 14MW06, including diethylene, ethylene, propylene, and triethylene glycol, because the previously identified data gap is closed.
- Continue groundwater monitoring to assess COC concentrations in groundwater, provide higher confidence for the predicted cleanup timeframes at individual wells, and establish an estimated cleanup timeframe sitewide.
- Implement the LUC to limit future drinking water use by recording a deed notice anticipated to be in the form of an Environmental Covenant in accordance with UECA:
    - For the purposes of ongoing site evaluations and final site closure, there is not currently an effort to manage the individual sites under the MOC as a whole. However, due to the proximity of the sites and the nature of groundwater, the LUC, as documented in the anticipated Environmental Covenant, will be developed to encompass all MOC sites. This will also be done in order to provide the most clarity to the spatial boundary to which the same LUCs apply, rather than issuing individual covenants per site within the MOC.

5.3.6 Site 10: Buried Drums

The contingency remedy at Site 10 is excavating and removing petroleum-contaminated soil, MNA of groundwater, and implementing an LUC to limit future drinking water use. The excavation portion of the remedy was initiated in 2011 and buried drums with liquid product were encountered. In 2018, two signs indicating where groundwater use for drinking water or ground disturbing activities are not recommended have been installed at the air field and at the fish camp. Each sign was two-sided and contained both Yupik and English transcriptions. Groundwater monitoring is ongoing and is discussed in Section 5.3.5. Soil, groundwater, and drum waste characterization data were reviewed for expectations of meeting cleanup levels and RAOs.

The only soil COC exceeding cleanup levels at Site 10 at the time of the DD was DRO (USACE 2009a). As implementation of the remedy began in 2011 with the excavation of the

J1A plume adjacent to Site 10, soil confirmation samples were collected for DRO and RRO only (USACE 2012). The excavation encountered water at 8 feet bgs and continued 2 feet below groundwater across the excavation. Samples collected in the excavation near Site 10 contained 11,000 and 16,000 mg/kg DRO and were subsequently excavated. Drums exposed during the excavation led to additional sampling and characterization in 2012.

In 2012, 27 drums were removed from two excavations in Site 10. Sixteen of the drums contained liquids classified as hazardous (USACE 2013b). Due to the varied drum contents, the soil confirmation sampling suite was expanded to include GRO, DRO, RRO, PCBs, VOCs, SVOCs, ethylene glycol, and RCRA metals plus nickel, vanadium, and zinc. Results indicate that DRO, ethylene glycol, PCE, and arsenic exceeded cleanup levels in 2012. The excavations were 5.5 to 6 feet bgs at the conclusion of the 2012 fieldwork.

In 2013, approximately 330 tons of POL-, ethylene glycol-, and arsenic-contaminated soil were removed from Site 10 (USACE 2014). Four excavations were opened to address the 2012 confirmation sample locations where concentrations DRO, ethylene glycol, PCE, and arsenic exceeded cleanup levels. Two excavations were initiated at the areas surrounding the DRO and arsenic exceedances from 2012. Subsequent confirmation samples were below cleanup levels for the expanded suite of analytes (USACE 2014). The location of the 2012 ethylene glycol exceedance was also excavated and sampled. Although the lateral extent of contamination was identified, confirmation samples collected from the excavation floor continued to exceed cleanup levels until bedrock was encountered and soil samples could no longer be collected (USACE 2014). The excavation was terminated at 4 feet below fractured bedrock at a total depth of 12 feet bgs.

The fourth excavation was opened where a metal detector indicated the presence of metallic anomalies beneath the ground surface. Approximately 0.29 tons of empty drums and metal debris were removed from the excavation and loaded into a container express unit for shipping and disposal. Additional excavation occurred following confirmation samples indicating the presence of RRO at concentrations exceeding the SSCL. Field laboratory sample results guided the excavation and when results indicated cleanup levels had been achieved, confirmation samples were collected and submitted for analysis. All confirmation samples indicated DRO and RRO were below the SSCL (USACE 2015a).

Ethylene glycol, methylene chloride, and PCE were not identified as COCs at Site 10 at the time of the DD. During the previous review (USACE 2015b), the maximum concentrations detected during the most recent sampling events were used to determine if a new risk evaluation was required. Because methylene chloride and PCE were not detected in following excavation efforts, only ethylene glycol was further evaluated (Appendix B). The maximum concentration of 890 mg/kg, which was later excavated to bedrock as described above, results in a hazard quotient level less than 1 (calculated at 0.01). Ethylene glycol was determined to not significantly affect the human health risk (Appendix B).

One of the drum waste characterization samples from 2012 (12NCDRUMO10) contained high levels of total halogens (2,800 mg/kg) but no detected concentrations of PCBs or halogenated VOCs (USACE 2013c). The elevated total halogen level was unable to be explained by the laboratory and the cause is unclear. Analytes 4,4-dichlorodiphenyldichloroethene and 4,4-dichlorodiphenyltri-chloroethane were not detected in any samples; therefore, pesticides do not appear to be a concern at this site or the reason for the elevated total halogen level.

In the previous review (USACE 2015b), it was identified that there was no indication that surface-stained soil or the five locations of the highest surface soil samples (up to 26,500 mg/kg DRO in 1994) were removed. These locations were further north and east than the excavations completed in 2011, 2012, or 2013. In 2014, two excavations were completed after additional sampling confirmed the 1994 exceedances (Figure A-14). Final confirmation sample results indicated that 1,1-dichloroethene remains at one location at a concentration that exceeds the evaluation criterion. Sample 14NC10SS045 and duplicate sample 14NC10SS046 contained 1,1-dichloroethene at concentrations of 0.058 mg/kg (J-, B-flagged) and 0.110 mg/kg, respectively, exceeding the 18 AAC 75 migration to groundwater cleanup level of 0.030 mg/kg at that time. These concentrations are below the ADEC 2018 migration to groundwater criterion of 1.2 mg/kg.

Although 1,1-dichloroethene was detected in remaining soil and elevated total halogens were measured in a single drum waste characterization sample at the site, these analytes do not contribute risk at the site and are not COCs. No remaining impacts to soil or groundwater above the DD cleanup levels (USACE 2009a) from Site 10 are suspected.

Recommendations for Site 10

Site 10 recommendations consist of the following:

- Implement the LUC to limit future drinking water use by recording a deed notice anticipated to be in the form of an Environmental Covenant in accordance with UECA.
- Continue conducting Periodic Reviews until all selected remedies are complete.

5.3.7 Site 11: Fuel Tanks

The contingency remedy at Site 11 is excavating and removing petroleum-contaminated soil to a depth of 15 feet bgs, MNA of groundwater, and implementing an LUC to limit future drinking water use. The excavation portion of the remedy was initiated in 2011. In 2018, two signs indicating where groundwater use for drinking water or ground disturbing activities are not recommended have been installed at the air field and at the fish camp. Each sign was two-sided and contained both Yupik and English transcriptions. Groundwater monitoring is ongoing and is discussed in Section 5.3.5. Soil data were reviewed for expectations of meeting cleanup levels and RAOs.

The only COC exceeding cleanup levels in soil at Site 11 at the time of the DD was DRO (USACE 2009a). In 2011, contaminated soil was removed from Site 11 to a depth of 2 feet below the groundwater surface, which occurred at 8 feet bgs (USACE 2012). Excavation efforts were conducted to the maximum extent practicable taking into consideration existing technology, site location, and logistics considering overall project purposes. The location of the highest surface contamination noted in the DD was removed through the J1A excavation activities. The stained surface soil in the tank footprints was also removed from this site. To the north, soil was removed as far as practicable without entering the wetland at Site 28 (Figure A-14). Confirmation sampling was conducted immediately above the groundwater table and indicated that five sidewall samples on the northern boundary of the excavation exceeded the SSCL for DRO with results ranging from 9,200 to 29,000 mg/kg for DRO (USACE 2012).

In 2013 and 2014, UVOST plume I1 was targeted for excavation. In 2013, a sidewall sample collected at the northern boundary of the UVOST plume exceeded the SSCLs at 10,000 mg/kg of DRO. This was not further excavated due to the potential impacts to the Site 28 wetland. A floor sample collected from 2 feet below the groundwater surface also exceeded the SSCL at 9,900 mg/kg and was not further excavated. The final sidewall sample that exceeded in 2013, 13NCMOCSS089 was subsequently removed in the 2014 field season. No confirmation samples collected in 2014 exceeded the SSCLs.

During the installation of monitoring wells, two soil samples were collected from each location and analyzed for GRO, DRO, RRO, BTEX, PAHs, PCBs and eight RCRA metals plus nickel, vanadium, and zinc. One soil sample was collected from the top of the groundwater interface and one soil sample was collected from the bottom of each boring. At 14MW06, which is within Site 11, soil sample 14NCWELLSS15 (Figure A-14) contained a concentration of 1-methylnaphthalene at 16 mg/kg and 2-methylnaphthalene at 22 mg/kg. These concentrations do not exceed the human health criteria in soil; however, they do exceed the migration to groundwater cleanup level of 0.41 mg/kg and 1.3 mg/kg, respectively (ADEC 2018b).

Recommendations for Site 11

Site 11 recommendations consist of the following:

- Implement the LUC to limit future drinking water use by recording a deed notice anticipated to be in the form of an Environmental Covenant in accordance with UECA.
- Continue conducting Periodic Reviews until all selected remedies are complete.

5.3.8 Site 13: Heat and Power Plant

The selected remedy at Site 13 is excavating and removing PCB-contaminated soil and implementing an LUC to limit future drinking water use. The remedy for petroleum-contaminated soil at the MOC also applies to this site. The contingency remedy of MNA for groundwater and excavation and disposal of soil to 15 feet bgs followed the removal of PCB-contaminated soil. The excavation portion of the remedy was initiated in 2010. In 2018, two signs indicating where groundwater use for drinking water or ground disturbing activities are not recommended have been installed at the air field and at the fish camp. Each sign was two-sided and contained both Yupik and English transcriptions. Groundwater monitoring is ongoing and is discussed in Section 5.3.5. Soil data were reviewed for expectations of meeting cleanup levels and RAOs.

Soil COCs at Site 13 at the time of the DD were DRO and PCBs (USACE 2009a). In 2010, 2011, 2012, and 2013, PCB-contaminated soil at Site 13 was excavated to depths up to 9.8 feet bgs. Confirmation samples were collected from the excavation floor and sidewalls and were below cleanup levels. Following complete removal of PCB-contaminated soil, petroleum-contaminated soil at Site 13 was excavated to a depth of 15 feet bgs within the A2, B1, and B2 plumes (Figure A-14). At 15 feet bgs, 80 to 90 percent of the excavation floor was submerged with groundwater. Confirmation samples were collected from the excavation floor and sidewalls and were below SSCLs (USACE 2015a).

At the time of the DD, the maximum PCB concentration was 37.1 mg/kg but concentrations up to 270 mg/kg were encountered during the subsequent excavations. At the conclusion of the 2013 field season, all analytical samples were below the SSCLs for PCBs (USACE 2015a). The excavation was backfilled and compacted. Contaminated soil removal south of the B plume is considered complete.

The maximum DRO concentration of 13,000 mg/kg listed in the DD was found at 10 to 12 feet bgs near the A2 plume. At the conclusion of the 2013 field season, all analytical samples were below SSCLs for DRO and RRO (USACE 2014). The excavation was backfilled and compacted. Contaminated soil removal at the A2, B1, and B2 plumes is considered complete.

In 2014, UVOST plumes C and E1 were excavated to below SSCLs. The maximum detected concentration of DRO identified was 21,000 (J-flagged) in the C plume and 9,400 in the E1 plume. The maximum detected concentration of DRO left in place was 6,400 mg/kg in the C plume and 3,800 mg/kg in the E1 plume.

Recommendations for Site 13

Site 13 recommendations consist of the following:

- Implement the LUC to limit future drinking water use by recording a deed notice anticipated to be in the form of an Environmental Covenant in accordance with UECA.
- Continue conducting Periodic Reviews until all selected remedies are complete.

5.3.9 Site 15: Fuel Pipeline

The contingency remedy at Site 15 is excavating and removing petroleum-contaminated soil, MNA of groundwater, and implementing an LUC to limit future drinking water use. The excavation portion of the remedy was initiated in 2011 and continued through 2013. In 2018, two signs indicating where groundwater use for drinking water or ground disturbing activities are not recommended have been installed at the air field and at the fish camp. Each sign was two-sided and contained both Yupik and English transcriptions. Soil data were reviewed for expectations of meeting cleanup levels and RAOs. Groundwater monitoring is ongoing and is discussed in Section 5.3.5.

The only soil COC exceeding cleanup levels at Site 15 at the time of the DD was DRO (USACE 2009a). In 2011, an attempt to excavate the G plume was unsuccessful when groundwater was encountered before the excavation could advance to the target depth of contamination at 8 feet bgs. No contaminated soil was excavated in 2011. In 2012, soil was removed to 2 feet below the groundwater surface, which occurred at 12 feet bgs. Confirmation sampling indicated that three samples on the excavation floor below the groundwater surface exceed the SSCL for DRO with concentrations ranging from 10,000 to 40,000 mg/kg (USACE 2013b). The location of three confirmation samples below the groundwater surface that contain DRO concentrations ranging from 10,000 to 40,000 mg/kg will not be excavated (Figure A-14). Excavation efforts were conducted to the maximum extent practicable taking into consideration existing technology, site location, and project logistics. Three additional sidewall samples exceeded the cleanup level for DRO in 2012 with results ranging from 9,200 to 12,000 mg/kg (USACE 2012).

In 2013, the locations of the three sidewall confirmation sample exceedances were located by survey and excavated. At the conclusion of the 2013 field season, sidewall confirmation sample 13NCMOCSS022 exceeded the SSCL with a concentration of 13,000 mg/kg DRO. The sample was collected within the footprint of the 2012 G plume excavation at a depth of approximately 14 feet bgs, deeper than the 2012 G plume excavation extent of 12 feet bgs, which was two feet below the standing water level in 2012. The location was excavated and subsequent field-screening results were less than the SSCLs. No additional soil will be removed within the footprint of historical excavations that extended 2 feet below groundwater (USACE 2015a). All other samples were confirmed to be below the SSCLs (USACE 2015a).

Recommendations for Site 15

Site 15 recommendations consist of the following:

- Complete the implementation of the remedy (remove DRO-contaminated soil).
- Implement the LUC to limit future drinking water uses by recording a deed notice anticipated to be in the form of an Environmental Covenant in accordance with UECA.
- Continue conducting Periodic Reviews until all selected remedies are complete.

5.3.10 Site 16: Paint and Dope Storage

The selected remedy for Site 16 is excavating and removing PCB-contaminated soil and implementing the LUC to limit future drinking water use. Excavation was initiated and completed in 2010. In 2018, two signs indicating where groundwater use for drinking water or ground disturbing activities are not recommended have been installed at the air field and at the fish camp. Each sign was two-sided and contained both Yupik and English transcriptions. Confirmation sampling data were reviewed for expectations of meeting cleanup levels and RAOs.

Final excavation sample results confirmed PCB concentrations for all Aroclors were less than 1 mg/kg (USACE 2011). Soil was removed to a depth of approximately 6 to 12 inches. The maximum Aroclor 1260 concentration remaining was 0.16 mg/kg. During excavation, Aroclor 1254 was detected in one location at 1.2 mg/kg (USACE 2011). Soil from that sample location was removed and confirmation sampling indicated the remaining maximum concentration of Aroclor 1254 to be 0.049 mg/kg. Aroclor 1254 was detected during the 1994 site investigation at 0.2 mg/kg at 6 inches bgs and was the only Aroclor other than Aroclor 1260 to be detected at that time. Therefore, excavation in 2010 appears to have removed the PCB-contaminated soil at Site 16.

Site 16 soil contaminant concentrations are given in Table 5-8.

Table 5-8
Site 16 Contaminant Concentrations in Soil

Analyte	Cleanup Level [a] (mg/kg)	DD Maximum Concentration (mg/kg)	2012 Maximum Remaining Concentration (mg/kg)
Aroclor 1254	1	0.2	0.049 J
Aroclor 1260	1	**1.4**	0.16 M,J
Lead	400	**822**[b]	not sampled [b]

Notes:
Bold = Concentration exceeds SSCLs established in the DD (USACE 2009a).
[a] Cleanup level recorded in the DD (USACE 2009a).
[b] It is assumed the lead was removed with stained soil removal in 2001 (USACE 2009a).
J – The analyte was positively identified; however, the associated result was less than the limit of quantitation but greater than or equal to the DL.
M – A matrix effect was present.
For definitions, refer to the Acronyms and Abbreviations section.

The 2010 PCB excavation confirmation samples were not analyzed for lead in 2010 (USACE 2011). Seven surface samples collected at this site in 1994 and 2001 did not exceed the cleanup level for lead (USACE 2009a). It is assumed that lead in the area has been removed through excavations in 2001 and 2010 and surface samples confirm that there is no widespread lead contamination at the site.

Recommendations for Site 16

Site 16 recommendations consist of the following:

- Implement the LUC to limit future drinking water use by recording a deed notice anticipated to be in the form of an Environmental Covenant in accordance with UECA.
- Conduct Periodic Reviews until all selected remedies are complete.

5.3.11 Site 19 Auto Maintenance

The contingency remedy at Site 19 is excavating and removing petroleum-contaminated soil, MNA of groundwater, and implementing an LUC to limit future drinking water use. The excavation portion of the remedy was initiated in 2011 and completed in 2012. In 2018, two signs indicating where groundwater use for drinking water or ground disturbing activities are not recommended have been installed at the air field and at the fish camp. Each sign was two-sided and contained both Yupik and English transcriptions. Groundwater monitoring is ongoing. Soil data were reviewed for expectations of meeting cleanup levels and RAOs.

In 2012, soil was removed to 2 feet below the groundwater surface, which occurred between 11 and 14 feet bgs. Confirmation samples collected from the excavation floor (Table 5-9), indicated that DRO and RRO concentration were less than the SSCLs (USACE 2013b).

Table 5-9
Site 19 Post-Excavation Analyte Concentrations in Soil

Analyte	Cleanup Level (mg/kg)	DD Maximum Concentration (mg/kg)	2012 Maximum Remaining Concentration (mg/kg)
DRO	9,200[a]	**13,300**	8,700
RRO	9,200	--	970

Notes:
-- Data not reported in the DD (USACE 2009a)
Bold = Concentration exceeds SSCLs established in the DD (USACE 2009a).
[a] Cleanup level recorded in the DD (USACE 2009a).
For definitions, refer to the Acronyms and Abbreviations section.

Recommendations for Site 19

Site 19 recommendations consist of the following:

- Implement the LUC to limit future drinking water use by recording a deed notice anticipated to be in the form of an Environmental Covenant in accordance with UECA.
- Continue conducting Periodic Reviews until all selected remedies are complete.

5.3.12 Site 27: Diesel Fuel Pump

The contingency remedy at Site 27 is excavating and removing petroleum-contaminated soil, MNA of groundwater, and implementing an LUC to limit future drinking water use. The excavation portion of the remedy was initiated in 2012. In 2018, two signs indicating where groundwater use for drinking water or ground disturbing activities are not recommended have been installed at the air field and at the fish camp. Each sign was two-sided and contained both Yupik and English transcriptions. Groundwater monitoring is ongoing and is discussed in Section 5.3.5. Soil, surface water, and groundwater data were reviewed for expectations of meeting cleanup levels and RAOs.

Soil COCs exceeding cleanup levels at Site 27 at the time of the DD were DRO (up to 51,000 mg/kg) and naphthalene (up to 191 mg/kg) (USACE 2009a). In 2012, soil was removed to 2 feet below the groundwater surface (3 to 11 feet bgs) or to the extent of contamination (8 feet bgs). Confirmation sampling indicated that five sample locations on the excavation floor below the groundwater interface exceed the SSCL for DRO with concentrations ranging from 13,000 mg/kg to 110,000 mg/kg (USACE 2013b). Excavation efforts were conducted to the maximum extent practicable taking into consideration existing technology, site location, and logistics considering overall project purposes.

In 2013, three of the five confirmation samples that exceeded cleanup levels were excavated due to increased accessibility from low water levels in the E4 plume (USACE 2015a). The excavation extents of the E4 plume expanded into the D2 plume and proceeded westward. Nine confirmation samples were collected from the western sidewall, one of which (13NCMOCSS069) contained DRO concentrations exceeding SSCLs (USACE 2015a). Along the northern sidewall, nine confirmation samples were collected, five of which contained DRO at concentrations exceeding the SSCL (Figure A-14). Two of the five samples also contained RRO concentrations exceeding the SSCL. No further excavation occurred at these sample locations due to their proximity to the Site 28 wetland (USACE 2015a).

In the first FYR, it was identified that the analyte list for soil does not appear to cover all site COCs identified in the DD and that naphthalene was previously detected at this site in concentrations exceeding the SSCL. In 2014, the sample that contained naphthalene at 191 mg/kg (UST-CS-27_EN-04-01) was relocated by a survey crew. The historical sample location appeared to be in an area of the E plume where soil had previously been excavated and removed. Soil sample 14NC27SS01 and duplicate 14NC27SS02 was collected from 12.5 to 13.5 feet bgs and sent to TestAmerica for naphthalene analysis. The field lab analyzed sample 14NC27SS01 for DRO and RRO. The sample results did not contain DRO, RRO, or naphthalene in concentrations that exceeded the cleanup levels. The soil associated with the historical sample location was likely removed during previous excavation activities at the MOC.

Excavation of the E2 UVOST plume to below SSCLs was also completed in 2014. The maximum detection of DRO identified was 22,000. The maximum detection of DRO left in place was 2,000 mg/kg in the E2 plume.

Surface water adjacent to Site 27 and downgradient of the MOC was collected at three locations before, during, and after excavation activities in 2012 and 2013. The samples were collected as indicators of potential construction effects. During active excavation, a sample was collected while work was occurring in the E plume approximately 150 feet from the MOCSW01 sample location. MOCSW02 was collected further downgradient, and MOCSW03 was collected crossgradient in an area overlapping the I plume delineated by UVOST in 2010. Samples were analyzed only for DRO and RRO (Table 5-10). TAH and TAqH analyses were not included until 2013, which enabled comparison to surface water quality parameters (USACE 2013b).

Table 5-10
Site 27 Downgradient Detections in Surface Water

Year	Analyte	Cleanup Level	Unit	MOCSW01			MOCSW02			MOCSW03		
				pre	during	post	pre	during	post	pre	during	post
2012	**DRO**	--	mg/L	6.7	7	5.6	1	0.69	0.6	2.2 J	3.1	2.4
	RRO	--	mg/L	3.1	4	1.9	0.33	0.23	0.2	0.52	0.68	0.31 J
2013	**DRO**	--	mg/L	6.1	5.2	3.2	0.085 J,ML	1.1	0.78	1.1	1.1	2.1
	RRO	--	mg/L	2.6	2.4	1.3	0.083 J,ML	1.1	0.15	0.49	0.40 B	0.39
	TAH	0.01	mg/L	0.00254	0.0027	0.002	0.0027	0.00266	0.002	0.00397	0.0027	0.00539
	TAqH	0.015	mg/L	0.0033038	0.003572	0.00248	0.0098246	0.0098154	0.0023542	0.0042837	0.0032996	0.01062

Notes:
The greater result of the primary or duplicate sample was included in the table for each event.
-- cleanup level not specified in the DD (USACE 2009a).
J – The analyte was positively identified; however, the associated result was less than the limit of quantitation but greater than or equal to the DL.
B – The analyte was detected in the method blank, the TB, or EB above the DL and the concentration in the sample did not exceed the blank concentration by a factor of five (factor of 10 for common laboratory contaminants acetone, toluene, and methylene chloride).
ML – Matrix interference suspected, result with potential high bias.
For definitions, refer to the Acronyms and Abbreviations section.

Recommendations for Site 27

Site 27 recommendations consist of the following:

- Implement the LUC to limit future drinking water use by recording a deed notice anticipated to be in the form of an Environmental Covenant in accordance with UECA.
- Continue conducting Periodic Reviews until all selected remedies are complete.

5.3.13 Site 28: Drainage Basin

The primary COCs in soil and sediment at Site 28 at the time of the DD were DRO, RRO, PAHs, PCBs, chromium, lead, and zinc (USACE 2009a). The selected remedy for Site 28 consisted of two components:

- Excavation and removal of petroleum-, PCB-, and metals-contaminated sediment, including the removal of near-surface sediments from the narrow channel upgradient of the Suqi River.
- Construction of a sedimentation pond or other appropriate controls and cleaning and removing the culverts or plugging them to prevent direct outflows of upgradient residual sources of contamination (USACE 2009a).

The culverts at Site 28 were removed in 2010 (USACE 2011). Sludge removed from the manhole in the western drainage contained high levels of Aroclor 1254, arsenic, barium, cadmium, lead, mercury, and silver. Additional investigations were conducted in 2011 and 2012 and sediment removal activities began in 2012 and continued in 2013.

During the additional investigations in 2011, sediment results were compared to the criteria specified in the DD when applicable. If sediment criteria were not listed in the DD for a particular analyte, the NOAA SQuiRTs for freshwater sediment at the probable effects level were used (Buchman 2008). Only 10 of the samples collected in 2011 met the 2012 definition of sediment (all submerged loose mineral and organic material except for that which is actively growing vegetation or is part of the vegetative mat) (USACE 2013a). All other samples were compared to SSCLs specified in the DD. Soil analytical results were also compared to values specified in 18 AAC 75, Tables B1 and B2 (ADEC 2008a) if a cleanup level was not specified in the DD for a particular analyte. The 2011 investigation found that DRO, RRO, toluene, ethylbenzene, total xylenes, PAHs, PCBs, arsenic, cadmium, chromium, lead, and selenium exceeded either SSCLs or 18 AAC 75, Table B soil cleanup levels (ADEC 2018b; USACE 2013a).

Excavation of contaminated sediments began in 2012 and continued in 2013 (USACE 2013b, 2013c, 2014). Sediment migration was controlled by an in-stream sediment trap while remedial activities were in progress. Sediment and surface water data were reviewed for expectations of meeting cleanup levels and RAOs.

Following Phase I sediment removal in 2012 at Areas 1 and 2 near the MOC, confirmation samples indicated that multiple compounds continued to exceed SSCLs. No sediment evaluation criteria are specified in the NOAA freshwater sediment screening tables for 1-methylnaphthalene, toluene, ethylbenzene, xylenes, or selenium.

In 2013, sediment removal continued within Areas 3 through 11. At the conclusion of the 2013 field season, several analytes, including DRO, RRO, LPAH, 2-methylnaphthalene, acenaphthene, fluorene, naphthalene, phenanthrene, arsenic, and chromium, remained at concentrations greater than SSCLs. In addition, 1-methylnaphthalene, acenaphthylene, and selenium were identified as exceeding other evaluation criteria and were thus carried forward to evaluate risk (refer to Appendix B). Analytes exceeding cleanup levels remain within all 11 sediment removal areas. Maximum results for each analyte are presented in Table 5-11.

In 2018, field activities included the mapping of sediment and surface water and the collection of sediment samples. During the sediment mapping effort, submerged areas were characterized as sediment or vegetative mat within the surveyed water bodies. A total of 54 sediment samples were collected from 0 to 2 feet bgs or until refusal was met with the hand tool. Forty-five samples were collected from surveyed locations based on the 2012 sediment mapping effort (USACE 2013a). Seven additional locations were relocated to suitable sample locations because the original staked survey locations did not contain sediment as defined by the project. Three samples of opportunity were collected from water bodies that contained a fuel odor or sheen (locations S28-51, 52, and 53). Sediment samples collected from Site 28 were analyzed for DRO by method AK102, DRO by method AK102 with silica gel cleanup, RRO by method AK103, RRO by method AK103 with silica gel cleanup, total organic carbon, PAHs, PCBs, and metals (arsenic, chromium, lead, selenium, and zinc). Results were compared to the SSCLs as defined in the DD (USACE 2009a). PAHs, PCBs, and metals concentrations were below the SSCLs. Exceedances of DRO and RRO do not occur beyond the natural stilling area. This distribution of contamination indicates the existing wetland is preventing contaminants above risk-based cleanup levels from moving downgradient from the natural stilling area to the Suqi River. The Site 28 contaminant concentrations are summarized in Table 5-11.

Table 5-11
Site 28 Contaminant Concentrations in Sediment

Analyte	Cleanup Level [a] (mg/kg)	DD Maximum Concentration (mg/kg)	2012 Maximum Detected Concentration (mg/kg)	2012 Post-Removal Concentrations (Area 1 and 2) (mg/kg)	2013 Post-Removal Concentrations (Areas 3 through 11)	2018 Post-Removal Concentrations (Areas 3 through 11)
Arsenic	93	--	**100**	4.5	88	86.2
Chromium	270	**649**	35[c]	19	32	48.3
Lead	530	**4,590**	91[c]	17	64	98.9
Zinc	960	**4,810**	380[c]	56	220	280
PCBs	0.7	**5.4**	**2.1 QH**[c]	0.084	0.61	0.482
2-methylnaphthalene	0.6	**500**	**890**	**890**	**86**	**529**
Acenaphthene	0.5	**14**	**10**	**10**	**5.2**	**16**
Fluoranthene	2.0	**14**	**5.6**[c]	0.23	**2.3**	**3.42**
Fluorene	0.8	**20**	**4,800**[b]	**15**	**11**	**25.3**
Naphthalene	1.7	**220**	**81,000**[b]	**450**	**40 J**	**230**
Phenanthrene	4.8	**21**	**57**[b]	**14**	**5 MN**	**13.3**
Total LPAH	7.8	--	**85,208**	**493**	**47.8**	**266.65**
Total HPAH	9.6	--	**13.36 J**	0.55	3.06	6.931
DRO	3,500	**150,000**	**110,000**[c]	**94,000**	**85,000**	**94,100**[d]
RRO	3,500	**14,000**	**34,000 MN**[c]	**9,100**	**26,000**	**106,000**[d]

Notes:
Bold = Concentration exceeds SSCLs
[a] Cleanup level recorded in the DD (USACE 2009a).
[b] Maximum concentration was detected within Area 1 or 2 and was subject to the Removal Effort in 2012 (USACE 2013b).
[c] Maximum concentration was detected within an area that was subject to the Removal Effort in 2013 (USACE 2014).
[d] Concentration reported from the AK102/AK103 silica gel method.
-- SSCL was not defined in the DD (USACE 2009a).
J – The analyte was positively identified; however, the associated result was less than the limit of quantitation but greater than or equal to the DL.
QH – Analyte result was considered an estimated value (biased high) due to a QC failure.
MN – Result is an estimate with no directional bias due to matrix interference.
For definitions, refer to the Acronyms and Abbreviations section.

Petroleum-Contaminated Sediment

Concentrated areas of fuel contamination are located in the middle and southern portion of Site 28 near the MOC. Downgradient of the MOC, several sample locations near the beginning of the stream channel and two ponds that the stream discharges to have high concentrations of fuel analytes (Appendix F). Following the 2018 sampling effort, a natural stilling area was found to be present between Area 9 an Area 10. The area appeared to be entirely composed of vegetative mat, which dispersed flow channels observed in Area 10.

The DD does not specify a cleanup level for several detected PAHs in sediment, including 1-methylnaphthalene, acenaphthylene, benzo(a)anthracene, and chrysene. All detected analytes in sediment were evaluated for changes in chemical-specific standards between the current regulation (WAC 173-204-520 T3) and the established DD cleanup levels, as well as, for new exceedances of the current applicable criteria.

PCB-Contaminated Sediment

PCBs exceeded the SSCL of 0.7 mg/kg in two of 51 sediment samples collected in 2012, with concentrations of 2.1-QH mg/kg and 0.84-QH mg/kg, respectively. The QH designation indicates the result is an estimated value with high bias due to QC failure. These samples were located near the MOC, within approximately 250 feet of the pad (USACE 2014). These concentrations are not greater than the maximum concentration of 5.4 mg/kg PCBs identified in the DD. In 2013, the two PCB exceedance locations were dredged within Areas 6 and 7. Subsequent confirmation samples were collected and PCBs were detected at concentrations less than the cleanup level.

Metal-Contaminated Sediment

No metals were identified during the 2018 sampling event exceeding the SSCLs, however, selenium was identified as exceeding the current WAC 173-204-520 Table III, dry-weight basis and assuming 1 percent total carbon, in the same manner as described in the DD (USACE 2009a). Locations where selenium exceeded this value were throughout most of the sediment areas in the Site 28 Drainage Basin and were not confined to one particular area (Appendix F). The DD does not specify a cleanup level for this metal. The measured concentration of selenium during the 2018 sampling effort (4.34 mg/kg) does not present a risk to human health and due to the distribution of the metal, is likely naturally occurring.

Surface Water

Surface water samples were collected from Site 28 to monitor the impact of remediation activities on contaminant concentrations. Samples were analyzed for DRO, RRO, BTEX, PAHs, PCBs, and total and dissolved metals (RCRA metals plus nickel, vanadium, and zinc). All surface water analytical results were below the TAqH criterion. All PCB results were nondetect and all GRO, DRO, and RRO results were nondetect, or very low with no significant variation occurring between sampling events (USACE 2013a, 2013b, 2014).

Surface water samples were also collected from constructed impoundments used to contain the geotubes as they dewatered. Samples were evaluated to determine whether contained waters were within discharge criteria (USACE 2013b). Water did not meet discharge criteria for TAH, TAqH, arsenic, or dissolved arsenic in 2012 and was not discharged. Modifications to the water treatment system occurred in 2013 as described in Section 3.16.1. Analytical results from the first batch using the modified treatment system were below discharge criteria presented in the State of Alaska Wastewater General Permit 2009DB0004-0216, 18 AAC 75, and 18 AAC 70 (USACE 2015b).

Recommendations for Site 28: Drainage Basin

Site 28 recommendations consist of the following:

- Continue remedy implementation (removal of contaminated sediment) until cleanup levels are met. Conduct pilot testing to assess if effectiveness of remedy implementation (dredging) can be improved.
- Formally document the contamination remaining at the southern end of Site 28 as associated with Site 11. In addition, formally document why continued remedy implementation (excavation) at the site is not feasible due to the presence of shallow groundwater and anticipated significant impacts to wetlands.
- Continue Periodic Reviews until RAOs are met.

5.3.14 Site 32 Lower Tramway

The selected remedy for Site 32 was excavation and removal of DRO-contaminated soil. Excavation efforts were initiated and completed in 2010; however, the area excavated was north of the DRO-contaminated area identified in the DD (USACE 2011). Excavation efforts conducted in 2010 removed approximately 20 tons of soil from two areas and did not identify any additional COCs for Site 32.

In 2014, excavation activities occurred following the relocation and resampling of historic sample locations with known contamination that had not been adequately addressed through previous remedial actions. Historic locations 01NE32SS102, 01NE32SS122, and 03NEC32SS07 were found to have remaining DRO concentrations ranging from 14,000 mg/kg to 18,000 mg/kg. Approximately 50 tons of contaminated soil were removed, five primary confirmation samples and two duplicate samples were collected. Final confirmation samples did not contain DRO or RRO exceeding SSCLs. Following receipt of sample results, the excavation was backfilled, graded, and seeded. The USACE considers soil removal at Site 32 complete.

5.4 SITE INSPECTIONS

The site inspections for this Periodic Review were conducted 01 through 03 August 2018. The site inspection team consisted of USACE consultants from ECC and Jacobs. The team visited each site included in this Periodic Review. The team located, attempted to locate, and inspected actively monitored wells and looked for signs of site disturbance (such as excavations) and changes in land use from those described in the DDs. Site inspection checklists are in Appendix C. Site conditions and inspection results, as determined from the site inspections, are summarized below by site in Sections 5.4.1 through 5.4.13.

5.4.1 Site 3: Fuel Pump House

Site 3 is located adjacent to three subsistence hunting camp structures. The area of previous excavation efforts appeared to be in good condition and vegetative growth was occurring. The surface water body observed during the 2013 site inspections was not observed again in 2018. The outline of the surface water body was identified; however, the feature appeared to be ephemeral (Photo No. 1 [Appendix C]). The feature was filled with miscellaneous debris including metal, a tire, and wood (Photo No. 2 [Appendix C]). A plastic one-quart oil container was also observed on site (Photo No. 3 [Appendix C]).

5.4.2 Site 6: Gravel Pad

The gravel pad remained at Site 6 and was being used for the camp during the site inspections (Photo No. 4 [Appendix C]). During the time of the inspection, a small depression had been dug into the eastern edge of the gravel pad and the soil was pushed into a small pile (Photo No. 5 [Appendix C]). This soil movement occurred during the camp mobilization activities and was re-graded prior to de-mobilization from NEC (Photo No. 6 [Appendix C]). Excavation areas during remedial actions were graded to promote positive drainage. Adjacent surface water was mostly dry. The small amount of visible water was clear with no observable sheen. Wood debris were noted in the rocks/ephemeral pond bed to the southwest of the gravel pad (Photo No. 7 [Appendix C]).

5.4.3 Site 8: POL Spill

The water level at Site 8 appeared considerably lower than described in previous reports. Vegetation at Site 8 appeared to be healthy with no signs of stress (Photo No. 8 [Appendix C]). No noticeable petroleum odor was noted. Sheen was observed on some ponded areas but appeared to be biogenic. Fish were observed in the Suqi River on the downstream edge of Site 8. There was no evidence of unauthorized site disturbance. Insufficient sediment was encountered for ISM sampling methodology for MNA of sediment at the site.

5.4.4 Site 9: Housing and Operations Landfill

The soil used for vegetative cover was observed to be very coarse, making vegetative growth difficult and sparse (Photo No. 9 [Appendix C]). A minimal amount of debris was observed on the landfill cap (Photo No. 10 [Appendix C]). No holes or penetrations were apparent in the landfill cap. The drainage ditch on the east side of the landfill cap was observed in good condition and appears to be efficiently promoting drainage away from the cap as planned (Photo No. 11 [Appendix C]).

5.4.5 Site 10: Buried Drums

Vegetation was sparse on the gravel pad. Areas of excavation were not easily distinguishable from the gravel pad and appeared to be properly brought to grade and seeded (Photo No. 12 [Appendix C]). No significant erosion was evident at the site. Minor site debris encountered included pipe and wire fragments, wood fragments with paint, and metal debris (Photo No. 13 [Appendix C]). MW10-1, along the border of Site 10, was found in good condition. There were no visible signs of contamination at the site.

5.4.6 Site 11: Fuel Tanks

Site 11 appeared in good condition and had been graded and seeded. The vegetation was noted to be partially established across the gravel (Photo No. 14 [Appendix C]). The excavation area and former middle tank footprint area appeared mildly distinguishable from the vegetative cover (Photo No. 15 [Appendix C]). Minor site debris encountered included metal fragments and wood.

5.4.7 Site 13: Heat and Power Plant

Site 13 excavation areas appeared to have been brought to grade and seeded (Photo No. 16 [Appendix C]). Vegetation was noted as poor to fair, largely due to soil quality (coarse gravel fill). There was slightly stressed vegetation on the edge of Site 13 (Photo No. 17 [Appendix C]). There were no visual indications of contamination remaining. MW88-5 was in good condition and there was no evidence of the decommissioned wells. No POL-related odor was detected, as previously described in the 2013 FYR site inspections.

5.4.8 Site 15: Fuel Pipeline

Site 15 excavation areas appeared to have been brought to grade and seeded (Photo No. 18 [Appendix C]). Fair vegetative cover exists over excavation areas. The coarse gravel fill appears to have prevented thick vegetation growth. There were no visual indications of contamination remaining. No POL-related odor was detected, as previously described in the 2013 FYR site inspections.

5.4.9 Site 16: Paint and Dope Storage

Site 16 excavation areas appeared to have slightly uneven fill in the areas of removal. Degraded rubber matting was observed in and around the ditch to the west of Site 16 (Photo No. 19 [Appendix C]). Concrete remains near the location of the decommissioned well MW16-3 (Photo No. 20 [Appendix C]). There is poor to no vegetative cover across most of the area (Photo No. 21 [Appendix C]). Monitoring well 14MW01 was in good condition. There were no visual indications of contamination remaining.

5.4.10 Site 19: Auto Maintenance

Site 19 Excavation H was brought to grade and seeded (Photo No. 22 [Appendix C]). Vegetative cover near the excavation area is fair with sparse grass. Approximately 3 inches of frost jacking has occurred at MW88-1. Approximately 2 inches of polyvinyl chloride stickup was also observed near a decommissioned well (Photo No. 23 [Appendix C]).

5.4.11 Site 27: Diesel Fuel Pump

Site 27 appears to be in good condition. Excavations were brought to grade and reseeded (Photo No. 24 [Appendix C]). The site appeared to have poor vegetation regrowth, particularly in the E-4 excavation area. The poor vegetation regrowth appears to be due to the coarse soil (Photo No. 25 [Appendix C]). No POL-related odors were identified or visual signs of contamination. Downgradient wells 14MW04 and 14MW05 are in good condition. Small amounts of metal debris (Photo No. 26 [Appendix C]) as well as the remains of casing and concrete from MW88-4 were observed (Photo No. 27 [Appendix C]).

5.4.12 Site 28: Drainage Basin

At the time of the most recent site inspections, several ponds and surface water had visible sheen (Photo Nos. 28 and 29 [Appendix C]). The site appeared to have low water conditions. Areas appeared to have stressed vegetation, which may have been due to the low water conditions (Photo No. 30 [Appendix C]). Debris was identified throughout the site and included treated utility poles (Photo Nos. 31 through 34 [Appendix C]), metal pipe (Photo No. 35 [Appendix C]), rubber tubing (Photo No. 36 [Appendix C]), rubber matting (Photo No. 37 [Appendix C]), plywood (Photo No. 38 [Appendix C]), and tarp material (Photo No. 39 [Appendix C]). A straw wattle was still intact near the boundary of the MOC and Site 28 (Photo No. 40, [Appendix C]). Potential fuel odors emanated from the submerged vegetative mat and ponds when disturbed, particularly in areas most adjacent to the MOC. This odor decreased and was not observable as the site inspection team approached Transect 16, Area 9 from the MOC. The site was also clearly marked with reindeer tracks (Photo No. 41 [Appendix C]).

5.4.13 Site 32: Lower Tramway

Site 32 excavations were brought to grade and reseeded (Photo No. 42 [Appendix C]). The tramway concrete foundation remained on site (Photo No. 43 [Appendix C]). An approximate 5-foot 6-inch diameter culvert was observed on site to allow the flow of an unnamed creek under the roadway leading to Site 32 (Photo No. 44 [Appendix C]). The roadway was in good condition with no signs of settlement near the culvert.

5.5 INTERVIEWS

Public notice in the *Nome Nugget* and flyers posted in Savoonga identified that public comment for the Periodic Reviews and concurrent FYR could be submitted by responding to a written questionnaire or following a planned public meeting in Savoonga. Public comments for this Periodic Review for Sites 3, 6, 8, 9, 10, 11, 13, 15, 16, 19, 27, 28 and 32 were solicited at a public meeting held by USACE in Savoonga on 11 April 2018. Follow-up with stakeholders occurred via email and phone calls. Completed questionnaires and public meeting minutes are provided in Appendix C. A summary of public feedback and USACE responses are also included in Appendix C.

6.0 TECHNICAL ASSESSMENT

The protectiveness of the remedies is analyzed in this technical assessment, which was completed by answering three questions for each site, as described below.

Question A: Is the remedy functioning as intended by the DD?

This question was answered by considering the remedy's implementation status (Periodic Review summary form), available information reviewed in Section 5, and comparing the remedy to the requirements in the DD. Remedial action performance, monitoring, LUCs, and indicators of potential problems were assessed as applicable.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?

Question B was answered by evaluating the effects of cleanup level or action limit changes in ARARs and exposure assumptions that were used at the time of remedy selection that may affect the protectiveness of the remedy. Toxicity and contaminant characteristics were evaluated using the questions provided in Exhibit 4-2 of the CERCLA FYR guidance (EPA 2001).

The evaluation of new or changed standards was accomplished by first identifying the applicable standard and then comparing it to the current standard. Potential cleanup levels for COPCs not identified in the DD were compared to current applicable state cleanup standards for soil and groundwater. Table B-1 in Appendix B summarizes the evaluation of COCs. The COCs with new or more stringent standards or with new data were further evaluated by comparing the current applicable standard with the most recent maximum detected levels, as shown in Table B-2 in Appendix B.

Carcinogenic risk and non-carcinogenic hazard values were calculated for any compound where current maximum detected levels exceeded the current applicable standard and where the current cleanup level was not defined. Cancer risk and non-cancer hazards for current maximum values were calculated using the ADEC *Procedures for Calculating Cumulative Risk*

(ADEC 2016). The results are presented in Table B-3 (Appendix B). The EPA risk management decision range of 1×10^{-4} to 1×10^{-6} for carcinogens, and a hazard quotient of 1 or less for non-carcinogens, are used to assess the risk calculation results.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

This question was answered by considering if ecological risks have been adequately addressed at the site, if the site is subject to natural disasters, and any plans for potential land use or land use changes.

6.1 SITE 3: FUEL PUMP HOUSE

Question A: Is the remedy functioning as intended in the DD?
Answer: Yes.

Remedial Action Performance

The selected remedy for Site 3 included excavation and disposal or treatment of petroleum-contaminated soil to prevent current and future exposure to humans and ecological receptors. Remedial efforts conducted in 2010 identified the historical sampling location and was unable to replicate the DRO exceedance. Four test pits were excavated and both floor and sidewall samples were found to be below SSCLs. In addition, historical sediment samples containing RRO exceeding cleanup levels were to be resampled and subjected to silica gel cleanup. Historical sediment sampling locations were identified and subjected to silica gel cleanup procedures. RRO concentrations in sediment were reduced by 60 percent following silica gel cleanup procedures and were no longer greater than SSCLs.

An additional area of petroleum-contaminated soil was identified within Site 3 in 2010. This area was excavated and removed from site. Confirmation sample results confirmed that DRO concentrations are below cleanup levels at Site 3.

Systems Operations/O&M

Periodic reviews are required at Site 3 until all selected remedies are complete.

Implementation of LUCs and Other Measures

The selected remedy for Site 3 included the implementation of an LUC to designate areas not suitable for drinking water. At the time of this review, the LUC has not been implemented but is currently in progress.

Opportunities for Optimization

None identified.

Early Indicators of Potential Issues

None identified.

Question B: Are the exposure assumption, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?
Answer: Yes.

Changes in Standards and TBCs

Are there changes in the standards identified as ARARs in the Record of Decision (ROD) that bear protectiveness of the remedy?

ADEC cleanup levels for DRO and RRO in soil and groundwater have not changed since the publication of the DD, therefore, the levels in the DD are considered protective. Sediment cleanup levels for DRO and RRO are not currently regulated under ADEC.

Are there newly promulgated standards that might apply or be relevant and appropriate to the site and that bear on the protectiveness of the remedy?

There are no newly promulgated standards for the COCs in soil and groundwater at Site 3. When compared to the EPA *Region 4 Ecological Risk Assessment Supplemental Guidance* Table 2c (EPA 2018a), the sediment cleanup level determined for RRO (3,500 mg/kg) is more conservative than the TPH – oil sediment screening value of 3,600 mg/kg. The DRO cleanup level in sediment (3,500 mg/kg) is less conservative than the TPH – diesel sediment screening value of 340 mg/kg.

What is the basis for each cleanup level identified in the ROD? Have there been changes to the basis of the cleanup levels?

The DD identified soil cleanup levels for Site 3 based on the HHRA (USACE 2004) which continue to be considered protective of future residential use. Sediment cleanup levels for Site 3 were based on incidental ingestion/dermal contact with future residents (exposure frequency of 90 days per year and a target hazard quotient of 0.1) and are still considered protective. Additionally, soil and groundwater cleanup level changes for DRO and RRO have not occurred under 18 AAC 75 (ADEC 2018b).

Changes in Exposure Pathways

Has land use or expected land use on or near the site changed?

No, the current land use and the expected land use on the site has not changed. The site is adjacent to subsistence fishing and hunting structures.

Have any human health or ecological routes of exposure or receptors changed or been newly identified?

No, there have been no new human health or ecological routes of exposure. No new receptors have been identified or have changed.

Are there newly identified contaminants or contaminant sources?

Yes, a one-quart plastic motor oil container was observed at the site during the 2018 site inspections. Sheen on an ephemeral surface water feature and a plastic motor oil cap were observed at the site during the 2013 site inspections. Non-FUDS activities may be impacting the site.

Are there unanticipated toxic byproducts of the remedy not previously addressed by the DD?

No, there were no unanticipated toxic byproducts of the remedy not previously addressed by the DD.

Have physical site conditions changed such that protectiveness may be affected? Has understanding of physical site conditions changed?

In the 2013 site inspections, a large area of surface water not present at the time of the DD was identified. The depressions that hold the surface water appear to be the result of excavations. During the 2018 site inspections, this depression was noted but there was no surface water within the depression. An evaluation of the surface water pathway was recommended in the first FYR; however, this does not seem to be a current nor consistent exposure pathway.

Changes in Toxicity and Other Contaminant Characteristics

Have toxicity factors for COCs at the site changed? Have other contaminant characteristics changed? Have ecological toxicity reference values and/or no observed adverse effects levels *(NOAELs)/*lowest observed adverse effect levels *(LOAELs) changed?*

No, toxicity factors and contaminant characteristics for DRO and RRO have not changed. Although there is no ecological toxicity reference value for DRO, the TPH – diesel sediment screening value from the EPA *Region 4 Ecological Risk Assessment Supplemental Guidance* Table 2c (EPA 2018a), is more conservative than the DRO cleanup level in sediment.

Changes in Risk Assessment Methods

None identified.

Expected Progress Toward Meeting RAOs

RAOs for Site 3 will be considered complete upon completion of the remedy.

Question C: *Has any other information come to light that could call into question the protectiveness of the remedy?*
Answer: *No.*

6.2 SITE 6: GRAVEL PAD

Question A: *Is the remedy functioning as intended in the DDs?*
Answer: *Yes.*

Remedial Action Performance

The selected remedy for Site 6 is excavation and disposal or treatment of DRO-contaminated soil. Remedial efforts identified the presence of RRO-contaminated soil above cleanup levels and were removed concurrently with DRO-contaminated soil. Field activities in 2010 excavated the area until DRO and RRO were confirmed to be below SSCLs, or when groundwater was encountered. Review of the remedial action report (USACE 2011) indicates groundwater was encountered prior to obtaining soil samples below SSCLs within a significant portion of the interior of the excavation. It is likely that groundwater encountered during excavation efforts contains DRO and RRO in addition to previously reported COCs; however, groundwater at Site 6 was not included as a contaminated medium in the DD.

Systems Operations/O&M

Periodic reviews are required at Site 6 until all selected remedies are complete.

Implementation of LUCs and Other Measures

The selected remedy for Site 6 included the implementation a LUC to designate areas not suitable for drinking water. At the time of this review, the LUC has not been implemented but is currently in progress.

Opportunities for Optimization

None identified.

Early Indicators of Potential Issues

None identified.

Question B: Are the exposure assumption, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?
Answer: Yes.

Changes in Standards and TBCs

Are there changes in the standards identified as ARARs in the ROD that bear protectiveness of the remedy?

COCs at Site 6 include DRO in soil and lead in groundwater. The DD identified soil cleanup levels for Site 6 based on the human health and ecological risk assessment (USACE 2004) which continue to be considered protective of future residential use. Additionally, the ADEC cleanup levels for DRO in soil and lead in groundwater have not changed since the publication of the DD, therefore, the levels in the DD are considered protective.

Are there newly promulgated standards that might apply or be relevant and appropriate to the site and that bear on the protectiveness of the remedy?

There are no newly promulgated standards for the COCs in soil and groundwater at Site 6.

What is the basis for each cleanup level identified in the ROD? Have there been changes to the basis of the cleanup levels?

The cleanup level for DRO in soil was calculated using site-specific values. 18 AAC 75 was the basis for the lead cleanup level in groundwater. Cleanup level changes for DRO in soil and lead in groundwater have not occurred under 18 AAC 75.

Changes in Exposure Pathways

Has land use or expected land use on or near the site changed?

No, current land use and the expected land use on the site has not changed.

Have any human health or ecological routes of exposure or receptors changed or been newly identified?

No, there have been no new human health or ecological routes of exposure. No new receptors have been identified or have changed.

Are there newly identified contaminants or contaminant sources?

The first FYR identified that PCBs were not evaluated as a COPC at Site 6 at the time of the DD (USACE 2009a). During pre-construction sampling efforts in 2009, PCBs were detected at Site 6 at a concentration of 2.2 mg/kg which exceeded the DD identified ARAR for PCBs in soil (18 AAC 75.341). Post-construction sampling at Site 6 in 2009 and surface ISM sampling in 2011 were not able to replicate PCB concentrations greater than 1 mg/kg. Analysis of PCBs was not included in waste characterization or confirmations samples collected during 2010 remedial efforts. In 2014, Bristol was scoped to address this data gap by investigating the location of the pre-construction sample containing 2.2 mg/kg PCBs and collecting soil samples via test pits to determine if PCB-contaminated soil remained at Site 6 (Figure A-4) (USACE 2016b). PCBs were not detected in any of the soil samples.

Are there unanticipated toxic byproducts of the remedy not previously addressed by the DD?

No, there were no unanticipated toxic byproducts of the remedy not previously addressed by the DD.

Have physical site conditions changed such that protectiveness may be affected? Has understanding of physical site conditions changed?

No, physical site conditions have not changed such that protectiveness may be affected.

Changes in Toxicity and Other Contaminant Characteristics

Have toxicity factors for COCs at the site changed? Have other contaminant characteristics changed? Have ecological toxicity reference values and/or NOAELs/LOAELs changed?

No, toxicity factors and contaminant characteristics for DRO and lead have not changed.

Changes in Risk Assessment Methods

None identified.

Expected Progress Toward Meeting RAOs

RAOs to prevent ingestion, inhalation, and dermal contact with contaminated soil are expected to be complete following the implementation of LUCs.

Question C: *Has any other information come to light that could call into question the protectiveness of the remedy?*
Answer: *No.*

6.3 SITE 8: POL SPILL

Question A: *Is the remedy functioning as intended in the DDs?*
Answer: *No.*

Remedial Action Performance

The selected remedy for Site 8 is MNA and LUCs. In 2018, based upon the recommendation made in the first FYR, the DUs were revised to better estimate the level of contamination in sediment at Site 8. However, due to changes in site conditions over time, sufficient material that met the DD definition of sediment could not be found in any of the three Site 8 DUs. Therefore, the MNA sampling at Site 8 did not occur.

Data from surface water (2014) and soil (2016) sampling at Site 8 identified that the lateral and vertical extent of DRO contamination in soil east of the 2016 sampling area is not delineated. Additionally, the reported location of the pipeline spill is inaccurate. Monitoring efforts may not include the full extent of contamination.

System Operations/O&M

Periodic reviews are required at Site 8 until all selected remedies are complete.

Implementation of ICs and Other Measures

The selected remedy for Site 8 included implementing LUCs by conducting a survey to delineate the location and extent of sediment contamination, provide a detailed map of the site to the landowner, and record a deed notice anticipated to be in the form of an Environmental Covenant in accordance with the UECA that the area should not be used for residential land use without additional investigation and/or cleanup. At the time of this review, LUCs have not been implemented.

Opportunities for Optimization

No optimization is recommended at this time. It is recommended that a supplemental investigation be completed to delineate the lateral and vertical extent of soil contamination east of the 2016 sampling area. It is also recommended that the location of the historic pipeline spill be revised based on 2016 sample data and any supplemental data collected in the future.

Early Indicators of Potential Issues

Little sediment that met the DD definition of sediment was observed at Site 8 during the 2018 site inspection. The vegetation in the area is thriving and site conditions have changed since the time of the DD. MNA sampling was not completed in 2018 due to the lack of sediment and is likely to be unsuccessful in the future. Additionally, soil contamination found in 2016 is not fully delineated to the east of the 2016 sample locations.

Question B: *Are the exposure assumption, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?*
Answer: *No.*

The exposure assumption for the site has changed since the promulgation of the DD (USACE 2009a). At the time of the DD, the site was described as containing a "wetland consist[ing] of dense, grassy vegetation and roots with little soil or peat development" and, therefore, the media of concern was sediment. In 2016, additional samples were collected to determine if the Site 8 DUs encompassed the lateral extent of POL affected sediment and soil at Site 8. DRO was measured in soil in exceedance of the SSCLs (14,000 mg/kg to 19,000 mg/kg). In 2018, sufficient material that met the DD definition of sediment could not be found in any of the three Site 8 DUs and could not be sampled. The exposure assumption of sediment as the contaminated media is no longer accurate, as soil has been identified with exceedances of the SSCLs and there is decreased sediment volume at the site.

Changes in Standards and TBCs

Are there changes in the standards identified as ARARs in the ROD that bear protectiveness of the remedy?

Cleanup levels in the DD were based on incidental ingestion/dermal contact with future residents (exposure frequency of 90 days per year and a target hazard quotient of 0.1) and WAC 173-204-520. For those compounds listed as COCs, the cleanup levels and are still considered protective.

Are there newly promulgated standards that might apply or be relevant and appropriate to the site and that bear on the protectiveness of the remedy?

There are no newly promulgated standards for the COCs in sediment at Site 8.

What is the basis for each cleanup level identified in the ROD? Have there been changes to the basis of the cleanup levels?

Cleanup levels in the DD were based on incidental ingestion/dermal contact with future residents (exposure frequency of 90 days per year and a target hazard quotient of 0.1). For the compound listed as a COC (DRO), the cleanup level is still considered protective.

Changes in Exposure Pathways

Has land use or expected land use on or near the site changed?

No, current land use and the expected land use on the site have not changed.

Have any human health or ecological routes of exposure or receptors changed or been newly identified?

Yes, a new exposure pathway was identified in 2016 when contaminated soil was identified at the site. DRO was measured up to 19,000 mg/kg in soil, exceeding the SSCL of 9,200 mg/kg. In addition, surface water collected in 2014 adjacent to the revised approximate location of the pipeline break exceeded the SSCL for TAqH. The measured concentration of TAqH was 0.0329 mg/L, exceeding the SSCL of 0.015 mg/L.

Additionally, during the site inspection and attempted follow-on sampling in 2018, sufficient sediment was not found for the ISM sampling effort. It appears that site conditions may have changed, and that sediment is not as prominent on the site as previously identified.

Are there newly identified contaminants or contaminant sources?

No, there were no new identified contaminants or contaminant sources.

Are there unanticipated toxic byproducts of the remedy not previously addressed by the DD?

No, there were no unanticipated toxic byproducts of the remedy not previously addressed by the DD.

Have physical site conditions changed such that protectiveness may be affected? Has understanding of physical site conditions changed?

Yes, physical site conditions have changed such that future protectiveness may be affected. However, the location of the suspected pipeline break has been revised based on new information from the 2014 and 2016 sampling efforts (USACE 2015a, 2017a). Soil and surface water collected from the site have exceeded SSCLs, media which had not been identified as of concern in the DD. Additionally, ISM sampling was not performed during the 2018 sampling and site inspection efforts due to the lack of sufficient sediment for ISM.

Changes in Toxicity and Other Contaminant Characteristics

Have toxicity factors for COCs at the site changed? Have other contaminant characteristics changed? Have ecological toxicity reference values and/or NOAELs/LOAELs changed?

No, toxicity factors and contaminant characteristics for DRO have not changed. Although there is no ecological toxicity reference value for DRO, the TPH – diesel sediment screening value from the EPA *Region 4 Ecological Risk Assessment Supplemental Guidance* Table 2c (EPA 2018a), is more conservative than the DRO cleanup level in sediment.

Changes in Risk Assessment Methods

None identified.

Expected Progress Toward Meeting RAOs

Current data is insufficient to evaluate whether RAOs for Site 8 will be met through MNA.

Question C: *Has any other information come to light that could call into question the protectiveness of the remedy?*
Answer: *Yes. The data collected in 2016 indicates that the Site 8 contamination has not been fully delineated.*

6.4 SITE 9: HOUSING AND OPERATIONS LANDFILL

Question A: *Is the remedy functioning as intended in the DD?*
Answer: *Yes.*

Remedial Action Performance

The selected remedy for Site 9 is landfill capping, removal of partially submerged exposed debris from flowing streams, periodic visual monitoring of the cap for settlement and erosion for five years, LTM to verify COCs in shallow groundwater are not migrating downgradient and impacting surface waters, LTM to demonstrate the shallow groundwater meets the RAOs for a non-drinking water source, and LUCs. Debris from the surface and surface water adjacent to the landfill was removed in 2010. Following debris removal, the landfill at Site 9 was capped and completed in 2010. Periodic visual monitoring and the 2018 site inspection did not identify any indications of erosion and/or cracking of the landfill cap. Capping appears to have provided containment by reducing water infiltration and minimizing vertical movement of contaminants and preventing human exposure to the waste materials. Monitoring events to verify COCs in shallow groundwater were not migrating downgradient and impacting surface waters was conducted in 2010/2011, 2013, and 2018. LTM to demonstrate the shallow groundwater meets the RAOs for a non-drinking water source is ongoing.

System Operations/O&M

The landfill cap will continue to be monitored on a five-year basis for up to 30 years for signs of erosion. Continue monitoring surface water adjacent to the cap to verify COCs in shallow groundwater are not migrating downgradient and affecting surface waters. Continue monitoring shallow groundwater (six LTM events spaced five years apart) via surface water to demonstrate the groundwater meets the RAOs for a non-drinking water source. Periodic reviews are required at Site 9 until LUCs are implemented and all monitoring events and visual inspections have been completed.

Implementation of ICs and Other Measures

The selected remedy for Site 9 included the implementation of LUCs to designate areas not suitable for drinking water and to prevent construction of buildings on top of landfills. At the time of this review, LUCs have not been implemented.

Opportunities for Optimization

None identified.

Early Indicators of Potential Issues

None identified.

Question B: *Are the exposure assumption, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?*
Answer: *Yes.*

Changes in Standards and TBCs

Are there changes in the standards identified as ARARs in the ROD that bear protectiveness of the remedy?

COCs at Site 9 are DRO and arsenic in soil and DRO, RRO, arsenic, and lead in groundwater. The ADEC cleanup levels have not changed for DRO in soil or RRO and lead in groundwater. The ADEC cleanup level for arsenic in groundwater has decreased from 0.01 mg/L to 0.00052 mg/L.

Are there newly promulgated standards that might apply or be relevant and appropriate to the site and that bear on the protectiveness of the remedy?

Although the ADEC cleanup level has decreased, the remedy is currently protective as arsenic was not measured in exceedance of 0.00052 mg/L in surface water or groundwater during the 2015 sampling effort. Arsenic was not sampled for during the 2018 sampling effort.

What is the basis for each cleanup level identified in the ROD? Have there been changes to the basis of the cleanup levels?

The DD cleanup levels for soil and groundwater at Site 9 were based on 18 AAC 75 and site-specific background values. The cleanup level for DRO in soil was calculated using risk-based site-specific values (in a residential scenario). No regulatory standard was used to establish the cleanup level for arsenic in soil; rather, the cleanup level for arsenic in soil was calculated using a site-specific background value. Cleanup levels for DRO, RRO, arsenic, and lead in groundwater were based on 18 AAC 75 (USACE 2009a).

The ADEC cleanup level for arsenic in groundwater has decreased from 0.01 mg/L to 0.00052 mg/L due to a change from the EPA MCL as the basis of the 18 AAC 75 cleanup level to a calculated risk-based cleanup level (ADEC 2015). Soil cleanup level changes for DRO and groundwater cleanup level changes for DRO, RRO, and lead have not occurred under 18 AAC 75 (ADEC 2018b). The DRO SSCL of 9,200 mg/kg for soil was more conservative than the ADEC cleanup level of 10,250 mg/kg.

Changes in Exposure Pathways

Has land use or expected land use on or near the site changed?

No, the current land use or expected land use has not changed at the site.

Have any human health or ecological routes of exposure or receptors changed or been newly identified?

No, human health or ecological routes of exposures or receptors have not changed or been newly identified.

Are there newly identified contaminants or contaminant sources?

No, there were no new identified contaminants or contaminant sources.

Are there unanticipated toxic byproducts of the remedy not previously addressed by the DD?

No, there were no unanticipated toxic byproducts of the remedy not previously addressed by the DD.

Have physical site conditions changed such that protectiveness may be affected? Has understanding of physical site conditions changed?

No, physical site conditions have not changed such that protectiveness may be affected.

Changes in Toxicity and Other Contaminant Characteristics

Have toxicity factors for COCs at the site changed? Have other contaminant characteristics changed? Have ecological toxicity reference values and/or NOAELs/LOAELs changed?

Toxicity factors and contaminant characteristics for DRO, RRO, arsenic, and lead have not changed; however, ADEC has reduced the cleanup level in groundwater for arsenic.

Changes in Risk Assessment Methods

None identified.

Expected Progress Toward Meeting RAOs

RAOs are expected to be met upon completion of the remedy.

Question C: *Has any other information come to light that could call into question the protectiveness of the remedy?*

Answer: *No.*

6.5 MOC GROUNDWATER

Question A: *Is the remedy functioning as intended in the DD?*
Answer: *Yes.*

Remedial Action Performance

The original selected remedy of chemical oxidation does not appear to be capable of meeting target cleanup levels for COCs. During the Phase I of ISCO implementation, field testing could not confirm a decrease in overall fuel-related contamination and groundwater contaminant concentrations appeared to stabilize back to original concentrations toward the end of the 28-day monitoring period. Due to the peat and organic silts in the soil, the presence of permafrost and/or frozen zones, and the observation of preferential flow zones, the contingency remedy of excavation was completed. Current groundwater conditions (e.g., low concentrations of DO, detectable concentrations of methane, and elevated concentrations of alkalinity and dissolved manganese) in wells 14MW04 and 14MW05 indicate natural attenuation is occurring at the MOC. Using geometric regression analyses from data collected between 2014 and 2018 in wells 14MW04 and 14MW05, DRO is predicted to attenuate in 2023 and 2030, respectively. Anaerobic processes are dominant for in-plume wells and aerobic processes are dominant at the margins of the plume.

Other in-plume monitoring wells at the MOC (14MW01, 14MW02) indicate DRO concentrations continue to increase based on statistical trends. No estimate of predicted completion of attenuation at the MOC can be provided until DRO concentrations are observed as declining at all source area wells. Additional monitoring data are needed to assess COC concentrations in groundwater, provide higher confidence for the predicted cleanup timeframes at individual wells, and establish an estimated cleanup timeframe sitewide.

Systems Operations/O&M

Continue monitoring shallow groundwater to evaluate natural attenuation in groundwater at the MOC. Periodic reviews are required for MOC groundwater until all selected remedies are complete.

Implementation of LUCs and Other Measures

The selected remedy for MOC groundwater included the implementation of the LUC to limit drinking water uses for groundwater at the MOC. At the time of this review, the LUC has not been implemented but is currently in progress.

For the purposes of ongoing site evaluations and final site closure, there is not currently an effort to manage the individual sites under the MOC as a whole. However, due to the proximity of the sites and the nature of groundwater, the LUC, as documented in the anticipated Environmental Covenant, will be developed to encompass all MOC sites. This will also be done in order to provide the most clarity to the spatial boundary to which the same LUCs apply, rather than issuing individual covenants per site within the MOC.

Opportunities for Optimization

Two of the wells visited during the 2018 monitoring effort need repair due to frost jacking (14MW05 and MW88-1) (Photo No. 48 [Appendix C]). One well, MW88-3, had a flush mount with lid threads that were severely rusted and the monitoring well could not be secured (Photo No. 49 [Appendix C]). Maintenance to these wells is suggested. Once the wells are repaired, a new survey of the top of casing elevations is recommended to provide updated elevation data. One partially decommissioned well was also observed at the MOC which may be acting as a direct conduit to groundwater (Photo No. 23 [Appendix C]). Full decommissioning of this well is recommended.

Early Indicators of Potential Issues

Question B: *Are the exposure assumption, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?*
Answer: *Yes.*

Changes in Standards and TBCs

Are there changes in the standards identified as ARARs in the ROD that bear protectiveness of the remedy?

The DD identified regulations promulgated by the State of Alaska in 18 AAC 75 to be the only ARAR for groundwater. Only one COC groundwater cleanup level has changed since the time of the DD: the GRO cleanup level has increased from 1.3 mg/L to 2.2 mg/L. The GRO cleanup level identified in the DD remains 1.3 mg/L. No formal request has been made at this time to adjust the GRO cleanup levels because GRO does not exceed the current DD cleanup levels.

Are there newly promulgated standards that might apply or be relevant and appropriate to the site and that bear on the protectiveness of the remedy?

Yes, the cleanup level for ethylbenzene has decreased from 0.7 mg/L to 0.015 mg/L. Although this is a DD groundwater COC, it was not detected during the 2018 sampling effort in exceedance of the current ADEC criteria. The ADEC cleanup level for arsenic in groundwater has decreased from 0.01 mg/L to 0.00052 mg/L. Arsenic was detected in the total and dissolved samples above the new criteria.

What is the basis for each cleanup level identified in the ROD? Have there been changes to the basis of the cleanup levels?

18 AAC 75 was the basis for each cleanup level identified for groundwater. The ADEC cleanup level for arsenic in groundwater has decreased from 0.01 mg/L to 0.00052 mg/L due to a change from the EPA MCL as the basis of the 18 AAC 75 cleanup level to a calculated risk-based cleanup level (ADEC 2015). Ethylbenzene decreased from 0.7 mg/L to 0.015 mg/L as the result of incorporating the child receptor into the calculation of the risk-based cleanup level. In addition to the changes to ethylbenzene and arsenic, manganese has been added as a hazardous substance with an associated cleanup level due to detections of this analyte on contaminated sites across Alaska, but not due to a change in the understanding of toxicity.

Changes in Exposure Pathways

Has land use or expected land use on or near the site changed?

No, the current land use and expected land use have not changed at the site.

Have any human health or ecological routes of exposure or receptors changed or been newly identified?

No, human health or ecological routes of exposures or receptors have not changed or been newly identified.

Are there newly identified contaminants or contaminant sources?

Yes, contaminants naphthalene, 1-methylnaphthalene, 2-methylnaphthalene, and manganese have been detected in groundwater at the MOC above the current ADEC groundwater cleanup levels. These contaminants were not DD COCs for groundwater at the MOC; however, they have been monitored during every monitoring event and are expected to decrease with the DD COCs.

Are there unanticipated toxic byproducts of the remedy not previously addressed by the DD?

No, there were no unanticipated toxic byproducts of the remedy not previously addressed by the DD.

Have physical site conditions changed such that protectiveness may be affected? Has understanding of physical site conditions changed?

No, physical site conditions have not changed such that current protectiveness may be affected. However, one partially decommissioned well was observed at Site 19 which may be acting as a direct conduit to groundwater.

Changes in Toxicity and Other Contaminant Characteristics

Have toxicity factors for COCs at the site changed? Have other contaminant characteristics changed? Have ecological toxicity reference values and/or NOAELs/LOAELs changed?

Toxicity factors and contaminant characteristics for DRO, GRO, RRO, benzene, ethylbenzene, arsenic, and lead have not changed; however, ADEC has reduced the cleanup level in groundwater for arsenic. In addition, manganese was added as a hazardous substance but the toxicity for manganese has not changed.

Maximum concentrations of analytes detected in 2018 were evaluated for risk (Appendix B). Those analytes which exceeded the current 18 AAC 75 groundwater cleanup level and did not have a DD cleanup level, or those analytes which had a DD cleanup level but the current criteria are more conservative than that of the SSCL, were further evaluated for their contribution to human health risk. During the promulgation of the October 2018, 18 AAC 75, manganese was added as a hazardous substance, prompting evaluation of risk for manganese at the site. Manganese resulted in a hazard quotient of 8.03, which is greater than the acceptable hazard quotient of 1. Naphthalene also resulted in a hazard quotient exceeding the acceptable hazard quotient with a calculated value of 4.75. Of those evaluated for carcinogenic risk, 1-methylnaphthalene did not exceed the EPA acceptable risk range (1.0×10^{-4} to 1.0×10^{-6}). Naphthalene exceeded this risk range with a calculated value of 1.76×10^{-4}. Groundwater elevations during this sampling event were higher than previous years and may have been in direct contact with source area contamination at the time of sampling, resulting in higher concentrations of fuel and fuel-constituents than previously detected.

Changes in Risk Assessment Methods

None identified.

Expected Progress Toward Meeting RAOs

Current data is insufficient to evaluate whether RAOs for MOC groundwater will be met using MNA.

Question C: *Has any other information come to light that could call into question the protectiveness of the remedy?*
Answer: *No.*

6.6 SITE 10: BURIED DRUMS

Question A: *Is the remedy functioning as intended in the DD?*
Answer: *Yes.*

Remedial Action Performance

The contingency remedy of excavation and removal of petroleum-contaminated soil was conducted in 2012 and 2013. Additional contaminants not anticipated by the DD were encountered in 2012 and removed in 2013. In the first FYR, it was identified that there was no indication that surface-stained soil or the five locations of the highest surface soil samples (up to 26,500 mg/kg DRO in 1994) were removed. In 2014, two excavations were completed after additional sampling confirmed the 1994 exceedances. Final confirmation sample results were all below the SSCLs. The remedy for groundwater at this site is MNA. Monitoring is ongoing.

Systems Operations/O&M

Periodic reviews are required at Site 10 until all selected remedies are complete.

Implementation of LUCs and Other Measures

The selected remedy for Site 10 included the implementation an LUC to prevent the use of the aquifer for drinking water purposes until cleanup levels are met. At the time of this review, the LUC had not been implemented.

Opportunities for Optimization

None identified.

Early Indicators of Potential Issues

None identified.

Question B: *Are the exposure assumption, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?*
Answer: *Yes.*

Changes in Standards and TBCs

Are there changes in the standards identified as ARARs in the ROD that bear protectiveness of the remedy?

The DD listed 18 AAC 75.341 as the ARAR for soil. For those compounds listed as COCs, the cleanup level has either not changed or the site-specific values were calculated using a Method Four risk assessment and the non-carcinogenic or carcinogenic toxicity has not changed.

Are there newly promulgated standards that might apply or be relevant and appropriate to the site and that bear on the protectiveness of the remedy?

There are no newly promulgated standards for the COC in soil at Site 10.

What is the basis for each cleanup level identified in the ROD? Have there been changes to the basis of the cleanup levels?

The cleanup levels for DRO in soil were calculated site-specific values. A soil cleanup level change for DRO has not occurred under 18 AAC 75.

Changes in Exposure Pathways

Has land use or expected land use on or near the site changed?

No, the current land use and expected land use on or near the site has not changed.

Have any human health or ecological routes of exposure or receptors changed or been newly identified?

No, human health or ecological routes of exposures or receptors have not changed or been newly identified.

Are there newly identified contaminants or contaminant sources?

Additional analytes were identified at Site 10 following the signature of the DD. In 2012, these analytes were detected at concentrations that exceeded the cleanup level established in the DD or the 18 AAC 75 migration to groundwater cleanup level (USACE 2013c). Remedial activities conducted in 2013 removed the identified contaminants to the maximum extent practicable (USACE 2014).

In 2014, drums were encountered during excavation of petroleum-contaminated soil, as a follow-up to a recommendation made in the first FYR (USACE 2015b), at historic sampling locations. The drums contained approximately 20 gallons of tar and soil surrounding the drums exceeded screening criteria for DRO, RRO, 1,2-dibromoethene, and PCE. Following excavation, one confirmation and duplicate sample contained 1,1-dichloroethene at concentrations of 0.058 mg/kg (J-, B-flagged) and 0.110 mg/kg, respectively, exceeding the 18 AAC 75 migration to groundwater cleanup level of 0.030 mg/kg at that time. However, these concentrations are below the ADEC 2018 migration to groundwater criterion of 1.2 mg/kg (ADEC 2018b).

Are there unanticipated toxic byproducts of the remedy not previously addressed by the DD?

No, there were no unanticipated toxic byproducts of the remedy not previously addressed by the DD.

Have physical site conditions changed such that protectiveness may be affected? Has understanding of physical site conditions changed?

No, physical site conditions have not changed such that current protectiveness may be affected.

Changes in Toxicity and Other Contaminant Characteristics

Have toxicity factors for COCs at the site changed? Have other contaminant characteristics changed? Have ecological toxicity reference values and/or NOAELs/LOAELs changed?

No, toxicity factors and contaminant characteristics for DRO have not changed.

Changes in Risk Assessment Methods

None identified.

Expected Progress Toward Meeting RAOs

RAOs are expected to be met upon completion of the remedy.

Question C: *Has any other information come to light that could call into question the protectiveness of the remedy?*
Answer: *No.*

6.7 SITE 11: FUEL TANKS

Question A: *Is the remedy functioning as intended in the DD?*
Answer: *Yes.*

Remedial Action Performance

The contingency remedy of excavation has been implemented. Excavation was initiated in 2011 and continued in 2013 and 2014. Contamination remains on the site above the SSCLs due to concern for impact to the Site 28 wetland and excavation limitations below groundwater.

Systems Operations/O&M

Periodic reviews are required at Site 11 until all selected remedies are complete.

Implementation of LUCs and Other Measures

The selected remedy for Site 11 included the implementation of an LUC to prevent the use of the aquifer for drinking water purposes until cleanup levels are met. At the time of this review, the LUC had not been implemented.

Opportunities for Optimization

None identified.

Early Indicators of Potential Issues

None identified.

Question B: *Are the exposure assumption, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?*
Answer: *Yes.*

Changes in Standards and TBCs

Are there changes in the standards identified as ARARs in the ROD that bear protectiveness of the remedy?

The COC at Site 11 is DRO in soil. The DD listed 18 AAC 75 as the ARAR for soil. For DRO, the cleanup level has not changed, and the site-specific values were calculated using a Method Four risk assessment and the non-carcinogenic or carcinogenic toxicity has not changed.

Are there newly promulgated standards that might apply or be relevant and appropriate to the site and that bear on the protectiveness of the remedy?

There are no newly promulgated standards for the COC in soil at Site 11.

What is the basis for each cleanup level identified in the ROD? Have there been changes to the basis of the cleanup levels?

The cleanup levels for DRO in soil were calculated site-specific values. A soil cleanup level change for DRO has not occurred under 18 AAC 75.

Changes in Exposure Pathways

Has land use or expected land use on or near the site changed?

No, the current land use and expected land use on or near the site has not changed.

Have any human health or ecological routes of exposure or receptors changed or been newly identified?

No, human health or ecological routes of exposures or receptors have not changed or been newly identified.

Are there newly identified contaminants or contaminant sources?

No, there were no new identified contaminants or contaminant sources.

Are there unanticipated toxic byproducts of the remedy not previously addressed by the DD?

No, there were no unanticipated toxic byproducts of the remedy not previously addressed by the DD.

Have physical site conditions changed such that protectiveness may be affected? Has understanding of physical site conditions changed?

No, physical site conditions have not changed such that current protectiveness may be affected.

Changes in Toxicity and Other Contaminant Characteristics

Have toxicity factors for COCs at the site changed? Have other contaminant characteristics changed? Have ecological toxicity reference values and/or NOAELs/LOAELs changed?

No, toxicity factors and contaminant characteristics for DRO have not changed.

Changes in Risk Assessment Methods

None identified.

Expected Progress Toward Meeting RAOs

RAOs are expected to be met upon completion of the remedy.

Question C: *Has any other information come to light that could call into question the protectiveness of the remedy?*
Answer: *No.*

6.8 SITE 13: HEAT AND POWER PLANT

Question A: *Is the remedy functioning as intended in the DD?*
Answer: *Yes.*

Remedial Action Performance

The remedy of excavation and removal of petroleum- and PCB-contaminated soil is functioning as described in the DD. The excavation portion of the remedy was initiated in 2010 and completed in 2014. Groundwater monitoring is ongoing.

Systems Operations/O&M

Periodic reviews are required at Site 13 until all selected remedies are complete.

Implementation of LUCs and Other Measures

The selected remedy for Site 13 included the implementation of an LUC to prevent the use of the aquifer for drinking water purposes until cleanup levels are met. At the time of this review, the LUC had not been implemented.

Opportunities for Optimization

None identified.

Early Indicators of Potential Issues

None identified.

Question B: *Are the exposure assumption, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?*
Answer: *Yes.*

Changes in Standards and TBCs

Are there changes in the standards identified as ARARs in the ROD that bear protectiveness of the remedy?

The COCs at Site 13 are DRO, benzene, and PCBs in soil. The DD listed 18 AAC 75 as the ARAR for soil. For DRO and PCBs, the cleanup levels have not changed. The DD cleanup levels for benzene and DRO were site-specific values calculated using a Method Four risk assessment and the non-carcinogenic or carcinogenic toxicity has not changed. The DD DRO cleanup level (9,200 mg/kg) was more conservative than the current human health cleanup level (10,250 mg/kg).

From 2008 to 2016, the benzene cleanup levels were 150 mg/kg for direct contact and 11 mg/kg for outdoor inhalation. The current ADEC cleanup level is the more conservative of the values, 11 mg/kg, and is now a “Human Health” cleanup level. The DD cleanup level for benzene at the site (2 mg/kg) was much more conservative than the ARAR.

Are there newly promulgated standards that might apply or be relevant and appropriate to the site and that bear on the protectiveness of the remedy?

No, the newly promulgated ADEC standards were changed to align more closely with the toxicity information published in IRIS (EPA 2018b). The SSCL for benzene and DRO were calculated using a Method Four risk assessment and the non-carcinogenic or carcinogenic toxicity has not changed for those analytes. The ADEC cleanup level for PCBs has not changed.

What is the basis for each cleanup level identified in the ROD? Have there been changes to the basis of the cleanup levels?

Yes, there have been changes to the cleanup levels; however, the non-carcinogenic or carcinogenic toxicity have not changed for DRO or benzene. The cleanup level for PCBs has not changed.

Changes in Exposure Pathways

Has land use or expected land use on or near the site changed?

No, the current land use and expected land use on or near the site have not changed.

Have any human health or ecological routes of exposure or receptors changed or been newly identified?

No, human health or ecological routes of exposures or receptors have not changed or been newly identified.

Are there newly identified contaminants or contaminant sources?

No, there were no new identified contaminants or contaminant sources.

Are there unanticipated toxic byproducts of the remedy not previously addressed by the DD?

No, there were no unanticipated toxic byproducts of the remedy not previously addressed by the DD.

Have physical site conditions changed such that protectiveness may be affected? Has understanding of physical site conditions changed?

No, physical site conditions have not changed such that current protectiveness may be affected.

Changes in Toxicity and Other Contaminant Characteristics

Have toxicity factors for COCs at the site changed? Have other contaminant characteristics changed? Have ecological toxicity reference values and/or NOAELs/LOAELs changed?

No, toxicity factors and contaminant characteristics for DRO, benzene, and PCBs have not changed.

Changes in Risk Assessment Methods

None identified.

Expected Progress Toward Meeting RAOs

RAOs are expected to be met upon completion of the remedy.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?
Answer: No.

6.9 SITE 15: FUEL PIPELINE

Question A: Is the remedy functioning as intended in the DD?
Answer: Yes.

Remedial Action Performance

The contingency remedy of excavation has been implemented. Excavation was completed in 2012. Contamination remains on the site above the SSCLs due to excavation limitations below groundwater. Groundwater monitoring is ongoing.

Systems Operations/O&M

When the excavation remedy is complete repair/refurbish existing wells. Periodic reviews are required at Site 15 until all selected remedies are complete.

Implementation of LUCs and Other Measures

The selected remedy for Site 15 included the implementation of an LUC to prevent the use of the aquifer for drinking water purposes until cleanup levels are met. At the time of this review, the LUC had not been implemented.

Opportunities for Optimization

None identified.

Early Indicators of Potential Issues

None identified.

Question B: Are the exposure assumption, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?
Answer: Yes.

Changes in Standards and TBCs

Are there changes in the standards identified as ARARs in the ROD that bear protectiveness of the remedy?

The COC at Site 15 is DRO in soil. The DD listed 18 AAC 75 as the ARAR for soil. For DRO, the cleanup level has not changed, and the site-specific values were calculated using a Method Four risk assessment and the non-carcinogenic or carcinogenic toxicity has not changed.

Are there newly promulgated standards that might apply or be relevant and appropriate to the site and that bear on the protectiveness of the remedy?

There are no newly promulgated standards for the COC in soil at Site 15.

What is the basis for each cleanup level identified in the ROD? Have there been changes to the basis of the cleanup levels?

The cleanup levels for DRO in soil were calculated site-specific values. A soil cleanup level change for DRO has not occurred under 18 AAC 75.

Changes in Exposure Pathways

Has land use or expected land use on or near the site changed?

No, the current land use and expected land use on or near the site has not changed.

Have any human health or ecological routes of exposure or receptors changed or been newly identified?

No, human health or ecological routes of exposures or receptors have not changed or been newly identified.

Are there newly identified contaminants or contaminant sources?

No, there were no new identified contaminants or contaminant sources.

Are there unanticipated toxic byproducts of the remedy not previously addressed by the DD?

No, there are no unanticipated toxic byproducts of the remedy not previously addressed by the DD.

Have physical site conditions changed such that protectiveness may be affected? Has understanding of physical site conditions changed?

No, physical site conditions have not changed such that current protectiveness may be affected.

Changes in Toxicity and Other Contaminant Characteristics

Have toxicity factors for COCs at the site changed? Have other contaminant characteristics changed? Have ecological toxicity reference values and/or NOAELs/LOAELs changed?

No, toxicity factors and contaminant characteristics for DRO have not changed.

Changes in Risk Assessment Methods

None identified.

Expected Progress Toward Meeting RAOs

RAOs are expected to be met upon completion of the remedy.

Question C: *Has any other information come to light that could call into question the protectiveness of the remedy?*
Answer: *No.*

6.10 SITE 16: PAINT AND DOPE STORAGE

Question A: *Is the remedy functioning as intended in the DD?*
Answer: *Yes.*

Remedial Action Performance

The remedy of excavation and removal of PCB-contaminated soil is functioning as described in the DD. Excavation was completed in 2010.

Systems Operations/O&M

Periodic reviews are required at Site 16 until all selected remedies are complete.

Implementation of LUCs and Other Measures

The selected remedy for Site 16 included the implementation of an LUC to prevent the use of the aquifer for drinking water purposes until cleanup levels are met. At the time of this review, LUCs had not been implemented.

Opportunities for Optimization

None identified.

Early Indicators of Potential Issues

None identified.

Question B:	*Are the exposure assumption, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?*
Answer:	*Yes.*

Changes in Standards and TBCs

Are there changes in the standards identified as ARARs in the ROD that bear protectiveness of the remedy?

The COC for Site 16 is PCB in soil. The DD listed 18 AAC 75 as the ARAR for soil. The ADEC cleanup level for PCBs have not changed.

Are there newly promulgated standards that might apply or be relevant and appropriate to the site and that bear on the protectiveness of the remedy?

There were no newly promulgated standards for the COC in soil at Site 16.

What is the basis for each cleanup level identified in the ROD? Have there been changes to the basis of the cleanup levels?

The cleanup level for PCB in soil was the ADEC cleanup level under 18 AAC 75. There have been no changes to the cleanup level.

Changes in Exposure Pathways

Has land use or expected land use on or near the site changed?

No, the current land use and expected land use on or near the site have not changed.

Have any human health or ecological routes of exposure or receptors changed or been newly identified?

No, human health or ecological routes of exposures or receptors have not changed or been newly identified.

Are there newly identified contaminants or contaminant sources?

No, there were no new identified contaminants or contaminant sources.

Are there unanticipated toxic byproducts of the remedy not previously addressed by the DD?

No, there were no unanticipated toxic byproducts of the remedy not previously addressed by the DD.

Have physical site conditions changed such that protectiveness may be affected? Has understanding of physical site conditions changed?

No, physical site conditions have not changed such that current protectiveness may be affected.

Changes in Toxicity and Other Contaminant Characteristics

Have toxicity factors for COCs at the site changed? Have other contaminant characteristics changed? Have ecological toxicity reference values and/or NOAELs/LOAELs changed?

No, toxicity factors and contaminant characteristics for PCBs have not changed.

Changes in Risk Assessment Methods

None identified.

Expected Progress Toward Meeting RAOs

RAOs are expected to be met upon completion of the remedy.

Question C: *Has any other information come to light that could call into question the protectiveness of the remedy?*
Answer: *No.*

6.11 SITE 19: AUTO MAINTENANCE

Question A: *Is the remedy functioning as intended in the DDs?*
Answer: *Yes.*

Remedial Action Performance

The remedy of excavation and removal of petroleum-contaminated soil is functioning as described in the DD. Excavation was initiated in 2011 and completed in 2012. Groundwater monitoring is ongoing.

Systems Operations/O&M

Periodic reviews at Site 19 are required until all selected remedies are complete.

Implementation of LUCs and Other Measures

The selected remedy for Site 19 included the implementation of an LUC to prevent the use of the aquifer for drinking water purposes until cleanup levels are met. At the time of this review, the LUC had not been implemented.

Opportunities for Optimization

None identified.

Early Indicators of Potential Issues

None identified.

Question B: *Are the exposure assumption, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?*
Answer: *Yes.*

Changes in Standards and TBCs

Are there changes in the standards identified as ARARs in the ROD that bear protectiveness of the remedy?

The COC at Site 19 is DRO in soil. The DD listed 18 AAC 75 as the ARAR for soil. The DD listed 18 AAC 75 as the ARAR for soil. For DRO, the cleanup level has not changed, the site-specific values were calculated using a Method Four risk assessment, and the non-carcinogenic or carcinogenic toxicity has not changed.

Are there newly promulgated standards that might apply or be relevant and appropriate to the site and that bear on the protectiveness of the remedy?

There are no newly promulgated standards for the COC in soil at Site 19.

What is the basis for each cleanup level identified in the ROD? Have there been changes to the basis of the cleanup levels?

The cleanup levels for DRO in soil were calculated site-specific values. A soil cleanup level change for DRO has not occurred under 18 AAC 75.

Changes in Exposure Pathways

Has land use or expected land use on or near the site changed?

No, the current land use and expected land use on or near the site has not changed.

Have any human health or ecological routes of exposure or receptors changed or been newly identified?

No, human health or ecological routes of exposures or receptors have not changed or been newly identified.

Are there newly identified contaminants or contaminant sources?

No, there were no new identified contaminants or contaminant sources.

Are there unanticipated toxic byproducts of the remedy not previously addressed by the DD?

No, there were no unanticipated toxic byproducts of the remedy not previously addressed by the DD.

Have physical site conditions changed such that protectiveness may be affected? Has understanding of physical site conditions changed?

No, physical site conditions have not changed such that current protectiveness may be affected.

Changes in Toxicity and Other Contaminant Characteristics

Have toxicity factors for COCs at the site changed? Have other contaminant characteristics changed? Have ecological toxicity reference values and/or NOAELs/LOAELs changed?

No, toxicity factors and contaminant characteristics for DRO have not changed.

Changes in Risk Assessment Methods

None identified.

Expected Progress Toward Meeting RAOs

RAOs are expected to be met upon completion of the remedy.

Question C: *Has any other information come to light that could call into question the protectiveness of the remedy?*

Answer: *No.*

6.12 SITE 27: DIESEL FUEL PUMP

Question A: *Is the remedy functioning as intended in the DDs?*
Answer: *Yes.*

Remedial Action Performance

The remedy of excavation and removal of petroleum-contaminated soil was implemented for DRO and RRO in soil. The excavation portion of the remedy was initiated in 2012 and ended in 2014. Excavation was terminated on the northern edges of the D2 and D3 UVOST plumes due to concerns about impact to the Site 28 wetland. Groundwater monitoring is ongoing.

Systems Operations/O&M

Periodic reviews are required at Site 27 until all selected remedies are complete.

Implementation of LUCs and Other Measures

The selected remedy for Site 27 included the implementation of an LUC to prevent the use of the aquifer for drinking water purposes until cleanup levels are met. At the time of this review, the LUC had not been implemented.

Opportunities for Optimization

None identified.

Early Indicators of Potential Issues

The currently analyte list for soil does not appear to cover all site COCs. Soil excavation confirmation samples were analyzed for DRO and RRO only. However, naphthalene was previously detected at this site in concentrations exceeding the SSCL. Naphthalene also exceeds its cleanup criterion in the sediment downgradient from this site at Site 28. Post-excavation samples from Site 28, Sediment Removal Area 2 detected naphthalene at concentrations up to 450 mg/kg (USACE 2013b).

Question B: *Are the exposure assumption, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?*
Answer: *Yes.*

Changes in Standards and TBCs

Are there changes in the standards identified as ARARs in the ROD that bear protectiveness of the remedy?

The COCs at Site 27 are DRO, benzene, and naphthalene in soil. The DD listed 18 AAC 75 as the ARAR for soil. The DRO SSCL of 9,200 mg/kg is more conservative than the ADEC cleanup level of 10,250 mg/kg. From 2008 to 2016, the benzene cleanup levels were 150 mg/kg for direct contact and 11 mg/kg for outdoor inhalation. The ADEC cleanup level was the more conservative of the values, 11 mg/kg, and currently a "human health" cleanup level. The DD cleanup level for benzene at the site (2 mg/kg) was much more conservative than the ARAR. At the time of the DD, naphthalene ADEC cleanup levels were 1400 mg/kg for direct contact and 28.0 mg/kg for outdoor inhalation in the previous regulation. The new ADEC "human health" criterion for naphthalene, which is derived from a combined exposure of direct contact and outdoor inhalation, is 29.0 mg/kg. The understanding of toxicity for this analyte has not changed.

Although the DD cleanup level of 120 mg/kg for naphthalene was greater than the new ADEC cleanup level, the DD cleanup level for naphthalene is a site-specific value that was calculated based on risk and exposure pathways. Additionally, the samples collected and analyzed for naphthalene in 2014 were below the DD cleanup level. The 2001 sample location of a naphthalene exceedance of 191 mg/kg could not be relocated and was likely removed during previous excavation activities at the MOC.

Are there newly promulgated standards that might apply or be relevant and appropriate to the site and that bear on the protectiveness of the remedy?

No, the newly promulgated ADEC standards were changed to align more closely with the toxicity information published in IRIS (EPA 2018b). The toxicity information in IRIS for benzene and naphthalene have not been revised since the publication of the DD.

What is the basis for each cleanup level identified in the ROD? Have there been changes to the basis of the cleanup levels?

The basis for each cleanup level in soil is 18 AAC 75. There have been no changes to the DRO cleanup level. Benzene and naphthalene have changed; however, toxicity information has not changed.

Changes in Exposure Pathways

Has land use or expected land use on or near the site changed?

No, the current land use and expected land use on or near the site have not changed.

Have any human health or ecological routes of exposure or receptors changed or been newly identified?

No, human health or ecological routes of exposures or receptors have not changed or been newly identified.

Are there newly identified contaminants or contaminant sources?

No, there were no new identified contaminants or contaminant sources.

Are there unanticipated toxic byproducts of the remedy not previously addressed by the DD?

No, there were no unanticipated toxic byproducts of the remedy not previously addressed by the DD.

Have physical site conditions changed such that protectiveness may be affected? Has understanding of physical site conditions changed?

No, physical site conditions have not changed such that current protectiveness may be affected.

Changes in Toxicity and Other Contaminant Characteristics

Have toxicity factors for COCs at the site changed? Have other contaminant characteristics changed? Have ecological toxicity reference values and/or NOAELs/LOAELs changed?

No, toxicity factors and contaminant characteristics for DRO, benzene, and naphthalene have not changed.

Changes in Risk Assessment Methods

None identified.

Expected Progress Toward Meeting RAOs

RAOs are expected to be met upon completion of the remedy.

Question C: *Has any other information come to light that could call into question the protectiveness of the remedy?*
Answer: *No.*

6.13 SITE 28: DRAINAGE BASIN

Question A: *Is the remedy functioning as intended in the DD?*
Answer: *No.*

Remedial Action Performance

The selected remedy for Site 28 consisted of two components: excavation and removal of petroleum-, PCB-, and metals-contaminated sediment, including the (1) removal of submerged sediments from the narrow channel upgradient of the Suqi River, and (2) construction of a sedimentation pond or other appropriate controls. The ends of the culverts would also be cleaned out and removed or plugged to prevent direct outflows of upgradient residual sources of contamination.

The culverts were removed in 2010. Excavation of contaminated sediments occurred in 2012 and 2013 after additional investigation was conducted in 2011 and 2012. Sediment migration was controlled by an in-stream sediment trap installed in 2012 while remedial activities were in progress. The in-stream sediment trap was removed prior to demobilization at the end of each field season.

Follow-up sediment mapping and sampling was conducted in 2018 to establish if sediment was re-accumulating following the removal efforts and determine if the re-accumulated sediment contained contamination above the SSCLs. It was determined that approximately 196 of the 281 cubic yards of sediment remaining in the Site 28 drainage contained contaminated material above the SSCLs. PAHs, PCBs, and metals concentrations were below the SSCLs. Exceedances of DRO and RRO do not occur beyond the natural stilling area. This distribution of contamination indicates the existing wetland is preventing contaminants above risk-based cleanup levels from moving downgradient from the natural stilling area to the Suqi River.

Systems Operations/O&M

Periodic Reviews are required at Site 28 until RAOs are met.

Opportunities for Optimization

None identified.

Early Indicators of Potential Issues

Contamination in sediment remains on site above SSCLs following remedial actions (sediment removal). Based on 2018 sediment measurements and analytical data, sediment re-accumulation did not appear to be a significant mechanism which would fully explain the volume of contaminated sediment observed in 2018. Additionally, subsurface soil contamination appears to be present at Site 28 on the southern boundary with the MOC. MOC excavations did not proceed into Site 28 at UVOST plumes D2, D3, I1, and J1B emanating from Site 11, due to concern of adversely impacting the wetland environment; however, no remedy for subsurface soil is included for Site 28.

Implementation of LUCs and Other Measures

The selected remedy for Site 28 included the implementation of an LUC to inform potential future landowners of the nature and extent of residual sediment contamination at Site 28 (USACE 2009a). At the time of this review, the LUC had not been implemented.

Question B: *Are the exposure assumption, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?*

Answer: *Yes.*

Changes in Standards and TBCs

Are there changes in the standards identified as ARARs in the ROD that bear protectiveness of the remedy?

The COCs at Site 28 are DRO, RRO, 2-methylnaphthalene, acenaphthene, fluoranthene, fluorene, PCBs, phenanthrene, naphthalene, chromium, lead, and zinc in sediment. The DD cleanup levels were derived from a combination of the *Sediment Management Standards* Chapter 173-204-520 (WAC 2013) and *Consensus-Based Sediment Quality Guidelines* (Wisconsin Department of Natural Resource 2003). For this Periodic Review, COC cleanup levels were compared to the EPA *Region 4 Ecological Risk Assessment Supplemental Guidance*, Table 2b, Sediment Screening Values for Hazardous Waste Sites for Narcotic Mode of Action (EPA 2018a). The freshwater sediment screening value, ecological screening value was used for comparison.

Are there newly promulgated standards that might apply or be relevant and appropriate to the site and that bear on the protectiveness of the remedy?

The WAC standard was updated in February 2013 (WAC 2013); Table III now appears in 173-204-562. For those analytes for which the WAC 173-204-520 was used, there were no changes to the cleanup level except for the high-molecular weight PAH (HPAH) value. The DD RAO was 9.6 mg/kg for the HPAH sum; however, the current WAC for HPAH is 53 mg/kg. The EPA Region 4 screening value for HPAH is 1,000 mg/kg. The DD cleanup level is more conservative than the current WAC standard and EPA Region 4 screening value.

Changes in Exposure Pathways

Has land use or expected land use on or near the site changed?

No, the current land use and expected land use on or near the site have not changed.

Have any human health or ecological routes of exposure or receptors changed or been newly identified?

No, human health or ecological routes of exposures or receptors have not changed or been newly identified.

Changes in Toxicity and Other Contaminant Characteristics

Are there newly identified contaminants or contaminant sources?

No, there were no new identified contaminants or contaminant sources.

Are there unanticipated toxic byproducts of the remedy not previously addressed by DD?

No, there were no unanticipated toxic byproducts of the remedy not previously addressed by the DD.

Changes in Risk Assessment Methods

Have physical site conditions changed such that protectiveness may be affected? Has understanding of physical site conditions changed?

No, physical site conditions have not changed such that current protectiveness may be negatively affected. However, it appears there is a natural stilling area downgradient from Area 9 (Figures A-17 through A-20) that is not allowing sediment contamination to migrate beyond the feature and into the Suqi River.

Have toxicity factors for COCs at the site changed? Have other contaminant characteristics changed? Have ecological toxicity reference values and/or NOAELs/LOAELs changed?

PAH cancer slope factors that were adjusted in the IRIS database (EPA 2005) since the time of the DD were benzo(a)pyrene, 1,2,3-trimethylbenzene, 1,3,5-trimethylbenzene, and 1,2,4-trimethylbenzene.

ADEC updated the cleanup levels of DD COC indeno(1,2,3-cd)pyrene in association with the toxicity change to benzo(a)pyrene and increased the migration to groundwater soil cleanup level and the groundwater cleanup level. All changes to cleanup levels were in association with soil and groundwater and human health exposure. The DD cleanup levels for the site are based on ecological exposure in the marine environment.

When comparing the 2018 sampling results to the EPA Region 4 screening values (EPA 2018a), the analytes DRO, RRO, 1-methylnaphthalene, 2-methylnaphthalene, acenaphthene, benzo(a)anthracene, chrysene, naphthalene, fluorene, fluoranthene, phenanthrene, PCBs, arsenic, chromium, lead, pyrene, selenium, and zinc were detected in exceedance of the criteria. Exceedances of the DD cleanup levels included DRO, RRO, acenaphthene, fluorene, 2-methylnaphthalene, naphthalene, total LPAHs, and phenanthrene, which are all fuel-related compounds.

Expected Progress Toward Meeting RAOs

The remedial action (dredging) completed for Site 28 did not perform as expected. In Removal Areas 5 through 7, vegetative material routinely clogged the in-line pumps and the sediment had to be removed by hand. Some dredging was able to continue in Area 7 following removal of sediment by hand. Due to the limited removal efforts in these areas, a re-evaluation of the remedial action (dredging) is recommended to address remaining site contamination.

Question C: *Has any other information come to light that could call into question the protectiveness of the remedy?*
Answer: *No.*

6.14 SITE 32: LOWER TRAMWAY

Question A: *Is the remedy functioning as intended in the DD?*
Answer: *Yes.*

Remedial Action Performance

The selected remedy for Site 32 is excavation and disposal or treatment of DRO-contaminated soil. DRO-contaminated soil identified in the DD was removed in 2014.

System Operations/O&M

In accordance with the 2009 DD (USACE 2009a), Periodic Reviews are required at Site 32 until all selected remedies are complete. The selected remedies have been completed and additional Periodic Reviews are not recommended.

Implementation of LUCs and Other Measures

Not applicable.

Opportunities for Optimization

None identified.

Early Indicators of Potential Issues

None identified.

Question B: *Are the exposure assumption, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?*
Answer: *Yes.*

Changes in Standards and TBCs

Are there changes in the standards identified as ARARs in the ROD that bear protectiveness of the remedy?

The COC at Site 32 is DRO in soil. The DD listed 18 AAC 75 as the ARAR for soil. For DRO, the cleanup level has not changed, the site-specific values were calculated using a Method Four risk assessment, and the non-carcinogenic and carcinogenic toxicities have not changed. The

DD identified soil cleanup levels based on the HHRA (USACE 2004) and continue to be considered protective of future residential use.

Are there newly promulgated standards that might apply or be relevant and appropriate to the site and that bear on the protectiveness of the remedy?

There were no newly promulgated standards for the COC in soil at Site 32.

What is the basis for each cleanup level identified in the ROD? Have there been changes to the basis of the cleanup levels?

The cleanup levels for DRO in soil were calculated site-specific values. A soil cleanup level change for DRO has not occurred under 18 AAC 75.

Changes in Exposure Pathways

Has land use or expected land use on or near the site changed?

No, the current land use and expected land use on or near the site have not changed.

Have any human health or ecological routes of exposure or receptors changed or been newly identified?

No, human health or ecological routes of exposures or receptors have not changed or been newly identified.

Are there newly identified contaminants or contaminant sources?

No, there were no new identified contaminants or contaminant sources.

Are there unanticipated toxic byproducts of the remedy not previously addressed by the DD?

No, there were no unanticipated toxic byproducts of the remedy not previously addressed by the DD.

Have physical site conditions changed such that protectiveness may be affected? Has understanding of physical site conditions changed?

No, physical site conditions have not changed such that current protectiveness may be affected.

Changes in Toxicity and Other Contaminant Characteristics

Have toxicity factors for COCs at the site changed? Have other contaminant characteristics changed? Have ecological toxicity reference values and/or NOAELs/LOAELs changed?

No, toxicity factors and contaminant characteristics for DRO have not changed.

Changes in Risk Assessment Methods

None identified.

Expected Progress Toward Meeting RAOs

RAOs have been met. NFA is recommended.

Question C: *Has any other information come to light that could call into question the protectiveness of the remedy?*
Answer: *No.*

6.15 TECHNICAL ASSESSMENT SUMMARY

Attainment of RAOs is measured through collection of empirical data and data were compared against ARARs. For most of the sites, the remedy is functioning as intended by the DD, but implementation is not yet complete. The remedy is expected to meet RAOs upon completion at Sites 3, 8, 9, 10, 11, 13, 15, 16, 19, 27, 28, and 32.

Vapor intrusion exposure at NEC is not currently an issue due to the absence of housing or habitable structures on the site. However, if residential structures are planned for areas of known soil or groundwater contamination, structures should be constructed in manner that eliminates the potential for vapor intrusion.

7.0 ISSUES

This section summarizes issues and concerns related to current site operations, conditions, or activities that were identified during this Periodic Review. Issues were evaluated to determine if they affected current or future protectiveness of the associated remedy. Table 7-1 summarizes issues identified as affecting the protectiveness of the associated remedy. Table 7-2 summarizes issues identified as not affecting the protectiveness of the associated remedy. Unresolved concerns raised by the community are summarized with responses provided by USACE in Appendix C (Attachment C-1).

Table 7-1
Issues Affecting Protectiveness

Issue No:	Site(s)	Issue	Reference	Affects Current Protectiveness? (Yes/No)	Affects Future Protectiveness? (Yes/No)
1	3, 6, 8, 9, 10, 11, 13, 15, 16, 19, 27, and 28	The following LUCs have not been fully implemented: • Limit future drinking water uses of groundwater at the MOC until cleanup levels are met. • Designate areas unsuitable for drinking water at Sites 3, 6, and 9. • Prevent construction of buildings on top of the landfill at Site 9. • Designate areas unsuitable for residential land use without additional investigation and/or cleanup at Site 8. • Inform potential future landowners of the nature and extent of residual sediment contamination at Site 28.	USACE 2009a	Yes	Yes
2	8	Data from 2016 soil sampling at Site 8 identified the lateral and vertical extent of DRO contamination in soil east of the 2016 sampling area is not delineated.	USACE 2015a USACE 2017b	No	Yes
3	10, 11, 13, 15, 16, 19, 27	Three monitoring wells require maintenance. Monitoring wells 14MW05 and MW88-1 are frost-jacked and the manhole cover is not secure. Monitoring well MW88-3 well lid threads are rusted and the lid cannot be secured. Also, one partially decommissioned well was observed at the MOC which may be acting as a direct conduit to groundwater.	Appendix C	Yes	Yes
4	15	DRO-contaminated soil above the SSCL remains at the floor of the Site 15 G Plume excavation: contamination along the excavation floor at 12 feet bgs, which was 2 feet below groundwater in 2012, as well as, contamination along the excavation sidewall that was not removed during the 2012 excavation. Although the 2013 excavation of the west sidewall reached 15 feet bgs, the contaminated soil along the excavation floor was not removed during the 2013 excavation activity. Current protectiveness is not affected due to the lack of a complete exposure pathway to the receptor and as a result of the depth of contamination.	USACE 2013c	No	Yes

Table 7-1 (Continued)
Issues Affecting Protectiveness

Issue No:	Site(s)	Issue	Reference	Affects Current Protectiveness? (Yes/No)	Affects Future Protectiveness? (Yes/No)
5	28	Sediment contamination above DD cleanup levels remains in Removal Areas 2 through 9 for DD COCs (DRO, RRO, 2-methylnapthalene, and naphthalene). An estimated 196 of the 281 cubic yards of sediment contains compounds at levels above their respective SSCLs.	Appendix F	No	Yes

Note:
For definitions, refer to the Acronyms and Abbreviations section.

Table 7-2
Issues Not Affecting Protectiveness

Issue No:	Site(s)	Issue	Reference	Affects Current Protectiveness? (Yes/No)	Affects Future Protectiveness? (Yes/No)
6	3	A one-quart plastic motor oil container was observed at the site during the 2018 site inspections. Sheen on an ephemeral surface water feature and a plastic motor oil cap was observed at the site during the 2013 site inspections.	Appendix C USACE 2015b	No	No
7	8	Based on changes in site conditions over time (e.g., lack of continuously submerged sediment), sufficient material that met the DD definition of sediment could not be found in any of the three Site 8 DUs in 2018. Therefore, the 2018 MNA sampling at Site 8 did not occur. Additionally, data from the 2016 sampling event suggest undelineated soil contamination is present outside of the DUs used to monitor Site 8.	USACE 2009a USACE 2017b	No	No
8	10	Three groundwater sampling events have occurred in response to recommendation in the first FYR (USACE 2015b) to address a data gap regarding ethylene glycol in groundwater downgradient of Site 10. DRO, RRO, PAHs, PCBs, VOCs, metals and natural attenuation parameters have been monitored in groundwater samples collected from wells MW10-1 and 14MW06. COPCs identified during removal actions in soil such as PCE, 1,1-dichloroethene, 1,2-dibromoethane, 1,1,2,2-tetrachloroethane, 1,2-dichloropropane, and TCE have not been identified in groundwater.	USACE 2016a USACE 2017b Appendix E	No	No
9	28	Post-DD changes to components of the selected remedy at Site 28 have occurred. Installation of a sedimentation pond, as described in the DD has not occurred.	USACE 2016b USACE 2009a	No	No
10	28	Subsurface soil POL contamination is suspected to be present in several areas along the southern end of Site 28, within the UVOST delineated plumes D2, D3, I2, J1B, and between UVOST plumes D and I. This POL contamination originated from Site 11.	USACE 2015b	No	No
11	3, 6, 8, 9, 10,11, 13, 15, 16, 19, 27	Clarification for components of the LUC remedy is needed due to a newly promulgated ADEC regulation.	UECA	No	No

Note:
For definitions, refer to the Acronyms and Abbreviations section.

8.0 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

Recommendations and follow-up actions have been identified to address the issues presented in Section 7. Table 8-1 presents recommendations to issues identified as affecting protectiveness, Table 8-2 presents recommendations to issues identified as not affecting protectiveness, and Table 8-3 presents sites recommended for NFA.

Table 8-1
Recommendations and Follow-up Actions for Issues Affecting Protectiveness

Item No.	Site(s)	Recommendations/Follow-up Actions	Party Responsible	Regulatory Party	Milestone Date[1]	Affects Protectiveness? (Yes/No)	
						Current	Future
1	3, 6, 8, 9, 10, 11, 13, 15, 16, 19, 27	Complete the implementation of LUCs by filing a deed notice anticipated to be in the form of an Environmental Covenant in accordance with the UECA, to record areas identified with residual contamination above DD cleanup levels (USACE 2009a). LUCs at Site 8 should not be implemented until a supplemental soil investigation occurs.	USACE	ADEC	2025	Yes	Yes
2	10, 11, 13, 15, 16, 19,, 27	Conduct maintenance on monitoring wells 14MW05, MW88-1, and MW88-3 and re-survey the top of casing elevations following maintenance. Abandon the partially decommissioned well at Site 19.	USACE	ADEC	2025	Yes	Yes
3	8	Complete a supplemental soil investigation to delineate the lateral and vertical extent of soil contamination east of the 2016 sampling area and revise the location of the historic pipeline spill currently estimated based on 2016 and supplemental sample data. Evaluate exposure risk and protectiveness as part of the next Periodic Review.	USACE	ADEC	2025	No	Yes
4	15	Complete the implementation of the remedy (remove residual DRO-contaminated soil above the SSCL).	USACE	ADEC	2025	No	Yes
5	28	Continue remedy implementation (removal of contaminated sediment) until cleanup levels are met. Conduct pilot testing to assess if effectiveness of remedy implementation (dredging) can be improved.	USACE	ADEC	2025	No	Yes

Notes:
[1] Milestone Date reflects the date by which the recommendation/follow-up action should be completed.
For definitions, refer to the Acronyms and Abbreviations section.

Table 8-2
Recommendations and Follow-up Actions for Issues Not Affecting Protectiveness

Item No.	Site	Recommendations/Follow-up Actions	Party Responsible	Regulatory Party	Milestone Date[1]	Affects Protectiveness? (Yes/No)	
						Current	Future
6	3	Discontinue Site 3 inspections based on non-FUDS activities which are occurring at Site 3 and the lack of post-remedy soil contamination.	USACE	ADEC	2025	No	No
7	8	Discontinue MNA sediment sampling at Site 8 until the supplemental soil investigation is complete.	USACE	ADEC	2025	No	No
8	10	Discontinue groundwater sample analysis for ethylene glycol and VOCs downgradient of Site 10 (monitoring wells MW10-1 and 14MW06) because the previously identified data gap is closed.	USACE	ADEC	2025	No	No
9	28	The contamination remaining at the southern end of Site 28 associated with Site 11 should be documented in an ESD. In addition, formally document in the ESD why continued remedy implementation (excavation) at the site is not feasible due to the presence of shallow groundwater and anticipated significant impacts to wetlands.	USACE	ADEC	2025	No	No
10	28	Complete an ESD for Site 28 to document that construction of a sedimentation pond in Site 28 is not necessary to prevent migration of contaminants above risk-based cleanup levels in the Suqi River.	USACE	ADEC	2025	No	No
11	3,6,8,9, 10,11,13, 15,16,19, 27	The anticipated change from LUCs (i.e., deed notices) in the form of Environmental Covenants in accordance with UECA should be addressed in an ESD document.	USACE	ADEC	2025	No	No

Note:
[1] Milestone Date reflects the date by which the recommendation/follow-up action should be completed.
For definitions, refer to the Acronyms and Abbreviations section.

Table 8-3
Recommendations For No Further Action

Item No.	Site	Recommendations/Follow-up Actions	Party Responsible	Regulatory Party	Milestone Date[1]	Affects Protectiveness? (Yes/No)	
						Current	Future
12	32	Discontinue Site 32 Periodic Reviews because the remedy is complete. Site 32 should be designated as NFA.	USACE	ADEC	2018	No	No

Notes:
[1] Milestone Date reflects the date by which the recommendation/follow-up action should be completed.
For definitions, refer to the Acronyms and Abbreviations section.

9.0 PROTECTIVENESS STATEMENT(S)

Protectiveness statements were developed in accordance with EPA's *Five-Year Review Guidance* (EPA 2001) and are included in this section.

9.1 SITE 3: FUEL PUMP HOUSE

The remedy at Site 3 is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas. Full implementation of the remedy currently affecting protectiveness, which includes the filing of a deed notice, is anticipated to occur by 2021.

9.2 SITE 6: GRAVEL PAD

The remedy at Site 6 is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas. Full implementation of the remedy currently affecting protectiveness, which includes the filing of a deed notice, is anticipated to occur by 2021.

9.3 SITE 8: POL SPILL

The remedy at Site 8 currently protects human health and the environment because there is no direct exposure pathway between the contaminated material and the receptor. However, for the remedy to be protective in the long-term, the following action needs to be taken to ensure protectiveness:

- Delineate the lateral and vertical extent of DRO contamination in soil east of the 2016 sample locations to further evaluate exposure risk and whether or not additional action is necessary to achieve protectiveness.

This effort is anticipated to occur by 2025.

9.4 SITE 9: HOUSING AND OPERATIONS LANDFILL

The remedy at Site 9 is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas. Full implementation of the remedy currently affecting protectiveness, which includes the filing of a deed notice, is anticipated to occur by 2021.

9.5 SITE 10: BURIED DRUMS

The remedy at Site 10 is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas. Full implementation of the remedy currently affecting protectiveness, which includes the filing of a deed notice, is anticipated to occur by 2021.

9.6 SITE 11: FUEL TANKS

The remedy at Site 11 is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas. Full implementation of the remedy currently affecting protectiveness, which includes the filing of a deed notice, is anticipated to occur by 2021.

9.7 SITE 13: HEAT AND POWER PLANT

The remedy at Site 13 is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas. Full implementation of the remedy currently affecting protectiveness, which includes the filing of a deed notice, is anticipated to occur by 2021.

9.8 SITE 15: FUEL PIPELINE

The remedy at Site 15 is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all current exposure pathways that could result in unacceptable risks in these areas. Full implementation of the remedy currently affecting protectiveness, which includes the filing of a deed notice, is anticipated to occur by 2021.

9.9 SITE 16: PAINT AND DOPE STORAGE

The remedy at Site 16 is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas. Full implementation of the remedy currently affecting protectiveness, which includes the filing of a deed notice, is anticipated to occur by 2021.

9.10 SITE 19: AUTO MAINTENANCE

The remedy at Site 19 is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas. Full implementation of the remedy currently affecting protectiveness, which includes the filing of a deed notice, is anticipated to occur by 2021.

9.11 SITE 27: DIESEL FUEL PUMP

The remedy at Site 27 is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas. Full implementation of the remedy currently affecting protectiveness, which includes the filing of a deed notice, is anticipated occur by 2021.

9.12 SITE 28: DRAINAGE CHANNEL

The remedy at Site 28 currently protects human health and the environment because there is no direct exposure pathway between the contaminated material and the receptor. However, for the remedy to be protective in the long-term, the following actions need to be taken to ensure protectiveness:

- Continue remedy implementation (removal of contaminated sediment) where 2018 sediment results indicate COCs are present in sediment above DD-established cleanup levels.
- Conduct pilot testing to assess if effectiveness of sediment removal (dredging) can be improved.
- Inform potential future landowners of the nature and extent of residual sediment contamination at Site 28 through the filing of an informational LUC.

These efforts are anticipated to be completed by 2025.

9.13 SITE 32: LOWER TRAMWAY

The remedy at Site 32 is protective of human health and the environment and is complete. Remedial activities are complete and have adequately addressed all exposure pathways that could result in unacceptable risks in these areas.

10.0 NEXT REVIEW

Reviews are necessary at Sites 3, 6, 8, 9, 10, 11, 13, 15, 16, 19, 27 and 28 on a periodic basis until all selected remedies are complete. These reviews should be completed under one cover on a five-year periodic basis. The triggering action date of the next Periodic Review is the completion date of this Periodic Review. The due date of the next Periodic Review is approximately five years following the completion date of this Periodic Review.

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APPENDIX A
FIGURES

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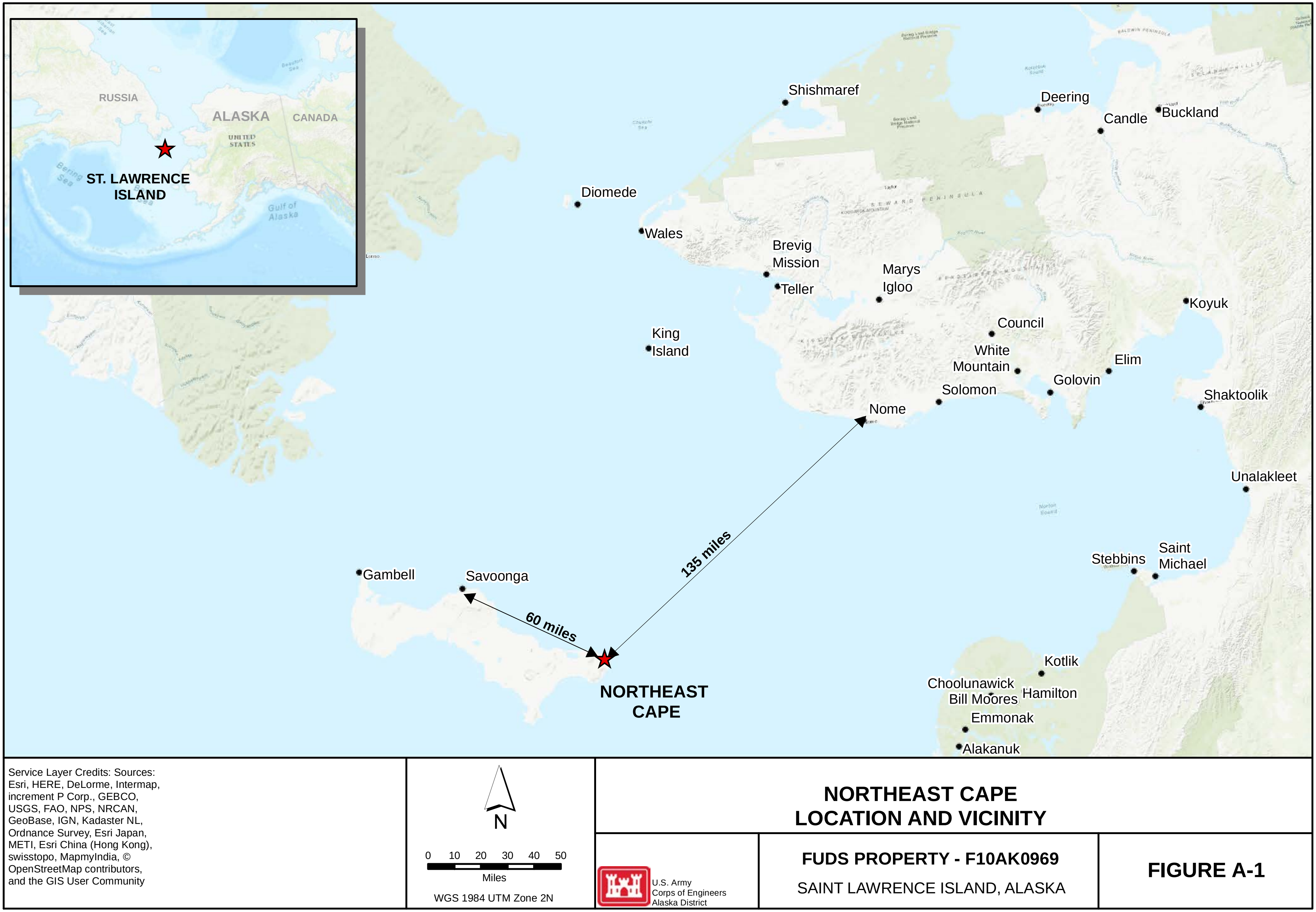


Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

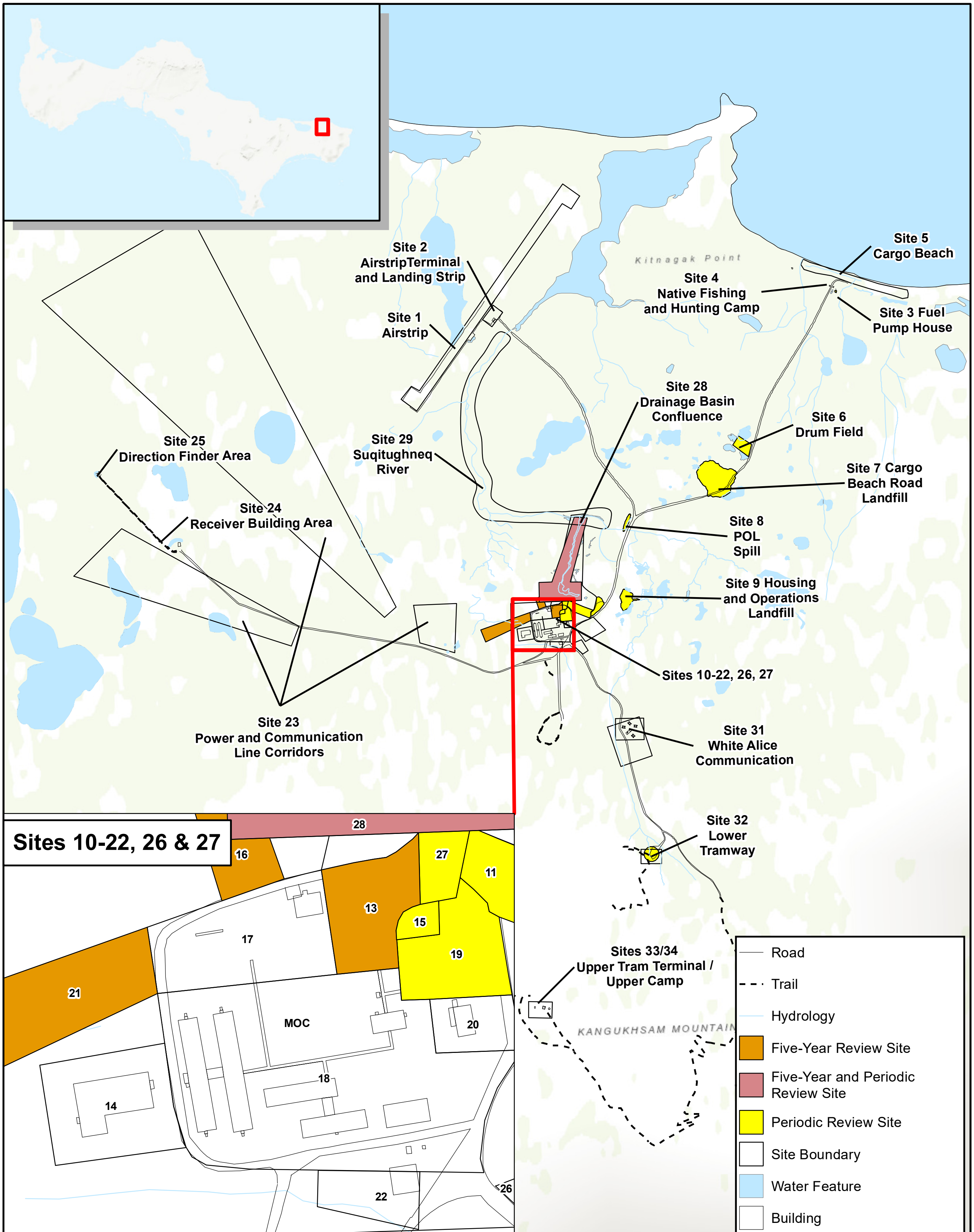
U.S. Army Corps of Engineers Alaska District

NORTHEAST CAPE LOCATION AND VICINITY

FUDS PROPERTY - F10AK0969

SAINT LAWRENCE ISLAND, ALASKA

FIGURE A-1



\\dc1vs01\gisproj\U\USACE\AK_NortheastCape_FUDS_2019PeriodicReview_Sup\01_MXD\FigA-02_PeriodicReviewSites.mxd HuffHA

PERIODIC REVIEW SITES
NORTHEAST CAPE PERIODIC REVIEW

U.S. Army
Corps of Engineers
Alaska District

FUDS PROPERTY - F10AK0969
SAINT LAWRENCE ISLAND, ALASKA

FIGURE A-2

N

0 30 60

FEET

WGS 1984 UTM Zone 2N

SITE 3 - FORMER FUEL PUMP HOUSE
NORTHEAST CAPE PERIODIC REVIEW

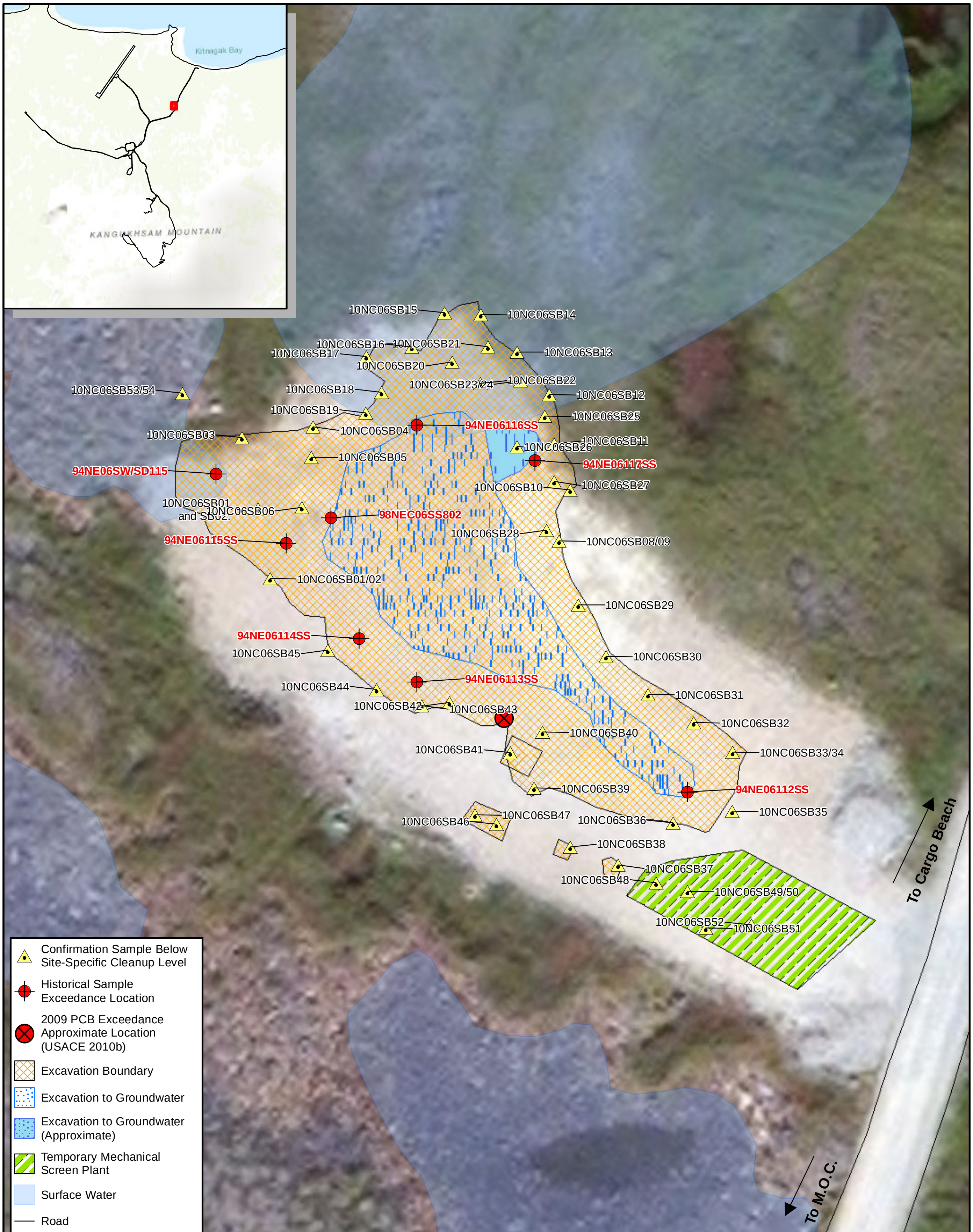
U.S. Army
Corps of Engineers
Alaska District

FUDS PROPERTY - F10AK0969

SAINT LAWRENCE ISLAND, ALASKA

FIGURE A-3

\\dc1vs01\GISProj\J\USACE\AK_NortheastCape_FUDS_2019PeriodicReview_Sup\01_MXD\FigA-03_Site03_FuelPumphouse.mxd beatycj



N

0 30 60

FEET

WGS 1984 UTM Zone 2N

SITE 6 - GRAVEL PAD
NORTHEAST CAPE PERIODIC REVIEW

U.S. Army
Corps of Engineers
Alaska District

FUDS PROPERTY - F10AK0969

SAINT LAWRENCE ISLAND, ALASKA

FIGURE A-4

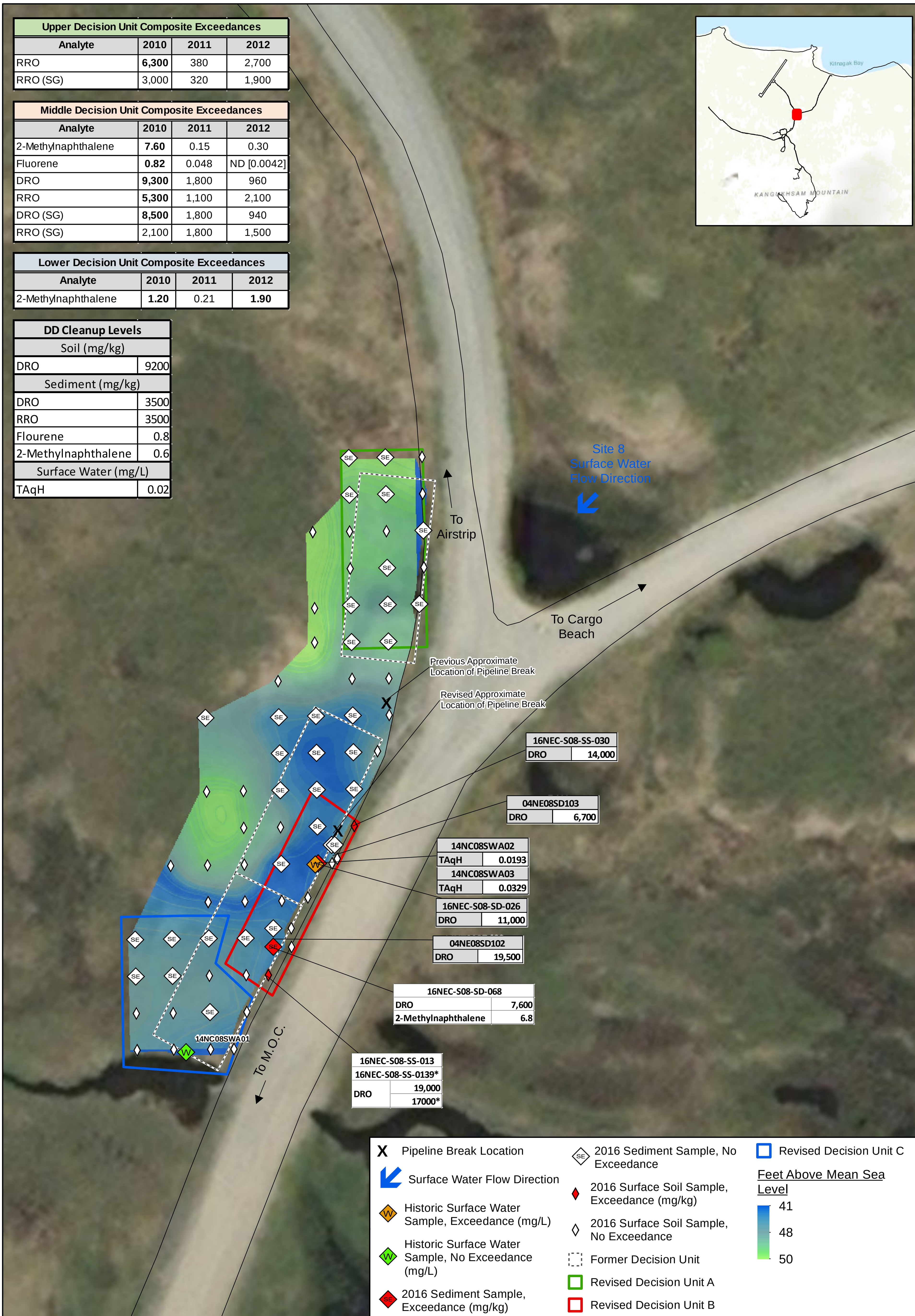
\\dc1vs01\GISProj\J\USACE\AK_NortheastCape_FUDS_2019PeriodicReview_Sup\01_MXD\FigA-04_Site06_GravelPad.mxd beatycj

Upper Decision Unit Composite Exceedances			
Analyte	2010	2011	2012
RRO	**6,300**	380	2,700
RRO (SG)	3,000	320	1,900

Middle Decision Unit Composite Exceedances			
Analyte	2010	2011	2012
2-Methylnaphthalene	**7.60**	0.15	0.30
Fluorene	**0.82**	0.048	ND [0.0042]
DRO	**9,300**	1,800	960
RRO	**5,300**	1,100	2,100
DRO (SG)	**8,500**	1,800	940
RRO (SG)	2,100	1,800	1,500

Lower Decision Unit Composite Exceedances			
Analyte	2010	2011	2012
2-Methylnaphthalene	**1.20**	0.21	**1.90**

DD Cleanup Levels	
Soil (mg/kg)	
DRO	9200
Sediment (mg/kg)	
DRO	3500
RRO	3500
Flourene	0.8
2-Methylnaphthalene	0.6
Surface Water (mg/L)	
TAqH	0.02



Notes:
mg/L = milligram per liter
mg/kg = milligram per kilogram
Soil and Sediment results are in mg/kg
Surface Water results are in mg/L
* = Duplicate Sample
-- = Not Specified
Sediment and soil sample depths ranged from 0.5 to 2.5 feet below ground surface
SG = Silica Gel Cleanup Mathod

N
0 20 40
FEET
WGS 1984 UTM Zone 2N

SITE 8 - POL SPILL
NORTHEAST CAPE PERIODIC REVIEW

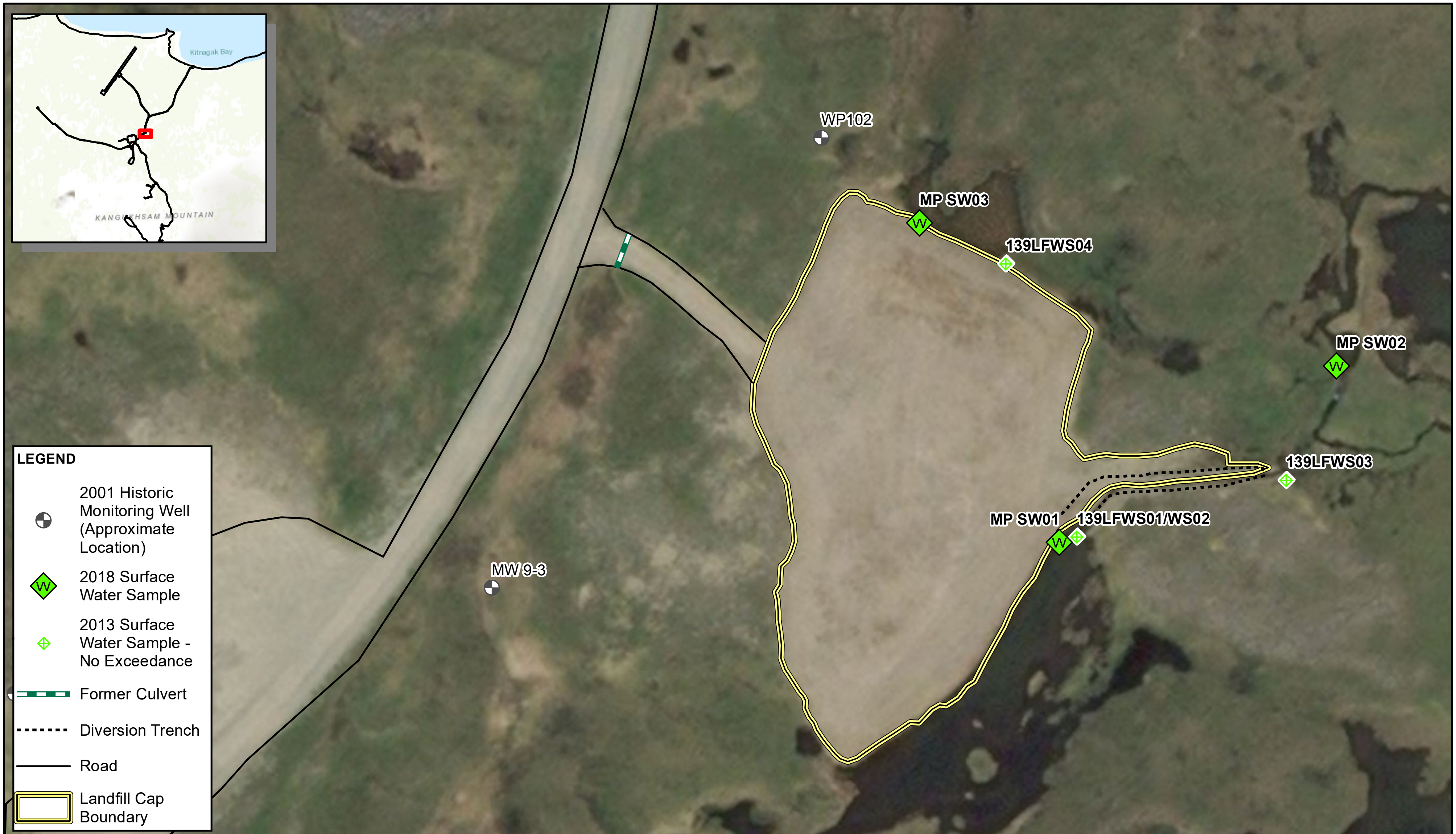
U.S. Army Corps of Engineers Alaska District

FUDS PROPERTY - F10AK0969

SAINT LAWRENCE ISLAND, ALASKA

FIGURE A-5

\\dc1vs01\gisproj\U\USACE\AK_NortheastCape_FUDS_2019PeriodicReview_Sup\01_MXD\FigA-06_Site9_HousingAndOpsLandfill.mxd HuffHA



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Source: Esri, DigitalGlobe,

Notes:
The differences in sampling locations from the 2013 and 2018 events were due to the variability in site conditions between years. The surface water was sampled at a representative location that could be collected with the sampling equipment without disturbing the underlying sediment and contained enough volume for a surface water sample.

N

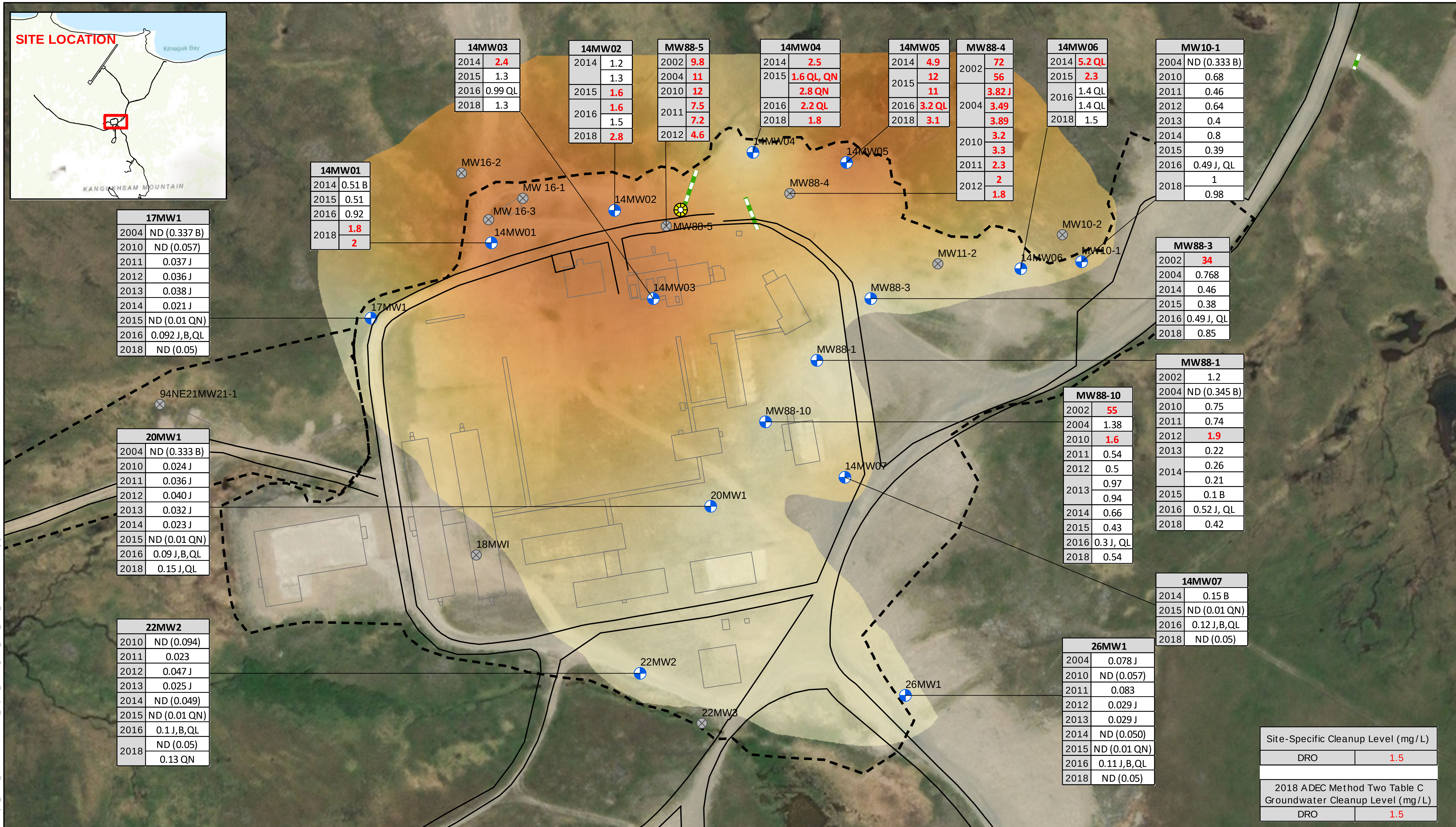
0 20 40 60 80 100
Feet
WGS 1984 UTM Zone 2N

SITE 9 - HOUSING AND OPERATIONS LANDFILL
NORTHEAST CAPE PERIODIC REVIEW

U.S. Army
Corps of Engineers
Alaska District

FUDS PROPERTY - F10AK0969
SAINT LAWRENCE ISLAND, ALASKA

FIGURE A-6



14MW03	
2014	2.4
2015	1.3
2016	0.99 QL
2018	1.3

14MW02	
2014	1.2
	1.3
2015	1.6
2016	1.6
	1.5
2018	2.8

MW88-5	
2002	9.8
2004	11
2010	12
2011	7.5
	7.2
2012	4.6

14MW04	
2014	2.5
2015	1.6 QL, QN
	2.8 QN
2016	2.2 QL
2018	1.8

14MW05	
2014	4.9
2015	12
	11
2016	3.2 QL
2018	3.1

MW88-4	
2002	72
	56
2004	3.82 J
	3.49
	3.89
2010	3.2
	3.3
2011	2.3
2012	2
	1.8

14MW06	
2014	5.2 QL
2015	2.3
2016	1.4 QL
	1.4 QL
2018	1.5

MW10-1	
2004	ND (0.333 B)
2010	0.68
2011	0.46
2012	0.64
2013	0.4
2014	0.8
2015	0.39
2016	0.49 J, QL
2018	1
	0.98

14MW01	
2014	0.51 B
2015	0.51
2016	0.92
2018	1.8
	2

17MW1	
2004	ND (0.337 B)
2010	ND (0.057)
2011	0.037 J
2012	0.036 J
2013	0.038 J
2014	0.021 J
2015	ND (0.01 QN)
2016	0.092 J,B,QL
2018	ND (0.05)

MW88-3	
2002	34
2004	0.768
2014	0.46
2015	0.38
2016	0.49 J, QL
2018	0.85

MW88-1	
2002	1.2
2004	ND (0.345 B)
2010	0.75
2011	0.74
2012	1.9
2013	0.22
2014	0.26
	0.21
2015	0.1 B
2016	0.52 J, QL
2018	0.42

MW88-10	
2002	55
2004	1.38
2010	1.6
2011	0.54
2012	0.5
2013	0.97
	0.94
2014	0.66
2015	0.43
2016	0.3 J, QL
2018	0.54

20MW1	
2004	ND (0.333 B)
2010	0.024 J
2011	0.036 J
2012	0.040 J
2013	0.032 J
2014	0.023 J
2015	ND (0.01 QN)
2016	0.09 J,B,QL
2018	0.15 J,QL

14MW07	
2014	0.15 B
2015	ND (0.01 QN)
2016	0.12 J,B,QL
2018	ND (0.05)

22MW2	
2010	ND (0.094)
2011	0.023
2012	0.047 J
2013	0.025 J
2014	ND (0.049)
2015	ND (0.01 QN)
2016	0.1 J,B,QL
2018	ND (0.05)
	0.13 QN

26MW1	
2004	0.078 J
2010	ND (0.057)
2011	0.083
2012	0.029 J
2013	0.029 J
2014	ND (0.050)
2015	ND (0.01 QN)
2016	0.11 J,B,QL
2018	ND (0.05)

Site-Specific Cleanup Level (mg/L)	
DRO	1.5

2018 ADEC Method Two Table C Groundwater Cleanup Level (mg/L)	
DRO	1.5

Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Existing Monitoring Well
Abandoned Monitoring Well
Former Manhole
Former Culvert
Former Building
MOC Boundary

DRO Concentration (mg/L)
3
1.5
0

Note:
The concentration gradient shown is depicted from data collected in 2018.

Approximate Groundwater Flow Direction

N
0 75 150
FEET
WGS 1984 UTM Zone 2N

DRO RESULTS IN GROUNDWATER AT THE MOC 2002 THROUGH 2018 NORTHEAST CAPE PERIODIC REVIEW

U.S. Army Corps of Engineers Alaska District

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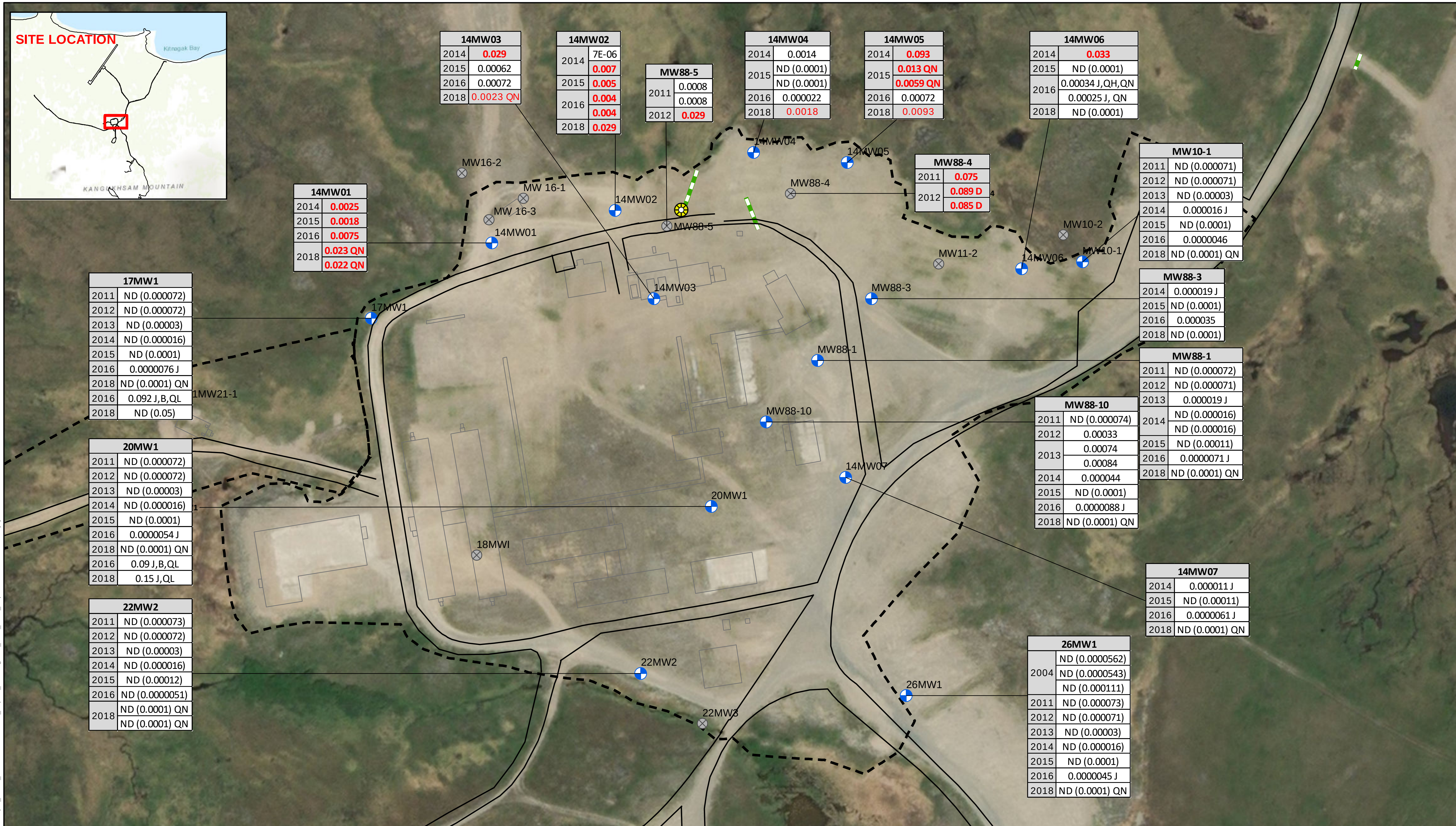
FIGURE A-7



14MW03	
2014	0.029
2015	0.00062
2016	0.00072
2018	0.0023 QN

14MW02	
2014	7E-06
	0.007
2015	0.005
2016	0.004
	0.004
2018	0.029

MW88-5	
2011	0.0008
	0.0008
2012	0.029

14MW04	
2014	0.0014
2015	ND (0.0001)
	ND (0.0001)
2016	0.000022
2018	0.0018

14MW05	
2014	0.093
2015	0.013 QN
	0.0059 QN
2016	0.00072
2018	0.0093

14MW06	
2014	0.033
2015	ND (0.0001)
2016	0.00034 J,QH,QN
	0.00025 J, QN
2018	ND (0.0001)

MW88-4	
2011	0.075
2012	0.089 D
	0.085 D

14MW01	
2014	0.0025
2015	0.0018
2016	0.0075
2018	0.023 QN
	0.022 QN

MW10-1	
2011	ND (0.000071)
2012	ND (0.000071)
2013	ND (0.00003)
2014	0.000016 J
2015	ND (0.0001)
2016	0.0000046
2018	ND (0.0001) QN

MW88-3	
2014	0.000019 J
2015	ND (0.0001)
2016	0.000035
2018	ND (0.0001)

17MW1	
2011	ND (0.000072)
2012	ND (0.000072)
2013	ND (0.00003)
2014	ND (0.000016)
2015	ND (0.0001)
2016	0.0000076 J
2018	ND (0.0001) QN
2016	0.092 J,B,QL
2018	ND (0.05)

MW88-1	
2011	ND (0.000072)
2012	ND (0.000071)
2013	0.000019 J
2014	ND (0.000016)
	ND (0.000016)
2015	ND (0.00011)
2016	0.0000071 J
2018	ND (0.0001) QN

MW88-10	
2011	ND (0.000074)
2012	0.00033
2013	0.00074
	0.00084
2014	0.000044
2015	ND (0.0001)
2016	0.0000088 J
2018	ND (0.0001) QN

20MW1	
2011	ND (0.000072)
2012	ND (0.000072)
2013	ND (0.00003)
2014	ND (0.000016)
2015	ND (0.0001)
2016	0.0000054 J
2018	ND (0.0001) QN
2016	0.09 J,B,QL
2018	0.15 J,QL

14MW07	
2014	0.000011 J
2015	ND (0.00011)
2016	0.0000061 J
2018	ND (0.0001) QN

22MW2	
2011	ND (0.000073)
2012	ND (0.000072)
2013	ND (0.00003)
2014	ND (0.000016)
2015	ND (0.00012)
2016	ND (0.0000051)
2018	ND (0.0001) QN
	ND (0.0001) QN

26MW1	
2004	ND (0.0000562)
	ND (0.0000543)
	ND (0.000111)
2011	ND (0.000073)
2012	ND (0.000071)
2013	ND (0.00003)
2014	ND (0.000016)
2015	ND (0.0001)
2016	0.0000045 J
2018	ND (0.0001) QN

Existing Monitoring Well
Abandoned Monitoring Well
Former Manhole
Former Culvert
Former Building
MOC Boundary

2018 ADEC Method Two Table C Groundwater Cleanup Level (mg/L)	
Naphthalene	0.0017

Approximate Groundwater Flow Direction

N

0 75 150
FEET
WGS 1984 UTM Zone 2N

NAPHTHALENE RESULTS IN GROUNDWATER AT THE MOC 2011 THROUGH 2018 NORTHEAST CAPE PERIODIC REVIEW

U.S. Army Corps of Engineers Alaska District

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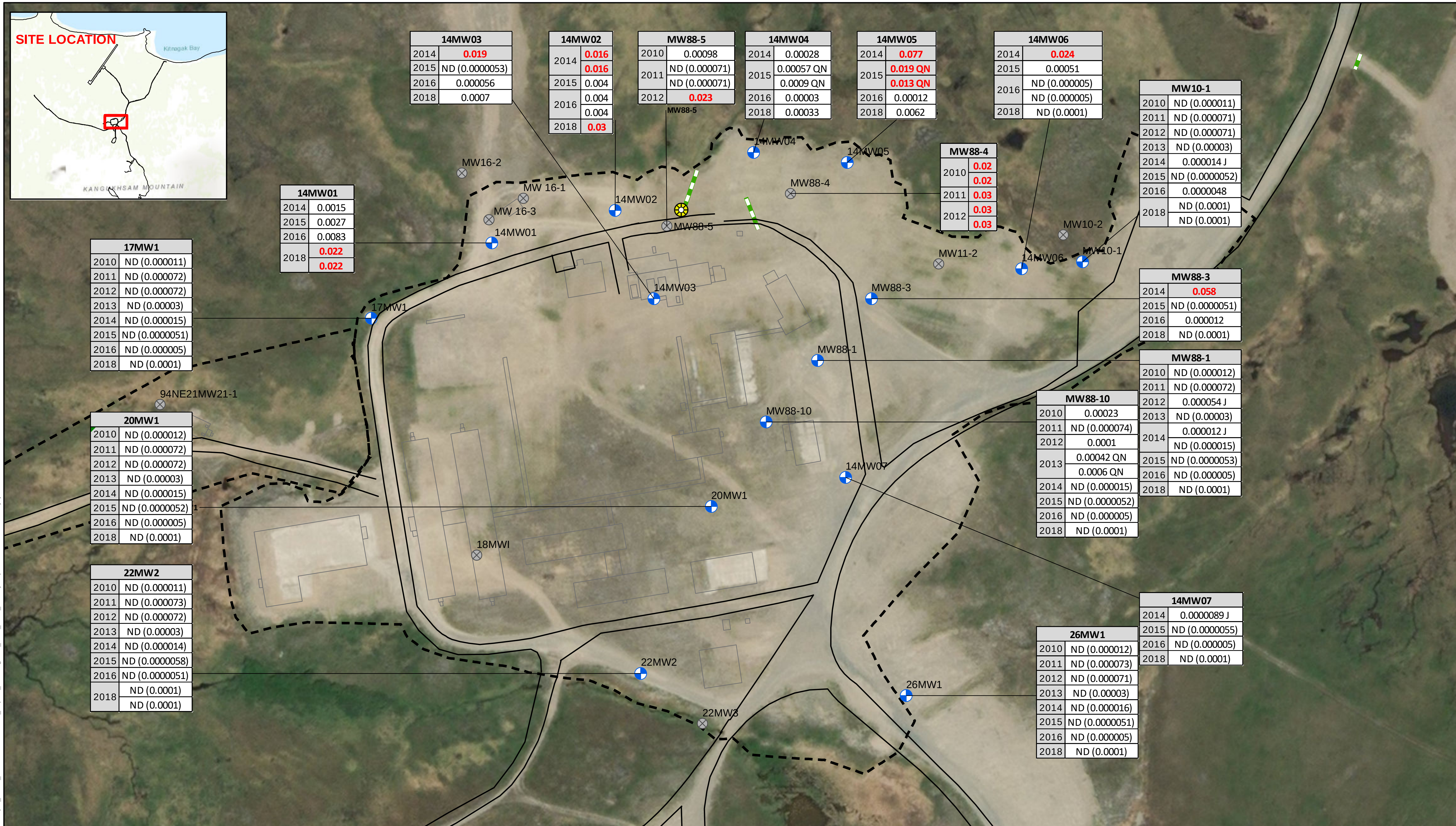
FIGURE A-8



14MW03	
2014	**0.019**
2015	ND (0.0000053)
2016	0.000056
2018	0.0007

14MW02	
2014	**0.016**
	0.016
2015	0.004
2016	0.004
	0.004
2018	**0.03**

MW88-5	
2010	0.00098
2011	ND (0.000071)
	ND (0.000071)
2012	**0.023**

14MW04	
2014	0.00028
2015	0.00057 QN
	0.0009 QN
2016	0.00003
2018	0.00033

14MW05	
2014	**0.077**
2015	**0.019 QN**
	0.013 QN
2016	0.00012
2018	0.0062

14MW06	
2014	**0.024**
2015	0.00051
2016	ND (0.000005)
	ND (0.000005)
2018	ND (0.0001)

MW10-1	
2010	ND (0.000011)
2011	ND (0.000071)
2012	ND (0.000071)
2013	ND (0.00003)
2014	0.000014 J
2015	ND (0.0000052)
2016	0.0000048
2018	ND (0.0001)
	ND (0.0001)

14MW01	
2014	0.0015
2015	0.0027
2016	0.0083
2018	**0.022**
	0.022

MW88-4	
2010	**0.02**
	0.02
2011	**0.03**
2012	**0.03**
	0.03

17MW1	
2010	ND (0.000011)
2011	ND (0.000072)
2012	ND (0.000072)
2013	ND (0.00003)
2014	ND (0.000015)
2015	ND (0.0000051)
2016	ND (0.000005)
2018	ND (0.0001)

MW88-3	
2014	**0.058**
2015	ND (0.0000051)
2016	0.000012
2018	ND (0.0001)

MW88-1	
2010	ND (0.000012)
2011	ND (0.000072)
2012	0.000054 J
2013	ND (0.00003)
2014	0.000012 J
	ND (0.000015)
2015	ND (0.0000053)
2016	ND (0.000005)
2018	ND (0.0001)

MW88-10	
2010	0.00023
2011	ND (0.000074)
2012	0.0001
2013	0.00042 QN
	0.0006 QN
2014	ND (0.000015)
2015	ND (0.0000052)
2016	ND (0.000005)
2018	ND (0.0001)

20MW1	
2010	ND (0.000012)
2011	ND (0.000072)
2012	ND (0.000072)
2013	ND (0.00003)
2014	ND (0.000015)
2015	ND (0.0000052)
2016	ND (0.000005)
2018	ND (0.0001)

22MW2	
2010	ND (0.000011)
2011	ND (0.000073)
2012	ND (0.000072)
2013	ND (0.00003)
2014	ND (0.000014)
2015	ND (0.0000058)
2016	ND (0.0000051)
2018	ND (0.0001)
	ND (0.0001)

14MW07	
2014	0.0000089 J
2015	ND (0.0000055)
2016	ND (0.000005)
2018	ND (0.0001)

26MW1	
2010	ND (0.000012)
2011	ND (0.000073)
2012	ND (0.000071)
2013	ND (0.00003)
2014	ND (0.000016)
2015	ND (0.0000051)
2016	ND (0.000005)
2018	ND (0.0001)

- Existing Monitoring Well
- Abandoned Monitoring Well
- Former Manhole
- Former Culvert
- Former Building
- MOC Boundary

2018 ADEC Method Two Table C Groundwater Cleanup Level (mg/L)	
1-Methylnaphthalene	0.011

Approximate Groundwater Flow Direction

N
0 75 150
FEET
WGS 1984 UTM Zone 2N

1-METHYLNAPHTHALENE RESULTS IN GROUNDWATER AT THE MOC 2010 THROUGH 2018 NORTHEAST CAPE PERIODIC REVIEW

U.S. Army Corps of Engineers Alaska District

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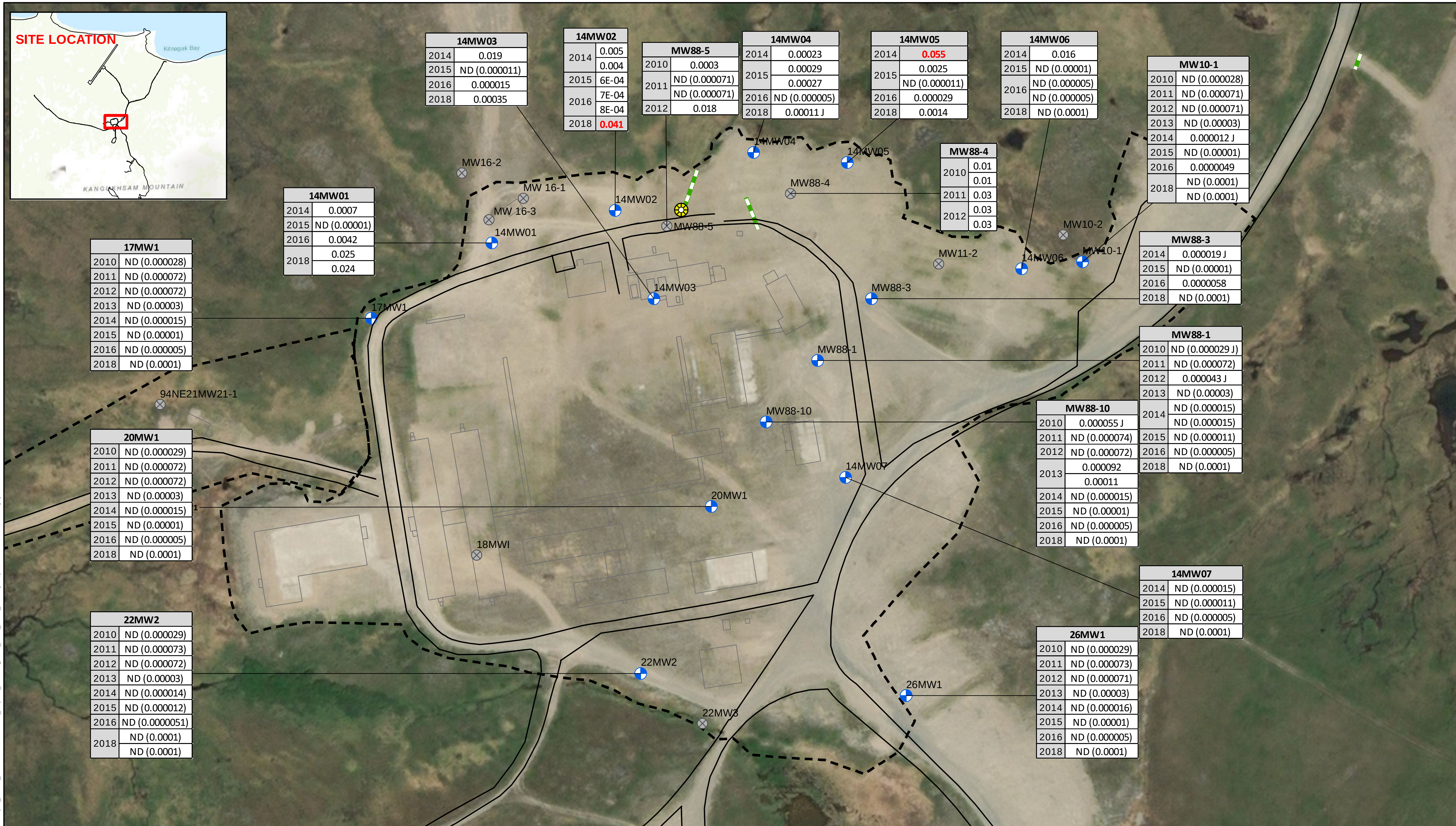
FIGURE A-9



14MW03	
2014	0.019
2015	ND (0.000011)
2016	0.000015
2018	0.00035

14MW02	
2014	0.005
	0.004
2015	6E-04
2016	7E-04
	8E-04
2018	0.041

MW88-5	
2010	0.0003
2011	ND (0.000071)
	ND (0.000071)
2012	0.018

14MW04	
2014	0.00023
2015	0.00029
	0.00027
2016	ND (0.000005)
2018	0.00011 J

14MW05	
2014	0.055
2015	0.0025
	ND (0.000011)
2016	0.000029
2018	0.0014

14MW06	
2014	0.016
2015	ND (0.00001)
2016	ND (0.000005)
	ND (0.000005)
2018	ND (0.0001)

MW10-1	
2010	ND (0.000028)
2011	ND (0.000071)
2012	ND (0.000071)
2013	ND (0.00003)
2014	0.000012 J
2015	ND (0.00001)
2016	0.0000049
2018	ND (0.0001)
	ND (0.0001)

MW88-4	
2010	0.01
	0.01
2011	0.03
2012	0.03
	0.03

14MW01	
2014	0.0007
2015	ND (0.00001)
2016	0.0042
2018	0.025
	0.024

17MW1	
2010	ND (0.000028)
2011	ND (0.000072)
2012	ND (0.000072)
2013	ND (0.00003)
2014	ND (0.000015)
2015	ND (0.00001)
2016	ND (0.000005)
2018	ND (0.0001)

MW88-3	
2014	0.000019 J
2015	ND (0.00001)
2016	0.0000058
2018	ND (0.0001)

MW88-1	
2010	ND (0.000029 J)
2011	ND (0.000072)
2012	0.000043 J
2013	ND (0.00003)
2014	ND (0.000015)
	ND (0.000015)
2015	ND (0.000011)
2016	ND (0.000005)
2018	ND (0.0001)

MW88-10	
2010	0.000055 J
2011	ND (0.000074)
2012	ND (0.000072)
2013	0.000092
	0.00011
2014	ND (0.000015)
2015	ND (0.00001)
2016	ND (0.000005)
2018	ND (0.0001)

20MW1	
2010	ND (0.000029)
2011	ND (0.000072)
2012	ND (0.000072)
2013	ND (0.00003)
2014	ND (0.000015)
2015	ND (0.00001)
2016	ND (0.000005)
2018	ND (0.0001)

14MW07	
2014	ND (0.000015)
2015	ND (0.000011)
2016	ND (0.000005)
2018	ND (0.0001)

22MW2	
2010	ND (0.000029)
2011	ND (0.000073)
2012	ND (0.000072)
2013	ND (0.00003)
2014	ND (0.000014)
2015	ND (0.000012)
2016	ND (0.0000051)
2018	ND (0.0001)
	ND (0.0001)

26MW1	
2010	ND (0.000029)
2011	ND (0.000073)
2012	ND (0.000071)
2013	ND (0.00003)
2014	ND (0.000016)
2015	ND (0.00001)
2016	ND (0.000005)
2018	ND (0.0001)

Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

- Existing Monitoring Well
- Abandoned Monitoring Well
- Former Manhole
- Former Culvert
- Former Building
- MOC Boundary

2018 ADEC Method Two Table C Groundwater Cleanup Level (mg/L)	
2-Methylnaphthalene	0.036

Approximate Groundwater Flow Direction

N
0 75 150
FEET
WGS 1984 UTM Zone 2N

2-METHYLNAPHTHALENE RESULTS IN GROUNDWATER AT THE MOC 2010 THROUGH 2018 NORTHEAST CAPE PERIODIC REVIEW

U.S. Army Corps of Engineers Alaska District

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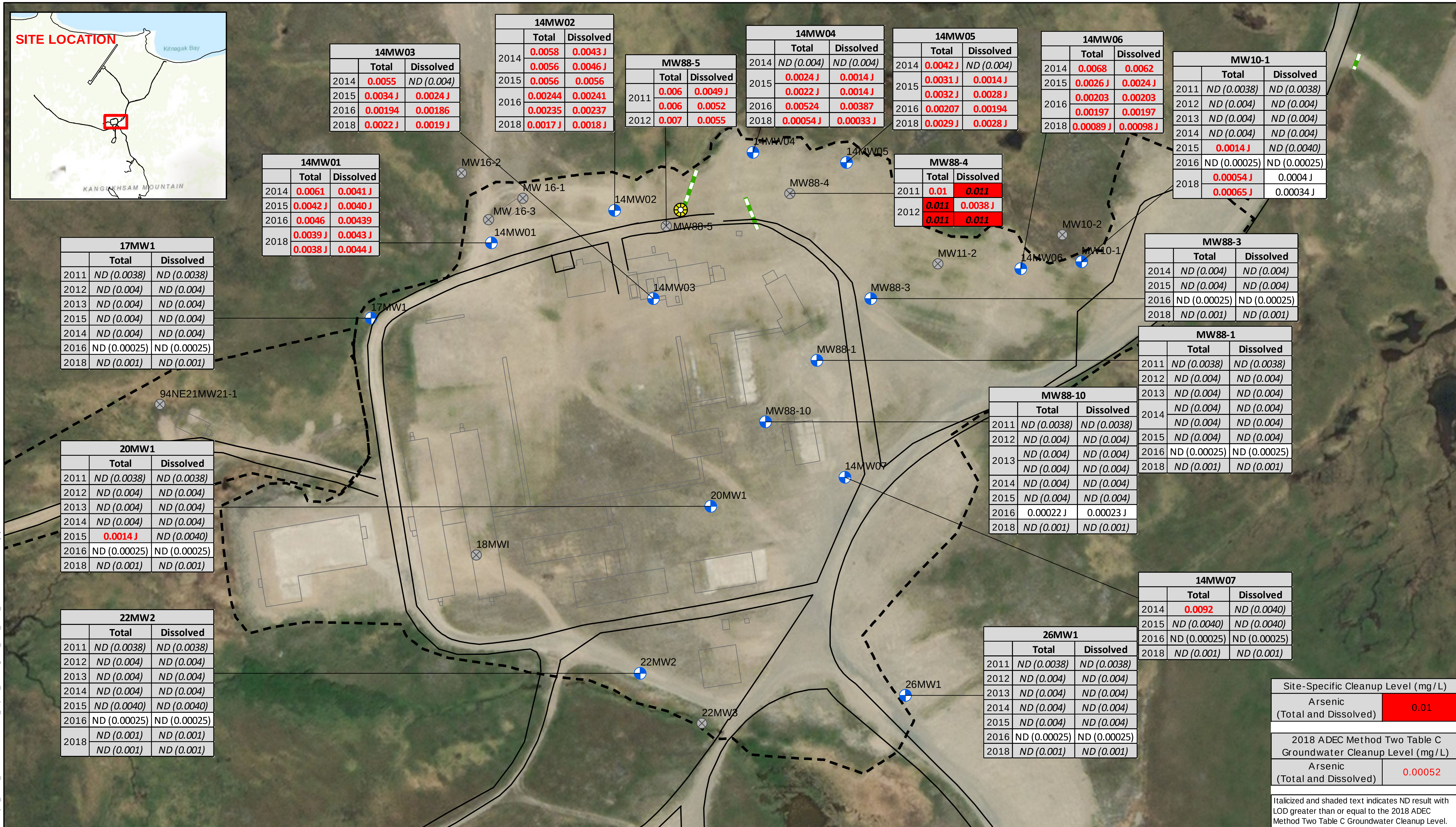
FIGURE A-10



14MW03	Total	Dissolved
2014	0.0055	ND (0.004)
2015	0.0034 J	0.0024 J
2016	0.00194	0.00186
2018	0.0022 J	0.0019 J

14MW02	Total	Dissolved
2014	0.0058	0.0043 J
	0.0056	0.0046 J
2015	0.0056	0.0056
2016	0.00244	0.00241
	0.00235	0.00237
2018	0.0017 J	0.0018 J

MW88-5	Total	Dissolved
2011	0.006	0.0049 J
	0.006	0.0052
2012	0.007	0.0055

14MW04	Total	Dissolved
2014	ND (0.004)	ND (0.004)
2015	0.0024 J	0.0014 J
	0.0022 J	0.0014 J
2016	0.00524	0.00387
2018	0.00054 J	0.00033 J

14MW05	Total	Dissolved
2014	0.0042 J	ND (0.004)
2015	0.0031 J	0.0014 J
	0.0032 J	0.0028 J
2016	0.00207	0.00194
2018	0.0029 J	0.0028 J

14MW06	Total	Dissolved
2014	0.0068	0.0062
2015	0.0026 J	0.0024 J
2016	0.00203	0.00203
	0.00197	0.00197
2018	0.00089 J	0.00098 J

MW10-1	Total	Dissolved
2011	ND (0.0038)	ND (0.0038)
2012	ND (0.004)	ND (0.004)
2013	ND (0.004)	ND (0.004)
2014	ND (0.004)	ND (0.004)
2015	0.0014 J	ND (0.0040)
2016	ND (0.00025)	ND (0.00025)
2018	0.00054 J	0.0004 J
	0.00065 J	0.00034 J

14MW01	Total	Dissolved
2014	0.0061	0.0041 J
2015	0.0042 J	0.0040 J
2016	0.0046	0.00439
2018	0.0039 J	0.0043 J
	0.0038 J	0.0044 J

MW88-4	Total	Dissolved
2011	0.01	*0.011*
2012	*0.011*	0.0038 J
	0.011	*0.011*

17MW1	Total	Dissolved
2011	ND (0.0038)	ND (0.0038)
2012	ND (0.004)	ND (0.004)
2013	ND (0.004)	ND (0.004)
2015	ND (0.004)	ND (0.004)
2014	ND (0.004)	ND (0.004)
2016	ND (0.00025)	ND (0.00025)
2018	ND (0.001)	ND (0.001)

MW88-3	Total	Dissolved
2014	ND (0.004)	ND (0.004)
2015	ND (0.004)	ND (0.004)
2016	ND (0.00025)	ND (0.00025)
2018	ND (0.001)	ND (0.001)

MW88-1	Total	Dissolved
2011	ND (0.0038)	ND (0.0038)
2012	ND (0.004)	ND (0.004)
2013	ND (0.004)	ND (0.004)
2014	ND (0.004)	ND (0.004)
	ND (0.004)	ND (0.004)
2015	ND (0.004)	ND (0.004)
2016	ND (0.00025)	ND (0.00025)
2018	ND (0.001)	ND (0.001)

MW88-10	Total	Dissolved
2011	ND (0.0038)	ND (0.0038)
2012	ND (0.004)	ND (0.004)
2013	ND (0.004)	ND (0.004)
	ND (0.004)	ND (0.004)
2014	ND (0.004)	ND (0.004)
2015	ND (0.004)	ND (0.004)
2016	0.00022 J	0.00023 J
2018	ND (0.001)	ND (0.001)

20MW1	Total	Dissolved
2011	ND (0.0038)	ND (0.0038)
2012	ND (0.004)	ND (0.004)
2013	ND (0.004)	ND (0.004)
2014	ND (0.004)	ND (0.004)
2015	0.0014 J	ND (0.0040)
2016	ND (0.00025)	ND (0.00025)
2018	ND (0.001)	ND (0.001)

14MW07	Total	Dissolved
2014	0.0092	ND (0.0040)
2015	ND (0.0040)	ND (0.0040)
2016	ND (0.00025)	ND (0.00025)
2018	ND (0.001)	ND (0.001)

22MW2	Total	Dissolved
2011	ND (0.0038)	ND (0.0038)
2012	ND (0.004)	ND (0.004)
2013	ND (0.004)	ND (0.004)
2014	ND (0.004)	ND (0.004)
2015	ND (0.0040)	ND (0.0040)
2016	ND (0.00025)	ND (0.00025)
2018	ND (0.001)	ND (0.001)
	ND (0.001)	ND (0.001)

26MW1	Total	Dissolved
2011	ND (0.0038)	ND (0.0038)
2012	ND (0.004)	ND (0.004)
2013	ND (0.004)	ND (0.004)
2014	ND (0.004)	ND (0.004)
2015	ND (0.004)	ND (0.004)
2016	ND (0.00025)	ND (0.00025)
2018	ND (0.001)	ND (0.001)

Site-Specific Cleanup Level (mg/L)	
Arsenic (Total and Dissolved)	0.01

2018 ADEC Method Two Table C Groundwater Cleanup Level (mg/L)	
Arsenic (Total and Dissolved)	0.00052

Italicized and shaded text indicates ND result with LOD greater than or equal to the 2018 ADEC Method Two Table C Groundwater Cleanup Level.

Existing Monitoring Well
Abandoned Monitoring Well
Former Manhole
Former Culvert
Former Building
MOC Boundary
Approximate Groundwater Flow Direction

N
0 75 150
FEET
WGS 1984 UTM Zone 2N

ARSENIC RESULTS IN GROUNDWATER AT THE MOC 2011 THROUGH 2018 NORTHEAST CAPE PERIODIC REVIEW

U.S. Army Corps of Engineers Alaska District

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FIGURE A-11

Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

- Existing Monitoring Well
- Abandoned Monitoring Well
- Former Manhole
- Former Culvert
- Former Building
- MOC Boundary

2018 ADEC Method Two Table C Groundwater Cleanup Level (mg/L)	
Manganese (Dissolved)	0.43

Approximate Groundwater Flow Direction

N

0 75 150
FEET
WGS 1984 UTM Zone 2N

MANGANESE RESULTS IN GROUNDWATER AT THE MOC 2010 THROUGH 2018 NORTHEAST CAPE PERIODIC REVIEW

U.S. Army Corps of Engineers Alaska District

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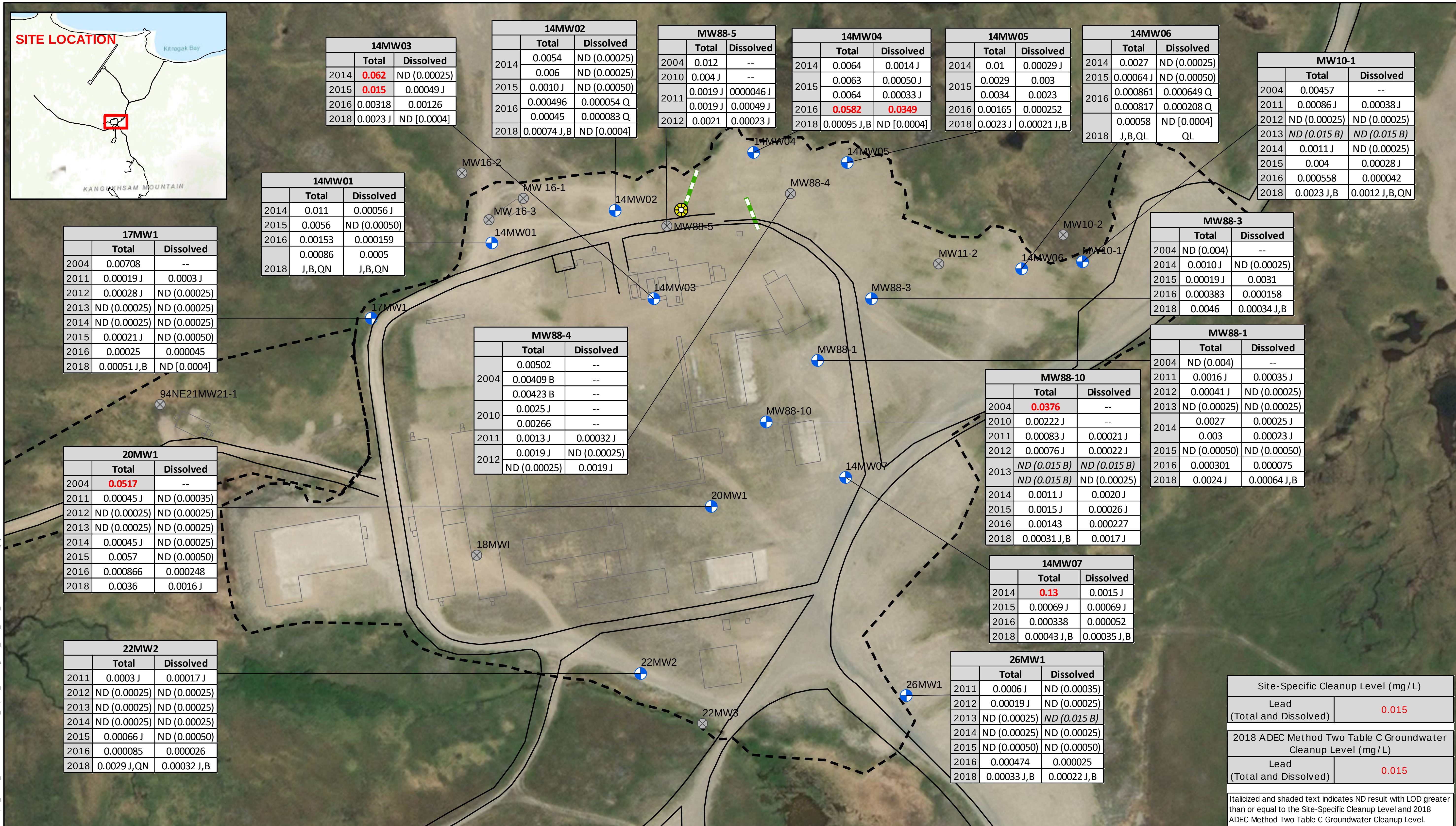
FIGURE A-12



14MW03

	Total	Dissolved
2014	0.062	ND (0.00025)
2015	0.015	0.00049 J
2016	0.00318	0.00126
2018	0.0023 J	ND [0.004]

14MW02

	Total	Dissolved
2014	0.0054	ND (0.00025)
	0.006	ND (0.00025)
2015	0.0010 J	ND (0.00050)
2016	0.000496	0.000054 Q
	0.00045	0.000083 Q
2018	0.00074 J,B	ND [0.0004]

MW88-5

	Total	Dissolved
2004	0.012	--
2010	0.004 J	--
2011	0.0019 J	0000046 J
	0.0019 J	0.00049 J
2012	0.0021	0.00023 J

14MW04

	Total	Dissolved
2014	0.0064	0.0014 J
2015	0.0063	0.00050 J
	0.0064	0.00033 J
2016	0.0582	0.0349
2018	0.00095 J,B	ND [0.0004]

14MW05

	Total	Dissolved
2014	0.01	0.00029 J
2015	0.0029	0.003
	0.0034	0.0023
2016	0.00165	0.000252
2018	0.0023 J	0.00021 J,B

14MW06

	Total	Dissolved
2014	0.0027	ND (0.00025)
2015	0.00064 J	ND (0.00050)
2016	0.000861	0.000649 Q
	0.000817	0.000208 Q
2018	0.00058 J,B,QL	ND [0.0004] QL

MW10-1

	Total	Dissolved
2004	0.00457	--
2011	0.00086 J	0.00038 J
2012	ND (0.00025)	ND (0.00025)
2013	*ND (0.015 B)*	*ND (0.015 B)*
2014	0.0011 J	ND (0.00025)
2015	0.004	0.00028 J
2016	0.000558	0.000042
2018	0.0023 J,B	0.0012 J,B,QN

14MW01

	Total	Dissolved
2014	0.011	0.00056 J
2015	0.0056	ND (0.00050)
2016	0.00153	0.000159
2018	0.00086 J,B,QN	0.0005 J,B,QN

17MW1

	Total	Dissolved
2004	0.00708	--
2011	0.00019 J	0.0003 J
2012	0.00028 J	ND (0.00025)
2013	ND (0.00025)	ND (0.00025)
2014	ND (0.00025)	ND (0.00025)
2015	0.00021 J	ND (0.00050)
2016	0.00025	0.000045
2018	0.00051 J,B	ND [0.0004]

MW88-3

	Total	Dissolved
2004	ND (0.004)	--
2014	0.0010 J	ND (0.00025)
2015	0.00019 J	0.0031
2016	0.000383	0.000158
2018	0.0046	0.00034 J,B

MW88-4

	Total	Dissolved
2004	0.00502	--
	0.00409 B	--
	0.00423 B	--
2010	0.0025 J	--
	0.00266	--
2011	0.0013 J	0.00032 J
2012	0.0019 J	ND (0.00025)
	ND (0.00025)	0.0019 J

MW88-1

	Total	Dissolved
2004	ND (0.004)	--
2011	0.0016 J	0.00035 J
2012	0.00041 J	ND (0.00025)
2013	ND (0.00025)	ND (0.00025)
2014	0.0027	0.00025 J
	0.003	0.00023 J
2015	ND (0.00050)	ND (0.00050)
2016	0.000301	0.000075
2018	0.0024 J	0.00064 J,B

MW88-10

	Total	Dissolved
2004	0.0376	--
2010	0.00222 J	--
2011	0.00083 J	0.00021 J
2012	0.00076 J	0.00022 J
2013	*ND (0.015 B)*	*ND (0.015 B)*
	ND (0.015 B)	ND (0.00025)
2014	0.0011 J	0.0020 J
2015	0.0015 J	0.00026 J
2016	0.00143	0.000227
2018	0.00031 J,B	0.0017 J

20MW1

	Total	Dissolved
2004	0.0517	--
2011	0.00045 J	ND (0.00035)
2012	ND (0.00025)	ND (0.00025)
2013	ND (0.00025)	ND (0.00025)
2014	0.00045 J	ND (0.00025)
2015	0.0057	ND (0.00050)
2016	0.000866	0.000248
2018	0.0036	0.0016 J

14MW07

	Total	Dissolved
2014	0.13	0.0015 J
2015	0.00069 J	0.00069 J
2016	0.000338	0.000052
2018	0.00043 J,B	0.00035 J,B

22MW2

	Total	Dissolved
2011	0.0003 J	0.00017 J
2012	ND (0.00025)	ND (0.00025)
2013	ND (0.00025)	ND (0.00025)
2014	ND (0.00025)	ND (0.00025)
2015	0.00066 J	ND (0.00050)
2016	0.000085	0.000026
2018	0.0029 J,QN	0.00032 J,B

26MW1

	Total	Dissolved
2011	0.0006 J	ND (0.00035)
2012	0.00019 J	ND (0.00025)
2013	ND (0.00025)	*ND (0.015 B)*
2014	ND (0.00025)	ND (0.00025)
2015	ND (0.00050)	ND (0.00050)
2016	0.000474	0.000025
2018	0.00033 J,B	0.00022 J,B

Site-Specific Cleanup Level (mg/L)	
Lead (Total and Dissolved)	0.015

2018 ADEC Method Two Table C Groundwater Cleanup Level (mg/L)	
Lead (Total and Dissolved)	0.015

Italicized and shaded text indicates ND result with LOD greater than or equal to the Site-Specific Cleanup Level and 2018 ADEC Method Two Table C Groundwater Cleanup Level.

Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Existing Monitoring Well
Abandoned Monitoring Well
Former Manhole
Former Culvert
Former Building
MOC Boundary
Approximate Groundwater Flow Direction

N
0 75 150
FEET
WGS 1984 UTM Zone 2N

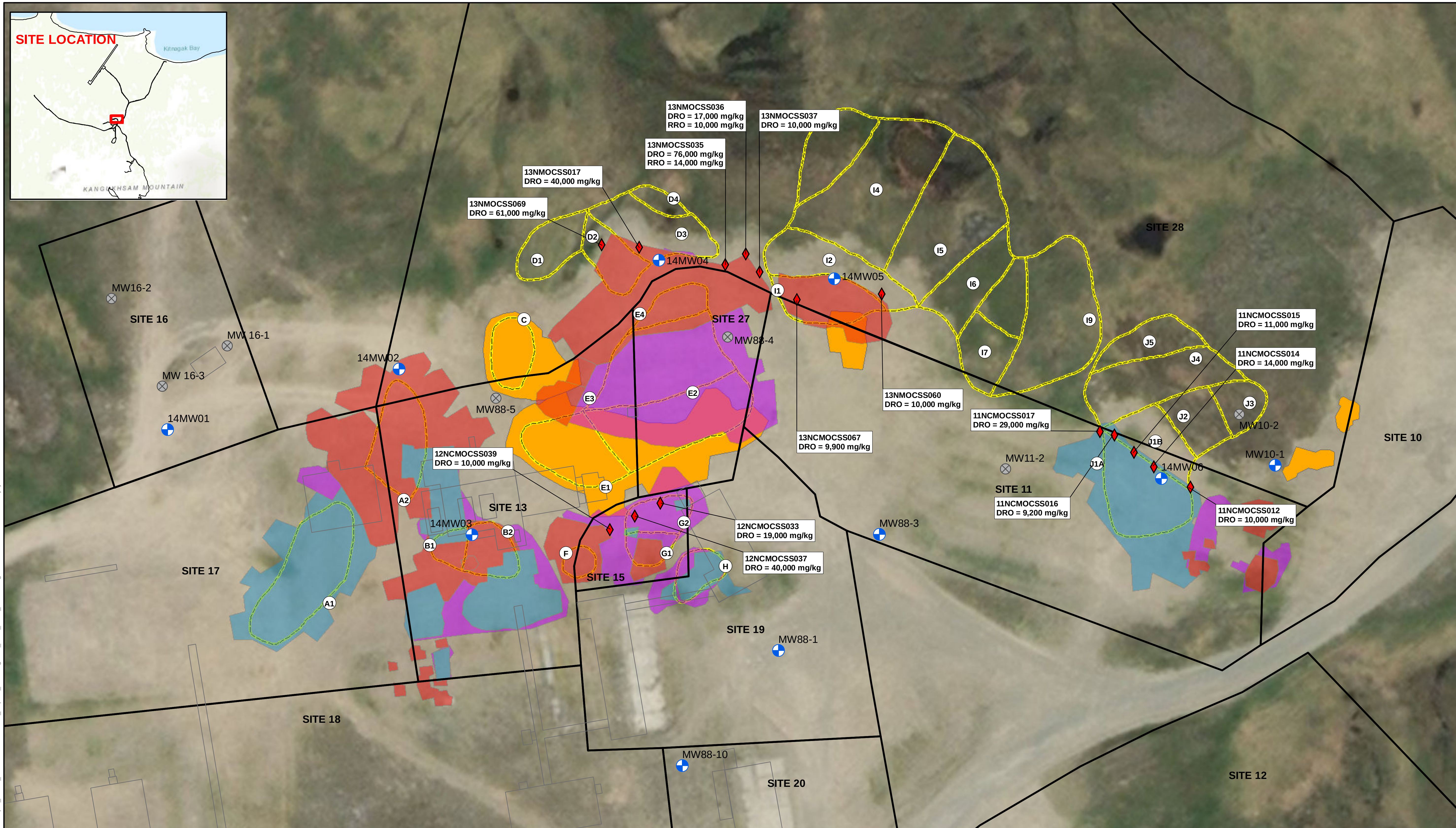
LEAD RESULTS IN GROUNDWATER AT THE MOC 2004 THROUGH 2018 NORTHEAST CAPE PERIODIC REVIEW

U.S. Army Corps of Engineers Alaska District

FUDS PROPERTY - F10AK0969
SAINT LAWRENCE ISLAND, ALASKA

FIGURE A-13

\\ldc1vs01\GISProj\U\USACE\AK_NortheastCape_FUDS_2019PeriodicReview_Sup\01_MXD\FigA-13_NEC_MOC_LeadinGW.mxd beatyc



Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

- Soil Confirmation Sample Location
- Existing Monitoring Well
- Abandoned Monitoring Well
- Former Building
- Environmental Site Boundary
- 2011 Excavation Extent
- 2012 Excavation Extent
- 2013 Excavation Extent
- 2014 Excavation Extent
- Estimated Fuel-Contaminated Soil Extent Based on 2010 UVOST® Data

Approximate Groundwater Flow Direction

N

0 40 80
FEET
WGS 1984 UTM Zone 2N

MOC - REMAINING SOIL CONTAMINATION
NORTHEAST CAPE PERIODIC REVIEW

U.S. Army Corps of Engineers Alaska District

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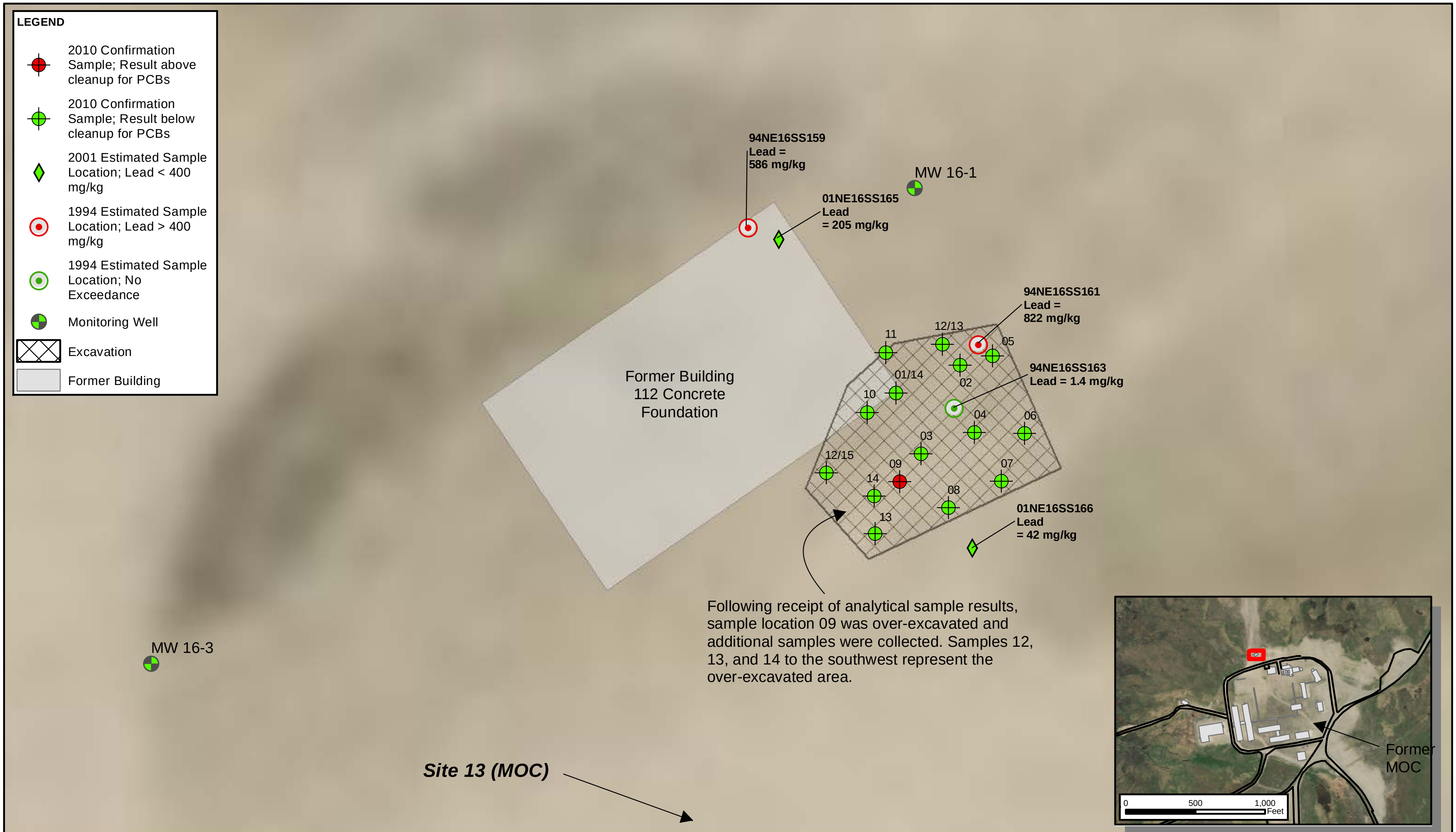
FIGURE A-14

\\dc1vs01\GISProj\U\USACE\AK_NortheastCape_FUDS_2019PeriodicReview_Sup\01_MXD\FigA-15_Site16_PaintAndDopeStorage.mxd beatycj



Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

N

0 2 4 6 8 10
Feet

WGS 1984 UTM Zone 2N

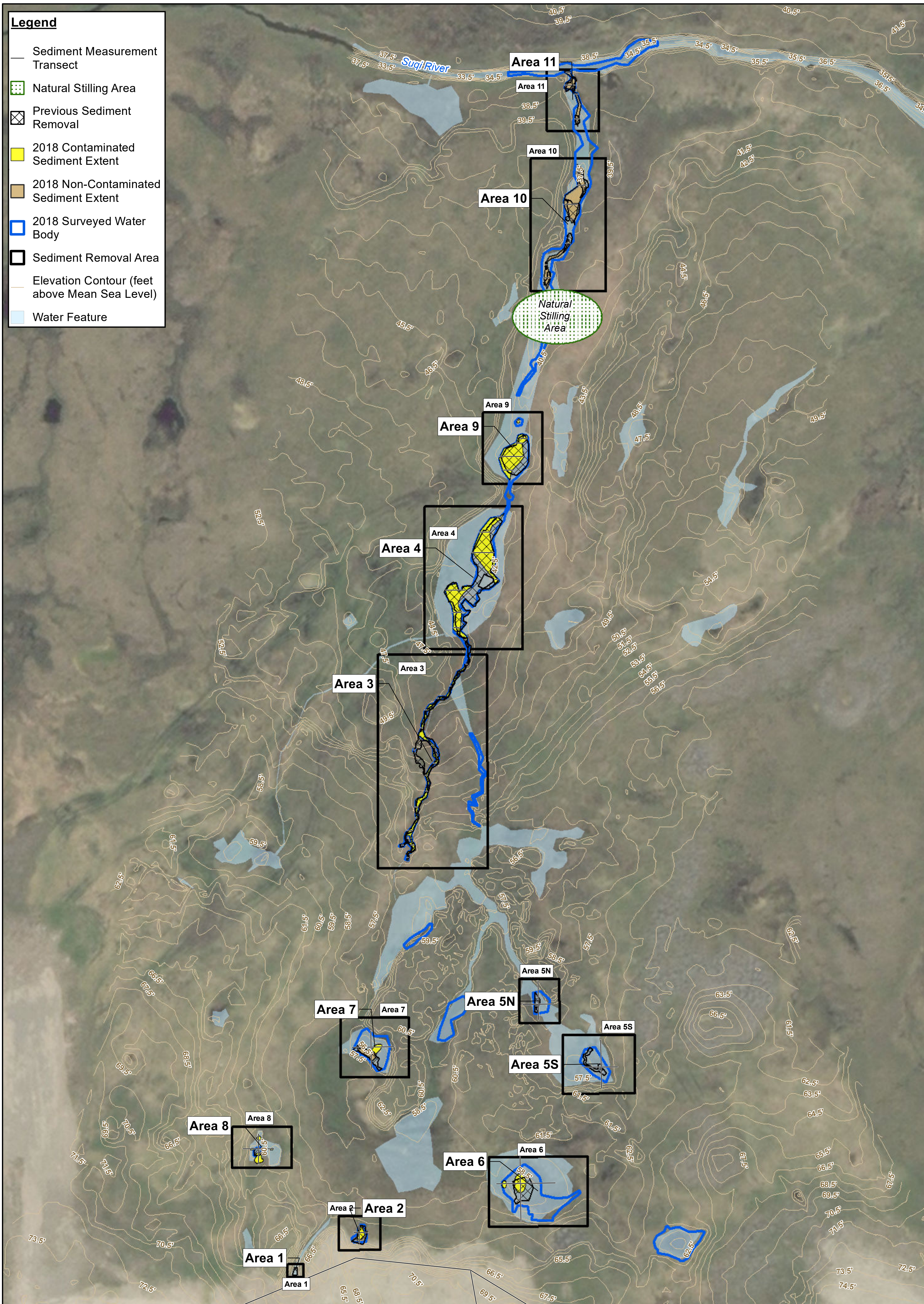
SITE 16 - PAINT AND DOPE STORAGE
NORTHEAST CAPE PERIODIC REVIEW

U.S. Army Corps of Engineers Alaska District

FUDS PROPERTY - F10AK0969

SAINT LAWRENCE ISLAND, ALASKA

FIGURE A-15



Approximate Groundwater Flow Direction

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

N

0 30 60 90 120
FEET

WGS 1984 UTM Zone 2N

SITE 28
TRANSECT OVERVIEW

U.S. Army Corps of Engineers Alaska District

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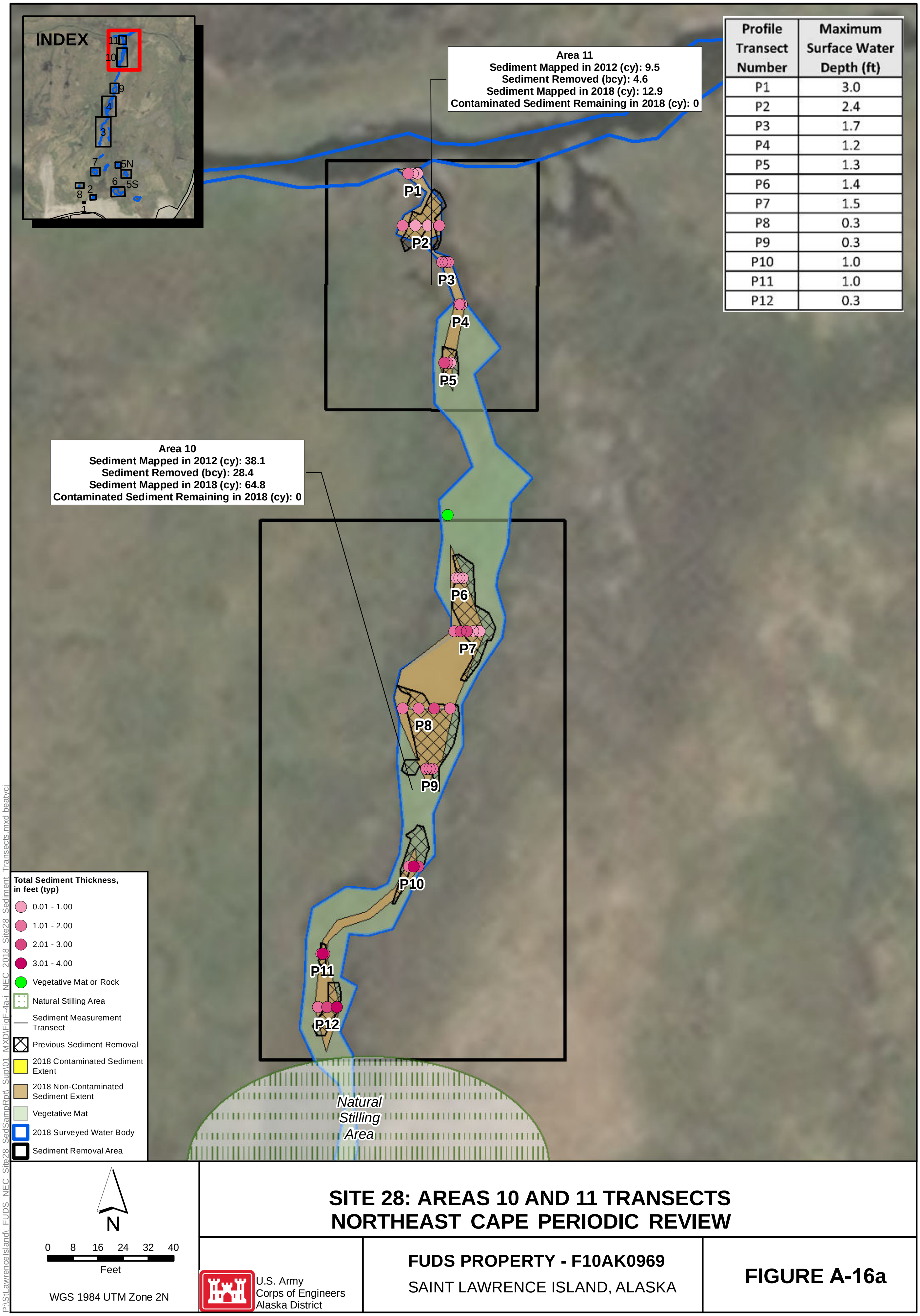
SAINT LAWRENCE ISLAND, ALASKA

FIGURE A-16



Profile Transect Number	Maximum Surface Water Depth (ft)
P1	3.0
P2	2.4
P3	1.7
P4	1.2
P5	1.3
P6	1.4
P7	1.5
P8	0.3
P9	0.3
P10	1.0
P11	1.0
P12	0.3

SITE 28: AREAS 10 AND 11 TRANSECTS
NORTHEAST CAPE PERIODIC REVIEW

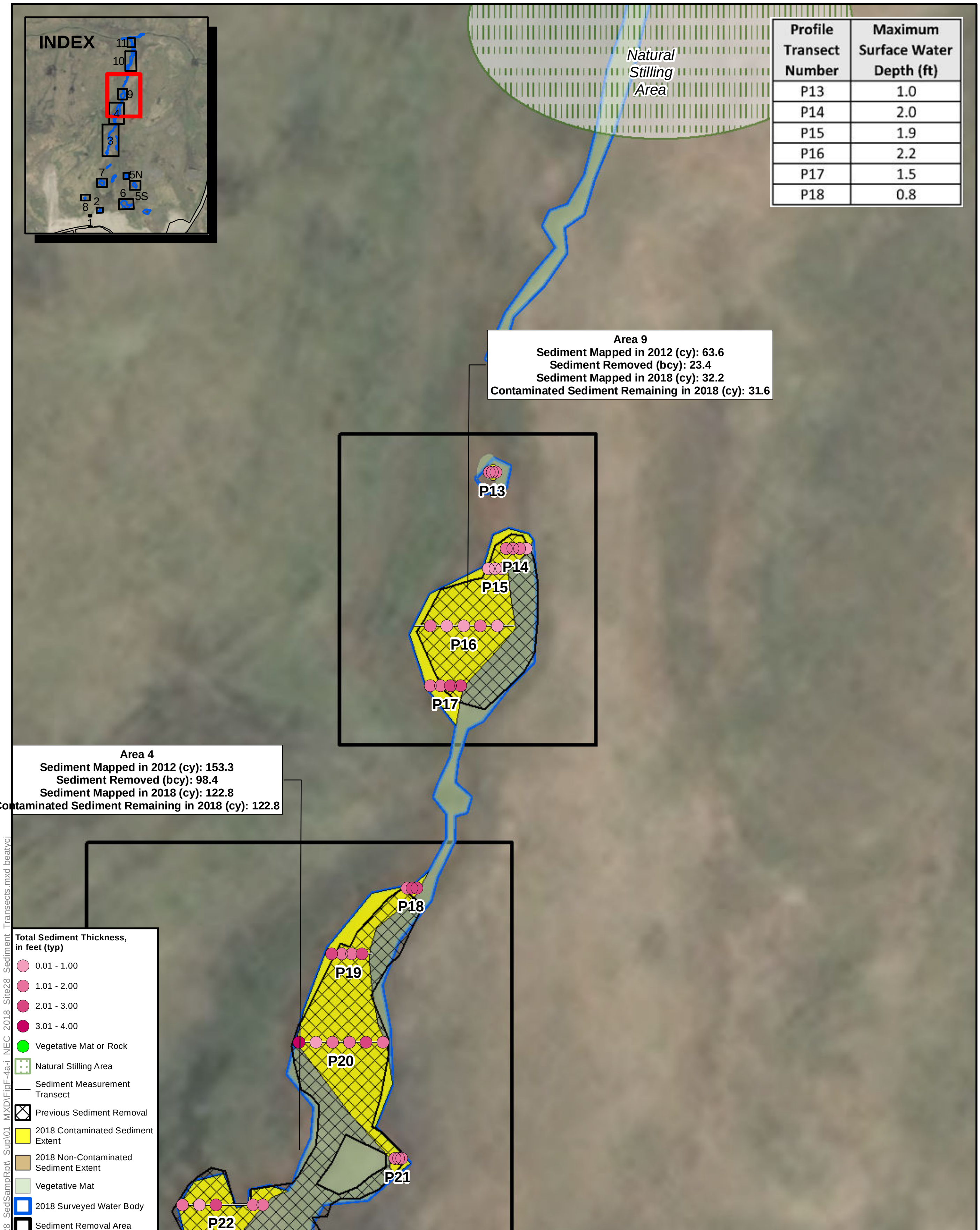
U.S. Army
Corps of Engineers
Alaska District

FUDS PROPERTY - F10AK0969

SAINT LAWRENCE ISLAND, ALASKA

FIGURE A-16a

P:\StLawrenceIsland_FUDS_NEC_Site28_SedSampRpt_Sup01_MXD\FigF-4a-I_NEC_2018_Site28_Sediment_Transects.mxd beatyci



Profile Transect Number	Maximum Surface Water Depth (ft)
P13	1.0
P14	2.0
P15	1.9
P16	2.2
P17	1.5
P18	0.8

N

0 8 16 24 32 40
Feet

WGS 1984 UTM Zone 2N

SITE 28: AREA 9 TRANSECTS
NORTHEAST CAPE PERIODIC REVIEW

U.S. Army
Corps of Engineers
Alaska District

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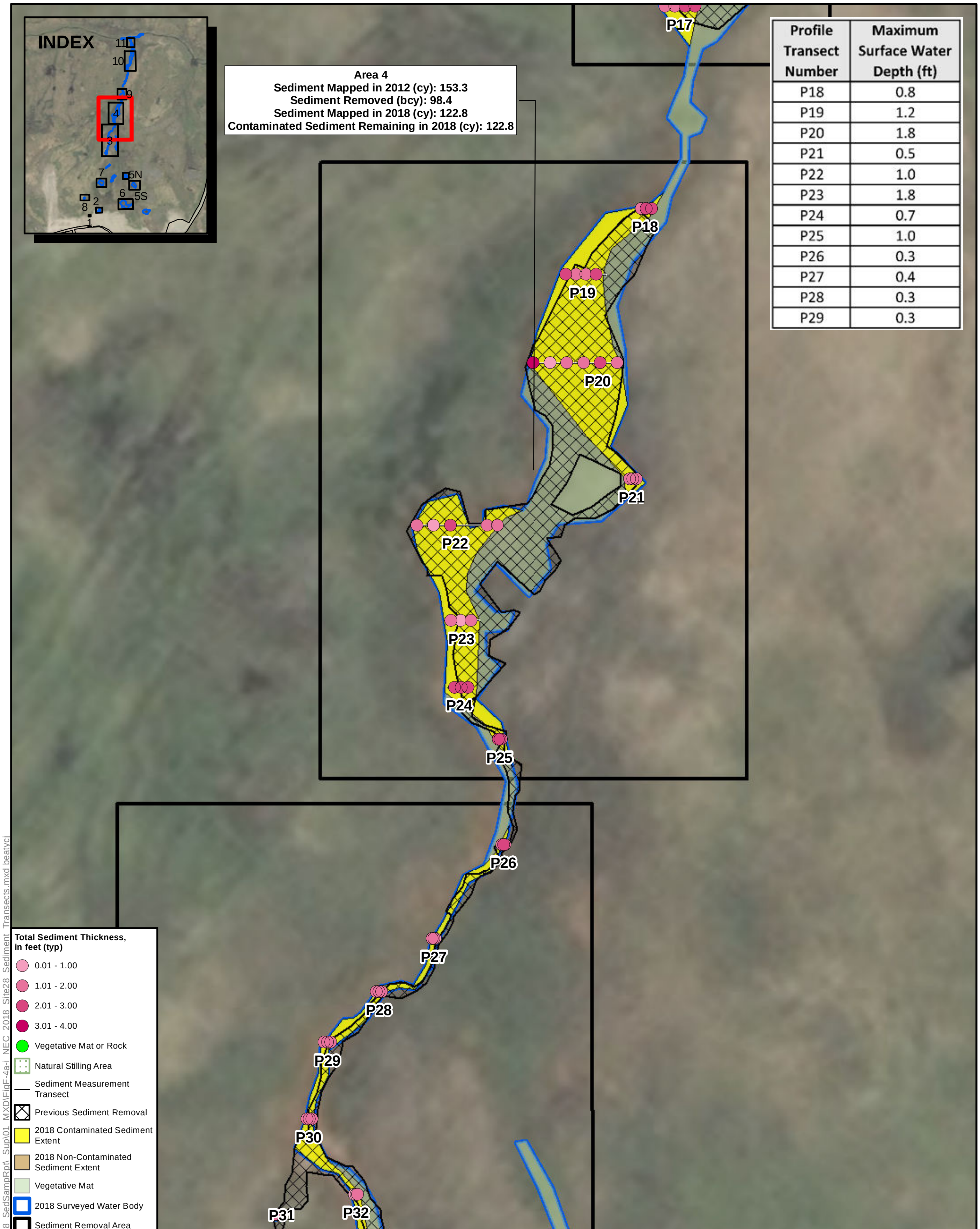
FIGURE A-16b

P:\StLawrenceIsland_FUDS_NEC_Site28_SedSampRpt_Supp01_MXD\FigF-4a-I_NEC_2018_Site28_Sediment_Transects.mxd beatyci



Profile Transect Number	Maximum Surface Water Depth (ft)
P18	0.8
P19	1.2
P20	1.8
P21	0.5
P22	1.0
P23	1.8
P24	0.7
P25	1.0
P26	0.3
P27	0.4
P28	0.3
P29	0.3

N

0 8 16 24 32 40

Feet

WGS 1984 UTM Zone 2N

SITE 28: AREA 4 TRANSECTS
NORTHEAST CAPE PERIODIC REVIEW

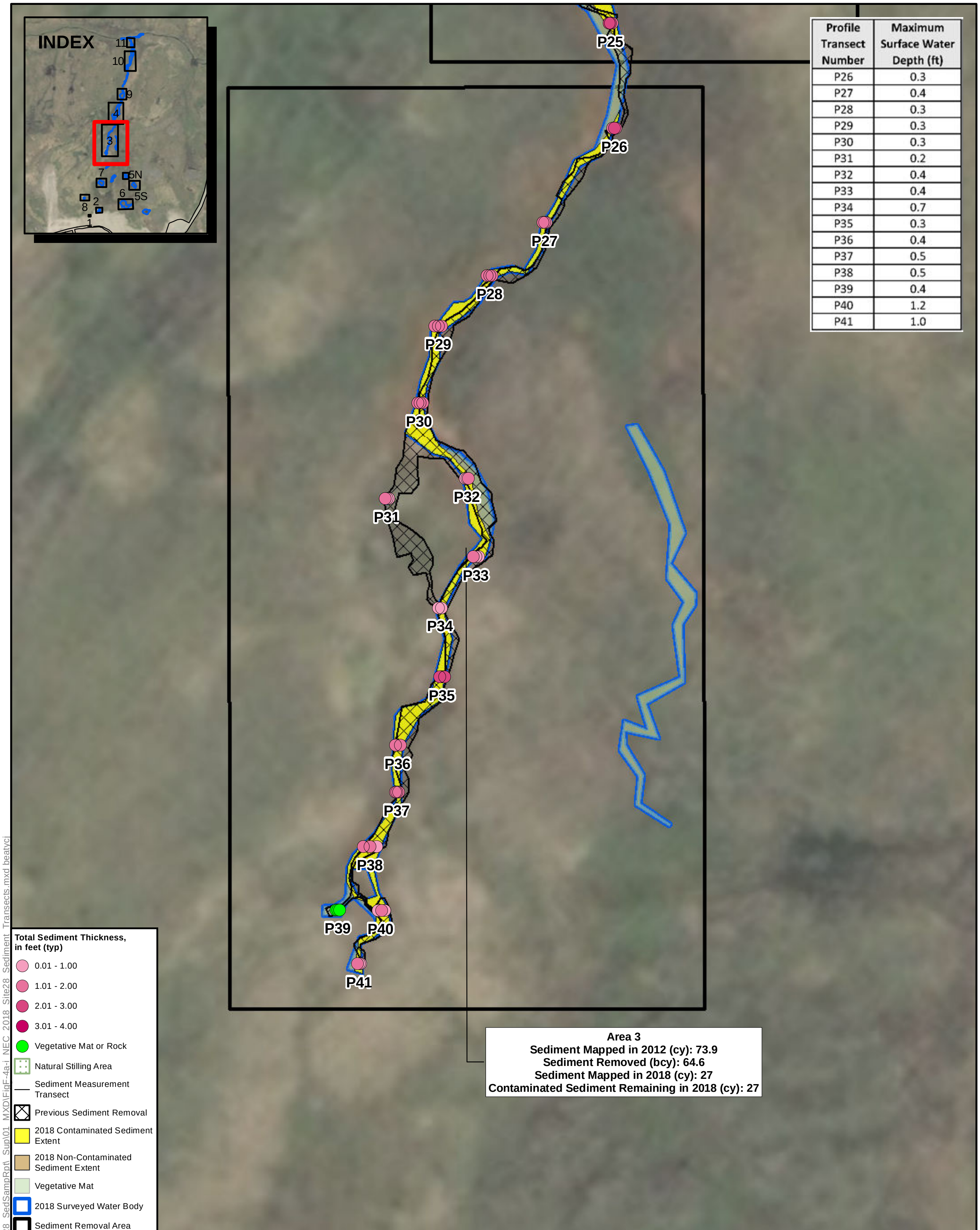
U.S. Army
Corps of Engineers
Alaska District

FUDS PROPERTY - F10AK0969

SAINT LAWRENCE ISLAND, ALASKA

FIGURE A-16c

P:\StLawrenceIsland_FUDS_NEC_Site28_SedSampRpt_Sup01_MXD\FigF-4a-i_NEC_2018_Site28_Sediment_Transects.mxd beatyci



Profile Transect Number	Maximum Surface Water Depth (ft)
P26	0.3
P27	0.4
P28	0.3
P29	0.3
P30	0.3
P31	0.2
P32	0.4
P33	0.4
P34	0.7
P35	0.3
P36	0.4
P37	0.5
P38	0.5
P39	0.4
P40	1.2
P41	1.0

Total Sediment Thickness, in feet (typ)

- 0.01 - 1.00
- 1.01 - 2.00
- 2.01 - 3.00
- 3.01 - 4.00
- Vegetative Mat or Rock
- Natural Stilling Area
- Sediment Measurement Transect
- Previous Sediment Removal
- 2018 Contaminated Sediment Extent
- 2018 Non-Contaminated Sediment Extent
- Vegetative Mat
- 2018 Surveyed Water Body
- Sediment Removal Area

N

0 8 16 24 32 40

Feet

WGS 1984 UTM Zone 2N

SITE 28: AREA 3 TRANSECTS
NORTHEAST CAPE PERIODIC REVIEW

U.S. Army
Corps of Engineers
Alaska District

FUDS PROPERTY - F10AK0969

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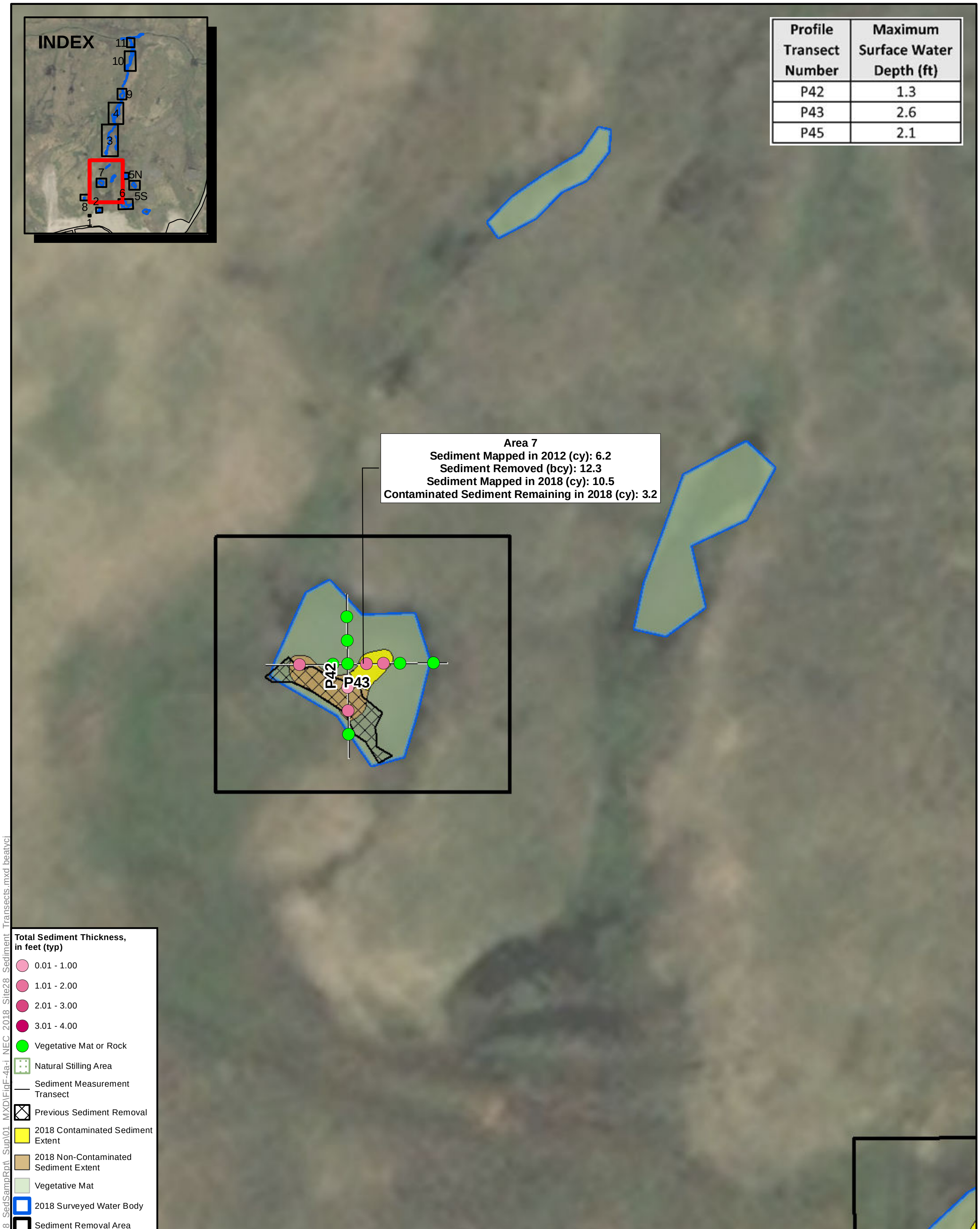
FIGURE A-16d

P:\StLawrenceIsland_FUDS_NEC_Site28_SedSampRpt_Supl01_MXD\FigF-4a-l_NEC_2018_Site28_Sediment_Transects.mxd beatyci



Profile Transect Number	Maximum Surface Water Depth (ft)
P42	1.3
P43	2.6
P45	2.1

N

0 8 16 24 32 40

Feet

WGS 1984 UTM Zone 2N

SITE 28: AREA 7 TRANSECTS
NORTHEAST CAPE PERIODIC REVIEW

U.S. Army
Corps of Engineers
Alaska District

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FIGURE A-16e

Profile Transect Number	Maximum Surface Water Depth (ft)
P44	2.2
P45	2.1

SITE 28: AREA 8 TRANSECTS
NORTHEAST CAPE PERIODIC REVIEW

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Alaska District

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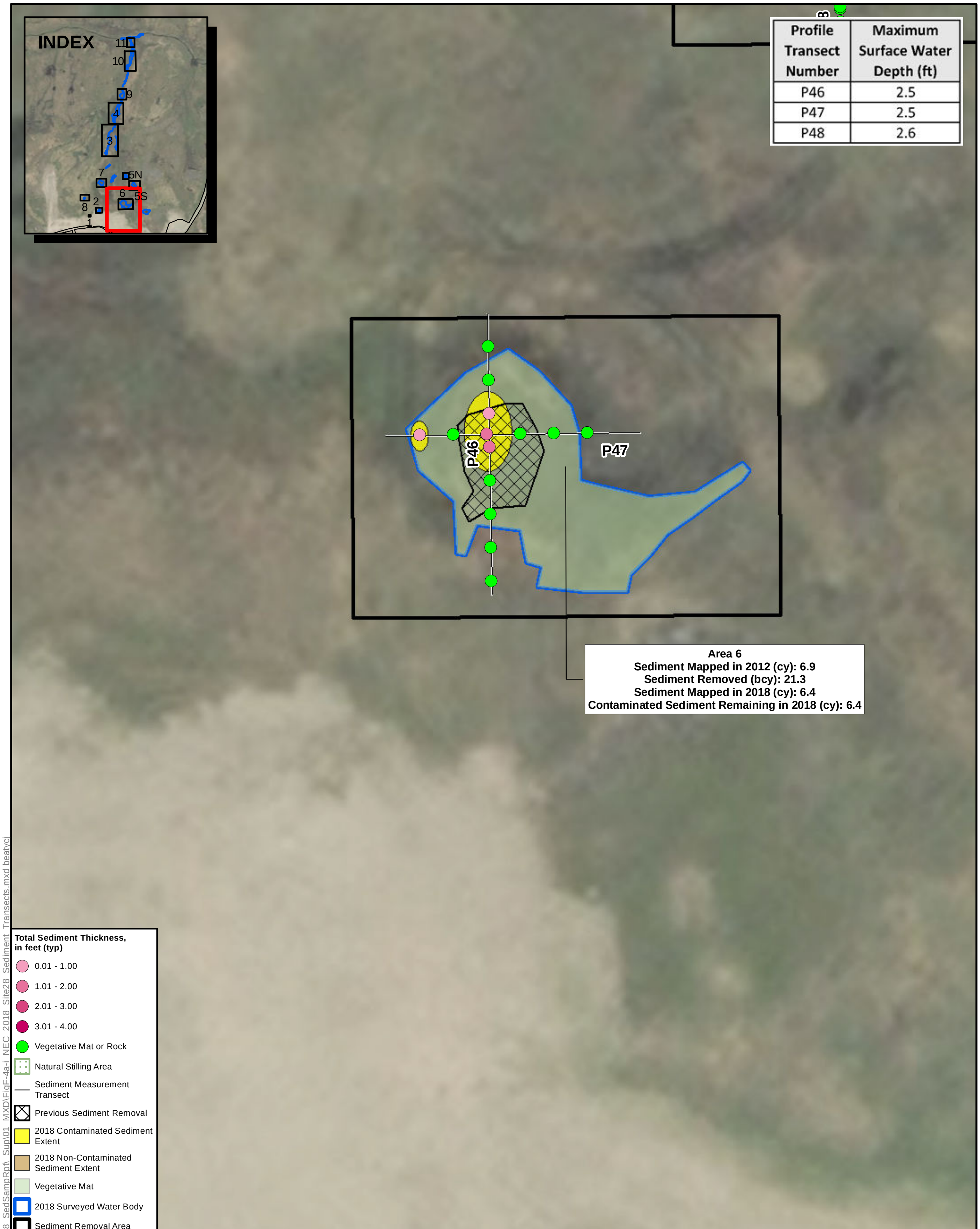
FIGURE A-16f

P:\StLawrenceIsland\ FUDS NEC Site28 SedSampRpt Supl01 MXD\FigF-4a-I NEC 2018 Site28 Sediment Transects.mxd beatyci



Profile Transect Number	Maximum Surface Water Depth (ft)
P46	2.5
P47	2.5
P48	2.6

N

0 8 16 24 32 40
Feet

WGS 1984 UTM Zone 2N

P:\StLawrenceIsland_FUDS_NEC_Site28_SedSampRpt_Supl01_MXD\FigF-4a-l_NEC_2018_Site28_Sediment_Transects.mxd beatyci

SITE 28: AREA 6 TRANSECTS
NORTHEAST CAPE PERIODIC REVIEW

U.S. Army
Corps of Engineers
Alaska District

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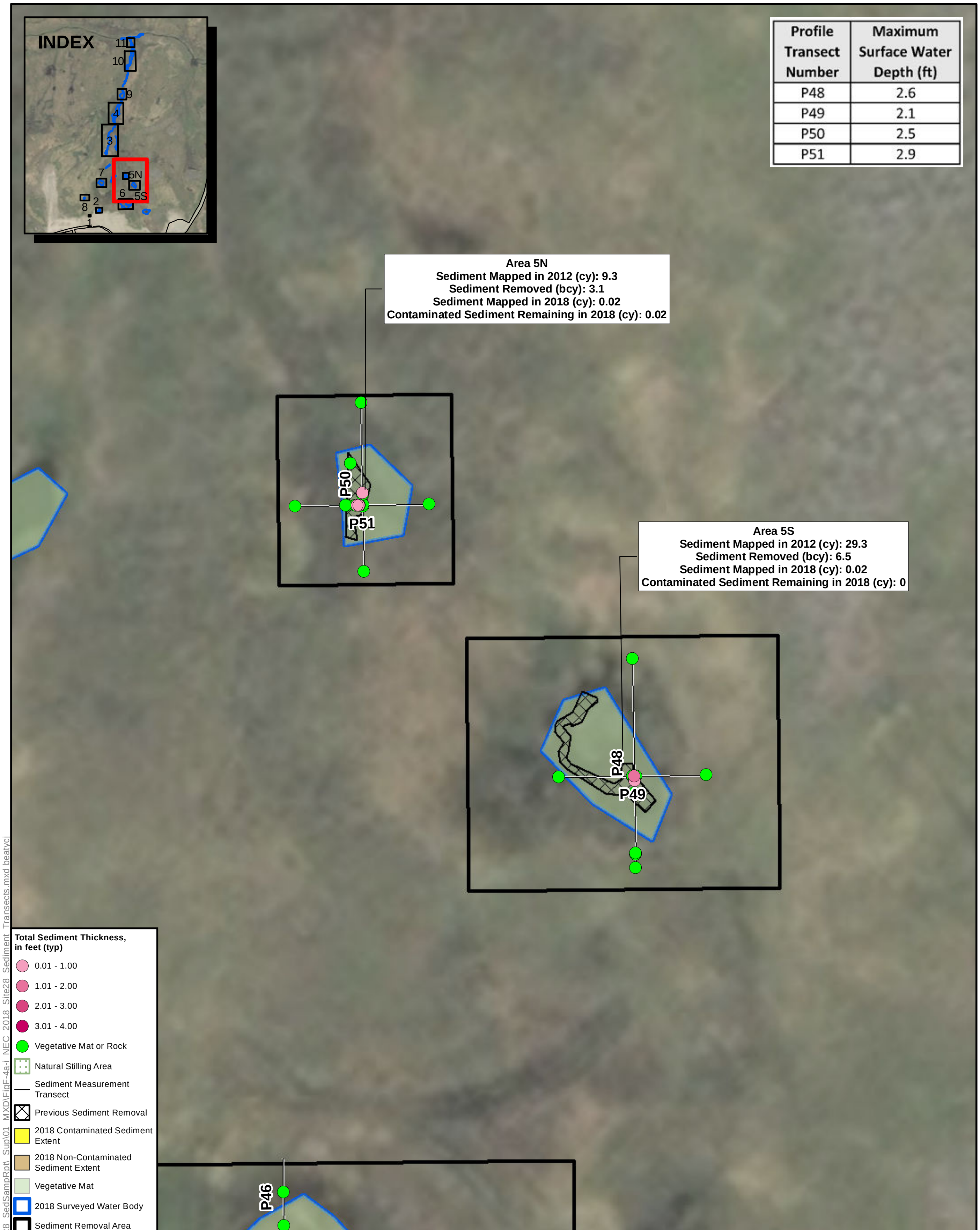
SAINT LAWRENCE ISLAND, ALASKA

FIGURE A-16g



Profile Transect Number	Maximum Surface Water Depth (ft)
P48	2.6
P49	2.1
P50	2.5
P51	2.9

N

0 8 16 24 32 40

Feet

WGS 1984 UTM Zone 2N

SITE 28: AREAS 5N AND 5S TRANSECTS
NORTHEAST CAPE PERIODIC REVIEW

U.S. Army
Corps of Engineers
Alaska District

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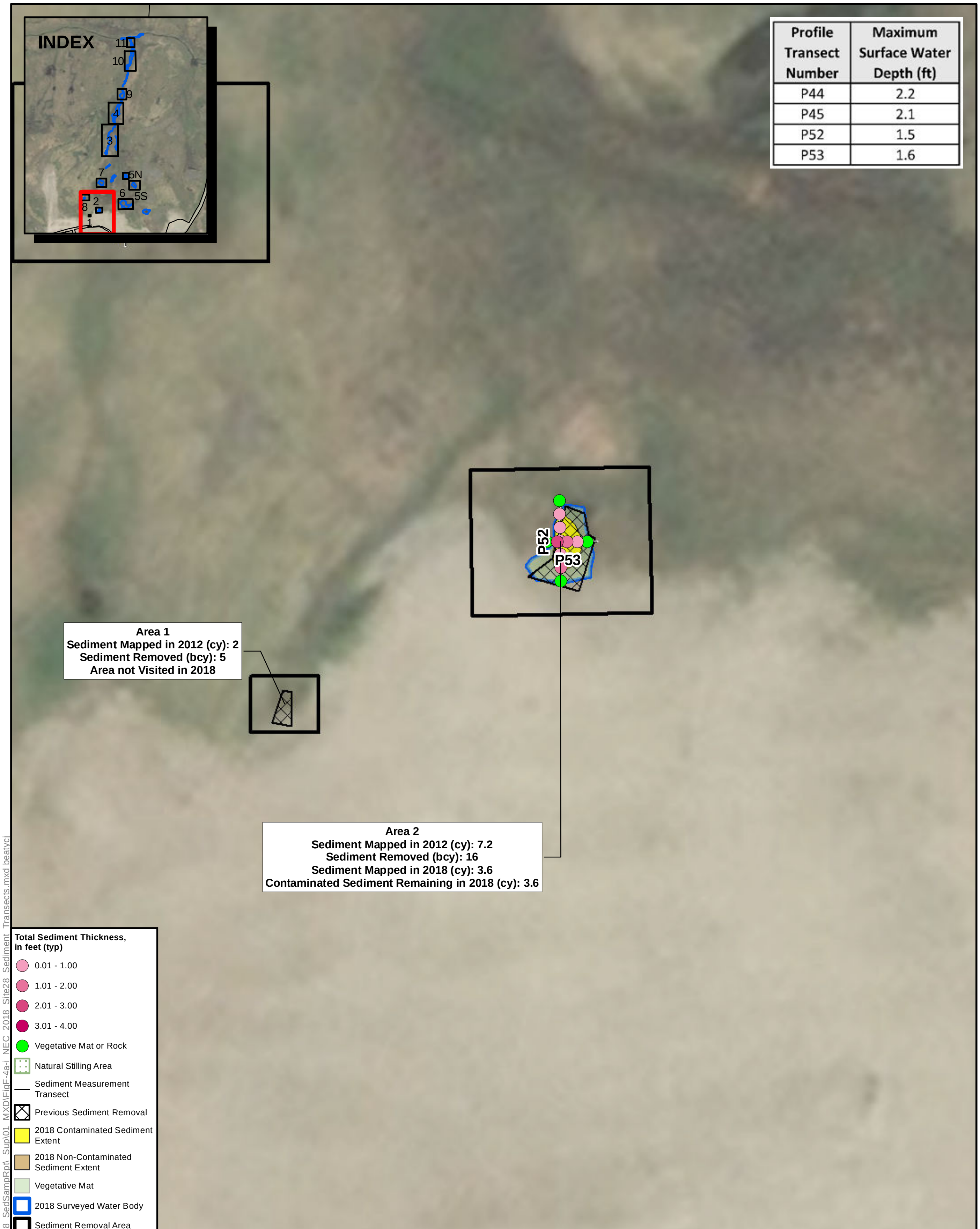
FIGURE A-16h

P:\StLawrenceIsland\ FUDS NEC Site28 SedSampRpt Supp01 MXD\FigF-4a-i NEC 2018 Site28 Sediment Transects.mxd beatyci



Profile Transect Number	Maximum Surface Water Depth (ft)
P44	2.2
P45	2.1
P52	1.5
P53	1.6

N

0 8 16 24 32 40

Feet

WGS 1984 UTM Zone 2N

SITE 28: AREA 2 TRANSECTS
NORTHEAST CAPE PERIODIC REVIEW

U.S. Army
Corps of Engineers
Alaska District

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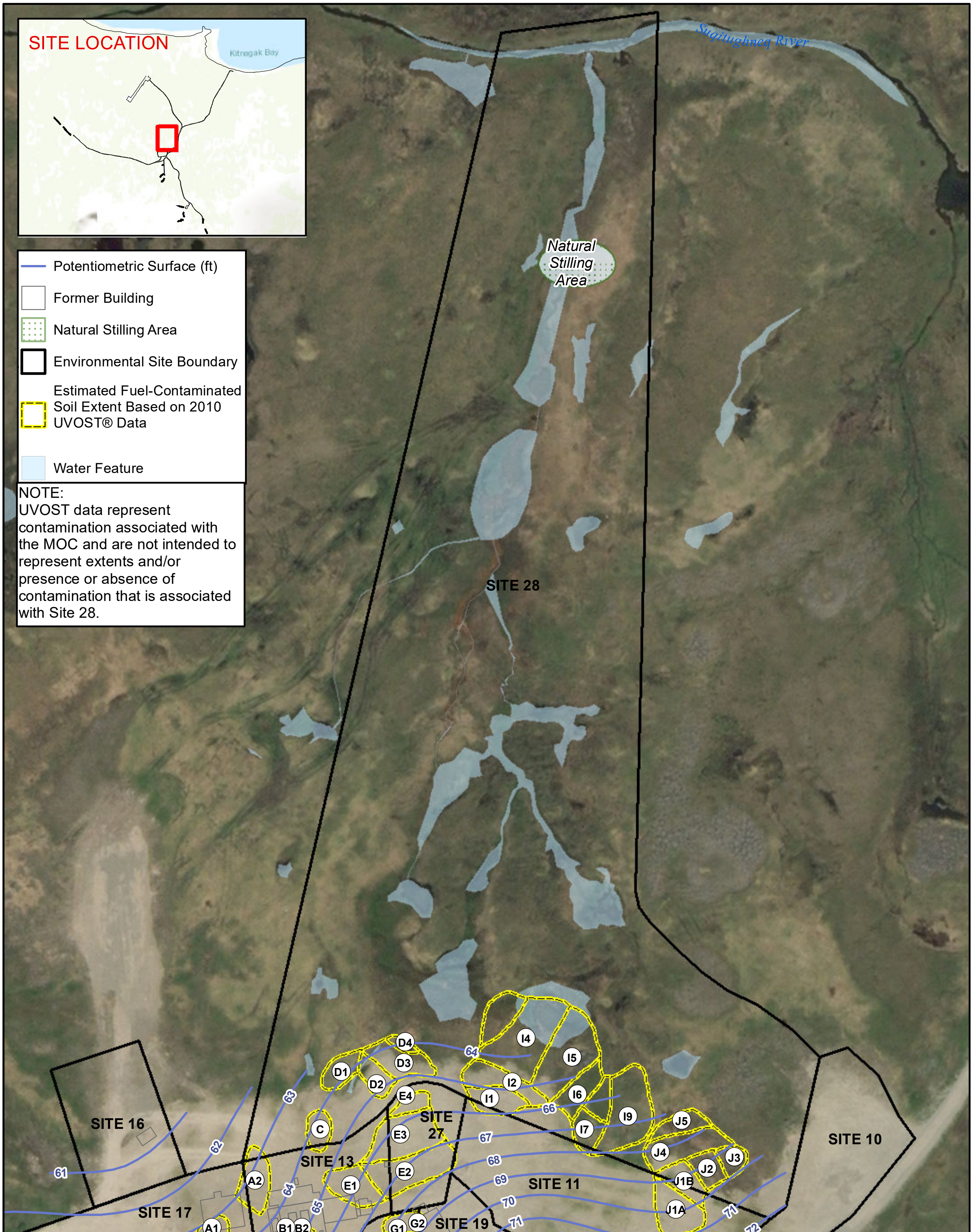
FIGURE A-16i

P:\StLawrenceIsland\ FUDS NEC Site28 SedSampRpt\ Supl01 MXD\FigF-4a-i NEC 2018 Site28 Sediment Transects.mxd beatyci



SITE 28: UVOST DELINEATED PLUMES
NORTHEAST CAPE PERIODIC REVIEW

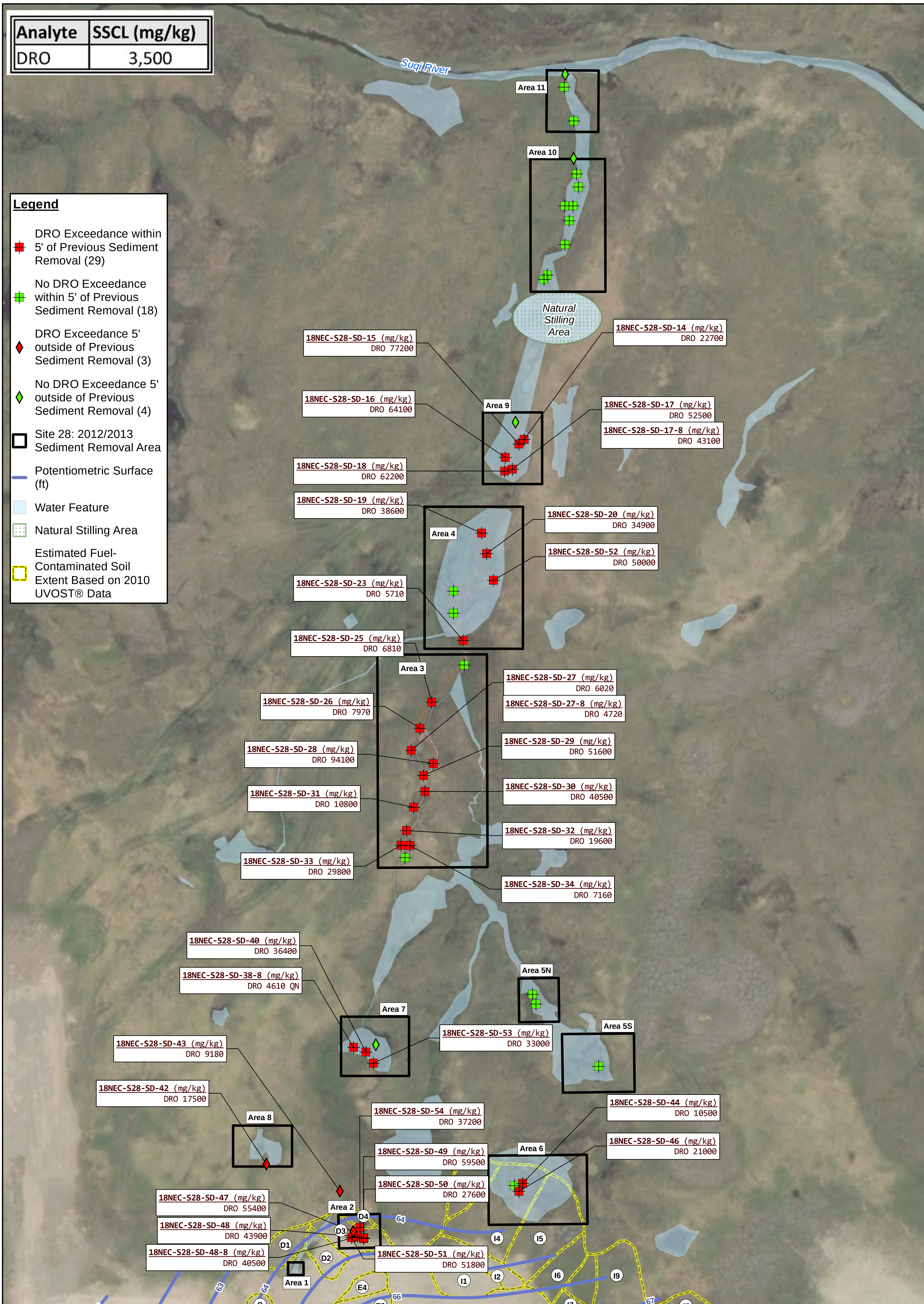
U.S. Army
Corps of Engineers
Alaska District

FUDS PROPERTY - F10AK0969
SAINT LAWRENCE ISLAND, ALASKA

FIGURE A-17

S:\UUSACE\AK_NortheastCape_FUDS_2019PeriodicReview_Sup\01_MXD\FigA-17_Site28_UVOST_Delineated_Plumes.mxd beatycj

P:\StLawrenceIsland_F10AK0969_NEC_2nd5YR_Sup\01_MXD\FigB-7toB-10_NEC_Site28_2018Results.mxd beatycj 1/9/2020



Approximate Groundwater Flow Direction

Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

N

0 30 60 90 120
FEET

WGS 1984 UTM Zone 2N

SITE 28: DRO IN SEDIMENT
2018 SAMPLING RESULTS AFTER SILICA GEL CLEANUP

NORTHEAST CAPE PERIODIC REVIEW

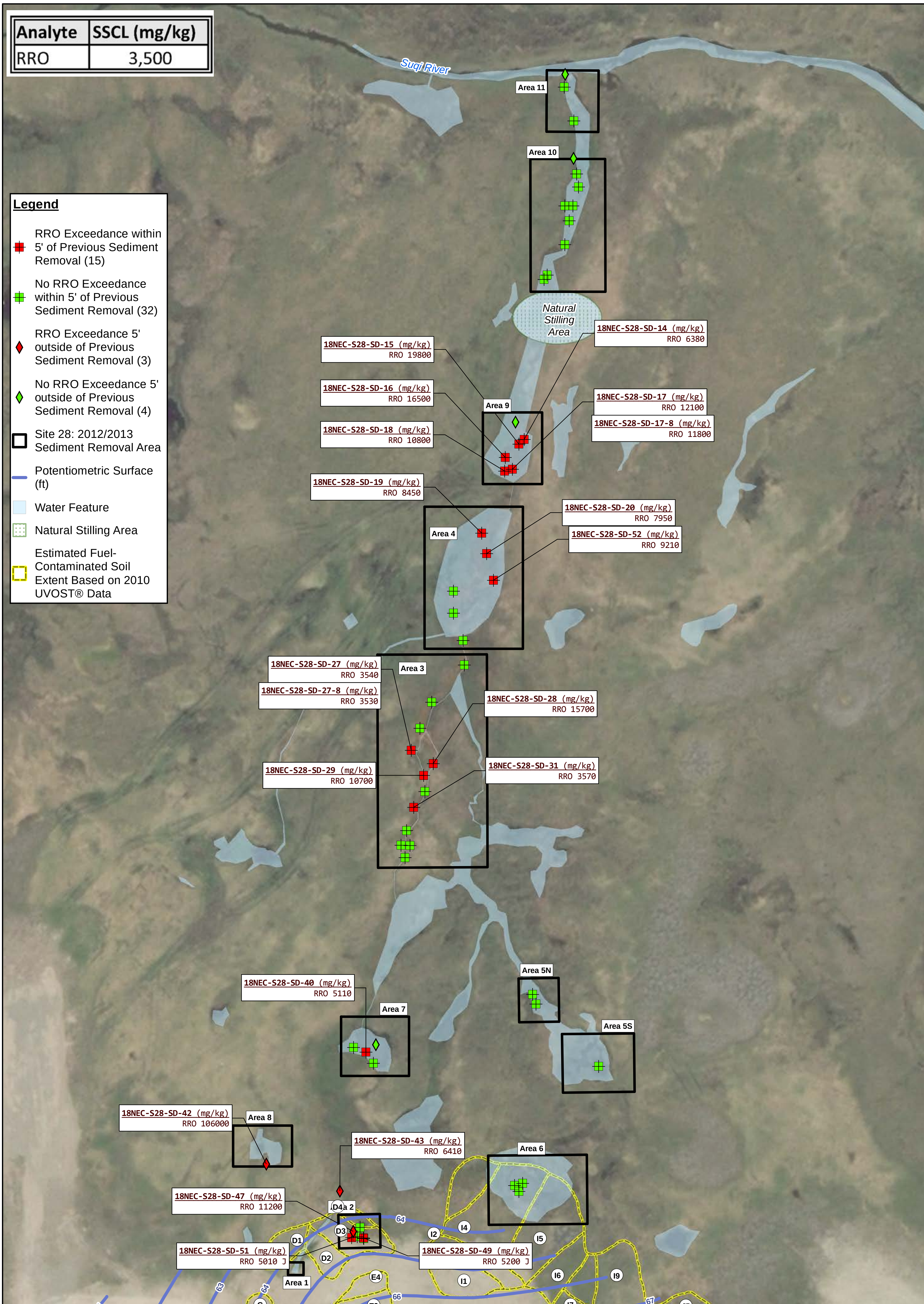
U.S. Army
Corps of Engineers
Alaska District

FUDS PROPERTY - F10AK0969

SAINT LAWRENCE ISLAND, ALASKA

FIGURE A-18

P:\StLawrenceIsland_F10AK0969_NEC_2nd5YR_Sup\01_MXD\FigB-7toB-10_NEC_Site28_2018Results.mxd beatycj 1/9/2020



Approximate Groundwater Flow Direction

Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

N

0 30 60 90 120
FEET

WGS 1984 UTM Zone 2N

SITE 28: RRO IN SEDIMENT
2018 SAMPLING RESULTS AFTER SILICA GEL CLEANUP

NORTHEAST CAPE PERIODIC REVIEW

U.S. Army Corps of Engineers Alaska District

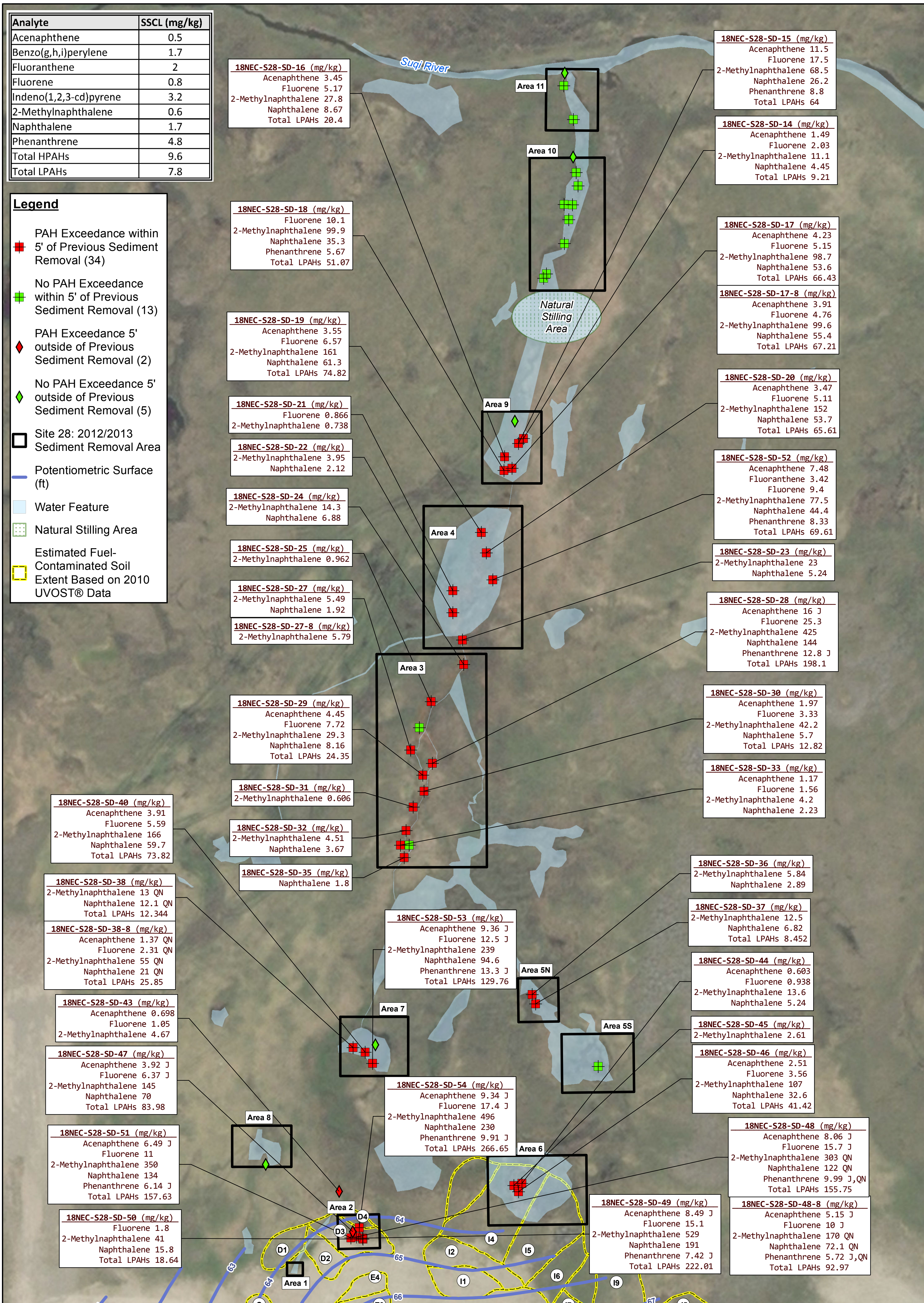
FUDS PROPERTY - F10AK0969

SAINT LAWRENCE ISLAND, ALASKA

FIGURE A-19

P:\StLawrenceIsland_F10AK0969_NEC_2nd5YR_Sup\01_MXD\FigB-7toB-10_NEC_Site28_2018Results.mxd beatycj 1/8/2020

Analyte	SSCL (mg/kg)
Acenaphthene	0.5
Benzo(g,h,i)perylene	1.7
Fluoranthene	2
Fluorene	0.8
Indeno(1,2,3-cd)pyrene	3.2
2-Methylnaphthalene	0.6
Naphthalene	1.7
Phenanthrene	4.8
Total HPAHs	9.6
Total LPAHs	7.8



Approximate Groundwater Flow Direction

Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

N

0 30 60 90 120
FEET

WGS 1984 UTM Zone 2N

SITE 28: PAHs IN SEDIMENT
2018 SAMPLING RESULTS AFTER SILICA GEL CLEANUP

NORTHEAST CAPE PERIODIC REVIEW

U.S. Army Corps of Engineers Alaska District

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SAINT LAWRENCE ISLAND, ALASKA

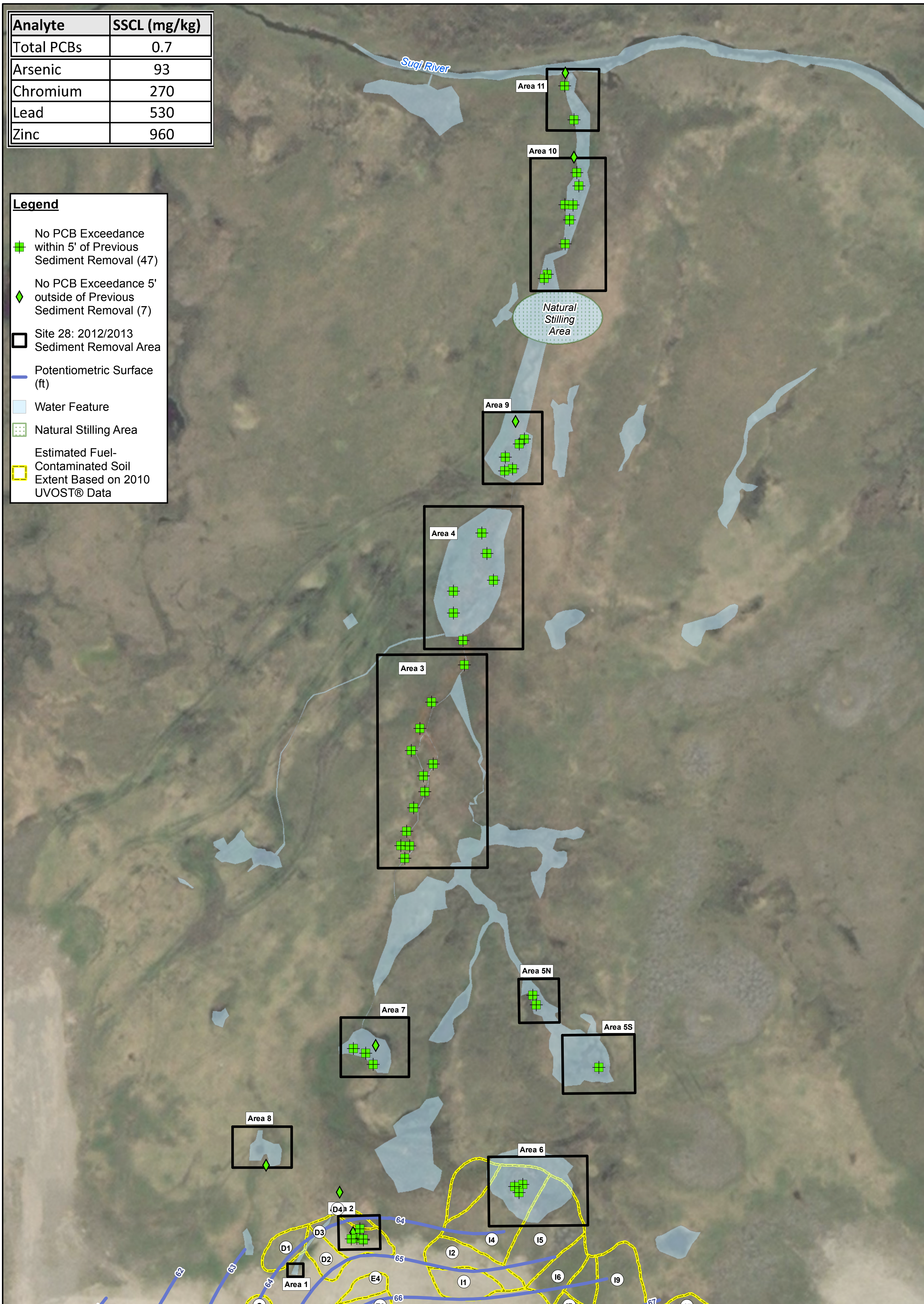
FIGURE A-20

P:\StLawrenceIsland_F10AK0969_NEC_2nd5YR_Sup\01_MXD\FigB-7toB-10_NEC_Site28_2018Results.mxd beatycj 1/8/2020

Analyte	SSCL (mg/kg)
Total PCBs	0.7
Arsenic	93
Chromium	270
Lead	530
Zinc	960

Legend

- No PCB Exceedance within 5' of Previous Sediment Removal (47)
- No PCB Exceedance 5' outside of Previous Sediment Removal (7)
- Site 28: 2012/2013 Sediment Removal Area
- Potentiometric Surface (ft)
- Water Feature
- Natural Stilling Area
- Estimated Fuel-Contaminated Soil Extent Based on 2010 UVOST® Data



Approximate Groundwater Flow Direction

Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

N

0 30 60 90 120
FEET

WGS 1984 UTM Zone 2N

SITE 28: PCBs AND METALS IN SEDIMENT
2018 SAMPLING RESULTS AFTER SILICA GEL CLEANUP

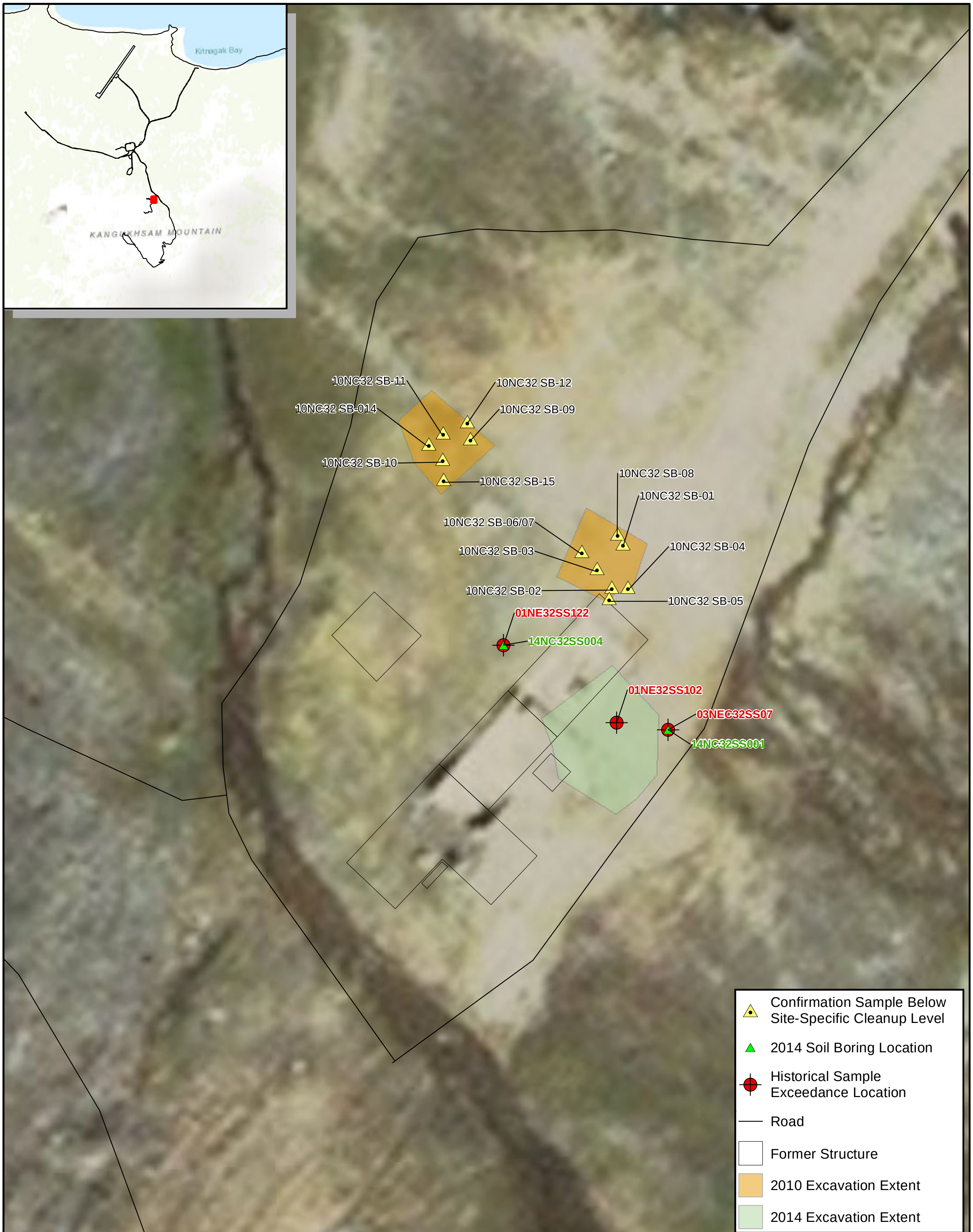
NORTHEAST CAPE PERIODIC REVIEW

U.S. Army Corps of Engineers Alaska District

FUDS PROPERTY - F10AK0969

SAINT LAWRENCE ISLAND, ALASKA

FIGURE A-21



N

0 20 40

FEET

WGS 1984 UTM Zone 2N

SITE 32 LOWER TRAMWAY
NORTHEAST CAPE PERIODIC REVIEW

U.S. Army
Corps of Engineers
Alaska District

FUDS PROPERTY - F10AK0969

SAINT LAWRENCE ISLAND, ALASKA

FIGURE A-22

\\dc1vs01\GISProj\U\USACE\AK_NortheastCape_FUDS_2019PeriodicReview_Sup\01_MXD\FigA-22_Site32_LowerTramway.mxd beatycj

APPENDIX B

CLEANUP LEVELS, TOXICITY AND RISK EVALUATION

U.S. Army Corps of Engineers
Alaska District

SECOND PERIODIC REVIEW REPORT

NORTHEAST CAPE FUDS
ST. LAWRENCE ISLAND, ALASKA

APPENDIX B
CLEANUP LEVELS, TOXICITY, AND RISK EVALUATION

Formerly Used Defense Site F10AK0969-03

FINAL
SEPTEMBER 2020

TABLE OF CONTENTS

TABLES

ATTACHMENT

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ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
ARAR	applicable or relevant and appropriate requirements
COC	contaminant of concern
COPC	contaminant of potential concern
DD	Decision Document
DRO	diesel-range organics
EPA	U.S. Environmental Protection Agency
ESV	ecological screening value
GRO	gasoline-range organics
HPAH	high-molecular weight polycyclic aromatic hydrocarbons
LOAEL	lowest observed adverse effect levels
LPAH	low-molecular weight polycyclic aromatic hydrocarbons
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
NA	not applicable
ND	nondetect
NOAEL	no observed adverse effects levels
PAH	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyl
RAO	remedial action objective
RRO	residual-range organics
TPH	total petroleum hydrocarbons
WAC	Washington Administrative Code

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INTRODUCTION

Updates to regulations and chemical-specific toxicity data may occur over time. The effects of those changes are evaluated as part of the technical assessment conducted for the Northeast Cape *Second Periodic Review Report* to ensure the selected remedy remains protective of human health. The evaluation of regulatory updates involves a two-step process followed by the evaluation of chemical-specific toxicity data updates (risk evaluation). The evaluation process summarized below is explained in greater detail in Section 6.0 of the Periodic Review report:

- The evaluation begins by determining whether any contaminants of potential concern (COPC) or contaminants of concern (COC) have new or changed standards since the time of the Decision Document (DD) (USACE 2009). All compounds identified in the DD are presented in Table B-1. Additionally, any compounds detected during remedy implementation that exceed the screening levels listed have been included; therefore, Table B-1 includes more compounds than the DD list of COCs.
- If a new or more stringent standard was identified, the COPC or COC was carried forward (Table B-2). The Table B-2 evaluation compares the current applicable standard with maximum detected levels at the time of the DD, or more recent applicable concentrations.
- If a respective concentration exceeded the applicable standards, or if the human health risk of the standard had not previously been evaluated, the compound was carried forward for the risk evaluation (Table B-3). A risk evaluation was completed by calculating carcinogenic and non-carcinogenic values for each individual compound at the best available onsite concentrations using current toxicity information. The risk/hazard values were calculated using the Alaska Department of Environmental Conservation (ADEC) cumulative risk calculator (ADEC 2016). The results of the risk evaluation are presented in Table B-3. The evaluation of risk for sediment was completed by screening the concentrations measured at Site 28 during the 2018 sampling effort against the U.S. Environmental Protection Agency (EPA) Region 4 Ecological Screening Value (ESV) (EPA 2018), as the remedial action objectives (RAOs) established in the DD were ecological-based cleanup levels.

ADEC CLEANUP LEVELS USED FOR SOIL

For soil cleanup levels, the ADEC Method Two under 40-inch zone, most stringent human health cleanup level (Title 18 of the Alaska Administrative Code [AAC], Chapter 75, Table B1) (ADEC 2018), was applied for all compounds not listed in the DD as COCs. Comparison to this criterion was not carried forward for those compounds listed with site-specific values calculated using a Method Four risk assessment.

CLEANUP LEVELS USED FOR GROUNDWATER AND SURFACE WATER

For groundwater or surface water cleanup levels, the cleanup levels or standards listed in 18 AAC 75, Table C (groundwater) or 18 AAC 70 (surface water) were used (ADEC 2018). The groundwater concentrations measured from the last sampling event were used in this evaluation.

CLEANUP LEVELS AND SCREENING VALUES USED FOR SEDIMENT

Cleanup levels for sediment were established in the DD using Washington State Administrative Code (WAC) 173-204-520 Table III sediment cleanup levels or consensus-based probable effect concentrations (MacDonald et. al 2000). The DD-established RAO was compared to the current WAC 173-204-520 Table III, dry-weight basis and assuming 1 percent total carbon, in the same manner as described in the DD (USACE 2009).

Table B-1
Evaluation of Changes in Chemical-Specific Standards

COPCs/COCs	DD-Established RAO for COCs	Source of the DD RAO	Has the source of the DD-Established RAO revised the standard to a more stringent level or Is this a new analyte detection?
Sediment (mg/kg)			
DRO C_{10} to C_{25}	3,500	Risk Assessment/ Site Specific	No
RRO C_{25} to C_{36}	3,500	Risk Assessment/ Site Specific	No
Acenaphthene	0.5	WAC 173-204-520 T3	No
Benzo(a)anthracene	**--**	**--**	**Yes (0.66)**
Benzo(g,h,i)perylene	1.7	MacDonald et al [a]	No
Chrysene	**--**	**--**	**Yes (4.6)**
Fluoranthene	2	MacDonald et al [a]	No (Less Stringent – 12)
Fluorene	0.8	WAC 173-204-520 T3	No
Indeno(1,2,3-cd)pyrene	**3.2**	**MacDonald et al [b]**	**Yes (0.88)**
2-Methylnaphthalene	0.6	WAC 173-204-520 T3	No
Naphthalene	1.7	WAC 173-204-520 T3	No
Phenanthrene	4.8	WAC 173-204-520 T3	No
Pyrene	**--**	**--**	**Yes (14)**
Total LPAHs	7.8	WAC 173-204-520 T3	No
Total HPAHs	9.6	WAC 173-204-520 T3	No
PCBs (sum)	0.7	WAC 173-204-520 T3	No
Arsenic	93	WAC 173-204-520 T3	No
Chromium	270	WAC 173-204-520 T3	No
Lead	530	WAC 173-204-520 T3	No
Selenium	**--**	**--**	**Yes (20)**
Zinc	960	WAC 173-204-520 T3	No

Table B-1 (Continued)
Evaluation of Changes in Chemical-Specific Standards

COPCs/COCs	DD-Established RAO for COCs	Source of the DD RAO	Has the source of the DD-Established RAO revised the standard to a more stringent level or Is this a new analyte detection?
Groundwater (mg/L)			
GRO C_6 to C_{10}	1.3	18 AAC 75 Table C	No (Less stringent than DD RAO – 2.2[c])
DRO C_{10} to C_{25}	1.5	18 AAC 75 Table C	No
RRO C_{25} to C_{36}	1.1	18 AAC 75 Table C	No
Benzene	0.005	18 AAC 75 Table C	No
Ethylbenzene	**0.7**	18 AAC 75 Table C	**Yes (0.015[d])**
Xylenes	**--**	--	**Yes (0.19)**
1-Methylnaphthalene	**--**	--	**Yes (0.011)**
2-Methylnaphthalene	**--**	--	**Yes (0.036)**
Naphthalene	**--**	--	**Yes (0.0017)**
Arsenic	**0.01**	18 AAC 75 Table C	**Yes (0.00052[c])**
Lead	0.015	18 AAC 75 Table C	No
Manganese	**--**	--	**Yes (0.43)**
Surface Water (mg/L)			
DRO C_{10} to C_{25}	No Sheen	18 AAC 70	No
RRO C_{25} to C_{36}	No Sheen	18 AAC 70	No
TAH	0.01	18 AAC 70	No
TAqH	0.015	18 AAC 70	No
Soil (mg/kg)			
DRO C_{10} to C_{25}	9,200[c]	Site Specific/18 AAC 75 Method 4	No (Less stringent than DD RAO – 10,250[e])
RRO C_{25} to C_{36}	9,200[c]	Site Specific/18 AAC 75 Method 4	No (Less stringent than DD RAO – 10,000[e])
Arsenic	11	Site Specific Background	No
Benzene	2[c]	Site Specific/18 AAC 75 Method 4	No (Less stringent than DD RAO– 11[e])

Table B-1 (Continued)
Evaluation of Changes in Chemical-Specific Standards

COPCs/COCs	DD-Established RAO for COCs	Source of the DD RAO	Has the source of the DD-Established RAO revised the standard to a more stringent level or Is this a new analyte detection?
Naphthalene	120[c]	Site Specific/18 AAC 75 Method 4	No (Less stringent than previous ADEC cleanup level – 29[e])

Notes:
Bold = Analyte carried forward to evaluation in Table B-2.
[a] The source of the cleanup level cited in the decision document is not accurate. The value is from *Consensus-Based Sediment Quality Guidelines* Table 2 probable effect concentration (Wisconsin Department of Natural Resources 2003).
[b] The source of the cleanup level cited in the decision document is not accurate. The value is from *Consensus-Based Sediment Quality Guidelines* Table 2 midpoint effect concentration (Wisconsin Department of Natural Resources 2003).
[c] Site-specific value based on risk to human health calculated using assumed composition percentages for total aromatic and total aliphatic fractions.
[d] Groundwater Cleanup Level. 18 AAC 75 Table C (29 September 2018).
[e] Most stringent of the human health based cleanup levels (ingestion or inhalation). 18 AAC 75 Table B1 or B2, Under 40 Inch Zone (29 September 2018)
For definitions, refer to the Acronyms and Abbreviations section.

Table B-2
Evaluation of Changes for New, More Stringent Standards

COPC/COCs	DD-Established RAO for COCs	Current Applicable Screening Criteria	Maximum Detected Since the DD[a]	New Risk Evaluation Needed?
Sediment (mg/kg)[b]				
Acenaphthylene	--	0.66	ND	No
Benzo(a)anthracene	--	0.108	0.359	No
Chrysene	--	0.166	0.702	No
Indeno(1,2,3-cd)pyrene	3.2	0.88	ND	No
Pyrene	--	0.195	2.45	No
Selenium	--	0.72	4.34	No
Groundwater (mg/L)[c]				
Arsenic	0.01	0.00052	0.0092	No
Ethylbenzene	0.7	0.015	0.0031	No
Xylenes	0.015	0.19	0.0038	No
1-Methylnaphthalene	**--**	**0.011**	**0.03**	**Yes**
2-Methylnaphthalene	**--**	**0.036**	**0.041**	**Yes**
Naphthalene	**--**	**0.0017**	**0.029**	**Yes**
Phenanthrene	--	0.17	0.00022	No
Manganese	**--**	**0.43**	**3.48**	**Yes**

Notes:
Bold = Analyte carried forward to evaluation in Table B-3.
[a] The sediment screening criteria is the current WAC 173-204-520 Table III, dry-weight basis and assuming 1 percent total carbon. The groundwater screening criteria is the 18 AAC 75 Table C cleanup level (29 September 2018).
[b] Sediment results used in this analysis are from the 2018 sampling effort.
[c] Groundwater results used in this analysis are from the 2016 (USACE 2017) sampling effort.
For definitions, refer to the Acronyms and Abbreviations section.

Table B-3
Risk/Hazard Estimates for New Chemicals above Standards

COPC/COCs	Applicable Site Concentration (mg/kg)	RfDo (mg/kg-d)	SFo $(mg/kg\text{-}d)^{-1}$	Hazard Quotient	Cancer Risk
Groundwater (mg/L)					
Manganese (non-diet)	3.48	0.024	--	**8.03**	**-**
1-Methylnaphthalene	0.03	0.07	0.029	0.0481	2.64E-05
2-Methylnaphthalene	0.041		--		-
Naphthalene	0.029	0.02	--	**4.75**	**1.76E-04**
Cumulative Total				**13**	**2E-04**

Notes:
Bold = Individual analyte or cumulative total exceeds acceptable risk threshold of HI=1 or Cancer Risk of 1E-04.
RfDo = reference dose (oral)
SFo = slope factor (oral)
For further definitions, refer to the Acronyms and Abbreviations section.

Table B-4
Toxicity and Risk Evaluation (Question B) Summary Table

Site	A) Are there changes in the standards identified as ARARs in the DD that bear protectiveness of the remedy? B) Are there newly promulgated standards that might apply or be relevant and appropriate to the site and that bear on the protectiveness of the remedy?	What is the basis for each COC cleanup level identified in the DD? Have there been changes to the basis of the cleanup levels?	Has land use or expected land use on or near the site changed?	Have any human health or ecological routes of exposure or receptors changed or been newly identified?	Are there newly identified contaminants or contaminant sources?	Are there unanticipated toxic byproducts of the remedy not previously addressed by the decision document?	Have physical site conditions changed such that protectiveness may be affected? Has understanding of physical site conditions changed?	Have toxicity factors for contaminants of concern at the site changed? Have other contaminant characteristics changed? Have ecological toxicity reference values and/or NOAELs/LOAELs changed?
Site 3	A) No B) Yes	No	No	No	Yes	No	No	No
Site 6	A) No B) No	No	No	No	No	No	No	No
Site 8	A) No B) No	No	No	Yes	Yes	No	Yes	No
Site 9	A) Yes B) No	Yes	No	No	No	No	No	No
MOC	A) Yes B) Yes	Yes	No	No	Yes	No	No	No
Site 10	A) No B) No	No	No	No	Yes	No	No	No
Site 11	A) No B) No	No	No	No	No	No	No	No
Site 13	A) No B) Yes	Yes	No	No	No	No	No	No
Site 15	A) No B) No	No	No	No	No	No	No	No
Site 16	A) No B) No	No	No	No	No	No	No	No
Site 19	A) No B) No	No	No	No	No	No	No	No
Site 27	A) Yes B) No	Yes	No	No	No	No	No	No
Site 28	A) Yes B) Yes	No	No	No	No	No	No	No
Site 32	A) No B) No	No	No	No	No	No	No	No

Note:
For definitions, refer to the Acronyms and Abbreviations section.

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RISK EVALUATION CONCLUSION

Of the media evaluated, contaminants in groundwater were the only analytes that needed to be carried forward to a quantitative cumulative risk evaluation (Table B-3); contaminants in soil, sediment, and surface water did not. Risk from newly quantified contaminants manganese and naphthalene in MOC groundwater are above acceptable levels of risk. Although these analytes are not listed as site COCs, they are anticipated to be addressed by the selected remedy for the site and are consistent with the conceptual site model of the release at the site. To insure protectiveness, complete remedy implementation of land use controls is recommended.

REFERENCES

ADEC (Alaska Department of Environmental Conservation). 2016 (15 September). *Procedures for Calculating Cumulative Risk*. Division of Spill Prevention and Response, Contaminated Sites Program.

ADEC. 2018 (29 September). *Oil and Other Hazardous Substances Pollution Control*. Division of Spill Prevention and Response, Contaminated Sites Program. 18 AAC 75.

EPA (U.S. Environmental Protection Agency). 2018 (March). *Region 4 Ecological Risk Assessment Supplemental Guidance*. Originally published November 1995.

MacDonald, D.D., Ingersoll, C.G., and T.A. Berger. 2000. *Development and evaluation of consensus-based sediment quality guidelines for freshwater ecosystems*. Arch. Environ. Contam. Toxicol. 39:20-31.

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USACE. 2017 (September). *2016 Site 8 and Suqitughneq River Surface Water and Sediment Sampling Report. Northeast Cape, St. Lawrence Island, Alaska.* FRMD No. F10AK096903_07.11_0510_a.

Wisconsin Department of Natural Resources. 2003 (December). *Consensus-Based Sediment Quality Guidelines.* Interim Guidance RR-088.

ATTACHMENT B-1
Site-Specific Risk Model

Site-specific Risk Models
Equation Inputs
Groundwater

Variable	Value
LT (lifetime - resident) year	70
K (volatilization factor of Andelman) L/m^3	0.5
l_{sc} (apparent thickness of stratum corneum) cm	0.001
ED_{resw} (exposure duration - resident) year	26
ED_{reswc} (exposure duration - child) year	6
ED_{reswa} (exposure duration - adult) year	20
ED_{0-2} (mutagenic exposure duration first phase) year	2
ED_{2-6} (mutagenic exposure duration second phase) year	4
ED_{6-16} (mutagenic exposure duration third phase) year	10
ED_{16-26} (mutagenic exposure duration fourth phase) year	10
EF_{resw} (exposure frequency) day/year	350
EF_{reswc} (exposure frequency - child) day/year	350
EF_{reswa} (exposure frequency - adult) day/year	350
EF_{0-2} (mutagenic exposure frequency first phase) day/year	350
EF_{2-6} (mutagenic exposure frequency second phase) day/year	350
EF_{6-16} (mutagenic exposure frequency third phase) day/year	350
EF_{16-26} (mutagenic exposure frequency fourth phase) day/year	350
$ET_{resw-adj}$ (age-adjusted exposure time) hour/event	0.67077
$ET_{resw-madj}$ (mutagenic age-adjusted exposure time) hour/event	0.67077
ET_{resw} (exposure time) hour/day	24
ET_{reswc} (dermal exposure time - child) hour/event	0.54
ET_{reswa} (dermal exposure time - adult) hour/event	0.71
ET_{reswc} (inhalation exposure time - child) hour/day	24
ET_{reswa} (inhalation exposure time - adult) hour/day	24
ET_{0-2} (mutagenic inhalation exposure time first phase) hour/day	24
ET_{2-6} (mutagenic inhalation exposure time second phase) hour/day	24
ET_{6-16} (mutagenic inhalation exposure time third phase) hour/day	24
ET_{16-26} (mutagenic inhalation exposure time fourth phase) hour/day	24
ET_{0-2} (mutagenic dermal exposure time first phase) hour/event	0.54
ET_{2-6} (mutagenic dermal exposure time second phase) hour/event	0.54
ET_{6-16} (mutagenic dermal exposure time third phase) hour/event	0.71
ET_{16-26} (mutagenic dermal exposure time fourth phase) hour/event	0.71

Site-specific Risk Models
Equation Inputs
Groundwater

Variable	Value
BW_{reswa} (body weight - adult) kg	80
BW_{reswc} (body weight - child) kg	15
BW_{0-2} (mutagenic body weight) kg	15
BW_{2-6} (mutagenic body weight) kg	15
BW_{6-16} (mutagenic body weight) kg	80
BW_{16-26} (mutagenic body weight) kg	80
$IFW_{res-adj}$ (adjusted intake factor) L/kg	327.95
$IFWM_{res-adj}$ (mutagenic adjusted intake factor) L/kg	1019.9
IRW_{reswc} (water intake rate - child) L/day	0.78
IRW_{reswa} (water intake rate - adult) L/day	2.5
IRW_{0-2} (mutagenic water intake rate) L/day	0.78
IRW_{2-6} (mutagenic water intake rate) L/day	0.78
IRW_{6-16} (mutagenic water intake rate) L/day	2.5
IRW_{16-26} (mutagenic water intake rate) L/day	2.5
EV_{reswa} (events - adult) per day	1
EV_{reswc} (events - child) per day	1
EV_{0-2} (mutagenic events) per day	1
EV_{2-6} (mutagenic events) per day	1
EV_{6-16} (mutagenic events) per day	1
EV_{16-26} (mutagenic events) per day	1
$DFW_{res-adj}$ (age-adjusted dermal factor) cm^2-event/kg	2610650
$DFWM_{res-adj}$ (mutagenic age-adjusted dermal factor) cm^2-event/kg	8191633
SA_{reswc} (skin surface area - child) cm^2	6365
SA_{reswa} (skin surface area - adult) cm^2	19652
SA_{0-2} (mutagenic skin surface area) cm^2	6365
SA_{2-6} (mutagenic skin surface area) cm^2	6365
SA_{6-16} (mutagenic skin surface area) cm^2	19652
SA_{16-26} (mutagenic skin surface area) cm^2	19652

Site-specific Risk Models
Cumulative Risk
Groundwater

ca=Cancer, nc=Noncancer, ca* (Where nc SL < 100 x ca SL), ca** (Where nc SL < 10 x ca SL),
max=SL exceeds ceiling limit (see User's Guide), sat=SL exceeds csat, sol=SL exceeds Solubility
I=IRIS; D=Drinking Water/Health Advisory Goals; P=PPRTV; A=ATSDR; C=Cal EPA; X=APPENDIX PPRTV SCREEN; H=HEAST; S=SURROGATE; W=RPF

*The sum of PFHpA, PFHxS, PFNA, PFOS, and PFOA concentrations should not exceed 0.07 ug/L.

Chemical	Mutagen?	Volatile?	Chronic RfD (mg/kg-day)	Chronic RfD Ref	Chronic RfC (mg/m³)	Chronic RfC Ref	Ingestion SF (mg/kg-day)$^{-1}$	SFO Ref	Inhalation Unit Risk (μg/m³)$^{-1}$	IUR Ref	GIABS	MW
Manganese (Non-diet) (7439-96-5)	No	No	2.40E-02	S	5.00E-05	I	-		-		0.04	54.938
Methylnaphthalene, 1- (90-12-0)	No	Yes	7.00E-02	A	-		2.90E-02	P	-		1	142.2
Naphthalene (91-20-3)	No	Yes	2.00E-02	I	3.00E-03	I	-		3.40E-05	C	1	128.18
*Total Risk/HI			-		-		-		-		-	-

Chemical	log K_{ow} (unitless)	In EPD?	Concentration (μg/L)	Ingestion Noncarcinogenic CDI Child	Inhalation Noncarcinogenic (Volatiles) CDI Child	Dermal Noncarcinogenic CDI Child	Ingestion Carcinogenic CDI	Inhalation (Volatiles) Carcinogenic CDI
Manganese (Non-diet) (7439-96-5)	-	Yes	3.48E+03	1.74E-01	-	7.65E-04	-	-
Methylnaphthalene, 1- (90-12-0)	3.87E+00	Yes	3.00E+01	1.50E-03	-	1.87E-03	3.85E-04	-
Naphthalene (91-20-3)	3.30E+00	Yes	2.90E+01	1.45E-03	1.39E-02	8.28E-04	3.72E-04	5.16E+00
*Total Risk/HI	-		-	-	-	-	-	-

Chemical	Dermal Carcinogenic CDI	Ingestion HI Child	Inhalation (Volatiles) HI Child	Dermal HI Child	Noncarcinogenic HI Child	Ingestion Risk	Inhalation (Volatiles) Risk	Dermal Risk	Carcinogenic Risk
Manganese (Non-diet) (7439-96-5)	-	7.23E+00	-	7.96E-01	**8.03E+00**	-	-	-	**-**
Methylnaphthalene, 1- (90-12-0)	5.24E-04	2.14E-02	-	2.67E-02	**4.81E-02**	1.12E-05	-	1.52E-05	**2.64E-05**
Naphthalene (91-20-3)	2.32E-04	7.23E-02	4.63E+00	4.14E-02	**4.75E+00**	-	1.76E-04	-	**1.76E-04**
*Total Risk/HI	-	*7.32E+00*	*4.63E+00*	*8.65E-01*	***1.28E+01***	*1.12E-05*	*1.76E-04*	*1.52E-05*	***2.02E-04***

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Inhalation Unit Risk Toxicity Metadata

Chemical	CASNUM	Inhalation Unit Risk (µg/m ^{3})$^{-1}$	Toxicity Source	EPA Cancer Classification	Inhalation Unit Risk Tumor Type	Inhalation Unit Risk Target Organ	Inhalation Unit Risk Species	Inhalation Unit Risk Method	Inhalation Unit Risk Route	Inhalation Unit Risk Treatment Duration	Inhalation Unit Risk Study Reference	Inhalation Unit Risk Study Date
Manganese (Non-diet)	7439-96-5											
Methylnaphthalene, 1-	90-12-0											
Naphthalene	91-20-3	3.40E-05	Cal EPA	Carcinogenic potential cannot be determined	NA	NA	NA	NA	NA	NA	NA	NA

Oral Slope Factor Toxicity Metadata

Chemical	CASNUM	Oral Slope Factor (mg/kg-day) $^{-1}$	Toxicity Source	EPA Cancer Classification	Oral Slope Factor Tumor Type	Oral Slope Factor Target Organ	Oral Slope Factor Species	Oral Slope Factor Method	Oral Slope Factor Route	Oral Slope Factor Treatment Duration	Oral Slope Factor Study Reference	Oral Slope Factor Study Date
Manganese (Non-diet)	7439-96-5											
Methylnaphthalene, 1-	90-12-0	2.90E-02	PPRTV	NA	Adenoma, Carcinoma	Lung	Mice	NA	Oral	81 weeks	Murata, et al., 1993	2008
Naphthalene	91-20-3											

Chemical	CASNUM	Oral Chronic Reference Dose (mg/kg-day)	Toxicity Source	Oral Chronic Reference Dose Basis	Oral Chronic Reference Dose Confidence Level	Oral Chronic Reference Dose Critical Effect	Oral Chronic Reference Dose Target Organ	Oral Chronic Reference Dose Modifying Factor	Oral Chronic Reference Dose Uncertainty Factor
Manganese (Non-diet)	7439-96-5	2.40E-02	IRIS	NOAEL: 0.14 mg/kg-day	Medium	CNS effects	Nervous	1	1
Methylnaphthalene, 1-	90-12-0	7.00E-02	ATSDR	LOAEL: 71.6 mg/kg-day	NA	Increased incidence of pulmonary alveolar proteinosis	Resp.	NA	1000
Naphthalene	91-20-3	2.00E-02	IRIS	NOAEL (ADJ): 71 mg/kg-day	Low	Decreased mean terminal body weight in males	Body weight	1	3000

Oral Chronic Reference Dose Species	Oral Chronic Reference Dose Route	Oral Chronic Reference Dose Study Duration	Oral Chronic Reference Dose Study Date	Oral Chronic Reference Dose Study Reference
Human	NA	NA	multiple	NRC 1989, Freeland-Graves et al. 1987, WHO 1973
Mouse	Resp.	81 weeks	2005	Murata et al. 1993
Rat	NA	NA	1980a	Battelle's Columbus Laboratories 1980a

Inhalation Chronic Toxicity Metadata

Chemical	CASNUM	Chronic Inhalation Reference Concentration (mg/m 3)	Toxicity Source	Inhalation Chronic Reference Concentration Basis	Inhalation Chronic Reference Concentration Confidence Level	Inhalation Chronic Reference Concentration Critical Effect	Inhalation Chronic Reference Concentration Target Organ	Inhalation Chronic Reference Concentration Modifying Factor	Inhalation Chronic Reference Concentration Uncertainty Factor
Manganese (Non-diet)	7439-96-5	0.00005	IRIS	LOAEL (HEC): 0.05 mg/m3	Medium	Impairment of neurobehavioral function	Nervous	1	1000
Methylnaphthalene, 1-	90-12-0	-							
Naphthalene	91-20-3	0.003	IRIS	LOAEL (HEC): 9.3 mg/m3	Medium	Nasal effects: hyperplasia and metaplasia in respiratory and olfactory epithelium, respectively	Nervous, Respiratory	1	3000

Inhalation Chronic Reference Concentration Species	Inhalation Chronic Reference Concentration Route	Inhalation Chronic Reference Concentration Study Duration	Inhalation Chronic Reference Concentration Study Date	Inhalation Chronic Reference Concentration Study Reference
Human	NA	NA	1992	Roels et al. 1992
Mouse	NA	NA	1992a	NTP 1992a

APPENDIX C

FIELD DOCUMENTATION

ATTACHMENT C-1
Community Issues

COMMUNITY ISSUES

Issues raised by the community regarding the Northeast Cape (NEC) Formerly Used Defense Site (FUDS) cleanup were identified through a public meeting conducted on April 11, 2018 and through interviews conducted with community members and the Alaska Department of Environmental Conservation (ADEC) regulator. General issues were grouped based on similar topics and the U.S. Army Corps of Engineers (USACE) response to the general issues are provided in this appendix. The detailed April 11, 2018 meeting minutes and interview documentation are included in this appendix following these USACE responses. USACE appreciates the feedback and recommendations we have received from community members and the regulator, which it always considers carefully.

Sites were prematurely closed without the consent of the tribes and they were not part of the Record of Decision (ROD). Tribal governments and people do not approve the minimal site characterization and remediation, it is not protective of the Sivuqaq Yupik peoples' health and well-being.

USACE response: The USACE followed the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process for cleanup at the NEC FUDS. Specifically, a site assessment, four phases of remedial investigation, and a feasibility study were conducted prior to development of the Proposed Plans and Decision Documents (DDs), and subsequent remedial actions. The sites that were closed were found not to pose an unacceptable risk to human health and the environment. The USACE gave serious consideration to the public comments received during the Proposed Plan stage and incorporated some of the comments into the DDs. The Assistant Secretary of the Army, Installations, Energy and Environment (ASA(IE&E)) is the lead agency. Under CERCLA, as the lead agency representative, USACE has sole decision making authority on non-National Priority List (NPL) sites, such as Northeast Cape FUDS. In accordance with the Defense Environmental Restoration Program-FUDS (DERP-FUDS), the USACE cannot incorporate cooperating agencies on CERCLA DDs.

There is not a good mechanism for re-opening sites because the process is too lengthy, "taking 2-3 years."

USACE response: The USACE is bound by law to follow the CERCLA process to address contamination on FUDS properties. The CERCLA process is lengthy.

There is no clarity on which sites are open and which sites are closed.

USACE response: The NEC FUDS is a complicated site. A summary of which sites are open and which sites are closed is provided in the Executive Summary of this Periodic Review.

The full nature and extent of contamination has not been fully investigated, so the remediation is incomplete. Source areas of contamination, including the main complex and uncontrolled landfills, have not been fully characterized or removed and these continue to contaminate the Suqi River. The contaminants at NEC pose a significant source of pollution to traditional subsistence foods, water supplies, and medicinal plants. Contamination continues to affect water sources, traditional medicinal and food plants, fish, and wildlife, as well as the health of the people. The remedies are not protective of human health and the environment.

USACE response: The USACE followed the CERCLA process and conducted a site assessment, four phases of remedial investigation, and a feasibility study of contamination at the NEC FUDS. The ADEC concurred with the adequacy of the investigations.

Remediation is considered complete at a site when the remedial action objectives (RAOs) established in the DDs for the site have been achieved. When RAOs have been met at a site, then the site is closed. For each site that remains open, five-year reviews or periodic reviews will continue to occur to ensure the remedy at the site remains protective of human health and the environment.

Remedies selected in the DDs were developed based on the human health and ecological risk assessment and are considered protective of future residential use. Ground disturbing activities (e.g., construction, excavation, or debris removal) are not recommended on the Sites 7 and 9 landfill caps, and it is not recommended that groundwater in the vicinity of Sites 4, 6, 7, 9, and the Main Operations Complex (MOC) be used for drinking water. Land-use controls (LUCs) apply to these areas. Though the LUCs are not yet fully implemented, two signs have been installed at the FUDS to inform site visitors of these locations. The signs are printed in both English and Siberian Yupik.

A community member stated that they had uncovered a landfill and reburied it when performing dirt work with heavy equipment near the dome associated with the White Alice site on top of Kangukhsam Mountain.

USACE response: The USACE will contact the community member to get a specific location of the landfill so it can investigate this report.

Remediation may have made the sites more toxic by mobilizing contaminants. Many sites at NEC remain highly toxic and will continue to harm future generations.

USACE response: The potential mobilization of contaminants during remediation was considered when developing and implementing the remedy for each site, and actions were taken to minimize the potential migration of contaminants. For example, at Site 28 Drainage Basin, a variety of actions were taken to minimize the movement of contaminated sediments from upstream source areas into downstream areas or the Suqi River during sediment removal. Those actions are discussed in Sections 3.1.2 of Appendix C of the second five-year review report.

The remedy for each site was designed to protect human health and the environment by either removing contamination to risk-based cleanup levels, or eliminating exposure pathways. At sites where contamination was left in place, institutional controls are being implemented to ensure relevant exposure pathways remain incomplete, and reviews are being conducted to ensure remedies remain protective of human health and the environment. Thus, current and future generations will not be exposed to unsafe levels of contamination, and their health will not be harmed.

There is a long way to go to achieve restoration and removal of the contamination. The premature closures, partial excavations, natural attenuation, and/or LUCs are completely inadequate. Additional remedies should be implemented including source removal and well-planned and executed remedial technologies such as in situ peroxidative and biological remediation.

USACE response: The remedy for each site was designed to protect human health and the environment by either removing contamination to risk-based cleanup levels, or eliminating exposure pathways. At sites where contamination was left in place, LUCs are being implemented to ensure relevant exposure pathways remain incomplete, and five-year and periodic reviews are being conducted to ensure remedies remain protective of human health and the environment. Thus, current and future generations will not be exposed to unsafe levels of contamination, and their health will not be harmed.

The plan for only one or two signs that describe the land use restrictions at NEC FUDS is not enough.

USACE response: USACE originally planned to install one sign along the road near Site 4, and subsequently accommodated a request from the Native Village of Savoonga Council for one additional sign near the NEC airstrip. Two signs were developed and installed during the summer of 2018. The signs are printed in both English and Siberian Yupik. The signs indicate locations where ground disturbing activities (e.g., construction, excavation, or debris removal) are not recommended on the Sites 7 and 9 landfill caps, and it is not recommended that groundwater in the vicinity of Sites 4, 6, 7, 9, and the MOC be used for drinking water. LUCs in the form of deed notices will also be developed in accordance with the DD

Everything before and after the NEC ROD happened without government to government consultation with our tribes. Local voices and knowledge have not been heard or considered. The USACE did not fulfill their government to government obligation.

USACE response: The USACE follows U.S. Department of Defense Native American Indian and Alaska Native Policy. We believe government to government relationships have been established with the Native Village of Savoonga and the Native Village of Gambell. The USACE will continue to consult with the Tribes on a government to government basis. The USACE strongly values the knowledge we have gained about NEC through consultation with the Tribes, and has incorporated that knowledge into site investigations and remedies.

It is requested that a new ROD be implemented with the full participation and consultation with tribal governments. The omission of the tribes from the ROD warrants inclusion of the tribes in any decisions concerning site remediation, acknowledging and using local knowledge and community-based participatory research data to drive adequate site characterization and remediation.

USACE response: USACE is required to follow the CERCLA clean-up process. The USACE consulted the Tribes during the proposed plan phase, and will continue to consult with the Tribes through the 5-year and periodic review process. It is not possible to implement a new ROD with Tribes as signatories. Under CERCLA, as the lead agency representative, USACE, has sole decision making authority on non- NPL sites, such as NEC. In accordance with the DERP-FUDS, the USACE cannot incorporate cooperating agencies on CERCLA DDs.

Native Village of NEC residents are now displaced due to the military toxic contamination from the abandoned FUDS at NEC. There is interest in re-establishing the NEC site because of the growing population of Savoonga. The site has not been cleaned up to residential standards.

USACE response: Many of the NEC sites have been cleaned up to residential standards. The remedy for each site was designed to protect human health and the environment for future residential use by either removing contamination to risk-based cleanup levels, or eliminating exposure pathways. At sites where contamination was left in place, institutional controls in the form of deed notices are being implemented to ensure relevant exposure pathways remain incomplete, and five-year and periodic reviews are being conducted to ensure remedies remain protective of human health and the environment.

The real estate value at NEC has been severely depreciated and the community would like to see compensation for that.

USACE response: Compensation for real estate depreciation is not authorized by the DERP-FUDS.

There is concern that people are drinking water from the Suqi River and other sources at NEC. They are also concerned that families who live and/or travel through NEC may be exposed to hazardous chemicals though inhalation, ingestion, and consumption of traditional foods. A community member requested that signs should be placed to warn the public against consuming the fish and the water from the Suqi River. A community member also requested that seals and fish coming into the Suqi River be tested.

USACE response: Water quality sampling has found contaminants are not present above cleanup levels in Suqi River water.

Two signs were developed and installed at NEC during the summer of 2018. The signs are printed in both English and Siberian Yupik. The signs state that ground disturbing activities (e.g., construction, excavation, or debris removal) are not recommended on the Sites 7 and 9 landfill caps. They also state that it is not recommended to use groundwater as drinking water at Sites 4, 6, 7, 9, and the MOC. LUCs in the form of deed notices are also being developed.

According to the human health risk assessment, site users will not be exposed to unsafe levels of contamination through the inhalation, ingestion, or traditional food consumption pathways.

Testing the seals and fish coming into the Suqi River is not warranted. The Agency for Toxic Substances and Disease Registry (ATSDR) performed a health consultation to evaluate the community's contaminant concerns at NEC (Public Comment draft released July 24, 2017). The health consultation concluded that "eating fish from NEC in the summer (3 months) is not expected to harm people's health" because "contaminants are not present in fish at sufficiently elevated levels to be harmful."

The watershed of the nearby Tapissak ("Tapi") River is also contaminated and that area has not been investigated or characterized. Their research shows elevated levels of polychlorinated biphenyls (PCBs).

USACE response: Review of historical maps and as-built documents indicated there was no sign of military use in the watershed of the Tapi River. This area is outside the FUDS property boundary and is not eligible for cleanup under FUDS.

The USACE has not assessed the effects of climate warming on the mobilization of contaminants that have been sequestered in landfills and within permafrost. Erosion and permafrost melting will likely increase the mobilization and bioavailability of contaminants at NEC, thus increasing hazards to the health of fish, wildlife, and people.

USACE response: Information gathered during future five-year and periodic review site inspections and long-term monitoring events will be used to evaluate protectiveness of the remedies at each site. If during a future review USACE finds evidence a remedy is no longer protective, then actions would be taken to ensure protectiveness.

The military did not honor the agreement that was signed by the Secretary of State (1951) not to pollute the Suqi with any human waste or any other pollutants or violate our hunting/trapping grounds. The community does not believe they will see the river come back to life in their lifetime and it is questionable if the river will ever come back to its former state. A human rights violation was committed – the Suqi river was wiped out with fish and the seals do not haul out anymore.

USACE response: The USACE appreciates these concerns. The USACE is constrained by the cleanup authority of the DERP-FUDS. Our mandate for environmental remediation is to achieve protection of human health and the environment, rather than return the site to its pristine condition.

USACE has yet to develop a Notice of Environmental Contamination as well as institutional controls with the landowner, which is a primary requirement for several of the remedies associated with NEC sites. This requirement is specified in both 2009 DDs, the Long-Term Management Plan (LTMMP), and other project documents and correspondence since the removal actions were completed in 2014, and is also a site closure requirement of 18 Alaska Administrative Code (AAC) 75. The current five-year review effort needs to discuss and include these issues as well as outline milestone dates for their completion.

USACE response: USACE agrees LUCs such as the Notice of Environmental Contamination and institutional controls are an important part of the remedy. LUCs will be implemented at NEC in the form of Deed Notices containing information regarding designated non-drinking water source areas, recommendations for preventing construction of buildings on top of the landfill areas, and the recommendation to not install drinking water wells within the MOC area until RAOs (cleanup levels) are achieved through natural attenuation processes. Deed Notices provide information or notification to local communities and landowners that residual or contained contamination may remain on site. Deed Notices will play an important role at NEC, by notifying site visitors of the locations of non-drinking water source areas and landfills. The USACE will continue efforts to coordinate with the landowner to develop Deed Notices. Once finalized, Deed Notices will be implemented through filing a Notice of Environmental Contamination at the State Recorder’s Office.

A discussion of LUCs and milestone dates is included in the Summary Forms of the periodic and five-year review reports.

There is concern regarding whether or not the issues of contaminant migration and/or exposure pathways via sediment and/or surface water at Site 28 and related drainages have been adequately investigated and/or monitored. This includes concerns regarding the state of the residual contamination source areas which remain within the tundra at Site 28 as well as likely ongoing sources from the MOC plumes which are located immediately adjacent to/upgradient of Site 28. Surface water monitoring data from Site 28 may be necessary in the future in order to make conclusive determinations regarding the status of migration and/or exposure pathways.

USACE response: Residual soil contamination remaining within the tundra in the southern portion of Site 28 adjacent to the MOC is overlain with naturally occurring vegetative mat and therefore is not migrating. The presence and quality of sediment at Site 28 is periodically evaluated. When accumulated contaminated sediment is periodically removed from Site 28 the concern about contaminated sediment migration is eliminated. Between sediment removal events, naturally existing ponds within Site 28 act as sedimentation ponds and limit migration of sediment that may become suspended in surface water at Site 28. In addition, the presence of a natural stilling area present between sediment Removal Areas 9 and 10 within Site 28 further inhibits migration of suspended sediment.

Previous surface water sample results have indicated future surface water monitoring in Site 28 is not warranted. In 2013, active sediment removal from Site 28 using a dredge modeled the worst-case scenario for potential contamination of surface water from suspended sediment as the surface water flowed through Site 28. To monitor whether or not contaminated sediment removal activities performed during 2013 were causing surface water contamination at Site 28, surface water samples were collected before, during, and after sediment removal activities. The three sample locations were in the active stream channel located downstream of sediment removal operations. The samples were analyzed for diesel-range organics (DRO), residual-range organics (RRO), benzene, toluene, ethylbenzene, and xylenes (BTEX), polycyclic aromatic hydrocarbons (PAHs), PCBs, Resource Conservation and Recovery Act (RCRA) 8 metals plus nickel, vanadium, and zinc, and turbidity. None of the surface water samples exceeded the DD criteria for total aromatic hydrocarbons (TAH)/total aqueous hydrocarbons (TaqH), and no hydrocarbon sheen was observed.

Surface water samples were also collected at three locations downstream of suspended sediment mitigation measures during active sediment removal. The samples were analyzed for DRO, RRO, BTEX, PAHs, PCBs, RCRA 8 metals plus nickel, vanadium, and zinc, and turbidity. None of the surface water samples exceeded the DD criteria for TAH/TaqH, and no hydrocarbon sheen was observed. The sample collected within Site 28 upstream of the confluence with the Suqi River contained an estimated concentration of only 0.042 milligrams per liter DRO.

The USACE will continue to evaluate dredging methods and techniques within Site 28 to improve the effectiveness of future contaminated sediment removal activities. Effectiveness and protectiveness of the remedy will continue to be assessed as part of future reviews.

Regarding Site 8, the extents of subsurface soil and groundwater contamination on both sides of the road remain the primary data gap at the site and require further evaluation in the current five-year review in order to determine/recommend the appropriate and necessary path forward.

USACE response: Agreed. The second periodic review for Site 8 includes a recommendation for a supplemental investigation to delineate the lateral and vertical extent of soil contamination east of the 2016 sampling area and revise the location of the historic pipeline spill based on all available site data.

All applicable surface water criteria should apply as ARARs at all applicable sites; even though the DDs may have limited the specifications of surface water cleanup level(s) and/or criteria to TAH/TAqH and sheen.

USACE response: ARARs were established in the DDs, and are considered protective of human health and the environment. ARARs as specified in the DDs will not be changed for the NEC FUDS unless it is determined the DD remedies are no longer protective of human health and the environment.

Site 7 and other uncharacterized landfills at NEC will continue to require CERCLA five-year reviews until such time that the agencies concur that periodic reviews are appropriate. Although the DD states the term periodic reviews, the Site 7 landfill has had prior sources and residual concentrations of CERCLA contaminants identified; while the agencies have agreed to disagree on this issue based upon prior deliberations, the uncharacterized areas of concern require CERCLA five-year reviews until otherwise determined appropriate to change the process to periodic reviews. Additionally, ongoing monitoring of the downgradient surface water and/or groundwater at these landfills is also applicable and necessary during the CERCLA five-year review until such time that the agencies conclusively concur that any contaminant migration and/or exposure pathways are incomplete and that the remedy remains protective.

USACE response: Sites 7 and 9 have been investigated, the remedies selected, and aside from LUCs, the remedies have been implemented. There are no "uncharacterized areas of concern that require CERCLA five-year reviews."

The selected remedy at Site 7 (Cargo Beach Landfill) did not include a requirement for monitoring surface water or groundwater. Sampling of shallow groundwater was attempted in the vicinity of Site 7 with only limited success due to the tundra/wetland environment, the presence of subsurface rock/boulders, the intermittent presence of water, and slow recharge of shallow groundwater within temporary wells. A LUC at Site 7 will be implemented because groundwater use as drinking water is not recommended at Site 7. Though the LUCs are not yet fully implemented, two signs have been installed at the FUDS to inform site visitors of these locations. The signs are printed in both English and Siberian Yupik. In addition, the groundwater exposure pathway at Site 7 is incomplete because there is not a sufficient quantity of water produced to be considered a reasonable potential future source for drinking water. Periodic reviews in accordance with the LTMP will continue at this site.

Details of the most recent periodic review related to Site 9 (Housing and Operations Landfill) are included in this report in Sections 3.7 and 5.3.4. The remedy at Site 9 included removal of submerged debris in active stream channels adjacent to the landfill, construction of a minimum 2-foot thick landfill cap, visual inspection of the landfill cap on an annual basis for settlement and erosion for five years, implementing LUCs, and long-term monitoring (LTM). LTM included three monitoring events spaced five years apart to demonstrate the shallow groundwater meets RAOs for a non-drinking water source, and six monitoring events spaced five years apart to demonstrate the shallow groundwater meets RAOs for a non-drinking water source. Removal of submerged debris in active stream channels adjacent to the landfill, construction of a minimum 2-foot thick landfill cap, and visual inspection of the landfill cap on an annual basis for settlement and erosion for five years have been implemented. LUC implementation is underway, but not yet complete. As a result of insufficient shallow groundwater volumes in the vicinity of the landfill, surface water has been used to demonstrate the shallow groundwater meets RAOs for a non-drinking water source. Surface water sample results to-date indicate the remedy is protective. Periodic reviews in accordance with the LTMP will continue at this site.

Settling/subsidence has been observed at the Site 7 landfill, as well as poor and inadequate vegetation establishment associated with the covers and adjacent surfaces of the Site 7 and Site 9 landfills.

USACE response: The second periodic review for Site 7 (Cargo Beach Landfill), will be available as a separate document, and will include details of issues noted during landfill visual inspections. The second periodic review for Site 7 includes a recommendation to conduct cap maintenance in areas where settling was observed. Granular fertilizer and seed were spread over the landfill cap following cap construction in 2009. In an attempt to address poor vegetative growth observed on the Site 7 landfill cap, granular fertilizer and seed were again spread over the landfill cap during 2011. A stabilization analysis conducted in 2011 determined the landfill cap met non-vegetative permanent stabilization requirements established in the 2011 Alaska Construction General Permit. During the 2018 landfill visual inspection, it was noted the soil used to construct the cap was very coarse and rocky, which significantly contributed to the sparse nature of vegetative growth.

Site 9: Vegetative cover observed during visual landfill cap inspections has been estimated at 70 to 80 percent on the cap surface and side slopes. Vegetative cover was noted as being short, but with good coverage. The cap appeared structurally sound and stable with no evidence of leaching or erosion. The landfill cap will continue to be visually monitored on a periodic basis, likely in conjunction with CERCLA five-year reviews at other NEC sites, for up to 30 years.

SUGGESTIONS REGARDING FUTURE OPERATION, MAINTENANCE, AND MONITORING AT THE SITE

The community and ADEC provided the following suggestions for the future operation, maintenance, and monitoring at NEC:

Suggestion: Assess the residual contamination remaining at the Fish Camp sites as indicated by the most recent site investigation analysis results (most/all of which were conducted under the prior Native American Lands Environmental Mitigation Program [NALEMP] efforts) – which appear to indicate that residual concentrations of PCBs, petroleum, oil, and lubricants, and metal chemicals of concern remained in soil and surface water.

Response: The USACE has requested funding to conduct a preliminary assessment at the Fish Camp site to determine if a FUDS-eligible project exists there.

Suggestion: Complete removal of the solid and hazardous waste materials at the NEC Site 7 and other landfills.

Response: The current remedy remains protective of human health and the environment. The USACE does not intend to remove remaining materials at the Site 7 and 9 landfills. Periodic reviews in accordance with the LTMP will continue at Sites 7 and 9.

Suggestion: Evaluate and continue the extent investigation as determined necessary for soil and groundwater at Site 8.

Response: The second periodic review for Site 8 includes a recommendation for a supplemental investigation to delineate the lateral and vertical extent of soil contamination east of the 2016 sampling area and revise the location of the historic pipeline spill based on available site data.

Suggestion: Continue to include LTM of surface water and groundwater at landfill sites.

Response: Continued long-term monitoring of surface and groundwater at the landfill sites is not warranted. The selected remedy at Site 7 (Cargo Beach Landfill) did not include a requirement for monitoring surface water or groundwater. Sampling of shallow groundwater was attempted in the vicinity of Site 7 with only limited success due to the tundra/wetland environment, the presence of subsurface rock/boulders, the intermittent presence of water, and slow recharge of shallow groundwater within temporary wells. An LUC at Site 7 will be implemented because groundwater use as drinking water is not recommended at Site 7. Though the LUCs are not yet fully implemented, two signs have been installed at the FUDS to inform site visitors of these locations. The signs are printed in both English and Siberian Yupik. In addition, the groundwater exposure pathway at Site 7 is incomplete because there is not a sufficient quantity of water produced to be considered a reasonable potential future source for drinking water.

Details of the most recent periodic review related to Site 9 (Housing and Operations Landfill) are included in this report in Sections 3.7 and 5.3.4. The remedy at Site 9 included removal of submerged debris in active stream channels adjacent to the landfill, construction of a minimum 2-foot thick landfill cap, visual inspection of the landfill cap on an annual basis for settlement and erosion for five years, implementing LUCs, and LTM. LTM included three monitoring events spaced five years apart to demonstrate the shallow groundwater meets RAOs for a non-drinking water source, and six monitoring events spaced five years apart to demonstrate the shallow groundwater meets RAOs for a non-drinking water source. Removal of submerged debris in active stream channels adjacent to the landfill, construction of a minimum 2-foot thick landfill cap, and visual inspection of the landfill cap on an annual basis for settlement and erosion for five years have been implemented. LUC implementation is underway, but not yet complete. As a result of insufficient shallow groundwater volumes in the vicinity of the landfill, surface water has been used to demonstrate the shallow groundwater meets RAOs for a non-drinking water source. Surface water sample results to-date indicate the remedy is protective. Periodic reviews will continue at this site.

Suggestion: Remove and treat the White Alice site soil and groundwater to effectively remove associated contaminants.

Response: The White Alice site is also referred to as Site 31. Further soil removal is not warranted at this site. In 1990, transformers, drums, tanks, fire extinguishers, and other containerized hazardous waste were removed from Site 31. Antennas, buildings, and aboveground storage tanks were demolished and removed in 2003. PCB-contaminated concrete was also removed from portions of the Main Electronics Building foundation. PCB contamination was also identified at a possible sewage outfall area located west of the main electronics building, and adjacent to the former transformer pad. In 2005, approximately 118 tons of PCB-contaminated soil was excavated from the three identified areas within Site 31. Excavations at the septic tank outfall and west of the building successfully removed all PCB contamination to concentrations below 1 milligram per kilogram (mg/kg). Confirmation samples collected in 2005 from the former transformer pad excavation indicate PCBs remained between 1.53 and 7.09 mg/kg in approximately 110 cubic yards of soil. The selected remedy of excavation and disposal of PCB-contaminated soil was initiated at Site 31 in 2010 and continued annually through the 2013 field season. Confirmation samples taken after 2013 soil removal indicated remaining site soil did not have PCB contamination above the DD cleanup level of 1 mg/kg. The site was recommended for No Further Action during the first five-year review.

Suggestion: Removal/remediation of contaminants in source areas that remain within the NEC MOC soil and groundwater, as well as ongoing monitoring to ensure safe drinking water supplies.

Response: Contaminated soil has been removed to the extent practicable at the MOC sites. In-situ chemical oxidation, which was the selected remedy for contaminated MOC groundwater, was deemed ineffective during a 2009 pilot-scale test as a result of the presence of peat and highly organic peat soil, presence of permafrost or semi-permafrost zones, and observed preferential flow pathways. As a result, the contingency remedy of monitored natural attenuation (MNA) for groundwater was implemented and is ongoing. It is not recommended that groundwater in the vicinity of the MOC be used for drinking water until RAOs (cleanup levels) are achieved through natural attenuation processes. LUCs apply to the MOC. Though the LUCs are not yet fully implemented, two signs have been installed at the FUDS to inform site visitors of the location around the MOC where groundwater use is not recommended. The signs are printed in both English and Siberian Yupik. Groundwater monitoring is ongoing at the MOC sites.

Suggestion: Evaluate additional LTM investigation in soils and groundwater in areas adjacent to and immediately downgradient of MOC (aka the upgradient areas of the Site 28 Drainage).

Response: In 2010, UVOST borings confirmed the presence of petroleum-contaminated soil within the tundra in the southern portion of Site 28 adjacent to the MOC. The shallow groundwater was investigated during the 1994 remedial investigation. Two monitoring wells were installed within the eastern drainage of Site 28. The 1994 sampling results indicated the potential for DRO and lead contamination. Subsequent sampling in 2001 demonstrated the levels of DRO and lead were below groundwater cleanup levels. No contaminants of concern were retained for the shallow groundwater. Additional investigation is not warranted.

Suggestion: Conduct surface water sampling at Site 28 and consider whether tissue sampling is necessary based upon historical and/or 2018 sediment sample results.

Response: Previous surface water sample results have indicated future surface water monitoring in Site 28 is not warranted. In 2013, active sediment removal from Site 28 using a dredge modeled the worst-case scenario for potential contamination of surface water from suspended sediment as the surface water flowed through Site 28. To monitor whether or not contaminated sediment removal activities performed during 2013 were causing surface water contamination in Site 28, surface water samples were collected before, during, and after sediment removal activities. The three sample locations were in the active stream channel located downstream of sediment removal operations. The samples were analyzed for DRO, RRO, BTEX, PAHs, PCBs, RCRA 8 metals plus nickel, vanadium, and zinc, and turbidity.

None of the surface water samples exceeded the DD criteria for TAH/TaqH, and no hydrocarbon sheen was observed.

Surface water samples were also collected at three locations downstream of suspended sediment mitigation measures during active sediment removal. The samples were analyzed for DRO, RRO, BTEX, PAHs, PCBs, RCRA 8 metals plus nickel, vanadium, and zinc, and turbidity. None of the surface water samples exceeded the DD criteria for TAH/TaqH, and no hydrocarbon sheen was observed.

The 2017 ATSDR health consultation (public review draft) concluded "eating fish from NEC in the summer (3 months) is not expected to harm people's health" because "contaminants are not present in fish at sufficiently elevated levels to be harmful." Based on historic and 2018 sediment sample results, tissue sampling is not warranted.

Suggestion: Effective remediation and LTM of the Suqi River drainage basin sediments and surface water (fuels and PCB contamination).

Response: Remedial investigations of the Suqi River were conducted between 1996 and 2004. Additional sediment and surface water sampling was performed during 2016. One sediment sample collected in 1996 exceeded the DD cleanup level of 3,500 mg/kg DRO with a DRO concentration of 25,000 mg/kg at one location about 850 feet downstream of the Site 28 Drainage Basin confluence with the Suqi River. Subsequent sampling events could not duplicate or substantiate this anomalous diesel detection. All other sediment samples collected from Site 29 Suqi River were below DD cleanup levels. PCBs have not been detected in Suqi River sediments above the DD cleanup level of 0.7 mg/kg. All surface water sample results from the Suqi River have been within drinking water standards. Remediation is not warranted because there is not an unacceptable risk to human health or the environment.

Suggestion: Complete removal or destruction of the contaminants identified at the former village site at NEC. Provide adequate funding for Native American Lands Environmental

Mitigation Program at Native Village of NEC, including provisions to adequately support and build capacity with training and jobs for the Native Village of Savoonga.

Response: Petroleum contaminated soils were excavated from this site by the FUDS program in 2000-2001. The NEC decision document stated that no further action was required at this site. In 2014, the Native Village of Savoonga excavated PCB-contaminated soil under the NALEMP program. Confirmation sample results indicated that PCBs remained in the soil slightly above the ADEC clean-up level of 1.0 mg/kg.

The Native Village of Savoonga is not currently eligible to participate in NALEMP due to financial issues. However, the USACE has requested funding to conduct a preliminary assessment at the former village site, also known as the Fish Camp, to determine if a FUDS-eligible project exists there.

Suggestion: Review of the failure of the chemical oxidation project and attention to the problems/solutions identified by the Restoration Advisory Board technical advisor Dr. Ron Scrudato.

Response: The results of the chemical oxidation pilot test have been reviewed. In situ chemical oxidation was deemed ineffective during a 2009 pilot-scale test as a result of the presence of peat and highly organic peat soil, presence of permafrost or semi-permafrost zones, and observed preferential flow pathways.

Suggestion: Restoration of the Suqi River watershed and shallow groundwater resources within the area of the MOC and upgradient regions of the MOC to ensure adequate and safe drinking water at NEC.

Response: The USACE is constrained by the cleanup authority of the DERP-FUDS. Our mandate for environmental remediation is to achieve protection of human health and the environment, rather than return the site to its pristine condition. The remedy for each NEC site was designed to protect human health and the environment by either removing contamination to risk-based cleanup levels, or eliminating exposure pathways. At sites where contamination was left in place, LUCs are being implemented to ensure relevant exposure pathways remain incomplete, and five-year and periodic reviews are being conducted to ensure remedies remain protective of human health and the environment.

Suggestion: Tracking and analysis of materials salvaged from NEC that have been used by families for construction of homes and camps. These present a likely exposure pathway for contaminants such as PCBs, lead, asbestos, and others.

Response: The FUDS program is not legally authorized to address issues related to beneficial use of salvaged materials.

Suggestion: Provide more advanced notice to ADEC, community members, and other stakeholders whenever USACE is planning and scheduling future community meetings in order to ensure all parties have adequate time to make arrangements for travel, schedule participation, provide input to the agenda, etc.

Response: Agreed. USACE will make every effort to work with the ADEC, community, and other stakeholders to identify the most appropriate dates to schedule meetings. Once scheduled, USACE will announce meetings well in advance to ensure optimal opportunity for participation.

Suggestion: Ensure that complete and comprehensive responsiveness summaries (e.g., complete responses to comments, meeting minutes, review and/or deliberation determinations) be provided to all stakeholders and attached to all respective documents for all applicable actions.

Response: Agreed.

Suggestion: Evaluate and apply the revisions and changes to 18 AAC 75 cleanup levels and what impacts have resulted to any sites and their respective remedies.

Response: Protectiveness of the remedy at each site is re-evaluated during each five-year and periodic review as stipulated in CERCLA guidance. This involves consideration of whether ADEC cleanup levels have changed since the last review. More fundamentally, the review assesses changes to scientific knowledge about the toxicity of COCs by evaluating whether EPA-derived reference doses or cancer slope factors for COCs have changed since the prior review.

Suggestion: Incorporate ATSDR health consultation conclusions and status of draft or final documents into this five-year review.

Response: USACE confirmed ATSDR has not yet released a final version of the health consultation, “Northeast Cape Formerly Used Defense Site (FUDS), St. Lawrence Island, Alaska.” Thus, the public comment version is still the most recent version available (July 24, 2017). Conclusions of the public comment version are incorporated in this periodic review in Section 5.3.

----End of Comments---

ATTACHMENT C-2
Meeting Minutes

MEETING MINUTES

NORTHEAST CAPE FORMERLY USED DEFENSE SITE 5-YEAR REVIEW PUBLIC MEETING	DATE HELD: 11 APRIL 2018	
	DATE ISSUED: 16 APRIL 2018	
	RECORDED BY: HALEY HUFF & JESSICA BAY	
DOC. NO: AE-ECC-J07-5FGA4600-G01-0001		PLACE: SAVOONGA CITY HALL
SUBJECT: SECOND NE CAPE FIVE-YEAR REVIEW		

PARTICIPANTS :

ANDREA ELCONIN – USACE	JESSICA BAY – ECC	PAM MILLER – ACAT (VIA PHONE)
AARON SCHEWMAN – USACE	KEVIN MAHER – JACOBS	
CURTIS DUNKIN – ADEC	HALEY HUFF – JACOBS	
	12 RESIDENTS OF SAVOONGA (SEE INCLUDED SIGN-IN SHEET)	

MEETING NOTES

Andrea Elconin opened the meeting by introducing USACE and ECC/Jacobs staff followed by a brief overview of the meeting purpose. Kevin Maher began the slide presentation following the USACE introduction.

Meeting Overview

The USACE met with the community of Savoonga to kick-off the Second Five-Year Review (5YR) at Northeast Cape Formerly Used Defense Site (NE Cape FUDS) and provide community members the opportunity to have ECC/Jacobs staff assist with the completion of a site questionnaire.

During the slide presentation, the following questions and USACE responses occurred:

QUESTIONS

- Once sites are closed, how often is the site monitored?
  a. Response - The sites will be closed when the remedial action objectives defined in the decision document have been met. Once the site is closed, there will be no further monitoring at the site unless new information is presented to the USACE that justifies re-opening the site.
- Will global warming/climate change have an effect on the contaminated sites?
  a. Response - If the site changes due to climate change (e.g., melting permafrost), then this will be noted during the next five-year review site inspections. Additional sampling may be warranted if new contamination is discovered.
- Which sites have not received site closure? Is there a way to re-open a site once it is closed?
  a. Response - New data that indicates a risk to human health can re-open a site.
- Sites with PCBs are not listed specifically in the mailer.
  a. Response - Sites with PCBs were cleaned up and are not listed because the USACE believes that all PCBs above the 1 ppm cleanup level have been removed from the Northeast Cape FUDS.

A community member stated that they do not feel like there is a good mechanism for re-opening sites because the process is too lengthy, “taking 2-3 years”.

A community member stated that they do not feel like there is clarity on which sites are open and which sites are closed. Additional community member statements at this time included:

- The five-year review report documents are not understandable to the public who are not familiar with the scientific information presented.

MEETING NOTES

- A summary of the draft five-year review report findings in the form of a public meeting would help the community provide comments during the draft five-year review report public comment period.

USACE Response - The USACE would consider the request to add a public meeting during the public comment period related to the draft five-year review report.

A community member stated that the plan for only one or two signs that describe the land use restrictions at NE Cape FUDS is not enough.

USACE Response – The USACE response included a summary of the current signage plan as follows:

- The Signage will be added this summer and will indicate the areas where groundwater use is discouraged and the capped landfill areas where construction is discouraged.
- A meeting with the Native Village of Savoonga Council resulted in a request for an additional sign near the Northeast Cape airstrip.

The USACE stated that the signs would be in English and Siberian Yupik. A community member recommended George Noonwook as a translator.

A community member requested that signs should be placed to warn the public against consuming the fish and the water from the Suqi River.

- Alaska Community Action on Toxics (ACAT) mentioned that they have data suggesting that the Suqi River is still highly contaminated.

USACE Response - The USACE responded that the sample results from the Suqi River, described in the administrative record, do not show contamination is present above the cleanup levels. The USACE requested that ACAT provide the data they referenced to the USACE PM, Andrea Elconin, for evaluation.

A community member requested that seals and fish coming into the Suqi River be tested.

USACE Response included the following:

- The USACE cannot test animals or fish at the NE Cape Site.
- The USACE suggests that another entity, such as ACAT, can pursue a grant to conduct this type of testing and would alert ACAT if they become aware such a grant is available.
    - ACAT replied that there is not currently a grant available or a funding mechanism for fish/animal testing and would like to collaborate with the USACE for possible funding sources and a letter of support for the work.
    - ACAT is currently collaborating with the universities for further research at the Northeast Cape FUDS.

A community member stated that they had uncovered a landfill and reburied it when performing dirt work with heavy equipment near the dome associated with the White Alice site on top of Kangukhsam Mountain. The type of debris uncovered and reburied was not identified in the discussion.

USACE Response – The USACE asked if there was a way to identify the location such as GPS coordinates. The community member did not have GPS coordinates.
A community member asked “What if the military wants to build another site at NE Cape due to tensions with North Korea or Russia?”

MEETING NOTES

The USACE responded that they would not be made aware of this type of information and that they are only involved with the Northeast Cape FUDS clean-up.

A community member asked if the Suqi River could be stocked with fish in the future?

USACE Response – Their technical expertise was not in the field of fishery management. However, they were not aware of any reason why this could not occur.

During the presentation of the slide describing 2018 Northeast Cape FUDS fieldwork, Pam Miller with ACAT requested more detailed information regarding the number of analytical samples and the associated analytical suites, and which areas would be sampled. The USACE suggested that this discussion occur after the slide presentation concluded so that others who did not want to hear the detailed information could leave the meeting.

USACE SUMMARY OF THE SAMPLING PLAN WITH PAM MILLER (ACAT) AFTER THE SLIDE PRESENTATION CONCLUDED:
Approximately four community members remained in the room and Pam Miller remained on the teleconference line for the detailed description of 2018 fieldwork. The USACE described the sample quantities and analytical methods that are planned for surface water samples, groundwater samples, and sediment samples, as well as the locations where samples will be collected.

Pam Miller asked if the USACE will analyze samples for PCB congeners instead of Aroclors?
USACE Response – The USACE said they are not planning on analyzing for congeners because the Decision Document cleanup levels are specific to total PCBs and that there are no regulatory-based cleanup levels for congeners.

Pam Miller stated that recent samples of Suqi River fish collected by a third party identified congeners are present and are a human health risk. Therefore, specific congeners should be measured.

USACE Response:

- The USACE requested that these data be provided to USACE PM, Andrea Elconin, for evaluation.
- Congeners do not have a regulatory cleanup level and the DD remedial action objective was to cleanup total PCBs to 1 ppm. Note: This was a mis-statement. The PCB cleanup level applicable to Site 29 Suqi River sediment is 0.93 ppm.

Pam Miller stated an Incremental Sampling Method (ISM) was not adequate because hot spots could be missed. Comment was specific to Site 8.

USACE Response - Decision Unit placement and extents have been revised to account for the 2016 discrete sample data set which identified the suspected area of release.

Pam Miller asked if mercury would be sampled for at Site 28.

USACE Response - Mercury has not been found in previous Site 28 samples above the cleanup level and Mercury would not be part of the analytical suite at Site 28.

Pam replied that her samples indicated mercury was present in the sediment of Site 28.

Meeting Notes

USACE Response - The USACE asked that data which showed mercury is present above the cleanup level, through third party sampling, be provided to the USACE for evaluation. Additionally, the USACE responded the MOC buildings that may have contained mercury light switches wee removed along with any potentially contaminated soil. Therefore, all sources of mercury which could contribute to Site 28 have been removed.

A community member stated the USACE is not sampling at locations suggested by the community, is only following the work plan, and is doing the minimum requirements to satisfy the law.

USACE Response - The USACE is bound by the regulation and the USACE is complying with regulation for the cleanup of the Northeast Cape FUDS.

A community member stated the community feels the previous 5 year-review did not address community concerns. The community feels their opinions are not impactful.

USACE Response - The USACE responded that the community input is impactful but the request of PCB congener analysis has to go down a different route and become an established cleanup level by regulation. The USACE identified that the planned signage was a result of community comments and that having onsite accommodations for community members to be present during 2018 fieldwork was also a result of community comments.

A community member recommended USACE meet with the Native corporations, as the landowners, in addition to the Native Village of Savoonga Council before the 2018 fieldwork occurs. Other suggestions included:

- Allow the corporations to review the sampling plan
- Present a digestible format of the results of the draft five-year review report

USACE Response – The USACE identified that the Native corporations were contacted and that they provided a right-of-entry to conduct 2018 fieldwork.

The public would also like the USACE to write a courtesy note to the Native corporations – re-stating the USACE is bound by law (specifically, the DD) and is limited in the types of sampling that can be performed. The note should also include appreciation of the public involvement and being welcomed into the village.

The meeting concluded.

Note – Nobody from the community remained after the meeting to complete and submit a five-year review questionnaire. Additionally, no one from the community returned to City Hall the next day to complete and submit a five-year review questionnaire.

The Second Five-Year Review for Northeast Cape Formerly Used Defense Site

Public Meeting

PRINT

Name/Organization	Signature
Dean Kulowiyi	Dean Kulowiyi
Irving Kava	Irving Kava
~~[illegible]~~ City of Savoonga	[illegible]
Christina Alowa	Christina Alowa
~~[illegible]~~	
City of [illegible]	[illegible]
Kukulget ~~[illegible]~~	[illegible]
~~[illegible]~~ IRA	Ray [illegible]
Perry Pungowiyi/Kukulget	Perry Pungowiyi
Kukulget, Inc.	[illegible]
Julian Seppilu	Julian Seppilu
Bryan Rookok Jr/ Kukulget, Inc.	[illegible]
NVS NALEMP PM Robert Annogiyuk	Robert Annogiyuk

ATTACHMENT C-3
Interviews

Interview Record

Name: Curtis Dunkin	Date: February 15, 2019
Organization: ADEC	Phone Number: 907.269.3053
Title: ADEC Regulatory Project Manager for the Northeast Cape FUDS	Email: Curtis.dunkin@alaska.gov
Interview Type: X Mail/Email	☐ Phone/In Person
Site Name: Northeast Cape, St. Lawrence Island	

The following interview questions are based on EPA guidance (EPA 540-R-01-007). Questions may be left unanswered if they do not apply to you.

Interview Questions

1. **What is your overall impression of the project (general sentiment)?**
ADEC appreciates the opportunity to submit its comments and concerns on the prospective second five-year review (FYR) effort for the Northeast Cape (NEC) Formerly Used Defense Site (FUDS).
Within the current FYR period, spanning between 2014 and 2019, the Army Corps of Engineers (USACE) has continued to conduct monitoring and periodic reviews at specified sites of the NEC FUDS as required by both the 2009 NEC Site 7 Decision Document (DD) and the 2009 NEC Site Wide DD, and the 2016 NEC Long-term Management Plan (LTMP). USACE has made progress on addressing site management needs including developing the 2016 LTMP and developing conceptual Land Use Control (LUC) boundaries at sites where required by the DD.
USACE has been responsive to evaluating and implementing additional investigation activities to address newly identified data gaps and site characterization needs at several NEC sites during the current FYR period.
USACE has continued to work on and has achieved many of the action items and milestones which were specified in the preceding FYR report (2015) section 9.0 table 9.1.
In general, the Alaska Department of Environmental Conservation's Contaminated Sites Program (ADEC) continues to agree with and perceives the site-specific protectiveness statements that were presented in the 2015 FYR report section 10 as continuing to be applicable and appropriate at the time of this questionnaire. ADEC is not aware of any major site management changes, issues, and/or concerns (i.e. land use changes, contamination migration, exposure risk, etc.) that would be considered inconsistent with what was identified in the 2009 DDs and/or the 2015 FYR that have been identified since the 2015 FYR report.
One of the accomplishments of the 2018 site work was the USACE installing signage along the Cargo Beach Road which had information detailing and figures depicting site locations, conceptual land use control boundaries, and warnings - as requested by community members and other stakeholders including ADEC. The signage included information in English on one side, and Siberian Yupik on the other.

ADEC's overall impression is that USACE has kept stakeholders adequately apprised of the project activities and schedules and have been responsive to community and agency involvement.

2. **<u>From your perspective, what effects have site operations had on the surrounding community? Are you aware of any community concerns/complaints regarding site operations, administration, implementation, or overall protectiveness of the remedies in the Decision Documents?</u>** ADEC perceives USACE's site operations to have had overall positive effects on the communities of Saint Lawrence Island. During the numerous mobilizations and implementations of field efforts over the years (both prior to as well as during the current FYR period), USACE consistently made it a priority objective to include community members in its hired field crews, has provided opportunities for community members to be designated community observers, and has also coordinated the logistics for community and agency members to travel to NEC to conduct field visits. USACE has also coordinated with ADEC for staff to conduct multi-day site inspections during the implementation of field work as well as participation in community outreach.
   ADEC is aware of numerous instances over the years, including during the current FYR period, that the USACE field staff provided major critical medical care to community members who were traveling to visit the Native Village of Northeast Cape (NVNC) and/or traveling between the surrounding fish and hunting camps.
   USACE site operations over the years have resulted in economic contributions to the local economies of the communities of Gambell and Savoonga.
   ADEC is aware of several ongoing concerns which have been expressed by community members via written and/or oral comments on projects (documents) and/or public meetings which have occurred prior to as well as during the current FYR period, including but not limited to the following: 1) potential leachate in surface and/or groundwater that could be associated with the landfills, 2) residual contamination in waters, sediments, and/or fish within the Site 28 and Suqi River drainages – including respective concerns associated with potential exposure risk(s); 3) potential residual FUDS contamination at several of the NVNC fish camp sites, and 4) FUDS debris and structural materials that represent health hazards to community members and/or wildlife.

3. **<u>Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities? If so, please provide details.</u>** ADEC is not aware of any such events listed in the question as having occurred in association with the Northeast Cape FUDS areas of concern (sites).

4. **<u>Do you feel well informed about the site's activities and progress? Have there been communications or activities regarding the site?</u>** ADEC feels that it is adequately informed regarding the site's activities and progress. USACE has coordinated public meetings in Savoonga to discuss the planning of and to solicit input for the prior draft 2014 FYR report and also in April 2018 to inform the community and to solicit input from stakeholders regarding the draft 2018 Remedial Action Review Work Plan.
   USACE has provided ADEC with the opportunity to review and comment on the LTM work plans and reports that have been implemented during the current FYR period, and has also hosted numerous technical planning meetings
   USACE has provided ADEC with regular updates during the implementation of field work during this FYR period. In instances that warranted consideration of potential or

necessary changes to the field and/or project plans, USACE has apprised ADEC and allowed ADEC the opportunity to review, make additional comments, and approve those changes prior to implementing them in the field. USACE has generally provided ADEC with complete and thorough documentation (electronic and hard copy) for draft and final documents, meeting materials, agendas, minutes, and decisions during this FYR period. While there have been a couple of minor instances where USACE's responsive summary to ADEC was delayed and/or not complete, (including meeting minutes and final responses associated with the two draft reports in 2016 associated with the Main Operations Complex LTM, Suqi River Current Conditions Evaluation, and the Site 8 LTM and investigation, as well as the meeting minutes from the April 2018 public meeting for the draft 2018 Remedial Action Review Work Plan), these instances have not resulted in negative impacts to any sites, their respective remedies and/or protectiveness, or the progress of implementing respective site work.

5. **Do you have any suggestions regarding future operation, maintenance, and monitoring at the site?** ADEC requests USACE consider the following to be included in the current FYR evaluation as well as future site investigation and/or monitoring activities: 1) evaluate and continue the extent investigation as determined necessary for soils and groundwater at Site 8; 2) continue to include LTM of surface water and groundwater at landfill sites; 3) continue LTM of groundwater at the MOC sites and evaluate additional LTM investigation in soils and groundwater in areas adjacent to and immediately downgradient of MOC (aka the upgradient areas of the Site 28 Drainage); 4) conduct surface water sampling at Site 28 and consider whether tissue sampling is necessary based upon historical and/or 2018 sediment sample results; 5) assess the residual contamination remaining at the Fish Camp sites as indicated by the most recent site investigation analysis results (most/all of which were conducted under the prior NALEMP efforts) – which appear to indicate that residual concentrations of PCBs, metals, and POL COCs remained in soils and surface water; and 6) evaluate and apply the revisions and changes to 18AAC75 cleanup levels and what impacts have resulted to any sites and their respective remedies.
   Additionally, USACE has yet to develop a Notice of Environmental Contamination as well as Institutional Controls with the landowner, which is a primary requirement for several of the remedies associated with NEC sites. This requirement is specified in both 2009 DDs, the LTMMP and other project documents and correspondence since the removal actions were completed in 2014, and is also a site closure requirement of 18 AAC 75. The current FYR effort needs to discuss and include these issues as well as outline milestone dates for their completion.

6. **Have any problems been encountered which required, or will require, changes to the remedy or Decision Document?**
   As of the date of the subject questionnaire, ADEC is not aware of any problems having been encountered, specifically during this FYR period that would require changes to the remedy or DDs. However, ADEC has noted its concerns (both prior to as well as within the current FYR period), via written comments and discussions associated with work plans, reports, meetings, etc., with regard to several issues and concerns discussed below.
   Site 28 Drainage: ADEC continues to have concerns regarding whether or not the issues of contaminant migration and/or exposure pathways via sediments and/or surface water at Site 28 and related drainages have been adequately investigated and/or monitored; including concerns regarding the state of the residual contamination source areas which

remain within the tundra at Site 28 as well as likely ongoing sources from the MOC plumes which are located immediately adjacent to/upgradient of Site 28. ADEC acknowledges that additional Site 28 sediment investigation data will be available and evaluated based upon the results of the 2018 investigation activities. However, ADEC noted in its responses to additional RTCs on the revised final 2018 work plan, that data gaps could still result from USACE's decision to not include surface water sampling at Site 28. Per ADEC's email to USACE dated July 11, 2018, "ADEC's comment was based on the issue that all of the existing surface water data from sample locations collected within the Site 28 drainage (i.e. upgradient of the confluence with the Suqi River), were either collected over the years of the RI phases or during the remedy implementation and sediment removal actions completed in 2013/14. ADEC's rationale for requesting additional surface water sampling from within the drainage during the 2018 effort was to provide current data to confirm whether surface water criteria are still being met five years after completion of the removal action; to support making a defensible determination with re: to the protectiveness of the remedy within this five-year review period."

Additionally, in the years following the finalization of the DDs in 2009, ADEC has emphasized its position that all applicable surface water criteria continue to apply as ARARs at all applicable sites; even though the DDs may have limited the specifications of surface water cleanup level(s) and/or criteria to i.e. TAH/TAqH and sheen. ADEC's current position is that additional surface water monitoring data from Site 28 may be necessary in the future in order to make conclusive determinations regarding the status of migration and/or exposure pathways. Further deliberations regarding comments and responses on the revised final 2018 work plan noted that USACE would include further evaluation of this issue in the prospective 2018-19 FYR report.

Site 8: Field conditions at the time of implementing the initial field activities, including surveying and locates of planned 2018 sediment sampling and mapping locations, indicated that sediment and/or surface water were not present within the targeted decision units. Subsequent site inspections conducted by ADEC, USACE, and the field team resulted in concurrence that the Site 8 sediment and surface water could not be investigated as specified in the 2018 work plan. Further discussion and observations by the project team members resulted in concurrence that the extents of subsurface soil and groundwater contamination on both sides of the road remained the primary data gap at this site and would require further evaluation in the current FYR in order to determine/recommend the appropriate and necessary path forward.

Site 7: ADEC has previously commented and noted its position that this and other uncharacterized landfills at Northeast Cape will continue to require CERCLA FYRs until such time that the agencies concur that Periodic Reviews are appropriate. While ADEC acknowledges that the DD states the term periodic reviews, the Site 7 landfill has had prior sources and residual concentrations of CERCLA contaminants identified; and while the agencies have agreed to disagree on this issue based upon prior deliberations, ADEC's position is that the uncharacterized areas of concern require CERCLA FYRs until otherwise determined appropriate to change the process to periodic reviews. Additionally, ongoing monitoring of the downgradient surface water and/or groundwater at these landfills is also applicable and necessary during the CERCLA FYR until such time that the agencies conclusively concur that any contaminant migration and/or exposure pathways are incomplete and that the remedy remains protective.

Fish Camp: Please see and apply ADEC's comment on this area of concern in response to question #5 in this questionnaire.

General: Please see and apply other applicable comments, responses, and/or deliberations from meeting and resolution minutes associated with activities which occurred within the current FYR period that are relevant to considerations regarding the functionability and/or protectiveness of the implemented remedies, site statuses, etc. including for example the development of the 2016 LTMMP, the development and implementation of the 2016 LTM and Suqi River and Site 8 LTM Work Plans and Reports, the 2018 public meeting, and the 2018 Remedial Action Review Work Plan; including related email correspondence between ADEC and USACE such as that referenced in the Site 28 discussion, dated July 2018 above and others.

7. **Are you aware of any changes in land use, access, or other site conditions that have occurred in the past five years that you feel may impact the protectiveness of the site?** ADEC is not aware of any changes to land use or access in association with the Northeast Cape FUDS and/or immediately adjacent areas. ADEC however does note that changes in site conditions have been observed and confirmed to have occurred at several sites - as identified since the DDs and within this FYR period including : 1) the drainage and surface water characteristics within the Site 8 areas of concern; 2) increased concentrations and extents of contamination in soils associated with Site 8 that have been identified since the DD and within this FYR period, 3) settling/subsidence at the Site 7 landfill; 4) poor and inadequate vegetation establishment associated with the covers and adjacent surfaces of the Site 7 and Site 9 landfills; and 5) sediment transport and deposition appears to have recurred within the Site 28 drainage however it is still unclear whether or not residual contamination is continuing to migrate through the system.

8. **Do you have any comments, suggestions, or recommendations regarding the site's management or operation?** ADEC would request/suggest the following of USACE: 1) to provide more advanced notice to ADEC, community members, and other stakeholders whenever USACE is planning and scheduling future community meetings in order to ensure all parties have adequate time to make arrangements for travel, schedule participation, provide input to the agenda, etc.; 2) ensure that complete and comprehensive responsiveness summaries (i.e. complete responses to comments, meeting minutes, review and/or deliberation determinations) be provided to all stakeholders and attached to all respective documents for all applicable actions (noting the two instances described in more detail in response #3 above); 3) incorporate ATSDR health consultation conclusions and status of draft or final documents into this FYR; and 4) ADEC appreciates USACE's coordination of the November 15, 2018 technical meeting which enabled the project team members to have a pre-draft FYR report discussion of the preliminary data from the 2018 efforts. ADEC was notified at that meeting that the results of the 2018 work would be presented as an appendix in and distributed simultaneously with the draft FYR report. ADEC noted that while it did not necessarily object to that approach, that having an earlier opportunity to review and comment on the draft 2018 report in its entirety would have allowed ADEC to be better-informed for submittal of the subject questionnaire; as it would have also likely addressed some of ADEC's comments and concerns which are notated in the subject questionnaire.

Interview Record

Name: Larry Kava	Date: 01/28/2019
Organization: Kawerak Inc.	Phone Number: 907-984-6414
Title: Savoonga Representative	Email: tc.sva@kawerak.org
Interview Type: ☐ Mail/Email	X Phone/In Person
Site Name: Northeast Cape, St. Lawrence Island	

The following interview questions are based on EPA guidance (EPA 540-R-01-007). Questions may be left unanswered if they do not apply to you.

Interview Questions

1. What is your overall impression of the project (general sentiment)?

Mr. Kava has no comment on the site. He has not traveled to Northeast Cape and does not use the land for hunting or fishing. He travels elsewhere. He does not have friends or family that he wanted to comment on behalf of for general impressions of the site.

2. From your perspective, what effects have site operations had on the surrounding community? Are you aware of any community concerns/complaints regarding site operations, administration, implementation, or overall protectiveness of the remedies in the Decision Documents?

3. Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities? If so, please provide details.

4. Do you feel well informed about the site's activities and progress? Have there been communications or activities regarding the site?

5. Do you have any suggestions regarding future operation, maintenance, and monitoring at the site?

6. Have any problems been encountered which required, or will require, changes to the remedy or Decision Document?

7. Are you aware of any changes in land use, access, or other site conditions that have occurred in the past five years that you feel may impact the protectiveness of the site?

8. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

Interview Record

Name: Pungowiyi, Delbert	Date: 2/5/2019
Organization: Native Village of Savoonga Tribal Government	Phone Number: 907-984-6414
Title: President	Email:
Interview Type: ×Mail/Email ☐ Phone/In Person	
Site Name: Northeast Cape, St. Lawrence Island	

The following interview questions are based on EPA guidance (EPA 540-R-01-007). Questions may be left unanswered if they do not apply to you.

Interview Questions

1. What is your overall impression of the project (general sentiment)?

I was on and off on the project from the start of the cleanup. It was pretty tough working with the government. Overall, the tribe and the native corporation are not too happy about the outcome of it. There were some old monofills that were requested to have more investigation. We also wanted the site to be cleaned up to residential standards and do not believe that the site has been cleaned up to residential standards. The people would like to re-establish the community in NE Cape.

We sacrificed a lot to our nation, willingly, with our utmost patriotism. When they proposed to use our island, we did not have any requests except not to pollute the area – the Suqi, which was very rich with Dolly Varden and ocean-going trout. Because of the high number of fish that entered the Suqi river, the food was abundant there (for seal). The military did not honor the agreement that was signed by the Secretary of State (1951) not to pollute the Suqi with any human waste or any other pollutants or violate our hunting/trapping grounds. We do not believe we will see the river come back to life in our lifetime and it is questionable if the river will ever come back to it's state.

A human rights violation was committed – the Suqi river was wiped out with fish and the seals do not haul out anymore. We had no choice but to go to the dumps after breakfast, lunch, and dinner. I was a four-year-old child, up to five years old. We can still taste that sour taste when we talk about it.

We argued very hard that the five members of the tribal council should sign off on the Decision Document. The liaison who chaired the meeting said I had put up the most powerful argument for our people (in 2008). It was a one hour and fifty-minute teleconference which was initially for an hour and fifteen minutes. Our liason put the USACE on the spot to extend the teleconference until our issues were resolved. We were not notified of the reasons why they went ahead with the signing of the ROD without informing us why the tribe was excluded from signing of the ROD. 10 years ago, when we agreed to a 30-year cleanup, I asked a gentleman (believe he is the director of the USACE) for the justification of the exclusion – Bush II had signed an executive order that the USACE solely represented the US of America. We are not happy with that and are more or less insulted by that. I would like to see in black and white how they justified that 2009 signing of the ROD and excluding our tribe in 2008. The lady from Oregon had said that I put up the strongest argument for my people. To date, the gentleman said that he would provide me the information for why the tribal government was excluded. I have not seen nothing in black and white or in writing how they justified that signing off of the ROD on the NE Cape cleanup. We do have unfinished business with our senators in Washington and I'm just not pushing it right now with the current president that we have. We are just waiting to see what comes out of the current administration. I'm afraid to push it hard because of the current president we have. We are holding off to see if we can receive any compensation for the human rights violations. We have all agreed that the NEC will not be cleaned up to its pristine condition as before. The real estate value of the area over there has been severely depreciated and we would like to see compensation for that. If we end up with nothing after all of our sacrifice to our country – willingly and patriotically.

When they requested adults for Alaska territorial guards – all men and women over 13 years old stepped up. All were issued semi-automatic rifles. Radar stations in Gambell – subject to eating off of the garbage during times of food in security. We were never given thanks or recognition of the sacrifice – the letter of appreciation was an insult to us. The country as a whole does not understand the role that our island and my people played during the Cold War Era. The ultimate sacrifice in my opinion – sacrificing our existence. We knew about the nuclear weapons that they created. When we agreed to let them use our island we knew the risks we were undertaking. One nuclear strike to this island and we knew we would lose everything. We feel that our nation is really indebted to us as opposed to struggling and having food security issues that we are faced with now with our climate change and our food stamp being cut off due to this president and administration. It has been very tough dealing with the USACE right from the beginning of the clean up – biggest concern was the dollar amount. This shouldn't have been an issue because of the sacrifice we have given to our nation.

We argued the best we could to have the monofill investigated and removed. Congress to cleanup the FUDS. Annie Alowa had ACAT do a documentary prior to her death. She had been going to Washington for over 20 years with Pam Miller. 7 branches. Each branch said they had to go to the other branch. A lot of running around. The documentary is titled "I will fight until I melt." She had that documentary sent to Congress and she was diagnosed herself with liver cancer. This was really most powerful thing to have Congress take action to cleanup the FUDS – not only on the island but across Alaska. I have been arguing that she have recognition. Not one person in the state of Alaska stepped up to the plate. She fought this all alone for over 20 years. I'm happy and proud that she got to hear that it was going to be done. There is a lot of history to that. When things settle down in Washington, our commander in chief could take our case to see if we could have some sort of agreement/settlement, possibly like the Aleuts did. The best way to bring some closure to this situation would be to have a delegation from the Savoonga and Gambell with blessing from the tribal council of what would bring closure to the site and to negotiate with congress for a settlement that would be dignified to our people and our tribes and with Washington. Something that the community can agree to - yes, we can live with this settlement. That's where I'm really at. We have unfinished business. I'm really holding off on pushing forward on that. Our president is kind of scary right now.

We are not happy with the outcome of it, not happy to have the monofills left there – we asked for them to be categorized and removed. We don't know what more is in the monofills. There is so much more in there. Overall, the community was really not happy with the – it was an uphill battle, uphill fight right from the beginning. We were not happy with the certificate of appreciation – that itself should have been done more officially – state of the Union address. Some how that the world would know the sacrifice that we provided to our nation. It was enormous. Our geographic position we are in – right next door to Russia could have been taken in an instant.

Disgruntled is a word that could be used. We are not disgruntled with hatred – those are diseases that destroy humanity. We are still proud of the sacrifice that we gave to our nation. But nevertheless, once they put the satellites and no longer needed land-based radar systems and antennas – they just closed down shop, turned their back on us, and up and left. All of those years we had no choice but to eat off the garbage that was being dumped on the site. We do know that cooks and personell had pity for us because they found new shirts with money in them, pants, whole cooked turkeys that were neatly wrapped up, bags of potatoes neatly bagged up. Somebody in the cooks or staff felt pity for us. The people were thankful. The adults would gather as much as they could and lay out as much as they could at the village. It was divided equally up to the households. Those are horrible memories that we have to live with.

2. From your perspective, what effects have site operations had on the surrounding community? Are you aware of any community concerns/complaints regarding site operations, administration, implementation, or overall protectiveness of the remedies in the Decision Documents?

This question was answered under question 1.

3. Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities? If so, please provide details.

They say that we can drink the Suqi. We still carry water and the USACE told us not to disturb the bottom – that is where all of the heavy metals are at. They've basically torn down the whole base. There are still 3 houses that are used seasonally by Eugene Toolie, Raymond Toolie. 3 or 4 houses that remained because they are still being used. We were told by Dr. Ron that if we picked salmon berries or greens over there, then have them washed thoroughly. After the cleanup was done, disturbance of dust had settled on the greens and berries. He would not pick and eat them himself. Washing them would reduce the PCBs by at least 30 percent. He was surprised in some cases by 50 percent. He would not eat them now because they are in the tissues still. Very powerful, painful experience. We feel like we were used, abused, and turned our backs on and walked away from us without so much as saying thank you for all of the sacrifice you have done for our nation.

4. Do you feel well informed about the site's activities and progress? Have there been communications or activities regarding the site?

Not really. The best ones that gave us the best information – all of the things we would not have known – top, lead toxicologists that have done many sites around the world - Dr. Ron and ACAT. Without them, we would not have known what kind of toxic chemicals we were exposed to.

Three different studies were done on the blood for PCBs – all came up with the same numbers. PCB levels… at least 6-9x, some times up to 10x higher than national average. The national average is 0.01 ppb. We learned from the experts. The highest level was 0.02 in the national average. Our PCB levels were off the chart for Savoonga and Gambell. 7.50 on up to 9.50.

Commercial grade PCB levels are not as high as military grade PCB. PCB levels taken on our island were high grade, which identified them as military PCBs. We have been ravaged by cancer and it is still a crisis to us.

It would be very hard for the USACE to say that the contamination is not causing the still born babies, cancer rates, and other issues.

5. Do you have any suggestions regarding future operation, maintenance, and monitoring at the site?

I think it's really difficult to answer with the climate change right now because the monofills they did – they just capped them with gravel. The monofills are not to be used for building structures or doing anything with it period. The one thing that scares me a lot is what toxic chemicals are in those monofills. With the permafrost melting at an unprecedent rate – with sewage and water systems sinking – that's a scary thought to the monofills. Eventually, with the way things are going now, we believe they will start leaching out into the ocean and into the beaches. Those are scary thoughts to us.

6. Have any problems been encountered which required, or will require, changes to the remedy or Decision Document?

This question was answered under question 1.

7. Are you aware of any changes in land use, access, or other site conditions that have occurred in the past five years that you feel may impact the protectiveness of the site?

The interest in re-establishing in the community is because if you look at the map – we are running out of space. If we start building more houses east of us, it will cost us lots. The airport is the biggest obstacle in our way. We are running out of space for building houses. Our population is growing. That is why there is interest in re-establishing the NE Cape site – which was very beautiful in it's pristine condition. It was so beautiful over there. That is one of the motivators for the tribal members. We do not believe that the site was cleaned up to residential standards. They had spills of over 230,000 gallons of diesel. It still seeps out. We still can smell it. Unrecorded spills is a big question mark. Apparently there was a pumphouse from the beach to the base – they had diesel pipes somewhere under the ground going up to the base. Eugene Toolie was a long time employee of the base... They had filled up a several thousand tank with diesel. The tanker – Mona Lisa – did not fully deliver the load and knew that there was a break somewhere. They found a pipe that was pulled apart – about a foot apart. Thousands and thousands of gallons spilled and seeped into the ground.

8. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

This question was answered under question 1.

Interview Record—Second Five-Year Review

Name: Vi Waghiyi and Pamela Miller	Date: 12/21/18
Organization: ACAT	Phone Number: 222-7714
Title:	Email: vi@akaction.org; pamela@akaction.org
Interview Type: x Mail/Email	☐ Phone/In Person
Site Name: Northeast Cape, St. Lawrence Island	

The following interview questions are based on EPA guidance (EPA 540-R-01-007). Questions may be left unanswered if they do not apply to you.

Interview Questions

1. **What is your overall impression of the project (general sentiment)?**

Vi: Sites were prematurely closed without the consent of the tribes and they were not part of the Record of Decision. Everything before and after the NEC ROD happened without government-government consultation with our tribes. Our tribal governments and people do not approve the minimal site characterization and remediation—it is not protective of our Sivuqaq Yupik peoples' health and well-being. A new ROD must be implemented with the full participation and consultation with our tribal governments.

Pam: The full nature and extent of contamination has not been fully investigated, so the remediation is incomplete. Source areas of contamination, including the main complex and uncontrolled landfills, have not been fully characterized or removed and these continue to contaminate the Suqi River. The contaminants at NEC pose a significant source of pollution to traditional subsistence foods, water supplies, and medicinal plants. Recent studies by our community-based research team show that fish (stickleback and blackfish) continue to have elevated levels of PCBs. Also, these sentinel fish in the Suqi River show estrogenic effects, thyroid disruption, and altered gene expression linked with exposure to PCBs. Fish and humans share the same hormone systems and most of the genes underlying diseases in humans are the same genes underlying those diseases in fish. Estrogenic effects are associated with abnormal development and certain cancers. Altered gene expression results are also consistent with higher cancer risk. Contamination continues to affect water sources, traditional medicinal and food plants, fish, and wildlife, as well as the health of the people.

2. **From your perspective, what effects have site operations had on the surrounding community? Are you aware of any community concerns/complaints regarding site operations, administration, implementation, or overall protectiveness of the remedies in the Decision Documents?**

Vi: Native Village of NE Cape residents are now displaced due to the military toxic contamination from the abandoned FUD sites at NE Cape. This contamination is causing health disparities associated with PCBs and other chemical exposures including cancers, heart disease, strokes, reproductive health harms, birth defects, learning disabilities, diabetes and thyroid disease. Army Corps has been patronizing, not transparent or inclusive. The Corps did not fulfill their government to government obligation. Remediation may have made the sites more toxic by mobilizing contaminants. Many sites at NE Cape remain highly toxic and will continue to harm future generations.

Pam: Yes. There have been extensive complaints that the concerns and knowledge of community members have not been taken into account in the decisions about the remedial investigations, site characterization, or remedial actions. The remedies are not protective of human health and the environment.

3. Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities? If so, please provide details.

Pam: We are concerned that people are drinking water from the Suqi River and other sources at NE Cape—this is a health hazard. In addition, families who live and/or travel through NE Cape may be exposed to hazardous chemicals though inhalation, ingestion, and consumption of traditional foods.

4. Do you feel well informed about the site's activities and progress? Have there been communications or activities regarding the site?

Vi: We are well informed ourselves that the site characterization and remediation have failed. Local voices and knowledge have not been heard or taken into account. As stated above, the omission of the tribes from the ROD warrants inclusion of the tribes in any decisions concerning site remediation, acknowledging and using local knowledge and community-based participatory research data to drive adequate site characterization and remediation. A new inclusive decision-making process and ROD with the tribes must take place.

5. Do you have any suggestions regarding future operation, maintenance, and monitoring at the site?

Vi: see answer to #4.

Pam: warning signs in Yupik (St. Lawrence Island Yupik created by local translators) and English should be placed to prevent consumption of water and/or fish from the Suqi and Tapi Rivers. Additional warning signs should be placed to prevent the gathering of plants and berries in and around NE Cape because of possible contamination.

An extensive ground- and surface water monitoring program should be implemented with monitoring well placement advised by the tribes and knowledgeable local community members. Leachate from the landfills and drainage downstream from the main complex should be monitored over the long-term, including water sampling as well as integrative sampling technologies such as SPMDs, sediment cores, and biological monitoring. A regular and comprehensive monitoring plan must be independently conducted using a community-based participatory research model that includes the people of SLI in the design, implementation, and interpretation of results. In addition to integrated analysis of surface and groundwater (use of SPMDs), and sediments, biological monitoring should include plants/berries, sentinel and edible species of fish, and marine mammals.

Remediation is not complete. Additional remedies should be implemented including source removal and well-planned and executed remedial technologies that such as in situ peroxidative and biological remediation. The Corps really botched the chemical oxidation project, then concluded it wouldn't work. Proper regulatory oversight and enforcement has been lacking. There should be provisions for: 1) use of innovative clean-up technologies relevant to the Arctic; 2) accountability to the leadership of the communities of Savoonga and Gambell, government-to-government consultation with Tribes, and citizen participation in remedial decisions. Tribes, as sovereign governments, must have the right to determine clean-up standards and serve as official parties to the Records of Decision. There is a long way to go to achieve restoration and removal of the contamination. The premature closures, partial excavations, natural attenuation, and/or land use controls are completely inadequate.

Matters of primary urgency for attention and action include:

- Complete removal of the solid and hazardous waste materials at the Northeast Cape Site 7 and other landfills;

- Removal and treatment of the White Alice site soils and groundwater to effectively remove associated contaminants;

- Removal/remediation of contaminants in source areas that remain within the Northeast Cape Main Complex soils and groundwater, as well as on-going monitoring to ensure safe drinking water supplies;

- Effective remediation and long-term monitoring of the Suqi River drainage basin sediments and surface water (fuels and PCB contamination);

- Complete removal or destruction of the contaminants identified at the former village site at Northeast Cape. Adequate funding for NALEMP program at Native Village of Northeast Cape, including provisions to adequately support and build capacity with training and jobs for the Native Village of Savoonga;

- Review of the failure of the chemical oxidation project and attention to the problems/solutions identified by RAB technical advisor Dr. Ron Scrudato;

- Restoration of the Suqi River watershed and shallow groundwater resources within the area of the Main Complex and up-gradient regions of the Main Complex to ensure adequate and safe drinking water at Northeast Cape;

- Tracking and analysis of materials salvaged from NE Cape that have been used by families for construction of homes and camps. These present a likely exposure pathway for such contaminants as PCBs, lead, asbestos, and others.

6. Have any problems been encountered which required, or will require, changes to the remedy or Decision Document?

Vi: There has been no real inclusion of the community or tribes in the decision making. No government to government consultation. As stated above, a new process and ROD is needed with tribes' full participation in the decision documents.

Pam: see answer to #6

7. Are you aware of any changes in land use, access, or other site conditions that have occurred in the past five years that you feel may impact the protectiveness of the site?

Vi: We know that the watershed of the nearby Tapissak ("Tapi") River is also contaminated and that area has not been investigated or characterized. Our research shows elevated levels of PCBs.

Pam: The Corps has not assessed the effects of climate warming on the mobilization of contaminants that have been sequestered in landfills and within permafrost. Erosion and permafrost melting will likely increase the mobilization and bioavailability of contaminants at NE Cape, thus increasing hazards to the health of fish, wildlife, and people.

8. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

Vi: The Corps needs to take the tribes' direction in the characterization, remediation, long-term monitoring to ensure that actions are protective of the health of humans, fish and wildlife.

Pam: A regular and comprehensive monitoring plan must be independently conducted using a community-based participatory research model that includes the people of SLI in the design, implementation, and interpretation of results. This should include integrated analysis of surface and groundwater (use of SPMDs), sediments, plants/berries, sentinel and edible species of fish, and marine mammals.

Interview Record

Name: June Walunga	Date: 01/29/2018
Organization: Kawerak Inc.	Phone Number:
Title:	Email: jwalunga@gci.net
Interview Type: X Mail/Email	Phone/In Person
Site Name: Northeast Cape, St. Lawrence Island	

The following interview questions are based on EPA guidance (EPA 540-R-01-007). Questions may be left unanswered if they do not apply to you.

Interview Questions

1. What is your overall impression of the project (general sentiment)?

There should have been more done; i.e. barging debris out instead of using monofill.

2. From your perspective, what effects have site operations had on the surrounding community? Are you aware of any community concerns/complaints regarding site operations, administration, implementation, or overall protectiveness of the remedies in the Decision Documents?

The site needs to be completely contaminant and debris free so people of Gambell and Savoonga can start using the land for hunting and fishing and start a new community there. There is fear of contaminants and lack of trust from both communities due to high rate of cancer. Pressing fact now is to finish cleaning the site.

3. Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities? If so, please provide details.

None

4. Do you feel well informed about the site's activities and progress? Have there been communications or activities regarding the site? No.

From the very beginning, there should have been open communication between the two tribes and EPA, DEC ACE, etc. To this day, we have not seen anything on paper and no information adequately provided to the tribal leaders. What is expected of us?

5. Do you have any suggestions regarding future operation, maintenance, and monitoring at the site?

Local knowledge should have been used; more input from Gambell & Savoonga communities. There are people who knows about the oil spills. Local monitors, at least two, one from each community, should be in place.

6. Have any problems been encountered which required, or will require, changes to the remedy or Decision Document?

Yes, there is still contaminants persistant to the site and surrounding areas where contaminants are known to exist.

7. Are you aware of any changes in land use, access, or other site conditions that have occurred in the past five years that you feel may impact the protectiveness of the site?

Settling is occurring at the existing landfill and buried debris is being exposed.
We are hoping the reindeer grazing does not happen in the area or to the small lakes that still shows contamination.

8. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

Re-evaluate the whole site and clean again where there are still contaminants. Re-evaluate again in few years. Keep re-assessing every four years.

ATTACHMENT C-4
Site Inspection Checklists

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: Site 3- Fuel Pumphouse	**Date of inspection:** 8/1/2018
Location and Region: NE Cape	**EPA ID:** AK 9799F299
Agency, office, or company leading the five-year review: USACE	**Weather/temperature:** 50°F, overcast
Remedy Includes: (Check all that apply) ☐ Landfill cover/containment ☐ Monitored natural attenuation ☐ Access controls ☒ Institutional controls ☐ Other Excavation & removal of petroleum-contaminated soils, LUCs	
Attachments: ☐ Inspection team roster attached ☐ Site map attached	
II. INTERVIEWS (Check all that apply)	
1. **O&M site manager** None ___ ___ (Name / Title / Date) Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ___ Problems, suggestions; ☐ Report attached ___	
2. **O&M staff** None ___ ___ (Name / Title / Date) Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ___ Problems, suggestions; ☐ Report attached ___	
3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply. Agency ADEC Contact Curtis Dunkin (Name) / Project Manager (Title) / 11/19/18 (Date) / (907) 269-3053 (Phone no.) Problems; suggestions; ☑ Report attached Questionnaire sent via email Agency ___ Contact ___ (Name) / ___ (Title) / ___ (Date) / ___ (Phone no.) Problems; suggestions; ☐ Report attached ___	
4. **Other interviews** (optional) ☒ Report attached.	

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)
1. **O&M Documents** ☐ O&M manual ☐ Readily available ☐ Up to date ☐ N/A ☐ As-built drawings ☐ Readily available ☐ Up to date ☐ N/A ☐ Maintenance logs ☐ Readily available ☐ Up to date ☐ N/A Remarks Decision Document used for site information and Site maps.
2. **Site-Specific Health and Safety Plan** ☐ Readily available ☐ Up to date ☒ N/A ☐ Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☒ N/A Remarks
3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☒ N/A Remarks
4. **Permits and Service Agreements** ☐ Air discharge permit ☐ Readily available ☐ Up to date ☒ N/A ☐ Effluent discharge ☐ Readily available ☐ Up to date ☒ N/A ☐ Waste disposal, POTW ☐ Readily available ☐ Up to date ☒ N/A ☐ Other permits ☐ Readily available ☐ Up to date ☒ N/A Remarks
5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A Remarks
6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A Remarks
7. **Groundwater Monitoring Records** ☐ Readily available ☐ Up to date ☒ N/A Remarks
8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A Remarks
9. **Discharge Compliance Records** ☐ Air ☐ Readily available ☐ Up to date ☒ N/A ☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A Remarks
10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A Remarks

Five-Year Review Site Inspection Checklist

IV. O&M COSTS

1. **O&M Organization**
☐ State in-house ☐ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☒ Other USACE

2. **O&M Cost Records**
☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate $5,851,587 ☐ Breakdown attached

Total annual cost by year for review period if available

From (Date)	To (Date)	Total cost	
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons: None

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☒ N/A
Remarks

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☒ N/A
Remarks

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented	☐ Yes	☒ No	☐ N/A
Site conditions imply ICs not being fully enforced	☐ Yes	☒ No	☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Periodic Reviews (visual inspection)
Frequency 5 years
Responsible party/agency USACE
Contact ______ Name ______ Title ______ Date ______ Phone no.

Reporting is up-to-date	☒ Yes	☐ No	☐ N/A
Reports are verified by the lead agency	☒ Yes	☐ No	☐ N/A
Specific requirements in deed or decision documents have been met	☐ Yes	☒ No	☐ N/A
Violations have been reported	☐ Yes	☒ No	☐ N/A

Other problems or suggestions: ☐ Report attached
Deed notice has not been recorded

2. **Adequacy** ☒ ICs are adequate ☒ ICs are inadequate ☐ N/A
Remarks

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks

2. **Land use changes on site** ☐ N/A
Remarks Location is still actively used as a fishing camp for Savoonga + Gambell residents

3. **Land use changes off site** ☒ N/A
Remarks

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks

Five-Year Review Site Inspection Checklist

B. Other Site Conditions

Remarks 2 subsistence structures remain on site. There is a lot of debris on the site - many items appear to have been collected from remediation activities. High vis coats, poly tanks, etc. Other debris consists of fishing ~~AA~~ HH supplies. A 1-Qt oil container was found on-site.

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
   Areal extent__________ Depth__________
   Remarks__________

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths__________ Widths__________ Depths__________
   Remarks__________

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent__________ Depth__________
   Remarks__________

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Areal extent__________ Depth__________
   Remarks__________

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks__________

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
   Remarks__________

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
   Areal extent__________ Height__________
   Remarks__________

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident
☐ Wet areas ☐ Location shown on site map Areal extent______________
☐ Ponding ☐ Location shown on site map Areal extent______________
☐ Seeps ☐ Location shown on site map Areal extent______________
☐ Soft subgrade ☐ Location shown on site map Areal extent______________
Remarks____
____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability
Areal extent______________
Remarks____
____

B. Benches ☐ Applicable ☐ N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay
Remarks____
____

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay
Remarks____
____

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay
Remarks____
____

C. Letdown Channels ☐ Applicable ☐ N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
Areal extent______________ Depth____________
Remarks____
____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type______________ Areal extent____________
Remarks____
____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent______________ Depth____________
Remarks____
____

Five-Year Review Site Inspection Checklist

4. **Undercutting** ☐ *Location shown on site map* ☐ *No evidence of undercutting*
Areal extent______________ Depth____________
Remarks____

5. **Obstructions** Type____________________ ☐ No obstructions
☐ Location shown on site map Areal extent______________
Size____________
Remarks____

6. **Excessive Vegetative Growth** Type____________________
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent______________
Remarks____

D. Cover Penetrations ☐ Applicable ☐ N/A

1. **Gas Vents** ☐ Active☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks____

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks____

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks____

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks____

E. Gas Collection and Treatment ☐ Applicable ☐ N/A
1. **Gas Treatment Facilities** ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse ☐ Good condition☐ Needs Maintenance Remarks________________________________
2. **Gas Collection Wells, Manifolds and Piping** ☐ Good condition☐ Needs Maintenance Remarks________________________________
3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings) ☐ Good condition☐ Needs Maintenance ☐ N/A Remarks________________________________
F. Cover Drainage Layer ☐ Applicable ☐ N/A
1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A Remarks________________________________
2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A Remarks________________________________
G. Detention/Sedimentation Ponds ☐ Applicable ☐ N/A
1. **Siltation** Areal extent______________ Depth____________ ☐ N/A ☐ Siltation not evident Remarks________________________________
2. **Erosion** Areal extent______________ Depth____________ ☐ Erosion not evident Remarks________________________________
3. **Outlet Works** ☐ Functioning ☐ N/A Remarks________________________________
4. **Dam** ☐ Functioning ☐ N/A Remarks________________________________

Five-Year Review Site Inspection Checklist

H. Retaining Walls ☐ Applicable ☐ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
Horizontal displacement____________ Vertical displacement_______________
Rotational displacement____________
Remarks____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
Remarks____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☐ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
Areal extent______________ Depth____________
Remarks____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
☐ Vegetation does not impede flow
Areal extent______________ Type____________
Remarks____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
Areal extent______________ Depth____________
Remarks____

4. **Discharge Structure** ☐ Functioning ☐ N/A
Remarks____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☐ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
Areal extent______________ Depth____________
Remarks____

2. **Performance Monitoring** Type of monitoring________________________
☐ Performance not monitored
Frequency____________________________ ☐ Evidence of breaching
Head differential________________________
Remarks____

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☒ N/A	
A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☐ N/A	
1.	**Pumps, Wellhead Plumbing, and Electrical** ☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A Remarks________________
2.	**Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance Remarks________________
3.	**Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks________________
B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☐ N/A	
1.	**Collection Structures, Pumps, and Electrical** ☐ Good condition ☐ Needs Maintenance Remarks________________
2.	**Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance Remarks________________
3.	**Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks________________

Five-Year Review Site Inspection Checklist

C. Treatment System	☐ Applicable ☒ N/A
1.	**Treatment Train** (Check components that apply) ☐ Metals removal ☐ Oil/water separation ☐ Bioremediation ☐ Air stripping ☐ Carbon adsorbers ☐ Filters__________ ☐ Additive (*e.g.*, chelation agent, flocculent)__________ ☐ Others__________ ☐ Good condition ☐ Needs Maintenance ☐ Sampling ports properly marked and functional ☐ Sampling/maintenance log displayed and up to date ☐ Equipment properly identified ☐ Quantity of groundwater treated annually__________ ☐ Quantity of surface water treated annually__________ Remarks__________
2.	**Electrical Enclosures and Panels** (properly rated and functional) ☐ N/A ☐ Good condition☐ Needs Maintenance Remarks__________
3.	**Tanks, Vaults, Storage Vessels** ☐ N/A ☐ Good condition☐ Proper secondary containment ☐ Needs Maintenance Remarks__________
4.	**Discharge Structure and Appurtenances** ☐ N/A ☐ Good condition☐ Needs Maintenance Remarks__________
5.	**Treatment Building(s)** ☐ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair ☐ Chemicals and equipment properly stored Remarks__________
6.	**Monitoring Wells** (pump and treatment remedy) ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ All required wells located ☐ Needs Maintenance ☐ N/A Remarks__________
D. Monitoring Data	
1.	Monitoring Data ☒ Is routinely submitted on time ☒ Is of acceptable quality
2.	Monitoring data suggests: ☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ☐ N/A

Remarks

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedy of excavation appears to be affective. No stressed vegetation or indications of contamination appear on site. Modern activities (i.e. use of fishing skiffs and providing boat maintenance) are occurring on the site.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

The remedy will be long-term protective once the deed notice is filed.

Five-Year Review Site Inspection Checklist

C.	Early Indicators of Potential Remedy Problems
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. None.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. None.

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Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: Site 6 - Gravel Pad	**Date of inspection:** 8/3/18
Location and Region: NE Cape	**EPA ID:** ~~AK2 Pm~~ AK9799F2999
Agency, office, or company leading the five-year review: USACE	**Weather/temperature:** Overcast/fog, light mist, 45°F

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment ☐ Monitored natural attenuation
☐ Access controls ☒ Institutional controls
☒ Other EXCAVATION & REMOVAL OF POL - CONTAMINATED SOIL

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** None
Name Title Date
Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ______
Problems, suggestions; ☐ Report attached ______

2. **O&M staff** None
Name Title Date
Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ______
Problems, suggestions; ☐ Report attached ______

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency ADEC
Contact Curtis Dunkin Project manager ~~03~~/19/18 907-269-3053
Name Title Date Phone no.
Problems; suggestions; ☒ Report attached Questionnaire sent via email

Agency ______
Contact ______
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ______

4. **Other interviews** (optional) ☒ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)			
1. **O&M Documents**			
☐ O&M manual	☐ Readily available	☐ Up to date	☒ N/A
☐ As-built drawings	☐ Readily available	☐ Up to date	☒ N/A
☐ Maintenance logs	☐ Readily available	☐ Up to date	☒ N/A
Remarks Decision Document used for site information and site maps			
2. **Site-Specific Health and Safety Plan**	☐ Readily available	☐ Up to date	☒ N/A
☐ Contingency plan/emergency response plan	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
3. **O&M and OSHA Training Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
4. **Permits and Service Agreements**			
☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
☐ Other permits ____	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
5. **Gas Generation Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
6. **Settlement Monument Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
7. **Groundwater Monitoring Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
8. **Leachate Extraction Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
9. **Discharge Compliance Records**			
☐ Air	☐ Readily available	☐ Up to date	☒ N/A
☐ Water (effluent)	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
10. **Daily Access/Security Logs**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			

Five-Year Review Site Inspection Checklist

IV. O&M COSTS

1. **O&M Organization**
☐ State in-house ☐ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☒ Other USACE

2. **O&M Cost Records**
☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate $5,851,587 ☐ Breakdown attached

Total annual cost by year for review period if available

From ________ To ________ ________ ☐ Breakdown attached
Date Date Total cost
From ________ To ________ ________ ☐ Breakdown attached
Date Date Total cost
From ________ To ________ ________ ☐ Breakdown attached
Date Date Total cost
From ________ To ________ ________ ☐ Breakdown attached
Date Date Total cost
From ________ To ________ ________ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons: None

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☒ N/A
Remarks

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☒ N/A
Remarks

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☑ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☑ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Periodic Reviews (visual inspection)
Frequency 5-years
Responsible party/agency USACE
Contact ____ Name ____ Title ____ Date ____ Phone no.

Reporting is up-to-date ☒ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☒ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☒ No ☐ N/A
Violations have been reported ☐ Yes ☒ No ☐ N/A
Other problems or suggestions: ☐ Report attached
Deed notice has not been recorded

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A
Remarks

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks

2. **Land use changes on site** ☒ N/A
Remarks

3. **Land use changes off site** ☒ N/A
Remarks

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks

Five-Year Review Site Inspection Checklist

B. Other Site Conditions
Remarks Gravel Pad covers site 6, with coarse gravel fill. Uneven, mossy tundra adjacent to gravel pad. Low water level. 3/4 adjacent ponds are dry, with low water seen in Pond to the South. No odor or sheen noted. Small depression dug in gravel pad (Eastern edge), with 540 cy of soil pushed up to adjacent Stockpile. However, this does not appear to be in area of ~~former~~ Pin excavation according to maps.

VII. LANDFILL COVERS ☐ Applicable ☒ N/A
A. Landfill Surface
1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident Areal extent______ Depth______ Remarks______
2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident Lengths______ Widths______ Depths______ Remarks______
3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident Areal extent______ Depth______ Remarks______
4. **Holes** ☐ Location shown on site map ☐ Holes not evident Areal extent______ Depth______ Remarks______
5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress ☐ Trees/Shrubs (indicate size and locations on a diagram) Remarks______
6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A Remarks______
7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident Areal extent______ Height______ Remarks______

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident
☐ Wet areas ☐ Location shown on site map Areal extent______________
☐ Ponding ☐ Location shown on site map Areal extent______________
☐ Seeps ☐ Location shown on site map Areal extent______________
☐ Soft subgrade ☐ Location shown on site map Areal extent______________
Remarks____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability
Areal extent______________
Remarks____

B. Benches ☐ Applicable ☐ N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay
Remarks____

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay
Remarks____

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay
Remarks____

C. Letdown Channels ☐ Applicable ☐ N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
Areal extent______________ Depth____________
Remarks____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type_______________ Areal extent_____________
Remarks____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent______________ Depth____________
Remarks____

Five-Year Review Site Inspection Checklist

4.	**Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting Areal extent______________ Depth____________ Remarks____ ____	
5.	**Obstructions** Type______________________ ☐ No obstructions ☐ Location shown on site map Areal extent______________ Size____________ Remarks____ ____	
6.	**Excessive Vegetative Growth** Type____________________ ☐ No evidence of excessive growth ☐ Vegetation in channels does not obstruct flow ☐ Location shown on site map Areal extent______________ Remarks____ ____	
D.	**Cover Penetrations** ☐ Applicable ☐ N/A	
1.	**Gas Vents** ☐ Active☐ Passive ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks____ ____	
2.	**Gas Monitoring Probes** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks____ ____	
3.	**Monitoring Wells** (within surface area of landfill) ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks____ ____	
4.	**Leachate Extraction Wells** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks____ ____	
5.	**Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A Remarks____ ____	

E. Gas Collection and Treatment ☐ Applicable ☐ N/A
1. **Gas Treatment Facilities** ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse ☐ Good condition ☐ Needs Maintenance Remarks____
2. **Gas Collection Wells, Manifolds and Piping** ☐ Good condition ☐ Needs Maintenance Remarks____
3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings) ☐ Good condition ☐ Needs Maintenance ☐ N/A Remarks____
F. Cover Drainage Layer ☐ Applicable ☐ N/A
1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A Remarks____
2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A Remarks____
G. Detention/Sedimentation Ponds ☐ Applicable ☐ N/A
1. **Siltation** Areal extent____________ Depth____________ ☐ N/A ☐ Siltation not evident Remarks____
2. **Erosion** Areal extent____________ Depth____________ ☐ Erosion not evident Remarks____
3. **Outlet Works** ☐ Functioning ☐ N/A Remarks____
4. **Dam** ☐ Functioning ☐ N/A Remarks____

Five-Year Review Site Inspection Checklist

H. Retaining Walls ☐ Applicable ☐ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
Horizontal displacement____________ Vertical displacement____________
Rotational displacement____________
Remarks____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
Remarks____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☐ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
Areal extent____________ Depth____________
Remarks____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
☐ Vegetation does not impede flow
Areal extent____________ Type____________
Remarks____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
Areal extent____________ Depth____________
Remarks____

4. **Discharge Structure** ☐ Functioning ☐ N/A
Remarks____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
Areal extent____________ Depth____________
Remarks____

2. **Performance Monitoring** Type of monitoring____________
☐ Performance not monitored
Frequency____________ ☐ Evidence of breaching
Head differential____________
Remarks____

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☒ N/A
A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☐ N/A
1. **Pumps, Wellhead Plumbing, and Electrical** ☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A Remarks_______________
2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance Remarks_______________
3. **Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks_______________
B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☐ N/A
1. **Collection Structures, Pumps, and Electrical** ☐ Good condition ☐ Needs Maintenance Remarks_______________
2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance Remarks_______________
3. **Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks_______________

Five-Year Review Site Inspection Checklist

C. Treatment System ☐ Applicable ☐ N/A

1. **Treatment Train** (Check components that apply)
☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
☐ Air stripping ☐ Carbon adsorbers
☐ Filters__________
☐ Additive (*e.g.*, chelation agent, flocculent)__________
☐ Others__________
☐ Good condition ☐ Needs Maintenance
☐ Sampling ports properly marked and functional
☐ Sampling/maintenance log displayed and up to date
☐ Equipment properly identified
☐ Quantity of groundwater treated annually__________
☐ Quantity of surface water treated annually__________
Remarks__________

2. **Electrical Enclosures and Panels** (properly rated and functional)
☐ N/A ☐ Good condition ☐ Needs Maintenance
Remarks__________

3. **Tanks, Vaults, Storage Vessels**
☐ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs Maintenance
Remarks__________

4. **Discharge Structure and Appurtenances**
☐ N/A ☐ Good condition ☐ Needs Maintenance
Remarks__________

5. **Treatment Building(s)**
☐ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair
☐ Chemicals and equipment properly stored
Remarks__________

6. **Monitoring Wells** (pump and treatment remedy)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks__________

D. Monitoring Data

1. Monitoring Data
☑ Is routinely submitted on time ☑ Is of acceptable quality

2. Monitoring data suggests:
☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The selected remedy was to excavate and remove PCB-contaminated soil. excavation area and surrounding has been graded with coarse gravel fill. no vegetation is present; little surface water was observed. Ponds to the North and west of gravel pad were dry. Pond to South contained water. The area of excavation was not distinguishable; no signs of contamination were noted (no odor, sheen on surface water).

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

there is no ongoing O&M at site 6. Site inspection did not observe any visual indication of contamination remaining at site 6.

Five-Year Review Site Inspection Checklist

C.	Early Indicators of Potential Remedy Problems
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. There are no issues or observations that suggest that the protectiveness of the remedy may be compromised in the future.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. There are no opportunities for optimization in monitoring tasks or the operation of the remedy.

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: Site 8 - POL Spill	**Date of inspection:** 8/2/18
Location and Region: NE Cape	**EPA ID:** AK9799F2999
Agency, office, or company leading the five-year review: USACE	**Weather/temperature:** Overcast/Fog, light breeze, 50°F
Remedy Includes: (Check all that apply) ☐ Landfill cover/containment ☒ Monitored natural attenuation ☐ Access controls ☒ Institutional controls ☐ Other ______	
Attachments: ☐ Inspection team roster attached ☐ Site map attached	

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** None

   Name ______ Title ______ Date ______

   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ______

   Problems, suggestions; ☐ Report attached ______

2. **O&M staff** None

   Name ______ Title ______ Date ______

   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ______

   Problems, suggestions; ☐ Report attached ______

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

   Agency ADEC

   Contact Curtis Dunkin | Project Manager | 11/19/18 | 907-269-3053

   Name | Title | Date | Phone no.

   Problems; suggestions; ☒ Report attached Questionnaire sent via email.

   Agency ______

   Contact ______

   Name | Title | Date | Phone no.

   Problems; suggestions; ☐ Report attached ______

4. **Other interviews** (optional) ☒ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)			
1. **O&M Documents**			
☐ O&M manual	☐ Readily available	☐ Up to date	☒ N/A
☐ As-built drawings	☐ Readily available	☐ Up to date	☒ N/A
☐ Maintenance logs	☐ Readily available	☐ Up to date	☒ N/A
Remarks DD used for site information and site maps.			
2. **Site-Specific Health and Safety Plan**	☐ Readily available	☐ Up to date	☒ N/A
☐ Contingency plan/emergency response plan	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
3. **O&M and OSHA Training Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
4. **Permits and Service Agreements**			
☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
☐ Other permits	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
5. **Gas Generation Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
6. **Settlement Monument Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
7. **Groundwater Monitoring Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
8. **Leachate Extraction Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
9. **Discharge Compliance Records**			
☐ Air	☐ Readily available	☐ Up to date	☒ N/A
☐ Water (effluent)	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
10. **Daily Access/Security Logs**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			

Five-Year Review Site Inspection Checklist

IV. O&M COSTS

1. **O&M Organization**
   - ☐ State in-house ☐ Contractor for State
   - ☐ PRP in-house ☐ Contractor for PRP
   - ☐ Federal Facility in-house ☐ Contractor for Federal Facility
   - ☒ Other USACE

2. **O&M Cost Records**
   - ☐ Readily available ☐ Up to date
   - ☐ Funding mechanism/agreement in place
   - Original O&M cost estimate $5,851,587 ☐ Breakdown attached

   Total annual cost by year for review period if available

From (Date)	To (Date)	Total cost	
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**
   Describe costs and reasons: Further investigation of the suspected pipeline break ~~suggested~~ ~~###~~ location suggested.

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☒ N/A
   Remarks

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☒ N/A
   Remarks

C. Institutional Controls (ICs)

1. **Implementation and enforcement**
Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Periodic Reviews (visual inspection)
Frequency 5 years
Responsible party/agency USACE
Contact ______ ______ ______ ______
Name Title Date Phone no.

Reporting is up-to-date ☑ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☑ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☑ No ☐ N/A
Violations have been reported ☐ Yes ☑ No ☐ N/A
Other problems or suggestions: ☐ Report attached
Deed notice has not been recorded.

2. **Adequacy** ☑ ICs are adequate ☐ ICs are inadequate ☐ N/A
Remarks

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks

2. **Land use changes on site** ☑ N/A
Remarks None

3. **Land use changes off site** ☑ N/A
Remarks none

VI. GENERAL SITE CONDITIONS

A. Roads ☑ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☐ Roads adequate ☐ N/A
Remarks road to MOC in good condition

Five-Year Review Site Inspection Checklist

B. Other Site Conditions

Remarks water level at site 8 appears considerably lower than described in previous reports. Partially-submerged vegetative mat and small ponded water bodies found throughout the established DUs. Vegetation appears healthy. Surface sheen observed on some ponded areas but appears to be biogenic. No fuel odor noted. Fish ~~adult~~ fin seen in Sugi River at downstream edge of site 8.

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
   Areal extent________ Depth________
   Remarks________

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths________ Widths________ Depths________
   Remarks________

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent________ Depth________
   Remarks________

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Areal extent________ Depth________
   Remarks________

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks________

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
   Remarks________

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
   Areal extent________ Height________
   Remarks________

8.	**Wet Areas/Water Damage**	☐ Wet areas/water damage not evident	
	☐ Wet areas	☐ Location shown on site map	Areal extent__________
	☐ Ponding	☐ Location shown on site map	Areal extent__________
	☐ Seeps	☐ Location shown on site map	Areal extent__________
	☐ Soft subgrade	☐ Location shown on site map	Areal extent__________
	Remarks____________________		
9.	**Slope Instability** ☐ Slides	☐ Location shown on site map	☐ No evidence of slope instability
	Areal extent__________		
	Remarks____________________		
B. Benches	☐ Applicable	☐ N/A	
	(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)		
1.	**Flows Bypass Bench**	☐ Location shown on site map	☐ N/A or okay
	Remarks____________________		
2.	**Bench Breached**	☐ Location shown on site map	☐ N/A or okay
	Remarks____________________		
3.	**Bench Overtopped**	☐ Location shown on site map	☐ N/A or okay
	Remarks____________________		
C. Letdown Channels	☐ Applicable	☐ N/A	
	(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)		
1.	**Settlement**	☐ Location shown on site map	☐ No evidence of settlement
	Areal extent__________	Depth__________	
	Remarks____________________		
2.	**Material Degradation**	☐ Location shown on site map	☐ No evidence of degradation
	Material type__________	Areal extent__________	
	Remarks____________________		
3.	**Erosion**	☐ Location shown on site map	☐ No evidence of erosion
	Areal extent__________	Depth__________	
	Remarks____________________		

Five-Year Review Site Inspection Checklist

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent______________ Depth____________
Remarks____

5. **Obstructions** Type____________________ ☐ No obstructions
☐ Location shown on site map Areal extent______________
Size____________
Remarks____

6. **Excessive Vegetative Growth** Type____________________
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent______________
Remarks____

D. Cover Penetrations ☐ Applicable ☐ N/A

1. **Gas Vents** ☐ Active☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks____

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks____

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks____

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks____

E. Gas Collection and Treatment ☐ Applicable ☐ N/A
1. **Gas Treatment Facilities** ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse ☐ Good condition☐ Needs Maintenance Remarks______________________________
2. **Gas Collection Wells, Manifolds and Piping** ☐ Good condition☐ Needs Maintenance Remarks______________________________
3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings) ☐ Good condition☐ Needs Maintenance ☐ N/A Remarks______________________________
F. Cover Drainage Layer ☐ Applicable ☐ N/A
1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A Remarks______________________________
2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A Remarks______________________________
G. Detention/Sedimentation Ponds ☐ Applicable ☐ N/A
1. **Siltation** Areal extent______________ Depth____________ ☐ N/A ☐ Siltation not evident Remarks______________________________
2. **Erosion** Areal extent______________ Depth____________ ☐ Erosion not evident Remarks______________________________
3. **Outlet Works** ☐ Functioning ☐ N/A Remarks______________________________
4. **Dam** ☐ Functioning ☐ N/A Remarks______________________________

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H. Retaining Walls ☐ Applicable ☐ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
Horizontal displacement____________ Vertical displacement_______________
Rotational displacement____________
Remarks____
____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
Remarks____
____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☐ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
Areal extent______________ Depth____________
Remarks____
____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
☐ Vegetation does not impede flow
Areal extent______________ Type____________
Remarks____
____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
Areal extent______________ Depth____________
Remarks____
____

4. **Discharge Structure** ☐ Functioning ☐ N/A
Remarks____
____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
Areal extent______________ Depth____________
Remarks____
____

2. **Performance Monitoring** Type of monitoring___________________________
☐ Performance not monitored
Frequency_______________________________ ☐ Evidence of breaching
Head differential__________________________
Remarks____
____

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☒ N/A
A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☐ N/A
1. **Pumps, Wellhead Plumbing, and Electrical** ☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A Remarks______________________________
2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance Remarks______________________________
3. **Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks______________________________
B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☐ N/A
1. **Collection Structures, Pumps, and Electrical** ☐ Good condition ☐ Needs Maintenance Remarks______________________________
2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance Remarks______________________________
3. **Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks______________________________

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C. Treatment System	☐ Applicable ☑ N/A
1.	**Treatment Train** (Check components that apply) ☐ Metals removal ☐ Oil/water separation ☐ Bioremediation ☐ Air stripping ☐ Carbon adsorbers ☐ Filters__________ ☐ Additive (*e.g.*, chelation agent, flocculent)__________ ☐ Others__________ ☐ Good condition ☐ Needs Maintenance ☐ Sampling ports properly marked and functional ☐ Sampling/maintenance log displayed and up to date ☐ Equipment properly identified ☐ Quantity of groundwater treated annually__________ ☐ Quantity of surface water treated annually__________ Remarks__________
2.	**Electrical Enclosures and Panels** (properly rated and functional) ☐ N/A ☐ Good condition ☐ Needs Maintenance Remarks__________
3.	**Tanks, Vaults, Storage Vessels** ☐ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs Maintenance Remarks__________
4.	**Discharge Structure and Appurtenances** ☐ N/A ☐ Good condition ☐ Needs Maintenance Remarks__________
5.	**Treatment Building(s)** ☐ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair ☐ Chemicals and equipment properly stored Remarks__________
6.	**Monitoring Wells** (pump and treatment remedy) ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ All required wells located ☐ Needs Maintenance ☐ N/A Remarks__________
D. Monitoring Data	
1.	Monitoring Data ☑ Is routinely submitted on time ☑ Is of acceptable quality
2.	Monitoring data suggests: ☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ☑ N/A
Remarks

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The selected remedy was Monitoring natural attenuation of contamination in sediment at Site 8. Little free sediment is observed at site 8 drainage. Site is predominately partially-submerged vegetative mat, with little evidence of free sediment transport.
No fuel odor was noted, and areas of surface water sheen appeared to be biogenic. Vegetation appears to be healthy and flourishing.
No evidence of POL-contamination (fuel odor, soil staining, stressed vegetation) is apparent on east side of road.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

No flowing water body present at Site 8. Surface water was entering Sugi River from small artesian well at the southern end of Dr. C. Water level, amount of standing water, and flowing water appear to vary seasonally at Site 8

Five-Year Review Site Inspection Checklist

C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. Sufficient material that met the DD definition of sediment could not be found in any of the 3 DUs. MNA sampling could not occur in 2018. Data from 2016 also suggests that undelineated soil contamination is present outside of the DUs.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. Discontinue MNA sampling until ~~the~~ a supplemental soil investigation is complete.

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION

Site name: Site 9 - Housing and Operations	**Date of inspection:** 8/2/2018
Location and Region: Northeast Cape	**EPA ID:** AK9799 2999
Agency, office, or company leading the five-year review: USACE	**Weather/temperature:** Overcast/fog, 50°F, light breeze

Remedy Includes: (Check all that apply)

☒ Landfill cover/containment ☐ Monitored natural attenuation
☐ Access controls ☐ Institutional controls
☒ Other Land Use controls (ground-disturbing activities & Groundwater use).

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** none
Name Title Date
Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ______
Problems, suggestions; ☐ Report attached ______

2. **O&M staff** none
Name Title Date
Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ______
Problems, suggestions; ☐ Report attached ______

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency ADEC
Contact Curtis Dunkin Project Manager 11/19/18 (907) 269-3053
Name Title Date Phone no.
Problems; suggestions; ☒ Report attached Questionnaire sent via email

Agency ______
Contact ______
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ______

4. **Other interviews** (optional) ☒ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
☐ O&M manual ☐ Readily available ☐ Up to date ☒ N/A
☐ As-built drawings ☐ Readily available ☐ Up to date ☒ N/A
☐ Maintenance logs ☐ Readily available ☐ Up to date ☒ N/A
Remarks____

2. **Site-Specific Health and Safety Plan** ☐ Readily available ☐ Up to date ☒ N/A
☐ Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☒ N/A
Remarks____

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks____

4. **Permits and Service Agreements**
☐ Air discharge permit ☐ Readily available ☐ Up to date ☒ N/A
☐ Effluent discharge ☐ Readily available ☐ Up to date ☒ N/A
☐ Waste disposal, POTW ☐ Readily available ☐ Up to date ☒ N/A
☐ Other permits____________ ☐ Readily available ☐ Up to date ☒ N/A
Remarks____

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks____

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks____

7. **Groundwater Monitoring Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks____

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks____

9. **Discharge Compliance Records**
☐ Air ☐ Readily available ☐ Up to date ☒ N/A
☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A
Remarks____

10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A
Remarks____

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IV. O&M COSTS

1. **O&M Organization**
   - ☐ State in-house ☐ Contractor for State
   - ☐ PRP in-house ☐ Contractor for PRP
   - ☐ Federal Facility in-house ☐ Contractor for Federal Facility
   - ☒ Other USACE

2. **O&M Cost Records**
   - ☐ Readily available ☐ Up to date
   - ☐ Funding mechanism/agreement in place

   Original O&M cost estimate $5,851,587 ☐ Breakdown attached

   Total annual cost by year for review period if available

From (Date)	To (Date)	Total cost	
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**

   Describe costs and reasons: None

V. ACCESS AND INSTITUTIONAL CONTROLS ☐ Applicable ☒ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☒ N/A

   Remarks

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☒ N/A

   Remarks

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented	☐ Yes	☒ No	☐ N/A
Site conditions imply ICs not being fully enforced	☐ Yes	☒ No	☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Periodic Reviews (visual inspection)
Frequency 5 years
Responsible party/agency USACE
Contact ______ Name ______ Title ______ Date ______ Phone no.

Reporting is up-to-date	☒ Yes	☐ No	☐ N/A
Reports are verified by the lead agency	☒ Yes	☐ No	☐ N/A
Specific requirements in deed or decision documents have been met	☐ Yes	☒ No	☐ N/A
Violations have been reported	☐ Yes	☒ No	☐ N/A

Other problems or suggestions: ☐ Report attached
Deed notice has not been recorded

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A
Remarks

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks

2. **Land use changes on site** ☒ N/A
Remarks none

3. **Land use changes off site** ☒ N/A
Remarks none

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks

Five-Year Review Site Inspection Checklist

B. Other Site Conditions

Remarks very little debris observed. One 12" piece of metal debris and small wood fragment the only debris found on landfill cap. No holes or penetrations are apparent. Diversion trench in good condition, no evidence of sedimentation.

VII. LANDFILL COVERS ☒ Applicable ☐ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
   Areal extent______ Depth______
   Remarks very slight localized depressions/low spots seen. likely due to overall low grade of cap

2. **Cracks** ☐ Location shown on site map ☒ Cracking not evident
   Lengths______ Widths______ Depths______
   Remarks______

3. **Erosion** ☐ Location shown on site map ☒ Erosion not evident
   Areal extent______ Depth______
   Remarks______

4. **Holes** ☐ Location shown on site map ☒ Holes not evident
   Areal extent______ Depth______
   Remarks______

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks little to no vegetative cover; likely due to poor rocky soil

6. **Alternative Cover (armored rock, concrete, etc.)** ☒ N/A
   Remarks______

7. **Bulges** ☐ Location shown on site map ☒ Bulges not evident
   Areal extent______ Height______
   Remarks______

8.	**Wet Areas/Water Damage**	☒ Wet areas/water damage not evident	
	☐ Wet areas	☐ Location shown on site map	Areal extent______
	☐ Ponding	☐ Location shown on site map	Areal extent______
	☐ Seeps	☐ Location shown on site map	Areal extent______
	☐ Soft subgrade	☐ Location shown on site map	Areal extent______
	Remarks no ponding observed on landfill cap. Ponds found adjacent on north and east side.		
9.	**Slope Instability** ☐ Slides	☐ Location shown on site map	☒ No evidence of slope instability
	Areal extent______		
	Remarks Low grade found across landfill cap. presents little opportunity for instability		

B. Benches ☐ Applicable ☒ N/A

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1.	**Flows Bypass Bench**	☐ Location shown on site map	☐ N/A or okay
	Remarks______		
2.	**Bench Breached**	☐ Location shown on site map	☐ N/A or okay
	Remarks______		
3.	**Bench Overtopped**	☐ Location shown on site map	☐ N/A or okay
	Remarks______		

C. Letdown Channels ☐ Applicable ☒ N/A

(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1.	**Settlement**	☐ Location shown on site map	☐ No evidence of settlement
	Areal extent______	Depth______	
	Remarks______		
2.	**Material Degradation**	☐ Location shown on site map	☐ No evidence of degradation
	Material type______	Areal extent______	
	Remarks______		
3.	**Erosion**	☐ Location shown on site map	☐ No evidence of erosion
	Areal extent______	Depth______	
	Remarks______		

Five-Year Review Site Inspection Checklist

4. **Undercutting** ☐ Location shown on site map ☒ No evidence of undercutting
Areal extent______________ Depth__________
Remarks____

5. **Obstructions** Type____________________ ☐ No obstructions
☐ Location shown on site map Areal extent____________
Size____________
Remarks____

6. **Excessive Vegetative Growth** Type____________________
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent____________
Remarks____

D. Cover Penetrations ☐ Applicable ☒ N/A

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks____

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks____

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks____

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks____

E. Gas Collection and Treatment		☐ Applicable ☒ N/A	
1.	**Gas Treatment Facilities** ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse ☐ Good condition☐ Needs Maintenance Remarks______________________________		
2.	**Gas Collection Wells, Manifolds and Piping** ☐ Good condition☐ Needs Maintenance Remarks______________________________		
3.	**Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings) ☐ Good condition☐ Needs Maintenance ☐ N/A Remarks______________________________		
F. Cover Drainage Layer		☐ Applicable ☒ N/A	
1.	**Outlet Pipes Inspected** Remarks______________________________	☐ Functioning	☐ N/A
2.	**Outlet Rock Inspected** Remarks______________________________	☐ Functioning	☐ N/A
G. Detention/Sedimentation Ponds		☐ Applicable ☒ N/A	
1.	**Siltation** Areal extent______________ Depth____________ ☐ Siltation not evident Remarks______________________________		☐ N/A
2.	**Erosion** Areal extent______________ Depth____________ ☐ Erosion not evident Remarks______________________________		
3.	**Outlet Works** Remarks______________________________	☐ Functioning	☐ N/A
4.	**Dam** Remarks______________________________	☐ Functioning	☐ N/A

Five-Year Review Site Inspection Checklist

H. Retaining Walls ☐ Applicable ☒ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
   Horizontal displacement__________ Vertical displacement__________
   Rotational displacement__________
   Remarks__________

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
   Remarks__________

I. Perimeter Ditches/Off-Site Discharge ☒ Applicable ☐ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
   Areal extent__________ Depth__________
   Remarks no sediment has accumulated in diversion trench. Trench lined with rip-rap.

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
   ☐ Vegetation does not impede flow
   Areal extent__________ Type__________
   Remarks diversion trench lined with rip-rap. healthy vegetation in ponds above and below trench.

3. **Erosion** ☐ Location shown on site map ☒ Erosion not evident
   Areal extent__________ Depth__________
   Remarks__________

4. **Discharge Structure** ☒ Functioning ☐ N/A
   Remarks diversion trench provides effective path for surface water. There is no evidence of surface water flow across the landfill cap.

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
   Areal extent__________ Depth__________
   Remarks__________

2. **Performance Monitoring** Type of monitoring__________
   ☐ Performance not monitored
   Frequency__________ ☐ Evidence of breaching
   Head differential__________
   Remarks__________

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☒ N/A
A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☐ N/A
1. **Pumps, Wellhead Plumbing, and Electrical** ☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A Remarks____________
2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance Remarks____________
3. **Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks____________
B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☐ N/A
1. **Collection Structures, Pumps, and Electrical** ☐ Good condition ☐ Needs Maintenance Remarks____________
2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance Remarks____________
3. **Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks____________

Five-Year Review Site Inspection Checklist

C. Treatment System ☐ Applicable ☒ N/A

1. **Treatment Train** (Check components that apply)
☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
☐ Air stripping ☐ Carbon adsorbers
☐ Filters______
☐ Additive (*e.g.*, chelation agent, flocculent)______
☐ Others______
☐ Good condition ☐ Needs Maintenance
☐ Sampling ports properly marked and functional
☐ Sampling/maintenance log displayed and up to date
☐ Equipment properly identified
☐ Quantity of groundwater treated annually______
☐ Quantity of surface water treated annually______
Remarks______

2. **Electrical Enclosures and Panels** (properly rated and functional)
☐ N/A ☐ Good condition ☐ Needs Maintenance
Remarks______

3. **Tanks, Vaults, Storage Vessels**
☐ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs Maintenance
Remarks______

4. **Discharge Structure and Appurtenances**
☐ N/A ☐ Good condition ☐ Needs Maintenance
Remarks______

5. **Treatment Building(s)**
☐ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair
☐ Chemicals and equipment properly stored
Remarks______

6. **Monitoring Wells** (pump and treatment remedy)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks______

D. Monitoring Data

1. Monitoring Data
☐ Is routinely submitted on time ☐ Is of acceptable quality

2. Monitoring data suggests:
☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ☒ N/A

Remarks

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

Landfill cap is in good condition with no evidence of erosion, holes, or cracks. Cap has a low grade established across, but no significant low spots or settling is apparent. The trench ~~cap~~ to the east of the landfill cap is providing adequate drainage for the adjacent pond, diverting flow away from landfill. This trench is in good condition, with no evidence of erosion or sedimentation. Trench is lined with small rip-rap.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

The current and long-term protectiveness ~~is~~ of the remedy is adequate.

Five-Year Review Site Inspection Checklist

C.	Early Indicators of Potential Remedy Problems
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. little to no vegetation is estabilished on landfill cap, likely due to rocky nature of the soil.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. None

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: Site 10 - Buried Drums	**Date of inspection:** 8/1/18
Location and Region: Northeast Cape	**EPA ID:** AK9799F2999
Agency, office, or company leading the five-year review: USACE	**Weather/temperature:** Overcast, 50°F

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☒ Monitored natural attenuation
- ☐ Access controls
- ☒ Institutional controls
- ☐ Other Excavation and Removal of POL-contaminated Soil LUCs

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** None ______ ______
   Name Title Date
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ______
   Problems, suggestions; ☐ Report attached ______

2. **O&M staff** None ______ ______
   Name Title Date
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ______
   Problems, suggestions; ☐ Report attached ______

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

   Agency ADEC
   Contact Curtis Dunkin Project Manager 11/19/18 (907) 269-3053
   Name Title Date Phone no.
   Problems; suggestions; ☒ Report attached Questionnaire sent to Curtis via email.

   Agency ______
   Contact ______ ______ ______ ______
   Name Title Date Phone no.
   Problems; suggestions; ☐ Report attached ______

4. **Other interviews** (optional) ☒ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)				
1. **O&M Documents**				
☐ O&M manual	☐ Readily available	☐ Up to date	☒ N/A
☐ As-built drawings	☐ Readily available	☐ Up to date	☒ N/A
☐ Maintenance logs	☐ Readily available	☐ Up to date	☒ N/A
Remarks Decision Document and First Five Year Review used for Site information and Site maps.			
2. **Site-Specific Health and Safety Plan**	☐ Readily available	☐ Up to date	☒ N/A
☐ Contingency plan/emergency response plan	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
3. **O&M and OSHA Training Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
4. **Permits and Service Agreements**			
☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
☐ Other permits______	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
5. **Gas Generation Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
6. **Settlement Monument Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
7. **Groundwater Monitoring Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
8. **Leachate Extraction Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
9. **Discharge Compliance Records**			
☐ Air	☐ Readily available	☐ Up to date	☒ N/A
☐ Water (effluent)	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
10. **Daily Access/Security Logs**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			

Five-Year Review Site Inspection Checklist

IV. O&M COSTS

1. **O&M Organization**
☐ State in-house ☐ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☒ Other USACE

2. **O&M Cost Records**
☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate $5,851,587 ☐ Breakdown attached
Estimate for all NE Cape sites to conduct six 5yr Reviews.

Total annual cost by year for review period if available

From ______ To ______ ______ ☐ Breakdown attached
Date Date Total cost
From ______ To ______ ______ ☐ Breakdown attached
Date Date Total cost
From ______ To ______ ______ ☐ Breakdown attached
Date Date Total cost
From ______ To ______ ______ ☐ Breakdown attached
Date Date Total cost
From ______ To ______ ______ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons: ______

V. ACCESS AND INSTITUTIONAL CONTROLS ☑ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☒ N/A
Remarks ______

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A
Remarks NE Cape is located on property of Sivuqaq, Inc. and Kukulget, Inc. Right of Entry is coordinated with these two Corporations.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented	☐ Yes	☑ No	☐ N/A
Site conditions imply ICs not being fully enforced	☐ Yes	☑ No	☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Periodic Reviews (visual inspection)
Frequency 5-years
Responsible party/agency USACE
Contact ______ Name ______ Title ______ Date ______ Phone no.

Reporting is up-to-date	☑ Yes	☐ No	☐ N/A
Reports are verified by the lead agency	☑ Yes	☐ No	☐ N/A
Specific requirements in deed or decision documents have been met	☐ Yes	☑ No	☐ N/A
Violations have been reported	☐ Yes	☑ No	☐ N/A

Other problems or suggestions: ☐ Report attached
Deed notice has not been recorded.

2. **Adequacy** ☑ ICs are adequate ☐ ICs are inadequate ☐ N/A
Remarks

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks

2. **Land use changes on site** ☐ N/A
Remarks none

3. **Land use changes off site** ☐ N/A
Remarks none

VI. GENERAL SITE CONDITIONS

A. Roads ☑ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks

Five-Year Review Site Inspection Checklist

B. Other Site Conditions

Remarks Site consists of well-graded gravel pad adjacent to Site 28 wetland. Sparse grass vegetation is present. No significant erosion observed at Site 10. minor site debris encountered include pipe/wire fragments, wood fragments (with paint), metal debris. No erosion evident along slope to site 28 border.

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
   Areal extent______ Depth______
   Remarks______

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths______ Widths______ Depths______
   Remarks______

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent______ Depth______
   Remarks______

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Areal extent______ Depth______
   Remarks______

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks______

6. **Alternative Cover (armored rock, concrete, etc.)** ☒ N/A
   Remarks______

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
   Areal extent______ Height______
   Remarks______

8.	**Wet Areas/Water Damage**	☐ Wet areas/water damage not evident	
	☐ Wet areas	☐ Location shown on site map	Areal extent______________
	☐ Ponding	☐ Location shown on site map	Areal extent______________
	☐ Seeps	☐ Location shown on site map	Areal extent______________
	☐ Soft subgrade	☐ Location shown on site map	Areal extent______________
	Remarks____		
9.	**Slope Instability** ☐ Slides	☐ Location shown on site map	☐ No evidence of slope instability
	Areal extent______________		
	Remarks____		
B. Benches	☐ Applicable ☒ N/A		
	(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)		
1.	**Flows Bypass Bench**	☐ Location shown on site map	☐ N/A or okay
	Remarks____		
2.	**Bench Breached**	☐ Location shown on site map	☐ N/A or okay
	Remarks____		
3.	**Bench Overtopped**	☐ Location shown on site map	☐ N/A or okay
	Remarks____		
C. Letdown Channels	☐ Applicable ☒ N/A		
	(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)		
1.	**Settlement**	☐ Location shown on site map	☐ No evidence of settlement
	Areal extent______________	Depth____________	
	Remarks____		
2.	**Material Degradation**	☐ Location shown on site map	☐ No evidence of degradation
	Material type______________	Areal extent_____________	
	Remarks____		
3.	**Erosion**	☐ Location shown on site map	☐ No evidence of erosion
	Areal extent______________	Depth____________	
	Remarks____		

Five-Year Review Site Inspection Checklist

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent______________ Depth____________
Remarks____
____

5. **Obstructions** Type______________________ ☐ No obstructions
☐ Location shown on site map Areal extent____________
Size____________
Remarks____
____

6. **Excessive Vegetative Growth** Type______________
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent______________
Remarks____
____

D. Cover Penetrations ☐ Applicable ☒ N/A

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks____
____

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks____
____

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks____
____

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks____
____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks____
____

E. Gas Collection and Treatment ☐ Applicable ☒ N/A
1. **Gas Treatment Facilities** ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse ☐ Good condition ☐ Needs Maintenance Remarks______________________________
2. **Gas Collection Wells, Manifolds and Piping** ☐ Good condition ☐ Needs Maintenance Remarks______________________________
3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings) ☐ Good condition ☐ Needs Maintenance ☐ N/A Remarks______________________________
F. Cover Drainage Layer ☐ Applicable ☒ N/A
1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A Remarks______________________________
2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A Remarks______________________________
G. Detention/Sedimentation Ponds ☐ Applicable ☒ N/A
1. **Siltation** Areal extent__________ Depth__________ ☐ N/A ☐ Siltation not evident Remarks______________________________
2. **Erosion** Areal extent__________ Depth__________ ☐ Erosion not evident Remarks______________________________
3. **Outlet Works** ☐ Functioning ☐ N/A Remarks______________________________
4. **Dam** ☐ Functioning ☐ N/A Remarks______________________________

Five-Year Review Site Inspection Checklist

H. Retaining Walls ☐ Applicable ☒ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
Horizontal displacement___________ Vertical displacement___________
Rotational displacement___________
Remarks______________________________________

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
Remarks______________________________________

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☒ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
Areal extent___________ Depth___________
Remarks______________________________________

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
☐ Vegetation does not impede flow
Areal extent___________ Type___________
Remarks______________________________________

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
Areal extent___________ Depth___________
Remarks______________________________________

4. **Discharge Structure** ☐ Functioning ☐ N/A
Remarks______________________________________

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
Areal extent___________ Depth___________
Remarks______________________________________

2. **Performance Monitoring** Type of monitoring____________________
☐ Performance not monitored
Frequency________________________ ☐ Evidence of breaching
Head differential____________________
Remarks______________________________________

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☒ N/A
A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☐ N/A
1. **Pumps, Wellhead Plumbing, and Electrical** ☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A Remarks
2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance Remarks
3. **Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks
B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A
1. **Collection Structures, Pumps, and Electrical** ☐ Good condition ☐ Needs Maintenance Remarks
2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance Remarks
3. **Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks

Five-Year Review Site Inspection Checklist

C. Treatment System ☐ Applicable ☒ N/A

1. **Treatment Train** (Check components that apply)
☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
☐ Air stripping ☐ Carbon adsorbers
☐ Filters____
☐ Additive (*e.g.*, chelation agent, flocculent)________________________
☐ Others____
☐ Good condition ☐ Needs Maintenance
☐ Sampling ports properly marked and functional
☐ Sampling/maintenance log displayed and up to date
☐ Equipment properly identified
☐ Quantity of groundwater treated annually________________
☐ Quantity of surface water treated annually________________
Remarks____

2. **Electrical Enclosures and Panels** (properly rated and functional)
☐ N/A ☐ Good condition ☐ Needs Maintenance
Remarks____

3. **Tanks, Vaults, Storage Vessels**
☐ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs Maintenance
Remarks____

4. **Discharge Structure and Appurtenances**
☐ N/A ☐ Good condition ☐ Needs Maintenance
Remarks____

5. **Treatment Building(s)**
☐ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair
☐ Chemicals and equipment properly stored
Remarks____

6. **Monitoring Wells** (pump and treatment remedy)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks____

D. Monitoring Data

1. Monitoring Data
☑ Is routinely submitted on time ☑ Is of acceptable quality

2. Monitoring data suggests:
☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

D. Monitored Natural Attenuation
1. **Monitoring Wells** (natural attenuation remedy) ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ All required wells located ☐ Needs Maintenance ☒ N/A Remarks Adjacent Sites 28 and 11 contain monitoring wells for MNA. MW10-1 is along border of site 10 and was found in good condition.

X. OTHER REMEDIES
If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS
A. Implementation of the Remedy
Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). The selected remedy for site 10 included chemical oxidation. However, this was not implemented and the contingency remedy of excavation of contaminated soil and MNA of groundwater was implemented. Adjacent monitoring well MW10-1 is in good condition. Areas of excavation are not easily distinguished, and appear to be brought to grade and seeded. There is no visual evidence of contamination remaining at the site.
B. Adequacy of O&M
Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. The monitoring well network ~~upgrades~~ PM appears adequate to monitor groundwater conditions across the AOC

Five-Year Review Site Inspection Checklist

C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. None
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. None

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION 8/2/18	
Site name: 11 - Fuel Tanks	**Date of inspection:**
Location and Region: Northeast Cape	**EPA ID:** AK9799F2999
Agency, office, or company leading the five-year review: USACE	**Weather/temperature:** Overcast, 45°F
Remedy Includes: (Check all that apply) ☐ Landfill cover/containment ☒ Monitored natural attenuation ☐ Access controls ☒ Institutional controls ☐ Other Excavation & Removal of POL - Contaminated Soil Land Use Controls	
Attachments: ☐ Inspection team roster attached ☐ Site map attached	

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** None

Name Title Date

Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ______

Problems, suggestions; ☐ Report attached ______

2. **O&M staff** None

Name Title Date

Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ______

Problems, suggestions; ☐ Report attached ______

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency ADEC

Contact Curtis Dunkin Project Manager 11/19/18 (907) 269-3053

Name Title Date Phone no.

Problems; suggestions; ☒ Report attached Questionnaire sent via email.

Agency ______

Contact ______

Name Title Date Phone no.

Problems; suggestions; ☐ Report attached ______

4. **Other interviews** (optional) ☒ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
☐ O&M manual ☐ Readily available ☐ Up to date ☒ N/A
☐ As-built drawings ☐ Readily available ☐ Up to date ☒ N/A
☐ Maintenance logs ☐ Readily available ☐ Up to date ☒ N/A
Remarks Decision Document and 1st FYR used for site information and site maps

2. **Site-Specific Health and Safety Plan** ☐ Readily available ☐ Up to date ☒ N/A
☐ Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☒ N/A
Remarks

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks

4. **Permits and Service Agreements**
☐ Air discharge permit ☐ Readily available ☐ Up to date ☒ N/A
☐ Effluent discharge ☐ Readily available ☐ Up to date ☒ N/A
☐ Waste disposal, POTW ☐ Readily available ☐ Up to date ☒ N/A
☐ Other permits________ ☐ Readily available ☐ Up to date ☒ N/A
Remarks

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks

7. **Groundwater Monitoring Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks

9. **Discharge Compliance Records**
☐ Air ☐ Readily available ☐ Up to date ☒ N/A
☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A
Remarks

10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A
Remarks

Five-Year Review Site Inspection Checklist

IV. O&M COSTS

1. **O&M Organization**
   - ☐ State in-house ☐ Contractor for State
   - ☐ PRP in-house ☐ Contractor for PRP
   - ☐ Federal Facility in-house ☐ Contractor for Federal Facility
   - ☒ Other USACE

2. **O&M Cost Records**
   - ☐ Readily available ☐ Up to date
   - ☐ Funding mechanism/agreement in place

   Original O&M cost estimate $5,851,587 ☐ Breakdown attached
   (Estimate for all NE Cape Sites to conduct 6 FYRs

   Total annual cost by year for review period if available

   From ______ (Date) To ______ (Date) ______ (Total cost) ☐ Breakdown attached
   From ______ (Date) To ______ (Date) ______ (Total cost) ☐ Breakdown attached
   From ______ (Date) To ______ (Date) ______ (Total cost) ☐ Breakdown attached
   From ______ (Date) To ______ (Date) ______ (Total cost) ☐ Breakdown attached
   From ______ (Date) To ______ (Date) ______ (Total cost) ☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**
   Describe costs and reasons: none

V. ACCESS AND INSTITUTIONAL CONTROLS ☑ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☑ N/A
   Remarks

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☑ N/A
   Remarks

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented	☐ Yes	☑ No	☐ N/A
Site conditions imply ICs not being fully enforced	☐ Yes	☑ No	☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Periodic Reviews (visual inspection)
Frequency 5-years
Responsible party/agency USACE
Contact ______ Name ______ Title ______ Date ______ Phone no.

Reporting is up-to-date	☑ Yes	☐ No	☐ N/A
Reports are verified by the lead agency	☑ Yes	☐ No	☐ N/A
Specific requirements in deed or decision documents have been met	☐ Yes	☑ No	☐ N/A
Violations have been reported	☐ Yes	☑ No	☐ N/A

Other problems or suggestions: ☐ Report attached
Deed notice has not been recorded.

2. **Adequacy** ☑ ICs are adequate ☐ ICs are inadequate ☐ N/A
Remarks

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☑ No vandalism evident
Remarks none

2. **Land use changes on site** ☑ N/A
Remarks none

3. **Land use changes off site** ☑ N/A
Remarks none

VI. GENERAL SITE CONDITIONS

A. Roads ☑ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☐ Roads adequate ☐ N/A
Remarks road accessing MOC is in good condition

Five-Year Review Site Inspection Checklist

B. Other Site Conditions

Remarks Site has been graded and seeded. Vegetation is partially established across gravel. Excavation area and former middle tank footprint area remain partially distinguishable by vegetative cover. Minor site debris encountered include metal fragments and wood.

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
   Areal extent________ Depth________
   Remarks________

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths________ Widths________ Depths________
   Remarks________

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent________ Depth________
   Remarks________

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Areal extent________ Depth________
   Remarks________

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks________

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
   Remarks________

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
   Areal extent________ Height________
   Remarks________

8.	**Wet Areas/Water Damage** ☐ Wet areas ☐ Ponding ☐ Seeps ☐ Soft subgrade Remarks____ ____	☐ Wet areas/water damage not evident ☐ Location shown on site map ☐ Location shown on site map ☐ Location shown on site map ☐ Location shown on site map	 Areal extent____________ Areal extent____________ Areal extent____________ Areal extent____________
9.	**Slope Instability** ☐ Slides Areal extent____________ Remarks____ ____	☐ Location shown on site map	☐ No evidence of slope instability
B. Benches	☐ Applicable ☐ N/A (Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)		
1.	**Flows Bypass Bench** Remarks____ ____	☐ Location shown on site map	☐ N/A or okay
2.	**Bench Breached** Remarks____ ____	☐ Location shown on site map	☐ N/A or okay
3.	**Bench Overtopped** Remarks____ ____	☐ Location shown on site map	☐ N/A or okay
C. Letdown Channels	☐ Applicable ☐ N/A (Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)		
1.	**Settlement** Areal extent____________ Remarks____ ____	☐ Location shown on site map Depth__________	☐ No evidence of settlement
2.	**Material Degradation** Material type____________ Remarks____ ____	☐ Location shown on site map Areal extent__________	☐ No evidence of degradation
3.	**Erosion** Areal extent____________ Remarks____ ____	☐ Location shown on site map Depth__________	☐ No evidence of erosion

Five-Year Review Site Inspection Checklist

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent____________ Depth____________
Remarks____

5. **Obstructions** Type____________ ☐ No obstructions
☐ Location shown on site map Areal extent____________
Size____________
Remarks____

6. **Excessive Vegetative Growth** Type____________
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent____________
Remarks____

D. Cover Penetrations ☐ Applicable ☐ N/A

1. **Gas Vents** ☐ Active☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks____

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks____

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks____

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks____

E. Gas Collection and Treatment ☐ Applicable ☐ N/A	
1.	**Gas Treatment Facilities** ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse ☐ Good condition☐ Needs Maintenance Remarks____________________
2.	**Gas Collection Wells, Manifolds and Piping** ☐ Good condition☐ Needs Maintenance Remarks____________________
3.	**Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings) ☐ Good condition☐ Needs Maintenance ☐ N/A Remarks____________________
F. Cover Drainage Layer ☐ Applicable ☐ N/A	
1.	**Outlet Pipes Inspected** ☐ Functioning ☐ N/A Remarks____________________
2.	**Outlet Rock Inspected** ☐ Functioning ☐ N/A Remarks____________________
G. Detention/Sedimentation Ponds ☐ Applicable ☐ N/A	
1.	**Siltation** Areal extent____________ Depth____________ ☐ N/A ☐ Siltation not evident Remarks____________________
2.	**Erosion** Areal extent____________ Depth____________ ☐ Erosion not evident Remarks____________________
3.	**Outlet Works** ☐ Functioning ☐ N/A Remarks____________________
4.	**Dam** ☐ Functioning ☐ N/A Remarks____________________

Five-Year Review Site Inspection Checklist

H. Retaining Walls		☐ Applicable ☐ N/A
1.	**Deformations**	☐ Location shown on site map ☐ Deformation not evident Horizontal displacement________ Vertical displacement________ Rotational displacement________ Remarks________
2.	**Degradation**	☐ Location shown on site map ☐ Degradation not evident Remarks________
I. Perimeter Ditches/Off-Site Discharge		☐ Applicable ☐ N/A
1.	**Siltation**	☐ Location shown on site map ☐ Siltation not evident Areal extent________ Depth________ Remarks________
2.	**Vegetative Growth**	☐ Location shown on site map ☐ N/A ☐ Vegetation does not impede flow Areal extent________ Type________ Remarks________
3.	**Erosion**	☐ Location shown on site map ☐ Erosion not evident Areal extent________ Depth________ Remarks________
4.	**Discharge Structure**	☐ Functioning ☐ N/A Remarks________
VIII. VERTICAL BARRIER WALLS		☐ Applicable ☒ N/A
1.	**Settlement**	☐ Location shown on site map ☐ Settlement not evident Areal extent________ Depth________ Remarks________
2.	**Performance Monitoring**	Type of monitoring________ ☐ Performance not monitored Frequency________ ☐ Evidence of breaching Head differential________ Remarks________

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☒ N/A
A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☐ N/A
1. **Pumps, Wellhead Plumbing, and Electrical** ☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A Remarks
2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance Remarks
3. **Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks
B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☐ N/A
1. **Collection Structures, Pumps, and Electrical** ☐ Good condition ☐ Needs Maintenance Remarks
2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance Remarks
3. **Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks

Five-Year Review Site Inspection Checklist

C. Treatment System ☐ Applicable ☐ N/A	
1.	**Treatment Train** (Check components that apply) ☐ Metals removal ☐ Oil/water separation ☐ Bioremediation ☐ Air stripping ☐ Carbon adsorbers ☐ Filters___ ☐ Additive (*e.g.*, chelation agent, flocculent)___ ☐ Others___ ☐ Good condition ☐ Needs Maintenance ☐ Sampling ports properly marked and functional ☐ Sampling/maintenance log displayed and up to date ☐ Equipment properly identified ☐ Quantity of groundwater treated annually___ ☐ Quantity of surface water treated annually___ Remarks___
2.	**Electrical Enclosures and Panels** (properly rated and functional) ☐ N/A ☐ Good condition ☐ Needs Maintenance Remarks___
3.	**Tanks, Vaults, Storage Vessels** ☐ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs Maintenance Remarks___
4.	**Discharge Structure and Appurtenances** ☐ N/A ☐ Good condition ☐ Needs Maintenance Remarks___
5.	**Treatment Building(s)** ☐ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair ☐ Chemicals and equipment properly stored Remarks___
6.	**Monitoring Wells** (pump and treatment remedy) ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ All required wells located ☐ Needs Maintenance ☐ N/A Remarks___
D. Monitoring Data	
1.	Monitoring Data ☑ Is routinely submitted on time ☑ Is of acceptable quality
2.	Monitoring data suggests: ☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks MW11-2 not located (decommissioned well). Wells 14MW06 and MW88-3 appear in good condition.

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The selected remedy was to excavate and remove contaminated soil, MNA of groundwater, and implement ~~groundwater~~ LUCs. For groundwater use. The remedy appears to be effective. The site has been re-graded and seeded, with grass cover moderately established. ~~Former~~ Area of excavation J1A is slightly visible as area of lighter vegetation; soil staining or stressed vegetation not ~~visible~~ observed.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

There is no visual evidence of contamination remaining at Site 11. The upgraded/expanded monitoring well network includes 14MW06, and appears adequate to monitor groundwater conditions across the MOC.

Five-Year Review Site Inspection Checklist

C.	Early Indicators of Potential Remedy Problems
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. none
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. none

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: 13 - Heat and Power Plant	**Date of inspection:** 8/02/18
Location and Region: Northeast Cape	**EPA ID:** AK9799F2999
Agency, office, or company leading the five-year review: USACE	**Weather/temperature:** Overcast, 50°F, light breeze

Remedy Includes: (Check all that apply)
- ☐ Landfill cover/containment
- ☒ Monitored natural attenuation
- ☐ Access controls
- ☒ Institutional controls
- ☐ Other Excavation and Removal of POL-contaminated soil and PCB-contaminated soil. LUCs

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** none
   Name / Title / Date
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ______
   Problems, suggestions; ☐ Report attached ______

2. **O&M staff** none
   Name / Title / Date
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ______
   Problems, suggestions; ☐ Report attached ______

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

   Agency ~~Curtis Dunkin~~ ADEC
   Contact Curtis Dunkin — Project Manager — 11/19/18 — (907) 269-3053
   Name / Title / Date / Phone no.
   Problems; suggestions; ☒ Report attached Questionnaire sent via email.

   Agency ______
   Contact ______
   Name / Title / Date / Phone no.
   Problems; suggestions; ☐ Report attached ______

4. **Other interviews** (optional) ☒ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)			
1. **O&M Documents**			
☐ O&M manual	☐ Readily available	☐ Up to date	☒ N/A
☐ As-built drawings	☐ Readily available	☐ Up to date	☒ N/A
☐ Maintenance logs	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
2. **Site-Specific Health and Safety Plan**	☐ Readily available	☐ Up to date	☒ N/A
☐ Contingency plan/emergency response plan	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
3. **O&M and OSHA Training Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
4. **Permits and Service Agreements**			
☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
☐ Other permits	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
5. **Gas Generation Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
6. **Settlement Monument Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
7. **Groundwater Monitoring Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
8. **Leachate Extraction Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
9. **Discharge Compliance Records**			
☐ Air	☐ Readily available	☐ Up to date	☒ N/A
☐ Water (effluent)	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
10. **Daily Access/Security Logs**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			

Five-Year Review Site Inspection Checklist

IV. O&M COSTS

1. **O&M Organization**
☐ State in-house ☐ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☒ Other USACE

2. **O&M Cost Records**
☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate $5,851,587 ☐ Breakdown attached

Total annual cost by year for review period if available

From (Date)	To (Date)	Total cost	
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons: None

V. ACCESS AND INSTITUTIONAL CONTROLS ☑ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☒ N/A
Remarks

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☑ N/A
Remarks

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☑ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☑ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) CERCLA FYR
Frequency five years
Responsible party/agency USACE
Contact ______ ______ ______ ______
Name Title Date Phone no.

Reporting is up-to-date ☑ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☑ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☑ No ☐ N/A
Violations have been reported ☐ Yes ☑ No ☐ N/A
Other problems or suggestions: ☐ Report attached
Deed notice has not been filed

2. **Adequacy** ☑ ICs are adequate ☐ ICs are inadequate ☐ N/A
Remarks

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks

2. **Land use changes on site** ☐ N/A
Remarks none

3. **Land use changes off site** ☐ N/A
Remarks none

VI. GENERAL SITE CONDITIONS

A. Roads ☑ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☐ Roads adequate ☐ N/A
Remarks road accessing MOC is in good condition

Five-Year Review Site Inspection Checklist

B. Other Site Conditions

Remarks Site graded with ~~poorly established vegetation due to pm~~ coarse gravel. Vegetative cover is poor to fair, largely due to rocky soil.

VII. LANDFILL COVERS ☐ Applicable ☑ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
   Areal extent______ Depth______
   Remarks______

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths______ Widths______ Depths______
   Remarks______

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent______ Depth______
   Remarks______

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Areal extent______ Depth______
   Remarks______

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks______

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
   Remarks______

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
   Areal extent______ Height______
   Remarks______

8.	**Wet Areas/Water Damage** ☐ Wet areas ☐ Ponding ☐ Seeps ☐ Soft subgrade Remarks____	☐ Wet areas/water damage not evident ☐ Location shown on site map ☐ Location shown on site map ☐ Location shown on site map ☐ Location shown on site map	 Areal extent______________ Areal extent______________ Areal extent______________ Areal extent______________
9.	**Slope Instability** ☐ Slides Areal extent______________ Remarks____	☐ Location shown on site map	☐ No evidence of slope instability
B. Benches	☐ Applicable ☐ N/A (Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)		
1.	**Flows Bypass Bench** Remarks____	☐ Location shown on site map	☐ N/A or okay
2.	**Bench Breached** Remarks____	☐ Location shown on site map	☐ N/A or okay
3.	**Bench Overtopped** Remarks____	☐ Location shown on site map	☐ N/A or okay
C. Letdown Channels	☐ Applicable ☐ N/A (Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)		
1.	**Settlement** ☐ Location shown on site map Areal extent______________ Depth____________ Remarks____	☐ No evidence of settlement	
2.	**Material Degradation** ☐ Location shown on site map Material type______________ Areal extent____________ Remarks____	☐ No evidence of degradation	
3.	**Erosion** ☐ Location shown on site map Areal extent______________ Depth____________ Remarks____	☐ No evidence of erosion	

Five-Year Review Site Inspection Checklist

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent______________ Depth____________
Remarks____

5. **Obstructions** Type____________________ ☐ No obstructions
☐ Location shown on site map Areal extent______________
Size____________
Remarks____

6. **Excessive Vegetative Growth** Type______________
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent______________
Remarks____

D. Cover Penetrations ☐ Applicable ☐ N/A

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks____

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks____

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks____

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks____

E. Gas Collection and Treatment	☐ Applicable ☐ N/A		
1.	**Gas Treatment Facilities** ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse ☐ Good condition ☐ Needs Maintenance Remarks____________________		
2.	**Gas Collection Wells, Manifolds and Piping** ☐ Good condition ☐ Needs Maintenance Remarks____________________		
3.	**Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings) ☐ Good condition ☐ Needs Maintenance ☐ N/A Remarks____________________		
F. Cover Drainage Layer	☐ Applicable ☐ N/A		
1.	**Outlet Pipes Inspected**	☐ Functioning	☐ N/A Remarks____________________
2.	**Outlet Rock Inspected**	☐ Functioning	☐ N/A Remarks____________________
G. Detention/Sedimentation Ponds	☐ Applicable ☐ N/A		
1.	**Siltation** Areal extent__________ Depth__________ ☐ N/A ☐ Siltation not evident Remarks____________________		
2.	**Erosion** Areal extent__________ Depth__________ ☐ Erosion not evident Remarks____________________		
3.	**Outlet Works** ☐ Functioning ☐ N/A Remarks____________________		
4.	**Dam** ☐ Functioning ☐ N/A Remarks____________________		

Five-Year Review Site Inspection Checklist

H. Retaining Walls ☐ Applicable ☐ N/A	
1.	**Deformations** ☐ Location shown on site map ☐ Deformation not evident Horizontal displacement__________ Vertical displacement__________ Rotational displacement__________ Remarks__________
2.	**Degradation** ☐ Location shown on site map ☐ Degradation not evident Remarks__________
I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☐ N/A	
1.	**Siltation** ☐ Location shown on site map ☐ Siltation not evident Areal extent__________ Depth__________ Remarks__________
2.	**Vegetative Growth** ☐ Location shown on site map ☐ N/A ☐ Vegetation does not impede flow Areal extent__________ Type__________ Remarks__________
3.	**Erosion** ☐ Location shown on site map ☐ Erosion not evident Areal extent__________ Depth__________ Remarks__________
4.	**Discharge Structure** ☐ Functioning ☐ N/A Remarks__________
VIII. VERTICAL BARRIER WALLS ☐ Applicable ☐ N/A	
1.	**Settlement** ☐ Location shown on site map ☐ Settlement not evident Areal extent__________ Depth__________ Remarks__________
2.	**Performance Monitoring** Type of monitoring__________ ☐ Performance not monitored Frequency__________ ☐ Evidence of breaching Head differential__________ Remarks__________

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☐ N/A
A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☐ N/A
1. **Pumps, Wellhead Plumbing, and Electrical** ☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A Remarks________________________________
2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance Remarks________________________________
3. **Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks________________________________
B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☐ N/A
1. **Collection Structures, Pumps, and Electrical** ☐ Good condition ☐ Needs Maintenance Remarks________________________________
2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance Remarks________________________________
3. **Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks________________________________

Five-Year Review Site Inspection Checklist

C. Treatment System ☐ Applicable ☐ N/A	
1.	**Treatment Train** (Check components that apply) ☐ Metals removal ☐ Oil/water separation ☐ Bioremediation ☐ Air stripping ☐ Carbon adsorbers ☐ Filters__________ ☐ Additive (*e.g.*, chelation agent, flocculent)__________ ☐ Others__________ ☐ Good condition ☐ Needs Maintenance ☐ Sampling ports properly marked and functional ☐ Sampling/maintenance log displayed and up to date ☐ Equipment properly identified ☐ Quantity of groundwater treated annually__________ ☐ Quantity of surface water treated annually__________ Remarks__________
2.	**Electrical Enclosures and Panels** (properly rated and functional) ☐ N/A ☐ Good condition ☐ Needs Maintenance Remarks__________
3.	**Tanks, Vaults, Storage Vessels** ☐ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs Maintenance Remarks__________
4.	**Discharge Structure and Appurtenances** ☐ N/A ☐ Good condition ☐ Needs Maintenance Remarks__________
5.	**Treatment Building(s)** ☐ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair ☐ Chemicals and equipment properly stored Remarks__________
6.	**Monitoring Wells** (pump and treatment remedy) ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ All required wells located ☐ Needs Maintenance ☐ N/A Remarks__________
D. Monitoring Data	
1.	Monitoring Data ☐ Is routinely submitted on time ☐ Is of acceptable quality
2.	Monitoring data suggests: ☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks MW 88-5 appears in good condition. No evidence of other decommissioned wells

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The selected remedy was to excavate and remove DRO- and PCB-contaminated soil, MNA of groundwater, and implement LUCs for groundwater use. All excavation areas have been brought to grade and reseeded. Vegetation is poor to fair, largely due to soil quality (coarse gravel fill). The remedy appears effective; there are no visual indications of contamination remaining. No POL-related odor was detected, as was described in the 2013 FYR site inspections.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

the monitoring well network at the MOC is in good condition and appears adequate to monitor groundwater conditions at site 13.

Five-Year Review Site Inspection Checklist

C.	Early Indicators of Potential Remedy Problems
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. None

D.	Opportunities for Optimization
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. None

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: Site 15 - Fuel Pipeline	**Date of inspection:** 8/2/2018
Location and Region: Northeast Cape	**EPA ID:** AK 9799 F2999
Agency, office, or company leading the five-year review: USACE	**Weather/temperature:** Broken Clouds, 50°F, breezy

Remedy Includes: (Check all that apply)
☐ Landfill cover/containment ☒ Monitored natural attenuation
☐ Access controls ☒ Institutional controls
☐ Other Excavation and Removal of POL - contaminated soil, LUCs

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** none
Name Title Date
Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ______
Problems, suggestions; ☐ Report attached ______

2. **O&M staff** none
Name Title Date
Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ______
Problems, suggestions; ☐ Report attached ______

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency ADEC
Contact Curtis Dunkin Project Manager 11/19/18 (907) 269-3053
Name Title Date Phone no.
Problems; suggestions; ☒ Report attached Questionnaire sent via email.

Agency ______
Contact ______
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ______

4. **Other interviews** (optional) ☒ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)				
1.	**O&M Documents**			
	☐ O&M manual	☐ Readily available	☐ Up to date	☒ N/A
	☐ As-built drawings	☐ Readily available	☐ Up to date	☒ N/A
	☐ Maintenance logs	☐ Readily available	☐ Up to date	☒ N/A
	Remarks______			
2.	**Site-Specific Health and Safety Plan**	☐ Readily available	☐ Up to date	☒ N/A
	☐ Contingency plan/emergency response plan	☐ Readily available	☐ Up to date	☒ N/A
	Remarks______			
3.	**O&M and OSHA Training Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks______			
4.	**Permits and Service Agreements**			
	☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
	☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
	☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
	☐ Other permits______	☐ Readily available	☐ Up to date	☒ N/A
	Remarks______			
5.	**Gas Generation Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks______			
6.	**Settlement Monument Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks______			
7.	**Groundwater Monitoring Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks______			
8.	**Leachate Extraction Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks______			
9.	**Discharge Compliance Records**			
	☐ Air	☐ Readily available	☐ Up to date	☒ N/A
	☐ Water (effluent)	☐ Readily available	☐ Up to date	☒ N/A
	Remarks______			
10.	**Daily Access/Security Logs**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks______			

Five-Year Review Site Inspection Checklist

IV. O&M COSTS

1. **O&M Organization**
   ☐ State in-house ☐ Contractor for State
   ☐ PRP in-house ☐ Contractor for PRP
   ☐ Federal Facility in-house ☐ Contractor for Federal Facility
   ☒ Other USACE

2. **O&M Cost Records**
   ☐ Readily available ☐ Up to date
   ☐ Funding mechanism/agreement in place
   Original O&M cost estimate $5,851,587 ☐ Breakdown attached

   Total annual cost by year for review period if available

   From ______ To ______ ______ ☐ Breakdown attached
   Date Date Total cost
   From ______ To ______ ______ ☐ Breakdown attached
   Date Date Total cost
   From ______ To ______ ______ ☐ Breakdown attached
   Date Date Total cost
   From ______ To ______ ______ ☐ Breakdown attached
   Date Date Total cost
   From ______ To ______ ______ ☐ Breakdown attached
   Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
   Describe costs and reasons: None

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☒ N/A
   Remarks______

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☒ N/A
   Remarks______

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☑ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☑ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Periodic Reviews (visual inspection)
Frequency 5 years
Responsible party/agency USACE
Contact ______ Name ______ Title ______ Date ______ Phone no.

Reporting is up-to-date ☒ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☒ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☒ No ☐ N/A
Violations have been reported ☐ Yes ☒ No ☐ N/A
Other problems or suggestions: ☐ Report attached
Deed notice has not been recorded.

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A
Remarks

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks

2. **Land use changes on site** ☒ N/A
Remarks none

3. **Land use changes off site** ☒ N/A
Remarks none

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☐ Roads adequate ☐ N/A
Remarks road accessing MOC is in good condition

Five-Year Review Site Inspection Checklist

B. Other Site Conditions

Remarks Minor site debris includes wood/metal fragments, pipe. Area consists of coarse gravel fill that has been graded and reseeded. Fair vegetative cover exists over excavation areas; rocky soil ~~prevents~~ seems to prevent thick growth. No vegetation over adjacent road.

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
   Areal extent________ Depth________
   Remarks________

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths________ Widths________ Depths________
   Remarks________

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent________ Depth________
   Remarks________

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Areal extent________ Depth________
   Remarks________

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks________

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
   Remarks________

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
   Areal extent________ Height________
   Remarks________

8.	**Wet Areas/Water Damage**	☐ Wet areas/water damage not evident	
	☐ Wet areas	☐ Location shown on site map	Areal extent______________
	☐ Ponding	☐ Location shown on site map	Areal extent______________
	☐ Seeps	☐ Location shown on site map	Areal extent______________
	☐ Soft subgrade	☐ Location shown on site map	Areal extent______________
	Remarks____		
9.	**Slope Instability** ☐ Slides	☐ Location shown on site map	☐ No evidence of slope instability
	Areal extent______________		
	Remarks____		
B. Benches	☐ Applicable	☐ N/A	
	(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)		
1.	**Flows Bypass Bench**	☐ Location shown on site map	☐ N/A or okay
	Remarks____		
2.	**Bench Breached**	☐ Location shown on site map	☐ N/A or okay
	Remarks____		
3.	**Bench Overtopped**	☐ Location shown on site map	☐ N/A or okay
	Remarks____		
C. Letdown Channels	☐ Applicable	☐ N/A	
	(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)		
1.	**Settlement**	☐ Location shown on site map	☐ No evidence of settlement
	Areal extent______________	Depth___________	
	Remarks____		
2.	**Material Degradation**	☐ Location shown on site map	☐ No evidence of degradation
	Material type______________	Areal extent_____________	
	Remarks____		
3.	**Erosion**	☐ Location shown on site map	☐ No evidence of erosion
	Areal extent______________	Depth___________	
	Remarks____		

Five-Year Review Site Inspection Checklist

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent______________ Depth____________
Remarks____

5. **Obstructions** Type____________________ ☐ No obstructions
☐ Location shown on site map Areal extent______________
Size____________
Remarks____

6. **Excessive Vegetative Growth** Type______________
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent______________
Remarks____

D. Cover Penetrations ☐ Applicable ☐ N/A

1. **Gas Vents** ☐ Active☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks____

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks____

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks____

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks____

E. Gas Collection and Treatment ☐ Applicable ☐ N/A

1. **Gas Treatment Facilities**
☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
☐ Good condition☐ Needs Maintenance
Remarks____

2. **Gas Collection Wells, Manifolds and Piping**
☐ Good condition☐ Needs Maintenance
Remarks____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
☐ Good condition☐ Needs Maintenance ☐ N/A
Remarks____

F. Cover Drainage Layer ☐ Applicable ☐ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
Remarks____

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
Remarks____

G. Detention/Sedimentation Ponds ☐ Applicable ☐ N/A

1. **Siltation** Areal extent______________ Depth____________ ☐ N/A
☐ Siltation not evident
Remarks____

2. **Erosion** Areal extent______________ Depth____________
☐ Erosion not evident
Remarks____

3. **Outlet Works** ☐ Functioning ☐ N/A
Remarks____

4. **Dam** ☐ Functioning ☐ N/A
Remarks____

Five-Year Review Site Inspection Checklist

H. Retaining Walls	☐ Applicable ☐ N/A	
1.	**Deformations** ☐ Location shown on site map ☐ Deformation not evident Horizontal displacement___________ Vertical displacement___________ Rotational displacement___________ Remarks___________	
2.	**Degradation** ☐ Location shown on site map ☐ Degradation not evident Remarks___________	
I. Perimeter Ditches/Off-Site Discharge	☐ Applicable ☐ N/A	
1.	**Siltation** ☐ Location shown on site map ☐ Siltation not evident Areal extent___________ Depth___________ Remarks___________	
2.	**Vegetative Growth** ☐ Location shown on site map ☐ N/A ☐ Vegetation does not impede flow Areal extent___________ Type___________ Remarks___________	
3.	**Erosion** ☐ Location shown on site map ☐ Erosion not evident Areal extent___________ Depth___________ Remarks___________	
4.	**Discharge Structure** ☐ Functioning ☐ N/A Remarks___________	
VIII. VERTICAL BARRIER WALLS	☐ Applicable ☒ N/A	
1.	**Settlement** ☐ Location shown on site map ☐ Settlement not evident Areal extent___________ Depth___________ Remarks___________	
2.	**Performance Monitoring** Type of monitoring___________ ☐ Performance not monitored Frequency___________ ☐ Evidence of breaching Head differential___________ Remarks___________	

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☒ N/A
A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☐ N/A
1. **Pumps, Wellhead Plumbing, and Electrical** ☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A Remarks___
2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance Remarks___
3. **Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks___
B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☐ N/A
1. **Collection Structures, Pumps, and Electrical** ☐ Good condition ☐ Needs Maintenance Remarks___
2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance Remarks___
3. **Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks___

Five-Year Review Site Inspection Checklist

C. Treatment System ☐ Applicable ☐ N/A
1. **Treatment Train** (Check components that apply) ☐ Metals removal ☐ Oil/water separation ☐ Bioremediation ☐ Air stripping ☐ Carbon adsorbers ☐ Filters ____ ☐ Additive (*e.g.*, chelation agent, flocculent) ____ ☐ Others ____ ☐ Good condition ☐ Needs Maintenance ☐ Sampling ports properly marked and functional ☐ Sampling/maintenance log displayed and up to date ☐ Equipment properly identified ☐ Quantity of groundwater treated annually ____ ☐ Quantity of surface water treated annually ____ Remarks ____
2. **Electrical Enclosures and Panels** (properly rated and functional) ☐ N/A ☐ Good condition ☐ Needs Maintenance Remarks ____
3. **Tanks, Vaults, Storage Vessels** ☐ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs Maintenance Remarks ____
4. **Discharge Structure and Appurtenances** ☐ N/A ☐ Good condition ☐ Needs Maintenance Remarks ____
5. **Treatment Building(s)** ☐ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair ☐ Chemicals and equipment properly stored Remarks ____
6. **Monitoring Wells** (pump and treatment remedy) ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ All required wells located ☐ Needs Maintenance ☐ N/A Remarks ____
D. Monitoring Data
1. Monitoring Data ☑ Is routinely submitted on time ☑ Is of acceptable quality
2. Monitoring data suggests: ☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks No monitoring well (decommissioned) observed at site 15

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The selected remedy was to excavate and remove DRO-contaminated soil, MNA of groundwater, and LUCs for groundwater use. Area of excavations G and F are at grade. ~~and~~ Vegetation regrowth is fair. The remedy appears adequate. No POL odor was detected as was noted in the 2013 FYR site inspections.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

the current and long-term protectiveness of the remedy appears adequate. There is no evidence of contamination remaining in the soil as visible from the surface. No monitoring well is located at Site 15. Adjacent wells upgradient, downgradient, and cross-gradient are in good condition and appear sufficient to monitor groundwater conditions.

Five-Year Review Site Inspection Checklist

C.	Early Indicators of Potential Remedy Problems
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. None
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. None

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: 16 - Paint and Dope Storage	**Date of inspection:** 8/2/18
Location and Region: Northeast Cape	**EPA ID:** AK9799F2999
Agency, office, or company leading the five-year review: USACE	**Weather/temperature:** Broken clouds, 50°F, breezy

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment ☒ Monitored natural attenuation
☐ Access controls ☒ Institutional controls
☐ Other Excavation and removal of PCB-contaminated soil
LUCs

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** none ______ ______
Name Title Date
Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ______
Problems, suggestions; ☐ Report attached ______

2. **O&M staff** none ______ ______
Name Title Date
Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ______
Problems, suggestions; ☐ Report attached ______

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency ADEC
Contact Curtis Dunkin Project Manager 11/19/18 (907) 269-3053
Name Title Date Phone no.
Problems; suggestions; ☒ Report attached Questionnaire sent via email

Agency ______
Contact ______ ______ ______ ______
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ______

4. **Other interviews** (optional) ☒ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)			
1. **O&M Documents**			
☐ O&M manual	☐ Readily available	☐ Up to date	☒ N/A
☐ As-built drawings	☐ Readily available	☐ Up to date	☒ N/A
☐ Maintenance logs	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
2. **Site-Specific Health and Safety Plan**	☐ Readily available	☐ Up to date	☒ N/A
☐ Contingency plan/emergency response plan	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
3. **O&M and OSHA Training Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
4. **Permits and Service Agreements**			
☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
☐ Other permits	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
5. **Gas Generation Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
6. **Settlement Monument Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
7. **Groundwater Monitoring Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
8. **Leachate Extraction Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
9. **Discharge Compliance Records**			
☐ Air	☐ Readily available	☐ Up to date	☒ N/A
☐ Water (effluent)	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
10. **Daily Access/Security Logs**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			

Five-Year Review Site Inspection Checklist

IV. O&M COSTS

1. **O&M Organization**
   - ☐ State in-house
   - ☐ Contractor for State
   - ☐ PRP in-house
   - ☐ Contractor for PRP
   - ☐ Federal Facility in-house
   - ☐ Contractor for Federal Facility
   - ☒ Other USACE

2. **O&M Cost Records**
   - ☐ Readily available
   - ☐ Up to date
   - ☐ Funding mechanism/agreement in place

   Original O&M cost estimate $5,851,587 ☐ Breakdown attached

   Estimate for all NEC sites to conduct six FYRs

   Total annual cost by year for review period if available

From (Date)	To (Date)	Total cost	
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**

   Describe costs and reasons:

V. ACCESS AND INSTITUTIONAL CONTROLS ☑ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☒ N/A

   Remarks

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☒ N/A

   Remarks

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented	☐ Yes	☑ No	☐ N/A
Site conditions imply ICs not being fully enforced	☐ Yes	☑ No	☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) CERCLA FYR - visual inspection
Frequency five years
Responsible party/agency USACE
Contact ______ Name ______ Title ______ Date ______ Phone no.

Reporting is up-to-date	☑ Yes	☐ No	☐ N/A
Reports are verified by the lead agency	☑ Yes	☐ No	☐ N/A
Specific requirements in deed or decision documents have been met	☐ Yes	☑ No	☐ N/A
Violations have been reported	☐ Yes	☑ No	☐ N/A

Other problems or suggestions: ☐ Report attached
Deed notice has not been filed.

2. **Adequacy** ☑ ICs are adequate ☐ ICs are inadequate ☐ N/A
Remarks

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks

2. **Land use changes on site** ☐ N/A
Remarks None

3. **Land use changes off site** ☐ N/A
Remarks None

VI. GENERAL SITE CONDITIONS

A. Roads ☑ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☐ Roads adequate ☐ N/A
Remarks The road accessing the MOC is in good condition.

Five-Year Review Site Inspection Checklist

B. Other Site Conditions

Remarks minor site debris includes wood, pipe, metal fragments, slightly uneven fill consists of coarse gravel in area of soil removed. Degraded rubber matting observed in and around ditch to the west of site 16. Poor to no vegetative cover across most of area.

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
   Areal extent______________ Depth____________
   Remarks______________________________

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths____________ Widths____________ Depths____________
   Remarks______________________________

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent______________ Depth____________
   Remarks______________________________

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Areal extent______________ Depth____________
   Remarks______________________________

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks______________________________

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
   Remarks______________________________

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
   Areal extent______________ Height____________
   Remarks______________________________

8. **Wet Areas/Water Damage**	☐ Wet areas/water damage not evident
☐ Wet areas	☐ Location shown on site map Areal extent______________
☐ Ponding	☐ Location shown on site map Areal extent______________
☐ Seeps	☐ Location shown on site map Areal extent______________
☐ Soft subgrade	☐ Location shown on site map Areal extent______________
Remarks____	
9. **Slope Instability** ☐ Slides	☐ Location shown on site map ☐ No evidence of slope instability
Areal extent______________	
Remarks____	
B. Benches ☐ Applicable ☐ N/A	
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)	
1. **Flows Bypass Bench**	☐ Location shown on site map ☐ N/A or okay
Remarks____	
2. **Bench Breached**	☐ Location shown on site map ☐ N/A or okay
Remarks____	
3. **Bench Overtopped**	☐ Location shown on site map ☐ N/A or okay
Remarks____	
C. Letdown Channels ☐ Applicable ☐ N/A	
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)	
1. **Settlement** ☐ Location shown on site map	☐ No evidence of settlement
Areal extent______________ Depth____________	
Remarks____	
2. **Material Degradation** ☐ Location shown on site map	☐ No evidence of degradation
Material type______________ Areal extent_____________	
Remarks____	
3. **Erosion** ☐ Location shown on site map	☐ No evidence of erosion
Areal extent______________ Depth____________	
Remarks____	

Five-Year Review Site Inspection Checklist

4.	**Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting Areal extent_____________ Depth___________ Remarks____
5.	**Obstructions** Type____________________ ☐ No obstructions ☐ Location shown on site map Areal extent____________ Size___________ Remarks____
6.	**Excessive Vegetative Growth** Type____________________ ☐ No evidence of excessive growth ☐ Vegetation in channels does not obstruct flow ☐ Location shown on site map Areal extent_____________ Remarks____
D. Cover Penetrations	☐ Applicable ☐ N/A
1.	**Gas Vents** ☐ Active☐ Passive ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks____
2.	**Gas Monitoring Probes** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks____
3.	**Monitoring Wells** (within surface area of landfill) ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks____
4.	**Leachate Extraction Wells** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks____
5.	**Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A Remarks____

E. Gas Collection and Treatment ☐ Applicable ☐ N/A	
1.	**Gas Treatment Facilities** ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse ☐ Good condition ☐ Needs Maintenance Remarks_______________
2.	**Gas Collection Wells, Manifolds and Piping** ☐ Good condition ☐ Needs Maintenance Remarks_______________
3.	**Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings) ☐ Good condition ☐ Needs Maintenance ☐ N/A Remarks_______________
F. Cover Drainage Layer ☐ Applicable ☐ N/A	
1.	**Outlet Pipes Inspected** ☐ Functioning ☐ N/A Remarks_______________
2.	**Outlet Rock Inspected** ☐ Functioning ☐ N/A Remarks_______________
G. Detention/Sedimentation Ponds ☐ Applicable ☐ N/A	
1.	**Siltation** Areal extent_______ Depth_______ ☐ N/A ☐ Siltation not evident Remarks_______________
2.	**Erosion** Areal extent_______ Depth_______ ☐ Erosion not evident Remarks_______________
3.	**Outlet Works** ☐ Functioning ☐ N/A Remarks_______________
4.	**Dam** ☐ Functioning ☐ N/A Remarks_______________

Five-Year Review Site Inspection Checklist

H. Retaining Walls ☐ Applicable ☐ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
Horizontal displacement__________ Vertical displacement__________
Rotational displacement__________
Remarks____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
Remarks____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☐ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
Areal extent__________ Depth__________
Remarks____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
☐ Vegetation does not impede flow
Areal extent__________ Type__________
Remarks____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
Areal extent__________ Depth__________
Remarks____

4. **Discharge Structure** ☐ Functioning ☐ N/A
Remarks____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
Areal extent__________ Depth__________
Remarks____

2. **Performance Monitoring** Type of monitoring____________________
☐ Performance not monitored
Frequency____________________ ☐ Evidence of breaching
Head differential____________________
Remarks____

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☒ N/A
A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☐ N/A
1. **Pumps, Wellhead Plumbing, and Electrical** ☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A Remarks_______________
2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance Remarks_______________
3. **Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks_______________
B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☐ N/A
1. **Collection Structures, Pumps, and Electrical** ☐ Good condition ☐ Needs Maintenance Remarks_______________
2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance Remarks_______________
3. **Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks_______________

Five-Year Review Site Inspection Checklist

C. Treatment System ☐ Applicable ☐ N/A

1. **Treatment Train** (Check components that apply)
   ☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
   ☐ Air stripping ☐ Carbon adsorbers
   ☐ Filters____________________
   ☐ Additive (*e.g.*, chelation agent, flocculent)____________________
   ☐ Others____________________
   ☐ Good condition ☐ Needs Maintenance
   ☐ Sampling ports properly marked and functional
   ☐ Sampling/maintenance log displayed and up to date
   ☐ Equipment properly identified
   ☐ Quantity of groundwater treated annually__________
   ☐ Quantity of surface water treated annually__________
   Remarks____________________

2. **Electrical Enclosures and Panels** (properly rated and functional)
   ☐ N/A ☐ Good condition ☐ Needs Maintenance
   Remarks____________________

3. **Tanks, Vaults, Storage Vessels**
   ☐ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs Maintenance
   Remarks____________________

4. **Discharge Structure and Appurtenances**
   ☐ N/A ☐ Good condition ☐ Needs Maintenance
   Remarks____________________

5. **Treatment Building(s)**
   ☐ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair
   ☐ Chemicals and equipment properly stored
   Remarks____________________

6. **Monitoring Wells** (pump and treatment remedy)
   ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
   ☐ All required wells located ☐ Needs Maintenance ☐ N/A
   Remarks____________________

D. Monitoring Data

1. Monitoring Data
   ☑ Is routinely submitted on time ☑ Is of acceptable quality

2. Monitoring data suggests:
   ☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

D. Monitored Natural Attenuation
1. **Monitoring Wells** (natural attenuation remedy) ☒ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ All required wells located ☐ Needs Maintenance ☐ N/A Remarks Concrete remains near location of decommissioned well MW 16-3 Monitoring well 14MW01 appears in good condition
X. OTHER REMEDIES
If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.
XI. OVERALL OBSERVATIONS
A. Implementation of the Remedy
Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). The selected remedy was to excavate and remove PCB- and lead-contaminated soil. Area of soil removal indistinguishable from former building footprint area. The selected remedy appears to be effective.
B. Adequacy of O&M
Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. There is no visual evidence of contamination remaining. The upgraded/expanded well network at the MOC appears adequate to monitor natural attenuation

Five-Year Review Site Inspection Checklist

C.	Early Indicators of Potential Remedy Problems
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.
	None

D.	Opportunities for Optimization
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.
	Excavation area and former Building 112 footprint could be graded and seeded for a more natural appearance

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION

Site name: 19 - Auto Maintenance	**Date of inspection:** 8/2/18
Location and Region: Northeast Cape	**EPA ID:** AK9799F2999
Agency, office, or company leading the five-year review: USACE	**Weather/temperature:** Overcast, 50°F, breezy

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment ☒ Monitored natural attenuation
☐ Access controls ☒ Institutional controls
☒ Other Excavation with disposal, LUCs

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** none ________ ________
Name Title Date
Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ________
Problems, suggestions; ☐ Report attached ________

2. **O&M staff** None ________ ________
Name Title Date
Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ________
Problems, suggestions; ☐ Report attached ________

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency ADEC
Contact Curtis Dunkin Project Manager 11/19/18 (907) 269-3053
Name Title Date Phone no.
Problems; suggestions; ☒ Report attached Questionnaire sent via email

Agency ________
Contact ________ ________ ________ ________
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached ________

4. **Other interviews** (optional) ☒ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)				
1.	**O&M Documents**			
	☐ O&M manual	☐ Readily available	☐ Up to date	☒ N/A
	☐ As-built drawings	☐ Readily available	☐ Up to date	☒ N/A
	☐ Maintenance logs	☐ Readily available	☐ Up to date	☒ N/A
	Remarks___			
2.	**Site-Specific Health and Safety Plan**	☐ Readily available	☐ Up to date	☒ N/A
	☐ Contingency plan/emergency response plan	☐ Readily available	☐ Up to date	☒ N/A
	Remarks___			
3.	**O&M and OSHA Training Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks___			
4.	**Permits and Service Agreements**			
	☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
	☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
	☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
	☐ Other permits___	☐ Readily available	☐ Up to date	☒ N/A
	Remarks___			
5.	**Gas Generation Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks___			
6.	**Settlement Monument Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks___			
7.	**Groundwater Monitoring Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks___			
8.	**Leachate Extraction Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks___			
9.	**Discharge Compliance Records**			
	☐ Air	☐ Readily available	☐ Up to date	☒ N/A
	☐ Water (effluent)	☐ Readily available	☐ Up to date	☒ N/A
	Remarks___			
10.	**Daily Access/Security Logs**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks___			

Five-Year Review Site Inspection Checklist

IV. O&M COSTS

1. **O&M Organization**
☐ State in-house ☐ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☐ Other______________________________

2. **O&M Cost Records**
☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate $5,851,587 ☐ Breakdown attached

Total annual cost by year for review period if available

From__________ To__________ __________ ☐ Breakdown attached
Date Date Total cost
From__________ To__________ __________ ☐ Breakdown attached
Date Date Total cost
From__________ To__________ __________ ☐ Breakdown attached
Date Date Total cost
From__________ To__________ __________ ☐ Breakdown attached
Date Date Total cost
From__________ To__________ __________ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons: None

V. ACCESS AND INSTITUTIONAL CONTROLS ☑ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☑ N/A
Remarks______________________________

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A
Remarks______________________________

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented	☐ Yes	☑ No	☐ N/A
Site conditions imply ICs not being fully enforced	☐ Yes	☑ No	☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) CERCLA FYR - visual inspection

Frequency five years

Responsible party/agency USACE

Contact ______ ______ ______ ______

Name Title Date Phone no.

Reporting is up-to-date	☑ Yes	☐ No	☐ N/A
Reports are verified by the lead agency	☑ Yes	☐ No	☐ N/A
Specific requirements in deed or decision documents have been met	☐ Yes	☑ No	☐ N/A
Violations have been reported	☐ Yes	☑ No	☐ N/A

Other problems or suggestions: ☐ Report attached

Deed notice has not been filed.

2. **Adequacy** ☑ ICs are adequate ☐ ICs are inadequate ☐ N/A

Remarks

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☑ No vandalism evident

Remarks

2. **Land use changes on site** ☑ N/A

Remarks

3. **Land use changes off site** ☑ N/A

Remarks

VI. GENERAL SITE CONDITIONS

A. Roads ☑ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☑ Roads adequate ☐ N/A

Remarks

Five-Year Review Site Inspection Checklist

B. Other Site Conditions

Remarks area of excavation it has been brought to grade and seeded. Coarse gravel fill across site. vegetative cover near excavation area is fair, with sparse grass.

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
   Areal extent ____________ Depth ____________
   Remarks ____________

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths ____________ Widths ____________ Depths ____________
   Remarks ____________

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent ____________ Depth ____________
   Remarks ____________

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Areal extent ____________ Depth ____________
   Remarks ____________

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks ____________

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
   Remarks ____________

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
   Areal extent ____________ Height ____________
   Remarks ____________

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident
☐ Wet areas ☐ Location shown on site map Areal extent______________
☐ Ponding ☐ Location shown on site map Areal extent______________
☐ Seeps ☐ Location shown on site map Areal extent______________
☐ Soft subgrade ☐ Location shown on site map Areal extent______________
Remarks____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability
Areal extent______________
Remarks____

B. Benches ☐ Applicable ☐ N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay
Remarks____

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay
Remarks____

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay
Remarks____

C. Letdown Channels ☐ Applicable ☐ N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
Areal extent______________ Depth____________
Remarks____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type_______________ Areal extent_____________
Remarks____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent______________ Depth____________
Remarks____

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4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent______________ Depth____________
Remarks____
____

5. **Obstructions** Type____________________ ☐ No obstructions
☐ Location shown on site map Areal extent______________
Size____________
Remarks____
____

6. **Excessive Vegetative Growth** Type_______________
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent______________
Remarks____
____

D. Cover Penetrations ☐ Applicable ☐ N/A

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks____
____

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks____
____

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks____
____

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks____
____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks____
____

E. Gas Collection and Treatment		☐ Applicable ☐ N/A		
1.	**Gas Treatment Facilities** ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse ☐ Good condition☐ Needs Maintenance Remarks____ ____			
2.	**Gas Collection Wells, Manifolds and Piping** ☐ Good condition☐ Needs Maintenance Remarks____ ____			
3.	**Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings) ☐ Good condition☐ Needs Maintenance ☐ N/A Remarks____ ____			
F. Cover Drainage Layer		☐ Applicable ☐ N/A		
1.	**Outlet Pipes Inspected**	☐ Functioning	☐ N/A	
	Remarks____ ____			
2.	**Outlet Rock Inspected**	☐ Functioning	☐ N/A	
	Remarks____ ____			
G. Detention/Sedimentation Ponds		☐ Applicable ☐ N/A		
1.	**Siltation** Areal extent______________	Depth____________		☐ N/A
	☐ Siltation not evident Remarks____ ____			
2.	**Erosion** Areal extent______________	Depth____________		
	☐ Erosion not evident Remarks____ ____			
3.	**Outlet Works**	☐ Functioning	☐ N/A	
	Remarks____ ____			
4.	**Dam**	☐ Functioning	☐ N/A	
	Remarks____ ____			

Five-Year Review Site Inspection Checklist

H. Retaining Walls		☐ Applicable	☐ N/A
1.	**Deformations** ☐ Location shown on site map ☐ Deformation not evident Horizontal displacement___________ Vertical displacement___________ Rotational displacement___________ Remarks____		
2.	**Degradation** ☐ Location shown on site map ☐ Degradation not evident Remarks____		
I. Perimeter Ditches/Off-Site Discharge		☐ Applicable	☐ N/A
1.	**Siltation** ☐ Location shown on site map ☐ Siltation not evident Areal extent___________ Depth___________ Remarks____		
2.	**Vegetative Growth** ☐ Location shown on site map ☐ N/A ☐ Vegetation does not impede flow Areal extent___________ Type___________ Remarks____		
3.	**Erosion** ☐ Location shown on site map ☐ Erosion not evident Areal extent___________ Depth___________ Remarks____		
4.	**Discharge Structure** ☐ Functioning ☐ N/A Remarks____		
VIII. VERTICAL BARRIER WALLS		☐ Applicable	☒ N/A
1.	**Settlement** ☐ Location shown on site map ☐ Settlement not evident Areal extent___________ Depth___________ Remarks____		
2.	**Performance Monitoring** Type of monitoring___________ ☐ Performance not monitored Frequency___________ ☐ Evidence of breaching Head differential___________ Remarks____		

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☒ N/A
A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☐ N/A
1. **Pumps, Wellhead Plumbing, and Electrical** ☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A Remarks
2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance Remarks
3. **Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks
B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☐ N/A
1. **Collection Structures, Pumps, and Electrical** ☐ Good condition ☐ Needs Maintenance Remarks
2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance Remarks
3. **Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks

Five-Year Review Site Inspection Checklist

C. Treatment System ☐ Applicable ☑ N/A

1. **Treatment Train** (Check components that apply)
   ☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
   ☐ Air stripping ☐ Carbon adsorbers
   ☐ Filters____________________
   ☐ Additive (*e.g.*, chelation agent, flocculent)____________________
   ☐ Others____________________
   ☐ Good condition ☐ Needs Maintenance
   ☐ Sampling ports properly marked and functional
   ☐ Sampling/maintenance log displayed and up to date
   ☐ Equipment properly identified
   ☐ Quantity of groundwater treated annually____________________
   ☐ Quantity of surface water treated annually____________________
   Remarks____________________

2. **Electrical Enclosures and Panels** (properly rated and functional)
   ☐ N/A ☐ Good condition ☐ Needs Maintenance
   Remarks____________________

3. **Tanks, Vaults, Storage Vessels**
   ☐ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs Maintenance
   Remarks____________________

4. **Discharge Structure and Appurtenances**
   ☐ N/A ☐ Good condition ☐ Needs Maintenance
   Remarks____________________

5. **Treatment Building(s)**
   ☐ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair
   ☐ Chemicals and equipment properly stored
   Remarks____________________

6. **Monitoring Wells** (pump and treatment remedy)
   ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
   ☐ All required wells located ☐ Needs Maintenance ☐ N/A
   Remarks____________________

D. Monitoring Data

1. Monitoring Data
   ☑ Is routinely submitted on time ☑ Is of acceptable quality

2. Monitoring data suggests:
   ☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

D. Monitored Natural Attenuation
1. **Monitoring Wells** (natural attenuation remedy) ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ All required wells located ☐ Needs Maintenance ☐ N/A Remarks MW88-1 : frost-jacking has occurred (over 3"). PVC (2") stickup observed in area of ~~apparent~~ PM supposed decomissioned well.

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The selected remedy was to excavate and remove POL contaminated soil, MNA of groundwater, and LUCs for groundwater use. Area of excavation H has been regraded and vegetation coverage is fair. Remedy appears to be effective.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

Monitoring well MW88-1 is in need of minor repairs due to frost jacking. Otherwise monitoring well network across MOC appears adequate to monitor groundwater conditions.

Five-Year Review Site Inspection Checklist

C.	Early Indicators of Potential Remedy Problems
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. none
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. well MW88-1 needs repair due to frost jacking. PVC stickup just north of excavation H appears to be abandoned well. Any abandoned wells should be properly decommissioned

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: 27 - Diesel Fuel Pump.	**Date of inspection:** 8/2/18
Location and Region: NE Cape	**EPA ID:** AK 9799 F2999
Agency, office, or company leading the five-year review: USACE	**Weather/temperature:** Overcast/fog, light breeze, 50°F
Remedy Includes: (Check all that apply) ☐ Landfill cover/containment ☒ Monitored natural attenuation ☐ Access controls ☒ Institutional controls ☐ Other excavation with disposal, LUCs	
Attachments: ☐ Inspection team roster attached ☐ Site map attached	

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** None

   Name Title Date

   Interviewed ☐ at site ☐ at office ☐ by phone Phone no.

   Problems, suggestions; ☐ Report attached

2. **O&M staff** None

   Name Title Date

   Interviewed ☐ at site ☐ at office ☐ by phone Phone no.

   Problems, suggestions; ☐ Report attached

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

   Agency ADEC

   Contact Curtis Dunkin | Project Manager | 11/19/18 | (907) 269-3053

   Name Title Date Phone no.

   Problems; suggestions; ☒ Report attached Questionnaire sent via email

   Agency

   Contact

   Name Title Date Phone no.

   Problems; suggestions; ☐ Report attached

4. **Other interviews** (optional) ☒ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)				
1.	**O&M Documents**			
	☐ O&M manual	☐ Readily available	☐ Up to date	☐ N/A
	☐ As-built drawings	☐ Readily available	☐ Up to date	☐ N/A
	☐ Maintenance logs	☐ Readily available	☐ Up to date	☐ N/A
	Remarks____________________			
2.	**Site-Specific Health and Safety Plan**	☐ Readily available	☐ Up to date	☐ N/A
	☐ Contingency plan/emergency response plan	☐ Readily available	☐ Up to date	☐ N/A
	Remarks____________________			
3.	**O&M and OSHA Training Records**	☐ Readily available	☐ Up to date	☐ N/A
	Remarks____________________			
4.	**Permits and Service Agreements**			
	☐ Air discharge permit	☐ Readily available	☐ Up to date	☐ N/A
	☐ Effluent discharge	☐ Readily available	☐ Up to date	☐ N/A
	☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☐ N/A
	☐ Other permits____________	☐ Readily available	☐ Up to date	☐ N/A
	Remarks____________________			
5.	**Gas Generation Records**	☐ Readily available	☐ Up to date	☐ N/A
	Remarks____________________			
6.	**Settlement Monument Records**	☐ Readily available	☐ Up to date	☐ N/A
	Remarks____________________			
7.	**Groundwater Monitoring Records**	☐ Readily available	☐ Up to date	☐ N/A
	Remarks____________________			
8.	**Leachate Extraction Records**	☐ Readily available	☐ Up to date	☐ N/A
	Remarks____________________			
9.	**Discharge Compliance Records**			
	☐ Air	☐ Readily available	☐ Up to date	☐ N/A
	☐ Water (effluent)	☐ Readily available	☐ Up to date	☐ N/A
	Remarks____________________			
10.	**Daily Access/Security Logs**	☐ Readily available	☐ Up to date	☐ N/A
	Remarks____________________			

Five-Year Review Site Inspection Checklist

IV. O&M COSTS

1. **O&M Organization**
   - ☐ State in-house
   - ☐ Contractor for State
   - ☐ PRP in-house
   - ☐ Contractor for PRP
   - ☐ Federal Facility in-house
   - ☐ Contractor for Federal Facility
   - ☒ Other USACE

2. **O&M Cost Records**
   - ☐ Readily available
   - ☐ Up to date
   - ☐ Funding mechanism/agreement in place

   Original O&M cost estimate $5,851,587 ☐ Breakdown attached

   Total annual cost by year for review period if available

From (Date)	To (Date)	Total cost	
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**

   Describe costs and reasons: None

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☒ N/A

   Remarks

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☒ N/A

   Remarks

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented	☐ Yes	☑ No	☐ N/A
Site conditions imply ICs not being fully enforced	☐ Yes	☑ No	☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Periodic Review - visual inspection
Frequency five years
Responsible party/agency USACE
Contact ______ ______ ______ ______
Name Title Date Phone no.

Reporting is up-to-date	☑ Yes	☐ No	☐ N/A
Reports are verified by the lead agency	☑ Yes	☐ No	☐ N/A
Specific requirements in deed or decision documents have been met	☐ Yes	☑ No	☐ N/A
Violations have been reported	☐ Yes	☑ No	☐ N/A

Other problems or suggestions: ☒ Report attached
Deed notice has not been filed

2. **Adequacy** ☑ ICs are adequate ☐ ICs are inadequate ☐ N/A
Remarks

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☑ No vandalism evident
Remarks

2. **Land use changes on site** ☑ N/A
Remarks

3. **Land use changes off site** ☑ N/A
Remarks

VI. GENERAL SITE CONDITIONS

A. Roads ☑ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☑ Roads adequate ☐ N/A
Remarks

Five-Year Review Site Inspection Checklist

B. Other Site Conditions

Remarks coarse gravel fill across site. Road runs through middle of site. no vegetative growth across road, poor vegetative growth otherwise due to rocky soil.

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
   Areal extent______________ Depth____________
   Remarks____

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths____________ Widths___________ Depths__________
   Remarks____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent______________ Depth____________
   Remarks____

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Areal extent______________ Depth____________
   Remarks____

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks____

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
   Remarks____

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
   Areal extent______________ Height____________
   Remarks____

8.	**Wet Areas/Water Damage** ☐ Wet areas ☐ Ponding ☐ Seeps ☐ Soft subgrade Remarks______	☐ Wet areas/water damage not evident ☐ Location shown on site map Areal extent______ ☐ Location shown on site map Areal extent______ ☐ Location shown on site map Areal extent______ ☐ Location shown on site map Areal extent______
9.	**Slope Instability** ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability Areal extent______ Remarks______	
B. Benches	☐ Applicable ☐ N/A (Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)	
1.	**Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay Remarks______	
2.	**Bench Breached** ☐ Location shown on site map ☐ N/A or okay Remarks______	
3.	**Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay Remarks______	
C. Letdown Channels	☐ Applicable ☐ N/A (Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)	
1.	**Settlement** ☐ Location shown on site map ☐ No evidence of settlement Areal extent______ Depth______ Remarks______	
2.	**Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation Material type______ Areal extent______ Remarks______	
3.	**Erosion** ☐ Location shown on site map ☐ No evidence of erosion Areal extent______ Depth______ Remarks______	

Five-Year Review Site Inspection Checklist

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent______________ Depth__________
Remarks____
____

5. **Obstructions** Type____________________ ☐ No obstructions
☐ Location shown on site map Areal extent______________
Size__________
Remarks____
____

6. **Excessive Vegetative Growth** Type____________________
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent______________
Remarks____
____

D. Cover Penetrations ☐ Applicable ☐ N/A

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks____
____

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks____
____

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks____
____

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks____
____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks____
____

E. Gas Collection and Treatment	☐ Applicable ☐ N/A	
1.	**Gas Treatment Facilities** ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse ☐ Good condition ☐ Needs Maintenance Remarks______	
2.	**Gas Collection Wells, Manifolds and Piping** ☐ Good condition ☐ Needs Maintenance Remarks______	
3.	**Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings) ☐ Good condition ☐ Needs Maintenance ☐ N/A Remarks______	
F. Cover Drainage Layer	☐ Applicable ☐ N/A	
1.	**Outlet Pipes Inspected** ☐ Functioning ☐ N/A Remarks______	
2.	**Outlet Rock Inspected** ☐ Functioning ☐ N/A Remarks______	
G. Detention/Sedimentation Ponds	☐ Applicable ☐ N/A	
1.	**Siltation** Areal extent______ Depth______ ☐ N/A ☐ Siltation not evident Remarks______	
2.	**Erosion** Areal extent______ Depth______ ☐ Erosion not evident Remarks______	
3.	**Outlet Works** ☐ Functioning ☐ N/A Remarks______	
4.	**Dam** ☐ Functioning ☐ N/A Remarks______	

Five-Year Review Site Inspection Checklist

H. Retaining Walls ☐ Applicable ☐ N/A
1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident Horizontal displacement__________ Vertical displacement__________ Rotational displacement__________ Remarks______________________________
2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident Remarks______________________________
I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☐ N/A
1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident Areal extent__________ Depth__________ Remarks______________________________
2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A ☐ Vegetation does not impede flow Areal extent__________ Type__________ Remarks______________________________
3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident Areal extent__________ Depth__________ Remarks______________________________
4. **Discharge Structure** ☐ Functioning ☐ N/A Remarks______________________________
VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A
1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident Areal extent__________ Depth__________ Remarks______________________________
2. **Performance Monitoring** Type of monitoring____________________ ☐ Performance not monitored Frequency____________________ ☐ Evidence of breaching Head differential____________________ Remarks______________________________

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☒ N/A	
A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☐ N/A	
1.	**Pumps, Wellhead Plumbing, and Electrical** ☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A Remarks___
2.	**Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance Remarks___
3.	**Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks___
B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☐ N/A	
1.	**Collection Structures, Pumps, and Electrical** ☐ Good condition ☐ Needs Maintenance Remarks___
2.	**Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance Remarks___
3.	**Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks___

Five-Year Review Site Inspection Checklist

C. Treatment System ☐ Applicable ☑ N/A	
1.	**Treatment Train** (Check components that apply) ☐ Metals removal ☐ Oil/water separation ☐ Bioremediation ☐ Air stripping ☐ Carbon adsorbers ☐ Filters________ ☐ Additive (*e.g.*, chelation agent, flocculent)________ ☐ Others________ ☐ Good condition ☐ Needs Maintenance ☐ Sampling ports properly marked and functional ☐ Sampling/maintenance log displayed and up to date ☐ Equipment properly identified ☐ Quantity of groundwater treated annually________ ☐ Quantity of surface water treated annually________ Remarks________
2.	**Electrical Enclosures and Panels** (properly rated and functional) ☐ N/A ☐ Good condition ☐ Needs Maintenance Remarks________
3.	**Tanks, Vaults, Storage Vessels** ☐ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs Maintenance Remarks________
4.	**Discharge Structure and Appurtenances** ☐ N/A ☐ Good condition ☐ Needs Maintenance Remarks________
5.	**Treatment Building(s)** ☐ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair ☐ Chemicals and equipment properly stored Remarks________
6.	**Monitoring Wells** (pump and treatment remedy) ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ All required wells located ☐ Needs Maintenance ☐ N/A Remarks________
D. Monitoring Data	
1.	Monitoring Data ☑ Is routinely submitted on time ☑ Is of acceptable quality
2.	Monitoring data suggests: ☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks MW88-4 has been decommissioned. Remains of casing and concrete remain at surface.

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The selected remedy was to excavate and remove contaminated soil, MNA of groundwater, and implement LUCs for groundwater. Excavation area is not ~~readily~~ 0m easily identified. Poor vegetative regrowth is likely due to rocky soil. The E-4 excavation area (2013) has the least established vegetation. No POL-related odor was detected at site 27. No monitoring wells are present within site 27 boundaries, but wells 14MW04 and 14MW05 monitor groundwater immediately downgradient.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

The current and long-term protectiveness of the remedy appears adequate. There are no visual indications of contamination remaining. The monitoring well network as upgraded/improved since the last FYR appears adequate, (with minor repairs needed for MW88-1).

Five-Year Review Site Inspection Checklist

C.	Early Indicators of Potential Remedy Problems
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.
	The PCL odor that was noted in the first FYR was not detected.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.
	None

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: Site 28 - Drainage Basin	**Date of inspection:** 03 Aug 2018
Location and Region: NEC	**EPA ID:** AK9799F299
Agency, office, or company leading the five-year review: USACE	**Weather/temperature:** 50°F, overcast

Remedy Includes: (Check all that apply)
- ☐ Landfill cover/containment
- ☐ Monitored natural attenuation
- ☐ Access controls
- ☐ Institutional controls
- ☒ Other excavation and installation of a sedimentation pond

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** None

Name	Title	Date
None		

Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ______

Problems, suggestions; ☐ Report attached ______

2. **O&M staff** None

Name	Title	Date
None		

Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ______

Problems, suggestions; ☐ Report attached ______

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency ADEC

Contact Name	Title	Date	Phone no.
Curtis Dunkin	Project manager	11/19/18	(907) 269-3053

Problems; suggestions; ☐ Report attached Questionnaire sent via email

Agency ______

Contact Name	Title	Date	Phone no.

Problems; suggestions; ☐ Report attached ______

4. **Other interviews** (optional) ☒ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**				
☐ O&M manual	☐ Readily available	☐ Up to date	☒ N/A	
☐ As-built drawings	☐ Readily available	☐ Up to date	☒ N/A	
☐ Maintenance logs	☐ Readily available	☐ Up to date	☒ N/A	

Remarks Decision Document used for site information and site maps.

2. **Site-Specific Health and Safety Plan**	☐ Readily available	☐ Up to date	☒ N/A
☐ Contingency plan/emergency response plan	☐ Readily available	☐ Up to date	☒ N/A

Remarks

3. **O&M and OSHA Training Records**	☐ Readily available	☐ Up to date	☒ N/A

Remarks

4. **Permits and Service Agreements**

☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
☐ Other permits ______	☐ Readily available	☐ Up to date	☒ N/A

Remarks

5. **Gas Generation Records**	☐ Readily available	☐ Up to date	☒ N/A

Remarks

6. **Settlement Monument Records**	☐ Readily available	☐ Up to date	☒ N/A

Remarks

7. **Groundwater Monitoring Records**	☐ Readily available	☐ Up to date	☒ N/A

Remarks

8. **Leachate Extraction Records**	☐ Readily available	☐ Up to date	☒ N/A

Remarks

9. **Discharge Compliance Records**

☐ Air	☐ Readily available	☐ Up to date	☒ N/A
☐ Water (effluent)	☐ Readily available	☐ Up to date	☐ N/A

Remarks

10. **Daily Access/Security Logs**	☐ Readily available	☐ Up to date	☒ N/A

Remarks

Five-Year Review Site Inspection Checklist

IV. O&M COSTS	
1.	**O&M Organization** ☐ State in-house ☐ Contractor for State ☐ PRP in-house ☐ Contractor for PRP ☐ Federal Facility in-house ☐ Contractor for Federal Facility ☒ Other USACE
2.	**O&M Cost Records** ☐ Readily available ☐ Up to date ☐ Funding mechanism/agreement in place Original O&M cost estimate $5,851,587 ☐ Breakdown attached Total annual cost by year for review period if available From ______ To ______ ______ ☐ Breakdown attached Date Date Total cost From ______ To ______ ______ ☐ Breakdown attached Date Date Total cost From ______ To ______ ______ ☐ Breakdown attached Date Date Total cost From ______ To ______ ______ ☐ Breakdown attached Date Date Total cost From ______ To ______ ______ ☐ Breakdown attached Date Date Total cost
3.	**Unanticipated or Unusually High O&M Costs During Review Period** Describe costs and reasons: None
V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A	
A. Fencing	
1.	**Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☒ N/A Remarks
B. Other Access Restrictions	
1.	**Signs and other security measures** ☐ Location shown on site map ☒ N/A Remarks

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented	☐ Yes	☒ No	☐ N/A
Site conditions imply ICs not being fully enforced	☐ Yes	☒ No	☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Periodic Reviews (visual inspection)
Frequency 5 years
Responsible party/agency USACE
Contact

Name	Title	Date	Phone no.

Reporting is up-to-date	☒ Yes	☐ No	☐ N/A
Reports are verified by the lead agency	☒ Yes	☐ No	☐ N/A
Specific requirements in deed or decision documents have been met	☒ Yes	☐ No	☐ N/A
Violations have been reported	☐ Yes	☒ No	☐ N/A

Other problems or suggestions: ☐ Report attached
~~Deed notice~~ HH

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A
Remarks

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks

2. **Land use changes on site** ☒ N/A
Remarks

3. **Land use changes off site** ☒ N/A
Remarks

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks

Five-Year Review Site Inspection Checklist

B. Other Site Conditions

Remarks Strong fuel odors and sheen present through out water bodies. Debris such as plywood, treated utility poles, rubber matting, corrugated metal, and additional debris encountered at the site. Some debris appears to be from remedial activities. Other is from site historic activities (utility poles)

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
   Areal extent__________ Depth__________
   Remarks__________

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths__________ Widths__________ Depths__________
   Remarks__________

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent__________ Depth__________
   Remarks__________

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Areal extent__________ Depth__________
   Remarks__________

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks__________

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
   Remarks__________

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
   Areal extent__________ Height__________
   Remarks__________

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident
☐ Wet areas ☐ Location shown on site map Areal extent______________
☐ Ponding ☐ Location shown on site map Areal extent______________
☐ Seeps ☐ Location shown on site map Areal extent______________
☐ Soft subgrade ☐ Location shown on site map Areal extent______________
Remarks____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability
Areal extent______________
Remarks____

B. Benches ☐ Applicable ☐ N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay
Remarks____

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay
Remarks____

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay
Remarks____

C. Letdown Channels ☐ Applicable ☐ N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
Areal extent______________ Depth______________
Remarks____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type______________ Areal extent______________
Remarks____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent______________ Depth______________
Remarks____

Five-Year Review Site Inspection Checklist

4.	**Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting Areal extent_____________ Depth____________ Remarks____ ____
5.	**Obstructions** Type____________________ ☐ No obstructions ☐ Location shown on site map Areal extent_____________ Size___________ Remarks____ ____
6.	**Excessive Vegetative Growth** Type___________________ ☐ No evidence of excessive growth ☐ Vegetation in channels does not obstruct flow ☐ Location shown on site map Areal extent_____________ Remarks____ ____
D. Cover Penetrations ☐ Applicable ☐ N/A	
1.	**Gas Vents** ☐ Active☐ Passive ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks____ ____
2.	**Gas Monitoring Probes** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks____ ____
3.	**Monitoring Wells** (within surface area of landfill) ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks____ ____
4.	**Leachate Extraction Wells** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks____ ____
5.	**Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A Remarks____ ____

E. Gas Collection and Treatment ☐ Applicable ☐ N/A
1. **Gas Treatment Facilities** ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse ☐ Good condition☐ Needs Maintenance Remarks______________________________
2. **Gas Collection Wells, Manifolds and Piping** ☐ Good condition☐ Needs Maintenance Remarks______________________________
3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings) ☐ Good condition☐ Needs Maintenance ☐ N/A Remarks______________________________
F. Cover Drainage Layer ☐ Applicable ☐ N/A
1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A Remarks______________________________
2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A Remarks______________________________
G. Detention/Sedimentation Ponds ☐ Applicable ☐ N/A
1. **Siltation** Areal extent______________ Depth____________ ☐ N/A ☐ Siltation not evident Remarks______________________________
2. **Erosion** Areal extent______________ Depth____________ ☐ Erosion not evident Remarks______________________________
3. **Outlet Works** ☐ Functioning ☐ N/A Remarks______________________________
4. **Dam** ☐ Functioning ☐ N/A Remarks______________________________

Five-Year Review Site Inspection Checklist

H. Retaining Walls ☐ Applicable ☒ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
Horizontal displacement__________ Vertical displacement__________
Rotational displacement__________
Remarks__________

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
Remarks__________

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☒ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
Areal extent__________ Depth__________
Remarks__________

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
☐ Vegetation does not impede flow
Areal extent__________ Type__________
Remarks__________

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
Areal extent__________ Depth__________
Remarks__________

4. **Discharge Structure** ☐ Functioning ☐ N/A
Remarks__________

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
Areal extent__________ Depth__________
Remarks__________

2. **Performance Monitoring** Type of monitoring__________
☐ Performance not monitored
Frequency__________ ☐ Evidence of breaching
Head differential__________
Remarks__________

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☒ N/A	
A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☐ N/A	
1.	**Pumps, Wellhead Plumbing, and Electrical** ☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A Remarks
2.	**Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance Remarks
3.	**Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks
B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A	
1.	**Collection Structures, Pumps, and Electrical** ☐ Good condition ☐ Needs Maintenance Remarks
2.	**Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance Remarks
3.	**Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks

Five-Year Review Site Inspection Checklist

C. Treatment System ☐ Applicable ☒ N/A	
1.	**Treatment Train** (Check components that apply) ☐ Metals removal ☐ Oil/water separation ☐ Bioremediation ☐ Air stripping ☐ Carbon adsorbers ☐ Filters________ ☐ Additive (*e.g.*, chelation agent, flocculent)________ ☐ Others________ ☐ Good condition ☐ Needs Maintenance ☐ Sampling ports properly marked and functional ☐ Sampling/maintenance log displayed and up to date ☐ Equipment properly identified ☐ Quantity of groundwater treated annually________ ☐ Quantity of surface water treated annually________ Remarks________
2.	**Electrical Enclosures and Panels** (properly rated and functional) ☐ N/A ☐ Good condition ☐ Needs Maintenance Remarks________
3.	**Tanks, Vaults, Storage Vessels** ☐ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs Maintenance Remarks________
4.	**Discharge Structure and Appurtenances** ☐ N/A ☐ Good condition ☐ Needs Maintenance Remarks________
5.	**Treatment Building(s)** ☐ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair ☐ Chemicals and equipment properly stored Remarks________
6.	**Monitoring Wells** (pump and treatment remedy) ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ All required wells located ☐ Needs Maintenance ☐ N/A Remarks________
D. Monitoring Data	
1.	Monitoring Data ☒ Is routinely submitted on time ☒ Is of acceptable quality
2.	Monitoring data suggests: ☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedy does not appear to be operating as designed. ~~Strong~~ Indications of contamination such as sheen, and odor are present on site.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

The remedy is short-term protective as currently implemented. It appears that contamination may remain above the SSCLs.

Five-Year Review Site Inspection Checklist

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

None.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

Continue further remedy implementation. or re-evaluate the remedy effectiveness ~~as currently implemented.~~ HH and determine if additional remedies should be considered through a focused FS.

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: Site 32 - Lower Tramway	**Date of inspection:** 01 August 18
Location and Region:	**EPA ID:** AK9799F299
Agency, office, or company leading the five-year review: USACE	**Weather/temperature:** 50°F, overcast

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment ☐ Monitored natural attenuation
☐ Access controls ☐ Institutional controls
☒ Other Excavation

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** None
   Name / Title / Date
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ______
   Problems, suggestions; ☐ Report attached ______

2. **O&M staff** None
   Name / Title / Date
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ______
   Problems, suggestions; ☐ Report attached ______

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

   Agency ADEC
   Contact Curtis Dunkin — Project Manager — 11/19/18 — (907) 269-3053
   Name / Title / Date / Phone no.
   Problems; suggestions; ☐ Report attached Questionnaire sent via email

   Agency ______
   Contact ______
   Name / Title / Date / Phone no.
   Problems; suggestions; ☐ Report attached ______

4. **Other interviews** (optional) ☒ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)			
1. **O&M Documents**			
☐ O&M manual	☐ Readily available	☐ Up to date	☒ N/A
☐ As-built drawings	☐ Readily available	☐ Up to date	☒ N/A
☐ Maintenance logs	☐ Readily available	☐ Up to date	☒ N/A
Remarks Decision Documents used for site information and site maps			
2. **Site-Specific Health and Safety Plan**	☐ Readily available	☐ Up to date	☒ N/A
☐ Contingency plan/emergency response plan	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
3. **O&M and OSHA Training Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
4. **Permits and Service Agreements**			
☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
☐ Other permits ________	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
5. **Gas Generation Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
6. **Settlement Monument Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
7. **Groundwater Monitoring Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
8. **Leachate Extraction Records**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
9. **Discharge Compliance Records**			
☐ Air	☐ Readily available	☐ Up to date	☒ N/A
☐ Water (effluent)	☐ Readily available	☐ Up to date	☒ N/A
Remarks			
10. **Daily Access/Security Logs**	☐ Readily available	☐ Up to date	☒ N/A
Remarks			

Five-Year Review Site Inspection Checklist

IV. O&M COSTS

1. **O&M Organization**
☐ State in-house ☐ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☒ Other USACE

2. **O&M Cost Records**
☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate $5,851,587 ☐ Breakdown attached

Total annual cost by year for review period if available

From ______ To ______ ______ ☐ Breakdown attached
Date Date Total cost
From ______ To ______ ______ ☐ Breakdown attached
Date Date Total cost
From ______ To ______ ______ ☐ Breakdown attached
Date Date Total cost
From ______ To ______ ______ ☐ Breakdown attached
Date Date Total cost
From ______ To ______ ______ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons: None

V. ACCESS AND INSTITUTIONAL CONTROLS ☐ Applicable ☒ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☒ N/A
Remarks

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☒ N/A
Remarks

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented	☐ Yes	☐ No	☒ N/A
Site conditions imply ICs not being fully enforced	☐ Yes	☐ No	☒ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Periodic Reviews
Frequency Five years
Responsible party/agency USACE
Contact ______ Name ______ Title ______ Date ______ Phone no.

Reporting is up-to-date	☒ Yes	☐ No	☐ N/A
Reports are verified by the lead agency	☒ Yes	☐ No	☐ N/A
Specific requirements in deed or decision documents have been met	☒ Yes	☐ No	☐ N/A
Violations have been reported	☐ Yes	☒ No	☐ N/A

Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☐ ICs are adequate ☐ ICs are inadequate ☒ N/A
Remarks

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks

2. **Land use changes on site** ☒ N/A
Remarks

3. **Land use changes off site** ☒ N/A
Remarks

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks

Five-Year Review Site Inspection Checklist

B. Other Site Conditions
Remarks Site appears in good shape. Concrete structures remain but excavated areas look well vegetated.
VII. LANDFILL COVERS ☐ Applicable ☒ N/A
A. Landfill Surface
1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident Areal extent______ Depth______ Remarks______
2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident Lengths______ Widths______ Depths______ Remarks______
3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident Areal extent______ Depth______ Remarks______
4. **Holes** ☐ Location shown on site map ☐ Holes not evident Areal extent______ Depth______ Remarks______
5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress ☐ Trees/Shrubs (indicate size and locations on a diagram) Remarks______
6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A Remarks______
7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident Areal extent______ Height______ Remarks______

8.	**Wet Areas/Water Damage**	☐ Wet areas/water damage not evident	
	☐ Wet areas	☐ Location shown on site map	Areal extent______
	☐ Ponding	☐ Location shown on site map	Areal extent______
	☐ Seeps	☐ Location shown on site map	Areal extent______
	☐ Soft subgrade	☐ Location shown on site map	Areal extent______
	Remarks______		
9.	**Slope Instability** ☐ Slides	☐ Location shown on site map	☐ No evidence of slope instability
	Areal extent______		
	Remarks______		

B. Benches ☐ Applicable ☑ N/A

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1.	**Flows Bypass Bench**	☐ Location shown on site map	☐ N/A or okay
	Remarks______		
2.	**Bench Breached**	☐ Location shown on site map	☐ N/A or okay
	Remarks______		
3.	**Bench Overtopped**	☐ Location shown on site map	☐ N/A or okay
	Remarks______		

C. Letdown Channels ☐ Applicable ☐ N/A

(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1.	**Settlement**	☐ Location shown on site map	☐ No evidence of settlement
	Areal extent______	Depth______	
	Remarks______		
2.	**Material Degradation**	☐ Location shown on site map	☐ No evidence of degradation
	Material type______	Areal extent______	
	Remarks______		
3.	**Erosion**	☐ Location shown on site map	☐ No evidence of erosion
	Areal extent______	Depth______	
	Remarks______		

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4.	**Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting Areal extent________ Depth________ Remarks________
5.	**Obstructions** Type________ ☐ No obstructions ☐ Location shown on site map Areal extent________ Size________ Remarks________
6.	**Excessive Vegetative Growth** Type________ ☐ No evidence of excessive growth ☐ Vegetation in channels does not obstruct flow ☐ Location shown on site map Areal extent________ Remarks________
D. Cover Penetrations ☐ Applicable ☐ N/A	
1.	**Gas Vents** ☐ Active☐ Passive ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks________
2.	**Gas Monitoring Probes** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks________
3.	**Monitoring Wells** (within surface area of landfill) ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks________
4.	**Leachate Extraction Wells** ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks________
5.	**Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A Remarks________

E. Gas Collection and Treatment ☐ Applicable ☐ N/A
1. **Gas Treatment Facilities** ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse ☐ Good condition☐ Needs Maintenance Remarks______________________________
2. **Gas Collection Wells, Manifolds and Piping** ☐ Good condition☐ Needs Maintenance Remarks______________________________
3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings) ☐ Good condition☐ Needs Maintenance ☐ N/A Remarks______________________________
F. Cover Drainage Layer ☐ Applicable ☐ N/A
1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A Remarks______________________________
2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A Remarks______________________________
G. Detention/Sedimentation Ponds ☐ Applicable ☐ N/A
1. **Siltation** Areal extent______________ Depth____________ ☐ N/A ☐ Siltation not evident Remarks______________________________
2. **Erosion** Areal extent______________ Depth____________ ☐ Erosion not evident Remarks______________________________
3. **Outlet Works** ☐ Functioning ☐ N/A Remarks______________________________
4. **Dam** ☐ Functioning ☐ N/A Remarks______________________________

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H. Retaining Walls ☐ Applicable ☐ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
   Horizontal displacement____________ Vertical displacement_______________
   Rotational displacement____________
   Remarks____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
   Remarks____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☐ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
   Areal extent______________ Depth____________
   Remarks____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
   ☐ Vegetation does not impede flow
   Areal extent______________ Type____________
   Remarks____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent______________ Depth____________
   Remarks____

4. **Discharge Structure** ☐ Functioning ☐ N/A
   Remarks____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
   Areal extent______________ Depth____________
   Remarks____

2. **Performance Monitoring** Type of monitoring__________________________
   ☐ Performance not monitored
   Frequency________________________________ ☐ Evidence of breaching
   Head differential__________________________
   Remarks____

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☒ N/A	
A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☐ N/A	
1.	**Pumps, Wellhead Plumbing, and Electrical** ☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A Remarks________________
2.	**Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance Remarks________________
3.	**Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks________________
B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☐ N/A	
1.	**Collection Structures, Pumps, and Electrical** ☐ Good condition ☐ Needs Maintenance Remarks________________
2.	**Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance Remarks________________
3.	**Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks________________

Five-Year Review Site Inspection Checklist

C. Treatment System	☐ Applicable ☑ N/A
1.	**Treatment Train** (Check components that apply) ☐ Metals removal ☐ Oil/water separation ☐ Bioremediation ☐ Air stripping ☐ Carbon adsorbers ☐ Filters ________ ☐ Additive (*e.g.*, chelation agent, flocculent) ________ ☐ Others ________ ☐ Good condition ☐ Needs Maintenance ☐ Sampling ports properly marked and functional ☐ Sampling/maintenance log displayed and up to date ☐ Equipment properly identified ☐ Quantity of groundwater treated annually ________ ☐ Quantity of surface water treated annually ________ Remarks ________
2.	**Electrical Enclosures and Panels** (properly rated and functional) ☐ N/A ☐ Good condition ☐ Needs Maintenance Remarks ________
3.	**Tanks, Vaults, Storage Vessels** ☐ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs Maintenance Remarks ________
4.	**Discharge Structure and Appurtenances** ☐ N/A ☐ Good condition ☐ Needs Maintenance Remarks ________
5.	**Treatment Building(s)** ☐ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair ☐ Chemicals and equipment properly stored Remarks ________
6.	**Monitoring Wells** (pump and treatment remedy) ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ All required wells located ☐ Needs Maintenance ☐ N/A Remarks ________
D. Monitoring Data	
1.	Monitoring Data ☑ Is routinely submitted on time ☑ Is of acceptable quality
2.	Monitoring data suggests: ☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ☒ N/A
Remarks

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedy appears affective and operating as designed.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

None.

Five-Year Review Site Inspection Checklist

C.	Early Indicators of Potential Remedy Problems
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. None
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. None

ATTACHMENT C-5
Photograph Log

PHOTOGRAPH LOG
TABLE OF CONTENTS

Photo Number **Page**

PHOTOGRAPH LOG
TABLE OF CONTENTS (Continued)

Photo No. 1 – 01 August 2018
View facing southwest of the previously identified surface water body at Site 3.

Photo No. 2 – 01 August 2018
View facing west of debris in the previously identified surface water body at Site 3.

Photo No. 3 – 01 August 2018
View facing down of a one-quart oil container found at Site 3.

Photo No. 4 – 03 August 2018
View facing northeast of the camp set-up on Site 6.

Photo No. 5 – 03 August 2018
View facing northwest of the minor earth work completed during camp set-up.

Photo No. 6 – 14 August 2018
View facing northwest of the earth work completed following camp tear-down.

Photo No. 7 – 03 August 2018
View facing north of wood debris in the rocks/ephemeral pond bed to the southwest of the gravel pad at Site 6.

Photo No. 8 – 06 August 2018
View facing northwest of Site 8.

Photo No. 9 – 02 August 2018
View facing east of Site 9.

Photo No. 10 – 02 August 2018
View facing down of metal debris identified at Site 9.

Photo No. 11 – 02 August 2018
View facing northeast of the diversion trench at Site 9.

Photo No. 12 – 01 August 2018
View facing east of the regraded slope at Site 10.

Photo No. 13 – 01 August 2018
View facing down of various debris (well casing and metal) found at Site 10.

Photo No. 14 – 02 August 2018
View facing west of Site 11.

Photo No. 15 – 02 August 2018
View facing north of Site 11.

Photo No. 16 – 02 August 2018
View facing west of Site 13.

Photo No. 17 – 02 August 2018
View facing southeast of slightly stressed vegetation at Site 13.

Photo No. 18 – 02 August 2018
View facing southeast of Site 15.

Photo No. 19 – 02 August 2018
View facing northwest of degraded rubber matting at Site 16.

Photo No. 20 – 02 August 2018
View facing down of concrete remaining from MW16-3 at Site 16.

Photo No. 21 – 02 August 2018
View facing north of Site 16.

Photo No. 22 – 02 August 2018
View facing west of Site 19. P. Mamrol is standing on the approximate location of excavation H.

Photo No. 23 – 02 August 2018
View facing down of an unidentified decommissioned well at Site 19.

Photo No. 24 – 02 August 2018
View facing southeast of Site 27 at 14MW05.

Photo No. 25 – 02 August 2018
View facing west of scattered vegetation regrowth at Site 27.

Photo No. 26 – 02 August 2018
View facing down of metal debris at Site 27.

Photo No. 27 – 02 August 2018
View facing down of decommissioned well at Site 27.

Photo No. 28 – 01 August 2018
View facing north of former excavations at Site 32.

Photo No. 29 – 01 August 2018
View facing east of the concrete tram landing at Site 32.

Photo No. 30 – 01 August 2018
View facing north of the culvert at Site 32.

Photo No. 31 – 04 August 2018
View facing north of frost-jacked well 14MW05

Photo No. 32 – 05 August 2018
View facing down of rusted threads in flush mount at MW88-3.

ATTACHMENT C-6
Logbook

Site Inspections

Rite in the Rain.
ALL-WEATHER
ENVIRONMENTAL
№ 550F

Authors

Haley Huff

DCN: AE-ECC-J07-5FGA
4600-H04-0003

1 55021
8-1-932149-50

CONTENTS

PAGE	REFERENCE	DATE

Location Northeast Cape Date 8/1/18

Project / Client SFGA4600 / USACE

Site 3

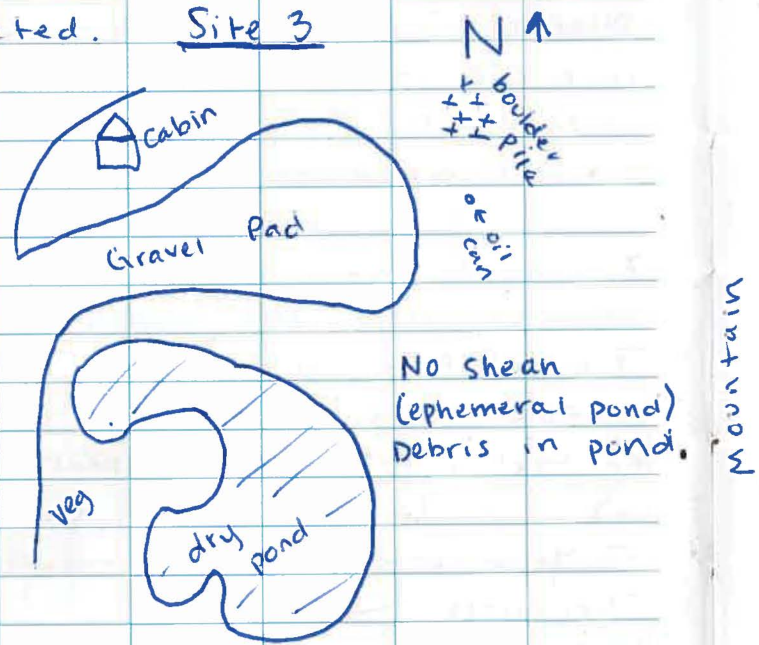
Weather: 50°F, 90% chance of rain, overcast
level of PPE: modified level D, eye protection on UTVs.
Personnel: Haley Huff (HH), Peter Mamrol (PM)
Daily Objectives: Site inspections
7:00: Safety tailgate and SPA creation/review. Surveyors setting control points. Site inspections will be documented on the EPA 5-Year Review Site Inspection Checklists
10:00: Arrive at Site 3. 1 Subsistence Fishing Structures remain. 2nd structure on the east side does not exist anymore. The 1st structure contains a lot of debris - poly tanks, high vis coat, etc. Also contains debris associated with fishing (expected). Subsistence cabin is clearly occupied regularly. Modern items in-site from window. Can of discarded oil on site. Photo

Location Northeast Cape Date 8/1/18

Project / Client 5FGA4600 / USACE

Site 3 / Site 32

collected. Site 3



1030 Completed site inspection at Site 3 - ~~cont~~ completing an orientation of the remaining Sites.

1047 Arrived at Site 32 - lower tramway

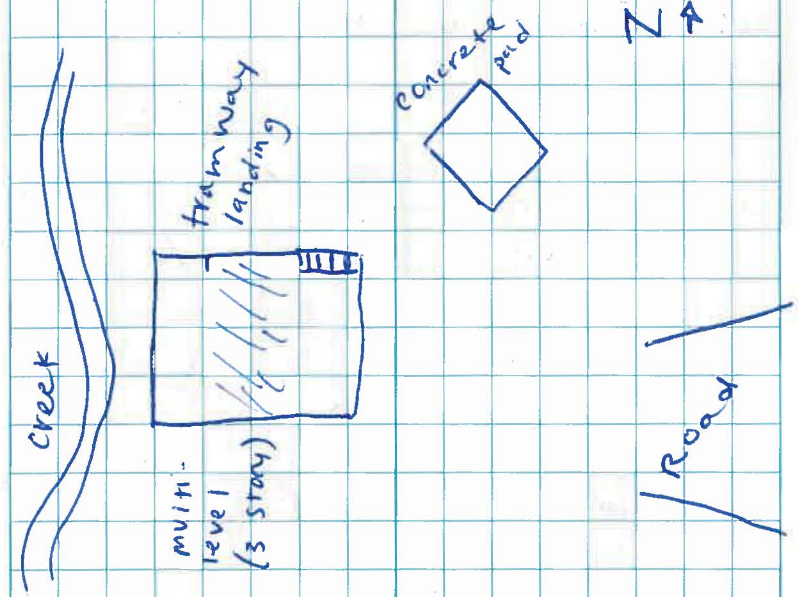
Concrete structures still (foundations) in place.

Landing for tramway abuts a the mountain - scree sloping sides.

Location Northeast Cape Date 8/1/18

Project / Client 5FGA4600 / USACE

Site 32 / Site 1



Scattered metal debris on site.

1149: Completed site inspection at Site 32. Mobilizing to the Airstrip.

12:07 Arrived at Site 1 Airstrip.

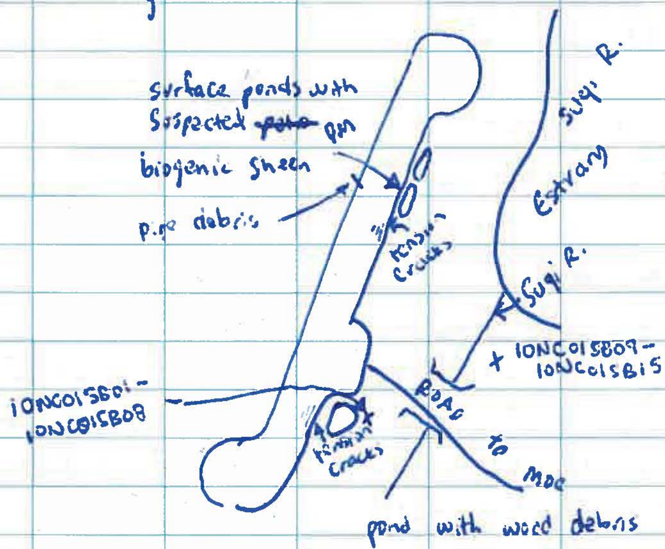
12:15 driving perimeter of runway. Observed sheen on ponded surface water on East side of runway. Suspected biogenic. due to "cracking". Little debris present on site (wood, pipes, metal).

Location Northeast Cape Date 8/1/18

Project / Client 5FGA4600 / USACE

Site 1

1226 Completed drive-through of ~~Site~~ Bm Runway.



1240 Break for lunch

1330 Continued review of site docs for SIs

1630 Return to Site 1. Inspect area near historic samples 10NC01SB09 - SB15 Sheen visible in marshy areas adjacent to Sugi River, suspected to be biogenic.

1650 Moved to area of historic samples 10NC01SB01 - SB08. Vegetative growth appears healthy

Location Northeast Cape Date 8/1/18

Project / Client 5FGA4600 / USACE

Site 10

1700 Left Site 1. Detoured at Site 8 to confirm the locations of the decision units. Sediment sample locations appear to be sufficient for the ISM random sampling event.

1725: Arrived at Site 10 to perform site inspection.

1735 Site is well-graded with sparse vegetation. Minor debris (wood, metal, plastic fragments) present in fill. Some of the wood fragments are painted

1755 Leave Site 10 for camp.

1800 Back at camp. Completing the final notes before QC check.

Haley Huff

HM 8/1/18
QC Reviewed

Location Northeast Cape Date 8/2/18

Project / Client 5FGA4600/USACE

Site 11 / Site 27

Weather: Rainy/overcast, 50°F
PPE: Mod Level D - Rain gear & eye protection for UTV
Personnel: PM & HH
7:00: Safety tailgate
7:30: Assisted groundwater team with calibrations and completed preliminary paperwork for site inspections
9:00: Arrived at the MOC - starting with the site inspection for Site 11. Metal debris scattered on site. Vegetation regrowth over excavation is healthy for the rocky soil type. Heavy equipment marks still evident.
9:30 Arrived at site 27. Site appears to be adequately re-vegetating for the poor soil quality (rocky, immature). Heavy equipment tracks are still evident. Some remaining metal debris

Location Northeast Cape Date 8/2/18

Project / Client 5FGA4600/USACE

Site 21 / Site 19

Found abandoned well casing and a small amount of silica sand. We believe it is the remainder of 88-4.
0954: Arrived at Site 19.
1121: Arrived at Site 21. Clearly graded and re-graveled. Veg growth poor on graded area due to poor soil conditions. Off-pad vegetation is healthy & thriving wetland/swamp.
1141: Completed MOC walk through to inspect the conditions of the wells and to orient ~~us w/~~ ourselves with the site layout. We will travel back to Site 19 to complete site inspections.
1152: Well MW88-1 has frost jacked at least 2-3", judging by the stick-up above the flush mount. Gravel pad has no vegetation. The previous excavation area it has fair vegetation regrowth - again,

Location Northeast Cape Date 8/2/18

Project / Client SFGA4600/ USACE

Site 19 / Site 15/ Site 13

poor soil conditions.

1208 Came across an abandoned well with PVC stick-up above ground surface. PVC clearly extends several feet bgs. We believe this well may have been recently exposed, HH because it is within the gravel pad. We did not take a water measurement or identify a bentonite/ silica sand fill.

1215 Arrived at Site 15. Excavation completed to grade. Veg regrowth is adequate for the poor, immature soil. No evidence of contamination on the site.

1233 Arrived at Site 13. Excavation has been backfilled to grade. No evidence of abandoned wells. The vegetation regrowth is adequate for the poor

Location Northeast Cape Date 8/2/18

Project / Client SFGA4600/ USACE

Site 13

soil quality - immature. Heavy equipment track marks obvious in vegetation regrowth.

1242 Arrived at Site 16. Poor vegetative regrowth. Abandoned well MW16-03 contains the concrete outer mount but no PVC remains. Excavation area indistinguishable from ~~bldg~~ HH building footprint/ road. Rubber matting present in depression on the west side of the site.

Sample naming convention for surface water samples:

18NEC - S9 - WS

-8 (Duplicate)

Sample Quantities:

~~1-250mL - filtered metals w/ Nitric~~ HH

1-250 mL w/ nitric - unfiltered metals

2-1L w/ HCL - DRO/RRO

Location Northeast Cape Date 8/2/18

Project / Client 5FGA4600/USACE

Site 8

~~PCBs - 1~~ HH

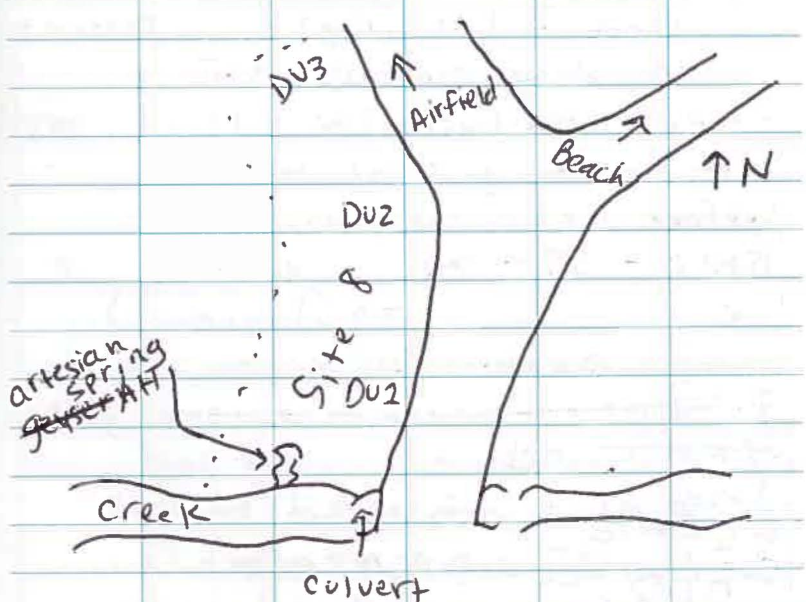
~~4 1L - PAHs & PCBs~~ HH

2 - 1L - PAHs

HH

We will measure YSI parameters and turbidity prior to sampling. Groundwater team will be handling surface water samples.

15:20: Arrived at Site 8.



Location Northeast Cape Date 8/2/18

Project / Client 5FGA4600/USACE

Site 8

Vegetation does not appear to be impacted by contamination. Fish are in the creek and the creek appears to not be impacted. Fairly dry conditions compared to observations from previous years. Small ponded water and submerged vegetative mat. Safety consideration: Ground fog closing in on site. Will leave if visibility decreases.

1545: Arrived at Site 9. Surface water surrounding the majority of the landfill. No ponding of surface water or erosion evident. No vegetation growth on the landfill cap. Surface water surrounding the cap is clear with no evidence of contamination impacts. The smallest amount of settling has occurred on portions of the landfill cap. There is

Location Northeast Cape Date 8/2/2018
Project / Client SFGA4600/USACE

Site 9

no sediment present in the diversion trench. The water is clear and free of debris - not turbid.

1630. Arrived at Site 7. Identified areas with significant settling. QAR Sean Benjamin visited us on site to discuss documentation of the settling. We also spoke with the surveyors to find out if surveying the topography of the settled material is within the current contract. Slight vegetation - mosses, and sparse grasses. More vegetation than Site 9 but not ideal for erosion control. Site Manager Stan Seegars also visited the Site to find out if we needed any assistance.

1800: Re-visited Site 18 to take photos of the asbestos taping posted during the remedial activities.

1830: end of day

Haley Huff

WM 8/12/18 QC review

Location Northeast Cape Date 8/3/2018
Project / Client SFGA4600 /USACE

Site 6

Weather: 45°F, Overcast/low fogs, light mist.

Level of PPE: modified level D. Eye protection on UTVs.

Personnel: Peter Mamrol (PM), Haley Huff (HH).

Daily objectives: Site Inspections, Site 6 and Site 28.

0700 Safety tailgate. Weather moving in for Sat-Mon. Charter flight planned for today.

0740 Site 6 site inspection. Camp is located on site 6 gravel pad camp consists of 8 wall tents fed with 9 55-gal drum ASTs with proper containment. Camp is neat and no spills or leaks have been noted.

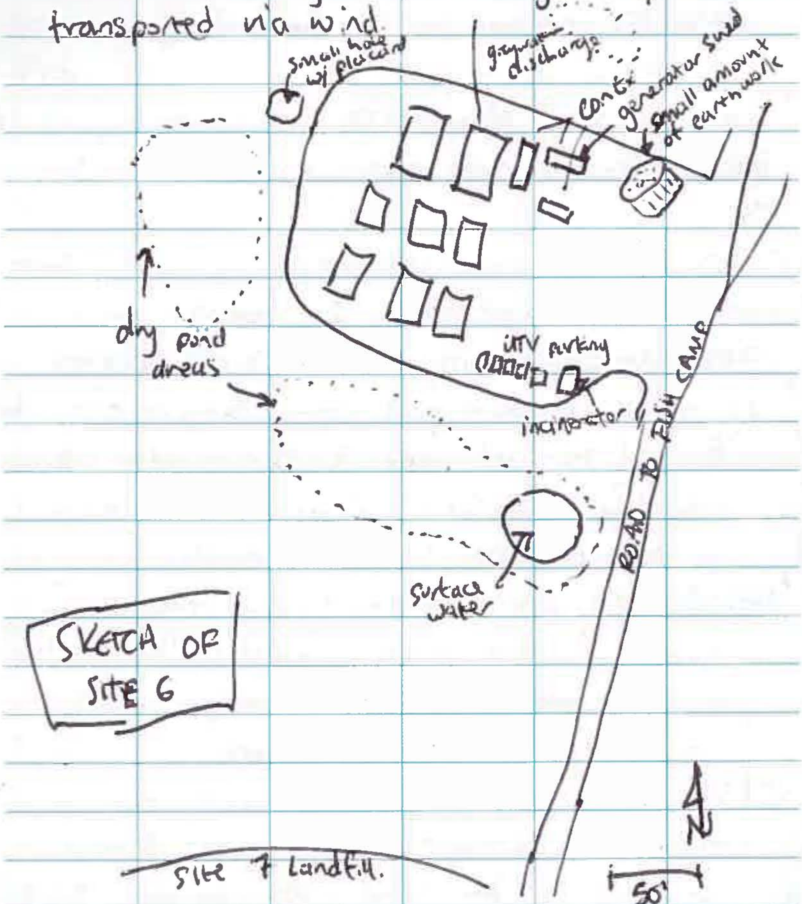
0745 Adjacent ponds are mostly dry. small amount of water visible in pond to the south of gravel pad. Wood debris noted in rocks/ pond bed to SW of gravel pad.

0755. Small amount of earthwork done on eastern portion of gravel pad - A small depression has been dug with adjacent stockpile (5-10 cy).

0800 5' x 5' hole (2-3' deep) observed to NW of gravel pad. Placard (#3432) sign found in bottom. No container observed.

Location Northeast Cape Date 8/3/18
Project / Client SFGA4600

Placard was likely ~~blown off gravel pad~~ pm transported via wind.



0915 met with surveyors at Site 7 landfill Cap to discuss cross-section of cap surface. Will collect cross-section across two areas of settlement

Location Northeast Cape Date 8/3/18
Project / Client SFGA 4600 / USACE

0945 Arrived at Site 9 to photograph culvert on west side of landfill. Culvert is in good condition and clear of constrictions. Appears to provide adequate path for drainage.

1000 Return to camp

1115 Depart camp for Site 28 inspection. Start at MOC border of Site 28 water seeps and ponds / streams begin just downgradient of MOC. Several ponds have visible sheen. Low water conditions. Areas where vegetation appears stressed – may be due to dry conditions

1135 Observed wood / plywood fragments

12:00 Small diameter rubber tubing, more wood debris

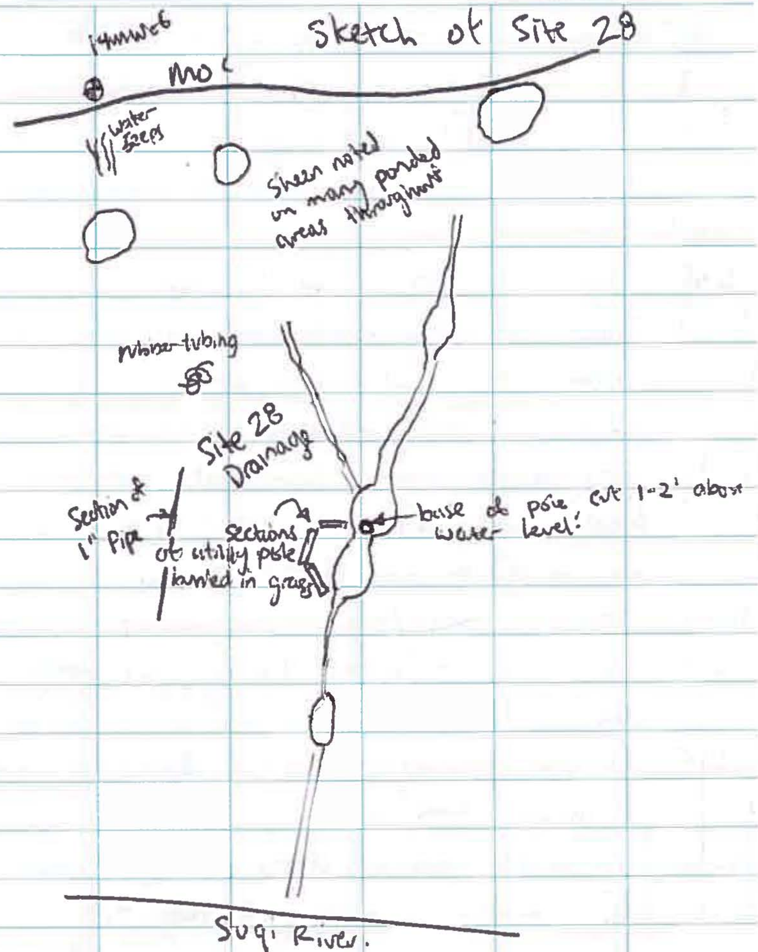
1215 1" pipe running toward Suqi River. Approximately 50' visible above tundra.

1220 18 to 24" base of utility pole (cut near base). located in middle of Area 4/9 pond. In grass on East side of pond, 3 sections of utility pole were found overgrown in the grass. The utility pole appears treated, with a tar-like substance covering the surface.

Location Northeast Cape Date 8/3/18

Project / Client SFGA4600 /USACE

Sketch of Site 28



1245 Done with site walk at Site 28. Leave for camp

1900 End of Day

Peter Mamrosi

PM 8/3/18 QC review

Location Northeast Cape Date 8/6/18

Project / Client SFGA4600 / USACE

Weather: 50°F, overcast

Level of PPE: Level D (modified)

Personnel: Peter Mamrosi (PM), Haley Huff (HH).

Daily objectives: measure distance of seeps to wells, photographs

1430 At Site 28 border w/ MOC. Measuring distance from wells to seeps.

14MW04 - 36' down gradient

14MW05 - 44' down gradient

14MW06 - 18' down gradient

10MW-1 - base of stickup in marshy area

Prior to demob, surveyors indicated strong odors and sheen present at Site 28. As they walked through water bodies & disturbed sediment, additional odor and sheen would generate. This was again observed during sediment probing demonstration with site visitors. Strong sheen had developed in pond at MOC border and had strong fuel odor, even observing from a distance.

1500 Took photo 157 to attempt to replicate photo from first sediment mapping effort. Crossed area of Site 28 where herd of ~400 reindeer had crossed and disturbed ground. Distinct fuel

Location Northeast Cape Date 8/6/18

Project / Client SFGA4600 / USACE

odor was present again.
Additional debris observed included plywood, rubber matting, corrugated metal,
No straw wattles observed in main channel.

1600 Return to camp

1820 photograph monument location on Site 7 landfill and remove pin flags

1835 photograph LUC sign at N end of runway

1845 remove pin flags from site 8 DAs.

1850 remove pin flags from site 9 landfill.

1930 Return to Camp

Peter Mamrol

Location Northeast Cape Date 8/6/18

Project / Client SFGA4600 / USACE

Weather: ~~Overcast~~ PM, Broken Clouds, 45°F calm

Level of PPE: Level D (modified

Personnel: Peter Mamrol (PM)

Daily objectives: photograph Site 28

Safety tailgate @ 7:00 AM.

0930 leaving camp for Site 28 photographs

0940 #44, #45, #46 pond

image 0985 - N

0986 - W

#41 pond

image 0987 - N

#36, #37 pond

image 0988 - N

pond from reindeer tread.

image 0989 - N 0991 - S

pond "sediment"

image ~~0990~~ PM - N/A 0992

#1 #2 pond

image ~~0997~~ PM 0993, 0998

pond sediment, 0994, 0997

#3 pond

image 0999

#4 pond, image 1000

Location Northeast Cape   Date 8/6/18

Project / Client 5FGA4600/ USACE

#5, #6 pond
image 1001
#7, # 8, #9
image 1003
#10
image 1004
#11, #12
image 1005
section of stream 1006
#13
image 1007
#14, #15, #16, #17, #18
image 1008
#19, #20
image 1009
#21, #22
image 1010
#23, #24
image 1011, 1012
#25
image 1013
#26, 28
image 1014
#27
image 1015

Location Northeast Cape   Date 8/6/18

Project / Client 5FGA4600 / USACE

#29, #30
image 1016
#31
image 1017
#32, 33, 34, 35
image 1018
note: #35 is an artesian upwelling.
image 1020, 1021, 1022, 1023, 1024
note: Sloughing off of high ground, 1026
#38, #39, #40
image 1027, 1028, 1029
#42
image 1030
#43
image 1031
#47, #48, #49, #50, #51
image 1032
#36, #37
image 1033
1055 Return to camp.

Peter Mamrol

Location NE Cape Date

Project / Client 5FGA4600 / USACE

Photo Log

#	Description	View
1	Subsistence fishing hut w/ debris	~~SE~~ SW
2	View facing west of site	W
3	Subsistence fishing hut	NE
4	View facing east of site	E
5	View facing ~~so~~ north of site	N
6	View facing north of site - subsistence supplies and structures	N
7	View of pond - dried	S
8/9/10	Debris in pond	Down
11	Motor oil at site	Down
12	Bone pile / fire ring at site	Down

Site 32

#	Description	View
13	Culvert -	N
14	Culvert	E
15	Stream drainage	N
16	Concrete ~~pr~~ former pad	down

Location NE Cape Date

Project / Client 5FGA4600 / USACE

#	Description	View
17	Lower tramway landing	E
18	Drainage pits infilled w/ debris and rocks	E and down
19	Tramway landing	E
20	View of borrow pit	E
21	Long view of tramway	S
22	Concrete Pad	NW-down
23	Peter standing on 1 excavation	NE
24	Peter standing on 2nd excavation	N
25	Drainage off of excavation area	NW
26	Excavation proximity to stream (Peter standing on excavation)	N
27	Drainage at site, adjacent to excavation areas	W

Site 1

#	Description	View
28	Building foundation near road to MOC	N
29	View from edge of airstrip looking East.	E
30	Settlement Cracking on the edge of Runway	NE

Location NE Cape Date

Project / Client 5FGA4600 / USACE

31	Surface sheen (possibly biogenic)	NE
32	on surface water ponded on East	
	Side of Runway	
33	Location of previous	N
	Samples at Suai River	
34	Test pit location (10NC09SB01-SB04 09-15).	S
35	Views of historic test pit location,	E
36	(Samples 10NC01SB01-SB08).	E
37		NE
38	Site 10, approximate location of	SE
	southern excavation	
39	Site 10, view of regraded slope.	E
40	Debris, well casing material, site	Down
	10.	
41	Wood debris with paint	Down
Site 11		
42	Site 11 view NE	NE
	Monitoring Well MW10-1	
	in figure	
43	Site 11 view west	W
44	Photo of "new" MW west	Down
	of 10-1, 14MW06	
45	Poor revegetation near	W
	new well	

Location NE Cape Date

Project / Client 5FGA4600 / USACE

46	Photo of Site 11	N
47	Wood debris	Down
Site 27		
48/49	Abandoned well 88-4	Down
50	Metal debris	Down
51	New well north of 88-4 (14MW05)	Down
52	View of Site 27	South East
53	Veg. regrowth	W
~~54 MW 8~~ HH		
Site 19		
54	MW 88-3 (SITE 11)	Down
55	View of Site ~~11~~	NW
Site 27		
56	14MW04	Down
MOC		
57	14MW03 (Site 13)	Down
58	14MW02 (Site 13)	Down
59	14MW01 (Site 16)	Down
60	Rubber Matting in	NW
	Depression (Site 16)	
~~70~~ 61 HH	Abandoned well MW16-3	Down
62 HH	17MW01	Down
Site 21		
~~22~~ HH 63	View	E

Location NE Cape Date

Project / Client SFGA4600 / USACE

~~73~~ ~~HH~~ 64/65	View	W
65	Irregular topography	N
~~66~~ 67	Rock pile	W
6	Site 19	
68	Peter standing on excavation H	W
69	Concrete pad	SW
70	Abandoned well	Down
	Site 15	
71	View	SE
	Site 13	
72	View	W
	Site 16	
73/74	View	N
	Site 13	
75	Slightly stressed veg on edge of site 13	~~A~~ SE
	Site 8	
76	View	N
77	View	S
78/79	Stream	W
80	Artesian well	S
	Site 9	
81	View from middle	E

Location NE Cape Date

Project / Client SFGA4600 / USACE

82	Slight settling on landfill cap	W
83	Vegetation regrowth on the landfill cap	W
84/85	Diversion trench	E
86	Diversion trench	NE
87	Silt fence	NW/Down
88	Metal debris	Down
89	Settling on cap	W
90	Surface water adjacent to landfill cap	N
91	View	~~E~~ W
	Site 7	
92	Identified low spot	SE
93	low spot on landfill cap	S
94	Low spot on landfill cap	SE
95	minor cracking at NE edge of landfill	NW
96	debris remaining near pond on NNW side of landfill	SW
97	debris near pond	down
98	debris near pond	SE
99	debris on NW side of landfill; ~~tarr~~ rm / rubber matting	SE

Location ______________ Date ______________

Project / Client ______________

100	Shallow rut on SW side of landfill	N
101	Culvert allowing surface water drainage off SSE edge of landfill.	pm ~~SW~~ pm ~~SE~~ SW
102	Road toward fish camp crossing landfill	NE
103	Armored rock on E side of landfill	NE
~~10~~ HH	<u>Site 18</u>	
104/05	Asbestos tape	Down/N
	<u>Site 6</u>	
106	Small hole off NW edge of gravel pad	NE
107	View in hole with placard (3432) debris	Down
108	View of dry ponds to the west of gravel pad	W
109	View of dry ponds to the SW of gravel pad	E
110	View of camp setup	NE
111	Pond to the South of gravel pad	NW
112	Minor earthwork done on eastern edge of gravel pad	NW
113	Camp greywater discharge setup	S
114	Camp tent setup configuration, with	N

Location ______________ Date ______________

Project / Client ______________

(cont.)	55-gal ast and containment.	
115	Wood debris in pond bed to the east of camp.	N
116	Culvert to the west of Site 9 landfill	NW
117	culvert	down
118	culvert	S
119	Site 28. Sheen on surface water near MW10-1	N/A
120	Site 28 - Sheen on surface water near MW10-1	N/A
121	Pond near MOC border with Site 28	N
122	Sheen on surface water, Site 28	Down
123	partially-buried rubber matting, Site 28	E
124	Pond in site 28	N
125	Stressed vegetation in Site 28	SE
126	rubber tubing debris, Site 28	down
127	Pond in site 28,	NE
128	Wood debris, Site 28	pm ~~N~~ SW
129	1" metal piping through Site 28	N
130	utility pole base in Site 28 pond	NE
131	Tarp debris	E
132	utility pole base in pond	N
133	fallen utility pole w/ creosote covering	down
134	utility pole with creosote covering	down
135	utility pole with creosote covering	down
136	fallen utility pole	down

Location ______________________ Date ____________

Project / Client ______________________________

~~Officejet Pro 6830~~ PM

137	fallen utility pole	W/A
138	plywood debris	W
139	main site 28 channel through grass	N
140	site 28 confluence w/ Sugi River.	W
141	Site 28 channel	S
142	Site 28 channel branch	SE
143	Sheen on pond at site 28	down
144	14MW0 full of water	down
145	Site 28 pond with sheen	N
146	Seeps below 14MWØ4	S
147	Seep and pond below 14MWØ4	S
148	Seep below 14MWØ5	S
149	Seep below 14MWØ6	S
150	Seep below 14MWØ6	S
151	Seep below 14MWØ6	down
152	well MW10-1 in marshy area	NE
153	well MW10-1 in marshy area	N
154	Straw wattle at MOC/site 28 border	E
155	plywood debris site 28	E
156	reindeer herd tracks site 28	NE
157	replicate photo of site 28 main channel	S
158	Sediment probe technique	N
159	Site 7 monument area	N
160	Site 7 monument	N/A

The manufacturers of *Rite in the Rain* all-weather writing products are grateful to the numerous environmental experts who have contributed to the development of this book. Should you have any additions, improvements or corrections for future publications of this field book or have suggestions for other environmental field book formats, we welcome your input.

Although much effort has been taken to ensure the accuracy of the following reference pages, J L Darling LLC cannot guarantee the accuracy of the data.

To provide input or solicit pricing on these or custom printed field books, contact your *Rite in the Rain* dealer or J L Darling LLC, 253-922-5000 or fax 253-922-5300.

www.RiteintheRain.com / sales@riteintherain.com

Common Field Data Error Codes

Error codes are used to explain common mistakes and are written above or close to the mistake.
Commonly used error codes include:

- RE Recording Error
- CE Calculation Error
- TE Transcription Error
- SE Spelling Error
- CL Changed for Clarity
- DC Original Sample Description Changed After Further Evaluation
- WO Write Over
- NI Not Initialed and Dated at Time of Entry
- OB Not Recorded at the Time of Initial Observation

Note: Error code should be circled, dated, and initialed when recorded.

Hazard Classifications

Class 1 Explosives
Class 2 Gas
Class 3 Flammable Liquid
Class 4 Flammable Solids (Potential spontaneous combustion, or emission of flammable gases when in contact with water)
Class 5 Oxidizing Substances and Organic Peroxides
Class 6 Toxic (poisonous) and infectious substances
Class 7 Radioactive material
Class 8 Corrosives
Class 9 Miscellaneous dangerous goods

Container type abbreviations (for sampling guidelines)

BR - Boston Round • ABR - Amber Boston Round • AJ - Amber Jug • AWM - Amber Wide Mouth • Poly - Polyethylene Bottles • BOD - Bottle • CWM - Clear Wide Mouth

APPENDIX D

PUBLIC NOTICES

Publisher's Affidavit

UNITED STATES OF AMERICA,

State Of Alaska } SS:

Second Division

Nils Hahn, being first duly sworn on oath deposes and says:

That I am and was at all times herein this affidavit mentioned,

Ad manager

of THE NOME NUGGET, a newspaper of general circulation and published weekly at Nome, Second Division, State of Alaska, and online that the US Army Corps of Engineers announces Start of Five-Year Review

a printed copy of which is hereto annexed, was published in said paper once and every week for one successive and consecutive weeks in the issues of the following dates:

3.29.2018

SUBSCRIBED and SWORN to before me this

29 day of March, 20 18

State of Alaska
NOTARY PUBLIC
Diana Haecker
My Commission Expires Oct. 1, 2020

NOTARY PUBLIC in and for the State of Alaska.

My commission expires

Oct 1. 2020

US Army Corps of Engineers Announces Start of Five-Year Review

The Unites States Army Corps of Engineers at Joint Base Elmendorf-Richardson (JBER) announces the beginning of the Five-Year Review of cleanup remedies being implemented at the Northeast Cape Formerly Used Defense Site located on St. Lawrence Island, Alaska.

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Section 121, and the National Contingency Plan require that remedial actions which result in any hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure be subject to a five-year review.

The purpose of the Five-Year Review is to evaluate whether the remedies selected to clean up contaminated sites are operating as designed and remain protective of human health and the environment.

The community is encouraged to participate in the review process. A public meeting to review the five-year review process will be held at the Savoonga City Hall on 11 April 2018 at 2:00 pm.

Detailed information concerning the Northeast Cape cleanup effort is available at the following information repositories:

Alaska Resources Library & Information Services,
University of Alaska, Anchorage
3211 Providence Drive
(907) 786-1871

Savoonga City Hall
(907) 984-6614

Gambell Sivuqaq Lodge
(907) 985-5335

The findings of the Five-Year Review will be available after February 2020.

Interested persons can participate in the Five-Year Review process through August 2018 by responding to a questionnaire available from:

Kevin Maher, Jacobs Engineering
949 E 36th, Suite 500
Anchorage, AK 99508
kevin.maher@jacobs.com (907) 762-1500

Information on the cleanup process is shared with interested persons through periodic Northeast Cape public meetings held in Savoonga, Alaska. If you would like to be added to the contact list, then please contact USACE Public Affairs at (907) 753-2615 or POA-FUDS@usace.army.mil

ADDITIONAL INFORMATION

Documents pertaining to Northeast Cape background information and the decision documents for Northeast Cape are on file at the following Information Repository locations:

Alaska Resources Library and Information Services, University of Alaska, Anchorage 3211 Providence Drive (907) 786-1871	Savoonga City Hall (907) 984-6614	Gambell Sivuqaq Lodge (907) 985-5335

Information on the cleanup process is shared with interested persons through periodic Northeast Cape public meetings held in Savoonga, Alaska. If you would like to be added to the contact list, please contact USACE Public Affairs at (907) 753-2615 or POA-FUDS@usace.army.mil

US ARMY CORPS OF ENGINEERS
Alaska District
P.O. Box 6898 (CEPOA-PM-ESP)
JBER, AK 99506-0898

OFFICIAL BUSINESS

DELIVER TO:

FIVE-YEAR REVIEW
NORTHEAST CAPE FORMERLY USED DEFENSE SITE
ST. LAWRENCE ISLAND, ALASKA

March 2018

FIVE-YEAR REVIEW

The United States Army Corps of Engineers (USACE) at Joint Base Elmendorf Richardson is conducting a Five-Year Review of remedial actions implemented at the Northeast Cape Formerly Used Defense Site located on St. Lawrence Island, Alaska.

The Five-Year Review is a detailed evaluation of the implementation and performance of the selected remedy (i.e., the environmental cleanup work). The objective of the evaluation is to document if cleanup activities (or "remedies") are protecting people and the environment from contamination. If the remedies are not protective, the Five-Year Review makes recommendations to improve protectiveness. Federal regulations require this type of evaluation, and the Alaska Department of Environmental Conservation (ADEC) will review the process to ensure completeness and accuracy. This will be the second five-year review for Northeast Cape.

SITES INCLUDED IN THE FIVE-YEAR REVIEW

Based on the signed decision document, remedial actions were selected for various sites to address surface soil, subsurface soil, groundwater, and sediment, contaminated with polychlorinated biphenyls (PCB), diesel-range organics (DRO), residual-range organics (RRO), arsenic, benzene, and naphthalene. These actions include.

Site Number and Name		Action
Site 1	Air Strip	EX/D
Site 3	Fuel Pumphouse	EX/D
Site 6	Gravel Pad	EX/D
Site 7	Cargo Beach Road Landfill	C/LUC
Site 8	Petroleum, Oil, and Lubricant Spill	MNA/LUC
Site 9	Housing and Operations Landfill	C/LUC
Site 10	Buried Drums	EX/D and MNA/LUC[1]
Site 11	Fuel Tanks	EX/D and MNA/LUC[1]
Site 13	Heat and Power Plant	EX/D and MNA/LUC[1]

Site Number and Name		Action
Site 15	Fuel Pipeline	EX/D and MNA/LUC[1]
Site 16	Paint and Dope Storage	EX/D
Site 19	Auto Maintenance	EX/D and MNA/LUC[1]
Site 21	Wastewater Tank	EX/D
Site 27	Diesel Fuel Pump	EX/D and MNA/LUC[1]
Site 28	Drainage Basin	EX/D
Site 29	Suqitughneq River	Incidental Debris Removal
Site 31	White Alice Communications	EX/D
Site 32	Lower Tramway	EX/D

Notes:
EX/D – Excavation with disposal or treatment
MNA/LUC – Monitored natural attenuation with land use controls
C/LUC – Capping with land use controls
[1]Although chemical oxidation was identified as the primary remedy in the decision document, it was not implemented. The decision document contingency remedy, excavation of soil and monitored natural attenuation of groundwater, will be implemented.

COMMUNITY INVOLVEMENT

The community is encouraged to participate in the review process. A public meeting to review the five-year review process will be held at the Savoonga City Hall on 11 April 2018 at 2:00 pm. For those in other locations, please join us via teleconference using the toll free call-in number:

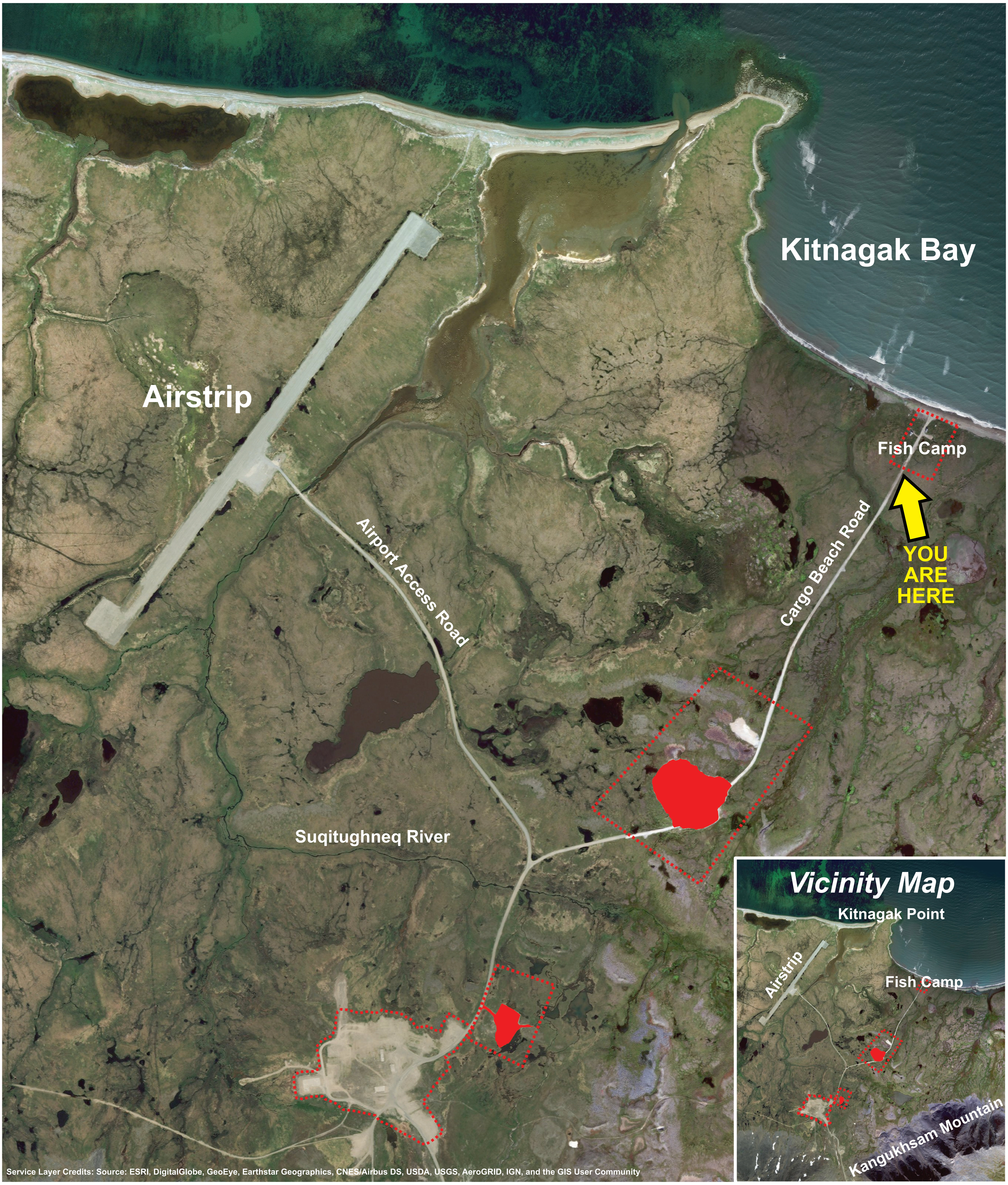
Toll Free Call-in Number: 1-855-209-1113
Access Code: 9077513429

Public comments may be provided immediately following a public meeting in Savoonga, or by responding to a written questionnaire through August 2018. The questionnaire can be requested from and comments submitted to:

Kevin Maher, Jacobs Engineering Group Inc.
949 E. 36th Ave Suite 500
Anchorage, AK 99508
kevin.maher@jacobs.com (907) 762-1500

U.S. Army Corps of Engineers
Northeast Cape Formerly Used Defense Site
Land Use Controls Map

U.S. ARMY CORPS OF ENGINEERS - ALASKA DISTRICT PUBLIC AFFAIRS OFFICE
907-753-2522, P.O. Box 6898, Joint Base Elmendorf-Richardson, AK 99506-0898



Legend

Groundwater Use for Drinking Water Not Recommended

Ground Disturbing Activities (Construction, Excavation, or Debris Removal) Not Recommended

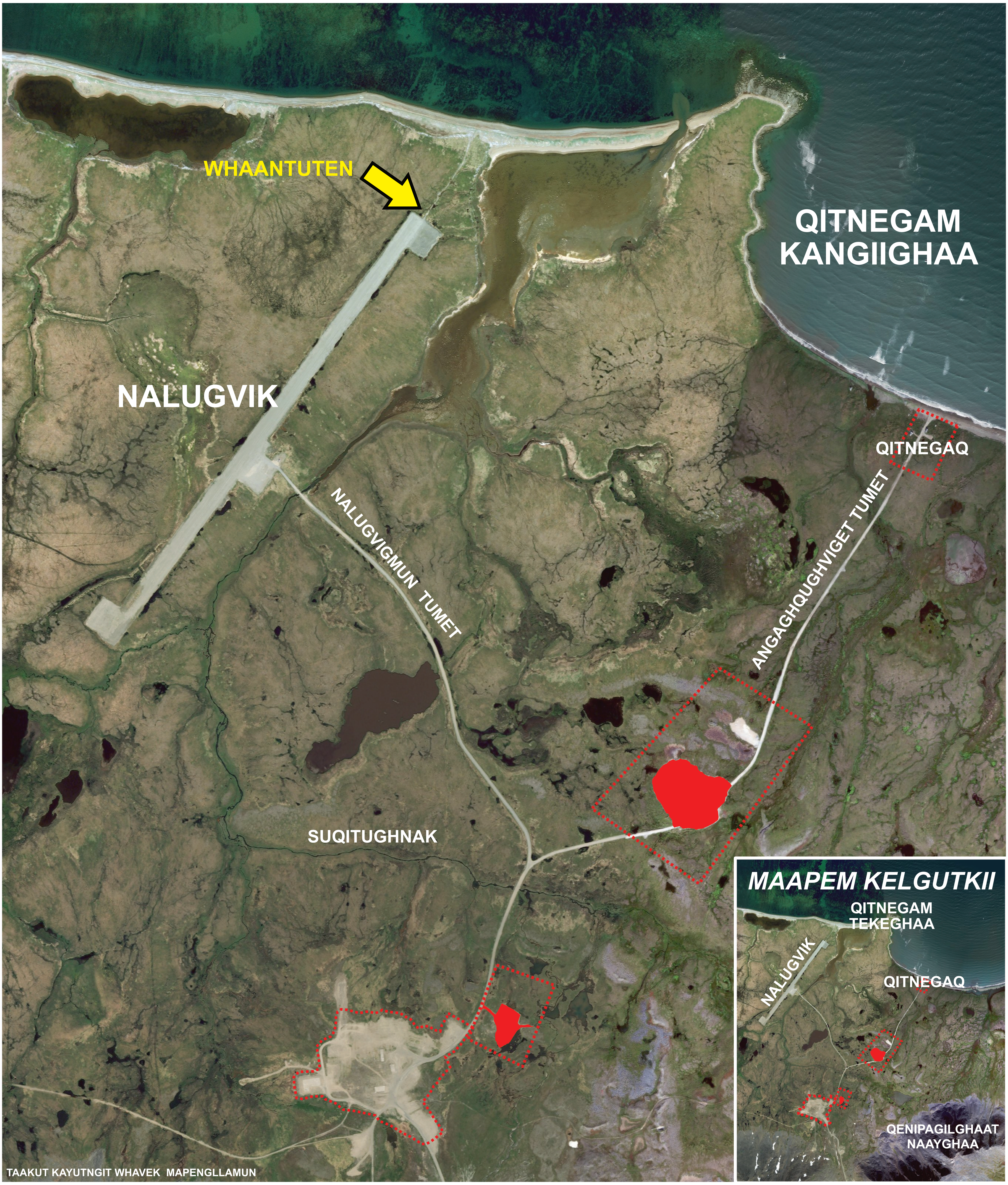
N

US ARMI KURET ENGINEER-NGIT

QITNEGAMELNGUQ NEKSAQANGA KELENGASIQ

KELGUTELGHET NATEN NUNA ATUQELEGHQAQ

US ARMI KURET ENGINEER-NGIT - ALASKA DISTRICT PUBLIC AFFAIRS OFFICE
907-753-2522, P.O. Box 6898, Joint Base Elmendorf-Richardson, AK 99506-0898



SAMENG PISII

MEQ NUNAMELGNUQ MEGHESNANILLEQ

NUNAM QAYVIGHQELLGHA IINGHULLUNI AYUQUQ
(ULIMAMUN, IIGGMUN, PEGHWAAGHET NUSUGRAMUN) IINGHUSAGUT

AYWAA

APPENDIX E

MNA GROUNDWATER ANNUAL SAMPLING REPORT AT THE NEC MOC

U.S. Army Corps of Engineers
Alaska District

SECOND PERIODIC REVIEW REPORT

APPENDIX E

2018 MNA GROUNDWATER ANNUAL SAMPLING REPORT AT THE NORTHEAST CAPE MAIN OPERATIONS COMPLEX

NORTHEAST CAPE FUDS
ST. LAWRENCE ISLAND, ALASKA

FUDS No. F10AK0969-03

FINAL
SEPTEMBER 2020

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TABLES

PHOTOGRAPHS (IN-TEXT)

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<u>SECTION</u>		<u>PAGE</u>

ATTACHMENTS

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ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
°F	degrees Fahrenheit
µg/L	microgram per liter
µS/cm	micro Siemens per centimeter
AAC	Alaska Administrative Code
AC&WS	Aircraft Control and Warning Station
ADEC	Alaska Department of Environmental Conservation
APPL	Agriculture & Priority Pollutants Laboratories, Inc.
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
btoc	below top of casing
COC	contaminant of concern
DD	decision document
DL	detection limit
DO	dissolved oxygen
DoD	U.S. Department of Defense
DQA	data quality assessment
DRO	diesel-range organics
DTW	depth to water
ECC	Environmental Compliance Consultants, Inc.
EPA	U.S. Environmental Protection Agency
ft	feet
FUDS	Formerly Used Defense Site
GRO	gasoline-range organics
GWE	groundwater elevation
HTRW	hazardous, toxic, and radiological waste
Jacobs	Jacobs Engineering Group Inc.
LOD	limit of detection
mg/L	milligrams per liter
MOC	Main Operations Complex
msl	mean sea level
mV	millivolt
ND	nondetect
NEC	Northeast Cape
NR	not recorded

ACRONYMS AND ABBREVIATIONS (Continued)

NTU	nephelometric turbidity units
ORP	oxidation-reduction potential
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
POL	petroleum, oil, and lubricants
PM	project manager
QC	quality control
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
RRO	residual-range organics
SIM	selective-ion monitoring
SOP	standard operating procedure
SSCL	site-specific cleanup level
Suqi River	Suqitughneq River
USACE	U.S. Army Corps of Engineers
UVOST	Ultraviolet Optical Screening Tool
VOC	volatile organic compound
WACS	White Alice Communications System
WP	work plan

EXECUTIVE SUMMARY

This report summarizes the continuing remedial action operations at the Main Operations Complex (MOC) at Northeast Cape on St. Lawrence Island, Alaska, conducted during August 2018. Environmental Compliance Consultants Inc. and Jacobs Engineering Group Inc. performed the fieldwork and prepared this report for the U.S. Army Corps of Engineers (USACE) under Hazardous, Toxic, and Radiological Wastes, Contract No. W911KB-17-D-0017, Task Order No. W911KB18F0020. This work was performed under the authority of the Defense Environmental Restoration Program and the Comprehensive Environmental Response, Compensation, and Liability Act. Activities completed during 2018 were conducted according to the *2018 Remedial Action Review Work Plan* (USACE 2018). Fieldwork included locating monitoring wells, measuring depths to groundwater, re-developing two monitoring wells (MW10-1 and 14MW04), and low-flow sampling of groundwater from the 15 currently serviceable monitoring wells at the MOC. Field data were used to infer groundwater elevations and the general groundwater flow direction, and field data and laboratory determinations of analyte concentrations supported the assessment of the natural attenuation of diesel-range organics (DRO) in groundwater.

All analytical results are compared to site-specific cleanup levels (SSCLs) established by the 2009 Decision Document (USACE 2018) and by Alaska Department of Environmental Conservation (ADEC) Alaska Administrative Code Title 18, Chapter 75, Method Two Table C groundwater cleanup levels (ADEC 2018).

The following findings are separated into two groups, findings based on the evaluation of 2018 MOC groundwater sampling data and findings based on the comparison of 2018 data to the historical data set:

- Findings for 2018 data evaluation:
  - The 2018 groundwater flow direction at the MOC is predominantly northwest, unchanged from previous sampling events.
  - DRO was the only analyte that exceeded groundwater SSCLs in 2018. The DRO plume is located along the northern margin of the MOC. DRO in samples collected from wells 14MW01, 14MW02, 14MW04, and 14MW05 exceeded the DRO SSCL of 1.5 mg/L at

2.0, 2.8, 1.8, and 3.1 mg/L, respectively. Groundwater from wells located in the central portion of the MOC did not exceed the DRO SSCL.

- Multiple analytes in groundwater sampled in 2018 exceeded the 2018 ADEC Method Two Table C groundwater cleanup levels. Comparisons of 2018 MOC groundwater results for analytes without an SSCL to 2018 ADEC Method Two Table C groundwater cleanup levels identified that naphthalene, 1-methylnaphthalene, 2-methylnaphthalene, and manganese were present above the 2018 ADEC Method Two Table C groundwater cleanup levels. Additionally, DRO and arsenic, analytes with SSCLs, exceeded the 2018 ADEC Method Two Table C groundwater cleanup levels.
- Current groundwater conditions (i.e., low concentrations of dissolved oxygen (DO), detectable concentrations of methane, and elevated concentrations of alkalinity and dissolved manganese) in wells 14MW04 and 14MW05 indicate natural attenuation is occurring at the MOC. Anaerobic processes are dominant for in-plume wells and aerobic processes are dominant at the margins of the plume.

• Findings for comparison of 2018 data with historical data:
  - The elevation of the groundwater table observed in 2018 was higher than the elevations observed and recorded in the previous three monitoring events at the MOC, and was the highest level observed during any sample year except at monitoring well 17MW1 in 2010 and 2011. Increases in DRO in many source area wells may be attributed to the high-water level via increased interaction with residual contamination in soil that was formerly above the water table.
  - No quantitative prediction of completion of attenuation at the MOC can be provided until decreasing DRO concentration trends are observed in all source area wells. Additional sampling is needed to overcome the variability in DRO concentration attributed to changing water levels from year to year. Qualitatively, it appears that natural attenuation will take decades rather than years.
  - DRO is demonstrably attenuating in two source area wells. At wells 14MW04 and 14MW05, DRO levels may reach the SSCL by 2020 or 2022 with attenuation complete by 2023 or 2030, respectively. The cleanup timeframes are based on geometric regression analyses using a small data set comprised of 2014, 2015, 2016, and 2018 results. Other in-plume monitoring wells at the MOC (14MW01, 14MW02) indicate DRO concentrations continue to increase based on statistical trends.

1.0 INTRODUCTION

This report presents the 2018 fieldwork activities and sample results and interpretations for Main Operations Complex (MOC) groundwater at Northeast Cape (NEC) Formerly Used Defense Site (FUDS) on St. Lawrence Island, Alaska. Environmental Compliance Consultants, Inc. (ECC) and Jacobs Engineering Group Inc. (Jacobs) performed the fieldwork and Jacobs prepared this report for the U.S. Army Corps of Engineers (USACE) under Hazardous, Toxic, and Radiological Waste (HTRW) Contract No. W911KB-17-D-0017, Task Order No. W911KB18F0020. This work was performed under the authority of the Defense Environmental Restoration Program and the Comprehensive Environmental Response, Compensation, and Liability Act.

Field activities were performed in accordance with the *2018 Remedial Action Review Work Plan* (WP) (USACE 2018), except for deviations noted in Section 4.0.

1.1 PROJECT GOALS AND OBJECTIVES

The project goals defined in the WP for the MOC were to sample and analyze groundwater for parameters relevant to the evaluation of natural attenuation and to assess trends, if any, for contaminants of concern (COCs) defined in the 2009 decision document (DD) (USACE 2018). Objectives completed to meet these goals include determination of groundwater elevations, re-development of two wells (MW10-1 and 14MW04), and low-flow sample collection and analysis from the 15 currently serviceable monitoring wells at the MOC.

1.2 REPORT ORGANIZATION

This report is organized as follows:

- Section 1.0 introduces the project, describes the project goals, and outlines the report organization.
- Section 2.0 describes the background of the site including physical characteristics and site history.
- Section 3.0 presents the key field personnel.

- Section 4.0 details deviations from the WP.
- Section 5.0 describes project mobilization, well re-development, sampling activities, waste management, and demobilization.
- Section 6.0 discusses investigation results.
- Section 7.0 presents conclusions derived from the field investigation and analytical data review.
- Section 8.0 lists the references cited in this document.

In addition to the main report, the following appendices provide further information:

- Attachment E-1 contains site figures, sampling locations, and analytical results.
- Attachment E-2 contains the data quality assessment (DQA).
- Attachment E-3 contains summarized historical analytical results tables and plots displaying trends over time.
- Attachment E-4 contains field documentation, including field logbooks and groundwater sampling data sheets.
- Attachment E-5 contains the photograph log.

2.0 BACKGROUND

The following sections present the NEC location, information about the physical and ecological setting, site history, and previous investigations at the MOC.

2.1 SITE DESCRIPTION

The NEC FUDS is located on St. Lawrence Island, Alaska, in the western portion of the Bering Sea, approximately 135 air miles southwest of Nome. It is 9 miles west of the northeastern cape of St. Lawrence Island at 63°19'N, 168°58'W. The NEC FUDS property originally encompassed approximately 4,800 acres (7.5 square miles) and is bordered by Kitnagak Bay to the northeast, Kangighsak Point to the northwest, and the Kinipaghulghat Mountains to the south (USACE 2015a).

NEC consists mainly of rolling tundra, which rises from the Bering Sea toward the base of the Kinipaghulghat Mountains. The Kinipaghulghat Mountains rise abruptly to an elevation of approximately 1,800 feet above mean sea level (msl) roughly 3 miles from the coastline. The NEC FUDS is not connected to other permanent communities on the island by road and is only accessible by air, water, or off-road vehicle trails. The Native Village of Savoonga, the closest community, is located approximately 60 miles to the northwest (Figure E-1).

2.1.1 Climate

St. Lawrence Island has a cool, moist, subarctic maritime climate, with some continental influences during winter when much of the Bering Sea is capped with pack ice. Winds and fog are common, and precipitation occurs approximately 300 days per year as light rain, mist, or snow. Annual snowfall is approximately 80 inches. Annual precipitation is about 16 inches, and more than half of the annual precipitation falls as light rain between June and September. Summer daily temperatures typically range between 34 degrees Fahrenheit (°F) and 48°F, with a record high of 65°F. Winter temperatures typically range from -2°F to 10°F, with an extreme low of -30°F. Freeze-up on the island normally occurs in October or November, and breakup normally occurs in June (USACE 2015b).

2.1.2 Geology

As described in the DD, St. Lawrence Island consists of isolated bedrock highlands of igneous, metamorphic, and older sedimentary rocks surrounded by unconsolidated surficial deposits overlying a relatively shallow erosional bedrock surface. The MOC is located at approximately 100 feet above msl. At the MOC, shallow unconsolidated surficial materials overlie quartz monzonitic rocks of the Kinipaghulghat Pluton (Patton and Csejtey 1980). The pluton forms the mountainous area south of the NEC sites, which includes Kangukhsam Mountain. The Suqitughneq River (Suqi River) drainage has created an erosional valley in the Kinipaghulghat Pluton and deposited an alluvial fan of unconsolidated sediments. NEC is located on this alluvial fan, which protrudes north from the mountain front toward the Bering Sea. Granitic bedrock is exposed at the coast north of the site, at Kitnagak Bay, which suggests that the quartz monzonitic bedrock is present at a relatively shallow depth beneath the unconsolidated materials as a wave-cut erosional platform.

In general, the native soil stratigraphy at NEC is characterized by silt near the surface overlying more sand-dominated soil at depth. The dark brown (in outcrops) to dark green (aqua-green or blue in some areas) and sometimes mottled silt contains varying quantities of clay/sand/gravel and varies from 0 to 10 feet in thickness. The sand at depth contains varying degrees of silt/gravel/cobbles and ranges from 2 feet to greater than 20 feet in thickness. These deeper, coarse-grained materials are generally unsorted and likely to be of glaciofluvial origin. The depth to bedrock at the NEC FUDS is unknown (USACE 2009).

2.1.3 Hydrogeology

The aquifer at the NEC FUDS MOC is contained within the unconsolidated alluvial material that underlies the area. The mountainous area to the south of the former installation is the recharge area for these unconsolidated materials, providing runoff from rain and snowmelt during the summer that permeates talus slopes and enters the alluvium. Based on the topography and geology of the site, the regional groundwater flow direction is expected to flow north across the site toward the Bering Sea from the mountainous recharge area to the south (USACE 2015b).

Groundwater elevations recorded in 2018 at the MOC sampling area wells ranged from approximately 61 to 80 feet above msl and exhibited depths from approximately 1 to 30 feet below ground surface (bgs). Groundwater appears to flow to the northwest. Depth to water at the MOC is greatest to the south, becoming progressively shallower toward the north; groundwater discharges to surface water in the drainage basin that runs through Site 28 at the north side of the MOC (USACE 2015b).

Key factors influencing the flow of groundwater at the site are permafrost and frozen soil, which render the unconsolidated materials effectively impermeable in some areas. The U.S. Geological Survey has classified St. Lawrence Island as an area of moderately thick to thin permafrost. Although the depth of permafrost at St. Lawrence Island is unknown, the base of permafrost on the mainland at Nome (135 air miles to the northeast) is estimated to be 120 feet bgs. The deeper unconsolidated deposits at the site are likely permafrost, and the shallow soil represent the active layer where soil freezes and thaws seasonally. Frozen soil has a profound effect in retarding groundwater flow during most of the year (USACE 2015b).

In addition to the Bering Sea that borders the NEC FUDS to the north, area surface water consists of small streams, small- to moderate-sized lakes, and marshy areas. Surface water generally flows northward from highland areas to the south. Small surface waterbodies are common throughout the area. The primary stream drainage in the area, the Suqi River, is fed by runoff from the prominent drainage of the Kinipaghulghat Mountain valley in the lower mountain area south of the former installation. Several smaller tributaries, originating from two small, unnamed lakes, feed the Suqi River as it flows north into Kitnagak Bay. Surface water flow in the area is highly dynamic, changing significantly over time. Significant changes in surface water characteristics have been noted at the NEC FUDS between field activities performed in 2014 as part of the First Five-Year Review (USACE 2015a) and field activities performed in 2018. During the 2018 field season, low water levels were observed in the ponds adjacent to Site 6, and completely dry ponds were observed at Site 3. In addition, surface water flow in the Site 8 drainage had been reduced to a small spring upwelling adjacent to the Suqi River (refer to Attachment E-5). Previous contractors undertaking remedial and removal actions at the FUDS have observed significant changes at multiple locations across the site. Water was encountered during excavations within the MOC ranging from 7 feet bgs in 2010 to approximately 12 feet bgs in 2012 (USACE 2015b). The variability of depth to groundwater at the MOC appears to be heavily influenced by proximity to wetlands near the Site 28 Drainage Basin, the seasonal spring thaw, and high levels of precipitation during the summer field season. Notable seasonal variation has been observed at a location directly south (uphill) from Site 26 where surface water runs through a culvert underneath the road that connects the MOC and Site 31 (USACE 2015b). This drainage originated in the Kinipaghulghat Mountains and exhibited variable flow in late spring/early summer. The drainage would flow for days at a time but would run dry later into the summer during drier periods.

2.1.4 Vegetation

Habitat types at the NEC area include moist tundra, alpine tundra, and bogs. Moist tundra is dominated by heaths, grasses, sedges, mosses, and lichens, with shrubs that include bearberry, dwarf birch, narrow-leaf Labrador tea, roseroot, coltsfoot, and willow. These plants typically grow in 1 to 3 feet of undecayed organic mat over saturated and frozen soil. Alpine tundra covers the slopes and exposed ridges of the nearby mountains and is comprised of dwarf, prostrate heaths and tundra species adapted to dry, thin soil. The NEC area has many low-lying areas with lakes, bogs, and poorly-drained soil (USACE 2015b).

2.1.5 Land and Resource Use

St. Lawrence Island residents from the villages of Gambell and Savoonga engage in year-round subsistence fishing, hunting, and gathering in the NEC area. Local subsistence hunting camp structures are located adjacent to Site 3 and are seasonally occupied (USACE 2009). During the 2018 field season, these structures were intermittently occupied. Additionally, residents from the villages of Gambell and Savoonga were observed in skiffs offshore from NEC. Discussions with community members indicated these fishermen were harvesting halibut. Currently, there are no permanent residents in the NEC area, but representatives of the Native Village of Savoonga have indicated a desire to re-establish a permanent residential community at the site in the future (USACE 2015a).

St. Lawrence Island supports habitats for the several protected species. Endangered or threatened species include the bowhead whale (endangered), polar bear (threatened), spectacled eider (endangered), Steller's eider (threatened), and the western distinct population segment of Steller sea lion (endangered). Walrus are protected under the Marine Mammal Protection Act.

Subsistence harvesting and hunting occur at NEC. The area is used for berry collection and reindeer subsistence hunting. The Suqi River, located within the NEC FUDS, is used for subsistence fishing. The ocean surrounding NEC is used extensively for subsistence activities including fishing and the hunting of whales, walrus, seals, and sea birds (USACE 2015a).

2.2 SITE HISTORY

NEC was constructed as an Aircraft Control and Warning Station (AC&WS) during 1950 and 1951 to provide radar coverage and surveillance for the Alaskan Air Command and later for the North American Air Defense Command as part of the Alaska Early Warning System. The site was activated in 1952, and a White Alice Communications System (WACS) station was added to the site in 1954. The AC&WS and WACS operations, supported by up to 212 personnel, were terminated in 1969 and 1972, respectively. Most military personnel were removed from the site by the end of 1969 (USACE 2015a).

NEC included housing areas, power plant facilities, fuel storage tanks, distribution lines, maintenance shops, wastewater treatment facilities, and landfills. The buildings and the majority of furnishings and equipment related to the AC&WS were initially abandoned in place due to the high cost of off-island transport (USACE 2015a).

In 1971, the villages of Gambell and Savoonga opted out of the Alaska Native Claims Settlement Act, which allowed them title to 1.136 million acres of land in the former St. Lawrence Island Reindeer Reserve, established in 1903. The Gambell Native Corporation and Savoonga Native Corporation (now known as Sivuqaq, Inc. and Kukulget, Inc., respectively) received titles to all of St. Lawrence Island (except U.S. Surveys 4235, 4237, 4340, 4369, and 3728) by Interim Conveyance No. 203 dated 21 June 1979 and finalized

2 December 1980. In 1982, the Navy obtained approximately 26 acres of land containing the former WACS. The land transfer was later deemed invalid and property ownership reverted to Sivuqaq, Inc. and Kukulget, Inc.

Demolition and removal of the buildings and most other structures from 1990 through 2014 were completed under multiple USACE contracts (USACE 2015b). The runway, improved gravel roads, and concrete slabs of some of the former structures remain intact. Four remedial investigations (RIs) were conducted at the NEC FUDS between 1994 and 2004, during which environmental concerns were grouped into 34 individual sites (USACE 2015a). Following the feasibility study in 2007 (USACE 2007) and completion of the DD in September of 2009, remedial actions occurred through 2014 (USACE 2015b).

2.2.1 Main Operations Complex

Sites 10 through 22, 26, and 27 are collectively referred to as the MOC (Figure E-2) and included the majority of site infrastructure such as buildings, heat and power supply, fuel storage tanks, maintenance shops, and housing. All aboveground portions of MOC structures have been demolished, but concrete foundations, pads, and backfilled utilidors remain. Fuel tanks and fuel distribution piping have been removed.

The primary sources of contamination at NEC are spills and leaks of fuel products associated with the former aboveground storage tanks, underground storage tanks, and associated piping. Other sources include polychlorinated biphenyls (PCBs) from transformers and electrical equipment, and vehicle maintenance fluids, such as glycol and solvent, from maintenance shops. Individual sites within the MOC were grouped to facilitate evaluation of an overall response action for the known contamination (USACE 2015a). These sites are located broadly across the central and eastern portion of the MOC.

The largest documented spill at NEC occurred in March 1967 when a plow truck hit petroleum, oil, and lubricant (POL) Tank No. 2, resulting in the release of approximately 30,000 gallons of fuel. As noted in the *First Five-Year Review Report, Northeast Cape FUDS* (USACE 2015a), interviews with former installation personnel suggest there were several undocumented incidents of spills greater than 30,000 gallons from the large aboveground storage tanks (USACE 2015a).

Based on the results of the excavation and removal activities, the northernmost edge of the area excavated at the MOC contains petroleum in subsurface soil at concentrations that are below the risk-based site-specific cleanup levels (SSCLs) specified in the 2009 DD. Additional excavation further northward was not performed due to the likelihood that excavation would have resulted in greater damage to the downgradient wetland area known as the Site 28 Drainage Basin. Residual contamination exceeding the soil SSCLs remains within the Site 28 Drainage Basin downgradient of the MOC.

Shallow groundwater is contaminated throughout the northern portion of the MOC. The DD-specified COCs in groundwater are gasoline-range organics (GRO), diesel-range organics (DRO), residual-range organics (RRO), benzene, ethylbenzene, arsenic, and lead (USACE 2009).

RIs were conducted in 1994, 1996, 1998, 2001, 2002, and 2004. The sampling results indicated soil and groundwater contained petroleum compounds at elevated levels. An in situ chemical oxidation pilot test was completed at the MOC in 2009. Results indicated that in situ chemical oxidation was not an effective means of remediating the petroleum-contaminated soil present at the MOC due to the peat and organic silts in the soil, the presence of permafrost and/or frozen zones, and the observation of preferential flow zones (USACE 2010). As a result, the alternate remedy of excavation and removal was implemented. In 2010, data collected using Ultraviolet Optical Screening Tool (UVOST) technology combined with a Geoprobe direct-push drill rig were used to plan petroleum-contaminated soil excavation. These plans were used from 2011 through 2014 to guide excavation of soil with DRO concentrations above the SSCL of 9,200 milligrams per kilogram. In 2014, field-screening soil samples were collected and analyzed by an Environmental Laboratory Accreditation Program-certified and Alaska Department of Environmental Conservation (ADEC)-approved onsite field laboratory to further guide excavation. Confirmation samples were collected upon completion of excavation activities and submitted to a fixed-base laboratory for analysis. Excavation and removal activities conducted from 2011 through 2013 also addressed concrete and soil contaminated with PCBs (USACE 2015a).

Several monitoring wells have been installed and removed over time at the MOC. Monitoring well installation at the MOC began during RIs and continued through 2014 (USACE 2015b). Previous groundwater sampling events from 2002 through 2015 collected groundwater from various combinations of monitoring wells (USACE 2017). Currently, there are 15 serviceable monitoring wells at the MOC (installed between 2002 and 2014): 17MW-1, 20MW-1, 22MW2, 26MW1, MW10-1, MW88-1, MW88-3, MW88-10, 14MW01, 14MW02, 14MW03, 14MW04, 14MW05, 14MW06, and 14MW07 (Figure E-3).

The current groundwater monitoring wells at the MOC can be grouped according to position relative to contamination. Wells 26MW1, 22MW2, 20MW-1, and 14MW07 are located upgradient of all known petroleum sources; wells 17MW1 and MW10-1 are crossgradient to known petroleum sources; and wells MW88-1, MW88-3, MW88-10, 14MW01, 14MW02, 14MW03, 14MW04, 14MW05, and 14MW06 are within petroleum source areas. Soil samples collected during well installation were analyzed for analytical suites that variably included GRO, DRO, RRO, benzene, toluene, ethylbenzene, and xylenes (BTEX), polycyclic aromatic hydrocarbons (PAHs), PCBs, total organic carbon, and metals. None of the soil samples exceeded SSCLs (USACE 2002, 2003, 2005, 2015b).

Groundwater samples collected at the MOC in both 2002 and 2004 were analyzed for GRO, DRO, RRO, and BTEX (USACE 2003, 2005). Additional analytes in 2002 included alkalinity, sulfate, methane, ethane, and ethene (USACE 2003) while in 2004 additional analytes included PAHs, total organic carbon, and metals (USACE 2005). Groundwater samples collected in 2002 and 2004 exceeded the future SSCL for GRO, DRO, RRO, benzene, and lead in wells MW88-3, MW88-4, MW88-5, MW88-10, and 20MW-1 (Table E-2-1).

Table E-2-1
Historical Groundwater Results Above SSCLs

Well ID	Year	Contaminant	SSCL (mg/L)	Result (mg/L)
14MW02	2015	DRO	1.5	1.6
	2016	DRO	1.5	1.6
14MW03	2014	DRO	1.5	2.4
		Total Lead	0.015	0.062
	2015	Total Lead	0.015	0.015
14MW04	2014	DRO	1.5	2.5
	2015	DRO	1.5	2.8 QN
	2016	DRO	1.5	2.2 QL
		Total Lead	0.015	0.0582
		Dissolved Lead	0.015	0.0349
14MW05	2014	DRO	1.5	4.9
	2015	DRO	1.5	12
	2016	DRO	1.5	3.2 QL
14MW06	2014	DRO	1.5	5.2 QL
	2015	DRO	1.5	2.3
14MW07	2014	Total Lead	0.015	0.13
20MW1	2004	Total Lead	0.015	0.0517
MW88-1	2012	DRO	1.5	1.9
MW88-3	2002	DRO	1.5	34
MW88-4	2002	DRO	1.5	72
				56*
		RRO	1.1	1.9
				1.3*
		Benzene	0.005	0.03
				0.03*
	2004	DRO	1.5	3.89
				3.82 J*
				3.49*
		RRO	1.1	1.46 B
				1.11 B*
		Benzene	0.005	0.033
				0.0337*
				0.0276*
	2010	DRO	1.5	3.3
				3.2*
	2011	DRO	1.5	2.3
		Benzene	0.005	0.0094
		Dissolved Arsenic	0.01	0.011
	2012	DRO	1.5	2.0
				1.8*
		Total Arsenic	0.01	0.011

Table E-2-1 (Continued)
Historical Groundwater Results Above SSCLs

Well ID	Year	Contaminant	SSCL (mg/L)	Result (mg/L)
				0.011*
		Dissolved Arsenic	0.01	0.011
MW88-5	2002	DRO	1.5	9.5
		RRO	1.1	2.3
		Benzene	0.005	0.019
	2004	GRO	1.3	1.5 J
		DRO	1.5	11.3
		RRO	1.1	2.28 B
		Benzene	0.005	0.0297
	2010	DRO	1.5	12
		RRO	1.1	1.6
		Benzene	0.005	0.0093
	2011	DRO	1.5	7.5
				7.2*
		RRO	1.1	2.0
				1.8*
		Benzene	0.005	0.016
				0.02*
	2012	DRO	1.5	4.6
		Benzene	0.005	0.0064
MW88-10	2002	DRO	1.5	55
		RRO	1.1	1.3
	2004	Total Lead	0.015	0.0376
	2010	DRO	1.5	1.6

Notes:
* = field duplicate
J – The analyte was positively identified; however, the associated result was less than the limit of quantitation but greater than or equal to the DL.
B – The analyte was detected in the method blank, the trip blank, or equipment blank above the DL and the concentration in the sample did not exceed the blank concentration by a factor of five (factor of 10 for common laboratory contaminants acetone, toluene, and methylene chloride).
QL – Analyte result was considered an estimated value (biased low) due to a QC failure.
QN – Analyte result was considered an estimated value (unknown bias) due to a QC failure.
For definitions, refer to the Acronyms and Abbreviations section.

The DD in 2009 promulgated DRO, GRO, RRO, benzene, ethylbenzene, arsenic, and lead as COCs for groundwater at the MOC (USACE 2009). From 2010 through 2011, groundwater samples collected from monitoring wells at the MOC were analyzed for GRO, DRO, BTEX, PAHs, PCBs, methane, metals, and natural attenuation parameters including ferrous iron, manganese, sulfate, nitrate, alkalinity, conductivity, dissolved oxygen (DO), and oxidation-reduction potential (ORP) (USACE 2011, 2012). Beginning in 2012, the analyte list was expanded to include RRO (USACE 2013, 2014). In 2014 and 2015, volatile organic compounds (VOCs) and glycols were added to the analytical suite for well 10MW-1 (USACE 2015b, 2016). Groundwater samples collected between 2010 and 2015 exceeded SSCLs for DRO, RRO, benzene, arsenic, and lead. Monitoring wells MW88-4 and MW88-5 were removed in 2013 due to contaminated soil excavation. Prior to removal, final samples from these wells did not exceed SSCLs.

All samples collected from wells in 2016 were analyzed for GRO, DRO, RRO, BTEX, PAHs, PCBs, methane, sulfate, and alkalinity. Samples collected from wells MW10-1 and 14MW06 associated with Site 10 within the MOC were also analyzed for VOCs and glycols. Analytical results indicated that DRO and lead exceeded SSCLs. The 2016 groundwater sampling report (USACE 2017) concluded that natural attenuation of petroleum was occurring in groundwater at the MOC via anaerobic biological processes and that DRO levels were predicted to reach the SSCL by 2023 with attenuation complete in 2047.

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3.0 KEY FIELD PERSONNEL

The following table (Table E-3-1) lists key project field personnel and their responsibilities.

Table E-3-1
Key Personnel and Responsibilities

Title	Organizational Affiliation	Name	Responsibilities
Superintendent	Prime Contractor (ECC)	Stanley Seegars	Implemented, oversaw, and coordinated project activities and camp activities. Supported PM as needed.
Contractor QC System Manager	Subcontractor (Jacobs)	Kevin Maher Angela DiBerardino	Conducted field inspections and ensured field activities complied with planning documents and approved contract.
Site Safety and Health Officer	Prime Contractor (ECC)	Stanley Seegars	Developed, implemented, and oversaw all safety and health-related project aspects.
Field Sampler	Prime Contractor (ECC) Subcontractor (Jacobs)	Jessica Bay Admon Abuamsha Haley Huff Peter Mamrol	Collected field screening and analytical samples and managed and shipped analytical samples.
Sample Expediter	Prime Contractor (ECC)	Dan Mcgauhey	Expedited coolers with analytical samples from Bering Air to Alaska Airlines GoldStreak in Nome, Alaska.
Project Chemist	Subcontractor (Jacobs)	Nathaniel Gingery	Coordinated with the laboratory, reviewed data, and ensured data quality objectives were met.
Analytical Laboratory PM	Laboratory Subcontractor APPL	Greg Salata	Analyzed the samples in accordance with contract and QC requirements.
Emergency Medical Professional	Medical Subcontractor (Beacon)	Zackery Bauder	Provided medical services in accordance with contract.

Note:
For definitions, refer to the Acronyms and Abbreviations section.

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4.0 WORK PLAN DEVIATIONS

Deviations from the WP occurred during the execution of fieldwork. None of the deviations significantly affected data usability or data quality. The WP deviations include the following:

- Although the 2018 WP referenced Table C cleanup levels provided in the 18 AAC 75 promulgated in 2017, the USACE requested that the most recent ADEC levels be used for comparison purposes in this report. Analytical results from samples collected in 2018 were screened against SSCLs and Table C cleanup levels provided in Title 18 of the Alaska Administrative Code (AAC), Section 75 (18 AAC 75) promulgated in September 2018 (ADEC 2018).
- Groundwater samples for the DRO and RRO were collected and submitted to the laboratory in 1-liter glass amber jars versus the 250-milliliter glass amber jars the 2018 WP specified.
- Depth to groundwater measurements from the 15 currently serviceable monitoring wells at the MOC were collected over four days in conjunction with sampling rather than within a four-hour period prior to sampling activities as specified by the WP.

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5.0 FIELD ACTIVITIES

Field activities at NEC took place between July and August 2018. Activities at the MOC took place from 1 through 5 August 2018 and were one component of a larger NEC field effort which occurred from 31 July to 10 August 2018. Other field activities unrelated to the MOC sampling effort will be described in other reports. This section discusses the 2018 field activities at the MOC, which included re-developing wells, measuring groundwater depths, sampling groundwater, and managing waste. Activities were completed in accordance with the WP and the standard operating procedures (SOPs) included therein. Field notes were recorded in logbooks, well development data sheets, and groundwater sampling data sheets (Attachment E-4).

5.1 MOBILIZATION AND DEMOBILIZATION

Mobilization and demobilization occurred during July and August 2018, respectively. Jacobs personnel traveled from Anchorage to Nome via commercial airline on 31 July 2018 and then to St. Lawrence Island via Bering Air charter. ECC and USACE traveled to St. Lawrence Island via Security Aviation charter on 31 July 2018. Supplies for the camp were barged to St. Lawrence Island prior to the commencement of fieldwork. PRL Logistics, Inc. provided services for a remote camp at NEC (Photograph E-5-1). Field gear was transported to NEC on 31 July 2018 via Bering Air charter. Travel at NEC was achieved using utility task vehicles. The USACE project manager (PM) and ADEC PM arrived by Security Aviation charter on 6 August 2018. The USACE PM departed the same day on a Security Aviation charter while the ADEC PM departed by Bering Air charter on 8 August. All personnel demobilized from NEC via Bering Air charter or Security Aviation charter by 10 August 2018. Personnel demobilized by Bering Air traveled to Nome and returned to Anchorage via commercial airline. All other personnel were demobilized by Security Aviation directly to Anchorage. Camp crew remained on site and deconstructed the facilities.

The remote camp was dismantled and prepared for the barge. The barge departed NEC on 14 September 2018. The same day, a site walk was conducted by ECC and a PRL Logistics, Inc. representative. While conducting the site walk, a sinkhole was discovered along Airport Access

Road (Photograph E-5-2). Minor garbage was removed and disposed of in Nome. The water discharge area for the camp was inspected and there were no signs of damage from camp activity.

Photograph E-5-1: Overview of camp set-up. View facing north.

Photograph E-5-2: Sinkhole discovered during demobilization site walk along Airport Access Road. View facing southwest.

5.2 WELL RE-DEVELOPMENT

Two monitoring wells (MW10-1 and 14MW04) were re-developed prior to sampling with the intent to improve water yield and reduce turbidity in subsequent groundwater samples. A photoionization detector headspace reading was measured at each well prior to well re-development. Bailers were used at each well to remove sediment fines during the initial surging and purging process. A push rod device was utilized to dislodge sediment that accumulated at the bottom of the well casing. Once settled fines were removed and turbidity levels decreased, a submersible pump was utilized for the remainder of the surging and purging process. Purge water was collected in 55-gallon drums and barged offsite as nonhazardous waste (see Section 5.4).

Field stability parameters were measured and recorded during purging using a YSI water quality meter with flow through cell and a micro turbidimeter. These parameters included pH, temperature, conductivity, turbidity, DO, and ORP. Measurements were recorded at five-minute intervals. Well re-development was considered complete once the well reached stability or maximum volume was purged. Both wells reached stability.

5.3 GROUNDWATER SAMPLING

Prior to groundwater sampling at the 15 currently serviceable monitoring wells at the MOC, equipment used to measure field parameters was verified daily to be calibrated before use or it was recalibrated. The MiniRae 2000 photoionization detector, YSI 556 meter, and turbidimeter were calibrated using appropriate solutions and techniques, as needed. Equipment calibration verification and/or calibration information was recorded in calibration logs (Attachment E-4).

Water levels were measured at the start of sampling for each well over the course of the four-day sampling period (refer to Section 4.0 for work plan deviations). Low-flow methodology was used for purging and sampling. Wells were purged at rates between 0.1 and 0.5 liters per minute using a variable speed submersible pump. Water levels within the wells were monitored to ensure minimal drawdown of the water column. A drawdown of less than 0.3 feet was maintained during purging for all monitoring wells.

Field stability parameters were measured and recorded during purging using a YSI water quality meter with flow through cell and a micro turbidimeter (Photograph E-5-3). Parameters included pH, temperature, conductivity, turbidity, DO, and ORP. Readings were recorded at five-minute intervals (as short as three-minute intervals for MW88-1).

Photograph E-5-3: Purging groundwater at Monitoring Well 88-1.
View facing north.

Purge water was collected in 5-gallon buckets and transported to 55-gallon drums stored at the camp facility. The 55-gallon drums were barged offsite as nonhazardous waste (see Section 5.4).

Immediately following the completion of well purging, the inlet line was removed from the flow through cell and used to dispense groundwater directly into pre-preserved containers supplied by Agriculture & Priority Pollutants Laboratories, Inc. (APPL) of Clovis, California. Samples for specific analyses were collected in order of volatility from most volatile to least volatile.

Groundwater samples collected in 2018 were analyzed for multiple parameters. Samples were analyzed for DRO by Alaska Method 102 (AK102), RRO by AK103, PAHs by U.S. Environmental Protection Agency (EPA) Method SW8270D-selective-ion monitoring (SIM), PCBs by SW8082A, BTEX by EPA Method SW8260C, methane by RSK 175, sulfate by EPA Method 300.0, alkalinity by SM 2320B, and total Resource Conservation and Recovery Act (RCRA) metals plus nickel, vanadium, and zinc by EPA Method SW6020A/SW7470A. Samples from monitoring wells MW10-1 and 14MW06 associated with Site 10 within the MOC were also analyzed for VOCs by SW8260C and glycols by EPA Method SW8015C. Additionally, filtered groundwater samples were collected from all wells for analysis of dissolved metals (RCRA metals plus manganese, nickel, vanadium, and zinc) by EPA Method SW6020A/SW7470A using a disposable 0.45-micron in-line water filter following collection for the other parameters listed above. Field test kits were used to measure nitrate and ferrous iron per SOP K-6904 and SOP K-6210 (Attachment A-1 of the 2018 WP [USACE 2018]).

Samples were thermally preserved in the field using gel ice immediately after collection and then stored in a temperature regulated refrigerator maintained at 0 to 6 degrees Celsius (°C) until offsite shipment to the laboratory. All samples were shipped via Bering Air from NEC to Nome. In Nome the coolers were transferred to Alaska Airlines GoldStreak priority cargo from Nome to APPL. For more detail, see the sample summary table (Exhibit E-1 of the DQA [Attachment E-2]).

5.4 WASTE MANAGEMENT

Investigation-derived waste was transported and disposed of in accordance with all applicable local, state, and federal regulations. Investigation-derived waste included used personal protective equipment, sample tubing, decontamination water, and general refuse. Solid wastes were stored in contractor bags and incinerated at the camp site. Purge water generated from well re-development and sampling and wastewater generated during decontamination were collected in 5-gallon buckets and transferred to 55-gallon drums (Photograph E-5-4). The liquid waste was transported offsite as nonhazardous waste via barge. Waste tracking and manifests are presented in Appendix I.

Photograph E-5-4: Purged groundwater stored in 55-gallon drums.
View facing north.

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6.0 INVESTIGATION RESULTS AND DISCUSSION

The primary focus of this section is to summarize and interpret the 2018 field measurements and analytical results collected at the MOC. Groundwater elevation contours (Figure E-3) and selected natural attenuation parameters (Figures E-4.1 through E-4.8) and analytical results (Figures E-5 through E-12) are presented in Attachment E-1. Complete analytical results and the DQA for the 2018 data are included in Attachment E-2. Attachment E-3 presents summaries of groundwater data from the 2018 and historical monitoring events. Attachment E-3 includes tables and/or plots for groundwater elevation measurements, selected natural attenuation parameter measurements, selected analytical results, and DRO natural attenuation regression and trend analysis.

6.1 DATA QUALITY EVALUATION

Data quality was assessed by reviewing the laboratory case narrative, laboratory data deliverables, and completing ADEC checklists. A review of the analytical results and associated quality control (QC) samples was performed by the Jacobs Project Chemist, as per the 2018 WP (USACE 2018).

Data quality was evaluated against the following requirements: U.S. Department of Defense (DoD) Quality Systems Manual (DoD 2017); ADEC analytical methods (ADEC 2017); and laboratory limits. Qualifiers were applied to sample results that did not meet the project data quality objectives. Qualified results are considered estimated and, whenever possible, indicated as biased high or low. For data qualifier definitions, refer to the DQA (Attachment E-2).

The DQA found the overall quality of the project data to be acceptable, and no results were rejected. The DRO result for sample 20MW01 was reported from an analytical run outside of the 40-day extract hold time due to a bottle switch with 14MW01 during initial sample extraction. The complete data set, in addition to data validation details, is provided in the DQA (Attachment E-2).

6.2 GROUNDWATER ELEVATION

Water level measurements collected from each of the 15 currently serviceable monitoring wells at the MOC are provided in Table E-6-1. A comparison of the 2018 groundwater elevations to previous measurements is provided in Table E-6-2.

Groundwater elevations ranged from 61.14 to 80.03 feet above msl (Table E-6-1). The maximum groundwater elevation at the MOC in 2018 was 80.03 feet above msl at well 26MW1. Generally, groundwater elevation was highest in monitoring wells located along the southeastern perimeter of the MOC. Wells along the southern perimeter of the MOC also demonstrated the greatest differences in groundwater elevation between 2016 and 2018 (Table E-6-2; Plot E-3.1 in Attachment E-3), with the maximum change in elevation of 5.56 feet observed at well 26MW1. Based on data collected during the 2018 sampling event, groundwater flow at the MOC is predominantly northwest (Figures E-3).

Table E-6-1
2018 Depth to Groundwater and Groundwater Elevation Measurements from Currently Serviceable Monitoring Wells at the MOC

Well ID	Date and Time	Stick-Up (ft)	DTW (ft btoc)	DTW (ft bgs)	GWE[1] (ft msl)	Change in GWE[2] (ft)
14MW01	8/3/2018 13:10	-0.15	14.05	14.20	61.14	1.75
14MW02	8/5/2018 15:46	-0.30	7.84	8.14	62.74	2.96
14MW03	8/4/2018 12:11	-0.20	9.35	9.55	64.79	2.90
14MW04	8/5/2018 10:50	-0.48	2.05	2.53	65.03	1.65
14MW05	8/5/2018 16:55	-0.52	1.67	2.19	64.96	1.95
14MW06	8/5/2018 10:50	-0.50	1.16	1.66	69.76	2.81
14MW07	8/3/2018 16:20	-0.25	21.40	21.65	73.59	4.48
17MW-1	8/4/2018 09:22	-0.15	10.40	10.55	63.07	1.90
20MW-1	8/3/2018 17:25	-0.15	18.94	19.09	72.52	3.81
22MW2	8/2/2018 15:54	-0.45	22.99	23.44	72.95	5.03
26MW1	8/2/2018 11:57	-0.40	29.80	30.20	80.03	5.56
MW10-1	8/3/2018 15:02	2.20	2.68	0.48	71.02	0.30
MW88-1	8/4/2018 09:30	-0.15	12.84	12.99	71.66	4.25
MW88-10	8/4/2018 15:00	-0.35	16.62	16.97	72.17	4.42
MW88-3	8/5/2018 13:50	-0.20	8.18	8.38	71.52	4.34

Notes:
[1] Groundwater elevation calculated from top of casing elevation measurement presented in Figure 5 (USACE 2015b) and depth to water from top of casing measured in 2018.
[2] Difference in groundwater elevation from 2016 (USACE 2017) to 2018.
For definitions, refer to the Acronyms and Abbreviations section.

Table E-6-2
Historical Groundwater Elevation Measurements from Selected Monitoring Wells at the MOC

Well ID	GWE (ft msl)									
	2018[1]	2016[2]	2015[3]	2014[4]	2013[5]	2012[6]	2011[7]	2010[8]	2004[9]	2002[10]
14MW01	61.14	59.54	58.75	59.03	--	--	--	--	--	--
14MW02	62.74	60.08	59.16	59.32	--	--	--	--	--	--
14MW03	64.79	62.09	60.73	60.74	--	--	--	--	--	--
14MW04	65.03	63.86	62.42	62.66	--	--	--	--	--	--
14MW05	64.96	63.53	62.51	61.82	--	--	--	--	--	--
14MW06	69.76	67.45	66.42	65.27	--	--	--	--	--	--
14MW07	73.59	69.36	67.08	67.47	--	--	--	--	--	--
17MW-1	63.07	61.32	60.41	60.88	60.44	62.22	64.19	64.11	61.39	61.57
20MW-1	72.52	68.86	66.64	67.04	66.44	69.27	71.24	67.68	66.30	66.48
22MW2	72.95	68.37	66.02	66.46	65.92	69.14	65.69	67.27	65.51	65.9
26MW1	80.03	74.87	71.42	72.98	71.14	74.38	76.88	68.97	70.53	70.63
MW10-1	71.02	68.52	66.85	66.55	66.25	69.25	70.32	68.63	66.15	66.53
MW88-1	71.66	67.56	65.53	65.858	64.92	67.38	69.22	65.84	65.63	66.04
MW88-10	72.17	68.10	65.97	66.28	65.51	67.96	70.58	67.20	65.98	66.17
MW88-3	71.52	67.38	65.48	65.74	--	--	--	--	65.5	65.86
MW88-4[11]	--	--	--	--	--	62.41	63.06	62.11	60.53	60.62
MW88-5[11]	--	--	--	--	--	60.19	61.48	60.5	60.34	60.55

Notes:
[1] Groundwater elevation calculated from top of casing elevation measurement presented in Figure 5 (USACE 2015b) and depth to water from top of casing measured in 2018.
[2] Groundwater elevation presented in 2016 Annual Groundwater Sampling Report (USACE 2017).
[3] Groundwater elevation presented in 2015 Annual Groundwater Sampling Report (USACE 2016).
[4] Groundwater elevation presented in 2014 NEC HTRW Remedial Actions, Revision 1 (USACE 2015b).
[5] Groundwater elevation presented in NEC HTRW Remedial Actions (USACE 2014).
[6] Groundwater elevation presented in NEC HTRW Remedial Actions (USACE 2013).
[7] Groundwater elevation presented in NEC HTRW Remedial Actions (USACE 2012).
[8] Groundwater elevation presented in NEC HTRW Remedial Actions (USACE 2011).
[9] Groundwater elevation presented in Phase IV RI (USACE 2005).
[10] Groundwater elevation presented in Site Characterization Technical Memorandum 2002 Phase III RI Sites 13, 15, 19, 27, and 22 (USACE 2002).
[11] Wells not measured from 2013 through 2018 were removed before 2013 sampling because of soil excavation at the MOC.
-- not measured
For definitions, refer to the Acronyms and Abbreviations section.

The shallowest groundwater was observed along the northern edge of the MOC, where depth to groundwater was measured as shallow as 0.48 feet bgs (MW10-1). Several seeps were identified immediately downgradient from monitoring wells near the northern border of the MOC, where the groundwater appears to begin to intersect the surface at the Site 28 Drainage Basin (Photograph E-6-1). The groundwater seeps nearest to wells 14MW04, 14MW05, 14MW06 were measured at distances of 26 feet to the north, 44 feet to the north, and 18 feet to the north, respectively. Standing water accumulated over the duration of sampling activities at MW10-1 as the ground surface was depressed from foot traffic (Photograph E-6-2). Additional photographs of groundwater seeps along the border of the MOC and the Site 28 Drainage Basin are included in Attachment E-5.

Photograph E-6-1: Measuring distance to nearest groundwater seep downgradient of 14MW06.
View facing south.

Photograph E-6-2: Standing water at the base of MW10-1.
View facing east.

6.3 CONTAMINANTS IN GROUNDWATER

This section provides two assessments of groundwater at the MOC in 2018. The first assessment compares the 2018 MOC monitoring well data with the DD-established SSCLs to evaluate current site conditions with respect to cleanup goals. The second assessment compares the 2018 MOC monitoring well data with the new ADEC Method Two Table C groundwater cleanup levels promulgated in 2018 for informational purposes. New cleanup levels have been promulgated by the State of Alaska for some MOC groundwater COCs since the signing of the DD.

Filtered and unfiltered groundwater sample results are presented in this report as distinct results to evaluate whether suspended soil particles in unfiltered groundwater are contributing to measured metals concentrations. If suspended solids are present, then metals adsorbed to soil particles would be liberated by the nitric acid preservative in the sample bottles, resulting in higher dissolved metal concentrations than actually present in situ. Because there are no distinct SSCLs or 2018 ADEC Method Two Table C groundwater cleanup levels associated with filtered or unfiltered groundwater and the 2018 ADEC Method Two Table C groundwater cleanup levels are typically calculated considering only the water-soluble fraction, the comparison of 2018 MOC monitoring well data to the SSCLs and 2018 ADEC Method Two Table C groundwater cleanup levels will consider only dissolved metals.

6.3.1 Comparison of 2018 MOC Monitoring Well Data to DD-Specified Groundwater SSCLs

Groundwater collected from multiple wells at the MOC in 2018 exceeded the SSCL only for DRO. Historically, exceedances have also been seen for GRO, RRO, benzene, arsenic, and lead. Table E-6-3 shows the 2018 results for all analytes with current or historical SSCL exceedances.

Table E-6-3
2018 MOC Groundwater Sample Results Compared to SSCLs

Well ID	GRO[1] (mg/L)	DRO[2] (mg/L)	RRO[3] (mg/L)	Benzene[4] (mg/L)	Arsenic-Total[5] (mg/L)	Arsenic-Dissolved[5] (mg/L)	Lead-Total[5] (mg/L)	Lead-Dissolved[5] (mg/L)
SSCL	1.3	1.5	1.1	0.005	0.01	0.01	0.015	0.015
14MW01	--	**1.8**	ND [0.2] QL	ND [0.0003] QN	0.0039 J	0.0043 J	0.0006 J,B,QN	0.00022 J,B,QN
	--	**2.0**	ND [0.2]	ND [0.0003]	0.0038 J	0.0044 J	0.00086 J,B,QN	0.0005 J,B,QN
14MW02	--	**2.8**	ND [0.2]	ND [0.0003]	0.0017 J	0.0018 J	0.00074 J,B	ND [0.0004]
14MW03	--	1.3	ND [0.2]	ND [0.0003]	0.0022 J	0.0019 J	0.0023 J	ND [0.0004]
14MW04	--	**1.8**	ND [0.2]	0.00018 J	0.00054 J	0.00033 J	0.00095 J,B	ND [0.0004]
14MW05	--	**3.1**	ND [0.2]	ND [0.0003]	0.0029 J	0.0028 J	0.0023 J	0.00021 J,B
14MW06	--	**1.5**	ND [0.2]	ND [0.0003]	0.00089 J	0.00098 J	0.00058 J,B,QL	ND [0.0004] QL
14MW07	--	ND [0.05]	ND [0.2]	ND [0.0003]	ND [0.001]	ND [0.001]	0.00043 J,B	0.00035 J,B
17MW1	--	ND [0.05]	ND [0.2]	ND [0.0003]	ND [0.001]	ND [0.001]	0.00051 J,B	ND [0.0004]
20MW1	--	0.15 QL	ND [0.2]	ND [0.0003]	ND [0.001]	ND [0.001]	0.0036	0.0016 J
22MW2	--	ND [0.05]	ND [0.2]	ND [0.0003]	ND [0.001]	ND [0.001]	0.0029 J,QN	0.00032 J,B
	--	0.13 QN	0.12 J,QN	ND [0.0003]	ND [0.001]	ND [0.001]	0.0017 J,QN	ND [0.0004]
26MW1	--	ND [0.05]	ND [0.2]	ND [0.0003]	ND [0.001]	ND [0.001]	0.00033 J,B	0.00022 J,B
MW10-1	--	1.0	0.58	ND [0.0003]	0.00054 J	0.0004 J	0.0023 J	0.0012 J,B,QN
	--	0.98	0.56	ND [0.0003]	0.00065 J	0.00034 J	0.0023 J	0.00084 J,B,QN
MW88-1	--	0.42	ND [0.2]	ND [0.0003]	ND [0.001]	ND [0.001]	0.0024 J	0.00064 J,B
MW88-10	--	0.54	ND [0.2]	ND [0.0003]	ND [0.001]	ND [0.001]	0.00031 J,B	0.0017 J
MW88-3	--	0.85	ND [0.2]	ND [0.0003]	ND [0.001]	ND [0.001]	0.0046	0.00034 J,B

Notes:
[1] Not analyzed in 2018.
[2] Analyzed by Method AK102
[3] Analyzed by Method AK103
[4] Analyzed by Method SW8260C
[5] Analyzed by Method SW6020
[ ] = The LOD for ND analytical results.
Bold and highlighted text indicates result exceeding the SSCL (USACE 2009).
J – The analyte was positively identified; however, the associated result was less than the limit of quantitation but greater than or equal to the DL.
B – The analyte was detected in the method blank, the trip blank, or equipment blank above the DL and the concentration in the sample did not exceed the blank concentration by a factor of five (factor of 10 for common laboratory contaminants acetone, toluene, and methylene chloride).
QL – Analyte result was considered an estimated value (biased low) due to a QC failure.
QN – Analyte result was considered an estimated value (unknown bias) due to a QC failure.
For definitions, refer to the Acronyms and Abbreviations section.

DRO concentrations exceeded or equaled the DD-specified SSCL in five serviceable monitoring wells (14MW01, 14MW02, 14MW04, 14MW05, and 14MW06) at the MOC. All five wells are located on the northern (downgradient) edge of the MOC, as shown on Figures E-5 and E-12 (Attachment E-1). The highest DRO concentration was 3.1 mg/L at 14MW05, approximately twice the SSCL, and the lowest DRO exceedance equaled the SSCL of 1.5 mg/L in 14MW06. Notable DRO detections below the SSCL include 1.3 mg/L at well 14MW03 and 1.0 mg/L (duplicate of 0.98 mg/L) from well MW10-1, both in the northern portion of the MOC.

None of the monitoring wells located upgradient of known soil contamination at the MOC contained exceedances of the SSCLs or other notable detections.

6.3.2 Comparison of 2018 MOC Monitoring Well Data to 2018 ADEC Method Two Table C Groundwater Cleanup Levels

Groundwater from multiple wells exceeded the 2018 ADEC Method Two Table C groundwater cleanup levels for DRO, three fuel constituents (naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene), arsenic and manganese. Table E-6-4 shows the results for these analytes in all 15 sampled wells.

Table E-6-4
2018 MOC Groundwater Results Exceeding the 2018 ADEC Method Two Table C Groundwater Cleanup Levels

Well ID	DRO[2] (mg/L)	Naphthalene[2] (mg/L)	1-Methylnaphthalene[3] (mg/L)	2-Methylnaphthalene[3] (mg/L)	Arsenic-Total[3] (mg/L)	Arsenic-Dissolved[3] (mg/L)	Manganese-Dissolved[3] (mg/L)
Cleanup Level[1]	1.5	0.0017	0.017	0.036	0.00052	0.00052	0.43
14MW01	**1.8**	**0.023 QN**	**0.022**	0.025	**0.0039 J**	**0.0043 J**	**0.840**
	2	**0.022 QN**	**0.022**	0.024	**0.0038 J**	**0.0044 J**	**0.832**
14MW02	**2.8**	**0.029**	**0.030**	**0.041**	**0.0017 J**	**0.0018 J**	**0.807**
14MW03	1.3	**0.0023 QN**	0.0007	0.00035	**0.0022 J**	**0.0019 J**	**1.47**
14MW04	**1.8**	**0.0018**	0.00033	0.00011 J	**0.00054 J**	0.00033 J	**1.15**
14MW05	**3.1**	**0.0093**	0.0062	0.0014	**0.0029 J**	**0.0028 J**	**3.48**
14MW06	**1.5**	ND [0.0001]	ND [0.0001]	ND [0.0001]	**0.00089 J**	**0.00098 J**	**0.600**
14MW07	ND [0.05]	ND [0.0001] QN	ND [0.0001]	ND [0.0001]	ND [0.001]	ND [0.001]	0.0144
17MW1	ND [0.05]	ND [0.0001] QN	ND [0.0001]	ND [0.0001]	ND [0.001]	ND [0.001]	0.0021 J
20MW1	0.15 QL	ND [0.0001] QN	ND [0.0001]	ND [0.0001]	ND [0.001]	ND [0.001]	0.0202
22MW2	ND [0.05]	ND [0.0001] QN	ND [0.0001]	ND [0.0001]	ND [0.001]	ND [0.001]	0.0012 J
	0.13 QN	ND [0.0001] QN	ND [0.0001]	ND [0.0001]	ND [0.001]	ND [0.001]	0.0011 J
26MW1	ND [0.05]	ND [0.0001] QN	ND [0.0001]	ND [0.0001]	ND [0.001]	ND [0.001]	0.0033 J
MW10-1	1.0	ND [0.0001] QN	ND [0.0001]	ND [0.0001]	**0.00054 J**	0.00040 J	**0.457**
	0.98	ND [0.0001] QN	ND [0.0001]	ND [0.0001]	**0.00065 J**	0.00034 J	**0.519**
MW88-1	0.42	ND [0.0001] QN	ND [0.0001]	ND [0.0001]	ND [0.001]	ND [0.001]	0.058
MW88-10	0.54	ND [0.0001] QN	ND [0.0001]	ND [0.0001]	ND [0.001]	ND [0.001]	0.363
MW88-3	0.85	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.001]	ND [0.001]	0.42

Notes:
[1] Cleanup levels from Method Two, Table C, groundwater cleanup levels (ADEC 2018).
[1] Analyzed by Method AK102
[2] Analyzed by Method SW8270SIM
[3] Analyzed by Method SW6020
[ ] = The LOD for ND analytical results.
J – The analyte was positively identified; however, the associated result was less than the limit of quantitation but greater than or equal to the DL.
QN – Analyte result was considered an estimated value (unknown bias) due to a QC failure.
QL – Analyte result was considered an estimated value (biased low) due to a QC failure.
Bold and highlighted text indicates results exceeding 2018 ADEC Method Two Table C groundwater cleanup levels (ADEC 2018).
For definitions, refer to the Acronyms and Abbreviations section.

For a discussion regarding DRO results, refer to Section 6.3.1. Fuel constituents only exceeded 2018 ADEC Method Two Table C groundwater cleanup levels in former source area wells within the DRO plume. Naphthalene exceeded 2018 ADEC Method Two Table C groundwater cleanup levels in five of the 15 currently serviceable monitoring wells at the MOC (wells 14MW01 through 14MW05) (Figure E-6). 1-Methylnaphthalene exceeded 2018 ADEC Method Two Table C groundwater cleanup levels in wells 14MW01 and 14MW02 (Figure E-7). 2-Methylnaphthalene exceeded 2018 ADEC Method Two Table C groundwater cleanup levels in well 14MW02 (Figure E-8). Arsenic (Figure E-9) and manganese (Figure E-11) exceeded 2018 ADEC Method Two Table C groundwater cleanup levels in wells 14MW01 through 14MW06, and MW10-1 near the downgradient extent of the MOC.

6.3.3 Analyte Concentration Trends in Groundwater

Although DRO was the only COC to exceed the SSCL in 2018, exceedances for the remaining COCs (GRO, DRO, RRO, benzene, arsenic, and lead) occurred historically prior to 2013 when soil was excavated, and lead exceedances continued through 2016. Exceedances of the 2018 ADEC Method Two Table C groundwater cleanup levels have occurred throughout the 2004 to 2018 period of groundwater monitoring. Detailed trends are discussed in the following subsections.

No evidence of hexavalent chromium in groundwater exists at NEC, and no known anthropogenic source for chromium in groundwater has been identified (USACE 2009). In accordance with ADEC guidance and the 2018 ADEC Method Two Table C groundwater cleanup levels, analytical results reported for total chromium are considered to be trivalent chromium in the absence of an anthropogenic source of hexavalent chromium (ADEC 2018). Total chromium concentrations did not exceed 2018 ADEC Method Two Table C groundwater cleanup levels of 22 mg/L for chromium (III).

Attachment E-3 presents historical results (Table E-3.3 [Attachment E-3]) and trends over time at wells with three or more sampling events for COCs that historically exceeded the SSCL (Plots E-3.3.1 through E-3.3.17 [Attachment E-3]), and for fuel-related analytes that exceeded the 2018 ADEC Method Two Table C groundwater cleanup levels in 2018 (Plots E-3.3.18 through E-3.3.34 [Attachment E-3]).

6.3.3.1 DRO

DRO has historically exceeded the SSCL of 1.5 mg/L in 11 monitoring wells in the central and northern portion of the MOC (Figures E-5 and E-12). The highest DRO concentrations occurred in wells MW88-4, MW88-10, and MW88-3 in 2002 at 72 mg/L (56 mg/L duplicate sample), 55 mg/L, and 34 mg/L, respectively. Samples collected from these wells in 2004 were much lower; only the sample collected from well MW88-4 exceeded the SSCL at 3.89 mg/L. In well MW88-5, the highest DRO concentration of 12 mg/L was found in a sample collected in 2010. Samples collected from wells MW88-4 and MW88-5 exceeded the SSCL for DRO through 2012, after which both wells were decommissioned and removed due to the excavation of POL-contaminated soil.

DRO results for groundwater samples collected after completion of excavations in 2013 are generally lower than pre-excavation levels at monitoring wells MW88-1, MW88-10, and MW88-3. Other currently serviceable monitoring wells that existed prior to excavations (10MW-1, 17MW1, 20MW1, 22MW2, and 26MW1) show little overall trend, but these wells are crossgradient or upgradient relative to the excavations and have exhibited only low to moderate DRO levels below the SSCL throughout the period of record.

Seven monitoring wells were installed in 2014 and have been sampled four times. Six of these monitoring wells (14MW01 through 14MW06) are near the 2013 excavations, while the seventh monitoring well (14MW07) is upgradient on the eastern side of the MOC. Among the wells near the excavations, 14MW03, 14MW04, 14MW05, and 14MW06 show generally decreasing concentrations of DRO since 2014, whereas DRO concentrations have increased in 14MW01 and 14MW02. Only 14MW03 has consistently yielded DRO results less than the SSCL after 2014. The upgradient well (14MW07) has yielded only low to nondetect levels of DRO.

Comparison of results from the two most recent sampling events (2016 and 2018) for the nine source-area wells suggests that DRO concentrations in groundwater are not yet decreasing on the average for the MOC source area. Six wells yielded higher DRO concentrations in 2018 compared to 2016 while three yielded lower concentrations, a split that is highly likely if the average concentration is constant over time.

6.3.3.2 GRO

The most recent GRO exceedance in groundwater collected from the MOC was in historical well MW88-5 in 2004 (a result of 1.5 mg/L). Subsequent sampling events in 2010, 2011, and 2012 yielded GRO concentrations below the SSCL (results of 0.19 mg/L, 0.25 mg/L, and 0.16 mg/L, respectively). Well MW88-5 was removed during the 2013 soil excavations. GRO has not exceeded the SSCL at any of the 15 currently serviceable monitoring wells through 2016. GRO was not analyzed in 2018.

6.3.3.3 RRO

The most recent RRO exceedance in groundwater was in 2011 in historical well MW88-5 (a result of 2.0 mg/L). Subsequent sampling in 2012 yielded an RRO concentration below the SSCL (a result of 0.58 mg/L). Well MW88-5 was removed during the 2013 soil excavations. RRO also exceeded the SSCL in current well MW88-10 in 2002 (a result of 1.3 mg/L). All subsequent RRO results from MW88-10 were below the SSCL, with a nondetect result in 2018.

6.3.3.4 Benzene

The most recent benzene exceedance was in historical well MW88-5 in 2012 (a result of 0.0064 mg/L). Well MW88-5 was removed during the 2013 soil excavations. Benzene has not exceeded the SSCL in any of the 15 currently serviceable monitoring wells at any time.

6.3.3.5 Arsenic

The most recent arsenic exceedance was in historical well MW88-5 in 2012 (result of 0.011 mg/L). Well MW88-5 was removed during the 2013 soil excavations. Arsenic has not exceeded the SSCL in any of the 15 currently serviceable monitoring wells at any time. Since no anthropogenic source for arsenic in MOC groundwater exists, arsenic levels in MOC groundwater are not likely the result of military impacts at NEC (USACE 2009). Elevated arsenic concentrations in groundwater should be attributed to background concentrations (ADEC 2018).

6.3.3.6 Lead

Historical lead concentrations have been highly variable with no temporal trend or spatial correlation. Total lead has exceeded the SSCL of 0.015 mg/L six times across five monitoring wells (Figure E-10 [Attachment E-1], Table E-3.3 and Plots E-3.3.1 through E-3.3.17 [Attachment E-3]). The highest lead result was 0.13 mg/L from upgradient well 14MW07 in 2014 when this well was installed. Subsequent total lead results from this well were more than two orders of magnitude lower, while dissolved lead was either similar to total lead or also up to two orders of magnitude lower. Other SSCL exceedances for total lead came from 2004 (from upgradient wells 20MW1 and MW88-10), 2014 and 2015 (from source area well 14MW03), and 2015 and 2016 (from source area well 14MW04). The only exceedance for dissolved lead (a result of 0.0349 mg/L) came from 14MW04 in 2016. All samples collected in 2018 yielded total and dissolved lead concentrations below the SSCL. At 14MW04, with exceedances in 2016, concentrations fell to 0.00095 mg/L for total lead and nondetect for dissolved lead.

It seems probable that the variability in both total and dissolved lead is related to the presence of soil particles, some of which may be colloidal in size. Where reliably quantified, total lead is always larger than or equal to dissolved lead, implicating a source that is variably removed by filtration. A contribution from colloidal particles would explain the year-to-year variability of the filtered lead results, variability unmatched by any other analyte or water quality parameter. Future sampling will likely encounter similar variability, and multiple rounds of sampling would be needed to establish a lead exceedance. Presently, the 2018 results for lead indicate that there are no exceedances at the MOC.

6.3.3.7 Analytes above 2018 ADEC Method Two Table C Groundwater Cleanup Levels

Several analytes exceeded 2018 ADEC Method Two Table C groundwater cleanup levels: naphthalene, 1-methylnaphthalene, 2-methylnaphthalene, and manganese, which do not have

SSCLs; DRO and lead, whose SSCLs match the 2018 ADEC criteria and are discussed in Sections 6.3.3.1 and 6.3.3.6, respectively; and arsenic, whose SSCL is greater than the 2018 ADEC Method Two Table C groundwater cleanup level.

Naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene are fuel constituents and tend to vary in concert. Current and historical results are presented on Figures E-6, E-7, and E-8, respectively (Attachment E-1), and time-series plots of these contaminants as ratios relative to the 2018 ADEC Method Two Table C groundwater cleanup levels are presented in Plots E-3.3.18 through E-3.3.34 (Attachment E-3) for each current or historical monitoring well. Although concentrations of these contaminants in any given sample tend to be similar (usually with a factor of two), their 2018 ADEC Method Two Table C groundwater cleanup levels differ widely. Because naphthalene is lower by an order of magnitude, it exhibits far greater exceedances on the ratio plots and is therefore the focus of the following discussion.

Historically, the highest naphthalene exceedances occurred in the areas excavated in 2013, with concentrations exceeding the 2018 ADEC Method Two Table C groundwater cleanup level by more than a factor of 50 in 2012 in excavated well MW88-4. Subsequent to excavation, each of the source area wells installed in 2014 (14MW01 through 14MW06) have yielded naphthalene exceedances in one or more rounds of sampling. In 2014, the greatest concentration (0.093 mg/L in 14MW05) was similar to the pre-excavation maximum (0.089 mg/L in MW88-4 in 2012). Maximum concentrations decreased substantially in the next two years (0.0059 mg/L in 14MW05 in 2015 and 0.0018 mg/L in 14MW01 in 2016) but rose again in 2018 to 0.029 mg/L in 14MW02.

Naphthalene trends in each of these source area wells generally followed the same pattern, declining through 2015 and then increasing in 2018. This can be explained by long-term natural attenuation overlaid by a rise in the water table in 2018, which resulted in increased groundwater contamination through interaction with residual contamination in what was normally the vadose zone. Well 14MW01 differs significantly from this pattern, with concentrations increasing markedly in 2016 when concentrations in other wells were declining. DRO in this well exhibited the same pattern (Plot E-3.3.1 [Attachment E-3]). This implies that residual fuel may still be present upgradient of 14MW01 at sufficiently high concentration to migrate slowly toward the well.

Historically, 1-methylnaphthalene and 2-methylnaphthalene concentrations have fluctuated over time. The maximum concentration of 1-methylnaphthalene was found in 2014 at well 14MW05 (0.077 mg/L), located downgradient of historical soil excavations, but 1-methylnaphthalene in well 14MW05 fell below the 2018 ADEC Method Two Table C groundwater cleanup level in 2016 and 2018. In 2018, 1-methylnaphthalene concentrations in the northwest portion of the MOC at wells 14MW01 and 14MW02 exceeded the 2018 ADEC Method Two Table C groundwater cleanup level. Similar to 1-methylnaphthalene, the maximum concentration of 2-methylnaphthalene was found 2014 at well 14MW05 (0.55 mg/L) but has remained below the 2018 ADEC Method Two Table C groundwater cleanup level since 2015. In 2018, only well 14MW02 had 2-methylnaphthalene above the 2018 ADEC Method Two Table C groundwater cleanup level.

Arsenic and manganese currently exceed 2018 ADEC Method Two Table C groundwater cleanup levels in all serviceable source area monitoring wells at the MOC (Figures E-9 and E-11 [Attachment E-1]). Three nominally upgradient wells have also exhibited exceedances historically (14MW07, MW88-10, and 26MW1). These metals have no known anthropogenic sources at the MOC but instead are likely present naturally as components of normally insoluble oxyhydroxide coatings on soil particles. Reducing conditions engendered by biodegradation of petroleum have led to the dissolution of particle coatings via reduction of iron and manganese to soluble forms and thereby released sequestered arsenic. Arsenic and manganese concentrations may decline with time as dissolution runs its course and the mobilized metals are flushed by groundwater flow. When fuel degradation is complete, oxyhydroxide grain coatings are expected to re-precipitate and restore the natural concentrations of these metals in groundwater.

6.4 NATURAL ATTENUATION OF DRO IN GROUNDWATER

Monitored natural attenuation is the DD-selected remedy for MOC groundwater. Natural attenuation relies on in situ biological, physical, and chemical processes to reduce contaminant concentrations over time. These processes are chiefly dilution, dispersion, and biological degradation by bacteria in groundwater. Typically, the primary line of evidence of natural attenuation is a steadily decreasing trend of analyte levels over time. Geochemical parameters provide a secondary line of evidence that biological or chemical processes are occurring and help identify what type of biological processes are taking place. Tracking geochemical conditions with COC concentrations over time will assist in the ongoing evaluation of remedy performance. Analyte concentrations over time and geochemical groundwater parameters were evaluated at all 15 currently serviceable monitoring wells at the MOC through field measurements and laboratory analysis for this report.

Natural attenuation parameters recorded during the 2018 field effort are summarized in Table E-6-5 and are presented on Figures E-4.1 through E-4.8 (Attachment E-1) and on Chart E-3.2 and Plots E-3.2.1 through E-3.2.11 (Attachment E-3). Temperature ranged from 3.18 to 10.77°C and was generally inversely related to depth below the surface; the temperature decreased as the depth to water increased. Conductivity ranged between 68 and 167 microSiemens per centimeter (µS/cm) and was generally highest in wells downgradient of the former source area. Turbidity was measured below 30 nephelometric turbidity units (NTU) in samples collected from all wells except in MW88-3 (30.07 NTU). Measurements for pH were slightly acidic and ranged between 5.50 and 6.28. Positive ORP was measured in all groundwater monitoring wells and ranged from 26.2 millivolts (mV) to 264.7 mV. Values for DO ranged from 0.65 to 14.4 milligrams per liter (mg/L). Wells with the highest concentrations of ferrous iron also exhibited the highest dissolved manganese concentrations and were all located in the former source area. Typically, low nitrate was found in wells in the former source area. Alkalinity was highest at well 14MW06, measured at 105 mg/L. The highest sulfate concentration was found at well 14MW01. The highest methane concentration was found at well 14MW05.

Table E-6-5
2018 DRO Concentrations and Natural Attenuation Parameters

Well ID	DRO (mg/L)	Temperature[1] (°C)	Conductivity[1] (µS/cm)	DO[1] (mg/L)	pH[1]	ORP[1] (mV)	Turbidity[1] (NTU)	Ferrous Iron (mg/L)	Dissolved Manganese (mg/L)	Sulfate (mg/L)	Nitrate (mg/L)	Alkalinity (mg/L)	Methane (mg/L)
Source Area Wells													
14MW01[2]	2.0	3.39	105	1.46	6.06	26.2	1.34	>10	0.84	25.3	0	33.0	0.034
14MW02	2.8	3.66	108	4.28	5.78	29.9	0.0	>10	0.807	20.1	0	31.6	0.021
14MW03	1.3	4.36	109	0.81	6.15	31.0	9.71	>10	1.47	17.3	0	46.6	0.015
14MW04	1.8	9.03	125	0.66	5.6	175.2	11.3	1	1.15	23.9	0	44.4	0.015
14MW05	3.1	7.95	158	0.97	6.14	35.8	7.64	>10	3.48	9.9	0	74.3	0.062
14MW06	1.5	8.55	167	0.65	6.28	131.7	0.47	0.3	0.6	12	0	105	0.0085
MW88-1	0.42	4.45	81	5.9	5.70	264.7	4.45	<1	0.058	24.6	0.2	7.9	ND [0.001]
MW88-3	0.85	10.77	84	1.79	5.50	205	30.07	<1	0.42	16.8	NR	11.2	ND [0.001]
MW88-10	0.54	4.52	74	1.41	5.95	222.1	5.08	<1	0.363	18.6	0.2	15.4	0.0073
Upgradient and Crossgradient Wells													
14MW07	ND [0.05]	3.57	68	12.82	5.66	195.5	0.57	2	0.0144	17.6	0	10.3	ND [0.001]
17MW-1	ND [0.05]	3.18	74	10.96	5.54	155.9	1.14	<1	0.0021 J	23.6	0.2	8.5	0.0082
20MW-1	0.15 QL	3.86	72	12.40	5.90	243.1	1.89	<1	0.0202	19	0.4	7.9	ND [0.001]
22MW2[2]	0.13 QN	5.36	86	11.22	5.75	176.5	0.25	<1	0.0012 J	18.4	0	8.5 QN	ND [0.001]
26MW1	ND [0.05]	4.70	78	14.40	5.76	132.6	5.29	<1	0.0033 J	17.6	0.4	3.0	ND [0.001]
MW10-1[2]	1.0	10.04	106	0.73	5.83	140.8	24.79	2	0.519	6.5	0	38.4	0.0074

Notes:
[1] Measurement collected prior to sampling.
[2] The higher laboratory result between the primary and duplicate samples is presented.
[ ] = LOD for ND analytical results.
J – The analyte was positively identified; however, the associated result was less than the limit of quantitation but greater than or equal to the DL.
QN – Analyte result was considered an estimated value (unknown bias) due to a QC failure.
QL – Analyte result was considered an estimated value (biased low) due to a QC failure.
For definitions, refer to the Acronyms and Abbreviations section.

Natural attenuation properties in samples collected from selected upgradient and crossgradient wells (17MW1, 26MW1, 22MW2, 20MW-1) is typical of water not affected by petroleum. This water contains high ORP and DO, low conductivity, undetectable ferrous iron, low levels of dissolved manganese, variable nitrate, low alkalinity, and low or undetectable methane. Upgradient well 14MW07 contains a moderate level of ferrous iron but otherwise typical values for the other parameters and may also represent unaffected groundwater. Crossgradient well MW10-1 contains moderately elevated levels of DRO, conductivity, iron, manganese, and alkalinity and low DO, which reflect the influence of the adjacent DRO plume.

Elevated levels of conductivity, iron, manganese, alkalinity, and methane and low DO and nitrate in samples collected from source area monitoring wells indicate that aerobic and anaerobic petroleum biodegradation is occurring in groundwater. Aerobic biodegradation consumes any available oxygen, followed by anaerobic degradation, which first reduces nitrate to ammonia and then converts insoluble ferric iron to soluble ferrous iron. Minor sulfate reduction may also be occurring, or sulfate concentrations may be naturally variable. Finally, minor methanogenesis is occurring.

The current DRO plume is located in the northern portion of the MOC in the area of former source area wells 14MW01, 14MW02, 14MW04, and 14MW05 (Figure E-5 [Attachment E-1]). Although DRO exceedances occurred in the central portion of the site through 2014 (wells 14MW03, MW88-1, MW88-3, and MW88-10), removal of contaminated soil in 2013 appears to have contributed to reductions in DRO concentrations in this area.

Monitoring wells 14MW01, 14MW02, 14MW04, and 14MW05 were selected for additional statistical trend analysis based on DRO exceeding the SSCL (1.5 mg/L) in 2018; DRO levels in these wells ranged from 1.8 to 3.1 mg/L. Samples collected in 2014, 2015, 2016, and 2018 provided the basis for identifying trends in DRO concentrations over time via the Mann-Kendall trend test (Attachment E-3). In wells with decreasing trends, geometric regression analysis provides a quantitative assessment of the rate of natural attenuation. However, the low number of measurements can only provide a coarse assessment of this primary line of evidence.

The Mann-Kendall trend test identifies whether a trend exists and, if a trend is present, it identifies the trend as increasing or decreasing. The Mann-Kendall test did not identify any significant trends to a confidence level of 95 percent for samples collected from wells 14MW01, 14MW02, 14MW04, and 14MW05. However, all four monitoring wells had statistically-significant evidence of trends evaluated at an 80 percent confidence level. Monitoring wells 14MW01 and 14MW02 had evidence of increasing trends, with approximate p-values of 0.07 for both tests. Monitoring wells 14MW04 and 14MW05 had decreasing trends with approximate p-values of 0.15 for both tests. The Mann-Kendall trend test analysis input and results are provided in Tables E-3.4.1.1 through E-3.4.1.5 (Attachment E-3).

Geometric regression analyses were prepared for monitoring wells 14MW04 and 14MW05. The geometric regression analysis assumes that degradation is a first-order process, such that the rate is proportional to the amount present, much like radioactive decay, and is conveniently expressed as a half-life. This geometric regression approach is consistent with EPA guidance (EPA 2014). The intersection of the regression line with the SSCL marks the timeframe at which the expected concentration of a sample is equal to or less than the SSCL; the natural variability inherent in sampling means that samples may still occasionally exceed the SSCL, but their average will be lower. This intersection marks the start of the attainment phase, during which the collected samples are expected to continue to exhibit a decreasing trend and define an average that is lower than the SSCL. EPA guidance recommends that eight samples be collected to demonstrate that the cleanup goal has been met. A second intersection is also considered: the timeframe at which the 95-percent upper confidence limit of the regression line crosses the SSCL provides an estimate of the cleanup timeframe accounting for data scatter. Beyond this timeframe, remediation is complete, and collected samples have a less than one in 20 chance of exceeding the SSCL due to natural variability.

Geometric regression suggests that DRO in well 14MW04 has a half-life of 7.0 years; DRO SSCL attainment is expected to start in 2020, and RAOs would be met in 2023 (Plot E-3.4.2 and Tables E-3.4.2.1 and E-3.4.2.2 in Attachment E-3). In well 14MW05, DRO has a half-life of 3.3 years, attainment of the SSCL for DRO is expected to begin in 2022, and remediation RAOs would be met in 2030 (Plot E-3.4.3 and Tables E-3.4.3.1 and E-3.4.3.2

[Attachment E-3]). Additional monitoring events in the future will provide additional data which will be used to more fully assess trends and provide higher confidence in half-life values.

The groundwater geochemical parameters measured in the field included ferrous iron, nitrate, conductivity, DO, and ORP. The groundwater geochemical parameters tested at the analytical laboratory included methane, manganese, sulfate, and alkalinity. Isopleth figures of selected geochemical parameters can be found in Attachment E-1 (Figures E-4.1 through E-4.8).

Geochemical patterns in all currently serviceable wells and the geometric regression plots from wells 14MW04 and 14MW05 support the inference of ongoing natural attenuation at the MOC. However, increases in DRO concentration in some wells, which correlate with high groundwater levels, obscure the effects of natural attenuation across much of the site.

7.0 SUMMARY AND CONCLUSIONS

The following conclusions are separated into two groups: conclusions based on the evaluation of 2018 MOC groundwater sampling data and conclusions based on the comparison of 2018 data to the historical data set.

- Summary and conclusions for 2018 data evaluation:
  - The 2018 groundwater flow direction at the MOC is predominantly northwest, unchanged from previous sampling events.
  - DRO was the only analyte that exceeded groundwater SSCLs in 2018. The DRO plume is located along the northern margin of the MOC. DRO in samples collected from wells 14MW01, 14MW02, 14MW04, and 14MW05 exceeded the DRO SSCL of 1.5 mg/L at 2.0, 2.8, 1.8, and 3.1 mg/L, respectively. Groundwater from wells located in the central portion of the MOC did not exceed the DRO SSCL.
  - Multiple analytes in groundwater sampled in 2018 exceeded the 2018 ADEC Method Two Table C groundwater cleanup levels. Comparisons of 2018 MOC groundwater results for analytes without an SSCL to 2018 ADEC Method Two Table C groundwater cleanup levels identified that naphthalene, 1-methylnaphthalene, 2-methylnaphthalene, and manganese were present above the 2018 ADEC Method Two Table C groundwater cleanup levels. Additionally, DRO and arsenic, analytes with SSCLs, exceeded the 2018 ADEC Method Two Table C groundwater cleanup levels.
  - Current groundwater conditions (i.e., low concentrations of DO, detectable concentrations of methane, and elevated concentrations of alkalinity and dissolved manganese) in wells 14MW04 and 14MW05 indicate natural attenuation is occurring at the MOC. Anaerobic processes are dominant for in-plume wells and aerobic processes are dominant at the margins of the plume.
- Summary and conclusions for comparison of 2018 data with historical data are as follows:
  - The elevation of the groundwater table observed in 2018 was higher than the elevations observed and recorded in the previous three monitoring events at the MOC, and was the highest level observed during any sample year except at monitoring well 17MW1 in 2010 and 2011. Increases in DRO in many source area wells may be attributed to the high water level via increased interaction with residual contamination in soil that was formerly above the water table.
  - No quantitative prediction of completion of attenuation at the MOC can be provided until decreasing DRO concentration trends are observed in all source area wells. Additional sampling is needed to overcome the variability in DRO concentration attributed to changing water levels from year to year. Qualitatively, it appears that natural attenuation will take decades rather than years.
  - DRO is demonstrably attenuating in two source area wells. At wells 14MW04 and 14MW05, DRO levels may reach the SSCL by 2020 or 2022 with attenuation complete

by 2023 or 2030, respectively. The cleanup timeframes are based on geometric regression analyses using a small data set comprised of 2014, 2015, 2016, and 2018 results. Other in-plume monitoring wells at the MOC (14MW01, 14MW02) indicate DRO concentrations continue to increase based on statistical trends. This may be due to the presence of upgradient soil contamination remaining in the MOC, such as at the 2012 excavation confirmation sample locations 12NCMOCSS039, 12NCMOCSS033, and 12NCMOCSS037, where excavation terminated at 2-feet below the groundwater surface. A recommendation to complete the implementation of the remedy (remove DRO-contaminated soil) for Site 15 is included in this periodic review.

8.0 REFERENCES

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ATTACHMENT E-1
Figures

Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
Copyright:(c) 2014 Esri

All Locations Are Approximate

0 25 50 75 100
Miles

WGS 1984 UTM Zone 2N

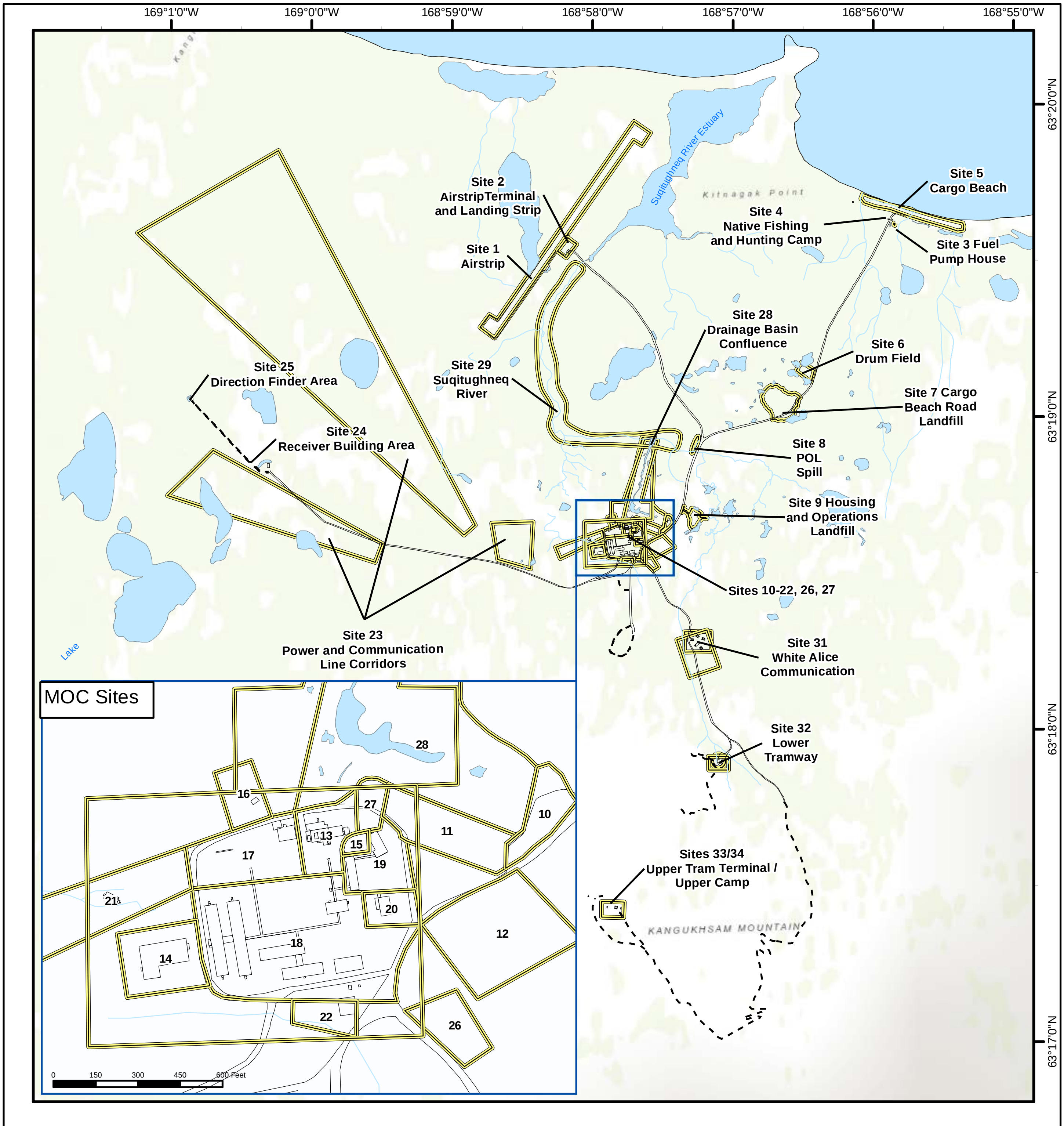
N

LOCATION AND VICINITY

ST. LAWRENCE ISLAND, ALASKA

DATE:	PROJECT MANAGER:	FIGURE NO:
29 MAY 2020	K. MAHER	E-1

P:\StLawrenceIsland_FUDS_MOC_GW_Report_Sup\MXD\E-01_NEC_MOC_Location_Vicinity.mxd beatycj



— Road
- - Trail
Water Feature
Remediation Site

Note:
For definitions, refer to the Acronyms and Abbreviations section.

N

0 0.25 0.5 0.75 1
Miles

WGS 1984 UTM Zone 2N

MOC
REMEDIATION SITES
SAINT LAWRENCE ISLAND, ALASKA

DATE:	PROJECT MANAGER:	FIGURE NO:
29 MAY 2020	K. MAHER	E-2

P:\StLawrenceIsland_FUDS_MOC_GW_Report_Sup\MXD\E-02_NEC_MOC_SiteMap.mxd beatycj

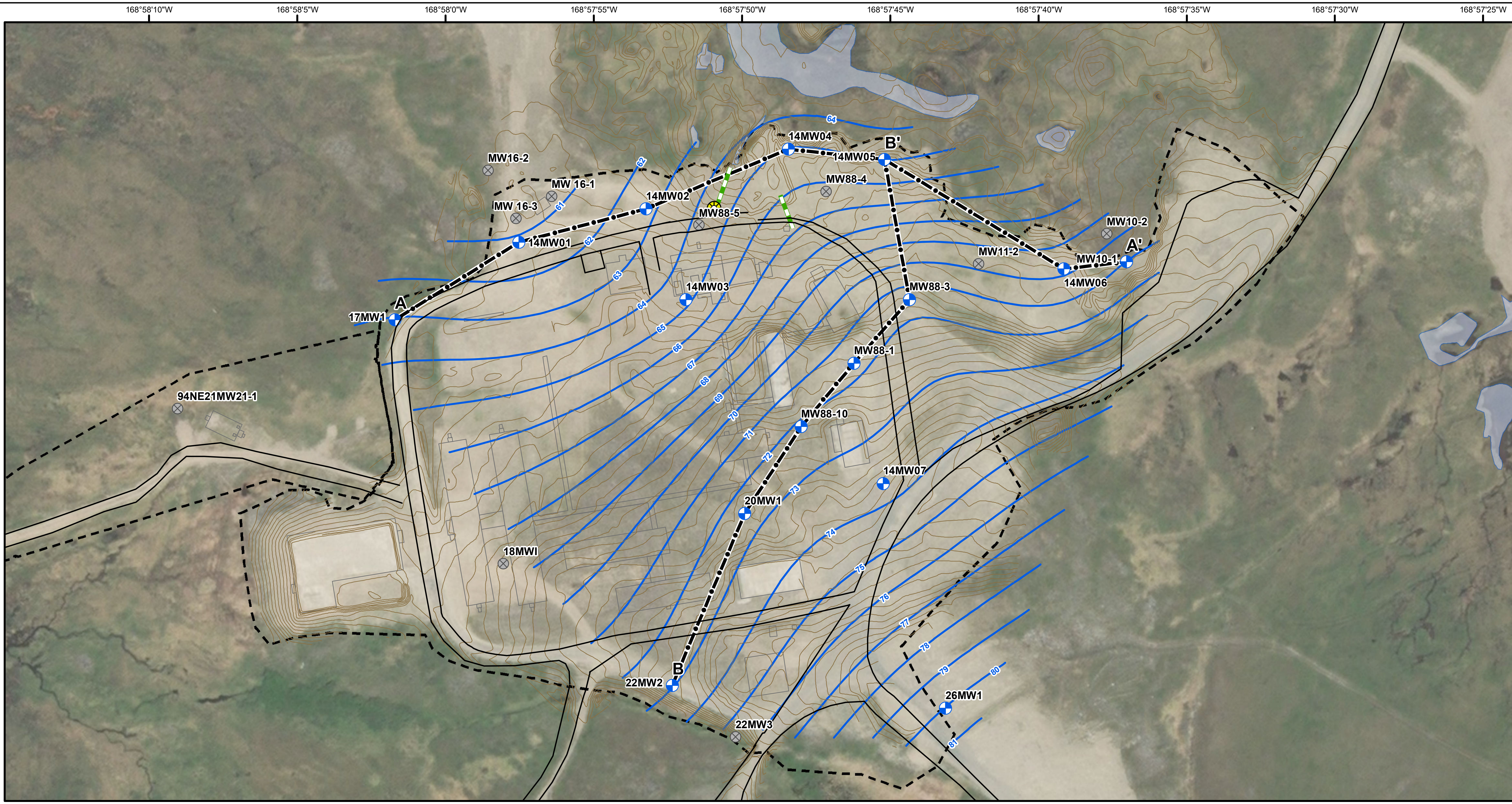


Image Source: ESRI Service Layer, Digital Globe. Vivid – Alaska. 2015 (23 June). *http://goto.arcgisonline.com/maps/World_Imagery.*

SITE LOCATION

Existing Monitoring Well
Abandoned Monitoring Well
Former Manhole
Former Culvert
Topographic Cross-Section
Elevation Contour (feet above Mean Sea Level)
2018 Groundwater Contour
Former Building
Surface Water Feature
MOC Boundary

Notes:
The Administrative Site Boundary (depicted as the "MOC Boundary") is based primarily on the footprint of DOD activities and structures associated with the MOC and not based on the extent(s) of contamination.

N

0 50 100 150 200 250 300
Feet

WGS 1984 UTM Zone 2N

1 inch = 150 feet

Approximate Groundwater Flow Direction

2018 MOC POTENTIOMETRIC SURFACE

ST. LAWRENCE ISLAND, ALASKA

DATE:	PROJECT MANAGER:	FIGURE NO:
03 SEP 2020	K. MAHER	E-3

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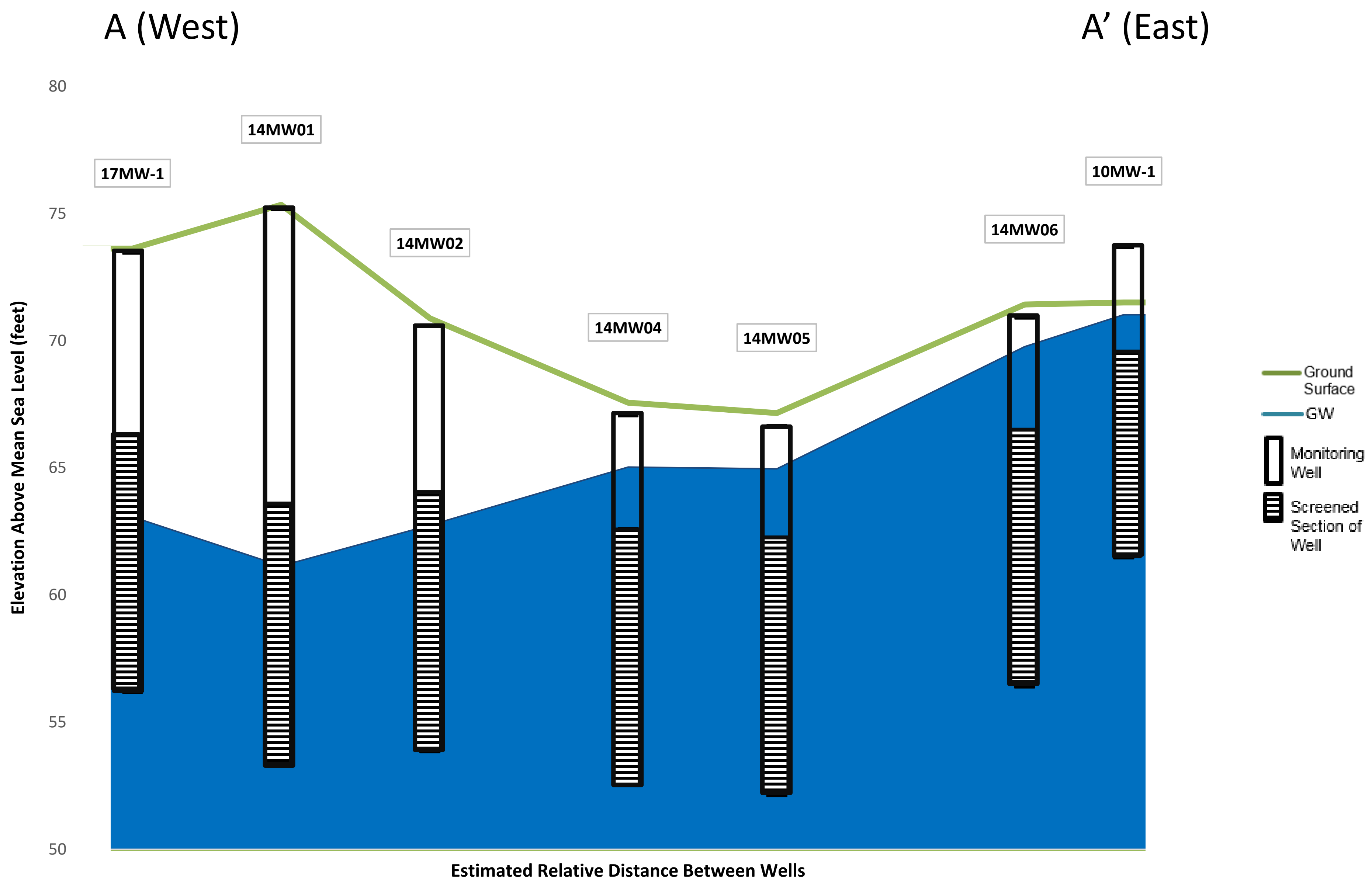
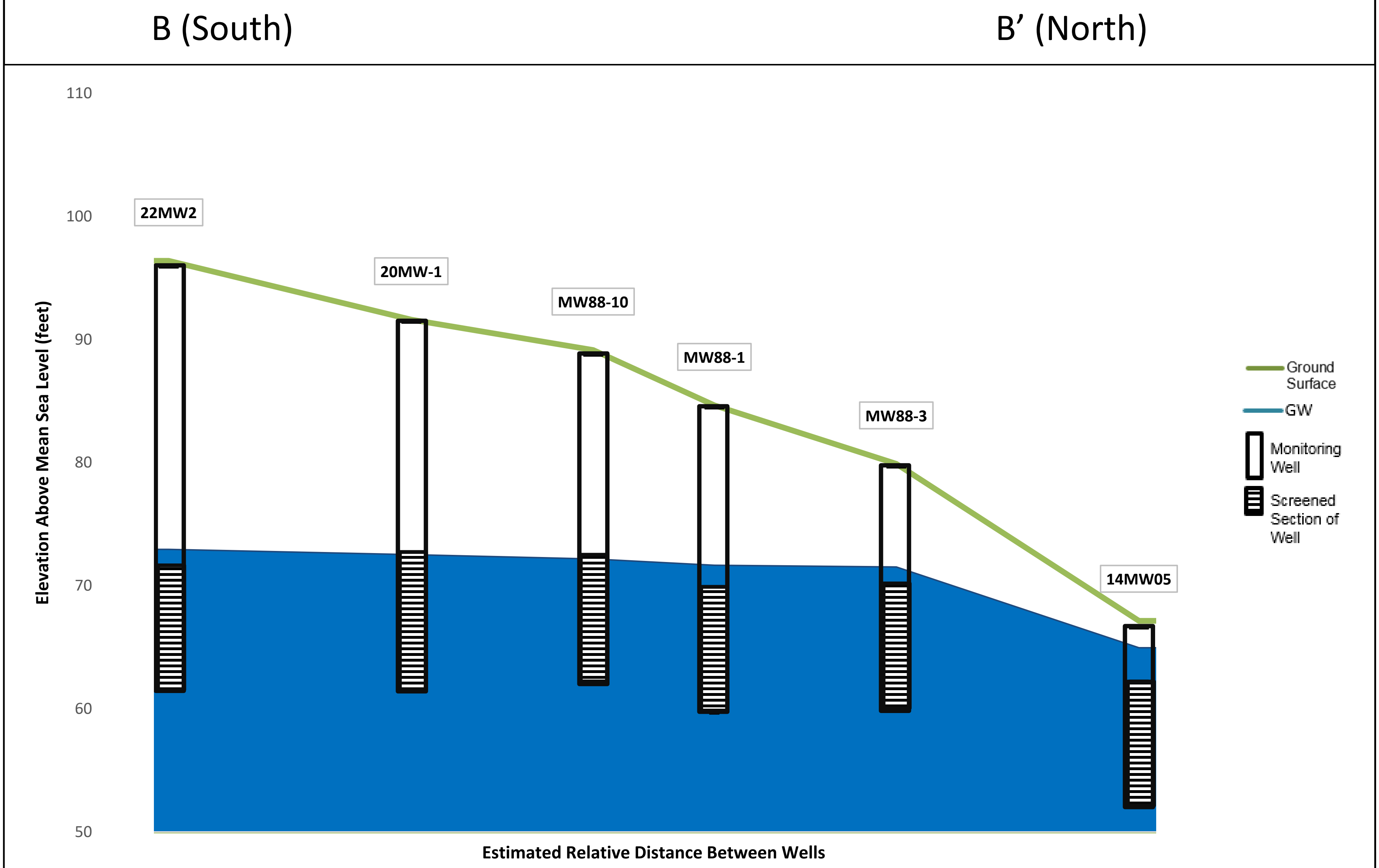


2018 WEST-EAST CROSS-SECTION OF THE MOC ST. LAWRENCE ISLAND, ALASKA		
DATE: 28 December 2018	PROJECT MANAGER: H. HUFF	FIGURE NO: E-3.2



2018 SOUTH-NORTH CROSS-SECTION OF THE MOC

ST. LAWRENCE ISLAND, ALASKA

DATE:	PROJECT MANAGER:	FIGURE NO:
28 December 2018	H. HUFF	E-3.3

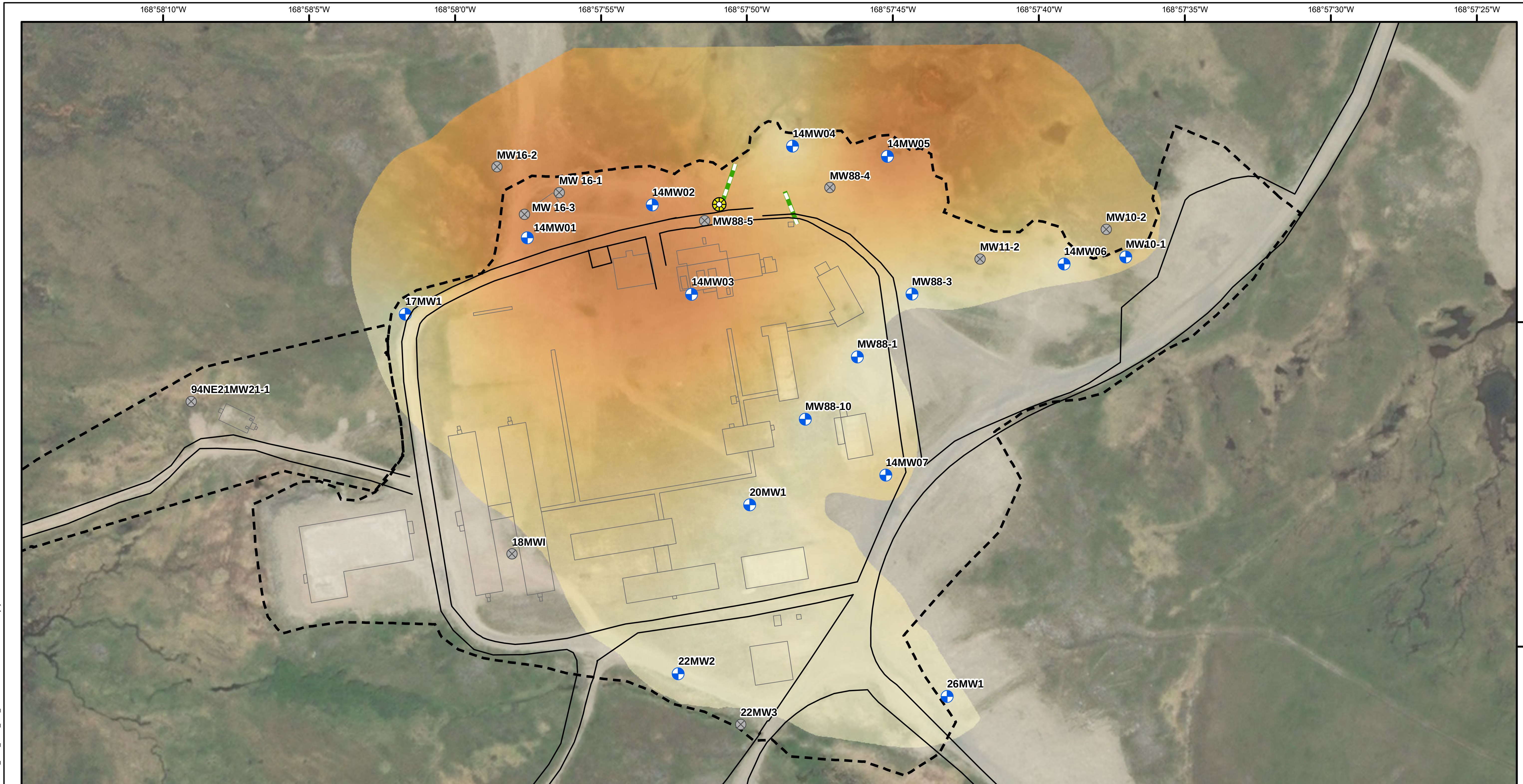
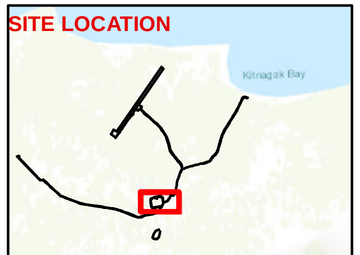


Image Source: ESRI Service Layer, Digital Globe. Vivid – Alaska. 2015 (23 June). *http://goto.arcgisonline.com/maps/World_Imagery.*

SITE LOCATION



Existing Monitoring Well
Abandoned Monitoring Well
Former Manhole
Former Culvert
Former Building
MOC Boundary

Ferrous Iron Concentration (mg/L)

10
5
0

Note:
The concentration gradient shown is depicted from data collected in 2018.

N

0 50 100 150 200 250 300
Feet

WGS 1984 UTM Zone 2N

1 inch = 150 feet

Approximate Groundwater Flow Direction

FERROUS IRON
IN GROUNDWATER AT THE MOC IN 2018
ST. LAWRENCE ISLAND, ALASKA

DATE:	PROJECT MANAGER:	FIGURE NO:
01 JUN 2020	K. MAHER	E-4.1

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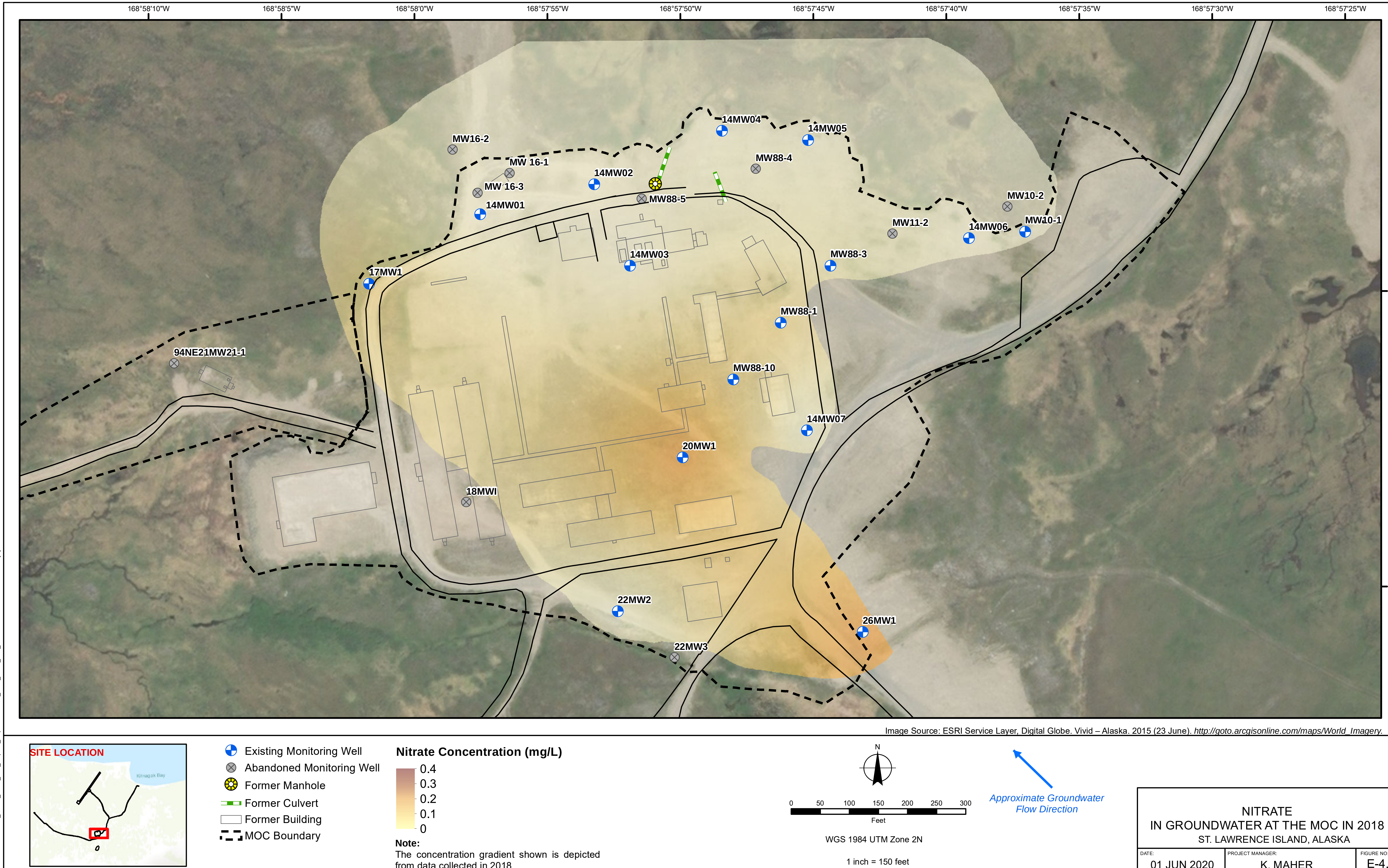
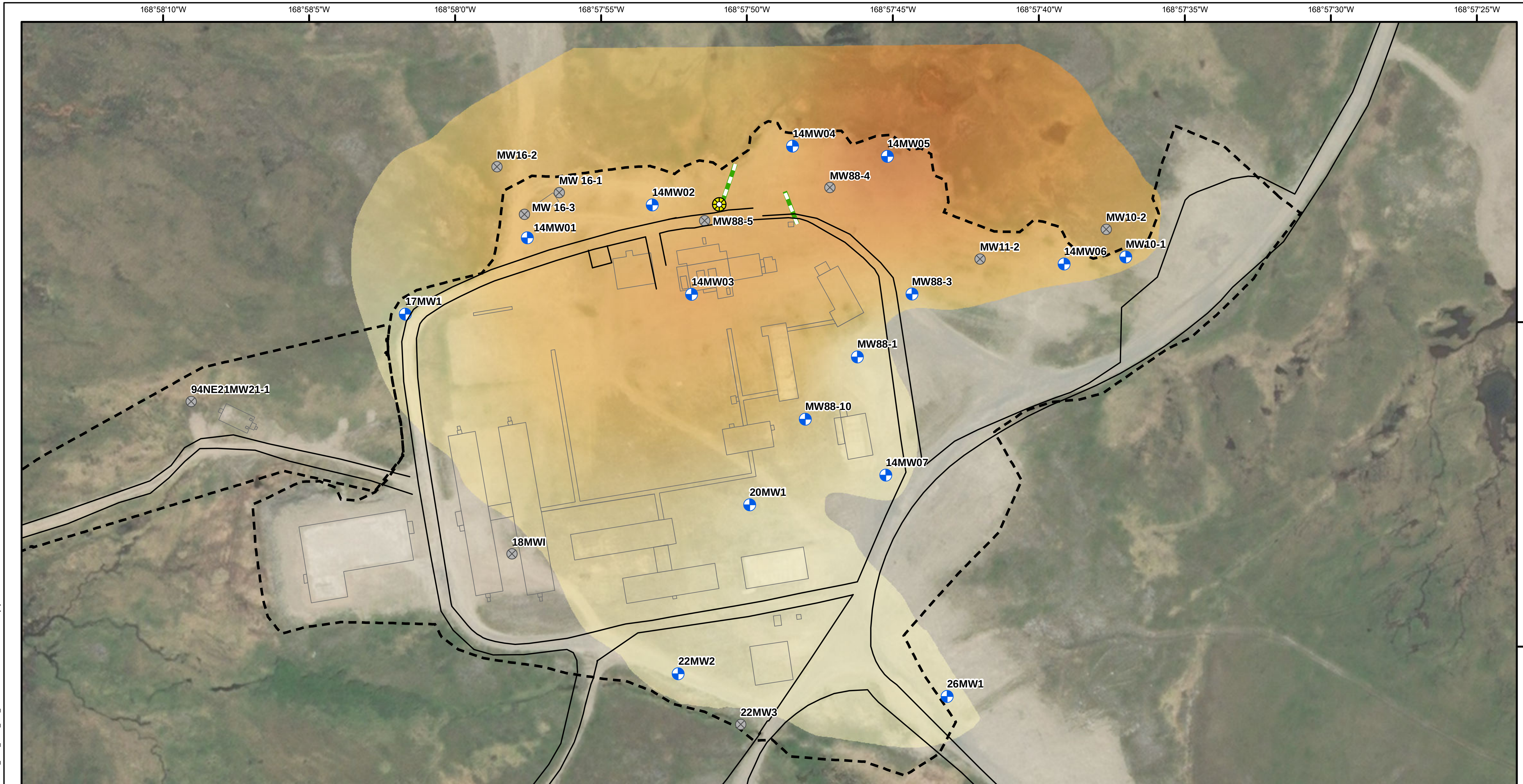


168°58'10"W
168°58'5"W
168°58'0"W
168°57'55"W
168°57'50"W
168°57'45"W
168°57'40"W
168°57'35"W
168°57'30"W
168°57'25"W
63°18'40"N
63°18'35"N
14MW04
14MW05
MW16-2
MW 16-1
MW88-4
14MW02
MW 16-3
MW88-5
14MW01
MW10-2
MW11-2
MW10-1
14MW06
14MW03
MW88-3
17MW1
MW88-1
94NE21MW21-1
MW88-10
14MW07
20MW1
18MWI
22MW2
26MW1
22MW3
Image Source: ESRI Service Layer, Digital Globe. Vivid – Alaska. 2015 (23 June). http://goto.arcgisonline.com/maps/World_Imagery.
SITE LOCATION
Existing Monitoring Well
Abandoned Monitoring Well
Former Manhole
Former Culvert
Former Building
MOC Boundary
Nitrate Concentration (mg/L)
0.4
0.3
0.2
0.1
0
Note:
The concentration gradient shown is depicted from data collected in 2018.
N
0 50 100 150 200 250 300
Feet
WGS 1984 UTM Zone 2N
1 inch = 150 feet
Approximate Groundwater Flow Direction
NITRATE
IN GROUNDWATER AT THE MOC IN 2018
ST. LAWRENCE ISLAND, ALASKA
DATE:
01 JUN 2020
PROJECT MANAGER:
K. MAHER
FIGURE NO:
E-4.2



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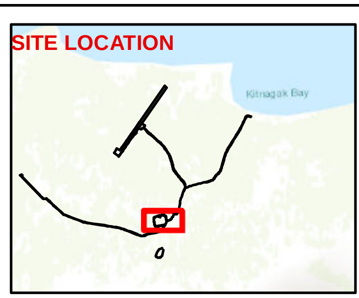

- Existing Monitoring Well
- Abandoned Monitoring Well
- Former Manhole
- Former Culvert
- Former Building
- MOC Boundary

Manganese Concentration (mg/L)

3
2
1
0

Note:
The concentration gradient shown is depicted from data collected in 2018.

N

0 50 100 150 200 250 300
Feet

WGS 1984 UTM Zone 2N

1 inch = 150 feet

Approximate Groundwater Flow Direction

MANGANESE
IN GROUNDWATER AT THE MOC IN 2018
ST. LAWRENCE ISLAND, ALASKA

DATE:	PROJECT MANAGER:	FIGURE NO:
01 JUN 2020	K. MAHER	E-4.3

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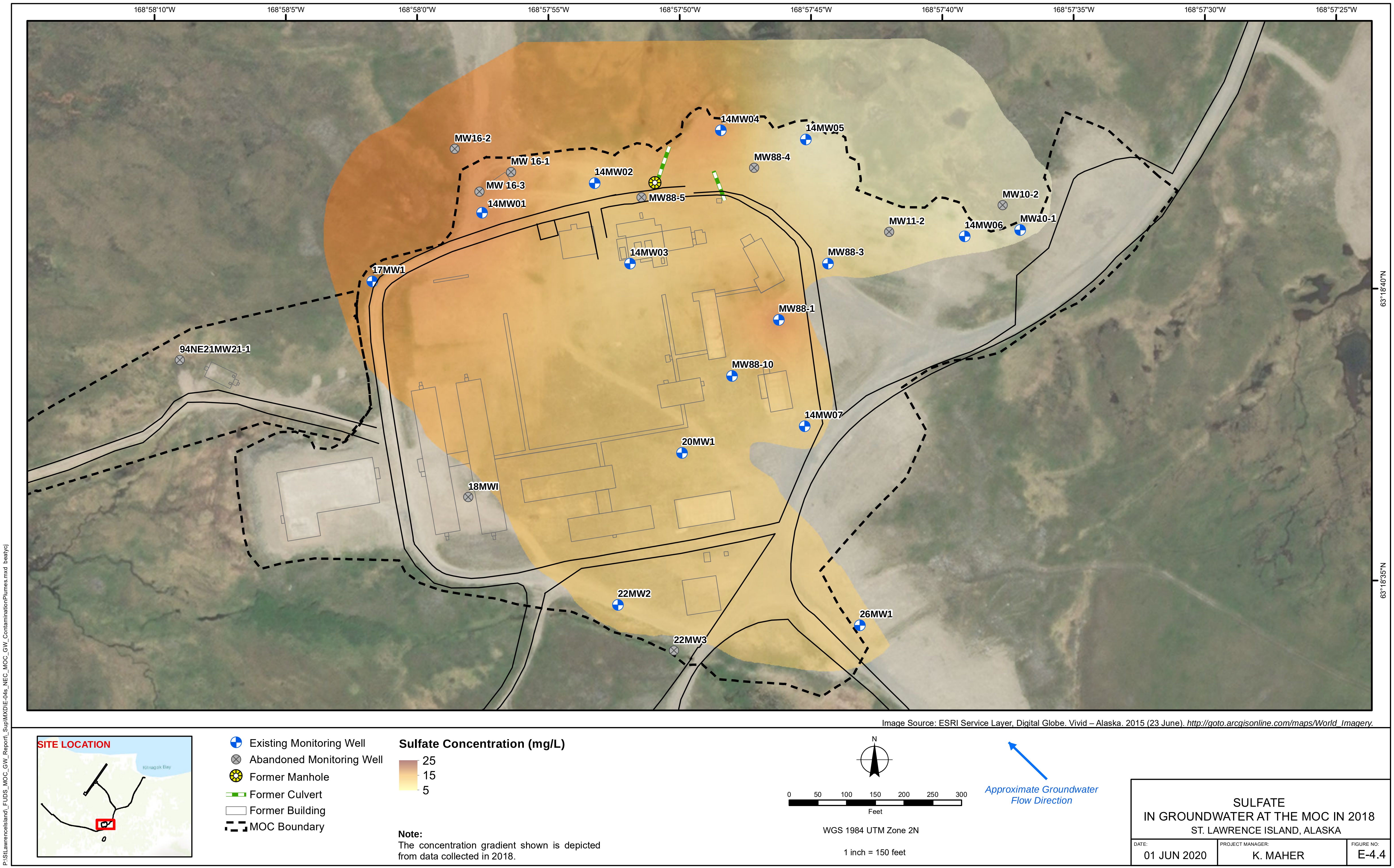
168°58'10"W
168°58'5"W
168°58'0"W
168°57'55"W
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168°57'35"W
168°57'30"W
168°57'25"W
63°18'40"N
63°18'35"N
14MW04
14MW05
MW16-2
MW 16-1
MW88-4
14MW02
MW 16-3
MW88-5
14MW01
MW10-2
MW10-1
MW11-2
14MW06
14MW03
MW88-3
17MW1
MW88-1
94NE21MW21-1
MW88-10
14MW07
20MW1
18MWI
22MW2
26MW1
22MW3
Image Source: ESRI Service Layer, Digital Globe. Vivid – Alaska. 2015 (23 June). http://goto.arcgisonline.com/maps/World_Imagery.
SITE LOCATION
Existing Monitoring Well
Abandoned Monitoring Well
Former Manhole
Former Culvert
Former Building
MOC Boundary
Sulfate Concentration (mg/L)
25
15
5
Note:
The concentration gradient shown is depicted from data collected in 2018.
N
0 50 100 150 200 250 300
Feet
WGS 1984 UTM Zone 2N
1 inch = 150 feet
Approximate Groundwater Flow Direction
SULFATE
IN GROUNDWATER AT THE MOC IN 2018
ST. LAWRENCE ISLAND, ALASKA
DATE:
01 JUN 2020
PROJECT MANAGER:
K. MAHER
FIGURE NO:
E-4.4
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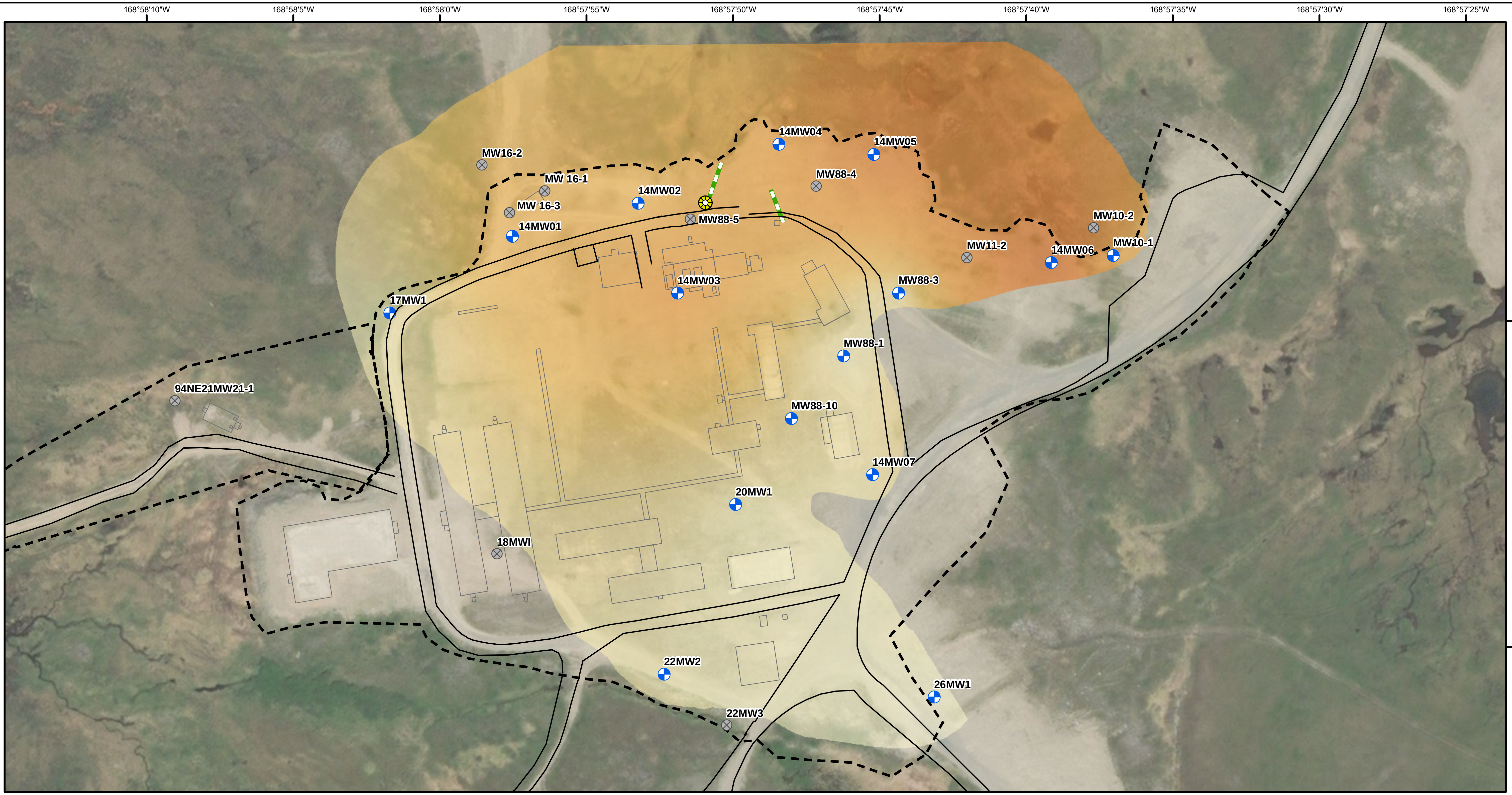

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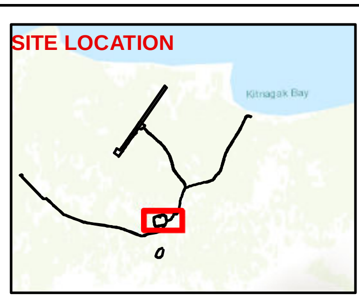

Existing Monitoring Well
Abandoned Monitoring Well
Former Manhole
Former Culvert
Former Building
MOC Boundary

Alkalinity (mg/L)
100
50
0

Note:
The concentration gradient shown is depicted from data collected in 2018.

N

0 50 100 150 200 250 300
Feet

WGS 1984 UTM Zone 2N

1 inch = 150 feet

Approximate Groundwater Flow Direction

ALKALINITY
IN GROUNDWATER AT THE MOC IN 2018
ST. LAWRENCE ISLAND, ALASKA

DATE:	PROJECT MANAGER:	FIGURE NO:
01 JUN 2020	K. MAHER	E-4.5

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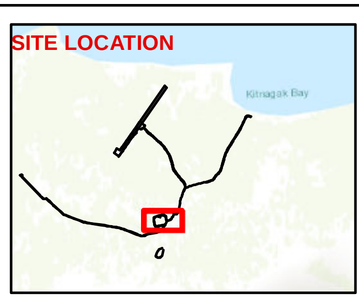

Existing Monitoring Well
Abandoned Monitoring Well
Former Manhole
Former Culvert
Former Building
MOC Boundary

Oxidation Reduction Potential (mV)
250
150
50

Note:
The concentration gradient shown is depicted from data collected in 2018.

N

0 50 100 150 200 250 300
Feet

WGS 1984 UTM Zone 2N

1 inch = 150 feet

Approximate Groundwater Flow Direction

OXIDATION REDUCTION POTENTIAL
IN GROUNDWATER AT THE MOC IN 2018
ST. LAWRENCE ISLAND, ALASKA

DATE:	PROJECT MANAGER:	FIGURE NO:
01 JUN 2020	K. MAHER	E-4.6

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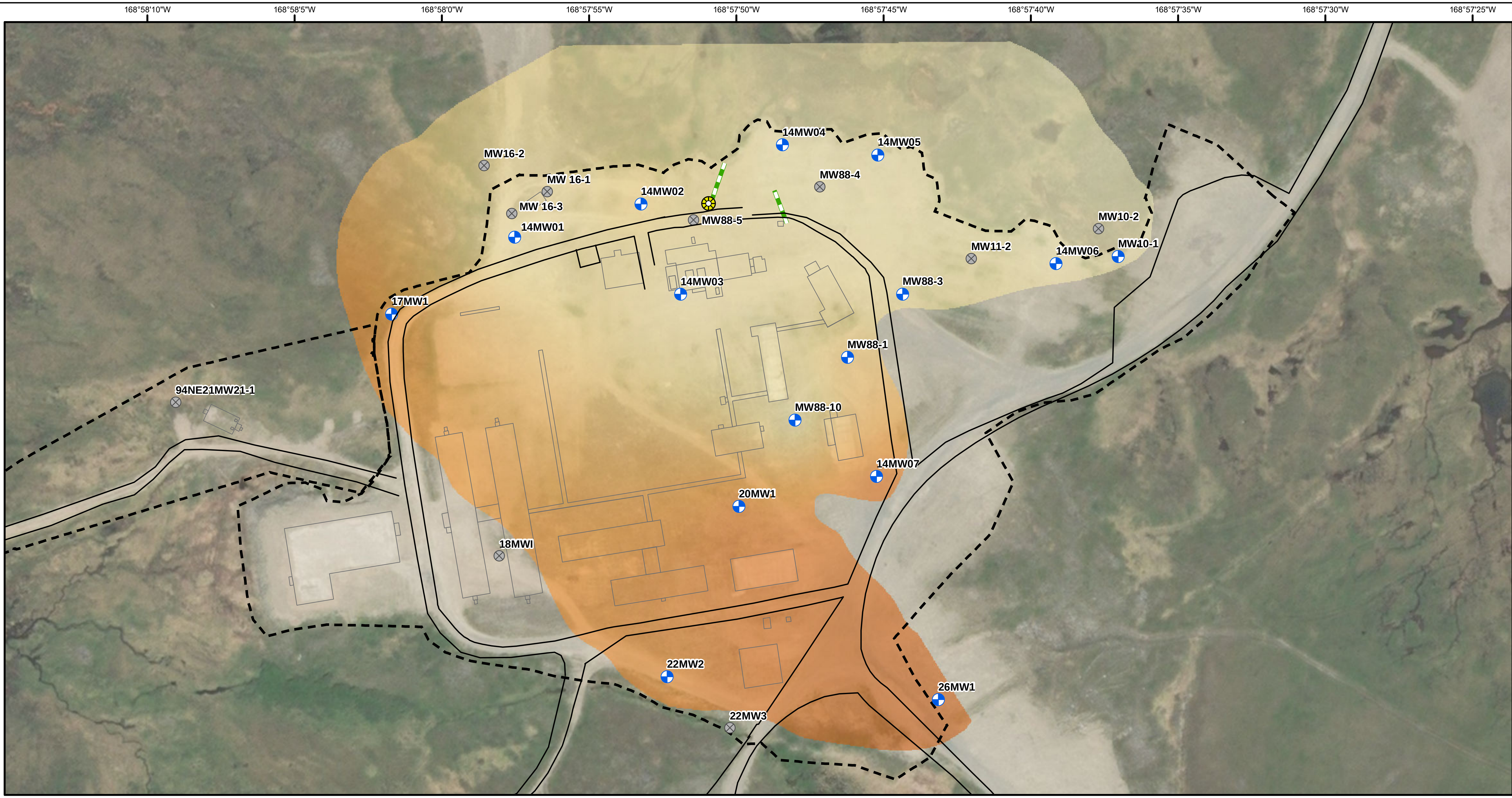
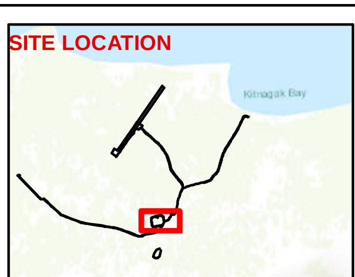


Image Source: ESRI Service Layer, Digital Globe. Vivid – Alaska. 2015 (23 June). *http://goto.arcgisonline.com/maps/World_Imagery.*



- Existing Monitoring Well
- Abandoned Monitoring Well
- Former Manhole
- Former Culvert
- Former Building
- MOC Boundary

Dissolved Oxygen (mg/L)

10
5
0

Note:
The concentration gradient shown is depicted from data collected in 2018.

N

0 50 100 150 200 250 300
Feet

WGS 1984 UTM Zone 2N

1 inch = 150 feet

Approximate Groundwater Flow Direction

DISSOLVED OXYGEN
IN GROUNDWATER AT THE MOC IN 2018
ST. LAWRENCE ISLAND, ALASKA

DATE:	PROJECT MANAGER:	FIGURE NO:
01 JUN 2020	K. MAHER	E-4.7

P:\StLawrenceIsland_FUDS_MOC_GW_Report_Sup\MXD\E-04s_NEC_MOC_GW_ContaminationPlumes.mxd beatycj

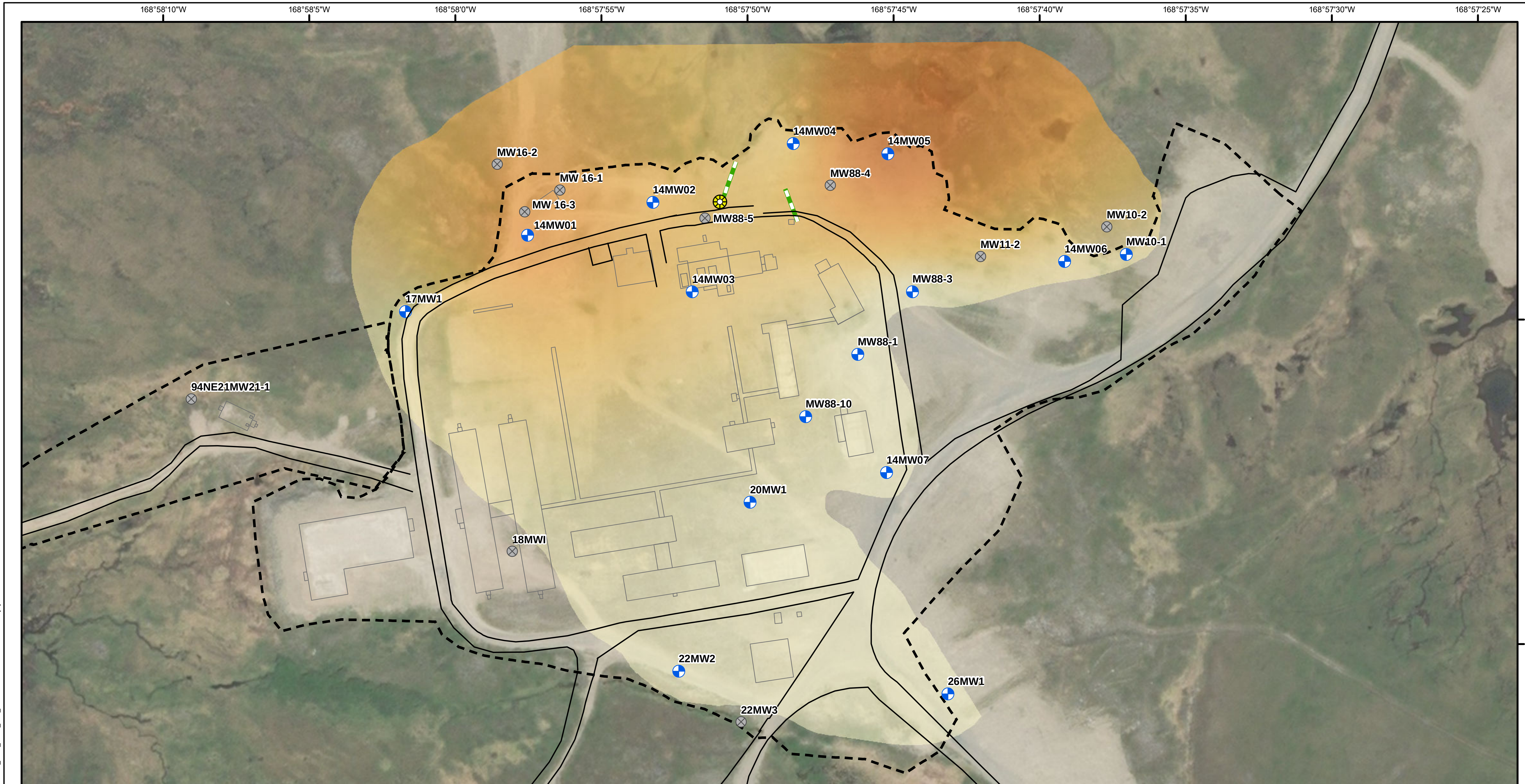
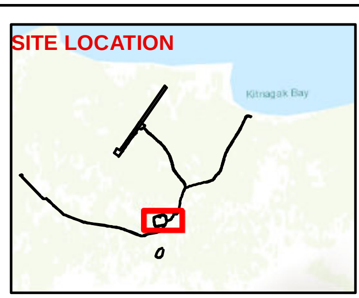


Image Source: ESRI Service Layer, Digital Globe. Vivid – Alaska. 2015 (23 June). *http://goto.arcgisonline.com/maps/World_Imagery.*



Existing Monitoring Well
Abandoned Monitoring Well
Former Manhole
Former Culvert
Former Building
MOC Boundary

Methane (mg/L)
0.05
0.025
0

Note:
The concentration gradient shown is depicted from data collected in 2018.

N

0 50 100 150 200 250 300
Feet

WGS 1984 UTM Zone 2N

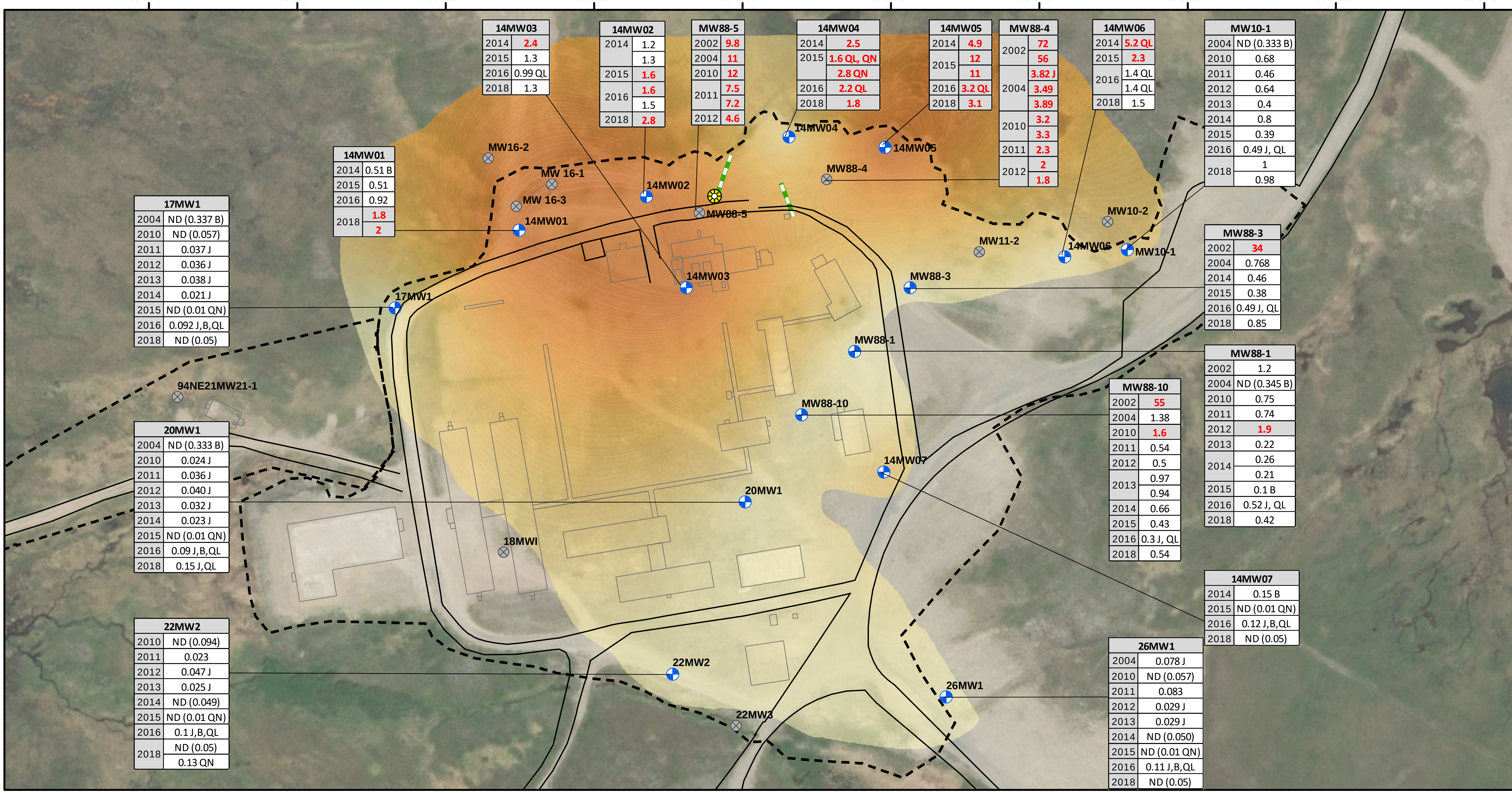
1 inch = 150 feet

Approximate Groundwater Flow Direction

METHANE
IN GROUNDWATER AT THE MOC IN 2018
ST. LAWRENCE ISLAND, ALASKA

DATE:	PROJECT MANAGER:	FIGURE NO:
01 JUN 2020	K. MAHER	E-4.8

P:\StLawrenceIsland_FUDS_MOC_GW_Report_Sup\MXD\E-04s_NEC_MOC_GW_ContaminationPlumes.mxd beatycj



14MW03	
2014	2.4
2015	1.3
2016	0.99 QL
2018	1.3

14MW02	
2014	1.2
	1.3
2015	1.6
2016	1.6
	1.5
2018	2.8

MW88-5	
2002	9.8
2004	11
2010	12
2011	7.5
	7.2
2012	4.6

14MW04	
2014	2.5
2015	1.6 QL, QN
	2.8 QN
2016	2.2 QL
2018	1.8

14MW05	
2014	4.9
2015	12
	11
2016	3.2 QL
2018	3.1

MW88-4	
2002	72
	56
2004	3.82 J
	3.49
	3.89
2010	3.2
	3.3
2011	2.3
2012	2
	1.8

14MW06	
2014	5.2 QL
2015	2.3
2016	1.4 QL
	1.4 QL
2018	1.5

MW10-1	
2004	ND (0.333 B)
2010	0.68
2011	0.46
2012	0.64
2013	0.4
2014	0.8
2015	0.39
2016	0.49 J, QL
2018	1
	0.98

14MW01	
2014	0.51 B
2015	0.51
2016	0.92
2018	1.8
	2

17MW1	
2004	ND (0.337 B)
2010	ND (0.057)
2011	0.037 J
2012	0.036 J
2013	0.038 J
2014	0.021 J
2015	ND (0.01 QN)
2016	0.092 J,B,QL
2018	ND (0.05)

MW88-3	
2002	34
2004	0.768
2014	0.46
2015	0.38
2016	0.49 J, QL
2018	0.85

MW88-1	
2002	1.2
2004	ND (0.345 B)
2010	0.75
2011	0.74
2012	1.9
2013	0.22
2014	0.26
	0.21
2015	0.1 B
2016	0.52 J, QL
2018	0.42

MW88-10	
2002	55
2004	1.38
2010	1.6
2011	0.54
2012	0.5
2013	0.97
	0.94
2014	0.66
2015	0.43
2016	0.3 J, QL
2018	0.54

20MW1	
2004	ND (0.333 B)
2010	0.024 J
2011	0.036 J
2012	0.040 J
2013	0.032 J
2014	0.023 J
2015	ND (0.01 QN)
2016	0.09 J,B,QL
2018	0.15 J,QL

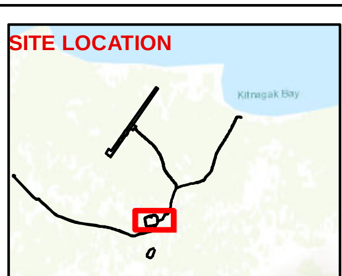
14MW07	
2014	0.15 B
2015	ND (0.01 QN)
2016	0.12 J,B,QL
2018	ND (0.05)

22MW2	
2010	ND (0.094)
2011	0.023
2012	0.047 J
2013	0.025 J
2014	ND (0.049)
2015	ND (0.01 QN)
2016	0.1 J,B,QL
2018	ND (0.05)
	0.13 QN

26MW1	
2004	0.078 J
2010	ND (0.057)
2011	0.083
2012	0.029 J
2013	0.029 J
2014	ND (0.050)
2015	ND (0.01 QN)
2016	0.11 J,B,QL
2018	ND (0.05)

Image Source: ESRI Service Layer, Digital Globe. Vivid – Alaska. 2015 (23 June). *http://goto.arcgisonline.com/maps/World_Imagery.*

SITE LOCATION



- Existing Monitoring Well
- Abandoned Monitoring Well
- Former Manhole
- Former Culvert
- Former Building
- MOC Boundary

DRO Concentration (mg/L)
3
1.5
0

Note:
The concentration gradient shown is depicted from data collected in 2018.
Bold and red text with gray shading indicate result is greater than or equal to the Site-Specific Cleanup Level and the 2018 ADEC Method Two Table C Groundwater Cleanup Level.

Site-Specific Cleanup Level (mg/L) (USACE 2009a)	
DRO	1.5

2018 ADEC Method Two Table C Groundwater Cleanup Level	
DRO	1.5

N

0 50 100 150 200 250 300
Feet

WGS 1984 UTM Zone 2N

1 inch = 150 feet

Approximate Groundwater Flow Direction

DRO RESULTS
IN GROUNDWATER AT THE MOC
2002 THROUGH 2018
ST. LAWRENCE ISLAND, ALASKA

DATE:	PROJECT MANAGER:	FIGURE NO:
01 JUN 2020	K. MAHER	E-5

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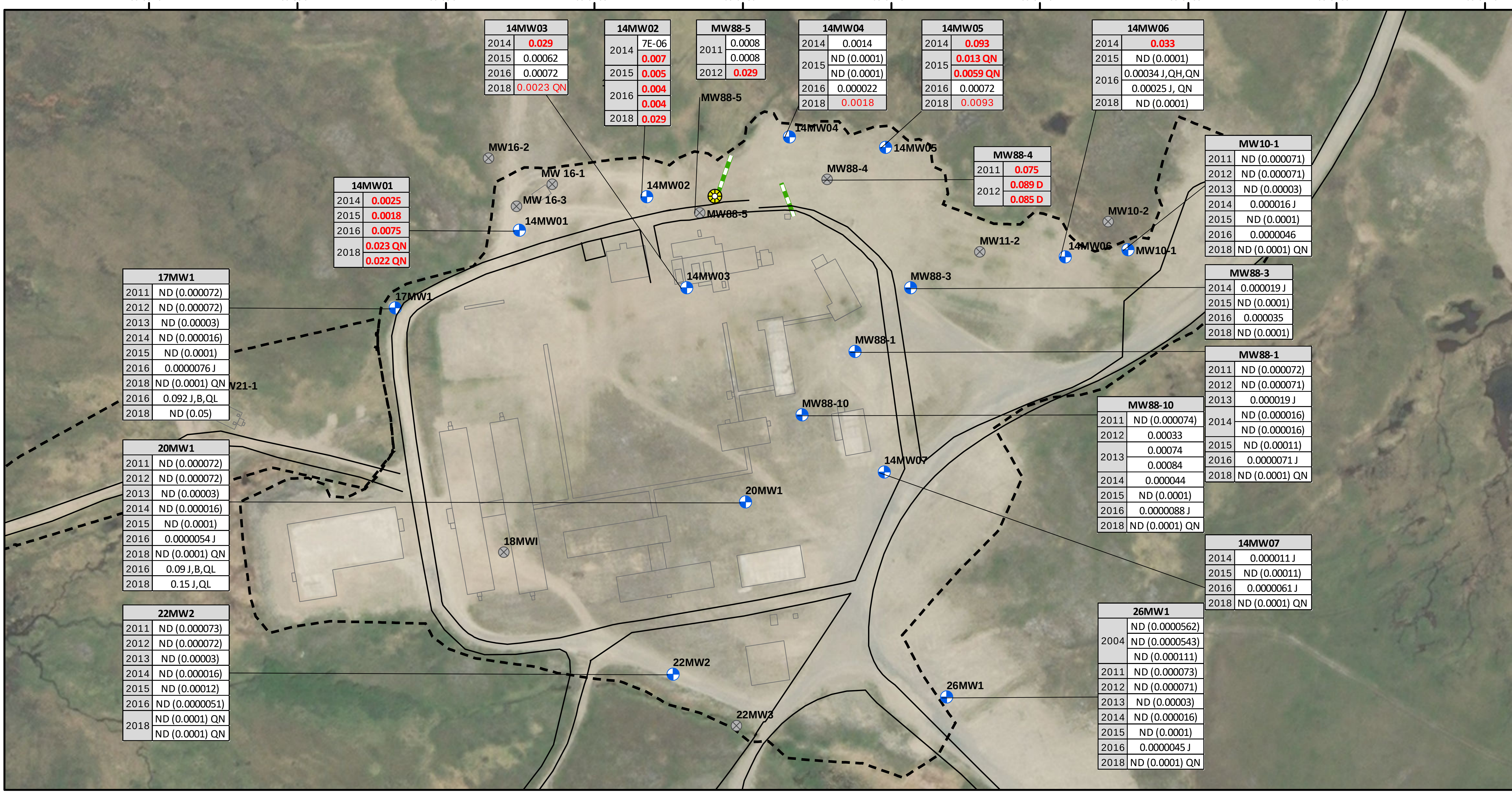


14MW03	
2014	**0.029**
2015	0.00062
2016	0.00072
2018	0.0023 QN

14MW02	
2014	7E-06
	0.007
2015	**0.005**
2016	**0.004**
	0.004
2018	**0.029**

MW88-5	
2011	0.0008
	0.0008
2012	**0.029**

14MW04	
2014	0.0014
2015	ND (0.0001)
	ND (0.0001)
2016	0.000022
2018	0.0018

14MW05	
2014	**0.093**
2015	**0.013 QN**
	0.0059 QN
2016	0.00072
2018	0.0093

14MW06	
2014	**0.033**
2015	ND (0.0001)
2016	0.00034 J,QH,QN
	0.00025 J, QN
2018	ND (0.0001)

MW88-4	
2011	**0.075**
2012	**0.089 D**
	0.085 D

14MW01	
2014	**0.0025**
2015	**0.0018**
2016	**0.0075**
2018	**0.023 QN**
	0.022 QN

MW10-1	
2011	ND (0.000071)
2012	ND (0.000071)
2013	ND (0.00003)
2014	0.000016 J
2015	ND (0.0001)
2016	0.0000046
2018	ND (0.0001) QN

17MW1	
2011	ND (0.000072)
2012	ND (0.000072)
2013	ND (0.00003)
2014	ND (0.000016)
2015	ND (0.0001)
2016	0.0000076 J
2018	ND (0.0001) QN
2016	0.092 J,B,QL
2018	ND (0.05)

MW88-3	
2014	0.000019 J
2015	ND (0.0001)
2016	0.000035
2018	ND (0.0001)

MW88-1	
2011	ND (0.000072)
2012	ND (0.000071)
2013	0.000019 J
2014	ND (0.000016)
	ND (0.000016)
2015	ND (0.00011)
2016	0.0000071 J
2018	ND (0.0001) QN

MW88-10	
2011	ND (0.000074)
2012	0.00033
2013	0.00074
	0.00084
2014	0.000044
2015	ND (0.0001)
2016	0.0000088 J
2018	ND (0.0001) QN

20MW1	
2011	ND (0.000072)
2012	ND (0.000072)
2013	ND (0.00003)
2014	ND (0.000016)
2015	ND (0.0001)
2016	0.0000054 J
2018	ND (0.0001) QN
2016	0.09 J,B,QL
2018	0.15 J,QL

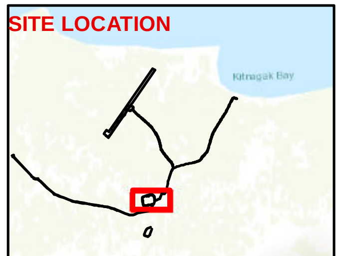
14MW07	
2014	0.000011 J
2015	ND (0.00011)
2016	0.0000061 J
2018	ND (0.0001) QN

22MW2	
2011	ND (0.000073)
2012	ND (0.000072)
2013	ND (0.00003)
2014	ND (0.000016)
2015	ND (0.00012)
2016	ND (0.0000051)
2018	ND (0.0001) QN
	ND (0.0001) QN

26MW1	
2004	ND (0.0000562)
	ND (0.0000543)
	ND (0.000111)
2011	ND (0.000073)
2012	ND (0.000071)
2013	ND (0.00003)
2014	ND (0.000016)
2015	ND (0.0001)
2016	0.0000045 J
2018	ND (0.0001) QN

Image Source: ESRI Service Layer, Digital Globe. Vivid – Alaska. 2015 (23 June). *http://goto.arcgisonline.com/maps/World_Imagery.*

SITE LOCATION



Existing Monitoring Well
Abandoned Monitoring Well
Former Manhole
Former Culvert
Former Building
MOC Boundary

Note:
Bold and red text with gray shading indicate result is greater than or equal to the Site-Specific Cleanup Level and the 2018 ADEC Method Two Table C Groundwater Cleanup Level.

2018 ADEC Method Two Table C Groundwater Cleanup Level (mg/L)	
Naphthalene	0.0017

N

0 50 100 150 200 250 300
Feet

WGS 1984 UTM Zone 2N

1 inch = 150 feet

Approximate Groundwater Flow Direction

NAPHTHALENE RESULTS
IN GROUNDWATER AT THE MOC
2011 THROUGH 2018
ST. LAWRENCE ISLAND, ALASKA

DATE:	PROJECT MANAGER:	FIGURE NO:
01 JUN 2020	K. MAHER	E-6

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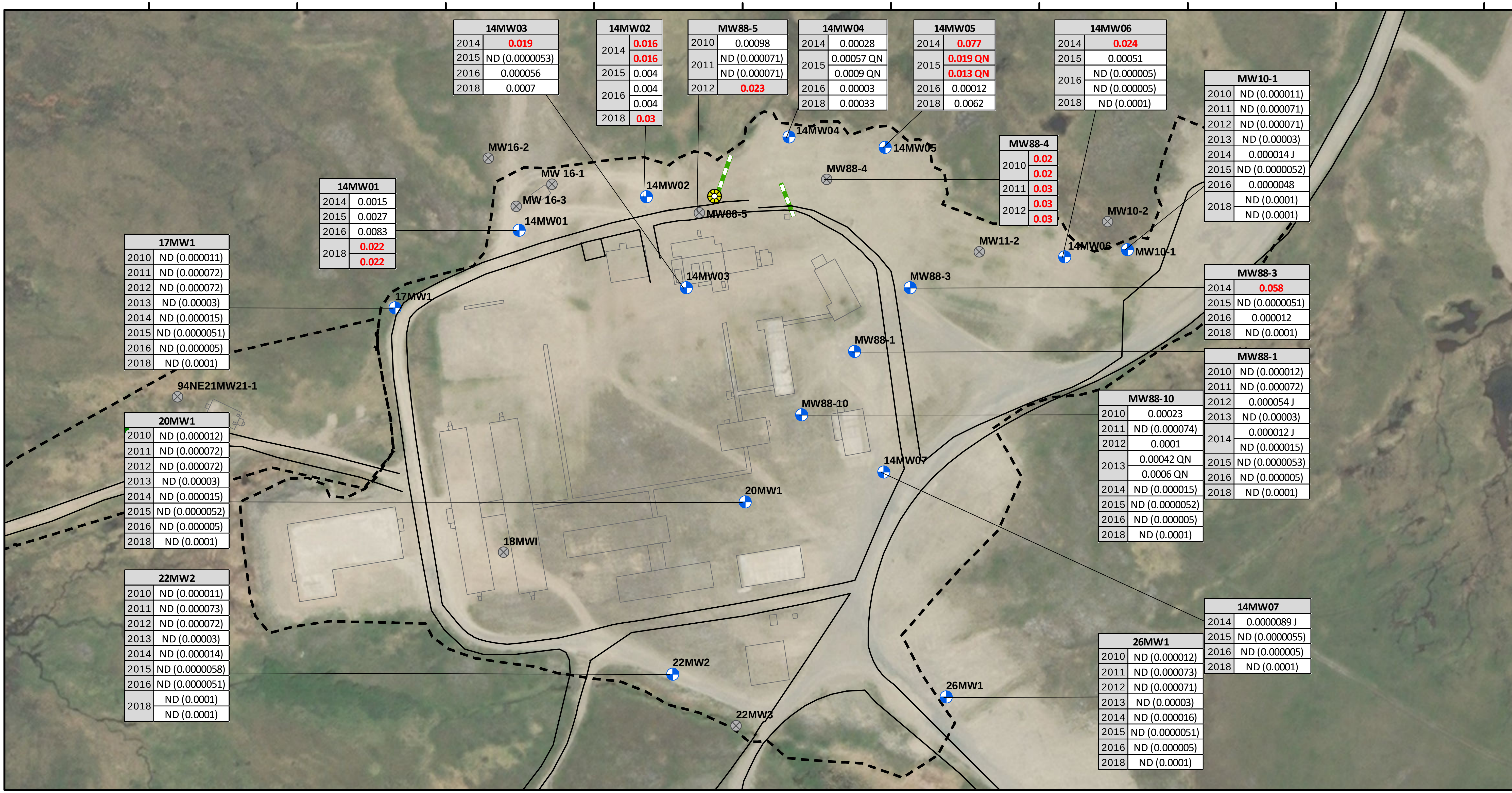


14MW03	
2014	**0.019**
2015	ND (0.0000053)
2016	0.000056
2018	0.0007

14MW02	
2014	**0.016**
	0.016
2015	0.004
2016	0.004
	0.004
2018	**0.03**

MW88-5	
2010	0.00098
2011	ND (0.000071)
	ND (0.000071)
2012	**0.023**

14MW04	
2014	0.00028
2015	0.00057 QN
	0.0009 QN
2016	0.00003
2018	0.00033

14MW05	
2014	**0.077**
2015	**0.019 QN**
	0.013 QN
2016	0.00012
2018	0.0062

14MW06	
2014	**0.024**
2015	0.00051
2016	ND (0.000005)
	ND (0.000005)
2018	ND (0.0001)

MW10-1	
2010	ND (0.000011)
2011	ND (0.000071)
2012	ND (0.000071)
2013	ND (0.00003)
2014	0.000014 J
2015	ND (0.0000052)
2016	0.0000048
2018	ND (0.0001)
	ND (0.0001)

MW88-4	
2010	**0.02**
	0.02
2011	**0.03**
2012	**0.03**
	0.03

14MW01	
2014	0.0015
2015	0.0027
2016	0.0083
2018	**0.022**
	0.022

17MW1	
2010	ND (0.000011)
2011	ND (0.000072)
2012	ND (0.000072)
2013	ND (0.00003)
2014	ND (0.000015)
2015	ND (0.0000051)
2016	ND (0.000005)
2018	ND (0.0001)

MW88-3	
2014	**0.058**
2015	ND (0.0000051)
2016	0.000012
2018	ND (0.0001)

MW88-1	
2010	ND (0.000012)
2011	ND (0.000072)
2012	0.000054 J
2013	ND (0.00003)
2014	0.000012 J
	ND (0.000015)
2015	ND (0.0000053)
2016	ND (0.000005)
2018	ND (0.0001)

20MW1	
2010	ND (0.000012)
2011	ND (0.000072)
2012	ND (0.000072)
2013	ND (0.00003)
2014	ND (0.000015)
2015	ND (0.0000052)
2016	ND (0.000005)
2018	ND (0.0001)

MW88-10	
2010	0.00023
2011	ND (0.000074)
2012	0.0001
2013	0.00042 QN
	0.0006 QN
2014	ND (0.000015)
2015	ND (0.0000052)
2016	ND (0.000005)
2018	ND (0.0001)

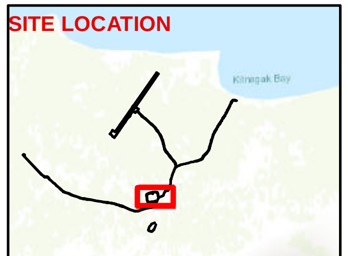
22MW2	
2010	ND (0.000011)
2011	ND (0.000073)
2012	ND (0.000072)
2013	ND (0.00003)
2014	ND (0.000014)
2015	ND (0.0000058)
2016	ND (0.0000051)
2018	ND (0.0001)
	ND (0.0001)

14MW07	
2014	0.0000089 J
2015	ND (0.0000055)
2016	ND (0.000005)
2018	ND (0.0001)

26MW1	
2010	ND (0.000012)
2011	ND (0.000073)
2012	ND (0.000071)
2013	ND (0.00003)
2014	ND (0.000016)
2015	ND (0.0000051)
2016	ND (0.000005)
2018	ND (0.0001)

Image Source: ESRI Service Layer, Digital Globe. Vivid – Alaska. 2015 (23 June). *http://goto.arcgisonline.com/maps/World_Imagery.*

SITE LOCATION



- Existing Monitoring Well
- Abandoned Monitoring Well
- Former Manhole
- Former Culvert
- Former Building
- MOC Boundary

Note:
Bold and red text with gray shading indicate result is greater than or equal to the Site-Specific Cleanup Level and the 2018 ADEC Method Two Table C Groundwater Cleanup Level.

2018 ADEC Method Two Table C Groundwater Cleanup Level (mg/L)	
1-Methylnaphthalene	0.011

N

0 50 100 150 200 250 300
Feet

WGS 1984 UTM Zone 2N

1 inch = 150 feet

Approximate Groundwater Flow Direction

1-METHYLNAPHTHALENE RESULTS IN GROUNDWATER AT THE MOC 2010 THROUGH 2018
ST. LAWRENCE ISLAND, ALASKA

DATE:	PROJECT MANAGER:	FIGURE NO:
01 JUN 2020	K. MAHER	E-7

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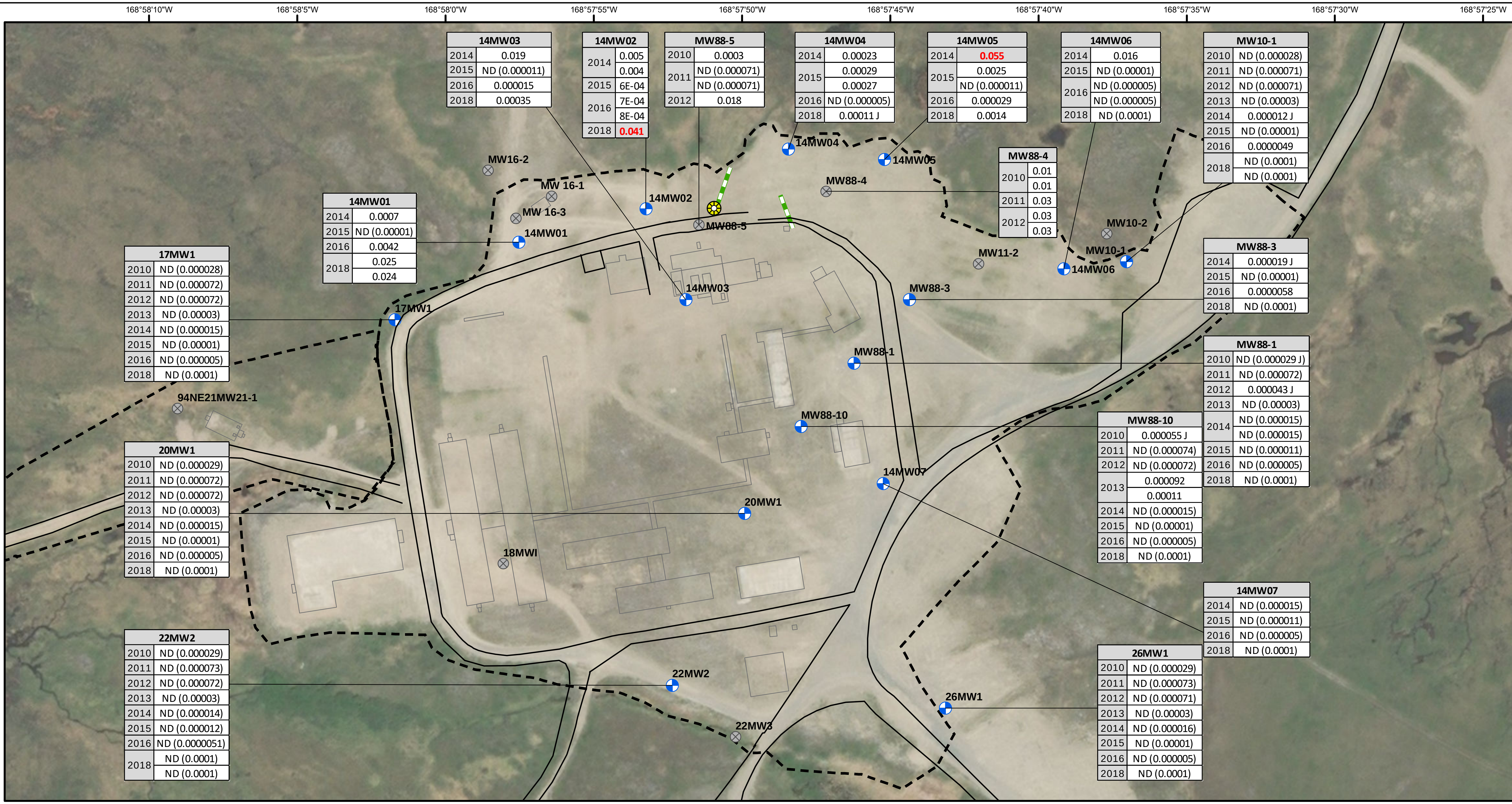

14MW03	
2014	0.019
2015	ND (0.000011)
2016	0.000015
2018	0.00035

14MW02	
2014	0.005
	0.004
2015	6E-04
2016	7E-04
	8E-04
2018	**0.041**

MW88-5	
2010	0.0003
2011	ND (0.000071)
	ND (0.000071)
2012	0.018

14MW04	
2014	0.00023
2015	0.00029
	0.00027
2016	ND (0.000005)
2018	0.00011 J

14MW05	
2014	**0.055**
2015	0.0025
	ND (0.000011)
2016	0.000029
2018	0.0014

14MW06	
2014	0.016
2015	ND (0.00001)
2016	ND (0.000005)
	ND (0.000005)
2018	ND (0.0001)

MW10-1	
2010	ND (0.000028)
2011	ND (0.000071)
2012	ND (0.000071)
2013	ND (0.00003)
2014	0.000012 J
2015	ND (0.00001)
2016	0.0000049
2018	ND (0.0001)
	ND (0.0001)

MW88-4	
2010	0.01
	0.01
2011	0.03
2012	0.03
	0.03

14MW01	
2014	0.0007
2015	ND (0.00001)
2016	0.0042
2018	0.025
	0.024

17MW1	
2010	ND (0.000028)
2011	ND (0.000072)
2012	ND (0.000072)
2013	ND (0.00003)
2014	ND (0.000015)
2015	ND (0.00001)
2016	ND (0.000005)
2018	ND (0.0001)

MW88-3	
2014	0.000019 J
2015	ND (0.00001)
2016	0.0000058
2018	ND (0.0001)

MW88-1	
2010	ND (0.000029 J)
2011	ND (0.000072)
2012	0.000043 J
2013	ND (0.00003)
2014	ND (0.000015)
	ND (0.000015)
2015	ND (0.000011)
2016	ND (0.000005)
2018	ND (0.0001)

MW88-10	
2010	0.000055 J
2011	ND (0.000074)
2012	ND (0.000072)
2013	0.000092
	0.00011
2014	ND (0.000015)
2015	ND (0.00001)
2016	ND (0.000005)
2018	ND (0.0001)

20MW1	
2010	ND (0.000029)
2011	ND (0.000072)
2012	ND (0.000072)
2013	ND (0.00003)
2014	ND (0.000015)
2015	ND (0.00001)
2016	ND (0.000005)
2018	ND (0.0001)

14MW07	
2014	ND (0.000015)
2015	ND (0.000011)
2016	ND (0.000005)
2018	ND (0.0001)

22MW2	
2010	ND (0.000029)
2011	ND (0.000073)
2012	ND (0.000072)
2013	ND (0.00003)
2014	ND (0.000014)
2015	ND (0.000012)
2016	ND (0.0000051)
2018	ND (0.0001)
	ND (0.0001)

26MW1	
2010	ND (0.000029)
2011	ND (0.000073)
2012	ND (0.000071)
2013	ND (0.00003)
2014	ND (0.000016)
2015	ND (0.00001)
2016	ND (0.000005)
2018	ND (0.0001)

Image Source: ESRI Service Layer, Digital Globe. Vivid – Alaska. 2015 (23 June). *http://goto.arcgisonline.com/maps/World_Imagery.*

SITE LOCATION

Kitnipak Bay

- Existing Monitoring Well
- Abandoned Monitoring Well
- Former Manhole
- Former Culvert
- Former Building
- MOC Boundary

Note:
Bold and red text with gray shading indicate result is greater than or equal to the Site-Specific Cleanup Level and the 2018 ADEC Method Two Table C Groundwater Cleanup Level.

2018 ADEC Method Two Table C Groundwater Cleanup Level (mg/L)	
2-Methylnaphthalene	0.036

N

0 50 100 150 200 250 300
Feet

WGS 1984 UTM Zone 2N

1 inch = 150 feet

Approximate Groundwater Flow Direction

2-METHYLNAPHTHALENE RESULTS IN GROUNDWATER AT THE MOC 2010 THROUGH 2018
ST. LAWRENCE ISLAND, ALASKA

DATE:	PROJECT MANAGER:	FIGURE NO:
01 JUN 2020	K. MAHER	E-8

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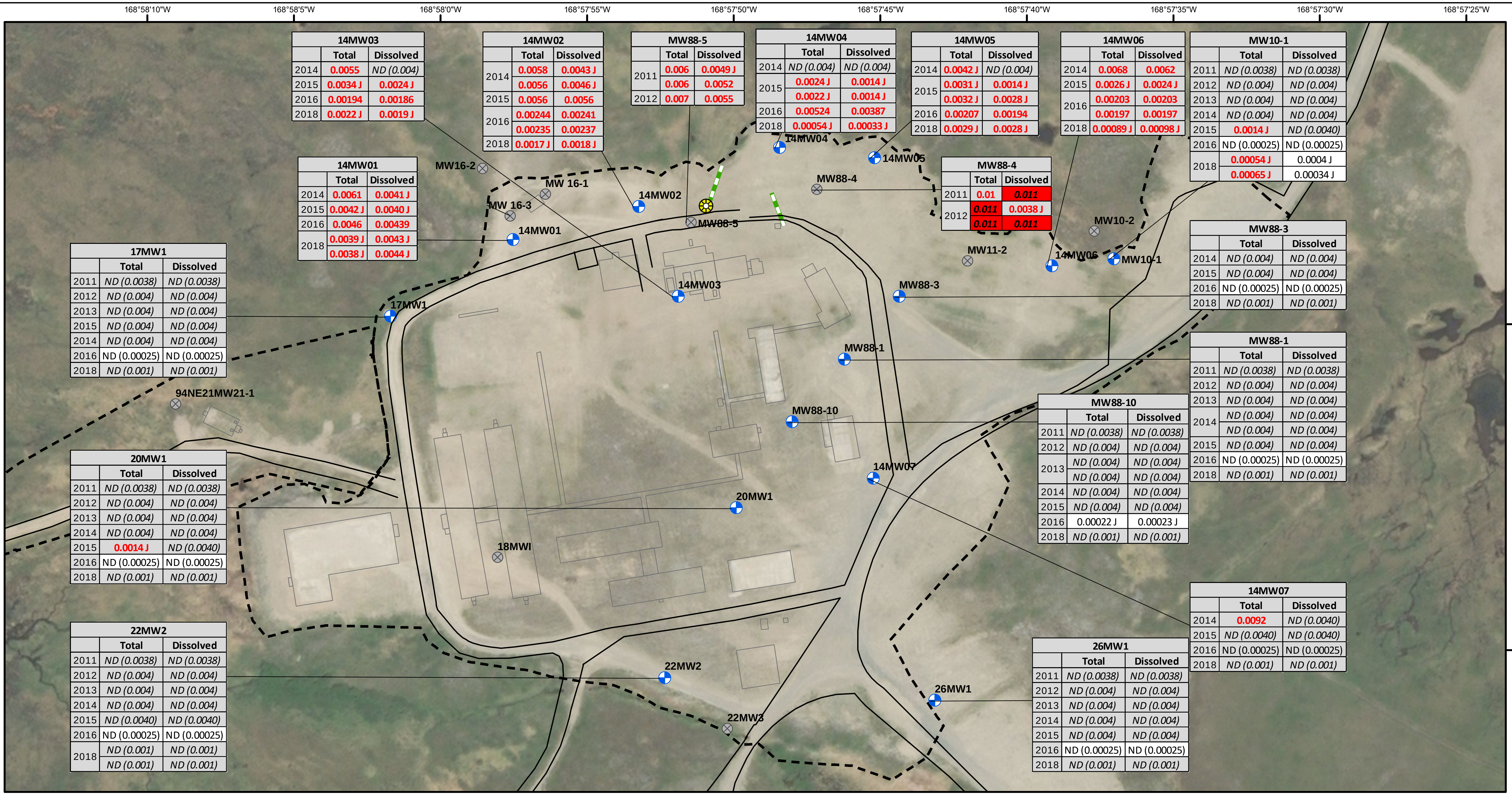


14MW03	Total	Dissolved
2014	**0.0055**	*ND (0.004)*
2015	**0.0034 J**	**0.0024 J**
2016	**0.00194**	**0.00186**
2018	**0.0022 J**	**0.0019 J**

14MW02	Total	Dissolved
2014	**0.0058**	**0.0043 J**
	0.0056	**0.0046 J**
2015	**0.0056**	**0.0056**
2016	**0.00244**	**0.00241**
	0.00235	**0.00237**
2018	**0.0017 J**	**0.0018 J**

MW88-5	Total	Dissolved
2011	**0.006**	**0.0049 J**
	0.006	**0.0052**
2012	**0.007**	**0.0055**

14MW04	Total	Dissolved
2014	*ND (0.004)*	*ND (0.004)*
2015	**0.0024 J**	**0.0014 J**
	0.0022 J	**0.0014 J**
2016	**0.00524**	**0.00387**
2018	**0.00054 J**	**0.00033 J**

14MW05	Total	Dissolved
2014	**0.0042 J**	*ND (0.004)*
2015	**0.0031 J**	**0.0014 J**
	0.0032 J	**0.0028 J**
2016	**0.00207**	**0.00194**
2018	**0.0029 J**	**0.0028 J**

14MW06	Total	Dissolved
2014	**0.0068**	**0.0062**
2015	**0.0026 J**	**0.0024 J**
2016	**0.00203**	**0.00203**
	0.00197	**0.00197**
2018	**0.00089 J**	**0.00098 J**

MW10-1	Total	Dissolved
2011	*ND (0.0038)*	*ND (0.0038)*
2012	*ND (0.004)*	*ND (0.004)*
2013	*ND (0.004)*	*ND (0.004)*
2014	*ND (0.004)*	*ND (0.004)*
2015	**0.0014 J**	*ND (0.0040)*
2016	ND (0.00025)	ND (0.00025)
2018	**0.00054 J**	0.0004 J
	0.00065 J	0.00034 J

14MW01	Total	Dissolved
2014	**0.0061**	**0.0041 J**
2015	**0.0042 J**	**0.0040 J**
2016	**0.0046**	**0.00439**
2018	**0.0039 J**	**0.0043 J**
	0.0038 J	**0.0044 J**

MW88-4	Total	Dissolved
2011	**0.01**	***0.011***
2012	***0.011***	**0.0038 J**
	0.011	***0.011***

MW88-3	Total	Dissolved
2014	*ND (0.004)*	*ND (0.004)*
2015	*ND (0.004)*	*ND (0.004)*
2016	ND (0.00025)	ND (0.00025)
2018	*ND (0.001)*	*ND (0.001)*

17MW1	Total	Dissolved
2011	*ND (0.0038)*	*ND (0.0038)*
2012	*ND (0.004)*	*ND (0.004)*
2013	*ND (0.004)*	*ND (0.004)*
2015	*ND (0.004)*	*ND (0.004)*
2014	*ND (0.004)*	*ND (0.004)*
2016	ND (0.00025)	ND (0.00025)
2018	*ND (0.001)*	*ND (0.001)*

MW88-1	Total	Dissolved
2011	*ND (0.0038)*	*ND (0.0038)*
2012	*ND (0.004)*	*ND (0.004)*
2013	*ND (0.004)*	*ND (0.004)*
2014	*ND (0.004)*	*ND (0.004)*
	ND (0.004)	*ND (0.004)*
2015	*ND (0.004)*	*ND (0.004)*
2016	ND (0.00025)	ND (0.00025)
2018	*ND (0.001)*	*ND (0.001)*

MW88-10	Total	Dissolved
2011	*ND (0.0038)*	*ND (0.0038)*
2012	*ND (0.004)*	*ND (0.004)*
2013	*ND (0.004)*	*ND (0.004)*
	ND (0.004)	*ND (0.004)*
2014	*ND (0.004)*	*ND (0.004)*
2015	*ND (0.004)*	*ND (0.004)*
2016	0.00022 J	0.00023 J
2018	*ND (0.001)*	*ND (0.001)*

20MW1	Total	Dissolved
2011	*ND (0.0038)*	*ND (0.0038)*
2012	*ND (0.004)*	*ND (0.004)*
2013	*ND (0.004)*	*ND (0.004)*
2014	*ND (0.004)*	*ND (0.004)*
2015	**0.0014 J**	*ND (0.0040)*
2016	ND (0.00025)	ND (0.00025)
2018	*ND (0.001)*	*ND (0.001)*

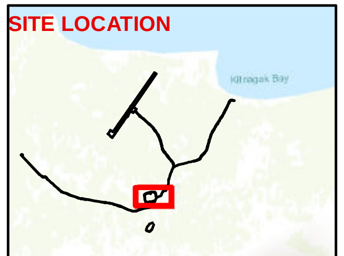
14MW07	Total	Dissolved
2014	**0.0092**	*ND (0.0040)*
2015	*ND (0.0040)*	*ND (0.0040)*
2016	ND (0.00025)	ND (0.00025)
2018	*ND (0.001)*	*ND (0.001)*

22MW2	Total	Dissolved
2011	*ND (0.0038)*	*ND (0.0038)*
2012	*ND (0.004)*	*ND (0.004)*
2013	*ND (0.004)*	*ND (0.004)*
2014	*ND (0.004)*	*ND (0.004)*
2015	*ND (0.0040)*	*ND (0.0040)*
2016	ND (0.00025)	ND (0.00025)
2018	*ND (0.001)*	*ND (0.001)*
	ND (0.001)	*ND (0.001)*

26MW1	Total	Dissolved
2011	*ND (0.0038)*	*ND (0.0038)*
2012	*ND (0.004)*	*ND (0.004)*
2013	*ND (0.004)*	*ND (0.004)*
2014	*ND (0.004)*	*ND (0.004)*
2015	*ND (0.004)*	*ND (0.004)*
2016	ND (0.00025)	ND (0.00025)
2018	*ND (0.001)*	*ND (0.001)*

Image Source: ESRI Service Layer, Digital Globe. Vivid – Alaska. 2015 (23 June). *http://goto.arcgisonline.com/maps/World_Imagery.*

SITE LOCATION



- Existing Monitoring Well
- Abandoned Monitoring Well
- Former Manhole
- Former Culvert
- Former Building
- MOC Boundary

Note:
Bold and red text with gray shading indicate result is greater than or equal to the Site-Specific Cleanup Level and the 2018 ADEC Method Two Table C Groundwater Cleanup Level.

Site-Specific Cleanup Level (mg/L) (USACE 2009a)	
Arsenic (Total and Dissolved)	0.01

2018 ADEC Method Two Table C Groundwater Cleanup Level (mg/L)	
Arsenic (Total and Dissolved)	0.00052

Italicized and shaded text indicates ND result with LOD greater than or equal to the 2018 ADEC Method Two Table C Groundwater Cleanup Level.

N

0 50 100 150 200 250 300
Feet

WGS 1984 UTM Zone 2N

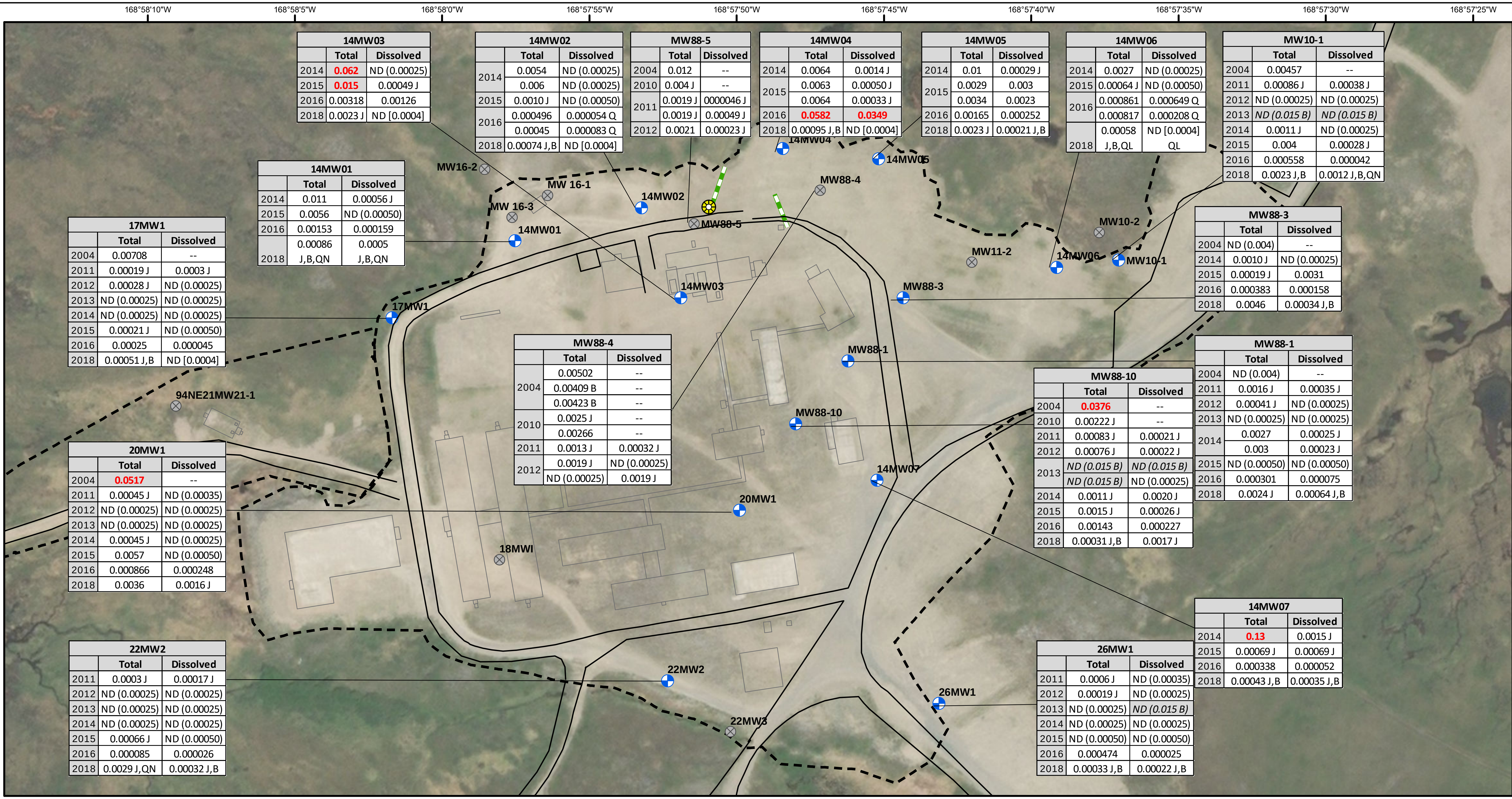
1 inch = 150 feet

Approximate Groundwater Flow Direction

ARSENIC RESULTS
IN GROUNDWATER AT THE MOC
2011 THROUGH 2018
ST. LAWRENCE ISLAND, ALASKA

DATE:	PROJECT MANAGER:	FIGURE NO:
01 JUN 2020	K. MAHER	E-9

P:\StLawrenceIsland_FUDS_MOC_GW_Report_Sup\MXD\E-09_NEC_MOC_ArsenicinGW.mxd beatyc



14MW03	Total	Dissolved
2014	**0.062**	ND (0.00025)
2015	**0.015**	0.00049 J
2016	0.00318	0.00126
2018	0.0023 J	ND [0.0004]

14MW02	Total	Dissolved
2014	0.0054	ND (0.00025)
	0.006	ND (0.00025)
2015	0.0010 J	ND (0.00050)
2016	0.000496	0.000054 Q
	0.00045	0.000083 Q
2018	0.00074 J,B	ND [0.0004]

MW88-5	Total	Dissolved
2004	0.012	--
2010	0.004 J	--
2011	0.0019 J	0000046 J
	0.0019 J	0.00049 J
2012	0.0021	0.00023 J

14MW04	Total	Dissolved
2014	0.0064	0.0014 J
2015	0.0063	0.00050 J
	0.0064	0.00033 J
2016	**0.0582**	**0.0349**
2018	0.00095 J,B	ND [0.0004]

14MW05	Total	Dissolved
2014	0.01	0.00029 J
2015	0.0029	0.003
	0.0034	0.0023
2016	0.00165	0.000252
2018	0.0023 J	0.00021 J,B

14MW06	Total	Dissolved
2014	0.0027	ND (0.00025)
2015	0.00064 J	ND (0.00050)
2016	0.000861	0.000649 Q
	0.000817	0.000208 Q
2018	0.00058 J,B,QL	ND [0.0004] QL

MW10-1	Total	Dissolved
2004	0.00457	--
2011	0.00086 J	0.00038 J
2012	ND (0.00025)	ND (0.00025)
2013	*ND (0.015 B)*	*ND (0.015 B)*
2014	0.0011 J	ND (0.00025)
2015	0.004	0.00028 J
2016	0.000558	0.000042
2018	0.0023 J,B	0.0012 J,B,QN

14MW01	Total	Dissolved
2014	0.011	0.00056 J
2015	0.0056	ND (0.00050)
2016	0.00153	0.000159
2018	0.00086 J,B,QN	0.0005 J,B,QN

17MW1	Total	Dissolved
2004	0.00708	--
2011	0.00019 J	0.0003 J
2012	0.00028 J	ND (0.00025)
2013	ND (0.00025)	ND (0.00025)
2014	ND (0.00025)	ND (0.00025)
2015	0.00021 J	ND (0.00050)
2016	0.00025	0.000045
2018	0.00051 J,B	ND [0.0004]

MW88-3	Total	Dissolved
2004	ND (0.004)	--
2014	0.0010 J	ND (0.00025)
2015	0.00019 J	0.0031
2016	0.000383	0.000158
2018	0.0046	0.00034 J,B

MW88-4	Total	Dissolved
2004	0.00502	--
	0.00409 B	--
	0.00423 B	--
2010	0.0025 J	--
	0.00266	--
2011	0.0013 J	0.00032 J
2012	0.0019 J	ND (0.00025)
	ND (0.00025)	0.0019 J

MW88-1	Total	Dissolved
2004	ND (0.004)	--
2011	0.0016 J	0.00035 J
2012	0.00041 J	ND (0.00025)
2013	ND (0.00025)	ND (0.00025)
2014	0.0027	0.00025 J
	0.003	0.00023 J
2015	ND (0.00050)	ND (0.00050)
2016	0.000301	0.000075
2018	0.0024 J	0.00064 J,B

MW88-10	Total	Dissolved
2004	**0.0376**	--
2010	0.00222 J	--
2011	0.00083 J	0.00021 J
2012	0.00076 J	0.00022 J
2013	*ND (0.015 B)*	*ND (0.015 B)*
	ND (0.015 B)	ND (0.00025)
2014	0.0011 J	0.0020 J
2015	0.0015 J	0.00026 J
2016	0.00143	0.000227
2018	0.00031 J,B	0.0017 J

20MW1	Total	Dissolved
2004	**0.0517**	--
2011	0.00045 J	ND (0.00035)
2012	ND (0.00025)	ND (0.00025)
2013	ND (0.00025)	ND (0.00025)
2014	0.00045 J	ND (0.00025)
2015	0.0057	ND (0.00050)
2016	0.000866	0.000248
2018	0.0036	0.0016 J

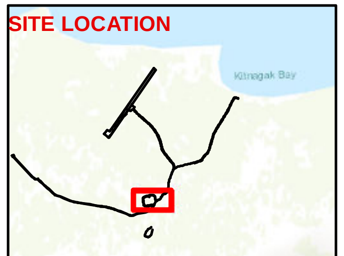
14MW07	Total	Dissolved
2014	**0.13**	0.0015 J
2015	0.00069 J	0.00069 J
2016	0.000338	0.000052
2018	0.00043 J,B	0.00035 J,B

22MW2	Total	Dissolved
2011	0.0003 J	0.00017 J
2012	ND (0.00025)	ND (0.00025)
2013	ND (0.00025)	ND (0.00025)
2014	ND (0.00025)	ND (0.00025)
2015	0.00066 J	ND (0.00050)
2016	0.000085	0.000026
2018	0.0029 J,QN	0.00032 J,B

26MW1	Total	Dissolved
2011	0.0006 J	ND (0.00035)
2012	0.00019 J	ND (0.00025)
2013	ND (0.00025)	*ND (0.015 B)*
2014	ND (0.00025)	ND (0.00025)
2015	ND (0.00050)	ND (0.00050)
2016	0.000474	0.000025
2018	0.00033 J,B	0.00022 J,B

Image Source: ESRI Service Layer, Digital Globe. Vivid – Alaska. 2015 (23 June). *http://goto.arcgisonline.com/maps/World_Imagery.*

SITE LOCATION



Existing Monitoring Well
Abandoned Monitoring Well
Former Manhole
Former Culvert
Former Building
MOC Boundary

Note:
Bold and red text with gray shading indicate result is greater than or equal to the Site-Specific Cleanup Level and the 2018 ADEC Method Two Table C Groundwater Cleanup Level.

Site-Specific Cleanup Level (mg/L) (USACE 2009a)	
Lead (Total and Dissolved)	0.015

2018 ADEC Method Two Table C Groundwater Cleanup Level (mg/L)	
Lead (Total and Dissolved)	0.015

Italicized and shaded text indicates ND result with LOD greater than or equal to the Site-Specific Cleanup Level and 2018 ADEC Method Two Table C Groundwater Cleanup Level.

N

0 50 100 150 200 250 300
Feet

WGS 1984 UTM Zone 2N

1 inch = 150 feet

Approximate Groundwater Flow Direction

LEAD RESULTS IN GROUNDWATER AT THE MOC 2004 THROUGH 2018
ST. LAWRENCE ISLAND, ALASKA

DATE:	PROJECT MANAGER:	FIGURE NO:
01 JUN 2020	K. MAHER	E-10

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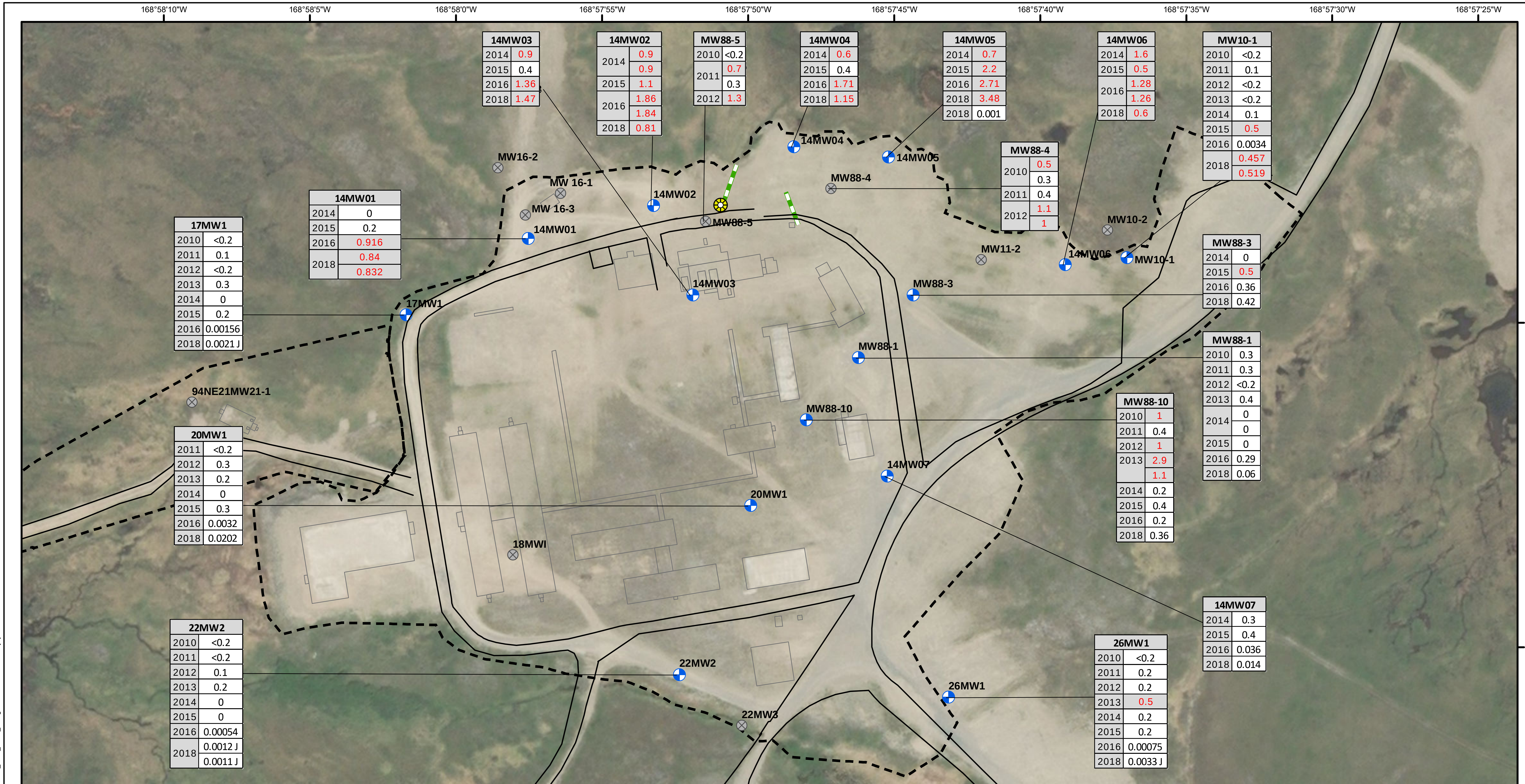
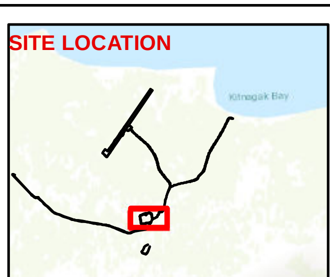


Image Source: ESRI Service Layer, Digital Globe. Vivid – Alaska. 2015 (23 June). *http://goto.arcgisonline.com/maps/World_Imagery.*



- Existing Monitoring Well
- Abandoned Monitoring Well
- Former Manhole
- Former Culvert
- Former Building
- MOC Boundary

Note:
Bold and red text with gray shading indicate result is greater than or equal to the Site-Specific Cleanup Level and the 2018 ADEC Method Two Table C Groundwater Cleanup Level.

2018 ADEC Method Two Table C Groundwater Cleanup Level (mg/L)	
Manganese (Dissolved)	0.43

N

0 50 100 150 200 250 300
Feet

WGS 1984 UTM Zone 2N

1 inch = 150 feet

Approximate Groundwater Flow Direction

MANGANESE RESULTS
IN GROUNDWATER AT THE MOC
2010 THROUGH 2018
ST. LAWRENCE ISLAND, ALASKA

DATE:	PROJECT MANAGER:	FIGURE NO:
01 JUN 2020	K. MAHER	E-11

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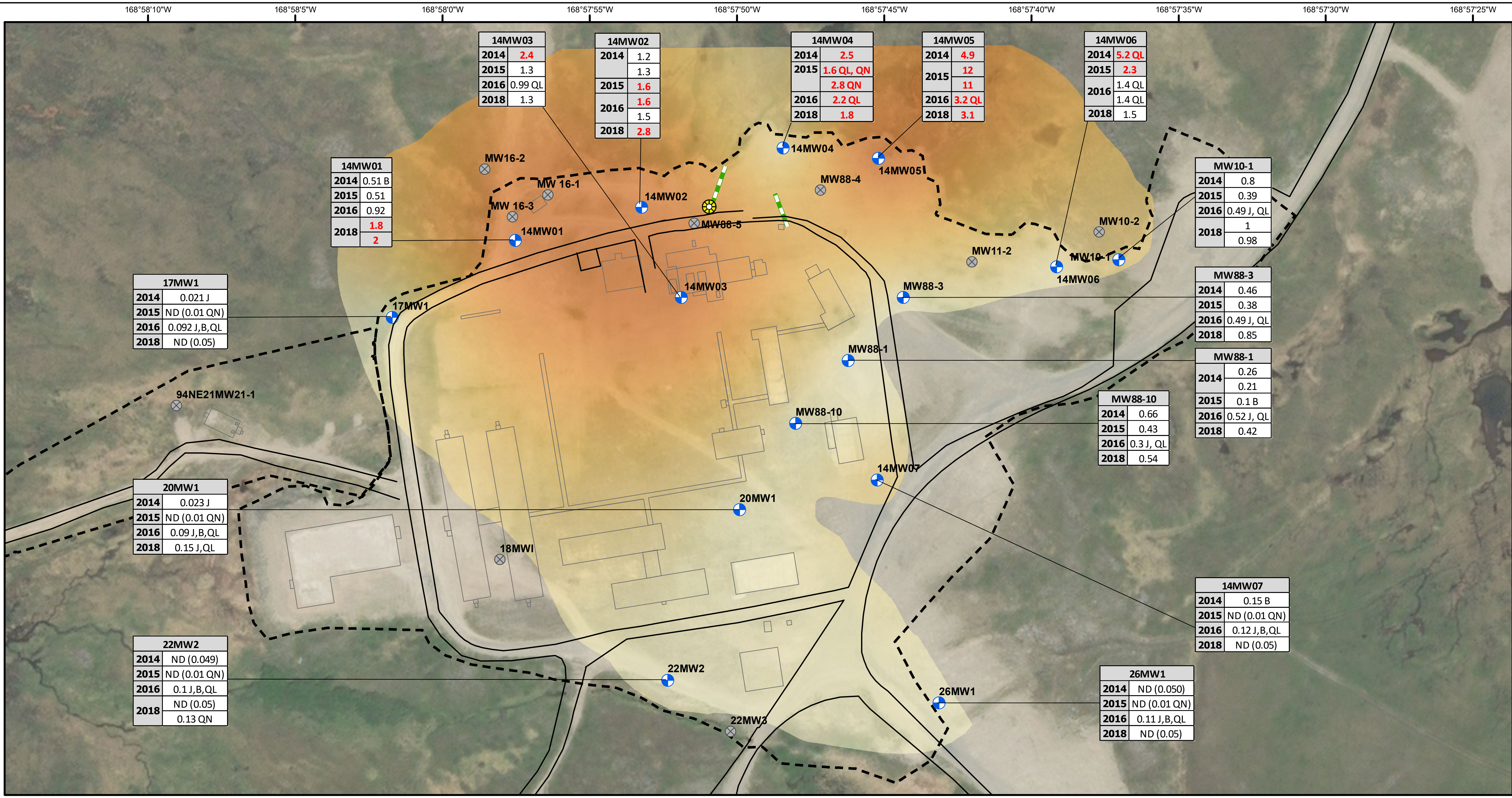
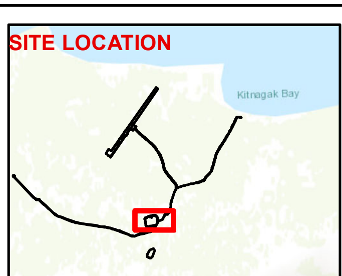


Image Source: ESRI Service Layer, Digital Globe. Vivid – Alaska. 2015 (23 June). *http://goto.arcgisonline.com/maps/World_Imagery.*

SITE LOCATION



- Existing Monitoring Well
- Abandoned Monitoring Well
- Former Manhole
- Former Culvert
- Former Building
- MOC Boundary

DRO Concentration (mg/L)
3
1.5
0

Note:
The concentration gradient shown is depicted from data collected in 2018.
Bold and black text with red shading indicate result is greater than the Site-Specific Cleanup Level and the 2018 ADEC Method Two Table C Groundwater Cleanup Level.
Bold and red text with gray shading indicate result is greater than or equal to the 2018 ADEC Method Two Table C Groundwater Cleanup Level."

Site-Specific Cleanup Level (mg/L) (USACE 2009a)	
DRO	1.5

2018 ADEC Method Two Table C Groundwater Cleanup Level (mg/L)	
DRO	1.5

N

0 50 100 150 200 250 300
Feet

WGS 1984 UTM Zone 2N

1 inch = 150 feet

Approximate Groundwater Flow Direction

DRO RESULTS
IN GROUNDWATER AT THE MOC
2014 THROUGH 2018
ST. LAWRENCE ISLAND, ALASKA

DATE:	PROJECT MANAGER:	FIGURE NO:
03 SEP 2020	K. MAHER	E-12

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ATTACHMENT E-2
Data Quality Assessment

2018 MNA GROUNDWATER ANNUAL SAMPLING REPORT AT THE NORTHEAST CAPE MAIN OPERATIONS COMPLEX

ATTACHMENT E-2
DATA QUALITY ASSESSMENT

NORTHEAST CAPE FUDS
ST. LAWRENCE ISLAND, ALASKA

FUDS No. F10AK0969-03

FINAL
SEPTEMBER 2020

TABLE OF CONTENTS

SECTION **PAGE**

TABLE

EXHIBITS

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ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
ADEC	Alaska Department of Environmental Conservation
APPL	Agriculture & Priority Pollutants Laboratories, Inc. of Clovis, CA
BTEX	benzene, toluene, ethylbenzene, and xylenes
btoc	below top of casing
CoC	chain-of-custody
DCE	dichloroethene
DF	dilution factor
DL	detection limit
DoD	U.S. Department of Defense
DQA	data quality assessment
DQO	data quality objectives
DRO	diesel-range organics
Dup	duplicate
EB	equipment blank
EDB	1,2-dibromoethane (ethylene dibromide)
EPA	U.S. Environmental Protection Agency
FD	field duplicate
GW	groundwater
HCL	hydrochloric acid
HNO_3	nitric acid
HPAH	high molecular weight polycyclic aromatic hydrocarbon
Jacobs	Jacobs Engineering Group Inc.
L	liter
LCL	lower control limit
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LOD	limit of detection
LOQ	limit of quantitation
LPAH	low molecular weight polycyclic aromatic hydrocarbon

ACRONYMS AND ABBREVIATIONS (Continued)

mg/L	milligrams per liter
mL	milliliter
MOC	Main Operations Complex
MS	matrix spike
MSD	matrix spike duplicate
N/A	not applicable
NEC	Northeast Cape
ND	nondetect
PAH	polycyclic aromatic hydrocarbon
QA	quality assurance
QAPP	quality assurance project plan
QC	quality control
QSM	Quality Systems Manual
Qty	quantity
RCRA	Resource Conservation and Recovery Act (of 1976, amended in 1984)
RPD	relative percent difference
RRO	residual-range organics
SD	sediment
SDG	sample delivery group
SGS	SGS North America, Inc. of Anchorage, AK
SIM	selective ion monitoring
SSCL	site-specific cleanup level
SW	surface water
TAT	turnaround time
TB	trip blank
TCE	trichloroethene
TMB	trimethylbenzene
UCL	upper control limit
USACE	U.S. Army Corps of Engineers
VC	vinyl chloride
VOC	volatile organic compound

ANALYTICAL DATA QUALIFIERS

The following data qualifiers are applicable to the 2018 Northeast Cape analytical data:

J The analyte was positively identified; however, the associated result was less than the limit of quantitation but greater than or equal to the DL.

B The analyte was detected in the method blank, the TB, or EB above the DL and the concentration in the sample did not exceed the blank concentration by a factor of five (factor of 10 for common laboratory contaminants acetone, toluene, and methylene chloride).

QH Analyte result is considered an estimated value (biased high) due to a QC failure.

QL Analyte result is considered an estimated value (biased low) due to a QC failure.

QN Analyte result is considered an estimated value (unknown bias) due to a QC failure.

R Result is rejected and should not be used for reporting purposes.

U Result is nondetect.

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1.0 INTRODUCTION

This data quality assessment (DQA) and the Alaska Department of Environmental Conservation (ADEC) Laboratory Data Review Checklists assess the overall quality and usability of data from the 2018 sampling events at Northeast Cape (NEC) on Saint Lawrence Island, Alaska at the Main Operations Complex (MOC). The groundwater samples were analyzed by Agriculture & Priority Pollutants Laboratories, Inc. of Clovis, CA (APPL) of Clovis, CA. All samples are presented in Table E2-1-1, categorized by method and sample type.

The exhibits included with this DQA present the sample summary table and analytical data tables (Exhibit E-1), tables of sample results that did not meet the project data quality objectives (DQOs) (Exhibit E-2), ADEC laboratory data review checklists (Exhibit E-3), and laboratory deliverables (Exhibit E-4).

Table E2-1-1
Field QC Sample Quantities

Matrix	Sample Type	PAHs 8270SIM	Alkalinity A2320B	DRO/RRO AK102+3	Metals E200.8	Sulfate E300.0	Methane RSK175	Metals SW6020	Dissolved Metals SW6020	Dissolved Mercury SW7470A	Total Mercury SW7470A	Glycols SW8015D	PCBs SW8082	VOCs SW8260C
Groundwater	Primary	15	15	15	N/A	15	15	15	15	15	15	2	15	15
	Duplicate	3	3	3	N/A	3	3	3	3	3	3	1	3	3
	MS/MSD	6	4	6	2	4	4	4	4	4	4	2	4	6
	TB	N/A	N/A	N/A	N/A	N/A	3	N/A	N/A	N/A	N/A	N/A	N/A	3
	EB	1	N/A	1	N/A	N/A	N/A	1	N/A	N/A	1	1	1	1

Note:
For definitions, refer to the Acronyms and Abbreviations section.

1.1 QC CRITERIA

Jacobs Engineering Group Inc. (Jacobs) performed this DQA and completed ADEC laboratory data review checklists for records associated with the analytical data, as per the *2018 Remedial Action Review Work Plan* (U.S. Army Corps of Engineers [USACE] 2018). Data quality was evaluated against the following requirements: U.S. Department of Defense (DoD) Quality Systems Manual (QSM) (DoD 2017); ADEC and U.S. Environmental Protection Agency (EPA) analytical methods (ADEC 2017a, EPA 2014); and laboratory control limits.

The Jacobs project chemist performed a completeness check of the electronic data to verify that data packages and electronic files included all the requested information. All analytical data were reviewed, including the chain-of-custody (CoC) and sample receipt records, laboratory case narratives, and laboratory data. Analytical data were reviewed for methodology, sample holding times, laboratory blanks, limits of quantitation (LOQs), limits of detection (LODs), detection limits (DLs), surrogate recoveries, laboratory control sample (LCS) and LCS duplicate (LCSD) recovery accuracies, matrix spike (MS) and MS duplicate (MSD) recovery accuracies, and precision. Other quality control (QC) parameters (initial calibration, continuing calibration, tuning, internal standards, interference check solutions, post-digestion spikes, and serial dilutions) were reviewed via the laboratory case narrative. These QC parameters met acceptance criteria; any sample results outside QC parameters are listed in Section 1.2 or in the associated ADEC laboratory data review checklist (Exhibit E-3). Analytical DQOs were considered met when the quality of the sample data met precision, accuracy, representativeness, completeness, comparability, and sensitivity requirements. The overall quality of the data was acceptable as qualified. Flagged data are considered usable but estimated.

Qualification was not required in the following circumstances:

- Surrogate or MS/MSD recoveries were outside QC limits, and the sample was diluted by a factor of five or greater.
- MS/MSD recoveries were outside QC limits, and the spiked concentration was less than that of the parent sample.
- An analyte was detected in the method blank, but there was no detection in the sample.

- Surrogate, MS, or LCS recoveries exceeded upper control limits (UCLs), and there was no detection in the sample(s).

1.2 DATA QUALITY SUMMARY

In general, the overall quality of project data was acceptable. One analytical result was rejected (see Section 1.2.1), and the completeness goal of 95 percent was met for all parameters. Complete details of the evaluation and associated samples are provided in the ADEC laboratory review checklists (Exhibit E-3). The tables in Exhibit E-2 include analytical results that did not meet project DQOs and required qualification.

The following anomalies identified during the data review process are as follows:

- Sample handling/preservation
- Method blank and trip blank (TB) contamination
- LCS accuracy and precision
- MS accuracy and precision
- Surrogate spike accuracy
- Field duplicate (FD) precision
- Calibration verification samples
- Reporting limit assessment
- Equipment blank (EB) contamination

Sections 1.2.1 through 1.2.9 describe anomalies and their effects on data quality and usability.

1.2.1 Sample Handling/Preservation

Twenty-eight coolers were sent to APPL for the groundwater sampling effort. All sample coolers were received within the acceptable temperature range of 0 to 6 degrees Celsius (°C). The laboratory did not note any frozen samples.

Erroneous temperatures were recorded in the receipt documentation for two coolers. The coolers “Nordic Track” and “Vibra-Belt” were received by the laboratory on 4 August

(Saturday), each with a recorded received cooler temperature of 8°C. The two coolers were part of six cooler sample delivery group (SDG) 86487. The field team did not receive the completed cooler receipt form from the lab as expected on 6 August and emailed the lab for a status update on receipt temperatures on 7 August. The lab responded on 7 August that the two coolers mentioned above were received outside of temperature. The field team then contacted the lab asking for more details because all six coolers in the delivery group were packed at the same time in the field, the same quantity of gel ice packs was used in all coolers, and all six coolers traveled together in the same shipment.

The laboratory provided the following explanation via email on 7 August:

> All,
>
> Paula McCartney (our lab director, included here) reviewed the paperwork and temperature review for Saturdays delivery with the analyst that did the temperature check and sample receipt. When checking temperatures Saturday, the analyst used the thermometer to check the temperature of the temperature blank and recorded these numbers on the CoCs in the upper right corner per our standard procedure. In recording the temperatures for those two coolers, the analyst applied the +0.3°C correction factor associated with the thermometer to the measured temperature and erroneously wrote 8.0°C instead of 6.0°C. Paula is comfortable that this is the case because she was also here Saturday (she made the airport runs) and the analyst confirmed that there were no temperature exceedances above 6.0°C. This was the information I passed along initially. The analyst DID have samples from another client measure outside the upper limit of 6.0°C and DID alert Paula on Saturday while she was here, further supporting that the analyst understood the temperature cutoff for sample receipt. The receipts will be updated, signed, and dated and sent to you with the sample receipt information. I apologize for any confusion this caused. At this point ALL coolers received from the field have been within temperature. No information regarding the condition of the ice packs is available from Saturday because the analyst didn't have any exceedances that required further explanation, and the cooler receipt from Saturday clearly states that sufficient ice was present. I can tell you that I checked the coolers we received this morning and the ice packs I checked were soft but still had solid parts inside them and were cold to the touch.
>
> Please let Paula or myself know if you have any further questions.

Gregory Salata, Ph.D."

The complete cooler receipt form was provided by the laboratory on 7 August showing hand corrections to the cooler temperatures for coolers "Nordic Track" and "Vibra-Belt" to 6.0°C. The quality assurance representative was consulted regarding the temperature issues and it was determined that recollection was not needed.

During the extraction process for diesel-range organics (DRO), two sample bottles, 18NEC-20MW01-WG and an MS sample from 18NEC-14MW01-WG, were switched prior to spike and surrogate addition. The bottle switch resulted in no usable data within hold time for 18NEC-20MW01-WG. The issue was identified by the Jacobs chemist while reviewing incoming sample results, which occurred after the 14-day hold time for the sample. Multiple lines of evidence were used to determine that a bottle switch occurred:

- The original DRO data reported by the lab for 18NEC-20MW01-WG was 2.2 milligrams per liter (mg/L), whereas all previous DRO results for this location were nondetect (ND).
- The field team did not note a fuel odor during sample collection, and in-well photoionization detector headspace readings were 0 parts per million.
- Chromatograms for the 18NEC-20MW01-WG SW8260 and SW8270SIM analyses did not show a fuel pattern.
- The reported 18NEC-14MW01-WG MS recovery for DRO was significantly biased low (-46 percent) while the MSD dup recovery (110 percent) was acceptable. All DRO LCS/LCSD recoveries were acceptable at 94 percent and 104 percent, respectively.
- The parent sample 18NEC-14MW01-WG and FD of the parent sample contained DRO at 1.8 mg/L and 2.0 mg/L, respectively.

Following consultation with the USACE chemist, both 18NEC-20MW01-WG and 18NEC-14MW01-WG were re-extracted outside of hold time for comparison to confirm the suspected bottle switch. The re-extraction occurred on 27 September (42 days past the 14-day hold time). The re-extracted DRO results for 18NEC-20MW01-WG and 18NEC-14MW01-WG are 0.15 mg/L and 1.6 mg/L, respectively, and confirm the bottle switch. After further consultation with the USACE chemist, the original DRO result for 18NEC-20MW01-WG was rejected and the re-extracted result is being reported and qualified as outside of hold time. The re-extracted result is deemed "usable" past hold time because DRO was detectable, the sample was refrigerated for the entire time at the laboratory, and the acid preservative in the sample bottle would inhibit bacterial degradation of DRO.

No other sample-handling anomalies affecting data quality or usability were identified by the laboratory or during this data quality review.

1.2.2 Method Blank and TB Contamination

The following analytes were detected above the DL in method blanks or TBs, resulting in the qualification of sample results:

- Chromium (total and dissolved) and nickel (total and dissolved) - Method 6020
- Acetone - Method 8260B

Sample results that were within five times of the concentration (10 times for acetone) detected in the method blank and/or TB were qualified B. Results that were qualified B may be false positives or biased high. Data usability is minimally affected because results qualified B are less than the site-specific cleanup levels (SSCLs) and 2018 ADEC evaluation criteria.

Table E-2.1 (Exhibit E-2) summarizes the sample results that were qualified due to method blank or TB contamination. The table also provides concentrations that were detected in the associated blanks.

1.2.3 LCS Accuracy and Precision

LCS/LCSDs are used to evaluate laboratory accuracy and precision. All LCS and LCSD recoveries were within laboratory and DoD QSM control limits.

The LCS/LCSD relative percent difference (RPD) for naphthalene in APPL analytical batch 232381 (SDG 86489) was outside of control limits. All associated samples were qualified QN to indicate an unknown bias. A list of affected samples is provided in Table E-2.2 (Exhibit 2). All other LCS/LCSD RPDs were within control limits.

1.2.4 MS Accuracy and Precision

MS/MSDs were collected to evaluate the accuracy and precision of matrix and/or laboratory procedures. The DoD QSM requirement of one project MS/MSD set for each preparation batch of 20 samples was not met. Table E2-1-2 presents the preparation batch and the associated parent sample MS/MSD. The MS/MSD recoveries and RPD for several analytes and analyses were outside of the QC criteria. When necessary, parent sample results were flagged QL, QH, or QN to indicate an estimated result with a possible low, high, or unknown bias. Failing recoveries on samples that were diluted by more than a factor of five were not qualified.

The following samples required qualification due to MS recoveries:

- 18NEC-14MW01-WG for residual-range organics (RRO), benzo(a)anthracene, and toluene
- 18NEC-14MW06-WG for bromomethane and lead (total and dissolved)

The following sample required qualification due to MS RPD:

- 18NEC-14MW01-WG for benzene, ethylbenzene, toluene, and xylenes

Table E2-1-2
Preparation Batch and Associated MS/MSD

SDG	Analytical Batch Number	Method	Parent Sample ID
86483	232159	RSK175	18NEC-14MW01-WG
86487	232159	RSK175	Reported with SDG 86483
86483	232182	A2320B	18NEC-14MW01-WG
86502	232184	A2320B	18NEC-14MW06-WG
86502	232192	RSK175	18NEC-14MW06-WG
86502	232237	8270SIM	18NEC-14MW06-WG
86483	232261	SW8015D	Reported with SDG 86502
86502	232261	SW8015D	18NEC-14MW06-WG
86483	232270	E300.0	**No SSQC**
86483	232271	E300.0	18NEC-14MW01-WG
86487	232275	E300.0	**No SSQC**
86483	232278	SW6020	18NEC-S09-WS-03
86483	232278	SW6020-T	18NEC-14MW01-WG
86487	232278	SW6020	Reported with SDG 86483
86487	232278	SW6020-T	Reported with SDG 86483
86483	232280	SW6020-D	18NEC-14MW01-WG
86502	232285	SW6020-T	18NEC-14MW06-WG

Table E2-1-2 (Continued)
Preparation Batch and Associated MS/MSD

SDG	Analytical Batch Number	Method	Parent Sample ID
86487	232339	SW8260C	**No SSQC**
86487	232341	SW6020-D	Reported with SDG 86502
86502	232341	SW6020-D	18NEC-14MW06-WG
86502	232344	E300.0	**No SSQC**
86502	232348	E300.0	18NEC-14MW06-WG
86483	232381	8270SIM	18NEC-S09-WS-03
86483	232381	8270SIM	18NEC-14MW01-WG
86487	232381	8270SIM	Reported with SDG 86483
86489	232381	8270SIM	Reported with SDG 86483
86483	232390	SW7470A-D	18NEC-14MW01-WG
86487	232390	SW7470A-D	Reported with SDG 86483
86502	232390	SW7470A-D	18NEC-14MW06-WG
86483	232391	AK102	18NEC-S09-WS-03
86487	232391	AK102	Reported with SDG 86483
86483	232392	AK103	18NEC-S09-WS-03
86487	232392	AK103	Reported with SDG 86483
86483	232396	SW7470A-T	18NEC-14MW01-WG
86487	232396	SW7470A-T	Reported with SDG 86483
86502	232396	SW7470A-T	18NEC-14MW06-WG
86502	232426	AK102	18NEC-14MW06-WG
86502	232427	AK103	18NEC-14MW06-WG
86483	232437	AK102	18NEC-14MW01-WG
86489	232437	AK102	Reported with SDG 86483
86502	232437	AK102	Reported with SDG 86483
86483	232439	AK103	18NEC-14MW01-WG
86489	232439	AK103	Reported with SDG 86483
86502	232439	AK103	Reported with SDG 86483
86483	232449	SW8082A	18NEC-14MW01-WG
86489	232449	SW8082A	Reported with SDG 86483
86487	232462	A2320B	**No SSQC**
86502	232462	A2320B	**No SSQC**
86483	232546	A2320B	**No SSQC**
86487	232546	A2320B	**No SSQC**
86502	232547	A2320B	**No SSQC**
86487	232548	SW8082A	**No SSQC**
86502	232556	SW8260C	18NEC-14MW06-WG
86502	232614	SW8082A	18NEC-14MW06-WG
86483	232626	SW8260C	18NEC-S09-WS-03
86483	232626	SW8260C	18NEC-14MW01-WG
86502	232626	SW8260C	Reported with SDG 86483
86483	232632	SW8260C	**No SSQC**

Notes:
SSQC = site specific quality control
For definitions, refer to the Acronyms and Abbreviations section.

As noted in Section 1.2.1, a laboratory error resulted in the wrong sample being spiked. As a result, there was no reported duplicate MS for sample 18NEC-14MW01-WG, thus no MS/MSD precision calculation could be performed for the DRO batch. The RPD for the associated LCS/LCSD was within control limits.

Data usability was minimally affected because the qualified parent sample result was either ND with an LOD below the SSCL or results were detected well below the SSCL. Table E-2.3 (Exhibit E-2) provides a summary of the MS and/or MSD recovery outliers and the affected sample results. Table E-2.4 (Exhibit E-2) provides a summary of the MS/MSD RPD outliers and the affected sample results.

1.2.5 Surrogate Spike Accuracy

Sample results with surrogates outside of QC criteria were qualified as estimated except in the following cases: ND samples with high surrogate recoveries or samples with a dilution factor (DF) of five or greater. Sample results for SW8260, SW8270, and SW8270SIM were only qualified for surrogate recovery exceedances if two or more surrogates did not meet QC criteria. No samples required qualification for surrogate recoveries.

1.2.6 FD Precision

FD samples were collected to evaluate the precision of matrix and/or laboratory procedures. The frequency criterion for FD, one per 10 primary samples, was met for each analytical method, as outlined in the Section 2.3.1 of the quality assurance project plan (QAPP) (USACE 2018). Table E2-1-1 provides a summary of the FD quantities, summarized by analytical method.

FD precision was evaluated against the recommended RPD limit of 30 percent for water, as stated in the ADEC *Field Sampling Guidance* (ADEC 2017b). RPD values for sample/duplicate pair results, where one was ND and the other was detected, were calculated using the LOD value for the ND result. Results were qualified as estimated (QN) in several samples due to high FD RPD values. All qualified results were less than the respective SSCLs.

The high RPD values can likely be attributed to the sample matrix. Unless otherwise noted, the greater of the primary result and the FD result will be used for reporting purposes. Table E-2.5 (Exhibit E-2) provides a summary of sample results that were qualified QN due to FD RPD outliers.

1.2.7 Calibration Verification Samples

The laboratory identified a continuing calibration verification result that was outside of control criteria. Selenium was recovered at 111 percent during the SW6020 analyses for SDGs 86483 and 86487, which slightly exceeded the control limit of 110 percent. This was an acceptable deviation because the failing continuing calibration verification, along with a passing opening continuing calibration verification, bracketed only an LCS that recovered within limits; therefore, no qualification of sample data was required.

1.2.8 Reporting Limit Assessment

Laboratory LODs for ND sample results were evaluated against the cleanup levels defined in Table 2-1 in the QAPP (USACE 2018). The confidence level at the LOD was 99 percent (1 percent false negative rate) as per the DoD QSM definition. This level of uncertainty was deemed acceptable for this DQA. No LODs exceeded the DD SSCL for groundwater samples; therefore, no qualification was needed.

1.2.9 EB Contamination

One EB was collected during the groundwater sampling activities. The following analytes were detected above the DL in the water EB, resulting in the qualification of sample results:

- Barium, chromium, lead, and silver (SW6020)
- Chloroform (SW6020)

Sample results that were within five times the concentration detected in the EB were qualified B. The EB detections of barium and chloroform did not result in any qualifications because all associate sample results were either ND or greater than five times the detected contamination. EB detections (chromium, lead, and silver) and associated qualified samples are shown in Table E-2.6 (Exhibit E-2).

All results that were qualified B due to EB contamination were also affected by method blank or TB contamination as presented in Section 1.2.2 and Table E-2.1 (Exhibit E-2).

2.0 CONCLUSION

In general, the overall quality of project data was acceptable. The completeness goal of 95 percent for all parameters was met. The qualifications applied during data validation did not adversely affect data usability. All reported data was considered usable as qualified for the purposes of the 2018 NEC Periodic Review and groundwater monitoring event. Limitations are discussed in this DQA and ADEC Laboratory Data Review Checklists (Exhibit E-3).

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3.0 REFERENCES

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EXHIBIT E2-1

Sample Summary Table and Analytical Data Tables

2018 MNA Groundwater Annual Sampling Report at the Northeast Cape MOC
Table E-1.1 Groundwater Results

					Location ID:	14MW01	14MW01	14MW02	14MW03	14MW03	14MW04
					Sample ID:	18NEC-14MW01-WG	18NEC-14MW01-WG-8	18NEC-14MW02-WG	18NEC-14MW03-WG	18NEC-14MW03-WG	18NEC-14MW04-WG
					Sample Date:	8/3/2018	8/3/2018	8/5/2018	8/4/2018	8/4/2018	8/4/2018
					Sample Type:	GW	GW	GW	GW	GW	GW
					SDG:	86483	86483	86502	86489	86502	86502
					Laboratory:	APPL	APPL	APPL	APPL	APPL	APPL
					QAQC:	Primary	Duplicate	Primary	Primary	Primary	Primary
Method	**Group**	**Analyte**	**Units**	**ADEC Evaluation Criteria[1]**	**SSCL[2]**						
A2320B		Alkalinity as CaCO3	mg/L	–	–	33 [1.7]	30.1 [1.7]	31.6 [1.7]	–	46.6 [1.7]	44.4 [1.7]
Fuels											
AK102_103	Fuels	DRO	mg/L	1.5	1.5	**1.8 [0.05]**	**2 [0.05]**	**2.8 [0.05]**	1.3 [0.05]	–	**1.8 [0.05]**
AK102_103	Fuels	RRO	mg/L	1.1	1.1	ND [0.2] QL	ND [0.2]	ND [0.2]	ND [0.2]	–	ND [0.2]
VOCs											
8260	VOCs	Acetone	mg/L	14	–	–	–	–	–	–	–
8260	VOCs	Benzene	mg/L	0.0046	0.005	ND [0.0003] QN	ND [0.0003]	ND [0.0003]	–	ND [0.0003]	0.00018 [0.0003] J
8260	VOCs	Bromobenzene	mg/L	0.062	–	–	–	–	–	–	–
8260	VOCs	Bromochloromethane	mg/L	–	–	–	–	–	–	–	–
8260	VOCs	Bromodichloromethane	mg/L	0.0013	–	–	–	–	–	–	–
8260	VOCs	Bromoform	mg/L	0.033	–	–	–	–	–	–	–
8260	VOCs	Bromomethane	mg/L	0.0075	–	–	–	–	–	–	–
8260	VOCs	tert-Butyl alcohol (TBA)	mg/L	–	–	–	–	–	–	–	–
8260	VOCs	n-Butylbenzene	mg/L	1	–	–	–	–	–	–	–
8260	VOCs	sec-Butylbenzene	mg/L	2	–	–	–	–	–	–	–
8260	VOCs	tert-Butylbenzene	mg/L	0.69	–	–	–	–	–	–	–
8260	VOCs	Carbon Disulfide	mg/L	0.81	–	–	–	–	–	–	–
8260	VOCs	Carbon Tetrachloride	mg/L	0.0046	–	–	–	–	–	–	–
8260	VOCs	Chlorobenzene	mg/L	0.078	–	–	–	–	–	–	–
8260	VOCs	Chloroethane	mg/L	21	–	–	–	–	–	–	–
8260	VOCs	Chloroform	mg/L	0.0022	–	–	–	–	–	–	–
8260	VOCs	Chloromethane	mg/L	0.19	–	–	–	–	–	–	–
8260	VOCs	2-Chlorotoluene	mg/L	–	–	–	–	–	–	–	–
8260	VOCs	4-Chlorotoluene	mg/L	–	–	–	–	–	–	–	–
8260	VOCs	Cumene	mg/L	0.45	–	–	–	–	–	–	–
8260	VOCs	p-Cymene	mg/L	–	–	–	–	–	–	–	–
8260	VOCs	cis-DCE	mg/L	0.036	–	–	–	–	–	–	–
8260	VOCs	trans-DCE	mg/L	0.36	–	–	–	–	–	–	–
8260	VOCs	1,2-Dibromo-3-chloropropane	mg/L	–	–	–	–	–	–	–	–
8260	VOCs	Dibromochloromethane	mg/L	0.0087	–	–	–	–	–	–	–
8260	VOCs	Dibromomethane	mg/L	0.0083	–	–	–	–	–	–	–
8260	VOCs	1,2-Dichlorobenzene	mg/L	0.3	–	–	–	–	–	–	–
8260	VOCs	1,3-Dichlorobenzene	mg/L	0.3	–	–	–	–	–	–	–
8260	VOCs	1,4-Dichlorobenzene	mg/L	0.0048	–	–	–	–	–	–	–
8260	VOCs	1,1-Dichloroethane	mg/L	0.028	–	–	–	–	–	–	–
8260	VOCs	1,2-Dichloroethane	mg/L	0.0017	–	–	–	–	–	–	–
8260	VOCs	1,1-Dichloroethene	mg/L	0.28	–	–	–	–	–	–	–
8260	VOCs	1,2-Dichloropropane	mg/L	0.0082	–	–	–	–	–	–	–
8260	VOCs	1,3-Dichloropropane	mg/L	–	–	–	–	–	–	–	–
8260	VOCs	2,2-Dichloropropane	mg/L	–	–	–	–	–	–	–	–
8260	VOCs	1,1-Dichloropropene	mg/L	–	–	–	–	–	–	–	–
8260	VOCs	1,3-Dichloropropene	mg/L	0.0047	–	–	–	–	–	–	–
8260	VOCs	cis-1,3-Dichloropropene	mg/L	0.0047	–	–	–	–	–	–	–
8260	VOCs	trans-1,3-Dichloropropene	mg/L	0.0047	–	–	–	–	–	–	–
VOCs (continued)											
8260	VOCs	EDB	mg/L	0.000075	–	–	–	–	–	–	–
8260	VOCs	Ethylbenzene	mg/L	0.015	0.7	0.003 [0.0005] QN	0.0031 [0.0005]	0.0024 [0.0005]	–	0.00047 [0.0005] J	ND [0.0005]
8015	VOCs	Ethylene Glycol	mg/L	40	–	–	–	–	–	–	–
8260	VOCs	Freon-11	mg/L	5.2	–	–	–	–	–	–	–
8260	VOCs	1,1,2-Trichloro-1,2,2-trifluoroethane	mg/L	10	–	–	–	–	–	–	–
8260	VOCs	Freon-113	mg/L	–	–	–	–	–	–	–	–
8260	VOCs	Freon-12	mg/L	0.2	–	–	–	–	–	–	–
8260	VOCs	Hexachlorobutadiene	mg/L	0.0014	–	–	–	–	–	–	–
8260	VOCs	2-Hexanone	mg/L	0.038	–	–	–	–	–	–	–

2018 MNA Groundwater Annual Sampling Report at the Northeast Cape MOC
Table E-1.1 Groundwater Results

					Location ID:	14MW01	14MW01	14MW02	14MW03	14MW03	14MW04
					Sample ID:	18NEC-14MW01-WG	18NEC-14MW01-WG-8	18NEC-14MW02-WG	18NEC-14MW03-WG	18NEC-14MW03-WG	18NEC-14MW04-WG
					Sample Date:	8/3/2018	8/3/2018	8/5/2018	8/4/2018	8/4/2018	8/4/2018
					Sample Type:	GW	GW	GW	GW	GW	GW
					SDG:	86483	86483	86502	86489	86502	86502
					Laboratory:	APPL	APPL	APPL	APPL	APPL	APPL
					QAQC:	Primary	Duplicate	Primary	Primary	Primary	Primary
Method	**Group**	**Analyte**	**Units**	**ADEC Evaluation Criteria[1]**	**SSCL[2]**						
8260	VOCs	MEK	mg/L	5.6	–	–	–	–	–	–	–
RSK-175	VOCs	Methane	mg/L	–	–	0.033 [0.001]	0.034 [0.001]	0.021 [0.001]	–	0.015 [0.001]	0.015 [0.001]
8260	VOCs	4-Methyl-2-pentanone	mg/L	6.3	–	–	–	–	–	–	–
8260	VOCs	Methylene Chloride	mg/L	0.11	–	–	–	–	–	–	–
8260	VOCs	MTBE	mg/L	0.14	–	–	–	–	–	–	–
8260	VOCs	PCE	mg/L	0.041	–	–	–	–	–	–	–
8260	VOCs	Propylbenzene	mg/L	0.66	–	–	–	–	–	–	–
8260	VOCs	Styrene	mg/L	1.2	–	–	–	–	–	–	–
8260	VOCs	TCE	mg/L	0.0028	–	–	–	–	–	–	–
8260	VOCs	1,2,3-TCP	mg/L	0.0000075	–	–	–	–	–	–	–
8260	VOCs	1,1,1,2-Tetrachloroethane	mg/L	0.0057	–	–	–	–	–	–	–
8260	VOCs	1,1,2,2-Tetrachloroethane	mg/L	0.00076	–	–	–	–	–	–	–
8260	VOCs	1,2,4-TMB	mg/L	0.056	–	–	–	–	–	–	–
8260	VOCs	1,3,5-TMB	mg/L	0.06	–	–	–	–	–	–	–
8260	VOCs	Toluene	mg/L	1.1	–	ND [0.0003] QL	ND [0.0003]	ND [0.0003]	–	ND [0.0003]	ND [0.0003]
8260	VOCs	Freon-113	mg/L	–	–	–	–	–	–	–	–
8260	VOCs	1,2,3-Trichlorobenzene	mg/L	0.007	–	–	–	–	–	–	–
8260	VOCs	1,2,4-Trichlorobenzene	mg/L	0.004	–	–	–	–	–	–	–
8260	VOCs	1,1,1-Trichloroethane	mg/L	8	–	–	–	–	–	–	–
8260	VOCs	1,1,2-Trichloroethane	mg/L	0.00041	–	–	–	–	–	–	–
8260	VOCs	VC	mg/L	0.00019	–	–	–	–	–	–	–
8260	VOCs	Vinyl Acetate	mg/L	0.41	–	–	–	–	–	–	–
8260	VOCs	Xylene, m & p	mg/L	–	–	0.0034 [0.0003] QN	0.0035 [0.0003]	0.0029 [0.0003]	–	ND [0.0003]	ND [0.0003]
8260	VOCs	Xylene, o	mg/L	–	–	0.00026 [0.0003] J,QN	0.00026 [0.0003] J	0.00017 [0.0003] J	–	ND [0.0003]	ND [0.0003]
8260	VOCs	Xylenes	mg/L	0.19	–	0.0037 [0.0003] QN	0.0038 [0.0003]	0.0031 [0.0003]	–	ND [0.0003]	ND [0.0003]
PAHs											
8270SIM	PAHs	Acenaphthene	mg/L	0.53	–	0.00055 [0.0001]	0.00055 [0.0001]	0.00067 [0.0001]	0.00029 [0.0001]	–	ND [0.0001]
8270SIM	PAHs	Acenaphthylene	mg/L	0.26	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	–	ND [0.0001]
8270SIM	PAHs	Anthracene	mg/L	0.043	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	–	ND [0.0001]
8270SIM	PAHs	Benzo(a)anthracene	mg/L	0.0003	–	ND [0.0001] QL	ND [0.0001]	ND [0.0001]	ND [0.0001]	–	ND [0.0001]
8270SIM	PAHs	Benzo(a)pyrene	mg/L	0.00025	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	–	ND [0.0001]
8270SIM	PAHs	Benzo(b)fluoranthene	mg/L	0.0025	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	–	ND [0.0001]
8270SIM	PAHs	Benzo(g,h,i)perylene	mg/L	0.00026	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	–	ND [0.0001]
8270SIM	PAHs	Benzo(k)fluoranthene	mg/L	0.0008	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	–	ND [0.0001]
PAHs (continued)											
8270SIM	PAHs	Chrysene	mg/L	0.002	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	–	ND [0.0001]
8270SIM	PAHs	Dibenzo(a,h)anthracene	mg/L	0.00025	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	–	ND [0.0001]
8270SIM	PAHs	Fluoranthene	mg/L	0.26	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	–	ND [0.0001]
8270SIM	PAHs	Fluorene	mg/L	0.29	–	0.0013 [0.0001]	0.0013 [0.0001]	0.0015 [0.0001]	0.00064 [0.0001]	–	ND [0.0001]
8270SIM	PAHs	Indeno(1,2,3-cd)pyrene	mg/L	0.00019	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	–	ND [0.0001]
8270SIM	PAHs	1-Methylnaphthalene	mg/L	0.011	–	**0.022 [0.0001]**	**0.022 [0.0001]**	**0.03 [0.0001]**	0.0007 [0.0001]	–	0.00033 [0.0001]
8270SIM	PAHs	2-Methylnaphthalene	mg/L	0.036	–	0.025 [0.0001]	0.024 [0.0001]	**0.041 [0.0001]**	0.00035 [0.0001]	–	0.00011 [0.0001] J
8260	PAHs	Naphthalene	mg/L	0.0017	–	–	–	–	–	–	–
8270SIM	PAHs	Naphthalene	mg/L	0.0017	–	**0.023 [0.0001] QN**	**0.022 [0.0001] QN**	**0.029 [0.0001]**	**0.0023 [0.0001] QN**	–	**0.0018 [0.0001]**
8270SIM	PAHs	Phenanthrene	mg/L	0.17	–	0.00017 [0.0001] J	0.00017 [0.0001] J	0.00015 [0.0001] J	0.000051 [0.0001] J	–	ND [0.0001]
8270SIM	PAHs	Pyrene	mg/L	0.12	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	–	ND [0.0001]
NR	PAHs	Total HPAHs	mg/L	–	–	ND []	ND []	ND []	ND []	–	ND []
NR	PAHs	Total LPAHs	mg/L	–	–	0.02502 []	0.02402 []	0.03132 []	0.003281 []	–	0.0018 []
PCBs											
8082	PCBs	Aroclor-1016	mg/L	0.0005	–	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	–	ND [0.00025]
8082	PCBs	Aroclor-1221	mg/L	0.0005	–	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	–	ND [0.00025]
8082	PCBs	Aroclor-1232	mg/L	0.0005	–	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	–	ND [0.00025]
8082	PCBs	Aroclor-1242	mg/L	0.0005	–	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	–	ND [0.00025]
8082	PCBs	Aroclor-1248	mg/L	0.0005	–	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	–	ND [0.00025]

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Table E-1.1 Groundwater Results

					Location ID:	14MW01	14MW01	14MW02	14MW03	14MW03	14MW04
					Sample ID:	18NEC-14MW01-WG	18NEC-14MW01-WG-8	18NEC-14MW02-WG	18NEC-14MW03-WG	18NEC-14MW03-WG	18NEC-14MW04-WG
					Sample Date:	8/3/2018	8/3/2018	8/5/2018	8/4/2018	8/4/2018	8/4/2018
					Sample Type:	GW	GW	GW	GW	GW	GW
					SDG:	86483	86483	86502	86489	86502	86502
					Laboratory:	APPL	APPL	APPL	APPL	APPL	APPL
					QAQC:	Primary	Duplicate	Primary	Primary	Primary	Primary
Method	**Group**	**Analyte**	**Units**	**ADEC Evaluation Criteria[1]**	**SSCL[2]**						
8082	PCBs	Aroclor-1254	mg/L	0.0005	–	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	–	ND [0.00025]
8082	PCBs	Aroclor-1260	mg/L	0.0005	–	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	–	ND [0.00025]
8082	PCBs	Aroclor-1262	mg/L	–	–	ND [0.0004]	ND [0.0004]	ND [0.0004]	ND [0.0004]	–	ND [0.0004]
8082	PCBs	Aroclor-1268	mg/L	–	–	ND [0.0004]	ND [0.0004]	ND [0.0004]	ND [0.0004]	–	ND [0.0004]
8082	PCBs	PCBs	mg/L	0.00044	–	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	–	ND [0.00025]
Metals											
SW6020-D	Metals	Arsenic	mg/L	0.00052	0.01	**0.0043 [0.001] J**	**0.0044 [0.001] J**	**0.0018 [0.001] J**	–	**0.0019 [0.001] J**	0.00033 [0.001] J
SW6020-T	Metals	Arsenic	mg/L	0.00052	0.01	**0.0039 [0.001] J**	**0.0038 [0.001] J**	**0.0017 [0.001] J**	–	**0.0022 [0.001] J**	**0.00054 [0.001] J**
SW6020-D	Metals	Barium	mg/L	3.8	–	0.0178 [0.0008]	0.0184 [0.0008]	0.0141 [0.0008]	–	0.0113 [0.0008]	0.0176 [0.0008]
SW6020-T	Metals	Barium	mg/L	3.8	–	0.0183 [0.0008]	0.0174 [0.0008]	0.0147 [0.0008]	–	0.0123 [0.0008]	0.0257 [0.0008]
SW6020-D	Metals	Cadmium	mg/L	0.0092	–	ND [0.0001]	ND [0.0001]	0.00017 [0.0001] J	–	0.00051 [0.0001] J	0.00024 [0.0001] J
SW6020-T	Metals	Cadmium	mg/L	0.0092	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	–	0.000056 [0.0001] J	0.00033 [0.0001] J
SW6020-D	Metals	Chromium	mg/L	22	–	0.0011 [0.0015] J,B	0.0013 [0.0015] J,B	0.0008 [0.0015] J,B	–	0.00049 [0.0015] J,B	0.00046 [0.0015] J,B
SW6020-T	Metals	Chromium	mg/L	22	–	0.0011 [0.0015] J,B	0.00089 [0.0015] J,B	0.0014 [0.0015] J,B	–	0.0016 [0.0015] J,B	0.0011 [0.0015] J,B
SW6020-D	Metals	Lead	mg/L	0.015	0.015	0.00022 [0.0004] J,B,QN	0.0005 [0.0004] J,B,QN	ND [0.0004]	–	ND [0.0004]	ND [0.0004]
SW6020-T	Metals	Lead	mg/L	0.015	0.015	0.0006 [0.0004] J,B,QN	0.00086 [0.0004] J,B,QN	0.00074 [0.0004] J,B	–	0.0023 [0.0004] J	0.00095 [0.0004] J,B
SW6020-D	Metals	Manganese	mg/L	0.43	–	**0.84 [0.0008]**	**0.832 [0.0008]**	**0.807 [0.0008]**	–	**1.47 [0.016]**	**1.15 [0.016]**
SW7470A-D	Metals	Mercury	mg/L	0.00052	–	ND [0.00015]	ND [0.00015]	ND [0.00015]	–	ND [0.00015]	ND [0.00015]
SW7470A-T	Metals	Mercury	mg/L	0.00052	–	ND [0.00015]	0.00018 [0.00015] J	ND [0.00015]	–	ND [0.00015]	ND [0.00015]
SW6020-D	Metals	Nickel	mg/L	0.39	–	0.00042 [0.0008] J,B,QN	0.001 [0.0008] J,B,QN	ND [0.0008]	–	0.00088 [0.0008] J	0.0031 [0.0008]
SW6020-T	Metals	Nickel	mg/L	0.39	–	0.0006 [0.0008] J,B	0.00068 [0.0008] J,B	0.00072 [0.0008] J,B	–	0.0014 [0.0008] J,B	0.0036 [0.0008]
SW6020-D	Metals	Selenium	mg/L	0.1	–	ND [0.002]	ND [0.002]	ND [0.002]	–	ND [0.002]	ND [0.002]
SW6020-T	Metals	Selenium	mg/L	0.1	–	ND [0.002]	ND [0.002]	ND [0.002]	–	ND [0.002]	ND [0.002]
SW6020-D	Metals	Silver	mg/L	0.094	–	0.000066 [0.0001] J,B,QN	ND [0.0001] QN	ND [0.0001]	–	ND [0.0001]	0.000038 [0.0001] J,B
SW6020-T	Metals	Silver	mg/L	0.094	–	0.000047 [0.0001] J,B,QN	0.000034 [0.0001] J,B,QN	0.00009 [0.0001] J,B	–	0.00011 [0.0001] J,B	ND [0.0001]
SW6020-D	Metals	Vanadium	mg/L	0.086	–	ND [0.001]	ND [0.001]	0.00052 [0.001] J	–	ND [0.001]	ND [0.001]
SW6020-T	Metals	Vanadium	mg/L	0.086	–	0.00061 [0.001] J	0.00054 [0.001] J	0.00057 [0.001] J	–	ND [0.001]	ND [0.001]
SW6020-D	Metals	Zinc	mg/L	6	–	ND [0.015]	0.01 [0.015] J	ND [0.015]	–	0.0106 [0.015] J	0.133 [0.015]
SW6020-T	Metals	Zinc	mg/L	6	–	ND [0.015]	ND [0.015]	ND [0.015]	–	0.0147 [0.015] J	0.133 [0.015]
IonsNutrients											
E300.0	IonsNutrients	Sulfate	mg/L	–	–	25.3 [0.396]	25.3 [0.198]	20.1 [0.198]	–	17.3 [0.198]	23.9 [0.198]

Notes:
[1] ADEC Table C Groundwater cleanup level (ADEC 2018).
[2] Decision Document Site-Specific Cleanup Level (USACE 2009).
[ ] denotes the LOD or no number if no LOD was reported
Bold = Result is greater than or equal to the ADEC screening level[1]
= Result is greater than or equal to the SSCL[2]
— = method or screening level not available or analysis not conducted
For data qualifiers, refer to the Analytical Data Qualifiers section of the DQA.
For definitions, refer to the Acronyms and Abbreviations section of the DQA.

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Table E-1.1 Groundwater Results

					Location ID:	14MW05	14MW06	14MW07	17MW1	17MW1	20MW1
					Sample ID:	18NEC-14MW05-WG	18NEC-14MW06-WG	18NEC-14MW07-WG	18NEC-MW17-1-WG	18NEC-MW17-1-WG	18NEC-20MW01-WG
					Sample Date:	8/5/2018	8/5/2018	8/3/2018	8/4/2018	8/4/2018	8/3/2018
					Sample Type:	GW	GW	GW	GW	GW	GW
					SDG:	86502	86502	86483	86489	86502	86483
					Laboratory:	APPL	APPL	APPL	APPL	APPL	APPL
					QAQC:	Primary	Primary	Primary	Primary	Primary	Primary
Method	**Group**	**Analyte**	**Units**	**ADEC Evaluation Criteria[1]**	**SSCL[2]**						
A2320B		Alkalinity as CaCO3	mg/L	–	–	74.3 [1.7]	105 [1.7]	10.3 [1.7]	–	8.5 [1.7]	7.9 [1.7]
Fuels											
AK102_103	Fuels	DRO	mg/L	1.5	1.5	**3.1 [0.05]**	**1.5 [0.05]**	ND [0.05]	ND [0.05]	–	0.15 [0.05] QL
AK102_103	Fuels	RRO	mg/L	1.1	1.1	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	–	ND [0.2]
VOCs											
8260	VOCs	Acetone	mg/L	14	–	–	ND [0.002]	–	–	–	–
8260	VOCs	Benzene	mg/L	0.0046	0.005	ND [0.0003]	ND [0.0003]	ND [0.0003]	–	ND [0.0003]	ND [0.0003]
8260	VOCs	Bromobenzene	mg/L	0.062	–	–	ND [0.0003]	–	–	–	–
8260	VOCs	Bromochloromethane	mg/L	–	–	–	ND [0.0003]	–	–	–	–
8260	VOCs	Bromodichloromethane	mg/L	0.0013	–	–	ND [0.0003]	–	–	–	–
8260	VOCs	Bromoform	mg/L	0.033	–	–	ND [0.0003]	–	–	–	–
8260	VOCs	Bromomethane	mg/L	0.0075	–	–	ND [0.0005] QL	–	–	–	–
8260	VOCs	tert-Butyl alcohol (TBA)	mg/L	–	–	–	ND [0.009]	–	–	–	–
8260	VOCs	n-Butylbenzene	mg/L	1	–	–	ND [0.0003]	–	–	–	–
8260	VOCs	sec-Butylbenzene	mg/L	2	–	–	ND [0.0003]	–	–	–	–
8260	VOCs	tert-Butylbenzene	mg/L	0.69	–	–	ND [0.0003]	–	–	–	–
8260	VOCs	Carbon Disulfide	mg/L	0.81	–	–	ND [0.0005]	–	–	–	–
8260	VOCs	Carbon Tetrachloride	mg/L	0.0046	–	–	ND [0.0003]	–	–	–	–
8260	VOCs	Chlorobenzene	mg/L	0.078	–	–	ND [0.0005]	–	–	–	–
8260	VOCs	Chloroethane	mg/L	21	–	–	ND [0.0005]	–	–	–	–
8260	VOCs	Chloroform	mg/L	0.0022	–	–	ND [0.0003]	–	–	–	–
8260	VOCs	Chloromethane	mg/L	0.19	–	–	ND [0.0005]	–	–	–	–
8260	VOCs	2-Chlorotoluene	mg/L	–	–	–	ND [0.0003]	–	–	–	–
8260	VOCs	4-Chlorotoluene	mg/L	–	–	–	ND [0.0003]	–	–	–	–
8260	VOCs	Cumene	mg/L	0.45	–	–	ND [0.0003]	–	–	–	–
8260	VOCs	p-Cymene	mg/L	–	–	–	ND [0.0003]	–	–	–	–
8260	VOCs	cis-DCE	mg/L	0.036	–	–	ND [0.0003]	–	–	–	–
8260	VOCs	trans-DCE	mg/L	0.36	–	–	ND [0.0003]	–	–	–	–
8260	VOCs	1,2-Dibromo-3-chloropropane	mg/L	–	–	–	ND [0.001]	–	–	–	–
8260	VOCs	Dibromochloromethane	mg/L	0.0087	–	–	ND [0.0003]	–	–	–	–
8260	VOCs	Dibromomethane	mg/L	0.0083	–	–	ND [0.0005]	–	–	–	–
8260	VOCs	1,2-Dichlorobenzene	mg/L	0.3	–	–	ND [0.0003]	–	–	–	–
8260	VOCs	1,3-Dichlorobenzene	mg/L	0.3	–	–	ND [0.0003]	–	–	–	–
8260	VOCs	1,4-Dichlorobenzene	mg/L	0.0048	–	–	ND [0.0003]	–	–	–	–
8260	VOCs	1,1-Dichloroethane	mg/L	0.028	–	–	ND [0.0003]	–	–	–	–
8260	VOCs	1,2-Dichloroethane	mg/L	0.0017	–	–	ND [0.0003]	–	–	–	–
8260	VOCs	1,1-Dichloroethene	mg/L	0.28	–	–	ND [0.0005]	–	–	–	–
8260	VOCs	1,2-Dichloropropane	mg/L	0.0082	–	–	ND [0.0003]	–	–	–	–
8260	VOCs	1,3-Dichloropropane	mg/L	–	–	–	ND [0.0003]	–	–	–	–
8260	VOCs	2,2-Dichloropropane	mg/L	–	–	–	ND [0.0005]	–	–	–	–
8260	VOCs	1,1-Dichloropropene	mg/L	–	–	–	ND [0.0005]	–	–	–	–
8260	VOCs	1,3-Dichloropropene	mg/L	0.0047	–	–	ND [0.0003]	–	–	–	–
8260	VOCs	cis-1,3-Dichloropropene	mg/L	0.0047	–	–	ND [0.0003]	–	–	–	–
8260	VOCs	trans-1,3-Dichloropropene	mg/L	0.0047	–	–	ND [0.0003]	–	–	–	–
VOCs (continued)											
8260	VOCs	EDB	mg/L	0.000075	–	–	ND [0.0005]	–	–	–	–
8260	VOCs	Ethylbenzene	mg/L	0.015	0.7	0.0017 [0.0005]	ND [0.0005]	ND [0.0005]	–	ND [0.0005]	ND [0.0005]
8015	VOCs	Ethylene Glycol	mg/L	40	–	–	ND [8]	–	–	–	–
8260	VOCs	Freon-11	mg/L	5.2	–	–	ND [0.0005]	–	–	–	–
8260	VOCs	1,1,2-Trichloro-1,2,2-trifluoroethane	mg/L	10	–	–	ND [0.0003]	–	–	–	–
8260	VOCs	Freon-113	mg/L	–	–	–	ND [0.0003]	–	–	–	–
8260	VOCs	Freon-12	mg/L	0.2	–	–	ND [0.0003]	–	–	–	–
8260	VOCs	Hexachlorobutadiene	mg/L	0.0014	–	–	ND [0.0003]	–	–	–	–
8260	VOCs	2-Hexanone	mg/L	0.038	–	–	ND [0.002]	–	–	–	–

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Table E-1.1 Groundwater Results

					Location ID: Sample ID: Sample Date: Sample Type: SDG: Laboratory: QAQC:	14MW05 18NEC-14MW05-WG 8/5/2018 GW 86502 APPL Primary	14MW06 18NEC-14MW06-WG 8/5/2018 GW 86502 APPL Primary	14MW07 18NEC-14MW07-WG 8/3/2018 GW 86483 APPL Primary	17MW1 18NEC-MW17-1-WG 8/4/2018 GW 86489 APPL Primary	17MW1 18NEC-MW17-1-WG 8/4/2018 GW 86502 APPL Primary	20MW1 18NEC-20MW01-WG 8/3/2018 GW 86483 APPL Primary
Method	**Group**	**Analyte**	**Units**	**ADEC Evaluation Criteria[1]**	**SSCL[2]**						
8260	VOCs	MEK	mg/L	5.6	–	–	ND [0.002]	–	–	–	–
RSK-175	VOCs	Methane	mg/L	–	–	0.062 [0.001]	0.0085 [0.001]	ND [0.001]	–	0.0082 [0.001]	ND [0.001]
8260	VOCs	4-Methyl-2-pentanone	mg/L	6.3	–	–	ND [0.005]	–	–	–	–
8260	VOCs	Methylene Chloride	mg/L	0.11	–	–	ND [0.001]	–	–	–	–
8260	VOCs	MTBE	mg/L	0.14	–	–	ND [0.0005]	–	–	–	–
8260	VOCs	PCE	mg/L	0.041	–	–	ND [0.0003]	–	–	–	–
8260	VOCs	Propylbenzene	mg/L	0.66	–	–	ND [0.0005]	–	–	–	–
8260	VOCs	Styrene	mg/L	1.2	–	–	ND [0.0005]	–	–	–	–
8260	VOCs	TCE	mg/L	0.0028	–	–	ND [0.0003]	–	–	–	–
8260	VOCs	1,2,3-TCP	mg/L	0.0000075	–	–	ND [0.001]	–	–	–	–
8260	VOCs	1,1,1,2-Tetrachloroethane	mg/L	0.0057	–	–	ND [0.0003]	–	–	–	–
8260	VOCs	1,1,2,2-Tetrachloroethane	mg/L	0.00076	–	–	ND [0.0003]	–	–	–	–
8260	VOCs	1,2,4-TMB	mg/L	0.056	–	–	ND [0.0003]	–	–	–	–
8260	VOCs	1,3,5-TMB	mg/L	0.06	–	–	ND [0.0003]	–	–	–	–
8260	VOCs	Toluene	mg/L	1.1	–	ND [0.0003]	ND [0.0003]	ND [0.0003]	–	ND [0.0003]	ND [0.0003]
8260	VOCs	Freon-113	mg/L	–	–	–	ND [0.0003]	–	–	–	–
8260	VOCs	1,2,3-Trichlorobenzene	mg/L	0.007	–	–	ND [0.0005]	–	–	–	–
8260	VOCs	1,2,4-Trichlorobenzene	mg/L	0.004	–	–	ND [0.0005]	–	–	–	–
8260	VOCs	1,1,1-Trichloroethane	mg/L	8	–	–	ND [0.0003]	–	–	–	–
8260	VOCs	1,1,2-Trichloroethane	mg/L	0.00041	–	–	ND [0.0005]	–	–	–	–
8260	VOCs	VC	mg/L	0.00019	–	–	ND [0.0003]	–	–	–	–
8260	VOCs	Vinyl Acetate	mg/L	0.41	–	–	ND [0.0008]	–	–	–	–
8260	VOCs	Xylene, m & p	mg/L	–	–	0.0016 [0.0003]	ND [0.0003]	ND [0.0003]	–	ND [0.0003]	ND [0.0003]
8260	VOCs	Xylene, o	mg/L	–	–	ND [0.0003]	ND [0.0003]	ND [0.0003]	–	ND [0.0003]	ND [0.0003]
8260	VOCs	Xylenes	mg/L	0.19	–	0.0016 [0.0003] J	ND [0.0003]	ND [0.0003]	–	ND [0.0003]	ND [0.0003]
PAHs											
8270SIM	PAHs	Acenaphthene	mg/L	0.53	–	0.00027 [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	–	ND [0.0001]
8270SIM	PAHs	Acenaphthylene	mg/L	0.26	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	–	ND [0.0001]
8270SIM	PAHs	Anthracene	mg/L	0.043	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	–	ND [0.0001]
8270SIM	PAHs	Benzo(a)anthracene	mg/L	0.0003	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	–	ND [0.0001]
8270SIM	PAHs	Benzo(a)pyrene	mg/L	0.00025	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	–	ND [0.0001]
8270SIM	PAHs	Benzo(b)fluoranthene	mg/L	0.0025	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	–	ND [0.0001]
8270SIM	PAHs	Benzo(g,h,i)perylene	mg/L	0.00026	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	–	ND [0.0001]
8270SIM	PAHs	Benzo(k)fluoranthene	mg/L	0.0008	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	–	ND [0.0001]
PAHs (continued)											
8270SIM	PAHs	Chrysene	mg/L	0.002	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	–	ND [0.0001]
8270SIM	PAHs	Dibenzo(a,h)anthracene	mg/L	0.00025	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	–	ND [0.0001]
8270SIM	PAHs	Fluoranthene	mg/L	0.26	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	–	ND [0.0001]
8270SIM	PAHs	Fluorene	mg/L	0.29	–	0.00051 [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	–	ND [0.0001]
8270SIM	PAHs	Indeno(1,2,3-cd)pyrene	mg/L	0.00019	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	–	ND [0.0001]
8270SIM	PAHs	1-Methylnaphthalene	mg/L	0.011	–	0.0062 [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	–	ND [0.0001]
8270SIM	PAHs	2-Methylnaphthalene	mg/L	0.036	–	0.0014 [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	–	ND [0.0001]
8260	PAHs	Naphthalene	mg/L	0.0017	–	–	ND [0.0005]	–	–	–	–
8270SIM	PAHs	Naphthalene	mg/L	0.0017	–	**0.0093 [0.0001]**	ND [0.0001]	ND [0.0001] QN	ND [0.0001] QN	–	ND [0.0001] QN
8270SIM	PAHs	Phenanthrene	mg/L	0.17	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	–	ND [0.0001]
8270SIM	PAHs	Pyrene	mg/L	0.12	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	–	ND [0.0001]
NR	PAHs	Total HPAHs	mg/L	–	–	ND []	ND []	ND []	ND []	–	ND []
NR	PAHs	Total LPAHs	mg/L	–	–	0.01008 []	ND []	ND []	ND []	–	ND []
PCBs											
8082	PCBs	Aroclor-1016	mg/L	0.0005	–	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	–	ND [0.00025]
8082	PCBs	Aroclor-1221	mg/L	0.0005	–	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	–	ND [0.00025]
8082	PCBs	Aroclor-1232	mg/L	0.0005	–	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	–	ND [0.00025]
8082	PCBs	Aroclor-1242	mg/L	0.0005	–	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	–	ND [0.00025]
8082	PCBs	Aroclor-1248	mg/L	0.0005	–	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	–	ND [0.00025]

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Table E-1.1 Groundwater Results

					Location ID:	14MW05	14MW06	14MW07	17MW1	17MW1	20MW1
					Sample ID:	18NEC-14MW05-WG	18NEC-14MW06-WG	18NEC-14MW07-WG	18NEC-MW17-1-WG	18NEC-MW17-1-WG	18NEC-20MW01-WG
					Sample Date:	8/5/2018	8/5/2018	8/3/2018	8/4/2018	8/4/2018	8/3/2018
					Sample Type:	GW	GW	GW	GW	GW	GW
					SDG:	86502	86502	86483	86489	86502	86483
					Laboratory:	APPL	APPL	APPL	APPL	APPL	APPL
					QAQC:	Primary	Primary	Primary	Primary	Primary	Primary
Method	**Group**	**Analyte**	**Units**	**ADEC Evaluation Criteria[1]**	**SSCL[2]**						
8082	PCBs	Aroclor-1254	mg/L	0.0005	–	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	–	ND [0.00025]
8082	PCBs	Aroclor-1260	mg/L	0.0005	–	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	–	ND [0.00025]
8082	PCBs	Aroclor-1262	mg/L	–	–	ND [0.0004]	ND [0.0004]	ND [0.0004]	ND [0.0004]	–	ND [0.0004]
8082	PCBs	Aroclor-1268	mg/L	–	–	ND [0.0004]	ND [0.0004]	ND [0.0004]	ND [0.0004]	–	ND [0.0004]
8082	PCBs	PCBs	mg/L	0.00044	–	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	–	ND [0.00025]
Metals											
SW6020-D	Metals	Arsenic	mg/L	0.00052	0.01	**0.0028 [0.001] J**	**0.00098 [0.001] J**	ND [0.001]	–	ND [0.001]	ND [0.001]
SW6020-T	Metals	Arsenic	mg/L	0.00052	0.01	**0.0029 [0.001] J**	**0.00089 [0.001] J**	ND [0.001]	–	ND [0.001]	ND [0.001]
SW6020-D	Metals	Barium	mg/L	3.8	–	0.0258 [0.0008]	0.0399 [0.0008]	0.0091 [0.0008]	–	0.0143 [0.0008]	0.0183 [0.0008]
SW6020-T	Metals	Barium	mg/L	3.8	–	0.028 [0.0008]	0.0398 [0.0008]	0.0089 [0.0008]	–	0.0147 [0.0008]	0.0162 [0.0008]
SW6020-D	Metals	Cadmium	mg/L	0.0092	–	ND [0.0001]	0.000076 [0.0001] J	ND [0.0001]	–	0.0001 [0.0001] J	0.000088 [0.0001] J
SW6020-T	Metals	Cadmium	mg/L	0.0092	–	0.00007 [0.0001] J	0.00018 [0.0001] J	0.000081 [0.0001] J	–	0.00011 [0.0001] J	0.0001 [0.0001] J
SW6020-D	Metals	Chromium	mg/L	22	–	0.0011 [0.0015] J,B	0.0011 [0.0015] J,B	0.0014 [0.0015] J,B	–	ND [0.0015]	0.0026 [0.0015] J,B
SW6020-T	Metals	Chromium	mg/L	22	–	0.0015 [0.0015] J,B	0.0012 [0.0015] J,B	0.0013 [0.0015] J,B	–	0.001 [0.0015] J,B	0.0025 [0.0015] J,B
SW6020-D	Metals	Lead	mg/L	0.015	0.015	0.00021 [0.0004] J,B	ND [0.0004] QL	0.00035 [0.0004] J,B	–	ND [0.0004]	0.0016 [0.0004] J
SW6020-T	Metals	Lead	mg/L	0.015	0.015	0.0023 [0.0004] J	0.00058 [0.0004] J,B,QL	0.00043 [0.0004] J,B	–	0.00051 [0.0004] J,B	0.0036 [0.0004]
SW6020-D	Metals	Manganese	mg/L	0.43	–	**3.48 [0.04]**	**0.6 [0.0008]**	0.0144 [0.0008]	–	0.0021 [0.0008] J	0.0202 [0.0008]
SW7470A-D	Metals	Mercury	mg/L	0.00052	–	ND [0.00015]	ND [0.00015]	ND [0.00015]	–	ND [0.00015]	ND [0.00015]
SW7470A-T	Metals	Mercury	mg/L	0.00052	–	ND [0.00015]	ND [0.00015]	ND [0.00015]	–	ND [0.00015]	ND [0.00015]
SW6020-D	Metals	Nickel	mg/L	0.39	–	0.0026 [0.0008] J	0.00071 [0.0008] J	0.0185 [0.0008]	–	0.00067 [0.0008] J	0.0018 [0.0008] J,B
SW6020-T	Metals	Nickel	mg/L	0.39	–	0.004 [0.0008]	0.00067 [0.0008] J,B	0.0163 [0.0008]	–	0.00095 [0.0008] J,B	0.0015 [0.0008] J,B
SW6020-D	Metals	Selenium	mg/L	0.1	–	ND [0.002]	ND [0.002]	ND [0.002]	–	ND [0.002]	ND [0.002]
SW6020-T	Metals	Selenium	mg/L	0.1	–	ND [0.002]	ND [0.002]	ND [0.002]	–	ND [0.002]	ND [0.002]
SW6020-D	Metals	Silver	mg/L	0.094	–	0.000083 [0.0001] J,B	ND [0.0001]	ND [0.0001]	–	ND [0.0001]	ND [0.0001]
SW6020-T	Metals	Silver	mg/L	0.094	–	0.00012 [0.0001] J,B	0.000036 [0.0001] J,B	0.000032 [0.0001] J,B	–	0.000051 [0.0001] J,B	ND [0.0001]
SW6020-D	Metals	Vanadium	mg/L	0.086	–	0.00098 [0.001] J	ND [0.001]	ND [0.001]	–	ND [0.001]	0.00085 [0.001] J
SW6020-T	Metals	Vanadium	mg/L	0.086	–	0.0013 [0.001] J	ND [0.001]	ND [0.001]	–	ND [0.001]	0.00051 [0.001] J
SW6020-D	Metals	Zinc	mg/L	6	–	0.0077 [0.015] J	ND [0.015]	0.0127 [0.015] J	–	0.0215 [0.015]	0.0142 [0.015] J
SW6020-T	Metals	Zinc	mg/L	6	–	0.0098 [0.015] J	ND [0.015]	0.0118 [0.015] J	–	0.0176 [0.015] J	0.0193 [0.015] J
IonsNutrients											
E300.0	IonsNutrients	Sulfate	mg/L	–	–	9.9 [0.198]	12 [0.198]	17.6 [0.198]	–	23.6 [0.198]	19 [0.198]

Notes:
[1] ADEC Table C Groundwater cleanup level (ADEC 2018).
[2] Decision Document Site-Specific Cleanup Level (USACE 2009).
[ ] denotes the LOD or no number if no LOD was reported
Bold = Result is greater than or equal to the ADEC screening level[1]
= Result is greater than or equal to the SSCL[2]
— = method or screening level not available or analysis not conducted
For data qualifiers, refer to the Analytical Data Qualifiers section of the DQA.
For definitions, refer to the Acronyms and Abbreviations section of the DQA.

Table E-1.1 Groundwater Results

					Location ID:	22MW2	22MW2	26MW1	MW10-1	MW10-1	MW88-1
					Sample ID:	18NEC-22MW2-WG	18NEC-22MW2-WG-8	18NEC-26MW01-WG	18NEC-MW10-1-WG	18NEC-MW10-1-WG-8	18NEC-MW88-1-WG
					Sample Date:	8/2/2018	8/2/2018	8/2/2018	8/3/2018	8/3/2018	8/4/2018
					Sample Type:	GW	GW	GW	GW	GW	GW
					SDG:	86487	86487	86487	86483	86483	86489
					Laboratory:	APPL	APPL	APPL	APPL	APPL	APPL
					QAQC:	Primary	Duplicate	Primary	Primary	Duplicate	Primary
Method	**Group**	**Analyte**	**Units**	**ADEC Evaluation Criteria[1]**	**SSCL[2]**						
A2320B		Alkalinity as CaCO3	mg/L	–	–	3.4 [1.7] QN	8.5 [1.7] QN	3 [1.7]	37.2 [1.7]	38.4 [1.7]	–
Fuels											
AK102_103	Fuels	DRO	mg/L	1.5	1.5	ND [0.05]	0.13 [0.05] QN	ND [0.05]	1 [0.05]	0.98 [0.05]	0.42 [0.05]
AK102_103	Fuels	RRO	mg/L	1.1	1.1	ND [0.2]	0.12 [0.2] J,QN	ND [0.2]	0.58 [0.2]	0.56 [0.2]	ND [0.2]
VOCs											
8260	VOCs	Acetone	mg/L	14	–	–	–	–	0.0042 [0.002] J,B	0.005 [0.002] J,B	–
8260	VOCs	Benzene	mg/L	0.0046	0.005	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	–
8260	VOCs	Bromobenzene	mg/L	0.062	–	–	–	–	ND [0.0003]	ND [0.0003]	–
8260	VOCs	Bromochloromethane	mg/L	–	–	–	–	–	ND [0.0003]	ND [0.0003]	–
8260	VOCs	Bromodichloromethane	mg/L	0.0013	–	–	–	–	ND [0.0003]	ND [0.0003]	–
8260	VOCs	Bromoform	mg/L	0.033	–	–	–	–	ND [0.0003]	ND [0.0003]	–
8260	VOCs	Bromomethane	mg/L	0.0075	–	–	–	–	ND [0.0005]	ND [0.0005]	–
8260	VOCs	tert-Butyl alcohol (TBA)	mg/L	–	–	–	–	–	ND [0.009]	ND [0.009]	–
8260	VOCs	n-Butylbenzene	mg/L	1	–	–	–	–	ND [0.0003]	ND [0.0003]	–
8260	VOCs	sec-Butylbenzene	mg/L	2	–	–	–	–	ND [0.0003]	ND [0.0003]	–
8260	VOCs	tert-Butylbenzene	mg/L	0.69	–	–	–	–	ND [0.0003]	ND [0.0003]	–
8260	VOCs	Carbon Disulfide	mg/L	0.81	–	–	–	–	ND [0.0005]	ND [0.0005]	–
8260	VOCs	Carbon Tetrachloride	mg/L	0.0046	–	–	–	–	ND [0.0003]	ND [0.0003]	–
8260	VOCs	Chlorobenzene	mg/L	0.078	–	–	–	–	ND [0.0005]	ND [0.0005]	–
8260	VOCs	Chloroethane	mg/L	21	–	–	–	–	ND [0.0005]	ND [0.0005]	–
8260	VOCs	Chloroform	mg/L	0.0022	–	–	–	–	ND [0.0003]	ND [0.0003]	–
8260	VOCs	Chloromethane	mg/L	0.19	–	–	–	–	ND [0.0005]	ND [0.0005]	–
8260	VOCs	2-Chlorotoluene	mg/L	–	–	–	–	–	ND [0.0003]	ND [0.0003]	–
8260	VOCs	4-Chlorotoluene	mg/L	–	–	–	–	–	ND [0.0003]	ND [0.0003]	–
8260	VOCs	Cumene	mg/L	0.45	–	–	–	–	ND [0.0003]	ND [0.0003]	–
8260	VOCs	p-Cymene	mg/L	–	–	–	–	–	ND [0.0003]	ND [0.0003]	–
8260	VOCs	cis-DCE	mg/L	0.036	–	–	–	–	ND [0.0003]	ND [0.0003]	–
8260	VOCs	trans-DCE	mg/L	0.36	–	–	–	–	ND [0.0003]	ND [0.0003]	–
8260	VOCs	1,2-Dibromo-3-chloropropane	mg/L	–	–	–	–	–	ND [0.001]	ND [0.001]	–
8260	VOCs	Dibromochloromethane	mg/L	0.0087	–	–	–	–	ND [0.0003]	ND [0.0003]	–
8260	VOCs	Dibromomethane	mg/L	0.0083	–	–	–	–	ND [0.0005]	ND [0.0005]	–
8260	VOCs	1,2-Dichlorobenzene	mg/L	0.3	–	–	–	–	ND [0.0003]	ND [0.0003]	–
8260	VOCs	1,3-Dichlorobenzene	mg/L	0.3	–	–	–	–	ND [0.0003]	ND [0.0003]	–
8260	VOCs	1,4-Dichlorobenzene	mg/L	0.0048	–	–	–	–	ND [0.0003]	ND [0.0003]	–
8260	VOCs	1,1-Dichloroethane	mg/L	0.028	–	–	–	–	ND [0.0003]	ND [0.0003]	–
8260	VOCs	1,2-Dichloroethane	mg/L	0.0017	–	–	–	–	ND [0.0003]	ND [0.0003]	–
8260	VOCs	1,1-Dichloroethene	mg/L	0.28	–	–	–	–	ND [0.0005]	ND [0.0005]	–
8260	VOCs	1,2-Dichloropropane	mg/L	0.0082	–	–	–	–	ND [0.0003]	ND [0.0003]	–
8260	VOCs	1,3-Dichloropropane	mg/L	–	–	–	–	–	ND [0.0003]	ND [0.0003]	–
8260	VOCs	2,2-Dichloropropane	mg/L	–	–	–	–	–	ND [0.0005]	ND [0.0005]	–
8260	VOCs	1,1-Dichloropropene	mg/L	–	–	–	–	–	ND [0.0005]	ND [0.0005]	–
8260	VOCs	1,3-Dichloropropene	mg/L	0.0047	–	–	–	–	ND [0.0003]	ND [0.0003]	–
8260	VOCs	cis-1,3-Dichloropropene	mg/L	0.0047	–	–	–	–	ND [0.0003]	ND [0.0003]	–
8260	VOCs	trans-1,3-Dichloropropene	mg/L	0.0047	–	–	–	–	ND [0.0003]	ND [0.0003]	–
VOCs (continued)											
8260	VOCs	EDB	mg/L	0.000075	–	–	–	–	ND [0.0005]	ND [0.0005]	–
8260	VOCs	Ethylbenzene	mg/L	0.015	0.7	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	–
8015	VOCs	Ethylene Glycol	mg/L	40	–	–	–	–	ND [8]	ND [8]	–
8260	VOCs	Freon-11	mg/L	5.2	–	–	–	–	ND [0.0005]	ND [0.0005]	–
8260	VOCs	1,1,2-Trichloro-1,2,2-trifluoroethane	mg/L	10	–	–	–	–	ND [0.0003]	ND [0.0003]	–
8260	VOCs	Freon-113	mg/L	–	–	–	–	–	ND [0.0003]	ND [0.0003]	–
8260	VOCs	Freon-12	mg/L	0.2	–	–	–	–	ND [0.0003]	ND [0.0003]	–
8260	VOCs	Hexachlorobutadiene	mg/L	0.0014	–	–	–	–	ND [0.0003]	ND [0.0003]	–
8260	VOCs	2-Hexanone	mg/L	0.038	–	–	–	–	ND [0.002]	ND [0.002]	–

Table E-1.1 Groundwater Results

					Location ID:	22MW2	22MW2	26MW1	MW10-1	MW10-1	MW88-1
					Sample ID:	18NEC-22MW2-WG	18NEC-22MW2-WG-8	18NEC-26MW01-WG	18NEC-MW10-1-WG	18NEC-MW10-1-WG-8	18NEC-MW88-1-WG
					Sample Date:	8/2/2018	8/2/2018	8/2/2018	8/3/2018	8/3/2018	8/4/2018
					Sample Type:	GW	GW	GW	GW	GW	GW
					SDG:	86487	86487	86487	86483	86483	86489
					Laboratory:	APPL	APPL	APPL	APPL	APPL	APPL
					QAQC:	Primary	Duplicate	Primary	Primary	Duplicate	Primary
Method	**Group**	**Analyte**	**Units**	**ADEC Evaluation Criteria[1]**	**SSCL[2]**						
8260	VOCs	MEK	mg/L	5.6	–	–	–	–	ND [0.002]	ND [0.002]	–
RSK-175	VOCs	Methane	mg/L	–	–	ND [0.001]	ND [0.001]	ND [0.001]	0.0074 [0.001]	0.0074 [0.001]	–
8260	VOCs	4-Methyl-2-pentanone	mg/L	6.3	–	–	–	–	ND [0.005]	ND [0.005]	–
8260	VOCs	Methylene Chloride	mg/L	0.11	–	–	–	–	ND [0.001]	ND [0.001]	–
8260	VOCs	MTBE	mg/L	0.14	–	–	–	–	ND [0.00052]	ND [0.00052]	–
8260	VOCs	PCE	mg/L	0.041	–	–	–	–	ND [0.0003]	ND [0.0003]	–
8260	VOCs	Propylbenzene	mg/L	0.66	–	–	–	–	ND [0.0005]	ND [0.0005]	–
8260	VOCs	Styrene	mg/L	1.2	–	–	–	–	ND [0.0005]	ND [0.0005]	–
8260	VOCs	TCE	mg/L	0.0028	–	–	–	–	ND [0.0003]	ND [0.0003]	–
8260	VOCs	1,2,3-TCP	mg/L	0.0000075	–	–	–	–	ND [0.001]	ND [0.001]	–
8260	VOCs	1,1,1,2-Tetrachloroethane	mg/L	0.0057	–	–	–	–	ND [0.0003]	ND [0.0003]	–
8260	VOCs	1,1,2,2-Tetrachloroethane	mg/L	0.00076	–	–	–	–	ND [0.0003]	ND [0.0003]	–
8260	VOCs	1,2,4-TMB	mg/L	0.056	–	–	–	–	ND [0.0003]	ND [0.0003]	–
8260	VOCs	1,3,5-TMB	mg/L	0.06	–	–	–	–	ND [0.0003]	ND [0.0003]	–
8260	VOCs	Toluene	mg/L	1.1	–	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	–
8260	VOCs	Freon-113	mg/L	–	–	–	–	–	ND [0.0003]	ND [0.0003]	–
8260	VOCs	1,2,3-Trichlorobenzene	mg/L	0.007	–	–	–	–	ND [0.0005]	ND [0.0005]	–
8260	VOCs	1,2,4-Trichlorobenzene	mg/L	0.004	–	–	–	–	ND [0.0005]	ND [0.0005]	–
8260	VOCs	1,1,1-Trichloroethane	mg/L	8	–	–	–	–	ND [0.0003]	ND [0.0003]	–
8260	VOCs	1,1,2-Trichloroethane	mg/L	0.00041	–	–	–	–	ND [0.0005]	ND [0.0005]	–
8260	VOCs	VC	mg/L	0.00019	–	–	–	–	ND [0.0003]	ND [0.0003]	–
8260	VOCs	Vinyl Acetate	mg/L	0.41	–	–	–	–	ND [0.0008]	ND [0.0008]	–
8260	VOCs	Xylene, m & p	mg/L	–	–	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	–
8260	VOCs	Xylene, o	mg/L	–	–	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	–
8260	VOCs	Xylenes	mg/L	0.19	–	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]	–
PAHs											
8270SIM	PAHs	Acenaphthene	mg/L	0.53	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
8270SIM	PAHs	Acenaphthylene	mg/L	0.26	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
8270SIM	PAHs	Anthracene	mg/L	0.043	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
8270SIM	PAHs	Benzo(a)anthracene	mg/L	0.0003	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
8270SIM	PAHs	Benzo(a)pyrene	mg/L	0.00025	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
8270SIM	PAHs	Benzo(b)fluoranthene	mg/L	0.0025	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
8270SIM	PAHs	Benzo(g,h,i)perylene	mg/L	0.00026	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
8270SIM	PAHs	Benzo(k)fluoranthene	mg/L	0.0008	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
PAHs (continued)											
8270SIM	PAHs	Chrysene	mg/L	0.002	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
8270SIM	PAHs	Dibenzo(a,h)anthracene	mg/L	0.00025	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
8270SIM	PAHs	Fluoranthene	mg/L	0.26	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
8270SIM	PAHs	Fluorene	mg/L	0.29	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
8270SIM	PAHs	Indeno(1,2,3-cd)pyrene	mg/L	0.00019	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
8270SIM	PAHs	1-Methylnaphthalene	mg/L	0.011	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
8270SIM	PAHs	2-Methylnaphthalene	mg/L	0.036	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
8260	PAHs	Naphthalene	mg/L	0.0017	–	–	–	–	ND [0.0005]	ND [0.0005]	–
8270SIM	PAHs	Naphthalene	mg/L	0.0017	–	ND [0.0001] QN	ND [0.0001] QN	ND [0.0001] QN	ND [0.0001] QN	ND [0.0001] QN	ND [0.0001] QN
8270SIM	PAHs	Phenanthrene	mg/L	0.17	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
8270SIM	PAHs	Pyrene	mg/L	0.12	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
NR	PAHs	Total HPAHs	mg/L	–	–	ND []	ND []	ND []	ND []	ND []	ND []
NR	PAHs	Total LPAHs	mg/L	–	–	ND []	ND []	ND []	ND []	ND []	ND []
PCBs											
8082	PCBs	Aroclor-1016	mg/L	0.0005	–	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]
8082	PCBs	Aroclor-1221	mg/L	0.0005	–	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]
8082	PCBs	Aroclor-1232	mg/L	0.0005	–	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]
8082	PCBs	Aroclor-1242	mg/L	0.0005	–	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]
8082	PCBs	Aroclor-1248	mg/L	0.0005	–	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]

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Table E-1.1 Groundwater Results

					Location ID:	22MW2	22MW2	26MW1	MW10-1	MW10-1	MW88-1
					Sample ID:	18NEC-22MW2-WG	18NEC-22MW2-WG-8	18NEC-26MW01-WG	18NEC-MW10-1-WG	18NEC-MW10-1-WG-8	18NEC-MW88-1-WG
					Sample Date:	8/2/2018	8/2/2018	8/2/2018	8/3/2018	8/3/2018	8/4/2018
					Sample Type:	GW	GW	GW	GW	GW	GW
					SDG:	86487	86487	86487	86483	86483	86489
					Laboratory:	APPL	APPL	APPL	APPL	APPL	APPL
					QAQC:	Primary	Duplicate	Primary	Primary	Duplicate	Primary
Method	**Group**	**Analyte**	**Units**	**ADEC Evaluation Criteria[1]**	**SSCL[2]**						
8082	PCBs	Aroclor-1254	mg/L	0.0005	–	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]
8082	PCBs	Aroclor-1260	mg/L	0.0005	–	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]
8082	PCBs	Aroclor-1262	mg/L	–	–	ND [0.0004]	ND [0.0004]	ND [0.0004]	ND [0.0004]	ND [0.0004]	ND [0.0004]
8082	PCBs	Aroclor-1268	mg/L	–	–	ND [0.0004]	ND [0.0004]	ND [0.0004]	ND [0.0004]	ND [0.0004]	ND [0.0004]
8082	PCBs	PCBs	mg/L	0.00044	–	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]
Metals											
SW6020-D	Metals	Arsenic	mg/L	0.00052	0.01	ND [0.001]	ND [0.001]	ND [0.001]	0.0004 [0.001] J	0.00034 [0.001] J	–
SW6020-T	Metals	Arsenic	mg/L	0.00052	0.01	ND [0.001]	ND [0.001]	ND [0.001]	**0.00054 [0.001] J**	**0.00065 [0.001] J**	–
SW6020-D	Metals	Barium	mg/L	3.8	–	0.0064 [0.0008]	0.0064 [0.0008]	0.0056 [0.0008]	0.0284 [0.0008]	0.0291 [0.0008]	–
SW6020-T	Metals	Barium	mg/L	3.8	–	0.0067 [0.0008]	0.007 [0.0008]	0.0057 [0.0008]	0.0301 [0.0008]	0.0294 [0.0008]	–
SW6020-D	Metals	Cadmium	mg/L	0.0092	–	0.000056 [0.0001] J,QN	ND [0.0001] QN	0.000081 [0.0001] J	0.00016 [0.0001] J	0.00012 [0.0001] J	–
SW6020-T	Metals	Cadmium	mg/L	0.0092	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	0.00035 [0.0001] J	0.00028 [0.0001] J	–
SW6020-D	Metals	Chromium	mg/L	22	–	0.00067 [0.0015] J,B	0.00055 [0.0015] J,B	0.0008 [0.0015] J,B	0.0022 [0.0015] J,B	0.0018 [0.0015] J,B	–
SW6020-T	Metals	Chromium	mg/L	22	–	0.00069 [0.0015] J,B,QN	0.001 [0.0015] J,B,QN	0.0012 [0.0015] J,B	0.0019 [0.0015] J,B	0.002 [0.0015] J,B	–
SW6020-D	Metals	Lead	mg/L	0.015	0.015	0.00032 [0.0004] J,B	ND [0.0004]	0.00022 [0.0004] J,B	0.0012 [0.0004] J,B,QN	0.00084 [0.0004] J,B,QN	–
SW6020-T	Metals	Lead	mg/L	0.015	0.015	0.0029 [0.0004] J,QN	0.0017 [0.0004] J,QN	0.00033 [0.0004] J,B	0.0023 [0.0004] J	0.0023 [0.0004] J	–
SW6020-D	Metals	Manganese	mg/L	0.43	–	0.0012 [0.0008] J	0.0011 [0.0008] J	0.0033 [0.0008] J	**0.457 [0.0008]**	**0.519 [0.0008]**	–
SW7470A-D	Metals	Mercury	mg/L	0.00052	–	ND [0.00015]	ND [0.00015]	ND [0.00015]	ND [0.00015]	ND [0.00015]	–
SW7470A-T	Metals	Mercury	mg/L	0.00052	–	ND [0.00015]	ND [0.00015]	ND [0.00015]	ND [0.00015]	ND [0.00015]	–
SW6020-D	Metals	Nickel	mg/L	0.39	–	ND [0.0008]	ND [0.0008]	ND [0.0008]	0.0053 [0.0008]	0.0055 [0.0008]	–
SW6020-T	Metals	Nickel	mg/L	0.39	–	ND [0.0008]	0.00034 [0.0008] J,B	0.00054 [0.0008] J,B	0.0044 [0.0008]	0.0049 [0.0008]	–
SW6020-D	Metals	Selenium	mg/L	0.1	–	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	–
SW6020-T	Metals	Selenium	mg/L	0.1	–	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	ND [0.002]	–
SW6020-D	Metals	Silver	mg/L	0.094	–	ND [0.0001]	0.000031 [0.0001] J,B	ND [0.0001]	0.000086 [0.0001] J,B	ND [0.0001]	–
SW6020-T	Metals	Silver	mg/L	0.094	–	0.000043 [0.0001] J,B,QN	ND [0.0001] QN	0.000058 [0.0001] J,B	0.00018 [0.0001] J,B	0.00017 [0.0001] J,B	–
SW6020-D	Metals	Vanadium	mg/L	0.086	–	ND [0.001]	ND [0.001]	ND [0.001]	0.00054 [0.001] J	0.00053 [0.001] J	–
SW6020-T	Metals	Vanadium	mg/L	0.086	–	ND [0.001]	ND [0.001]	ND [0.001]	0.0014 [0.001] J	0.0015 [0.001] J	–
SW6020-D	Metals	Zinc	mg/L	6	–	0.0117 [0.015] J	0.0106 [0.015] J	0.0101 [0.015] J	0.072 [0.015]	0.0676 [0.015]	–
SW6020-T	Metals	Zinc	mg/L	6	–	0.0079 [0.015] J	0.0086 [0.015] J	ND [0.015]	0.0719 [0.015]	0.0759 [0.015]	–
IonsNutrients											
E300.0	IonsNutrients	Sulfate	mg/L	–	–	18.4 [0.198]	18.4 [0.198]	17.6 [0.198]	6.5 [0.198]	6.5 [0.198]	–

Notes:
[1] ADEC Table C Groundwater cleanup level (ADEC 2018).
[2] Decision Document Site-Specific Cleanup Level (USACE 2009).
[ ] denotes the LOD or no number if no LOD was reported
Bold = Result is greater than or equal to the ADEC screening level[1]
= Result is greater than or equal to the SSCL[2]
— = method or screening level not available or analysis not conducted
For data qualifiers, refer to the Analytical Data Qualifiers section of the DQA.
For definitions, refer to the Acronyms and Abbreviations section of the DQA.

Table E-1.1 Groundwater Results

					Location ID:	MW88-1	MW88-10	MW88-10	MW88-3
					Sample ID:	18NEC-MW88-1-WG	18NEC-MW88-10-WG	18NEC-MW88-10-WG	18NEC-MW88-3-WG
					Sample Date:	8/4/2018	8/4/2018	8/4/2018	8/5/2018
					Sample Type:	GW	GW	GW	GW
					SDG:	86502	86489	86502	86502
					Laboratory:	APPL	APPL	APPL	APPL
					QAQC:	Primary	Primary	Primary	Primary
Method	**Group**	**Analyte**	**Units**	**ADEC Evaluation Criteria[1]**	**SSCL[2]**				
A2320B		Alkalinity as CaCO3	mg/L	–	–	7.9 [1.7]	–	15.4 [1.7]	11.2 [1.7]
Fuels									
AK102_103	Fuels	DRO	mg/L	1.5	1.5	–	0.54 [0.05]	–	0.85 [0.05]
AK102_103	Fuels	RRO	mg/L	1.1	1.1	–	ND [0.2]	–	ND [0.2]
VOCs									
8260	VOCs	Acetone	mg/L	14	–	–	–	–	–
8260	VOCs	Benzene	mg/L	0.0046	0.005	ND [0.0003]	–	ND [0.0003]	ND [0.0003]
8260	VOCs	Bromobenzene	mg/L	0.062	–	–	–	–	–
8260	VOCs	Bromochloromethane	mg/L	–	–	–	–	–	–
8260	VOCs	Bromodichloromethane	mg/L	0.0013	–	–	–	–	–
8260	VOCs	Bromoform	mg/L	0.033	–	–	–	–	–
8260	VOCs	Bromomethane	mg/L	0.0075	–	–	–	–	–
8260	VOCs	tert-Butyl alcohol (TBA)	mg/L	–	–	–	–	–	–
8260	VOCs	n-Butylbenzene	mg/L	1	–	–	–	–	–
8260	VOCs	sec-Butylbenzene	mg/L	2	–	–	–	–	–
8260	VOCs	tert-Butylbenzene	mg/L	0.69	–	–	–	–	–
8260	VOCs	Carbon Disulfide	mg/L	0.81	–	–	–	–	–
8260	VOCs	Carbon Tetrachloride	mg/L	0.0046	–	–	–	–	–
8260	VOCs	Chlorobenzene	mg/L	0.078	–	–	–	–	–
8260	VOCs	Chloroethane	mg/L	21	–	–	–	–	–
8260	VOCs	Chloroform	mg/L	0.0022	–	–	–	–	–
8260	VOCs	Chloromethane	mg/L	0.19	–	–	–	–	–
8260	VOCs	2-Chlorotoluene	mg/L	–	–	–	–	–	–
8260	VOCs	4-Chlorotoluene	mg/L	–	–	–	–	–	–
8260	VOCs	Cumene	mg/L	0.45	–	–	–	–	–
8260	VOCs	p-Cymene	mg/L	–	–	–	–	–	–
8260	VOCs	cis-DCE	mg/L	0.036	–	–	–	–	–
8260	VOCs	trans-DCE	mg/L	0.36	–	–	–	–	–
8260	VOCs	1,2-Dibromo-3-chloropropane	mg/L	–	–	–	–	–	–
8260	VOCs	Dibromochloromethane	mg/L	0.0087	–	–	–	–	–
8260	VOCs	Dibromomethane	mg/L	0.0083	–	–	–	–	–
8260	VOCs	1,2-Dichlorobenzene	mg/L	0.3	–	–	–	–	–
8260	VOCs	1,3-Dichlorobenzene	mg/L	0.3	–	–	–	–	–
8260	VOCs	1,4-Dichlorobenzene	mg/L	0.0048	–	–	–	–	–
8260	VOCs	1,1-Dichloroethane	mg/L	0.028	–	–	–	–	–
8260	VOCs	1,2-Dichloroethane	mg/L	0.0017	–	–	–	–	–
8260	VOCs	1,1-Dichloroethene	mg/L	0.28	–	–	–	–	–
8260	VOCs	1,2-Dichloropropane	mg/L	0.0082	–	–	–	–	–
8260	VOCs	1,3-Dichloropropane	mg/L	–	–	–	–	–	–
8260	VOCs	2,2-Dichloropropane	mg/L	–	–	–	–	–	–
8260	VOCs	1,1-Dichloropropene	mg/L	–	–	–	–	–	–
8260	VOCs	1,3-Dichloropropene	mg/L	0.0047	–	–	–	–	–
8260	VOCs	cis-1,3-Dichloropropene	mg/L	0.0047	–	–	–	–	–
8260	VOCs	trans-1,3-Dichloropropene	mg/L	0.0047	–	–	–	–	–
VOCs (continued)									
8260	VOCs	EDB	mg/L	0.000075	–	–	–	–	–
8260	VOCs	Ethylbenzene	mg/L	0.015	0.7	ND [0.0005]	–	ND [0.0005]	ND [0.0005]
8015	VOCs	Ethylene Glycol	mg/L	40	–	–	–	–	–
8260	VOCs	Freon-11	mg/L	5.2	–	–	–	–	–
8260	VOCs	1,1,2-Trichloro-1,2,2-trifluoroethane	mg/L	10	–	–	–	–	–
8260	VOCs	Freon-113	mg/L	–	–	–	–	–	–
8260	VOCs	Freon-12	mg/L	0.2	–	–	–	–	–
8260	VOCs	Hexachlorobutadiene	mg/L	0.0014	–	–	–	–	–
8260	VOCs	2-Hexanone	mg/L	0.038	–	–	–	–	–

Table E-1.1 Groundwater Results

					Location ID:	MW88-1	MW88-10	MW88-10	MW88-3
					Sample ID:	18NEC-MW88-1-WG	18NEC-MW88-10-WG	18NEC-MW88-10-WG	18NEC-MW88-3-WG
					Sample Date:	8/4/2018	8/4/2018	8/4/2018	8/5/2018
					Sample Type:	GW	GW	GW	GW
					SDG:	86502	86489	86502	86502
					Laboratory:	APPL	APPL	APPL	APPL
					QAQC:	Primary	Primary	Primary	Primary
Method	**Group**	**Analyte**	**Units**	**ADEC Evaluation Criteria[1]**	**SSCL[2]**				
8260	VOCs	MEK	mg/L	5.6	–	–	–	–	–
RSK-175	VOCs	Methane	mg/L	–	–	ND [0.001]	–	0.0073 [0.001]	ND [0.001]
8260	VOCs	4-Methyl-2-pentanone	mg/L	6.3	–	–	–	–	–
8260	VOCs	Methylene Chloride	mg/L	0.11	–	–	–	–	–
8260	VOCs	MTBE	mg/L	0.14	–	–	–	–	–
8260	VOCs	PCE	mg/L	0.041	–	–	–	–	–
8260	VOCs	Propylbenzene	mg/L	0.66	–	–	–	–	–
8260	VOCs	Styrene	mg/L	1.2	–	–	–	–	–
8260	VOCs	TCE	mg/L	0.0028	–	–	–	–	–
8260	VOCs	1,2,3-TCP	mg/L	0.0000075	–	–	–	–	–
8260	VOCs	1,1,1,2-Tetrachloroethane	mg/L	0.0057	–	–	–	–	–
8260	VOCs	1,1,2,2-Tetrachloroethane	mg/L	0.00076	–	–	–	–	–
8260	VOCs	1,2,4-TMB	mg/L	0.056	–	–	–	–	–
8260	VOCs	1,3,5-TMB	mg/L	0.06	–	–	–	–	–
8260	VOCs	Toluene	mg/L	1.1	–	ND [0.0003]	–	ND [0.0003]	ND [0.0003]
8260	VOCs	Freon-113	mg/L	–	–	–	–	–	–
8260	VOCs	1,2,3-Trichlorobenzene	mg/L	0.007	–	–	–	–	–
8260	VOCs	1,2,4-Trichlorobenzene	mg/L	0.004	–	–	–	–	–
8260	VOCs	1,1,1-Trichloroethane	mg/L	8	–	–	–	–	–
8260	VOCs	1,1,2-Trichloroethane	mg/L	0.00041	–	–	–	–	–
8260	VOCs	VC	mg/L	0.00019	–	–	–	–	–
8260	VOCs	Vinyl Acetate	mg/L	0.41	–	–	–	–	–
8260	VOCs	Xylene, m & p	mg/L	–	–	ND [0.0003]	–	ND [0.0003]	ND [0.0003]
8260	VOCs	Xylene, o	mg/L	–	–	ND [0.0003]	–	ND [0.0003]	ND [0.0003]
8260	VOCs	Xylenes	mg/L	0.19	–	ND [0.0003]	–	ND [0.0003]	ND [0.0003]
PAHs									
8270SIM	PAHs	Acenaphthene	mg/L	0.53	–	–	ND [0.0001]	–	ND [0.0001]
8270SIM	PAHs	Acenaphthylene	mg/L	0.26	–	–	ND [0.0001]	–	ND [0.0001]
8270SIM	PAHs	Anthracene	mg/L	0.043	–	–	ND [0.0001]	–	ND [0.0001]
8270SIM	PAHs	Benzo(a)anthracene	mg/L	0.0003	–	–	ND [0.0001]	–	ND [0.0001]
8270SIM	PAHs	Benzo(a)pyrene	mg/L	0.00025	–	–	ND [0.0001]	–	ND [0.0001]
8270SIM	PAHs	Benzo(b)fluoranthene	mg/L	0.0025	–	–	ND [0.0001]	–	ND [0.0001]
8270SIM	PAHs	Benzo(g,h,i)perylene	mg/L	0.00026	–	–	ND [0.0001]	–	ND [0.0001]
8270SIM	PAHs	Benzo(k)fluoranthene	mg/L	0.0008	–	–	ND [0.0001]	–	ND [0.0001]
PAHs (continued)									
8270SIM	PAHs	Chrysene	mg/L	0.002	–	–	ND [0.0001]	–	ND [0.0001]
8270SIM	PAHs	Dibenzo(a,h)anthracene	mg/L	0.00025	–	–	ND [0.0001]	–	ND [0.0001]
8270SIM	PAHs	Fluoranthene	mg/L	0.26	–	–	ND [0.0001]	–	ND [0.0001]
8270SIM	PAHs	Fluorene	mg/L	0.29	–	–	ND [0.0001]	–	ND [0.0001]
8270SIM	PAHs	Indeno(1,2,3-cd)pyrene	mg/L	0.00019	–	–	ND [0.0001]	–	ND [0.0001]
8270SIM	PAHs	1-Methylnaphthalene	mg/L	0.011	–	–	ND [0.0001]	–	ND [0.0001]
8270SIM	PAHs	2-Methylnaphthalene	mg/L	0.036	–	–	ND [0.0001]	–	ND [0.0001]
8260	PAHs	Naphthalene	mg/L	0.0017	–	–	–	–	–
8270SIM	PAHs	Naphthalene	mg/L	0.0017	–	–	ND [0.0001] QN	–	ND [0.0001]
8270SIM	PAHs	Phenanthrene	mg/L	0.17	–	–	ND [0.0001]	–	ND [0.0001]
8270SIM	PAHs	Pyrene	mg/L	0.12	–	–	ND [0.0001]	–	ND [0.0001]
NR	PAHs	Total HPAHs	mg/L	–	–	–	ND []	–	ND []
NR	PAHs	Total LPAHs	mg/L	–	–	–	ND []	–	ND []
PCBs									
8082	PCBs	Aroclor-1016	mg/L	0.0005	–	–	ND [0.00025]	–	ND [0.00025]
8082	PCBs	Aroclor-1221	mg/L	0.0005	–	–	ND [0.00025]	–	ND [0.00025]
8082	PCBs	Aroclor-1232	mg/L	0.0005	–	–	ND [0.00025]	–	ND [0.00025]
8082	PCBs	Aroclor-1242	mg/L	0.0005	–	–	ND [0.00025]	–	ND [0.00025]
8082	PCBs	Aroclor-1248	mg/L	0.0005	–	–	ND [0.00025]	–	ND [0.00025]

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Table E-1.1 Groundwater Results

					Location ID:	MW88-1	MW88-10	MW88-10	MW88-3
					Sample ID:	18NEC-MW88-1-WG	18NEC-MW88-10-WG	18NEC-MW88-10-WG	18NEC-MW88-3-WG
					Sample Date:	8/4/2018	8/4/2018	8/4/2018	8/5/2018
					Sample Type:	GW	GW	GW	GW
					SDG:	86502	86489	86502	86502
					Laboratory:	APPL	APPL	APPL	APPL
					QAQC:	Primary	Primary	Primary	Primary
Method	**Group**	**Analyte**	**Units**	**ADEC Evaluation Criteria[1]**	**SSCL[2]**				
8082	PCBs	Aroclor-1254	mg/L	0.0005	–	–	ND [0.00025]	–	ND [0.00025]
8082	PCBs	Aroclor-1260	mg/L	0.0005	–	–	ND [0.00025]	–	ND [0.00025]
8082	PCBs	Aroclor-1262	mg/L	–	–	–	ND [0.0004]	–	ND [0.0004]
8082	PCBs	Aroclor-1268	mg/L	–	–	–	ND [0.0004]	–	ND [0.0004]
8082	PCBs	PCBs	mg/L	0.00044	–	–	ND [0.00025]	–	ND [0.00025]
Metals									
SW6020-D	Metals	Arsenic	mg/L	0.00052	0.01	ND [0.001]	–	ND [0.001]	ND [0.001]
SW6020-T	Metals	Arsenic	mg/L	0.00052	0.01	ND [0.001]	–	ND [0.001]	ND [0.001]
SW6020-D	Metals	Barium	mg/L	3.8	–	0.0072 [0.0008]	–	0.0124 [0.0008]	0.016 [0.0008]
SW6020-T	Metals	Barium	mg/L	3.8	–	0.0095 [0.0008]	–	0.012 [0.0008]	0.0224 [0.0008]
SW6020-D	Metals	Cadmium	mg/L	0.0092	–	0.000093 [0.0001] J	–	0.00031 [0.0001] J	0.00015 [0.0001] J
SW6020-T	Metals	Cadmium	mg/L	0.0092	–	0.000083 [0.0001] J	–	0.00028 [0.0001] J	0.00019 [0.0001] J
SW6020-D	Metals	Chromium	mg/L	22	–	0.00072 [0.0015] J,B	–	0.0016 [0.0015] J,B	0.00078 [0.0015] J,B
SW6020-T	Metals	Chromium	mg/L	22	–	0.041 [0.0015]	–	0.0011 [0.0015] J,B	0.0024 [0.0015] J,B
SW6020-D	Metals	Lead	mg/L	0.015	0.015	0.00064 [0.0004] J,B	–	0.0017 [0.0004] J	0.00034 [0.0004] J,B
SW6020-T	Metals	Lead	mg/L	0.015	0.015	0.0024 [0.0004] J	–	0.00031 [0.0004] J,B	0.0046 [0.0004]
SW6020-D	Metals	Manganese	mg/L	0.43	–	0.058 [0.0008]	–	0.363 [0.0008]	0.42 [0.0008]
SW7470A-D	Metals	Mercury	mg/L	0.00052	–	ND [0.00015]	–	ND [0.00015]	ND [0.00015]
SW7470A-T	Metals	Mercury	mg/L	0.00052	–	ND [0.00015]	–	ND [0.00015]	ND [0.00015]
SW6020-D	Metals	Nickel	mg/L	0.39	–	0.00058 [0.0008] J	–	0.0024 [0.0008] J	0.0022 [0.0008] J
SW6020-T	Metals	Nickel	mg/L	0.39	–	0.0029 [0.0008] J	–	0.0019 [0.0008] J,B	0.0031 [0.0008]
SW6020-D	Metals	Selenium	mg/L	0.1	–	ND [0.002]	–	ND [0.002]	ND [0.002]
SW6020-T	Metals	Selenium	mg/L	0.1	–	ND [0.002]	–	ND [0.002]	ND [0.002]
SW6020-D	Metals	Silver	mg/L	0.094	–	ND [0.0001]	–	ND [0.0001]	0.0001 [0.0001] J,B
SW6020-T	Metals	Silver	mg/L	0.094	–	0.00017 [0.0001] J,B	–	ND [0.0001]	0.00017 [0.0001] J,B
SW6020-D	Metals	Vanadium	mg/L	0.086	–	ND [0.001]	–	0.00066 [0.001] J	ND [0.001]
SW6020-T	Metals	Vanadium	mg/L	0.086	–	0.0012 [0.001] J	–	ND [0.001]	0.0017 [0.001] J
SW6020-D	Metals	Zinc	mg/L	6	–	0.0172 [0.015] J	–	0.0322 [0.015]	0.0239 [0.015]
SW6020-T	Metals	Zinc	mg/L	6	–	0.0156 [0.015] J	–	0.0175 [0.015] J	0.0347 [0.015]
IonsNutrients									
E300.0	IonsNutrients	Sulfate	mg/L	–	–	24.6 [0.198]	–	18.6 [0.198]	16.8 [0.198]

Notes:
[1] ADEC Table C Groundwater cleanup level (ADEC 2018).
[2] Decision Document Site-Specific Cleanup Level (USACE 2009).
[ ] denotes the LOD or no number if no LOD was reported
Bold = Result is greater than or equal to the ADEC screening level[1]
= Result is greater than or equal to the SSCL[2]
— = method or screening level not available or analysis not conducted
For data qualifiers, refer to the Analytical Data Qualifiers section of the DQA.
For definitions, refer to the Acronyms and Abbreviations section of the DQA.

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Table E-1.2 Sample Summary

COC Sample ID	Location ID	Collection Date	Collection Time	Sampler	Qty	Container Type	Container Volume	Preservative	Matrix	Analytical Method Requested	QC Type	TAT	Notes	Site	COC Number	Cooler Name	Cooler Date	Laboratory	SDG Number	Sample Depth (depth of tubing, feet btoc)
18NEC-26MW01-WG	26MW01	2-Aug-18	1325	KM/JB	2	Polyethylene Bottle	250 mL	HNO3, 0-6°C	GW	SW6020A/7470A (RCRA Metals plus nickel, vanadium, and zinc)		14 Days		NE Cape (MOC)	18NEC-05	Jump Soles	3-Aug-18	APPL	86483	31.0
18NEC-26MW01-WG	26MW01	2-Aug-18	1325	KM/JB	1	Polyethylene Bottle	250 mL	FF, HNO3, 0-6°C	GW	SW6020A/7470A (RCRA metals plus manganese, nickel, vanadium, and zinc)		14 Days	FF = Field Filtered	NE Cape (MOC)	18NEC-05	Jump Soles	3-Aug-18	APPL	86483	31.0
18NEC-26MW01-WG	26MW01	2-Aug-18	1325	KM/JB	1	Polyethylene Bottle	250 mL	0°C to 6°C	GW	EPA 300.0		14 Days		NE Cape (MOC)	18NEC-05	Jump Soles	3-Aug-18	APPL	86483	31.0
18NEC-26MW01-WG	26MW01	2-Aug-18	1325	KM/JB	1	Polyethylene Bottle	250 mL	0°C to 6°C	GW	EPA 310.1		14 Days		NE Cape (MOC)	18NEC-05	Jump Soles	3-Aug-18	APPL	86483	31.0
18NEC-26MW01-WG	26MW01	2-Aug-18	1325	KM/JB	3	Amber Glass Bottle	40 mL	HCl, 0°C to 6°C	GW	SW8260C (BTEX Only)		14 Days		NE Cape (MOC)	18NEC-05	Jump Soles	3-Aug-18	APPL	86483	31.0
18NEC-26MW01-WG	26MW01	2-Aug-18	1325	KM/JB	3	Amber Glass Bottle	40 mL	HCl, 0°C to 6°C	GW	RSK 175		14 Days		NE Cape (MOC)	18NEC-05	Jump Soles	3-Aug-18	APPL	86483	31.0
18NEC-26MW01-WG	26MW01	2-Aug-18	1325	KM/JB	2	Amber Glass Bottle	1 L	HCl, 0°C to 6°C	GW	AK102/103		14 Days		NE Cape (MOC)	18NEC-01	Vibro-Belt	3-Aug-18	APPL	86483	31.0
18NEC-26MW01-WG	26MW01	2-Aug-18	1325	KM/JB	3	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8082A		14 Days		NE Cape (MOC)	18NEC-01	Vibro-Belt	3-Aug-18	APPL	86483	31.0
18NEC-26MW01-WG	26MW01	2-Aug-18	1325	KM/JB	3	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8270D SIM		14 Days		NE Cape (MOC)	18NEC-01	Vibro-Belt	3-Aug-18	APPL	86483	31.0
18NEC-22MW2-WG	22MW2	2-Aug-18	1705	KM/JB	1	Polyethylene Bottle	250 mL	HNO3, 0-6°C	GW	SW6020A/7470A (RCRA Metals plus nickel, vanadium, and zinc)		14 Days		NE Cape (MOC)	18NEC-02	Shake Weight	3-Aug-18	APPL	86487	24.0
18NEC-22MW2-WG	22MW2	2-Aug-18	1705	KM/JB	1	Polyethylene Bottle	250 mL	FF, HNO3, 0-6°C	GW	SW6020A/7470A (RCRA metals plus manganese, nickel, vanadium, and zinc)		14 Days	FF = Field Filtered	NE Cape (MOC)	18NEC-02	Shake Weight	3-Aug-18	APPL	86487	24.0
18NEC-22MW2-WG	22MW2	2-Aug-18	1705	KM/JB	1	Polyethylene Bottle	250 mL	0°C to 6°C	GW	EPA 300.0		14 Days		NE Cape (MOC)	18NEC-02	Shake Weight	3-Aug-18	APPL	86487	24.0
18NEC-22MW2-WG	22MW2	2-Aug-18	1705	KM/JB	1	Polyethylene Bottle	250 mL	0°C to 6°C	GW	EPA 310.1		14 Days		NE Cape (MOC)	18NEC-02	Shake Weight	3-Aug-18	APPL	86487	24.0
18NEC-22MW2-WG	22MW2	2-Aug-18	1705	KM/JB	3	Amber Glass Bottle	40 mL	HCl, 0°C to 6°C	GW	SW8260C (BTEX Only)		14 Days		NE Cape (MOC)	18NEC-05	Jump Soles	3-Aug-18	APPL	86487	24.0
18NEC-22MW2-WG	22MW2	2-Aug-18	1705	KM/JB	3	Amber Glass Bottle	40 mL	HCl, 0°C to 6°C	GW	RSK 175		14 Days		NE Cape (MOC)	18NEC-05	Jump Soles	3-Aug-18	APPL	86487	24.0
18NEC-22MW2-WG	22MW2	2-Aug-18	1705	KM/JB	2	Amber Glass Bottle	1 L	HCl, 0°C to 6°C	GW	AK102/103		14 Days		NE Cape (MOC)	18NEC-02	Shake Weight	3-Aug-18	APPL	86487	24.0
18NEC-22MW2-WG	22MW2	2-Aug-18	1705	KM/JB	2	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8082A		14 Days		NE Cape (MOC)	18NEC-02	Shake Weight	3-Aug-18	APPL	86487	24.0
18NEC-22MW2-WG	22MW2	2-Aug-18	1705	KM/JB	2	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8270D SIM		14 Days		NE Cape (MOC)	18NEC-02	Shake Weight	3-Aug-18	APPL	86487	24.0
18NEC-22MW2-WG-8	22MW2	2-Aug-18	1705	KM/JB	1	Polyethylene Bottle	250 mL	HNO3, 0-6°C	GW	SW6020A/7470A (RCRA Metals plus nickel, vanadium, and zinc)	DUP	14 Days		NE Cape (MOC)	18NEC-03	Ab Blaster	3-Aug-18	APPL	86487	24.0
18NEC-22MW2-WG-8	22MW2	2-Aug-18	1705	KM/JB	1	Polyethylene Bottle	250 mL	FF, HNO3, 0-6°C	GW	SW6020A/7470A (RCRA metals plus manganese, nickel, vanadium, and zinc)	DUP	14 Days	FF = Field Filtered	NE Cape (MOC)	18NEC-03	Ab Blaster	3-Aug-18	APPL	86487	24.0
18NEC-22MW2-WG-8	22MW2	2-Aug-18	1705	KM/JB	1	Polyethylene Bottle	250 mL	0°C to 6°C	GW	EPA 300.0	DUP	14 Days		NE Cape (MOC)	18NEC-03	Ab Blaster	3-Aug-18	APPL	86487	24.0
18NEC-22MW2-WG-8	22MW2	2-Aug-18	1705	KM/JB	1	Polyethylene Bottle	250 mL	0°C to 6°C	GW	EPA 310.1	DUP	14 Days		NE Cape (MOC)	18NEC-03	Ab Blaster	3-Aug-18	APPL	86487	24.0
18NEC-22MW2-WG-8	22MW2	2-Aug-18	1705	KM/JB	3	Amber Glass Bottle	40 mL	HCl, 0°C to 6°C	GW	SW8260C (BTEX Only)	DUP	14 Days		NE Cape (MOC)	18NEC-05	Jump Soles	3-Aug-18	APPL	86487	24.0
18NEC-22MW2-WG-8	22MW2	2-Aug-18	1705	KM/JB	3	Amber Glass Bottle	40 mL	HCl, 0°C to 6°C	GW	RSK 175	DUP	14 Days		NE Cape (MOC)	18NEC-05	Jump Soles	3-Aug-18	APPL	86487	24.0
18NEC-22MW2-WG-8	22MW2	2-Aug-18	1705	KM/JB	2	Amber Glass Bottle	1 L	HCl, 0°C to 6°C	GW	AK102/103	DUP	14 Days		NE Cape (MOC)	18NEC-03	Ab Blaster	3-Aug-18	APPL	86487	24.0
18NEC-22MW2-WG-8	22MW2	2-Aug-18	1705	KM/JB	2	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8082A	DUP	14 Days		NE Cape (MOC)	18NEC-03	Ab Blaster	3-Aug-18	APPL	86487	24.0
18NEC-22MW2-WG-8	22MW2	2-Aug-18	1705	KM/JB	2	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8270D SIM	DUP	14 Days		NE Cape (MOC)	18NEC-03	Ab Blaster	3-Aug-18	APPL	86487	24.0
18NEC-TB03	18NEC-TB03	2-Aug-18	0800	KM/JB/AA	3	Amber Glass Bottle	40 mL	HCl, 0°C to 6°C	TB	SW8260C	TB	14 Days		NE Cape	18NEC-15	Perfect Pushup	4-Aug-18	APPL	86483	N/A
18NEC-TB04	18NEC-TB04	2-Aug-18	0800	KM/JB/AA	3	Amber Glass Bottle	40 mL	HCl, 0°C to 6°C	TB	RSK 175	TB	14 Days		NE Cape	18NEC-15	Perfect Pushup	4-Aug-18	APPL	86483	N/A
18NEC-MW10-1-WG	MW10-1	3-Aug-18	1620	JB/PM/HH	2	Amber Glass Bottle	1 L	HCl, 0°C to 6°C	GW	AK102/103		14 Days		NE Cape (MOC)	18NEC-08	Yoga Pants	4-Aug-18	APPL	86483	3.7
18NEC-MW10-1-WG	MW10-1	3-Aug-18	1620	JB/PM/HH	2	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8270D SIM		14 Days		NE Cape (MOC)	18NEC-08	Yoga Pants	4-Aug-18	APPL	86483	3.7
18NEC-MW10-1-WG	MW10-1	3-Aug-18	1620	JB/PM/HH	2	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8082A		14 Days		NE Cape (MOC)	18NEC-08	Yoga Pants	4-Aug-18	APPL	86483	3.7
18NEC-MW10-1-WG	MW10-1	3-Aug-18	1620	JB/PM/HH	2	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8015C (Glycol)		14 Days		NE Cape (MOC)	18NEC-08	Yoga Pants	4-Aug-18	APPL	86483	3.7
18NEC-MW10-1-WG	MW10-1	3-Aug-18	1620	JB/PM/HH	3	Amber Glass Bottle	40 mL	HCl, 0°C to 6°C	GW	SW8260C (Full List)		14 Days		NE Cape (MOC)	18NEC-15	Perfect Pushup	4-Aug-18	APPL	86483	3.7
18NEC-MW10-1-WG	MW10-1	3-Aug-18	1620	JB/PM/HH	3	Amber Glass Bottle	40 mL	HCl, 0°C to 6°C	GW	RSK 175		14 Days		NE Cape (MOC)	18NEC-15	Perfect Pushup	4-Aug-18	APPL	86483	3.7
18NEC-MW10-1-WG	MW10-1	3-Aug-18	1620	JB/PM/HH	1	Polyethylene Bottle	250 mL	HNO3, 0-6°C	GW	SW6020A/7470A (RCRA Metals plus nickel, vanadium, and zinc)		14 Days		NE Cape (MOC)	18NEC-15	Perfect Pushup	4-Aug-18	APPL	86483	3.7
18NEC-MW10-1-WG	MW10-1	3-Aug-18	1620	JB/PM/HH	1	Polyethylene Bottle	250 mL	FF, HNO3, 0-6°C	GW	SW6020A/7470A (RCRA metals plus manganese, nickel, vanadium, and zinc)		14 Days	FF = Field Filtered	NE Cape (MOC)	18NEC-15	Perfect Pushup	4-Aug-18	APPL	86483	3.7
18NEC-MW10-1-WG	MW10-1	3-Aug-18	1620	JB/PM/HH	1	Polyethylene Bottle	250 mL	0°C to 6°C	GW	EPA 300.0, 310.1		14 Days		NE Cape (MOC)	18NEC-15	Perfect Pushup	4-Aug-18	APPL	86483	3.7
18NEC-MW10-1-WG-8	MW10-1	3-Aug-18	1620	JB/PM/HH	2	Amber Glass Bottle	1 L	HCl, 0°C to 6°C	GW	AK102/103	DUP	14 Days		NE Cape (MOC)	18NEC-09	Bowflex	4-Aug-18	APPL	86483	3.7
18NEC-MW10-1-WG-8	MW10-1	3-Aug-18	1620	JB/PM/HH	2	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8270D SIM	DUP	14 Days		NE Cape (MOC)	18NEC-09	Bowflex	4-Aug-18	APPL	86483	3.7
18NEC-MW10-1-WG-8	MW10-1	3-Aug-18	1620	JB/PM/HH	2	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8082A	DUP	14 Days		NE Cape (MOC)	18NEC-09	Bowflex	4-Aug-18	APPL	86483	3.7
18NEC-MW10-1-WG-8	MW10-1	3-Aug-18	1620	JB/PM/HH	2	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8015C (Glycol)	DUP	14 Days		NE Cape (MOC)	18NEC-09	Bowflex	4-Aug-18	APPL	86483	3.7
18NEC-MW10-1-WG-8	MW10-1	3-Aug-18	1620	JB/PM/HH	3	Amber Glass Bottle	40 mL	HCl, 0°C to 6°C	GW	SW8260C (Full List)	DUP	14 Days		NE Cape (MOC)	18NEC-15	Perfect Pushup	4-Aug-18	APPL	86483	3.7
18NEC-MW10-1-WG-8	MW10-1	3-Aug-18	1620	JB/PM/HH	3	Amber Glass Bottle	40 mL	HCl, 0°C to 6°C	GW	RSK 175	DUP	14 Days		NE Cape (MOC)	18NEC-15	Perfect Pushup	4-Aug-18	APPL	86483	3.7
18NEC-MW10-1-WG-8	MW10-1	3-Aug-18	1620	JB/PM/HH	1	Polyethylene Bottle	250 mL	HNO3, 0-6°C	GW	SW6020A/7470A (RCRA Metals plus nickel, vanadium, and zinc)	DUP	14 Days		NE Cape (MOC)	18NEC-15	Perfect Pushup	4-Aug-18	APPL	86483	3.7
18NEC-MW10-1-WG-8	MW10-1	3-Aug-18	1620	JB/PM/HH	1	Polyethylene Bottle	250 mL	FF, HNO3, 0-6°C	GW	SW6020A/7470A (RCRA metals plus manganese, nickel, vanadium, and zinc)	DUP	14 Days	FF = Field Filtered	NE Cape (MOC)	18NEC-15	Perfect Pushup	4-Aug-18	APPL	86483	3.7
18NEC-MW10-1-WG-8	MW10-1	3-Aug-18	1620	JB/PM/HH	1	Polyethylene Bottle	250 mL	0°C to 6°C	GW	EPA 300.0, 310.1	DUP	14 Days		NE Cape (MOC)	18NEC-15	Perfect Pushup	4-Aug-18	APPL	86483	3.7
18NEC-14MW01-WG	14MW01	3-Aug-18	1415	KM	6	Amber Glass Bottle	1 L	HCl, 0°C to 6°C	GW	AK102/103	MS/MSD	14 Days		NE Cape (MOC)	18NEC-10	Teeter Hang Up	4-Aug-18	APPL	86483	15.6
18NEC-14MW01-WG	14MW01	3-Aug-18	1415	KM	2	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8270D SIM	MS/MSD	14 Days		NE Cape (MOC)	18NEC-10	Teeter Hang Up	4-Aug-18	APPL	86483	15.6
18NEC-14MW01-WG	14MW01	3-Aug-18	1415	KM	4	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8270D SIM	MS/MSD	14 Days		NE Cape (MOC)	18NEC-11	EZ Shaper	4-Aug-18	APPL	86483	15.6
18NEC-14MW01-WG	14MW01	3-Aug-18	1415	KM	4	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8082A	MS/MSD	14 Days		NE Cape (MOC)	18NEC-11	EZ Shaper	4-Aug-18	APPL	86483	15.6
18NEC-14MW01-WG	14MW01	3-Aug-18	1415	KM	2	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8082A	MS/MSD	14 Days		NE Cape (MOC)	18NEC-12	Peleton	4-Aug-18	APPL	86483	15.6
18NEC-14MW01-WG	14MW01	3-Aug-18	1415	KM	9	Amber Glass Bottle	40 mL	HCl, 0°C to 6°C	GW	SW8260C (BTEX Only)	MS/MSD	14 Days		NE Cape (MOC)	18NEC-15	Perfect Pushup	4-Aug-18	APPL	86483	15.6
18NEC-14MW01-WG	14MW01	3-Aug-18	1415	KM	9	Amber Glass Bottle	40 mL	HCl, 0°C to 6°C	GW	RSK 175	MS/MSD	14 Days		NE Cape (MOC)	18NEC-15	Perfect Pushup	4-Aug-18	APPL	86483	15.6
18NEC-14MW01-WG	14MW01	3-Aug-18	1415	KM	3	Polyethylene Bottle	250 mL	HNO3, 0-6°C	GW	SW6020A/7470A (RCRA Metals plus nickel, vanadium, and zinc)	MS/MSD	14 Days		NE Cape (MOC)	18NEC-15	Perfect Pushup	4-Aug-18	APPL	86483	15.6
18NEC-14MW01-WG	14MW01	3-Aug-18	1415	KM	3	Polyethylene Bottle	250 mL	FF, HNO3, 0-6°C	GW	SW6020A/7470A (RCRA metals plus manganese, nickel, vanadium, and zinc)	MS/MSD	14 Days	FF = Field Filtered	NE Cape (MOC)	18NEC-15	Perfect Pushup	4-Aug-18	APPL	86483	15.6
18NEC-14MW01-WG	14MW01	3-Aug-18	1415	KM	3	Polyethylene Bottle	250 mL	0°C to 6°C	GW	EPA 300.0, 310.1	MS/MSD	14 Days		NE Cape (MOC)	18NEC-14	Balance Board	4-Aug-18	APPL	86483	15.6
18NEC-14MW01-WG-8	14MW01	3-Aug-18	1415	KM	2	Amber Glass Bottle	1 L	HCl, 0°C to 6°C	GW	AK102/103	DUP	14 Days		NE Cape (MOC)	18NEC-12	Peleton	4-Aug-18	APPL	86483	15.6
18NEC-14MW01-WG-8	14MW01	3-Aug-18	1415	KM	2	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8270D SIM	DUP	14 Days		NE Cape (MOC)	18NEC-12	Peleton	4-Aug-18	APPL	86483	15.6
18NEC-14MW01-WG-8	14MW01	3-Aug-18	1415	KM	2	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8082A	DUP	14 Days		NE Cape (MOC)	18NEC-12	Peleton	4-Aug-18	APPL	86483	15.6
18NEC-14MW01-WG-8	14MW01	3-Aug-18	1415	KM	3	Amber Glass Bottle	40 mL	HCl, 0°C to 6°C	GW	SW8260C (BTEX Only)	DUP	14 Days		NE Cape (MOC)	18NEC-15	Perfect Pushup	4-Aug-18	APPL	86483	15.6

2018 MNA Groundwater Annual Sampling Report at the Northeast Cape MOC
Table E-1.2 Sample Summary

COC Sample ID	Location ID	Collection Date	Collection Time	Sampler	Qty	Container Type	Container Volume	Preservative	Matrix	Analytical Method Requested	QC Type	TAT	Notes	Site	COC Number	Cooler Name	Cooler Date	Laboratory	SDG Number	Sample Depth (depth of tubing, feet btoc)
18NEC-14MW01-WG-8	14MW01	3-Aug-18	1415	KM	3	Amber Glass Bottle	40 mL	HCl, 0°C to 6°C	GW	RSK 175	DUP	14 Days		NE Cape (MOC)	18NEC-15	Perfect Pushup	4-Aug-18	APPL	86483	15.6
18NEC-14MW01-WG-8	14MW01	3-Aug-18	1415	KM	1	Polyethylene Bottle	250 mL	HNO3, 0-6°C	GW	SW6020A/7470A (RCRA Metals plus nickel, vanadium, and zinc)	DUP	14 Days		NE Cape (MOC)	18NEC-14	Balance Board	4-Aug-18	APPL	86483	15.6
18NEC-14MW01-WG-8	14MW01	3-Aug-18	1415	KM	1	Polyethylene Bottle	250 mL	FF, HNO3, 0-6°C	GW	SW6020A/7470A (RCRA metals plus manganese, nickel, vanadium, and zinc)	DUP	14 Days	FF = Field Filtered	NE Cape (MOC)	18NEC-14	Balance Board	4-Aug-18	APPL	86483	15.6
18NEC-14MW01-WG-8	14MW01	3-Aug-18	1415	KM	1	Polyethylene Bottle	250 mL	0°C to 6°C	GW	EPA 300.0, 310.1	DUP	14 Days		NE Cape (MOC)	18NEC-14	Balance Board	4-Aug-18	APPL	86483	15.6
18NEC-14MW07-WG	14MW07	3-Aug-18	1713	KM/PM	2	Amber Glass Bottle	1 L	HCl, 0°C to 6°C	GW	AK102/103		14 Days		NE Cape (MOC)	18NEC-13	Medicine Ball	4-Aug-18	APPL	86483	22.9
18NEC-14MW07-WG	14MW07	3-Aug-18	1713	KM/PM	2	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8270D SIM		14 Days		NE Cape (MOC)	18NEC-13	Medicine Ball	4-Aug-18	APPL	86483	22.9
18NEC-14MW07-WG	14MW07	3-Aug-18	1713	KM/PM	2	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8082A		14 Days		NE Cape (MOC)	18NEC-13	Medicine Ball	4-Aug-18	APPL	86483	22.9
18NEC-14MW07-WG	14MW07	3-Aug-18	1713	KM/PM	3	Amber Glass Bottle	40 mL	HCl, 0°C to 6°C	GW	SW8260C (BTEX Only)		14 Days		NE Cape (MOC)	18NEC-15	Perfect Pushup	4-Aug-18	APPL	86483	22.9
18NEC-14MW07-WG	14MW07	3-Aug-18	1713	KM/PM	3	Amber Glass Bottle	40 mL	HCl, 0°C to 6°C	GW	RSK 175		14 Days		NE Cape (MOC)	18NEC-15	Perfect Pushup	4-Aug-18	APPL	86483	22.9
18NEC-14MW07-WG	14MW07	3-Aug-18	1713	KM/PM	1	Polyethylene Bottle	250 mL	HNO3, 0-6°C	GW	SW6020A/7470A (RCRA Metals plus nickel, vanadium, and zinc)		14 Days		NE Cape (MOC)	18NEC-14	Balance Board	4-Aug-18	APPL	86483	22.9
18NEC-14MW07-WG	14MW07	3-Aug-18	1713	KM/PM	1	Polyethylene Bottle	250 mL	FF, HNO3, 0-6°C	GW	SW6020A/7470A (RCRA metals plus manganese, nickel, vanadium, and zinc)		14 Days	FF = Field Filtered	NE Cape (MOC)	18NEC-14	Balance Board	4-Aug-18	APPL	86483	22.9
18NEC-14MW07-WG	14MW07	3-Aug-18	1713	KM/PM	1	Polyethylene Bottle	250 mL	0°C to 6°C	GW	EPA 300.0, 310.1		14 Days		NE Cape (MOC)	18NEC-14	Balance Board	4-Aug-18	APPL	86483	22.9
18NEC-20MW01-WG	20MW01	3-Aug-18	1815	KM	2	Amber Glass Bottle	1 L	HCl, 0°C to 6°C	GW	AK102/103		14 Days		NE Cape (MOC)	18NEC-13	Medicine Ball	4-Aug-18	APPL	86483	20.2
18NEC-20MW01-WG	20MW01	3-Aug-18	1815	KM	2	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8270D SIM		14 Days		NE Cape (MOC)	18NEC-14	Balance Board	4-Aug-18	APPL	86483	20.2
18NEC-20MW01-WG	20MW01	3-Aug-18	1815	KM	2	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8082A		14 Days		NE Cape (MOC)	18NEC-14	Balance Board	4-Aug-18	APPL	86483	20.2
18NEC-20MW01-WG	20MW01	3-Aug-18	1815	KM	3	Amber Glass Bottle	40 mL	HCl, 0°C to 6°C	GW	SW8260C (BTEX Only)		14 Days		NE Cape (MOC)	18NEC-15	Perfect Pushup	4-Aug-18	APPL	86483	20.2
18NEC-20MW01-WG	20MW01	3-Aug-18	1815	KM	3	Amber Glass Bottle	40 mL	HCl, 0°C to 6°C	GW	RSK 175		14 Days		NE Cape (MOC)	18NEC-15	Perfect Pushup	4-Aug-18	APPL	86483	20.2
18NEC-20MW01-WG	20MW01	3-Aug-18	1815	KM	1	Polyethylene Bottle	250 mL	HNO3, 0-6°C	GW	SW6020A/7470A (RCRA Metals plus nickel, vanadium, and zinc)		14 Days		NE Cape (MOC)	18NEC-14	Balance Board	4-Aug-18	APPL	86483	20.2
18NEC-20MW01-WG	20MW01	3-Aug-18	1815	KM	1	Polyethylene Bottle	250 mL	FF, HNO3, 0-6°C	GW	SW6020A/7470A (RCRA metals plus manganese, nickel, vanadium, and zinc)		14 Days	FF = Field Filtered	NE Cape (MOC)	18NEC-14	Balance Board	4-Aug-18	APPL	86483	20.2
18NEC-20MW01-WG	20MW01	3-Aug-18	1815	KM	1	Polyethylene Bottle	250 mL	0°C to 6°C	GW	EPA 300.0, 310.1		14 Days		NE Cape (MOC)	18NEC-14	Balance Board	4-Aug-18	APPL	86483	20.2
18NEC-TB01	18NEC-TB01	3-Aug-18	0800	KM/JB/AA	3	Amber Glass Bottle	40 mL	HCl, 0°C to 6°C	TB	SW8260C	TB	14 Days		NE Cape	18NEC-15	Perfect Pushup	4-Aug-18	APPL	86487	N/A
18NEC-TB02	18NEC-TB02	3-Aug-18	0800	KM/JB/AA	3	Amber Glass Bottle	40 mL	HCl, 0°C to 6°C	TB	RSK 175	TB	14 Days		NE Cape	18NEC-15	Perfect Pushup	4-Aug-18	APPL	86487	N/A
18NEC-MW17-1-WG	MW17-1	4-Aug-18	1045	JB	2	Amber Glass Bottle	1 L	HCl, 0°C to 6°C	GW	AK102/103		14 Days		NE Cape (MOC)	18NEC-17	Stair Master	5-Aug-18	APPL	86502	11.4
18NEC-MW17-1-WG	MW17-1	4-Aug-18	1045	JB	2	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8270D SIM		14 Days		NE Cape (MOC)	18NEC-17	Stair Master	5-Aug-18	APPL	86502	11.4
18NEC-MW17-1-WG	MW17-1	4-Aug-18	1045	JB	2	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8082A		14 Days		NE Cape (MOC)	18NEC-18	Gazelle	5-Aug-18	APPL	86502	11.4
18NEC-MW17-1-WG	MW17-1	4-Aug-18	1045	JB	1	Polyethylene Bottle	250 mL	HNO3, 0-6°C	GW	SW6020A/7470A (RCRA Metals plus nickel, vanadium, and zinc)		14 Days		NE Cape (MOC)	18NEC-19	Endless Pool	6-Aug-18	APPL	86502	11.4
18NEC-MW17-1-WG	MW17-1	4-Aug-18	1045	JB	1	Polyethylene Bottle	250 mL	FF, HNO3, 0-6°C	GW	SW6020A/7470A (RCRA metals plus manganese, nickel, vanadium, and zinc)		14 Days	FF = Field Filtered	NE Cape (MOC)	18NEC-19	Endless Pool	6-Aug-18	APPL	86502	11.4
18NEC-MW17-1-WG	MW17-1	4-Aug-18	1045	JB	1	Polyethylene Bottle	250 mL	0°C to 6°C	GW	EPA 300.0, 310.1		14 Days		NE Cape (MOC)	18NEC-19	Endless Pool		APPL	86502	11.4
18NEC-MW88-1-WG	MW88-1	4-Aug-18	1050	AA/SS	1	Polyethylene Bottle	250 mL	HNO3, 0-6°C	GW	SW6020A/7470A (RCRA Metals plus nickel, vanadium, and zinc)		14 Days		NE Cape (MOC)	18NEC-19	Endless Pool	6-Aug-18	APPL	86489	14.2
18NEC-MW88-1-WG	MW88-1	4-Aug-18	1050	AA/SS	1	Polyethylene Bottle	250 mL	FF, HNO3, 0-6°C	GW	SW6020A/7470A (RCRA metals plus manganese, nickel, vanadium, and zinc)		14 Days	FF = Field Filtered	NE Cape (MOC)	18NEC-19	Endless Pool	6-Aug-18	APPL	86489	14.2
18NEC-MW88-1-WG	MW88-1	4-Aug-18	1050	AA/SS	2	Amber Glass Bottle	1 L	HCl, 0°C to 6°C	GW	AK102/103		14 Days		NE Cape (MOC)	18NEC-16	Rowing Machine	5-Aug-18	APPL	86489	14.2
18NEC-MW88-1-WG	MW88-1	4-Aug-18	1050	AA/SS	2	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8270D SIM		14 Days		NE Cape (MOC)	18NEC-16	Rowing Machine	5-Aug-18	APPL	86489	14.2
18NEC-MW88-1-WG	MW88-1	4-Aug-18	1050	AA/SS	2	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8082A		14 Days		NE Cape (MOC)	18NEC-16	Rowing Machine	5-Aug-18	APPL	86489	14.2
18NEC-MW88-1-WG	MW88-1	4-Aug-18	1050	AA/SS	1	Polyethylene Bottle	250 mL	0°C to 6°C	GW	EPA 300.0, 310.1		14 Days		NE Cape (MOC)	18NEC-19	Endless Pool	6-Aug-18	APPL	86489	14.2
18NEC-14MW03-WG	MW03	4-Aug-18	1320	KM	1	Polyethylene Bottle	250 mL	HNO3, 0-6°C	GW	SW6020A/7470A (RCRA Metals plus nickel, vanadium, and zinc)		14 Days		NE Cape (MOC)	18NEC-19	Endless Pool	6-Aug-18	APPL	86489	10.8
18NEC-14MW03-WG	MW03	4-Aug-18	1320	KM	1	Polyethylene Bottle	250 mL	FF, HNO3, 0-6°C	GW	SW6020A/7470A (RCRA metals plus manganese, nickel, vanadium, and zinc)		14 Days	FF = Field Filtered	NE Cape (MOC)	18NEC-19	Endless Pool	6-Aug-18	APPL	86489	10.8
18NEC-14MW03-WG	MW03	4-Aug-18	1320	KM	1	Polyethylene Bottle	250 mL	0°C to 6°C	GW	EPA 300.0, 310.1		14 Days		NE Cape (MOC)	18NEC-19	Endless Pool	6-Aug-18	APPL	86489	10.8
18NEC-MW88-10-WG	MW88-10	4-Aug-18	1602	PM	1	Polyethylene Bottle	250 mL	HNO3, 0-6°C	GW	SW6020A/7470A (RCRA Metals plus nickel, vanadium, and zinc)		14 Days		NE Cape (MOC)	18NEC-19	Endless Pool	6-Aug-18	APPL	86489	18.1
18NEC-14MW03-WG	MW03	4-Aug-18	1320	KM	2	Amber Glass Bottle	1 L	HCl, 0°C to 6°C	GW	AK102/103		14 Days		NE Cape (MOC)	18NEC-16	Rowing Machine	5-Aug-18	APPL	86502	10.8
18NEC-14MW03-WG	MW03	4-Aug-18	1320	KM	2	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8270D SIM		14 Days		NE Cape (MOC)	18NEC-17	Stair Master	5-Aug-18	APPL	86502	10.8
18NEC-14MW03-WG	MW03	4-Aug-18	1320	KM	2	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8082A		14 Days		NE Cape (MOC)	18NEC-17	Stair Master	5-Aug-18	APPL	86502	10.8
18NEC-MW88-10-WG	MW88-10	4-Aug-18	1602	PM	1	Polyethylene Bottle	250 mL	FF, HNO3, 0-6°C	GW	SW6020A/7470A (RCRA metals plus manganese, nickel, vanadium, and zinc)		14 Days	FF = Field Filtered	NE Cape (MOC)	18NEC-19	Endless Pool	6-Aug-18	APPL	86489	18.1
18NEC-MW88-10-WG	MW88-10	4-Aug-18	1602	PM	1	Polyethylene Bottle	250 mL	0°C to 6°C	GW	EPA 300.0, 310.1		14 Days		NE Cape (MOC)	18NEC-19	Endless Pool		APPL	86489	18.1
18NEC-14MW06-WG	14MW06	5-Aug-18	1127	PM	3	Polyethylene Bottle	250 mL	HNO3, 0-6°C	GW	SW6020A/7470A (RCRA Metals plus nickel, vanadium, and zinc)	MS/MSD	14 Days		NE Cape (MOC)	18NEC-19	Endless Pool	6-Aug-18	APPL	86502	2.7
18NEC-14MW06-WG	14MW06	5-Aug-18	1127	PM	3	Polyethylene Bottle	250 mL	FF, HNO3, 0-6°C	GW	SW6020A/7470A (RCRA metals plus manganese, nickel, vanadium, and zinc)	MS/MSD	14 Days	FF = Field Filtered	NE Cape (MOC)	18NEC-19	Endless Pool	6-Aug-18	APPL	86489	2.7
18NEC-14MW06-WG	14MW06	5-Aug-18	1127	PM	3	Polyethylene Bottle	250 mL	0°C to 6°C	GW	EPA 300.0, 310.1	MS/MSD	14 Days		NE Cape (MOC)	18NEC-19	Endless Pool	6-Aug-18	APPL	86502	2.7
18NEC-MW88-10-WG	MW88-10	4-Aug-18	1602	PM	2	Amber Glass Bottle	1 L	HCl, 0°C to 6°C	GW	AK102/103		14 Days		NE Cape (MOC)	18NEC-18	Gazelle	5-Aug-18	APPL	86489	18.1
18NEC-MW88-10-WG	MW88-10	4-Aug-18	1602	PM	2	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8270D SIM		14 Days		NE Cape (MOC)	18NEC-18	Gazelle	5-Aug-18	APPL	86489	18.1
18NEC-MW88-10-WG	MW88-10	4-Aug-18	1602	PM	2	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8082A		14 Days		NE Cape (MOC)	18NEC-18	Gazelle	5-Aug-18	APPL	86489	18.1
18NEC-14MW06-WG	14MW06	5-Aug-18	1127	PM	6	Amber Glass Bottle	1 L	HCl, 0°C to 6°C	GW	AK102/103	MS/MSD	14 Days		NE Cape (MOC)	18NEC-20	Vertical Climber	6-Aug-18	APPL	86502	2.7
18NEC-14MW06-WG	14MW06	5-Aug-18	1127	PM	2	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8270D SIM	MS/MSD	14 Days		NE Cape (MOC)	18NEC-20	Vertical Climber	6-Aug-18	APPL	86502	2.7
18NEC-14MW06-WG	14MW06	5-Aug-18	1127	PM	4	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8270D SIM	MS/MSD	14 Days		NE Cape (MOC)	18NEC-21	Sauna Suit	6-Aug-18	APPL	86502	2.7
18NEC-14MW06-WG	14MW06	5-Aug-18	1127	PM	4	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8082A	MS/MSD	14 Days		NE Cape (MOC)	18NEC-21	Sauna Suit	6-Aug-18	APPL	86502	2.7
18NEC-14MW06-WG	14MW06	5-Aug-18	1127	PM	2	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8082A	MS/MSD	14 Days		NE Cape (MOC)	18NEC-22	Ab Firm Pro	6-Aug-18	APPL	86502	2.7
18NEC-14MW06-WG	14MW06	3-Aug-18	1127	PM	6	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8015C (Glycol)	MS/MSD	14 Days		NE Cape (MOC)	18NEC-22	Ab Firm Pro	6-Aug-18	APPL	86502	2.7
18NEC-MW17-1-WG	MW17-1	4-Aug-18	1045	JB	3	Amber Glass Bottle	40 mL	HCl, 0°C to 6°C	GW	SW8260C (BTEX Only)		14 Days		NE Cape (MOC)	18NEC-23	Roller Slide	6-Aug-18	APPL	86489	11.4
18NEC-MW17-1-WG	MW17-1	4-Aug-18	1045	JB	3	Amber Glass Bottle	40 mL	HCl, 0°C to 6°C	GW	RSK 175		14 Days		NE Cape (MOC)	18NEC-23	Roller Slide	6-Aug-18	APPL	86489	11.4

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Table E-1.2 Sample Summary

COC Sample ID	Location ID	Collection Date	Collection Time	Sampler	Qty	Container Type	Container Volume	Preservative	Matrix	Analytical Method Requested	QC Type	TAT	Notes	Site	COC Number	Cooler Name	Cooler Date	Laboratory	SDG Number	Sample Depth (depth of tubing, feet btoc)
18NEC-MW88-1-WG	MW88-1	4-Aug-18	1050	AA/SS	3	Amber Glass Bottle	40 mL	HCl, 0°C to 6°C	GW	SW8260C (BTEX Only)		14 Days		NE Cape (MOC)	18NEC-23	Roller Slide	6-Aug-18	APPL	86502	14.2
18NEC-MW88-1-WG	MW88-1	4-Aug-18	1050	AA/SS	3	Amber Glass Bottle	40 mL	HCl, 0°C to 6°C	GW	RSK 175		14 Days		NE Cape (MOC)	18NEC-23	Roller Slide	6-Aug-18	APPL	86502	14.2
18NEC-14MW03-WG	MW03	4-Aug-18	1320	KM	3	Amber Glass Bottle	40 mL	HCl, 0°C to 6°C	GW	SW8260C (BTEX Only)		14 Days		NE Cape (MOC)	18NEC-23	Roller Slide	6-Aug-18	APPL	86489	10.8
18NEC-14MW03-WG	MW03	4-Aug-18	1320	KM	3	Amber Glass Bottle	40 mL	HCl, 0°C to 6°C	GW	RSK 175		14 Days		NE Cape (MOC)	18NEC-23	Roller Slide	6-Aug-18	APPL	86489	10.8
18NEC-MW88-10-WG	MW88-10	4-Aug-18	1602	PM	3	Amber Glass Bottle	40 mL	HCl, 0°C to 6°C	GW	SW8260C (BTEX Only)		14 Days		NE Cape (MOC)	18NEC-23	Roller Slide	6-Aug-18	APPL	86502	18.1
18NEC-MW88-10-WG	MW88-10	4-Aug-18	1602	PM	3	Amber Glass Bottle	40 mL	HCl, 0°C to 6°C	GW	RSK 175		14 Days		NE Cape (MOC)	18NEC-23	Roller Slide	6-Aug-18	APPL	86502	18.1
18NEC-14MW06-WG	14MW06	5-Aug-18	1127	PM	9	Amber Glass Bottle	40 mL	HCl, 0°C to 6°C	GW	SW8260C (Full List)	MS/MSD	14 Days		NE Cape (MOC)	18NEC-23	Roller Slide	6-Aug-18	APPL	86502	2.7
18NEC-14MW06-WG	14MW06	5-Aug-18	1127	PM	9	Amber Glass Bottle	40 mL	HCl, 0°C to 6°C	GW	RSK 175	MS/MSD	14 Days		NE Cape (MOC)	18NEC-23	Roller Slide	6-Aug-18	APPL	86502	2.7
18NEC-14MW02-WG	14MW02	5-Aug-18	1642	PM	3	Amber Glass Bottle	40 mL	HCl, 0°C to 6°C	GW	SW8260C (BTEX Only)		14 Days		NE Cape (MOC)	18NEC-23	Roller Slide	6-Aug-18	APPL	86502	9.3
18NEC-14MW02-WG	14MW02	5-Aug-18	1642	PM	3	Amber Glass Bottle	40 mL	HCl, 0°C to 6°C	GW	RSK 175		14 Days		NE Cape (MOC)	18NEC-23	Roller Slide	6-Aug-18	APPL	86502	9.3
18NEC-MW88-3-WG	MW88-3	5-Aug-18	1505	KM	3	Amber Glass Bottle	40 mL	HCl, 0°C to 6°C	GW	SW8260C (BTEX Only)		14 Days		NE Cape (MOC)	18NEC-23	Roller Slide	6-Aug-18	APPL	86502	9.6
18NEC-MW88-3-WG	MW88-3	5-Aug-18	1505	KM	3	Amber Glass Bottle	40 mL	HCl, 0°C to 6°C	GW	RSK 175		14 Days		NE Cape (MOC)	18NEC-23	Roller Slide	6-Aug-18	APPL	86502	9.6
18NEC-14MW05-WG	14MW05	5-Aug-18	1750	KM	3	Amber Glass Bottle	40 mL	HCl, 0°C to 6°C	GW	SW8260C (BTEX Only)		14 Days		NE Cape (MOC)	18NEC-23	Roller Slide	6-Aug-18	APPL	86502	6.6
18NEC-14MW05-WG	14MW05	5-Aug-18	1750	KM	3	Amber Glass Bottle	40 mL	HCl, 0°C to 6°C	GW	RSK 175		14 Days		NE Cape (MOC)	18NEC-23	Roller Slide	6-Aug-18	APPL	86502	6.6
18NEC-EB01-WG		5-Aug-18	2030	KM	3	Amber Glass Bottle	40 mL	HCl, 0°C to 6°C	GW	SW8260C (Full List)		14 Days		NE Cape	18NEC-23	Roller Slide	6-Aug-18	APPL	86502	surface
18NEC-TB05	18NEC-TB05	4-Aug-18	0800	KM	3	Amber Glass Bottle	40 mL	HCl, 0°C to 6°C	GW	SW8260C (Full List)		14 Days		NE Cape	18NEC-23	Roller Slide	6-Aug-18	APPL	86502	N/A
18NEC-TB06	18NEC-TB06	4-Aug-18	0800	KM	3	Amber Glass Bottle	40 mL	HCl, 0°C to 6°C	GW	RSK 175		14 Days		NE Cape	18NEC-23	Roller Slide	6-Aug-18	APPL	86502	N/A
18NEC-14MW04-WG	14MW04	5-Aug-18	1305	KM	3	Amber Glass Bottle	40 mL	HCl, 0°C to 6°C	GW	SW8260C (BTEX Only)		14 Days		NE Cape	18NEC-23	Roller Slide	6-Aug-18	APPL	86502	3.5
18NEC-14MW04-WG	14MW04	5-Aug-18	1305	KM	3	Amber Glass Bottle	40 mL	HCl, 0°C to 6°C	GW	RSK 175		14 Days		NE Cape	18NEC-23	Roller Slide	6-Aug-18	APPL	86502	3.5
18NEC-14MW02-WG	14MW02	5-Aug-18	1642	PM	2	Amber Glass Bottle	1 L	HCl, 0°C to 6°C	GW	AK102/103		14 Days		NE Cape (MOC)	18NEC-24	Bullworker Classic	6-Aug-18	APPL	86502	9.3
18NEC-14MW02-WG	14MW02	5-Aug-18	1642	PM	2	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8270D SIM		14 Days		NE Cape (MOC)	18NEC-24	Bullworker Classic	6-Aug-18	APPL	86502	9.3
18NEC-14MW02-WG	14MW02	5-Aug-18	1642	PM	2	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8082A		14 Days		NE Cape (MOC)	18NEC-24	Bullworker Classic	6-Aug-18	APPL	86502	9.3
18NEC-14MW02-WG	14MW02	5-Aug-18	1642	PM	1	Polyethylene Bottle	250 mL	HNO3, 0-6°C	GW	SW6020A/7470A (RCRA Metals plus nickel, vanadium, and zinc)		14 Days		NE Cape (MOC)	18NEC-24	Bullworker Classic	6-Aug-18	APPL	86502	9.3
18NEC-14MW02-WG	14MW02	5-Aug-18	1642	PM	1	Polyethylene Bottle	250 mL	FF, HNO3, 0-6°C	GW	SW6020A/7470A (RCRA metals plus manganese, nickel, vanadium, and zinc)		14 Days	FF = Field Filtered	NE Cape (MOC)	18NEC-24	Bullworker Classic	6-Aug-18	APPL	86502	9.3
18NEC-14MW02-WG	14MW02	5-Aug-18	1642	PM	1	Polyethylene Bottle	250 mL	0°C to 6°C	GW	EPA 300.0, 310.1		14 Days		NE Cape (MOC)	18NEC-24	Bullworker Classic	6-Aug-18	APPL	86502	9.3
18NEC-MW88-3-WG	MW88-3	5-Aug-18	1505	KM	2	Amber Glass Bottle	1 L	HCl, 0°C to 6°C	GW	AK102/103		14 Days		NE Cape (MOC)	18NEC-25	BodyBoss	6-Aug-18	APPL	86502	9.6
18NEC-MW88-3-WG	MW88-3	5-Aug-18	1505	KM	2	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8270D SIM		14 Days		NE Cape (MOC)	18NEC-25	BodyBoss	6-Aug-18	APPL	86502	9.6
18NEC-MW88-3-WG	MW88-3	5-Aug-18	1505	KM	2	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8082A		14 Days		NE Cape (MOC)	18NEC-25	BodyBoss	6-Aug-18	APPL	86502	9.6
18NEC-MW88-3-WG	MW88-3	5-Aug-18	1505	KM	1	Polyethylene Bottle	250 mL	HNO3, 0-6°C	GW	SW6020A/7470A (RCRA Metals plus nickel, vanadium, and zinc)		14 Days		NE Cape (MOC)	18NEC-25	BodyBoss	6-Aug-18	APPL	86502	9.6
18NEC-MW88-3-WG	MW88-3	5-Aug-18	1505	KM	1	Polyethylene Bottle	250 mL	FF, HNO3, 0-6°C	GW	SW6020A/7470A (RCRA metals plus manganese, nickel, vanadium, and zinc)		14 Days	FF = Field Filtered	NE Cape (MOC)	18NEC-25	BodyBoss	6-Aug-18	APPL	86502	9.6
18NEC-MW88-3-WG	MW88-3	5-Aug-18	1505	KM	1	Polyethylene Bottle	250 mL	0°C to 6°C	GW	EPA 300.0, 310.1		14 Days		NE Cape (MOC)	18NEC-25	BodyBoss	6-Aug-18	APPL	86502	9.6
18NEC-14MW05-WG	14MW05	5-Aug-18	1750	KM	2	Amber Glass Bottle	1 L	HCl, 0°C to 6°C	GW	AK102/103		14 Days		NE Cape (MOC)	18NEC-26	Air Stair Climber	6-Aug-18	APPL	86502	6.6
18NEC-14MW05-WG	14MW05	5-Aug-18	1750	KM	2	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8270D SIM		14 Days		NE Cape (MOC)	18NEC-26	Air Stair Climber	6-Aug-18	APPL	86502	6.6
18NEC-14MW05-WG	14MW05	5-Aug-18	1750	KM	2	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8082A		14 Days		NE Cape (MOC)	18NEC-26	Air Stair Climber	6-Aug-18	APPL	86502	6.6
18NEC-14MW05-WG	14MW05	5-Aug-18	1750	KM	1	Polyethylene Bottle	250 mL	HNO3, 0-6°C	GW	SW6020A/7470A (RCRA Metals plus nickel, vanadium, and zinc)		14 Days		NE Cape (MOC)	18NEC-26	Air Stair Climber	6-Aug-18	APPL	86502	6.6
18NEC-14MW05-WG	14MW05	5-Aug-18	1750	KM	1	Polyethylene Bottle	250 mL	FF, HNO3, 0-6°C	GW	SW6020A/7470A (RCRA metals plus manganese, nickel, vanadium, and zinc)		14 Days	FF = Field Filtered	NE Cape (MOC)	18NEC-26	Air Stair Climber	6-Aug-18	APPL	86502	6.6
18NEC-14MW05-WG	14MW05	5-Aug-18	1750	KM	1	Polyethylene Bottle	250 mL	0°C to 6°C	GW	EPA 300.0, 310.1		14 Days		NE Cape (MOC)	18NEC-26	Air Stair Climber	6-Aug-18	APPL	86502	6.6
18NEC-EB01-WG		5-Aug-18	2030	KM	1	Polyethylene Bottle	250 mL	HNO3, 0-6°C	GW	SW6020A/7470A (RCRA Metals plus nickel, vanadium, and zinc)		14 Days		NE Cape	18NEC-27	Thigh Rocker	6-Aug-18	APPL	86502	N/A
18NEC-EB01-WG		5-Aug-18	2030	KM	2	Amber Glass Bottle	1 L	HCl, 0°C to 6°C	GW	AK102/103		14 Days		NE Cape (MOC)	18NEC-27	Thigh Rocker	6-Aug-18	APPL	86502	N/A
18NEC-EB01-WG		5-Aug-18	2030	KM	2	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8270D SIM		14 Days		NE Cape (MOC)	18NEC-27	Thigh Rocker	6-Aug-18	APPL	86502	N/A
18NEC-EB01-WG		5-Aug-18	2030	KM	2	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8082A		14 Days		NE Cape (MOC)	18NEC-27	Thigh Rocker	6-Aug-18	APPL	86502	N/A
18NEC-EB01-WG		5-Aug-18	2030	KM	2	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8015C (Glycol)		14 Days		NE Cape (MOC)	18NEC-27	Thigh Rocker	6-Aug-18	APPL	86502	N/A
18NEC-14MW04-WG	14MW04	5-Aug-18	1305	KM	2	Amber Glass Bottle	1 L	HCl, 0°C to 6°C	GW	AK102/103		14 Days		NE Cape (MOC)	18NEC-28	Hawaii Chair	6-Aug-18	APPL	86502	3.5
18NEC-14MW04-WG	14MW04	5-Aug-18	1305	KM	2	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8270D SIM		14 Days		NE Cape (MOC)	18NEC-28	Hawaii Chair	6-Aug-18	APPL	86502	3.5
18NEC-14MW04-WG	14MW04	5-Aug-18	1305	KM	2	Amber Glass Bottle	1 L	0°C to 6°C	GW	SW8082A		14 Days		NE Cape (MOC)	18NEC-28	Hawaii Chair	6-Aug-18	APPL	86502	3.5
18NEC-14MW04-WG	14MW04	5-Aug-18	1305	KM	1	Polyethylene Bottle	250 mL	HNO3, 0-6°C	GW	SW6020A/7470A (RCRA Metals plus nickel, vanadium, and zinc)		14 Days		NE Cape (MOC)	18NEC-28	Hawaii Chair	6-Aug-18	APPL	86502	3.5
18NEC-14MW04-WG	14MW04	5-Aug-18	1305	KM	1	Polyethylene Bottle	250 mL	FF, HNO3, 0-6°C	GW	SW6020A/7470A (RCRA metals plus manganese, nickel, vanadium, and zinc)		14 Days	FF = Field Filtered	NE Cape (MOC)	18NEC-28	Hawaii Chair	6-Aug-18	APPL	86502	3.5
18NEC-14MW04-WG	14MW04	5-Aug-18	1305	KM	1	Polyethylene Bottle	250 mL	0°C to 6°C	GW	EPA 300.0, 310.1		14 Days		NE Cape (MOC)	18NEC-28	Hawaii Chair	6-Aug-18	APPL	86502	3.5

Notes:
Project NPDL number 18-053
For definitions, refer to the Acronyms and Abbreviations section of the DQA.

EXHIBIT E2-2

Qualified Sample Results Tables

2018 MNA Groundwater Annual Sampling Report at the Northeast Cape MOC
Table E-2.1 Method Blank and Trip Blank Contamination

SDG	Sample ID	Lab Sample ID	Location ID	Method	Analyte	Result	LOD	LOQ	Units	DF	Analytical Batch	Qualifier	CoC Number
--	MB	LB-M1808091A	--	SW6020	Chromium	0.00066	0.0015	0.01	mg/L	1	232278	--	--
86483	18NEC-14MW01-WG-8-T	AZ77494-T	14MW01	SW6020	Chromium	0.00089	0.0015	0.01	mg/L	1	232278	J, B	18NEC-07-15
86483	18NEC-14MW01-WG-T	AZ77493-T	14MW01	SW6020	Chromium	0.0011	0.0015	0.01	mg/L	1	232278	J, B	18NEC-07-15
86483	18NEC-14MW07-WG-T	AZ77495-T	14MW07	SW6020	Chromium	0.0013	0.0015	0.01	mg/L	1	232278	J, B	18NEC-07-15
86483	18NEC-20MW01-WG-T	AZ77496-T	20MW01	SW6020	Chromium	0.0025	0.0015	0.01	mg/L	1	232278	J, B	18NEC-07-15
86487	18NEC-22MW2-WG-8	AZ77484-T	22MW2	SW6020-T	Chromium	0.001	0.0015	0.01	mg/L	1	232278	J, B	18NEC-01-6
86487	18NEC-22MW2-WG	AZ77483-T	22MW2	SW6020-T	Chromium	0.00069	0.0015	0.01	mg/L	1	232278	J, B	18NEC-01-6
86487	18NEC-26MW01-WG	AZ77482-T	26MW01	SW6020-T	Chromium	0.0012	0.0015	0.01	mg/L	1	232278	J, B	18NEC-01-6
86483	18NEC-MW10-1-WG-8-T	AZ77492-T	MW10-1	SW6020	Chromium	0.002	0.0015	0.01	mg/L	1	232278	J, B	18NEC-07-15
86483	18NEC-MW10-1-WG-T	AZ77491-T	MW10-1	SW6020	Chromium	0.0019	0.0015	0.01	mg/L	1	232278	J, B	18NEC-07-15
--	MB	LB-M1808091A	--	SW6020	Nickel	0.00045	0.0008	0.003	mg/L	1	232278	--	--
86483	18NEC-14MW01-WG-8-T	AZ77494-T	14MW01	SW6020	Nickel	0.00068	0.0008	0.003	mg/L	1	232278	J, B	18NEC-07-15
86483	18NEC-14MW01-WG-T	AZ77493-T	14MW01	SW6020	Nickel	0.0006	0.0008	0.003	mg/L	1	232278	J, B	18NEC-07-15
86483	18NEC-20MW01-WG-T	AZ77496-T	20MW01	SW6020	Nickel	0.0015	0.0008	0.003	mg/L	1	232278	J, B	18NEC-07-15
86487	18NEC-22MW2-WG-8	AZ77484-T	22MW2	SW6020-T	Nickel	0.00034	0.0008	0.003	mg/L	1	232278	J, B	18NEC-01-6
86487	18NEC-26MW01-WG	AZ77482-T	26MW01	SW6020-T	Nickel	0.00054	0.0008	0.003	mg/L	1	232278	J, B	18NEC-01-6
--	MB	LB-M1808092A	--	SW6020	Chromium	0.00066	0.0015	0.01	mg/L	1	232280	--	--
86483	18NEC-14MW01-WG-8-D	AZ77494-D	14MW01	SW6020	Chromium	0.0013	0.0015	0.01	mg/L	1	232280	J, B	18NEC-07-15
86483	18NEC-14MW01-WG-D	AZ77493-D	14MW01	SW6020	Chromium	0.0011	0.0015	0.01	mg/L	1	232280	J, B	18NEC-07-15
86483	18NEC-14MW07-WG-D	AZ77495-D	14MW07	SW6020	Chromium	0.0014	0.0015	0.01	mg/L	1	232280	J, B	18NEC-07-15
86483	18NEC-20MW01-WG-D	AZ77496-D	20MW01	SW6020	Chromium	0.0026	0.0015	0.01	mg/L	1	232280	J, B	18NEC-07-15
86483	18NEC-MW10-1-WG-8-D	AZ77492-D	MW10-1	SW6020	Chromium	0.0018	0.0015	0.01	mg/L	1	232280	J, B	18NEC-07-15
86483	18NEC-MW10-1-WG-D	AZ77491-D	MW10-1	SW6020	Chromium	0.0022	0.0015	0.01	mg/L	1	232280	J, B	18NEC-07-15
--	MB	LB-M1808092A	--	SW6020	Nickel	0.00045	0.0008	0.003	mg/L	1	232280	--	--
86483	18NEC-14MW01-WG-8-D	AZ77494-D	14MW01	SW6020	Nickel	0.001	0.0008	0.003	mg/L	1	232280	J, B	18NEC-07-15
86483	18NEC-14MW01-WG-D	AZ77493-D	14MW01	SW6020	Nickel	0.00042	0.0008	0.003	mg/L	1	232280	J, B	18NEC-07-15
86483	18NEC-20MW01-WG-D	AZ77496-D	20MW01	SW6020	Nickel	0.0018	0.0008	0.003	mg/L	1	232280	J, B	18NEC-07-15
--	MB	LB-M180810AW	--	SW6020	Chromium	0.00063	0.0015	0.01	mg/L	1	232285	--	--
86502	18NEC-14MW02-WG	AZ77590-T	14MW02	SW6020-T	Chromium	0.0014	0.0015	0.01	mg/L	1	232285	J, B	18NEC-19 - 28
86502	18NEC-14MW03-WG	AZ77587-T	MW03	SW6020-T	Chromium	0.0016	0.0015	0.01	mg/L	1	232285	J, B	18NEC-19 - 28
86502	18NEC-14MW04-WG	AZ77596-T	14MW04	SW6020-T	Chromium	0.0011	0.0015	0.01	mg/L	1	232285	J, B	18NEC-19 - 28
86502	18NEC-14MW05-WG	AZ77592-T	14MW05	SW6020-T	Chromium	0.0015	0.0015	0.01	mg/L	1	232285	J, B	18NEC-19 - 28
86502	18NEC-14MW06-WG	AZ77589-T	14MW06	SW6020-T	Chromium	0.0012	0.0015	0.01	mg/L	1	232285	J, B	18NEC-19 - 28
86502	18NEC-MW17-1-WG	AZ77585-T	MW17-1	SW6020-T	Chromium	0.001	0.0015	0.01	mg/L	1	232285	J, B	18NEC-19 - 28
86502	18NEC-MW88-10-WG	AZ77588-T	MW88-10	SW6020-T	Chromium	0.0011	0.0015	0.01	mg/L	1	232285	J, B	18NEC-19 - 28
86502	18NEC-MW88-3-WG	AZ77591-T	MW88-3	SW6020-T	Chromium	0.0024	0.0015	0.01	mg/L	1	232285	J, B	18NEC-19 - 28
--	MB	LB-M180810AW	--	SW6020	Nickel	0.00044	0.0008	0.003	mg/L	1	232285	--	--
86502	18NEC-14MW02-WG	AZ77590-T	14MW02	SW6020-T	Nickel	0.00072	0.0008	0.003	mg/L	1	232285	J, B	18NEC-19 - 28
86502	18NEC-14MW03-WG	AZ77587-T	MW03	SW6020-T	Nickel	0.0014	0.0008	0.003	mg/L	1	232285	J, B	18NEC-19 - 28
86502	18NEC-14MW06-WG	AZ77589-T	14MW06	SW6020-T	Nickel	0.00067	0.0008	0.003	mg/L	1	232285	J, B	18NEC-19 - 28
86502	18NEC-MW17-1-WG	AZ77585-T	MW17-1	SW6020-T	Nickel	0.00095	0.0008	0.003	mg/L	1	232285	J, B	18NEC-19 - 28
86502	18NEC-MW88-10-WG	AZ77588-T	MW88-10	SW6020-T	Nickel	0.0019	0.0008	0.003	mg/L	1	232285	J, B	18NEC-19 - 28
--	MB	LB-M1808101A	--	SW6020	Chromium	0.00057	0.0015	0.01	mg/L	1	232341	--	--
86502	18NEC-14MW02-WG	AZ77590-D	14MW02	SW6020-D	Chromium	0.0008	0.0015	0.01	mg/L	1	232341	J, B	18NEC-19 - 28
86502	18NEC-14MW03-WG	AZ77587-D	MW03	SW6020-D	Chromium	0.00049	0.0015	0.01	mg/L	1	232341	J, B	18NEC-19 - 28
86502	18NEC-14MW04-WG	AZ77596-D	14MW04	SW6020-D	Chromium	0.00046	0.0015	0.01	mg/L	1	232341	J, B	18NEC-19 - 28
86502	18NEC-14MW05-WG	AZ77592-D	14MW05	SW6020-D	Chromium	0.0011	0.0015	0.01	mg/L	1	232341	J, B	18NEC-19 - 28
86502	18NEC-14MW06-WG	AZ77589-D	14MW06	SW6020-D	Chromium	0.0011	0.0015	0.01	mg/L	1	232341	J, B	18NEC-19 - 28
86487	18NEC-22MW2-WG-8	AZ77484-D	22MW2	SW6020-D	Chromium	0.00055	0.0015	0.01	mg/L	1	232341	J, B	18NEC-01-6
86487	18NEC-22MW2-WG	AZ77483-D	22MW2	SW6020-D	Chromium	0.00067	0.0015	0.01	mg/L	1	232341	J, B	18NEC-01-6
86487	18NEC-26MW01-WG	AZ77482-D	26MW01	SW6020-D	Chromium	0.0008	0.0015	0.01	mg/L	1	232341	J, B	18NEC-01-6
86502	18NEC-MW88-1-WG	AZ77586-D	MW88-1	SW6020-D	Chromium	0.00072	0.0015	0.01	mg/L	1	232341	J, B	18NEC-19 - 28
86502	18NEC-MW88-10-WG	AZ77588-D	MW88-10	SW6020-D	Chromium	0.0016	0.0015	0.01	mg/L	1	232341	J, B	18NEC-19 - 28
86502	18NEC-MW88-3-WG	AZ77591-D	MW88-3	SW6020-D	Chromium	0.00078	0.0015	0.01	mg/L	1	232341	J, B	18NEC-19 - 28
86483	18NEC-MW10-1-WG	AZ77491	MW10-1	SW8260C	Acetone	0.0042	0.002	0.01	mg/L	1	232632	J, B	18NEC-07-15
86483	18NEC-MW10-1-WG-8	AZ77492	MW10-1	SW8260C	Acetone	0.005	0.002	0.01	mg/L	1	232632	J, B	18NEC-07-15
86483	18NEC-TB03	AZ77497	18NEC-TB03	SW8260C	Acetone	0.0029	0.002	0.01	mg/L	1	232632	J	18NEC-07-15
86483	18NEC-14MW01-WG	AZ77493-D	14MW01	SW6020-D	Lead	0.00022	0.0004	0.003	mg/L	1	232280	J,B,QN	18NEC-07-15

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Table E-2.1 Method Blank and Trip Blank Contamination

SDG	Sample ID	Lab Sample ID	Location ID	Method	Analyte	Result	LOD	LOQ	Units	DF	Analytical Batch	Qualifier	CoC Number
86483	18NEC-14MW01-WG	AZ77493-T	14MW01	SW6020-T	Lead	0.0006	0.0004	0.003	mg/L	1	232278	J,B,QN	18NEC-07-15
86483	18NEC-14MW01-WG-8	AZ77494-T	14MW01	SW6020-T	Lead	0.00086	0.0004	0.003	mg/L	1	232278	J,B,QN	18NEC-07-15
86483	18NEC-14MW01-WG-8	AZ77494-D	14MW01	SW6020-D	Lead	0.0005	0.0004	0.003	mg/L	1	232280	J,B,QN	18NEC-07-15
86502	18NEC-14MW02-WG	AZ77590-T	14MW02	SW6020-T	Lead	0.00074	0.0004	0.003	mg/L	1	232285	J,B	18NEC-19 - 28
86502	18NEC-14MW04-WG	AZ77596-T	14MW04	SW6020-T	Lead	0.00095	0.0004	0.003	mg/L	1	232285	J,B	18NEC-19 - 28
86502	18NEC-14MW05-WG	AZ77592-D	14MW05	SW6020-D	Lead	0.00021	0.0004	0.003	mg/L	1	232341	J,B	18NEC-19 - 28
86502	18NEC-14MW06-WG	AZ77589-T	14MW06	SW6020-T	Lead	0.00058	0.0004	0.003	mg/L	1	232285	J,B,QL	18NEC-19 - 28
86483	18NEC-14MW07-WG	AZ77495-D	14MW07	SW6020-D	Lead	0.00035	0.0004	0.003	mg/L	1	232280	J,B	18NEC-07-15
86483	18NEC-14MW07-WG	AZ77495-T	14MW07	SW6020-T	Lead	0.00043	0.0004	0.003	mg/L	1	232278	J,B	18NEC-07-15
86487	18NEC-22MW2-WG	AZ77483-D	22MW2	SW6020-D	Lead	0.00032	0.0004	0.003	mg/L	1	232341	J,B	18NEC-01-6
86487	18NEC-26MW01-WG	AZ77482-T	26MW1	SW6020-T	Lead	0.00033	0.0004	0.003	mg/L	1	232278	J,B	18NEC-01-6
86487	18NEC-26MW01-WG	AZ77482-D	26MW1	SW6020-D	Lead	0.00022	0.0004	0.003	mg/L	1	232341	J,B	18NEC-01-6
86483	18NEC-MW10-1-WG	AZ77491-D	MW10-1	SW6020-D	Lead	0.0012	0.0004	0.003	mg/L	1	232280	J,B,QN	18NEC-07-15
86483	18NEC-MW10-1-WG-8	AZ77492-D	MW10-1	SW6020-D	Lead	0.00084	0.0004	0.003	mg/L	1	232280	J,B,QN	18NEC-07-15
86502	18NEC-MW17-1-WG	AZ77585-T	17MW1	SW6020-T	Lead	0.00051	0.0004	0.003	mg/L	1	232285	J,B	18NEC-19 - 28
86502	18NEC-MW88-10-WG	AZ77588-T	MW88-10	SW6020-T	Lead	0.00031	0.0004	0.003	mg/L	1	232285	J,B	18NEC-19 - 28
86502	18NEC-MW88-1-WG	AZ77586-D	MW88-1	SW6020-D	Lead	0.00064	0.0004	0.003	mg/L	1	232341	J,B	18NEC-19 - 28
86502	18NEC-MW88-3-WG	AZ77591-D	MW88-3	SW6020-D	Lead	0.00034	0.0004	0.003	mg/L	1	232341	J,B	18NEC-19 - 28
86487	18NEC-S09-WS-01	AZ77481	S09-01	SW6020	Lead	0.00033	0.0004	0.003	mg/L	1	232278	J,B	18NEC-01-6
86487	18NEC-S09-WS-02	AZ77479	S09-02	SW6020	Lead	0.00044	0.0004	0.003	mg/L	1	232278	J,B	18NEC-01-6
86483	18NEC-S09-WS-03	AZ77489	S09-03	SW6020	Lead	0.00068	0.0004	0.003	mg/L	1	232278	J,B	18NEC-07-15
86483	18NEC-S09-WS-03-8	AZ77490	S09-03	SW6020	Lead	0.00081	0.0004	0.003	mg/L	1	232278	J,B	18NEC-07-15
86483	18NEC-14MW01-WG	AZ77493-D	14MW01	SW6020-D	Silver	0.000066	0.0001	0.005	mg/L	1	232280	J,B,QN	18NEC-07-15
86483	18NEC-14MW01-WG	AZ77493-T	14MW01	SW6020-T	Silver	0.000047	0.0001	0.005	mg/L	1	232278	J,B,QN	18NEC-07-15
86483	18NEC-14MW01-WG-8	AZ77494-T	14MW01	SW6020-T	Silver	0.000034	0.0001	0.005	mg/L	1	232278	J,B,QN	18NEC-07-15
86502	18NEC-14MW02-WG	AZ77590-T	14MW02	SW6020-T	Silver	0.00009	0.0001	0.005	mg/L	1	232285	J,B	18NEC-19 - 28
86502	18NEC-14MW03-WG	AZ77587-T	14MW03	SW6020-T	Silver	0.00011	0.0001	0.005	mg/L	1	232285	J,B	18NEC-19 - 28
86502	18NEC-14MW04-WG	AZ77596-D	14MW04	SW6020-D	Silver	0.000038	0.0001	0.005	mg/L	1	232341	J,B	18NEC-19 - 28
86502	18NEC-14MW05-WG	AZ77592-D	14MW05	SW6020-D	Silver	0.000083	0.0001	0.005	mg/L	1	232341	J,B	18NEC-19 - 28
86502	18NEC-14MW05-WG	AZ77592-T	14MW05	SW6020-T	Silver	0.00012	0.0001	0.005	mg/L	1	232285	J,B	18NEC-19 - 28
86502	18NEC-14MW06-WG	AZ77589-T	14MW06	SW6020-T	Silver	0.000036	0.0001	0.005	mg/L	1	232285	J,B	18NEC-19 - 28
86483	18NEC-14MW07-WG	AZ77495-T	14MW07	SW6020-T	Silver	0.000032	0.0001	0.005	mg/L	1	232278	J,B	18NEC-07-15
86487	18NEC-22MW2-WG	AZ77483-T	22MW2	SW6020-T	Silver	0.000043	0.0001	0.005	mg/L	1	232278	J,B	18NEC-01-6
86487	18NEC-22MW2-WG-8	AZ77484-D	22MW2	SW6020-D	Silver	0.000031	0.0001	0.005	mg/L	1	232341	J,B	18NEC-01-6
86487	18NEC-26MW01-WG	AZ77482-T	26MW1	SW6020-T	Silver	0.000058	0.0001	0.005	mg/L	1	232278	J,B	18NEC-01-6
86483	18NEC-MW10-1-WG	AZ77491-D	MW10-1	SW6020-D	Silver	0.000086	0.0001	0.005	mg/L	1	232280	J,B	18NEC-07-15
86483	18NEC-MW10-1-WG	AZ77491-T	MW10-1	SW6020-T	Silver	0.00018	0.0001	0.005	mg/L	1	232278	J,B	18NEC-07-15
86483	18NEC-MW10-1-WG-8	AZ77492-T	MW10-1	SW6020-T	Silver	0.00017	0.0001	0.005	mg/L	1	232278	J,B	18NEC-07-15
86502	18NEC-MW17-1-WG	AZ77585-T	17MW1	SW6020-T	Silver	0.000051	0.0001	0.005	mg/L	1	232285	J,B	18NEC-19 - 28
86502	18NEC-MW88-1-WG	AZ77586-T	MW88-1	SW6020-T	Silver	0.00017	0.0001	0.005	mg/L	1	232285	J,B	18NEC-19 - 28
86502	18NEC-MW88-3-WG	AZ77591-T	MW88-3	SW6020-T	Silver	0.00017	0.0001	0.005	mg/L	1	232285	J,B	18NEC-19 - 28
86502	18NEC-MW88-3-WG	AZ77591-D	MW88-3	SW6020-D	Silver	0.0001	0.0001	0.005	mg/L	1	232341	J,B	18NEC-19 - 28

Notes:

For data qualifiers, refer to the Analytical Data Qualifiers section of the DQA.

For definitions, refer to the Acronyms and Abbreviations section of the DQA.

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Table E-2.2 LCS/LCSD RPD

SDG	Sample ID	Lab Sample ID	Method	Analyte	Result	LOD	LOQ	Expected	LCL	UCL	RPD	Units	Lab Lot Number	Qualifier
86483	LCS	BS-L180810BW	8270SIM	Naphthalene	0.00277	0.0001	0.0002	0.005	43	114	20.3	mg/L	232381	--
86483	LCSD	BD-L180810BW	8270SIM	Naphthalene	0.00226	0.0001	0.0002	0.005	43	114		mg/L	232381	--
86483	18NEC-14MW01-WG	AZ77493RX	8270SIM	Naphthalene	0.023	0.0001	0.0002	0	0	0	--	mg/L	232381	QN
86483	18NEC-14MW01-WG-8	AZ77494	8270SIM	Naphthalene	0.022	0.0001	0.0002	0	0	0	--	mg/L	232381	QN
86489	18NEC-14MW03-WG	AZ77501	8270SIM	Naphthalene	0.0023	0.0001	0.0002	0	0	0	--	mg/L	232381	QN
86483	18NEC-14MW07-WG	AZ77495	8270SIM	Naphthalene	ND	0.0001	0.0002	0	0	0	--	mg/L	232381	QN
86483	18NEC-20MW01-WG	AZ77496	8270SIM	Naphthalene	ND	0.0001	0.0002	0	0	0	--	mg/L	232381	QN
86487	18NEC-22MW2-WG	AZ77483	8270SIM	Naphthalene	ND	0.0001	0.0002	0	0	0	--	mg/L	232381	QN
86487	18NEC-22MW2-WG-8	AZ77484	8270SIM	Naphthalene	ND	0.0001	0.0002	0	0	0	--	mg/L	232381	QN
86487	18NEC-26MW01-WG	AZ77482	8270SIM	Naphthalene	ND	0.0001	0.0002	0	0	0	--	mg/L	232381	QN
86483	18NEC-MW10-1-WG	AZ77491	8270SIM	Naphthalene	ND	0.0001	0.0002	0	0	0	--	mg/L	232381	QN
86483	18NEC-MW10-1-WG-8	AZ77492	8270SIM	Naphthalene	ND	0.0001	0.0002	0	0	0	--	mg/L	232381	QN
86489	18NEC-MW17-1-WG	AZ77502	8270SIM	Naphthalene	ND	0.0001	0.0002	0	0	0	--	mg/L	232381	QN
86489	18NEC-MW88-1-WG	AZ77500	8270SIM	Naphthalene	ND	0.0001	0.0002	0	0	0	--	mg/L	232381	QN
86489	18NEC-MW88-10-WG	AZ77503	8270SIM	Naphthalene	ND	0.0001	0.0002	0	0	0	--	mg/L	232381	QN
86487	18NEC-S09-WS-01	AZ77481	8270SIM	Naphthalene	ND	0.0001	0.0002	0	0	0	--	mg/L	232381	QN
86487	18NEC-S09-WS-02	AZ77479	8270SIM	Naphthalene	ND	0.0001	0.0002	0	0	0	--	mg/L	232381	QN
86483	18NEC-S09-WS-03	AZ77489RX	8270SIM	Naphthalene	ND	0.0001	0.0002	0	0	0	--	mg/L	232381	QN
86487	18NEC-S09-WS-03-8	AZ77488	8270SIM	Naphthalene	ND	0.0001	0.0002	0	0	0	--	mg/L	232381	QN

Notes:

For data qualifiers, refer to the Analytical Data Qualifiers section of the DQA.

For definitions, refer to the Acronyms and Abbreviations section of the DQA.

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Table E-2.3 MS/MSD Recoveries

SDG	Sample ID	Lab Sample ID	Method	Analyte	Result (mg/L)	LOD (mg/L)	LOQ (mg/L)	Recovery (%)	Lab LCL (%)	Lab UCL (%)	QSM LCL (%)	QSM UCL (%)	Units	Lab Lot Number	Expected Result (mg/L)	Qualifier
86483	18NEC-14MW01-WG	AZ77493	AK103	RRO	0	0.2	0.5	--	--	--	--	--	MG/L	232439	--	QL
86483	18NEC-14MW01-WG	AZ77493MS	AK103	RRO	0.661	0.2	0.5	52.88	60	120	--	--	MG/L	232439	1.25	--
86483	18NEC-14MW01-WG	AZ77493MSD	AK103	RRO	0.719	0.2	0.5	57.52	60	120	--	-	MG/L	232439	1.25	--
86483	18NEC-14MW01-WG	AZ77493RX	8270SIM	Benzo(a)anthracen	0	0.0001	0.0002	--	--	--	--	--	mg/L	232381	--	QL
86483	18NEC-14MW01-WG	AZ77493RXMSD	8270SIM	Benzo(a)anthracen	0.00287	0.0001	0.0002	57.4	59	120	59	120	mg/L	232381	0.005	--
86483	18NEC-14MW01-WG	AZ77493	SW8260C	Toluene	0	0.0003	0.001	--	--	--	--	--	mg/L	232626	--	QL
86483	18NEC-14MW01-WG	AZ77493MSD	SW8260C	Toluene	0.00793	0.0003	0.001	79.3	80	121	80	121	mg/L	232626	0.01	--
86502	18NEC-14MW06-WG	AZ77589	SW8260C	Bromomethane	0	0.0005	0.002	--	--	--	--	--	mg/L	232556	--	QL
86502	18NEC-14MW06-WG	AZ77589MS	SW8260C	Bromomethane	0.00521	0.0005	0.002	52.1	53	141	53	141	mg/L	232556	0.01	--
86502	18NEC-14MW06-WG	AZ77589MSD	SW8260C	Bromomethane	0.00496	0.0005	0.002	49.6	53	141	53	141	mg/L	232556	0.01	--
86502	18NEC-14MW06-WG	AZ77589-D	SW6020-D	Lead	0	0.0004	0.003	--	--	--	--	--	mg/L	232341	--	QL
86502	18NEC-14MW06-WG	AZ77589MSD-D	SW6020-D	Lead	0.219	0.0004	0.003	87.55097146	88	115	88	115	mg/L	232341	0.25014	--
86502	18NEC-14MW06-WG	AZ77589-T	SW6020-T	Lead	0.00058	0.0004	0.003	--	--	--	--	--	mg/L	232285	--	J,QL
86502	18NEC-14MW06-WG	AZ77589MS-T	SW6020-T	Lead	0.217	0.0004	0.003	86.59909011	88	115	88	115	mg/L	232285	0.25058	--

Notes:
For data qualifiers, refer to the Analytical Data Qualifiers section of the DQA.
For definitions, refer to the Acronyms and Abbreviations section of the DQA.

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Table E-2.4 MS/MSD RPD

SDG	Sample ID	Lab Sample ID	Method	Analyte	Parent Sample Result	MS Result	MSD Result	RPD (%)	Units	Lab Lot Number	Qualifier
86483	18NEC-14MW01-WG	AZ77493	SW8260C	Benzene	ND	0.0114	0.00828	32	mg/L	232626	QN
86483	18NEC-14MW01-WG	AZ77493	SW8260C	Ethylbenzene	0.003	0.0135	0.0109	21	mg/L	232626	QN
86483	18NEC-14MW01-WG	AZ77493	SW8260C	Toluene	ND	0.0104	0.00793	27	mg/L	232626	QL
86483	18NEC-14MW01-WG	AZ77493	SW8260C	Xylene, m & p	0.0034	0.0252	0.0195	26	mg/L	232626	QN
86483	18NEC-14MW01-WG	AZ77493	SW8260C	Xylene, o	0.00026	0.0107	0.00838	24	mg/L	232626	J, QN
86483	18NEC-14MW01-WG	AZ77493	SW8260C	Xylenes	0.0037	0.0359	0.0279	25	mg/L	232626	QN

Notes:
For data qualifiers, refer to the Analytical Data Qualifiers section of the DQA.
For definitions, refer to the Acronyms and Abbreviations section of the DQA.

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Table E-2.5 Duplicate Sample RPD

SDG	Parent Sample ID	Parent Lab Sample ID	Dup Sample ID	Dup Lab Sample ID	Method	Analyte	Parent Sample Result	Dup Sample Result	RPD (%)	Problem	Parent Sample Date	Dup Sample Date	Parent Qualifier	Duplicate Qualifier
86483	18NEC-MW10-1-WG	AZ77491-D	18NEC-MW10-1-WG-8	AZ77492-D	SW6020-D	Lead	0.0012	0.00084	35.3	Over 30%	03-Aug-18	03-Aug-18	J,B,QN	J,B,QN
86483	18NEC-14MW01-WG	AZ77493-D	18NEC-14MW01-WG-8	AZ77494-D	SW6020-D	Lead	0.00022	0.0005	77.8	Over 30%	03-Aug-18	03-Aug-18	J,B,QN	J,B,QN
86483	18NEC-14MW01-WG	AZ77493-D	18NEC-14MW01-WG-8	AZ77494-D	SW6020-D	Nickel	0.00042	0.001	81.7	Over 30%	03-Aug-18	03-Aug-18	J,B,QN	J,B,QN
86483	18NEC-14MW01-WG	AZ77493-D	18NEC-14MW01-WG-8	AZ77494-D	SW6020-D	Silver	0.000066	ND [0.0001]	41.0	Over 30%	03-Aug-18	03-Aug-18	J,B,QN	QN
86483	18NEC-14MW01-WG	AZ77493-T	18NEC-14MW01-WG-8	AZ77494-T	SW6020-T	Lead	0.0006	0.00086	35.6	Over 30%	03-Aug-18	03-Aug-18	J,B,QN	J,B,QN
86483	18NEC-14MW01-WG	AZ77493-T	18NEC-14MW01-WG-8	AZ77494-T	SW6020-T	Silver	0.000047	0.000034	32.1	Over 30%	03-Aug-18	03-Aug-18	J,B,QN	J,B,QN
86487	18NEC-22MW2-WG	AZ77483	18NEC-22MW2-WG-8	AZ77484	A2320B	Alkalinity as CaCO3	3.4	8.5	85.7	Over 30%	02-Aug-18	02-Aug-18	QN	QN
86487	18NEC-22MW2-WG	AZ77483-D	18NEC-22MW2-WG-8	AZ77484-D	SW6020-D	Cadmium	0.000056	ND [0.0001]	56.4	Over 30%	02-Aug-18	02-Aug-18	J,QN	QN
86487	18NEC-22MW2-WG	AZ77483-T	18NEC-22MW2-WG-8	AZ77484-T	SW6020-T	Chromium	0.00069	0.001	36.7	Over 30%	02-Aug-18	02-Aug-18	J,B,QN	J,B,QN
86487	18NEC-22MW2-WG	AZ77483-T	18NEC-22MW2-WG-8	AZ77484-T	SW6020-T	Lead	0.0029	0.0017	52.2	Over 30%	02-Aug-18	02-Aug-18	J,QN	J,QN
86487	18NEC-22MW2-WG	AZ77483-T	18NEC-22MW2-WG-8	AZ77484-T	SW6020-T	Silver	0.000043	ND [0.0001]	79.7	Over 30%	02-Aug-18	02-Aug-18	J,B,QN	QN

Notes:
For data qualifiers, refer to the Analytical Data Qualifiers section of the DQA.
For definitions, refer to the Acronyms and Abbreviations section of the DQA.

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Table E-2.6 Results Qualified B due to Equipment Blank Contamination

SDG	Sample ID	Lab Sample ID	Location ID	Method	Analyte	Result	LOD	LOQ	Units	DF	Analytical Batch	Qualifier	CoC Number
86502	18NEC-EB01-WG	AZ77593	18NEC-EB01	SW6020	Barium	0.00059	0.0008	0.003	1	mg/L	232285	J	18NEC-19 - 28
86502	18NEC-EB01-WG	AZ77593	18NEC-EB01	SW8260C	Chloroform	0.00051	0.0003	0.001	1	mg/L	232556	J	18NEC-19 - 28
86502	18NEC-EB01-WG	AZ77593	18NEC-EB01	SW6020	Chromium	0.00099	0.0015	0.01	1	mg/L	232285	J	18NEC-19 - 28
86483	18NEC-14MW01-WG-8	AZ77494-D	14MW01	SW6020-D	Chromium	0.0013	0.0015	0.01	1	mg/L	232280	J, B	18NEC-07-15
86483	18NEC-14MW01-WG-8	AZ77494-T	14MW01	SW6020-T	Chromium	0.00089	0.0015	0.01	1	mg/L	232278	J, B	18NEC-07-15
86483	18NEC-14MW01-WG	AZ77493-D	14MW01	SW6020-D	Chromium	0.0011	0.0015	0.01	1	mg/L	232280	J, B	18NEC-07-15
86483	18NEC-14MW01-WG	AZ77493-T	14MW01	SW6020-T	Chromium	0.0011	0.0015	0.01	1	mg/L	232278	J, B	18NEC-07-15
86502	18NEC-14MW02-WG	AZ77590-D	14MW02	SW6020-D	Chromium	0.0008	0.0015	0.01	1	mg/L	232341	J, B	18NEC-19 - 28
86502	18NEC-14MW02-WG	AZ77590-T	14MW02	SW6020-T	Chromium	0.0014	0.0015	0.01	1	mg/L	232285	J, B	18NEC-19 - 28
86502	18NEC-14MW03-WG	AZ77587-D	14MW03	SW6020-D	Chromium	0.00049	0.0015	0.01	1	mg/L	232341	J, B	18NEC-19 - 28
86502	18NEC-14MW03-WG	AZ77587-T	14MW03	SW6020-T	Chromium	0.0016	0.0015	0.01	1	mg/L	232285	J, B	18NEC-19 - 28
86502	18NEC-14MW04-WG	AZ77596-D	14MW04	SW6020-D	Chromium	0.00046	0.0015	0.01	1	mg/L	232341	J, B	18NEC-19 - 28
86502	18NEC-14MW04-WG	AZ77596-T	14MW04	SW6020-T	Chromium	0.0011	0.0015	0.01	1	mg/L	232285	J, B	18NEC-19 - 28
86502	18NEC-14MW05-WG	AZ77592-D	14MW05	SW6020-D	Chromium	0.0011	0.0015	0.01	1	mg/L	232341	J, B	18NEC-19 - 28
86502	18NEC-14MW05-WG	AZ77592-T	14MW05	SW6020-T	Chromium	0.0015	0.0015	0.01	1	mg/L	232285	J, B	18NEC-19 - 28
86502	18NEC-14MW06-WG	AZ77589-D	14MW06	SW6020-D	Chromium	0.0011	0.0015	0.01	1	mg/L	232341	J, B	18NEC-19 - 28
86502	18NEC-14MW06-WG	AZ77589-T	14MW06	SW6020-T	Chromium	0.0012	0.0015	0.01	1	mg/L	232285	J, B	18NEC-19 - 28
86483	18NEC-14MW07-WG	AZ77495-D	14MW07	SW6020-D	Chromium	0.0014	0.0015	0.01	1	mg/L	232280	J, B	18NEC-07-15
86483	18NEC-14MW07-WG	AZ77495-T	14MW07	SW6020-T	Chromium	0.0013	0.0015	0.01	1	mg/L	232278	J, B	18NEC-07-15
86483	18NEC-20MW01-WG	AZ77496-D	20MW1	SW6020-D	Chromium	0.0026	0.0015	0.01	1	mg/L	232280	J, B	18NEC-07-15
86483	18NEC-20MW01-WG	AZ77496-T	20MW1	SW6020-T	Chromium	0.0025	0.0015	0.01	1	mg/L	232278	J, B	18NEC-07-15
86487	18NEC-22MW2-WG-8	AZ77484-D	22MW2	SW6020-D	Chromium	0.00055	0.0015	0.01	1	mg/L	232341	J, B	18NEC-01-6
86487	18NEC-22MW2-WG-8	AZ77484-T	22MW2	SW6020-T	Chromium	0.001	0.0015	0.01	1	mg/L	232278	J,B,QN	18NEC-01-6
86487	18NEC-22MW2-WG	AZ77483-D	22MW2	SW6020-D	Chromium	0.00067	0.0015	0.01	1	mg/L	232341	J, B	18NEC-01-6
86487	18NEC-22MW2-WG	AZ77483-T	22MW2	SW6020-T	Chromium	0.00069	0.0015	0.01	1	mg/L	232278	J,B,QN	18NEC-01-6
86487	18NEC-26MW01-WG	AZ77482-D	26MW1	SW6020-D	Chromium	0.0008	0.0015	0.01	1	mg/L	232341	J, B	18NEC-01-6
86487	18NEC-26MW01-WG	AZ77482-T	26MW1	SW6020-T	Chromium	0.0012	0.0015	0.01	1	mg/L	232278	J, B	18NEC-01-6
86483	18NEC-MW10-1-WG-8	AZ77492-D	MW10-1	SW6020-D	Chromium	0.0018	0.0015	0.01	1	mg/L	232280	J, B	18NEC-07-15
86483	18NEC-MW10-1-WG-8	AZ77492-T	MW10-1	SW6020-T	Chromium	0.002	0.0015	0.01	1	mg/L	232278	J, B	18NEC-07-15
86483	18NEC-MW10-1-WG	AZ77491-D	MW10-1	SW6020-D	Chromium	0.0022	0.0015	0.01	1	mg/L	232280	J, B	18NEC-07-15
86483	18NEC-MW10-1-WG	AZ77491-T	MW10-1	SW6020-T	Chromium	0.0019	0.0015	0.01	1	mg/L	232278	J, B	18NEC-07-15
86502	18NEC-MW17-1-WG	AZ77585-T	17MW1	SW6020-T	Chromium	0.001	0.0015	0.01	1	mg/L	232285	J, B	18NEC-19 - 28
86502	18NEC-MW88-1-WG	AZ77586-D	MW88-1	SW6020-D	Chromium	0.00072	0.0015	0.01	1	mg/L	232341	J, B	18NEC-19 - 28
86502	18NEC-MW88-10-WG	AZ77588-D	MW88-10	SW6020-D	Chromium	0.0016	0.0015	0.01	1	mg/L	232341	J, B	18NEC-19 - 28
86502	18NEC-MW88-10-WG	AZ77588-T	MW88-10	SW6020-T	Chromium	0.0011	0.0015	0.01	1	mg/L	232285	J, B	18NEC-19 - 28
86502	18NEC-MW88-3-WG	AZ77591-D	MW88-3	SW6020-D	Chromium	0.00078	0.0015	0.01	1	mg/L	232341	J, B	18NEC-19 - 28
86502	18NEC-MW88-3-WG	AZ77591-T	MW88-3	SW6020-T	Chromium	0.0024	0.0015	0.01	1	mg/L	232285	J, B	18NEC-19 - 28
86502	18NEC-EB01-WG	AZ77593	18NEC-EB01	SW6020	Lead	0.00026	0.0004	0.003	1	mg/L	232285	J	18NEC-19 - 28
86483	18NEC-14MW01-WG-8	AZ77494-D	14MW01	SW6020-D	Lead	0.0005	0.0004	0.003	1	mg/L	232280	J,B,QN	18NEC-07-15
86483	18NEC-14MW01-WG-8	AZ77494-T	14MW01	SW6020-T	Lead	0.00086	0.0004	0.003	1	mg/L	232278	J,B,QN	18NEC-07-15
86483	18NEC-14MW01-WG	AZ77493-D	14MW01	SW6020-D	Lead	0.00022	0.0004	0.003	1	mg/L	232280	J,B,QN	18NEC-07-15
86483	18NEC-14MW01-WG	AZ77493-T	14MW01	SW6020-T	Lead	0.0006	0.0004	0.003	1	mg/L	232278	J,B,QN	18NEC-07-15
86502	18NEC-14MW02-WG	AZ77590-T	14MW02	SW6020-T	Lead	0.00074	0.0004	0.003	1	mg/L	232285	J,B	18NEC-19 - 28

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Table E-2.6 Results Qualified B due to Equipment Blank Contamination

SDG	Sample ID	Lab Sample ID	Location ID	Method	Analyte	Result	LOD	LOQ	Units	DF	Analytical Batch	Qualifier	CoC Number
86502	18NEC-14MW04-WG	AZ77596-T	14MW04	SW6020-T	Lead	0.00095	0.0004	0.003	1	mg/L	232285	J,B	18NEC-19 - 28
86502	18NEC-14MW05-WG	AZ77592-D	14MW05	SW6020-D	Lead	0.00021	0.0004	0.003	1	mg/L	232341	J,B	18NEC-19 - 28
86502	18NEC-14MW06-WG	AZ77589-T	14MW06	SW6020-T	Lead	0.00058	0.0004	0.003	1	mg/L	232285	J,B,QL	18NEC-19 - 28
86483	18NEC-14MW07-WG	AZ77495-D	14MW07	SW6020-D	Lead	0.00035	0.0004	0.003	1	mg/L	232280	J,B	18NEC-07-15
86483	18NEC-14MW07-WG	AZ77495-T	14MW07	SW6020-T	Lead	0.00043	0.0004	0.003	1	mg/L	232278	J,B	18NEC-07-15
86487	18NEC-22MW2-WG	AZ77483-D	22MW2	SW6020-D	Lead	0.00032	0.0004	0.003	1	mg/L	232341	J,B	18NEC-01-6
86487	18NEC-26MW01-WG	AZ77482-D	26MW1	SW6020-D	Lead	0.00022	0.0004	0.003	1	mg/L	232341	J,B	18NEC-01-6
86487	18NEC-26MW01-WG	AZ77482-T	26MW1	SW6020-T	Lead	0.00033	0.0004	0.003	1	mg/L	232278	J,B	18NEC-01-6
86483	18NEC-MW10-1-WG-8	AZ77492-D	MW10-1	SW6020-D	Lead	0.00084	0.0004	0.003	1	mg/L	232280	J,B,QN	18NEC-07-15
86483	18NEC-MW10-1-WG	AZ77491-D	MW10-1	SW6020-D	Lead	0.0012	0.0004	0.003	1	mg/L	232280	J,B,QN	18NEC-07-15
86502	18NEC-MW17-1-WG	AZ77585-T	17MW1	SW6020-T	Lead	0.00051	0.0004	0.003	1	mg/L	232285	J,B	18NEC-19 - 28
86502	18NEC-MW88-1-WG	AZ77586-D	MW88-1	SW6020-D	Lead	0.00064	0.0004	0.003	1	mg/L	232341	J,B	18NEC-19 - 28
86502	18NEC-MW88-10-WG	AZ77588-T	MW88-10	SW6020-T	Lead	0.00031	0.0004	0.003	1	mg/L	232285	J,B	18NEC-19 - 28
86502	18NEC-MW88-3-WG	AZ77591-D	MW88-3	SW6020-D	Lead	0.00034	0.0004	0.003	1	mg/L	232341	J,B	18NEC-19 - 28
86487	18NEC-S09-WS-01	AZ77481	S09-01	SW6020	Lead	0.00033	0.0004	0.003	1	mg/L	232278	J,B	18NEC-01-6
86487	18NEC-S09-WS-02	AZ77479	S09-02	SW6020	Lead	0.00044	0.0004	0.003	1	mg/L	232278	J,B	18NEC-01-6
86483	18NEC-S09-WS-03	AZ77489	S09-03	SW6020	Lead	0.00068	0.0004	0.003	1	mg/L	232278	J,B	18NEC-07-15
86483	18NEC-S09-WS-03-8	AZ77490	S09-03	SW6020	Lead	0.00081	0.0004	0.003	1	mg/L	232278	J,B	18NEC-07-15
86502	18NEC-EB01-WG	AZ77593	18NEC-EB01	SW6020	Silver	0.00012	0.0001	0.005	1	mg/L	232285	J	18NEC-19 - 28
86483	18NEC-14MW01-WG-8	AZ77494-T	14MW01	SW6020-T	Silver	0.000034	0.0001	0.005	1	mg/L	232278	J,B,QN	18NEC-07-15
86483	18NEC-14MW01-WG	AZ77493-D	14MW01	SW6020-D	Silver	0.000066	0.0001	0.005	1	mg/L	232280	J,B,QN	18NEC-07-15
86483	18NEC-14MW01-WG	AZ77493-T	14MW01	SW6020-T	Silver	0.000047	0.0001	0.005	1	mg/L	232278	J,B,QN	18NEC-07-15
86502	18NEC-14MW02-WG	AZ77590-T	14MW02	SW6020-T	Silver	0.00009	0.0001	0.005	1	mg/L	232285	J,B	18NEC-19 - 28
86502	18NEC-14MW03-WG	AZ77587-T	14MW03	SW6020-T	Silver	0.00011	0.0001	0.005	1	mg/L	232285	J,B	18NEC-19 - 28
86502	18NEC-14MW04-WG	AZ77596-D	14MW04	SW6020-D	Silver	0.000038	0.0001	0.005	1	mg/L	232341	J,B	18NEC-19 - 28
86502	18NEC-14MW05-WG	AZ77592-D	14MW05	SW6020-D	Silver	0.000083	0.0001	0.005	1	mg/L	232341	J,B	18NEC-19 - 28
86502	18NEC-14MW05-WG	AZ77592-T	14MW05	SW6020-T	Silver	0.00012	0.0001	0.005	1	mg/L	232285	J,B	18NEC-19 - 28
86502	18NEC-14MW06-WG	AZ77589-T	14MW06	SW6020-T	Silver	0.000036	0.0001	0.005	1	mg/L	232285	J,B	18NEC-19 - 28
86483	18NEC-14MW07-WG	AZ77495-T	14MW07	SW6020-T	Silver	0.000032	0.0001	0.005	1	mg/L	232278	J,B	18NEC-07-15
86487	18NEC-22MW2-WG-8	AZ77484-D	22MW2	SW6020-D	Silver	0.000031	0.0001	0.005	1	mg/L	232341	J,B	18NEC-01-6
86487	18NEC-22MW2-WG	AZ77483-T	22MW2	SW6020-T	Silver	0.000043	0.0001	0.005	1	mg/L	232278	J,B,QN	18NEC-01-6
86487	18NEC-26MW01-WG	AZ77482-T	26MW1	SW6020-T	Silver	0.000058	0.0001	0.005	1	mg/L	232278	J,B	18NEC-01-6
86483	18NEC-MW10-1-WG-8	AZ77492-T	MW10-1	SW6020-T	Silver	0.00017	0.0001	0.005	1	mg/L	232278	J,B	18NEC-07-15
86483	18NEC-MW10-1-WG	AZ77491-D	MW10-1	SW6020-D	Silver	0.000086	0.0001	0.005	1	mg/L	232280	J,B	18NEC-07-15
86483	18NEC-MW10-1-WG	AZ77491-T	MW10-1	SW6020-T	Silver	0.00018	0.0001	0.005	1	mg/L	232278	J,B	18NEC-07-15
86502	18NEC-MW17-1-WG	AZ77585-T	17MW1	SW6020-T	Silver	0.000051	0.0001	0.005	1	mg/L	232285	J,B	18NEC-19 - 28
86502	18NEC-MW88-1-WG	AZ77586-T	MW88-1	SW6020-T	Silver	0.00017	0.0001	0.005	1	mg/L	232285	J,B	18NEC-19 - 28
86502	18NEC-MW88-3-WG	AZ77591-D	MW88-3	SW6020-D	Silver	0.0001	0.0001	0.005	1	mg/L	232341	J,B	18NEC-19 - 28
86502	18NEC-MW88-3-WG	AZ77591-T	MW88-3	SW6020-T	Silver	0.00017	0.0001	0.005	1	mg/L	232285	J,B	18NEC-19 - 28

Notes:
For data qualifiers, refer to the Analytical Data Qualifiers section of the DQA.
For definitions, refer to the Acronyms and Abbreviations section of the DQA.

EXHIBIT E2-3

ADEC Laboratory Data Review Checklists

Laboratory Data Review Checklist

Completed by:

Nathaniel Gingery

Title:

Project Chemist

Date:

10/01/2018

CS Report Name:

Northeast Cape Periodic Review

Report Date:

12/20/2018

Consultant Firm:

Jacobs

Laboratory Name:

APPL Inc.

Laboratory Report Number:

86483

ADEC File Number:

ST LAW MOC 475.38.013

Hazard Identification Number:

221

1. Laboratory

a. Did an ADEC CS approved laboratory receive and perform all of the submitted sample analyses?

◉ Yes ○ No Comments:

All analyses were performed by APPL Inc. of Clovis, CA.

b. If the samples were transferred to another "network" laboratory or sub-contracted to an alternate laboratory, was the laboratory performing the analyses ADEC CD approved?

○ Yes ◉ No Comments:

Not applicable.

2. Chain of Custody (CoC)

a. CoC information completed, signed, and dated (including released/received by)?

◉ Yes ○ No Comments:

b. Correct analyses requested?

◉ Yes ○ No Comments:

3. Laboratory Sample Receipt Documentation

a. Sample/cooler temperature documented and within range at receipt (0° ± 6° C)?

◉ Yes ○ No Comments:

Cooler name, temperature blank temp °C/cooler temp °C:
1. Perfect Pushup 3.5/3.5
2. Thigh Master 3.9/4.0
3. Yoga Pants 3.5/3.3
4. Bowflex 4.7/4.5
5. Balance Board 4.6/5.0
6. Teeter Hang Up 4.2/4.0
7. Peleton 4.1/4.0
8. EZ Shaper 4.3/4.5
9. Medicine Ball 0.2/2.0

b. Sample preservation acceptable - acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?

◉ Yes ○ No Comments:

c. Sample condition documented - broken, leaking (Methanol), zero headspace (VOC vials)?

◉ Yes ○ No Comments:

Several samples were indicated to contain bubbles, however all were within acceptable limits.

d. If there were any discrepancies, were they documented? For example, incorrect sample containers/preservation, sample temperature outside of acceptable range, insufficient or missing samples, etc.?

○ Yes ○ No Comments:

N/A

e. Data quality or usability affected? Explain.

Comments:

Data quality and usability were not affected.

4. Case Narrative

a. Present and understandable?

◉ Yes ○ No Comments:

b. Discrepancies, errors or QC failures identified by the lab?

◉ Yes ○ No Comments:

Selenium recovered high (111%) in a CCV for SW6020. It only bracketed a passing LCS/LCSD, so no corrective action was required. During the extraction process for diesel-range organics (DRO), two sample bottles, 18NEC-20MW01-WG and an MS sample from 18NEC-14MW01-WG, were switched prior to spike and surrogate addition.

c. Were all corrective actions documented?

◉ Yes ○ No Comments:

Corrective action was completed; Both 18NEC-20MW01-WG and 18NEC-14MW01-WG were re-extracted outside of hold time for comparison to confirm the suspected bottle switch. The re-extraction occurred on 27 September (42 days past the 14-day hold time). The re-extracted DRO results for 18NEC-20MW01-WG and 18NEC-14MW01-WG are 0.15 mg/L and 1.6 mg/L, respectively, and confirm the bottle switch.

d. What is the effect on data quality/usability according to the case narrative?

Comments:

The original DRO result for 18NEC-20MW01-WG was rejected due to a sample switch during extraction. The re-extracted result is being reported and qualified as outside of hold time.

Other discrepancies will be discussed in their related sections below.

5. Samples Results

a. Correct analyses performed/reported as requested on COC?

○ Yes ◉ No Comments:

The laboratory incorrectly spiked 18NEC-20MW01-WG instead of the MS/MSD replicate container of 18NEC-14MW01-WG. This resulted in a MS recovery and RPD outside of control limits. The switch was detected after the hold time had passed, but 18NEC-20MW01-WG was extracted before twice the hold time had elapsed and the result is considered usabl

b. All applicable holding times met?

○ Yes ◉ No Comments:

The lab initially analyzed 18NEC-14MW07-WG and 18NEC-20MW01-WG for alkalinity within hold time, but did not reanalyze the samples by a titration method as is required for samples with less than 20ppb alkalinity within hold time.

The DRO sample result for 18NEC-20MW01-WG was re-extracted outside of hold time to confirm analytical results. The original analysis was rejected and the re-extracted result was reported and as outside of hold time with a low bias.

c. All soils reported on a dry weight basis?

○ Yes ○ No Comments:

No soil samples were part of this SDG.

d. Are the reported PQLs less than the Cleanup Level or the minimum required detection level for the project?

◉ Yes ○ No Comments:

All reporting limits were less than the Project Cleanup Levels.

e. Data quality or usability affected? Explain.

Comments:

The data quality and usability were not affected.
The DRO result for sample 18NEC-20MW01-WG is qualified with a low bias due to hold time but is 10 times less than the PAL and is minimally affected.

6. QC Samples

a. Method Blank

i. One method blank reported per matrix, analysis and 20 samples

◉ Yes ○ No Comments:

ii. All method blank results less than PQL?

◉ Yes ○ No Comments:

Chromium and Nickel were detected above the detection level but below the PQL in the method blanks for analytical batches 232278 and 232280.

iii. If above PQL, what samples are affected?

Comments:

The affected samples were: 18NEC-14MW01-WG-8 18NEC-14MW01-WG 18NEC-14MW07-WG 18NEC-20MW01-WG 18NEC-MW10-1-WG-8 18NEC-MW10-1-WG

iv. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

◉ Yes ○ No Comments:

Sample results within five times the method blank result were flagged B to indicate potentially elevated results due to method blank contamination.

v. Data quality or usability affected? Explain.

Comments:

The data quality and usability were minimally affected as all B qualified results were below the PQL and screening levels.

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics - One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)

○ Yes ◉ No Comments:

An LCS/LCSD was analyzed for all methods. DoD QSM required MS/MSDs were assigned to samples 18NEC-14MW01-WG and 18NEC-S09-WS-03. An MS/MSD was not analyzed with VOC batch 232632. All other analytical methods had the required batch MS/MSD analyzed.

ii. Metals/Inorganics - one LCS and one sample duplicate reported per matrix, analysis and 20 samples?

◉ Yes ○ No Comments:

MS/MSDs were assigned to samples 18NEC-14MW01-WG and 18NEC-S09-WS-03.

iii. Accuracy - All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods: AK101 60%-120%, AK102 75%-125%, AK103 60%-120%; all other analyses see the laboratory QC pages)

○ Yes ◉ No Comments:

All LCS/LCSD accuracy requirements were met.

The lab notified Jacobs staff of MS/MSD failures in the 8270SIM analysis (1 & 2 methylnaphthalene and naphthalene) and re-extracted/reanalyzed the affected samples within hold time. The second analysis is used for reporting.

AK103 - The 18NEC-14MW01-WG MS (52.9%) and MSD (57.5%) recovered outside of QC limits for RRO (60-120%).

SW8260 - The 18NEC-14MW01-WG MSD (79.3%) recovered outside of QC limits for Toluene (80-121%).

SW8270SIM - The 18NEC-14MW01-WG MSD (57.4%) recovered outside of QC limits for Benzo(a)anthracene (59-120%). 1-methylnaphthalene, 2-methylnaphthalene, and naphthalene had recoveries less than control limits; however, the spike amount was less the parent sample and no data was qualified.

iv. Precision - All relative percent differences (RPD) reported and less than method or laboratory limits? And project specified DQOs, if applicable. RPD reported from LCS/LCSD, MS/MSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)

○ Yes ◉ No Comments:

SW8270SIM - The LCS/LCSD RPD for Naphthalene (20.3%) exceeded the QC limit (20%)

The lab notified Jacobs staff of MS/MSD failures in the 8270SIM analysis and re-extracted/reanalyzed the affected samples within hold time. The second analysis is used for reporting. Both sets of results are included in the report from the lab.

The laboratory incorrectly spiked 18NEC-20MW01-WG instead of the MS/MSD replicate container of 18NEC-14MW01-WG. Therefore the AK102 batch 232437 does not have a valid MS/MSD pair and the precision cannot be calculated. The LCS/LCSD RPD passed however.

SW8260 - The 18NEC-14MW01-WG MS/MSD RPD for Benzene (32%), Ethylbenzene (21%), Toluene (27%), m&p-Xylenes (26%), o-Xylene (24%), and total Xylenes (25%) exceeded the allowable 20% QC limit.

v. If %R or RPD is outside of acceptable limits, what samples are affected?

Comments:

The following samples were affected by LCS/LCSD and/or MS/MSD failures:

18NEC-14MW01-WG
18NEC-14MW01-WG-8
18NEC-14MW03-WG
18NEC-14MW07-WG
18NEC-20MW01-WG
18NEC-22MW2-WG
18NEC-22MW2-WG-8
18NEC-26MW01-WG
18NEC-MW10-1-WG
18NEC-MW10-1-WG-8

18NEC-MW17-1-WG
18NEC-MW88-1-WG
18NEC-MW88-10-WG
18NEC-S09-WS-01
18NEC-S09-WS-02
18NEC-S09-WS-03
18NEC-S09-WS-03-8

vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

◉ Yes ○ No Comments:

18NEC-14MW01-WG -the analytes listed in sections 6biii and 6biv were qualified QL for low MS and MSD recoveries to indicate a potential low bias or QN for the LCS/LCSD and MS/MSD RPD failures to indicate an unknown bias.

All other samples listed in section 6bv were qualified QN for Naphthalene due to the LCS/LCSD RPD failure.

vii. Data quality or usability affected? (Use comment box to explain)

Comments:

Data quality and usability were minimally affected. Samples qualified QN are considered estimated with an unknown bias. Results with a QL qualifier are considered estimated with a low bias. The QL qualified results and detection limits (for nondetect results) were significantly less than the PALs.
The affect on data is minimal for not having an MS/D analyzed with batch 232632. For laboratory batch 232626 two project samples were utilized for batch MS/MSD. The LCS was in control for batch 232632.

c. Surrogates - Organics Only

i. Are surrogate recoveries reported for organic analyses - field, QC and laboratory samples?

◉ Yes ○ No Comments:

All organic analyses were reported with surrogates.

ii. Accuracy - All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods 50-150 %R; all other analyses see the laboratory report pages)

◉ Yes ○ No Comments:

All surrogate recoveries were within laboratory and DoD QSM limits.

iii. Do the sample results with failed surrogate recoveries have data flags? If so, are the data flags clearly defined?

○ Yes ○ No Comments:

N/A

iv. Data quality or usability affected? (Use the comment box to explain.)

○ Yes ◉ No Comments:

Data quality and usability were not affected.

d. Trip blank - Volatile analyses only (GRO, BTEX, Volatile Chlorinated Solvents, etc.): Water and Soil

i. One trip blank reported per matrix, analysis and cooler?

◉ Yes ○ No Comments:

Two trip blanks were included with this SDG, 18NEC-TB03 for SW8260 VOCs and 18NEC-TB04 for RSK175 methane.

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)

◉ Yes ○ No Comments:

Both trip blanks were included in cooler "Perfect Pushup" with all VOC and methane containers.

iii. All results less than PQL?

○ Yes ◉ No Comments:

18NEC-TB03 had a detection of Acetone above the LOD but below the LOQ.

iv. If above PQL, what samples are affected?

Comments:

18NEC-MW10-1-WG and 18NEC-MW10-1-WG-8 had Acetone recoveries of less than ten times the trip blank contamination and were qualified B to indicate a potential high bias.

v. Data quality or usability affected? Explain.

Comments:

Data quality and usability were minimally affected. The B qualified data was above the associated LODs but below the LOQs and screening levels.

e. Field Duplicate

i. One field duplicate submitted per matrix, analysis and 10 project samples?

◉ Yes ○ No Comments:

Three duplicates were submitted with five primary samples.

ii. Submitted blind to lab?

◉ Yes ○ No Comments:

Sample / Duplicate: 18NEC-14MW01-WG / 18NEC-14MW01-WG-8, 18NEC-10-1-WG / 18NEC-10-1-WG-8, 18NEC-S09-WS-03 / 18NEC-S09-WS-03-8 Several of the analyses for 18NEC-S09-WS-03 and 18NEC-S09-WS-03-8 were analyzed with SDG 86487.

iii. Precision - All relative percent differences (RPD) less than specified DQOs?
(Recommended: 30% water, 50% soil)

$$RPD (\%) = \text{Absolute value of: } \frac{(R_1 - R_2)}{(R_1 + R_2)} \times 100$$

Where: R_1 = Sample Concentration
R_2 = Field Duplicate Concentration (R_1-R_2)

○ Yes ◉ No Comments:

All precision requirements were met for 8NEC-S09-WS-03 / 18NEC-S09-WS-03-8.

The following analytes had RPDs greater than 30% in the sample/duplicate:
18NEC-MW10-1-WG / 18NEC-MW10-1-WG-8
Lead-dissolved (35.3%)

18NEC-14MW01-WG / 18NEC-14MW01-WG-8
Lead-dissolved (77.8%)
Nickel-dissolved (81.7%)
Silver-dissolved (41%)
Lead-total (35.6%)
Silver-total (32.1%)

iv. Data quality or usability affected? (Use the comment box to explain why or why not.)

◉ Yes ○ No Comments:

Data quality and usability are minimally affected. The analytes listed above are flagged QG in both the parent and duplicate samples to indicate an unknown bias. The higher result will be used for reporting.

f. Decontamination or Equipment Blank (If not applicable, a comment stating why must be entered below.)

◉ Yes ○ No Comments:

One equipment blank was submitted with SDG 86502 for the 2018 North East Cape groundwater sampling effort.

i. All results less than PQL?

◉ Yes ○ No Comments:

See the checklist for SDG 86502 for more information.

ii. If above PQL, what samples are affected?

Comments:

Several samples from all four water SDGs were affected. Please see Table C-2-1 in Attachment C-2 for the list of affected samples.

iii. Data quality or usability affected? Explain.

Comments:

Data quality and usability were minimally affected. All affected results were qualified B to indicate a possible high bias.

7. Other Data Flags/Qualifiers (ACOE, AFCEE, Lab Specific, etc.)

a. Defined and appropriate?

(•) Yes ( ) No Comments:

Qualifiers applied to this data are defined in the Data Quality Assessment appendix of this report.

Laboratory Data Review Checklist

Completed by:

Nathaniel Gingery

Title:

Project Chemist

Date:

10/16/2018

CS Report Name:

Northeast Cape Periodic Review

Report Date:

12/20/2018

Consultant Firm:

Jacobs

Laboratory Name:

APPL Inc.

Laboratory Report Number:

86487

ADEC File Number:

ST LAW MOC 475.38.013

Hazard Identification Number:

221

1. Laboratory

a. Did an ADEC CS approved laboratory receive and perform all of the submitted sample analyses?

◉ Yes ○ No Comments:

All analyses were performed by APPL Inc. of Clovis, CA.

b. If the samples were transferred to another "network" laboratory or sub-contracted to an alternate laboratory, was the laboratory performing the analyses ADEC CD approved?

○ Yes ◉ No Comments:

Not applicable.

2. Chain of Custody (CoC)

a. CoC information completed, signed, and dated (including released/received by)?

◉ Yes ○ No Comments:

b. Correct analyses requested?

◉ Yes ○ No Comments:

3. Laboratory Sample Receipt Documentation

a. Sample/cooler temperature documented and within range at receipt (0° ± 6° C)?

◉ Yes ○ No Comments:

Cooler name, temperature blank temp °C
1. Vibro-Belt 6.0 °C
2. Shake Weight 4.3 °C
3. Ab Blaster 3.2 °C
4. Vibrating Rollers 2.8 °C
5. Jump Soles 4.8 °C
6. Nordic Track 6.0 °C

Coolers Vobro-Belt and Nordic Track were reported at 8.0 originally. The lab determined this was a recording error and that the actual temperature was 6.0. See the case narrative in the deliverable for SDG 86487 for further clarification.

b. Sample preservation acceptable - acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?

◉ Yes ○ No Comments:

c. Sample condition documented - broken, leaking (Methanol), zero headspace (VOC vials)?

◉ Yes ○ No Comments:

No discrepancies were noted.

d. If there were any discrepancies, were they documented? For example, incorrect sample containers/preservation, sample temperature outside of acceptable range, insufficient or missing samples, etc.?

○ Yes ○ No Comments:

N/A

e. Data quality or usability affected? Explain.

Comments:

Data quality and usability were not affected.

4. Case Narrative

a. Present and understandable?

◉ Yes ○ No Comments:

b. Discrepancies, errors or QC failures identified by the lab?

◉ Yes ○ No Comments:

Selenium recovered high (111%) in a CCV for SW6020. It only bracketed a passing LCS/LCSD, so no corrective action was required.

c. Were all corrective actions documented?

◉ Yes ○ No Comments:

The lab noted all corrective actions taken.

d. What is the effect on data quality/usability according to the case narrative?

Comments:

Discrepancies will be discussed in their related sections below.

5. Samples Results

a. Correct analyses performed/reported as requested on COC?

◉ Yes ○ No Comments:

b. All applicable holding times met?

○ Yes ◉ No Comments:

The lab initially analyzed 18NEC-22MW2-WG and 18NEC-22M21-WG-8 for alkalinity within hold time, but did not reanalyze the samples by a titration method as is required for samples with less than 20ppb alkalinity within hold time.

c. All soils reported on a dry weight basis?

○ Yes ○ No Comments:

No soil samples were part of this SDG.

d. Are the reported PQLs less than the Cleanup Level or the minimum required detection level for the project?

◉ Yes ○ No Comments:

All reporting limits were less than the Project Cleanup Levels.

e. Data quality or usability affected? Explain.

Comments:

The data quality and usability were not affected.

6. <u>QC Samples</u>

a. Method Blank

i. One method blank reported per matrix, analysis and 20 samples

◉ Yes ○ No Comments:

ii. All method blank results less than PQL?

◉ Yes ○ No Comments:

Chromium and Nickel were detected above the detection level but below the PQL in the method blanks for analytical batch 232278. Chromium was detected above the detection level but below the PQL in the method blank for batch 232341.

iii. If above PQL, what samples are affected?

Comments:

The affected samples were:
18NEC-22MW2-WG
18NEC-22MW2-WG-8
18NEC-26MW01-WG

iv. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

◉ Yes ○ No Comments:

Sample results within five times the method blank result were flagged B to indicate potentially elevated results due to method blank contamination.

v. Data quality or usability affected? Explain.

Comments:

The data quality and usability were minimally affected as all B qualified results were below the PQL and screening levels.

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics - One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)

◉ Yes ○ No Comments:

An LCS/LCSD was analyzed for all methods. DoD QSM required MS/MSDs were assigned to samples 18NEC-14MW01-WG and 18NEC-S09-WS-03. See the checklist for SDG 86483 for more details.

ii. Metals/Inorganics - one LCS and one sample duplicate reported per matrix, analysis and 20 samples?

◉ Yes ○ No Comments:

MS/MSDs were assigned to samples 18NEC-14MW01-WG and 18NEC-S09-WS-03. See the checklist for SDG 86483 for more details.

iii. Accuracy - All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods: AK101 60%-120%, AK102 75%-125%, AK103 60%-120%; all other analyses see the laboratory QC pages)

○ Yes ◉ No Comments:

All LCS/LCSD accuracy requirements were met. The lab notified Jacobs staff of MS/MSD failures in the 8270SIM analysis and re-extracted/reanalyzed the affected samples within hold time. The second analysis is used for reporting. See the checklist for SDG 86483 for more details.

iv. Precision - All relative percent differences (RPD) reported and less than method or laboratory limits? And project specified DQOs, if applicable. RPD reported from LCS/LCSD, MS/MSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)

○ Yes ◉ No Comments:

SW8270SIM - The LCS/LCSD RPD for Naphthalene (20.3%) exceeded the QC limit (20%) The lab notified Jacobs staff of MS/MSD failures in the 8270SIM analysis and re-extracted/reanalyzed the affected

samples within hold time. The second analysis is used for reporting. Both sets of results are included in the report from the lab.

See the checklist for SDG 86483 for more details.

v. If %R or RPD is outside of acceptable limits, what samples are affected?

Comments:

The following samples were affected by LCS/LCSD and/or MS/MSD failures:

18NEC-22MW2-WG
18NEC-22MW2-WG-8
18NEC-26MW01-WG
18NEC-S09-WS-01
18NEC-S09-WS-02
18NEC-S09-WS-03-8

vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

(●) Yes ( ) No Comments:

All affected samples were qualified QN for Naphthalene due to the LCS/LCSD RPD failure.

vii. Data quality or usability affected? (Use comment box to explain)

Comments:

Data quality and usability were minimally affected. Samples qualified QN are considered estimated with an unknown bias.

Due to the remote nature of St. Lawrence Island and the process of shipping samples on a daily basis it was not feasible to collect a MS/MSD on a daily basis; therefore, a MS/MSD did not get submitted with this grouping of samples. Two project samples were analyzed as an MS/MSD submitted with SDG 86483. A summary of batch QC and project MS/MSD are included in the DQA.

c. Surrogates - Organics Only

i. Are surrogate recoveries reported for organic analyses - field, QC and laboratory samples?

(●) Yes ( ) No Comments:

All organic analyses were reported with surrogates.

ii. Accuracy - All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods 50-150 %R; all other analyses see the laboratory report pages)

(●) Yes ( ) No Comments:

All surrogate recoveries were within laboratory and DoD QSM limits.

iii. Do the sample results with failed surrogate recoveries have data flags? If so, are the data flags clearly defined?

( ) Yes ( ) No Comments:

NA

iv. Data quality or usability affected? (Use the comment box to explain.)

○ Yes ◉ No Comments:

Data quality and usability were not affected.

d. Trip blank - Volatile analyses only (GRO, BTEX, Volatile Chlorinated Solvents, etc.): Water and Soil

i. One trip blank reported per matrix, analysis and cooler?

◉ Yes ○ No Comments:

Two trip blanks were included with this SDG, 18NEC-TB01 for SW8260 VOCs and 18NEC-TB02 for RSK175 methane.

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)

◉ Yes ○ No Comments:

Both trip blanks were included in cooler "Jump Soles" with all VOC and methane containers.

iii. All results less than PQL?

◉ Yes ○ No Comments:

There were no detections in the trip blanks for this SDG.

iv. If above PQL, what samples are affected?

Comments:

N/A

v. Data quality or usability affected? Explain.

Comments:

Data quality and usability were not affected.

e. Field Duplicate

i. One field duplicate submitted per matrix, analysis and 10 project samples?

◉ Yes ○ No Comments:

Two duplicates were submitted with four primary samples.

ii. Submitted blind to lab?

◉ Yes ○ No Comments:

Sample / Duplicate:
18NEC- 22WM2-WG / 18NEC-22MW2-WG-8, 18NEC-S09-WS-03 / 18NEC-S09-WS-03-8
Several of the analyses for 18NEC-S09-WS-03 and 18NEC-S09-WS-03-8 were analyzed with SDG 86483.

iii. Precision - All relative percent differences (RPD) less than specified DQOs?
(Recommended: 30% water, 50% soil)

$$RPD (\%) = \text{Absolute value of: } \frac{(R_1 - R_2)}{(R_1 + R_2)} \times 100$$

Where: R_1 = Sample Concentration
R_2 = Field Duplicate Concentration (R_1-R_2)

○ Yes ◉ No Comments:

The duplicate precision for 8NEC- 22WM2-WG / 18NEC-22MW2-WG-8 was not met for alkalinity and metals analysis.
Alkalinity RPD 85.7%
dissolved cadmium RPD 56.4%
chromium RPD 37%
lead RPD 52%
silver RPD 80%

iv. Data quality or usability affected? (Use the comment box to explain why or why not.)

◉ Yes ○ No Comments:

Data quality and usability are minimally affected. The higher result will be used for reporting. All data was less than the PALs.

f. Decontamination or Equipment Blank (If not applicable, a comment stating why must be entered below.)

◉ Yes ○ No Comments:

One equipment blank was submitted with SDG 86502 for the 2018 North East Cape groundwater sampling effort.

i. All results less than PQL?

◉ Yes ○ No Comments:

See the checklist for SDG 86502 for more information.

ii. If above PQL, what samples are affected?

Comments:

Several samples from all four water SDGs were affected. Please see Table C-2-1 in Attachment C-2 for the list of affected samples.

iii. Data quality or usability affected? Explain.

Comments:

Data quality and usability were minimally affected. All affected results were qualified B to indicate a possible high bias.

7. Other Data Flags/Qualifiers (ACOE, AFCEE, Lab Specific, etc.)

a. Defined and appropriate?

(•) Yes ( ) No Comments:

Qualifiers applied to this data are defined in the Data Quality Assessment appendix of this report.

Laboratory Data Review Checklist

Completed by:

Nathaniel Gingery

Title:

Project Chemist

Date:

10/16/2018

CS Report Name:

Northeast Cape Periodic Review

Report Date:

12/20/2018

Consultant Firm:

Jacobs

Laboratory Name:

APPL Inc.

Laboratory Report Number:

86489

ADEC File Number:

ST LAW MOC 475.38.013

Hazard Identification Number:

221

1. Laboratory

a. Did an ADEC CS approved laboratory receive and perform all of the submitted sample analyses?

◉ Yes ○ No Comments:

All analyses were performed by APPL Inc. of Clovis, CA.

b. If the samples were transferred to another "network" laboratory or sub-contracted to an alternate laboratory, was the laboratory performing the analyses ADEC CD approved?

○ Yes ◉ No Comments:

Not applicable.

2. Chain of Custody (CoC)

a. CoC information completed, signed, and dated (including released/received by)?

◉ Yes ○ No Comments:

b. Correct analyses requested?

◉ Yes ○ No Comments:

3. Laboratory Sample Receipt Documentation

a. Sample/cooler temperature documented and within range at receipt (0° ± 6° C)?

◉ Yes ○ No Comments:

Cooler name, temperature blank temp °C / cooler temperature °C
1. Gazzelle 5.0 °C / 2.5 °C
2. Stair Master 4.5 °C / 3.0 °C
3. Rowing Machine 5.0 °C / 3.5 °C

b. Sample preservation acceptable - acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?

◉ Yes ○ No Comments:

c. Sample condition documented - broken, leaking (Methanol), zero headspace (VOC vials)?

◉ Yes ○ No Comments:

No discrepancies were noted.

d. If there were any discrepancies, were they documented? For example, incorrect sample containers/preservation, sample temperature outside of acceptable range, insufficient or missing samples, etc.?

○ Yes ○ No Comments:

N/A

e. Data quality or usability affected? Explain.

Comments:

Data quality and usability were not affected.

4. Case Narrative

a. Present and understandable?

◉ Yes ○ No Comments:

b. Discrepancies, errors or QC failures identified by the lab?

◉ Yes ○ No Comments:

c. Were all corrective actions documented?

◉ Yes ○ No Comments:

The lab noted all corrective actions taken.

d. What is the effect on data quality/usability according to the case narrative?

Comments:

Discrepancies will be discussed in their related sections below.

5. Samples Results

a. Correct analyses performed/reported as requested on COC?

◉ Yes ○ No Comments:

b. All applicable holding times met?

◉ Yes ○ No Comments:

c. All soils reported on a dry weight basis?

○ Yes ○ No Comments:

No soil samples were part of this SDG.

d. Are the reported PQLs less than the Cleanup Level or the minimum required detection level for the project?

◉ Yes ○ No Comments:

All reporting limits were less than the Project Cleanup Levels.

e. Data quality or usability affected? Explain.

Comments:

The data quality and usability were not affected.

6. QC Samples

a. Method Blank

i. One method blank reported per matrix, analysis and 20 samples

◉ Yes ○ No Comments:

ii. All method blank results less than PQL?

◉ Yes ○ No Comments:

There were no detections in the method blanks for this SDG.

iii. If above PQL, what samples are affected?

Comments:

N/A

iv. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

◉ Yes ○ No Comments:

N/A

v. Data quality or usability affected? Explain.

Comments:

The data quality and usability were not affected.

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics - One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)

(•) Yes ( ) No Comments:

An LCS/LCSD was analyzed for all methods.
DoD QSM required MS/MSDs were assigned to samples 18NEC-14MW01-WG and 18NEC-S09-WS-03. Each QC batch had the appropriate MS/MSD analyzed, the parent sample was not associated with SDG 86489 and therefore is not included in this checklist. See the checklist for SDG 86483 for more details regarding batch MS/MSD.

ii. Metals/Inorganics - one LCS and one sample duplicate reported per matrix, analysis and 20 samples?

(•) Yes ( ) No Comments:

MS/MSDs were assigned to samples 18NEC-14MW01-WG and 18NEC-S09-WS-03. See the checklist for SDG 86483 for more details.

iii. Accuracy - All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods: AK101 60%-120%, AK102 75%-125%, AK103 60%-120%; all other analyses see the laboratory QC pages)

( ) Yes (•) No Comments:

All LCS/LCSD accuracy requirements were met.

The lab notified Jacobs staff of MS/MSD failures in the 8270SIM analysis and re-extracted/reanalyzed the affected samples within hold time. The second analysis is used for reporting.

See the checklist for SDG 86483 for more details.

iv. Precision - All relative percent differences (RPD) reported and less than method or laboratory limits? And project specified DQOs, if applicable. RPD reported from LCS/LCSD, MS/MSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)

( ) Yes (•) No Comments:

SW8270SIM - The LCS/LCSD RPD for Naphthalene (20.3%) exceeded the QC limit (20%)

The lab notified Jacobs staff of MS/MSD failures in the 8270SIM analysis and re-extracted/reanalyzed the affected samples within hold time. The second analysis is used for reporting. Both sets of results are included in the report from the lab.

The laboratory incorrectly spiked 18NEC-20MW01-WG instead of the MS/MSD replicate container of 18NEC-14MW01-WG. Therefore the AK102 batch 232437 does not have a valid MS/MSD pair and the precision cannot be calculated. The LCS/LCSD RPD passed however.

See the checklist for SDG 86483 for more details.

v. If %R or RPD is outside of acceptable limits, what samples are affected?

Comments:

The following samples were affected by LCS/LCSD failures:

18NEC-14MW03-WG
18NWC-MW17-1-WG
18NEC-MW88-1-WG
18NEC-MW88-10-WG

vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

◉ Yes ○ No Comments:

All affected samples were qualified QN for Naphthalene due to the LCS/LCSD RPD failure.

vii. Data quality or usability affected? (Use comment box to explain)

Comments:

Data quality and usability were minimally affected. Samples qualified QN are considered estimated with an unknown bias.

c. Surrogates - Organics Only

i. Are surrogate recoveries reported for organic analyses - field, QC and laboratory samples?

◉ Yes ○ No Comments:

All organic analyses were reported with surrogates.

ii. Accuracy - All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods 50-150 %R; all other analyses see the laboratory report pages)

◉ Yes ○ No Comments:

All surrogate recoveries were within laboratory and DoD QSM limits.

iii. Do the sample results with failed surrogate recoveries have data flags? If so, are the data flags clearly defined?

○ Yes ○ No Comments:

NA

iv. Data quality or usability affected? (Use the comment box to explain.)

○ Yes ◉ No Comments:

Data quality and usability were not affected.

d. Trip blank - Volatile analyses only (GRO, BTEX, Volatile Chlorinated Solvents, etc.): Water and Soil

i. One trip blank reported per matrix, analysis and cooler?

(•) Yes ( ) No Comments:

No volatiles requiring trip blanks were submitted with this SDG.

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)

(•) Yes ( ) No Comments:

N/A

iii. All results less than PQL?

(•) Yes ( ) No Comments:

N/A

iv. If above PQL, what samples are affected?

Comments:

N/A

v. Data quality or usability affected? Explain.

Comments:

Data quality and usability were not affected.

e. Field Duplicate

i. One field duplicate submitted per matrix, analysis and 10 project samples?

(•) Yes ( ) No Comments:

No duplicates were submitted with the four samples in this SDG. The requirement for one duplicate every ten project samples was met by the duplicates discussed in the other SDGs.

ii. Submitted blind to lab?

(•) Yes ( ) No Comments:

iii. Precision - All relative percent differences (RPD) less than specified DQOs? (Recommended: 30% water, 50% soil)

$$\text{RPD (\%)} = \text{Absolute value of: } \frac{(R_1-R_2)}{(R_1+R_2)} \times 100$$

Where: R_1 = Sample Concentration
R_2 = Field Duplicate Concentration (R_1-R_2)

(•) Yes ( ) No Comments:

N/A

iv. Data quality or usability affected? (Use the comment box to explain why or why not.)

( ) Yes (•) No Comments:

Data quality and usability are unaffected.

f. Decontamination or Equipment Blank (If not applicable, a comment stating why must be entered below.)

(•) Yes ( ) No Comments:

One equipment blank was submitted with SDG 86502 for the 2018 North East Cape groundwater sampling effort.

i. All results less than PQL?

(•) Yes ( ) No Comments:

See the checklist for SDG 86502 for more information.

ii. If above PQL, what samples are affected?

Comments:

Several samples from all four water SDGs were affected. Please see Table C-2-1 in Attachment C-2 for the list of affected samples.

iii. Data quality or usability affected? Explain.

Comments:

Data quality and usability were minimally affected. All affected results were qualified B to indicate a possible high bias.

7. Other Data Flags/Qualifiers (ACOE, AFCEE, Lab Specific, etc.)

a. Defined and appropriate?

(•) Yes ( ) No Comments:

Qualifiers applied to this data are defined in the Data Quality Assessment appendix of this report.

Laboratory Data Review Checklist

Completed by:

Nathaniel Gingery

Title:

Project Chemist

Date:

10/16/2018

CS Report Name:

Northeast Cape Periodic Review

Report Date:

12/20/2018

Consultant Firm:

Jacobs

Laboratory Name:

APPL Inc.

Laboratory Report Number:

86502

ADEC File Number:

ST LAW MOC 475.38.013

Hazard Identification Number:

221

1. Laboratory

a. Did an ADEC CS approved laboratory receive and perform all of the submitted sample analyses?

◉ Yes ○ No Comments:

All analyses were performed by APPL Inc. of Clovis, CA.

b. If the samples were transferred to another "network" laboratory or sub-contracted to an alternate laboratory, was the laboratory performing the analyses ADEC CD approved?

○ Yes ◉ No Comments:

Not applicable.

2. Chain of Custody (CoC)

a. CoC information completed, signed, and dated (including released/received by)?

◉ Yes ○ No Comments:

b. Correct analyses requested?

◉ Yes ○ No Comments:

3. Laboratory Sample Receipt Documentation

a. Sample/cooler temperature documented and within range at receipt (0° ± 6° C)?

◉ Yes ○ No Comments:

Cooler name, temperature blank temp °C / cooler temperature

1. Endless Pool 4.0 °C / 4.2 °C
2. Vertical Climber 4.0 °C / 3.8 °C
3. Sauna Suit 4.0 °C / 4.1 °C
4. Ab Firm Pro 5.0 °C / 5.7 °C
5. Roller Slide 3.5 °C / 3.5 °C
6. Bullworker Classic 3.0 °C / 3.3 °C
7. BodyBoss 2.0 °C / 2.1 °C
8. Air Stair Climber 5.0 °C / 4.7 °C
9. Thigh Rocker 4.5 °C / 4.5 °C
10. Hawaii Chair 4.5 °C / 4.3 °C

b. Sample preservation acceptable - acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?

◉ Yes ○ No Comments:

c. Sample condition documented - broken, leaking (Methanol), zero headspace (VOC vials)?

◉ Yes ◯ No Comments:

Several samples were indicated to contain bubbles, however all were within acceptable limits.

d. If there were any discrepancies, were they documented? For example, incorrect sample containers/preservation, sample temperature outside of acceptable range, insufficient or missing samples, etc.?

◯ Yes ◯ No Comments:

N/A

e. Data quality or usability affected? Explain.

Comments:

Data quality and usability were not affected.

4. Case Narrative

a. Present and understandable?

◉ Yes ◯ No Comments:

b. Discrepancies, errors or QC failures identified by the lab?

◉ Yes ◯ No Comments:

c. Were all corrective actions documented?

◉ Yes ◯ No Comments:

The lab noted all corrective actions taken.

d. What is the effect on data quality/usability according to the case narrative?

Comments:

Discrepancies will be discussed in their related sections below.

5. Samples Results

a. Correct analyses performed/reported as requested on COC?

◉ Yes ◯ No Comments:

b. All applicable holding times met?

○ Yes ◉ No Comments:

The lab initially analyzed 18NEC-MW88-10-WG and 18NEC-MW88-3-WG-8 for alkalinity within hold time, but did not reanalyze the samples by a titration method as is required for samples with less than 20ppb alkalinity within hold time.

c. All soils reported on a dry weight basis?

○ Yes ○ No Comments:

No soil samples were part of this SDG.

d. Are the reported PQLs less than the Cleanup Level or the minimum required detection level for the project?

◉ Yes ○ No Comments:

All reporting limits were less than the Project Cleanup Levels.

e. Data quality or usability affected? Explain.

Comments:

The data quality and usability were not affected.

6. <u>QC Samples</u>

a. Method Blank

i. One method blank reported per matrix, analysis and 20 samples

◉ Yes ○ No Comments:

ii. All method blank results less than PQL?

◉ Yes ○ No Comments:

Chromium and Nickel were detected above the detection level but below the PQL in the method blanks for analytical batch 232285. Chromium was detected above the detection level but below the PQL in the method blank for batch 232341.

iii. If above PQL, what samples are affected?

Comments:

The affected samples were:

18NEC-14MW02-WG
18NEC-14MW03-WG
18NEC-14MW04-WG
18NEC-14MW05-WG
18NEC-14MW06-WG
18NEC-MW17-1-WG
18NEC-MW88-10-WG

18NEC-MW88-3-WG
18NEC-MW88-1-WG

iv. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

◉ Yes ○ No Comments:

Sample results within five times the method blank result were flagged B to indicate potentially elevated results due to method blank contamination.

v. Data quality or usability affected? Explain.

Comments:

The data quality and usability were minimally affected as all B qualified results were below the PQL and screening levels.

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics - One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)

◉ Yes ○ No Comments:

An LCS/LCSD was analyzed for all methods. DoD QSM required MS/MSDS were assigned to sample 18NEC-14MW06-WG.

ii. Metals/Inorganics - one LCS and one sample duplicate reported per matrix, analysis and 20 samples?

◉ Yes ○ No Comments:

The MS/MSD was assigned to sample 18NEC-14MW06-WG. Other batch MS/MSD information (BTEX (batch 232626), DRO (batch 232437) and RRO (batch 232439)) is included with SDG checklist 86483.

iii. Accuracy - All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods: AK101 60%-120%, AK102 75%-125%, AK103 60%-120%; all other analyses see the laboratory QC pages)

○ Yes ◉ No Comments:

All LCS/LCSD accuracy requirements were met.

MS/MSD:
The following analytes had recoveries outside of QC limits in one or both MS/MSD for sample 18NEC-14MW06-WG:

SW8260:
Bromomethane (52.1% in the MS and 49.6% in the MSD)

SW6020:
Lead-dissolved (87.6% in the MSD)
Lead-total (86.6% in the MS)

iv. Precision - All relative percent differences (RPD) reported and less than method or laboratory limits? And project specified DQOs, if applicable. RPD reported from LCS/LCSD, MS/MSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)

◉ Yes ◯ No Comments:

All precision requirements in the LCS/LCSDs were met.

The laboratory incorrectly spiked 18NEC-20MW01-WG instead of the MS/MSD replicate container of 18NEC-14MW01-WG. Therefore, the AK102 batch 232437 does not have a valid MS/MSD pair and the precision cannot be calculated. The LCS/LCSD RPD passed however.

v. If %R or RPD is outside of acceptable limits, what samples are affected?

Comments:

18NEC-14MW06-WG was affected by the MS/MSD accuracy failures.

vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

◉ Yes ◯ No Comments:

18NEC-14MW06-WG was qualified QL for the analytes listed in section 6biii to indicate a possible low bias.

vii. Data quality or usability affected? (Use comment box to explain)

Comments:

Data quality and usability were minimally affected. Samples qualified QL are considered estimated and biased low. Please see checklist 86483 for other MS/MSD impacts.

c. Surrogates - Organics Only

i. Are surrogate recoveries reported for organic analyses - field, QC and laboratory samples?

◉ Yes ◯ No Comments:

All organic analyses were reported with surrogates.

ii. Accuracy - All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods 50-150 %R; all other analyses see the laboratory report pages)

◉ Yes ◯ No Comments:

All surrogate recoveries were within laboratory and DoD QSM limits.

iii. Do the sample results with failed surrogate recoveries have data flags? If so, are the data flags clearly defined?

◯ Yes ◯ No Comments:

NA

iv. Data quality or usability affected? (Use the comment box to explain.)

○ Yes ◉ No Comments:

Data quality and usability were not affected.

d. Trip blank - Volatile analyses only (GRO, BTEX, Volatile Chlorinated Solvents, etc.): Water and Soil

i. One trip blank reported per matrix, analysis and cooler?

◉ Yes ○ No Comments:

Two trip blanks were included with this SDG, 18NEC-TB05 for SW8260 VOCs and 18NEC-TB06 for RSK175 methane.

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)

◉ Yes ○ No Comments:

Both trip blanks were included in cooler "Roller Slide" with all VOC and methane containers.

iii. All results less than PQL?

◉ Yes ○ No Comments:

Acetone was detected in 18NEC-TB05, however all associated samples were nondetect for acetone, thus no qualification was needed.

iv. If above PQL, what samples are affected?

Comments:

No samples were affected.

v. Data quality or usability affected? Explain.

Comments:

Data quality and usability were not affected.

e. Field Duplicate

i. One field duplicate submitted per matrix, analysis and 10 project samples?

◉ Yes ○ No Comments:

No duplicate samples were submitted with the nine primary samples. The requirement for one duplicate every ten project samples was met by the duplicates discussed in the other SDGs.

ii. Submitted blind to lab?

◉ Yes ◯ No Comments:

iii. Precision - All relative percent differences (RPD) less than specified DQOs?
(Recommended: 30% water, 50% soil)

$$RPD\ (\%) = \text{Absolute value of: } \frac{(R_1 - R_2)}{(R_1 + R_2)} \times 100$$

Where: R_1 = Sample Concentration
R_2 = Field Duplicate Concentration (R_1-R_2)

◯ Yes ◉ No Comments:

All precision requirements were met.

iv. Data quality or usability affected? (Use the comment box to explain why or why not.)

◯ Yes ◉ No Comments:

Data quality and usability are unaffected. The higher result will be used for reporting.

f. Decontamination or Equipment Blank (If not applicable, a comment stating why must be entered below.)

◉ Yes ◯ No Comments:

One equipment blank was submitted with this SDG for the 2018 North East Cape groundwater sampling effort.

i. All results less than PQL?

◉ Yes ◯ No Comments:

There were several detections in the equipment blank:

<u>SW8260:</u>
Chloroform (0.00051 mg/L)

<u>SW6020:</u>
Barium (0.00059 mg/L)
Chromium (0.0099 mg/L)
Lead (0.00026 mg/L)
Silver (0.00012 mg/L)

ii. If above PQL, what samples are affected?

Comments:

Several samples from all four water SDGs were affected. Please see Table C-2-1 in Attachment C-2 for the list of affected samples.

iii. Data quality or usability affected? Explain.

Comments:

Data quality and usability were minimally affected. All affected results were qualified B to indicate a possible high bias.

7. <u>Other Data Flags/Qualifiers (ACOE, AFCEE, Lab Specific, etc.)</u>

a. Defined and appropriate?

◉ Yes ◯ No Comments:

Qualifiers applied to this data are defined in the Data Quality Assessment appendix of this report.

EXHIBIT E2-4

Laboratory Deliverables

(Provided electronically on CD)

ATTACHMENT E-3
Summarized Analytical Results and Trend Plots

2018 MNA Groundwater Annual Sampling Report at the MOC
Attachment E-3 Summarized Analytical Results and Trend Plots

This attachment provides tables and plots for groundwater at currently installed and serviceable monitoring wells and select historical monitoring wells (MW88-4 and MW88-5) at the Main Operations Complex (MOC). These tables and plots depict groundwater elevation, natural attenuation parameter concentrations, contaminant concentrations as a ratio of the site-specific cleanup level (SSCL) (or 2018 Alaska Department of Environmental Conservation [ADEC] Method Two Table C groundwater cleanup levels) and predicted diesel-range organics (DRO) attenuation over time.

Groundwater elevation field measurements have been made at currently installed and serviceable monitoring wells and select historical monitoring wells (MW88-4 and MW88-5) beginning in 2002 and continuing through 2018. Plot E-3.1 displays these groundwater elevation measurements over time.

Natural attenuation parameters have been collected from currently installed and serviceable monitoring wells and select historical monitoring wells (MW88-4 and MW88-5) beginning in 2002 and continuing through 2018. Parameters were collected in 2002, 2004, annually between 2010 and 2016, and in 2018. Table E-3.2 presents a table of natural attenuation parameters. Plots E-3.2.1 through E-3.2.11 display natural attenuation parameters over time from 2010 onward.

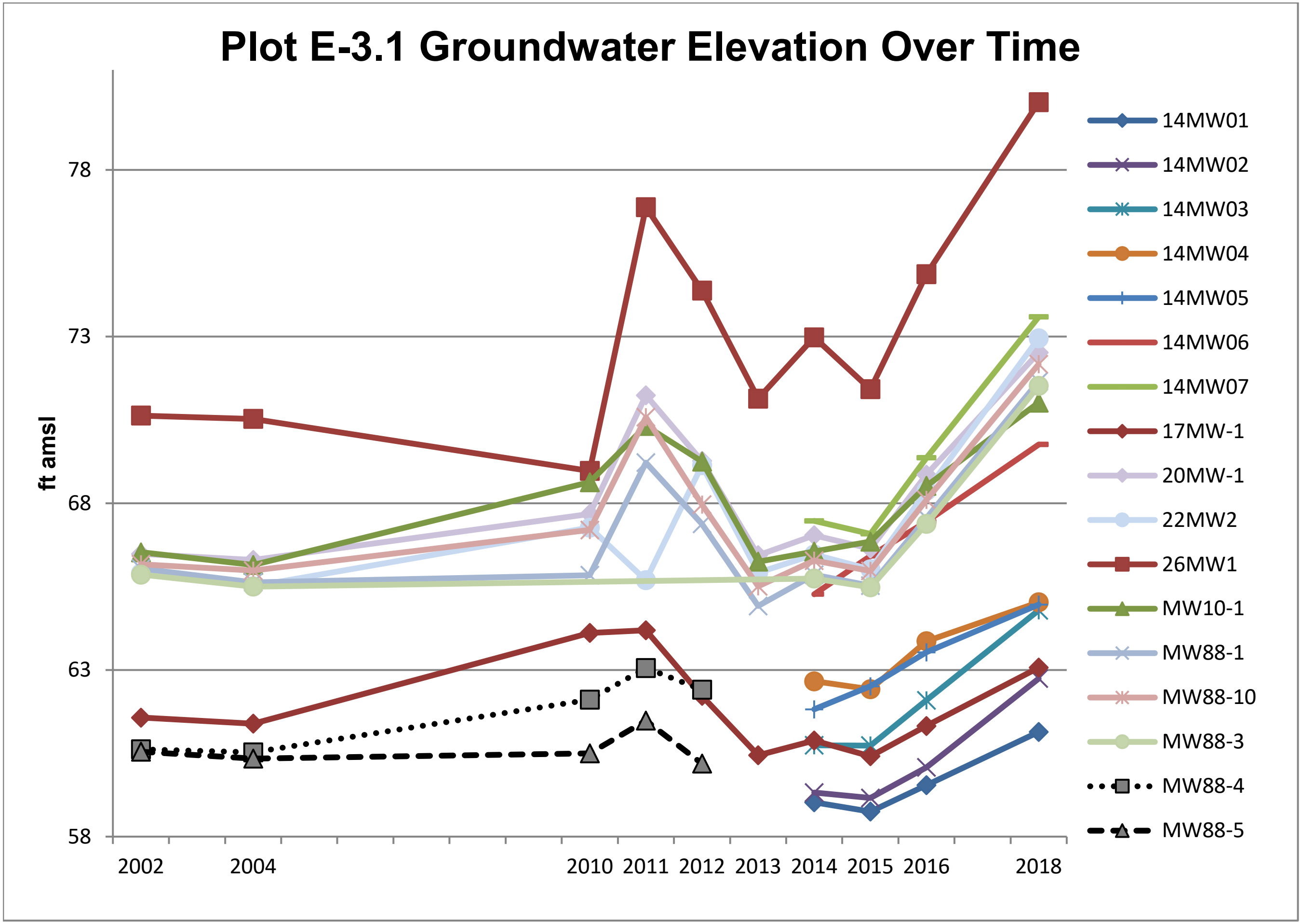
Groundwater samples were collected from currently installed and serviceable monitoring wells and select historical monitoring wells (MW88-4 and MW88-5) beginning in 2002 and continuing through 2018. Table E-3.3 presents contaminant concentrations exceeding SSCLs and/or 2018 ADEC Method Two Table C groundwater cleanup levels. Plots E-3.3.1 through E-3.3.17 display concentrations of contaminants of concern over time relative to SSCLs. Plots E-3.3.18 through E-3.3.33 display naphthalene, 1-methynlaphthalene, and 2-methylnaphthalene concentrations over time relative to 2018 ADEC Method Two Table C groundwater cleanup levels because these analytes exceeded the 2018 ADEC Method Two Table C groundwater cleanup levels at eight monitoring wells across the MOC but lack Decision Document-specified SSCLs. Plot E-3.2.2 displays the trend for manganese, which exceeded the 2018 ADEC Method

Two Table C groundwater cleanup levels at multiple wells. Manganese is not a primary contaminant but is liberated from soil as a byproduct of fuel biodegradation.

Statistical trends for the natural attenuation of DRO are presented in Exhibit E-3.1. Only monitoring wells with 2018 exceedances of the DRO SSCL (wells 14MW01, 14MW02, 14WM04, and 14MW05) were selected for the Mann-Kendall trend test. Tables E-3.4.1.1 through E-3.4.1.5 present the output of the Mann-Kendall trend test for currently installed and serviceable monitoring wells 14MW01, 14MW02, 14WM04, and 14MW05. Geometric regression was completed for wells 14MW04 and 14MW05 because the Mann-Kendall trend test indicated a decreasing DRO concentration trend for each well. Geometric regression for monitoring wells is presented in Plots/Tables E-3.4.2 through E-3.4.3.

EXHIBIT E-3.1

Groundwater Elevation Over Time



ft amsl = feet above mean sea level

EXHIBIT E-3.2

MNA Parameters Over Time

2018 MNA Groundwater Annual Sampling Report at the Northeast Cape MOC

Table E-3.2 MOC Monitoring Well MNA Parameters Over Time

Monitoring Well	Year	Ferrous Iron mg/L	Manganese mg/L	Sulfate mg/L	Nitrate mg/L	Alkalinity mg/L	Temperature °C	Conductivity µS/cm	pH	ORP mV	DO mg/L	Methane µg/L
14MW01	2014	0.85	0	7	0	80	2.89	--	6.51	-191.9	3.78	83
14MW01	2015	0.09	0.2	8	0.02	0	2.06	135	6.32	32.7	0.77	54
14MW01	2016	10	0.916	17.7	0	18.7	4.37	94	6.02	0.6	0.53	24
14MW01	2018	>10	0.84	25.3	0	33	3.39	105	6.06	26.2	1.46	34
14MW02	2014	0.86	0.9	3	0	80	1.38	--	6.39	-103.8	1.17	200
14MW02	2015	3.3	1.1	7	0.01	40	2.5	164	6.26	-64	0.15	240
14MW02	2016	10	1.86	14.7	0	40	6.84	123	5.88	11.6	0.51	23
14MW02	2018	>10	0.807	20.1	0	31.6	3.66	108	5.78	29.9	4.28	21
14MW03	2014	0.89	0.9	8	--	180	3.41	--	6.65	-404.9	8.03	47
14MW03	2015	2.17	0.4	6	<0.4	40	3.89	189	6.63	-193.9	0.37	88
14MW03	2016	10	1.36	16.9	0	28	4.14	93	5.99	26.7	0.6	8.2
14MW03	2018	>10	1.47	17.3	0	46.6	4.36	109	6.15	31	0.81	15
14MW04	2014	0.81	0.6	12	0	140	5.9	819	5.92	27.3	0.33	25
14MW04	2015	0.51	0.4	27	0.02	40	5.57	294	5.97	-118.1	1.05	110
14MW04	2016	3.5	1.71	31.2	0	91	7.66	203	6.05	91.4	0.62	20
14MW04	2018	1	1.15	23.9	0	44.4	9.03	125	5.6	175.2	0.66	15
14MW05	2014	0.95	0.7	6	0	--	3.61	--	6.23	-39.3	3.5	33
14MW05	2015	2.8	2.2	10	0.03	40	3.81	138	6.21	31.8	0.32	99
14MW05	2016	10	2.71	23.1	0	47	6.82	127	5.87	74.6	0.46	10
14MW05	2018	>10	3.48	9.9	0	74.3	7.95	158	6.14	35.8	0.97	62
14MW06	2014	1.75	1.6	3	0	--	2.57	--	6.21	-68.5	0.32	160
14MW06	2015	0.09	0.5	6	0.02	80	5.95	222	6.61	24.9	0.18	110
14MW06	2016	2	1.28	15.3	0.2	140	9.33	235	6.57	47.2	0.45	8.3
14MW06	2018	0.3	0.6	12	0	105	8.55	167	6.28	131.7	0.65	8.5
14MW07	2014	0.25	0.3	1	<0.01	40	6.49	--	6.9	-385.4	4.52	30
14MW07	2015	0.07	0.4	4	0.09	0	3.4	56	6.36	125.9	8.47	1.6 J
14MW07	2016	<0.03	0.0359	12.7	0.1	11.7	3.74	52	5.42	187.7	10.09	ND (0.63)
14MW07	2018	2	0.0144	17.6	0	10.3	3.57	68	5.66	195.5	12.82	ND (1.0)
17MW1	2010	0.01	<0.2	16	0.2	0	3.09	68	5.76	160.8	7.32	ND (0.19)
17MW1	2011	0.06	0.1	15	0.7	40	2.73	67	5.78	237.1	4.47	ND (0.29)
17MW1	2012	<0.03	<0.2	16	0.19	40	2.74	108	5.45	205.5	9.22	ND (0.29)
17MW1	2013	0.01	0.3	20	0.11	37	3.45	65	5.45	149.2	9.77	ND (0.37)
17MW1	2014	--	0	5	0.11	60	2.35	--	5.65	166.6	11.15	ND (0.37)
17MW1	2015	0.06	0.2	10	0.08	0	2.47	99	5.83	164	10.52	ND (0.80)
17MW1	2016	<0.03	0.00156	16.9	0.2	10	3.94	56	5.45	223.4	10.31	ND (0.63)
17MW1	2018	<1	0.0021	23.6	0.2	8.5	3.18	74	5.54	155.9	10.96	8.2
20MW1	2010	--	--	--	--	--	3.61	63	6.29	101.4	3.96	ND (0.19)
20MW1	2011	<0.01	<0.2	24	1.3	80	2.33	82	5.89	125.8	10.78	ND (0.29)
20MW1	2012	<0.03	0.3	16	0.23	40	3.39	143	5.76	231.5	9.04	ND (0.29)
20MW1	2013	ND	0.2	22	0.26	45	3.58	83	5.65	62.4	10.45	ND (0.37)
20MW1	2014	--	0	6	0.2	80	2.37	--	5.68	180	11.85	ND (0.37)
20MW1	2015	0.32	0.3	14	0.22	0	2.11	87	5.93	-155.3	11.2	ND (0.80)
20MW1	2016	<0.03	0.00321	19.6	0.1	21	4.63	73	5.6	222.5	11.65	ND (0.63)
20MW1	2018	<1	0.0202	19	0.4	7.9	3.86	72	5.9	243.1	12.4	ND (1.0)
22MW2	2010	<0.01	<0.2	12	0.6	0	3.9	65	6.09	234.2	10.07	0.8
22MW2	2011	<0.01	<0.2	7	1	40	6.4	60	5.63	53.7	10.99	ND (0.29)
22MW2	2012	<0.03	0.1	12	0.34	40	3.54	108	5.79	204.6	12.45	ND (0.29)
22MW2	2013	0.01	0.2	16	0.16	30	5.42	69	5.92	129.5	14.82	ND (0.37)
22MW2	2014	0.02	0	6	0.08	60	2.85	--	5.75	165.3	13.14	ND (0.37)
22MW2	2015	0.06	0	13	0.06	0	3.29	55	5.89	-73.5	10.78	ND (0.80)
22MW2	2016	<0.03	0.000535	15.4	0.1	7	4.5	55	5.52	230.6	12.15	ND (0.63)
22MW2	2018	<1	0.0012 J	18.4	0	8.5 QN	5.36	86	5.75	176.5	11.22	ND (1.0)
26MW1	2010	<0.01	<0.2	6	0.3	0	3.01	47	6.77	202.1	11.5	0.44

2018 MNA Groundwater Annual Sampling Report at the Northeast Cape MOC
Table E-3.2 MOC Monitoring Well MNA Parameters Over Time

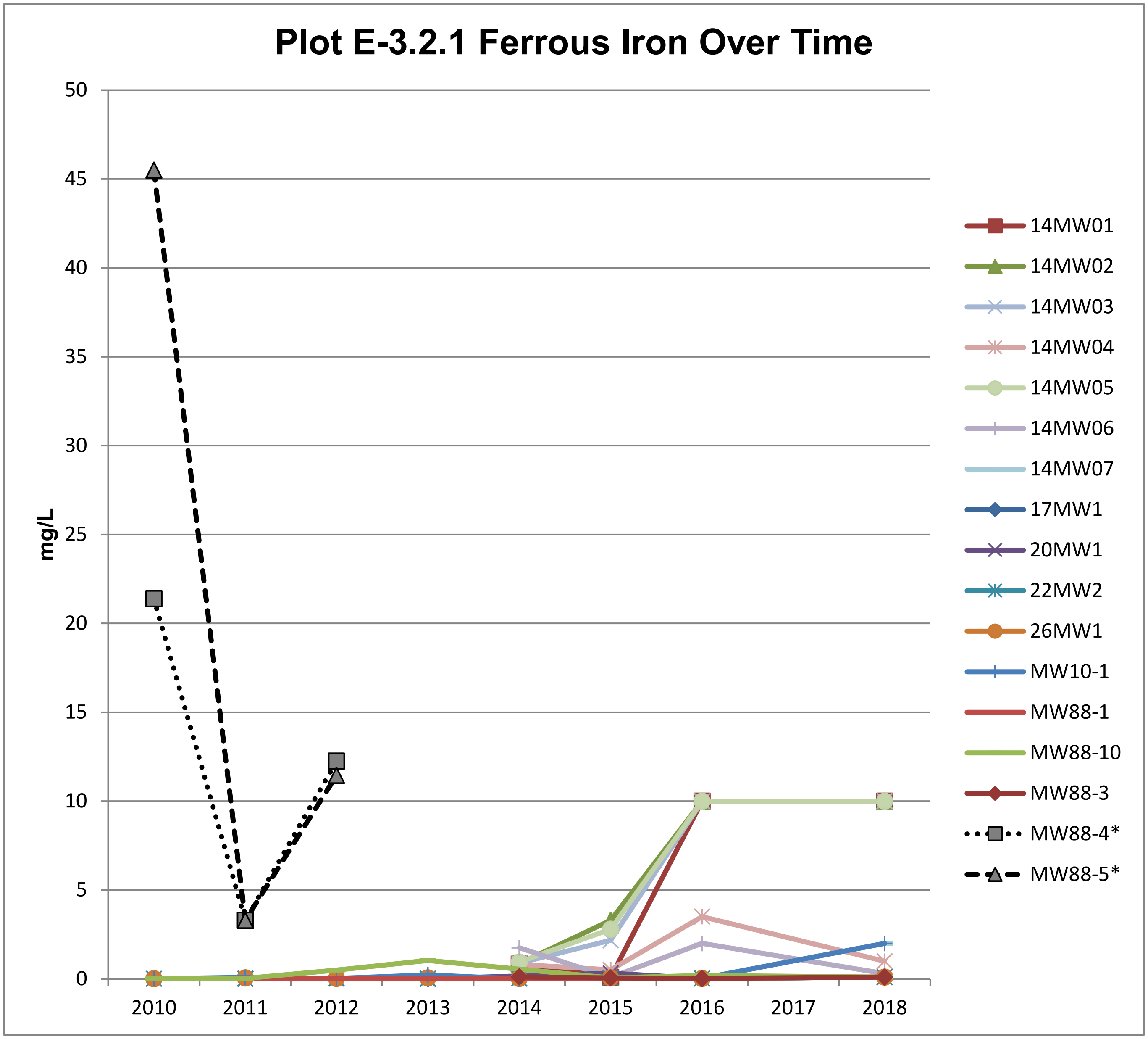
Monitoring Well	Year	Ferrous Iron mg/L	Manganese mg/L	Sulfate mg/L	Nitrate mg/L	Alkalinity mg/L	Temperature °C	Conductivity µS/cm	pH	ORP mV	DO mg/L	Methane µg/L
26MW1	2011	0.05	0.2	10	1.3	40	3.47	61	5.74	202.8	12.63	ND (0.29)
26MW1	2012	<0.03	0.2	6	0.26	40	3.22	84	5.79	197.2	12.4	ND (0.29)
26MW1	2013	0.05	0.5	10	0.12	40	4.19	50	5.49	222.7	13.99	ND (0.37)
26MW1	2014	0.02	0.2	6	0.05	80	2.83	--	5.63	230.1	13.47	ND (0.37)
26MW1	2015	0.05	0.2	9	0.06	0	2.54	75	6.05	160.9	13.67	ND (0.80)
26MW1	2016	<0.03	0.000754	13.6	0	6.3	4.54	50	5.48	231.4	12.98	ND (0.63)
26MW1	2018	<1	0.0033	17.6	0.4	3	4.7	78	5.76	132.6	14.4	ND (1.0)
MW10-1	2010	<0.01	<0.2	3	0.3	0	6.59	63	5.63	202.5	5.58	0.48
MW10-1	2011	0.09	0.1	4	0.4	40	6.03	56	5.45	85.5	4.74	0.29 J
MW10-1	2012	<0.03	<0.2	3	<0.01	40	4.42	0.153	5.37	251.6	2.93	0.85
MW10-1	2013	0.23	0.2	3	0.11	50	3.79	78	5.43	68.9	1.26	26
MW10-1	2014	0	0.1	3	0.07	--	6.62	--	5.35	185.1	2.83	1 J
MW10-1	2015	0.09	0.5	5	0.16	0	7.02	99	5.52	-101.1	2.44	ND (0.80)
MW10-1	2016	<0.3	0.00344	7.37	0.2	17	10.03	39	5.25	225.1	4.75	ND (0.63)
MW10-1	2018	2	0.519	6.5	0	38.4	10.04	106	5.83	140.8	0.73	7.4
MW88-1	2010	<0.01	0.3	7	0.3	40	2.85	68	5.59	190.1	1.26	0.34
MW88-1	2011	0.04	0.3	8	1.5	40	2.3	60	5.75	70.9	2.09	0.44 J
MW88-1	2012	<0.03	<0.2	8	bc	40	3.27	111	5.52	225.9	1.58	0.37 J
MW88-1	2013	0.03	0.4	9	0.29	40	2.66	68	5.31	114.3	2.23	ND (0.37)
MW88-1	2014	0.03	0	3	0.07	40	2.18	--	5.38	231.6	6.43	ND (0.37)
MW88-1	2015	0	0	9	0.16	0	2.46	92	5.5	-136	6.49	ND (0.80)
MW88-1	2016	0.1	0.291	14.1	0.2	13	6.15	58	5.23	183.7	4.09	ND (0.63)
MW88-1	2018	<1	0.058	24.6	0.2	7.9	4.45	81	5.7	264.7	5.9	ND (1.0)
MW88-10	2010	<0.01	1	6	0.1	40	2.89	65	7.58	146	0.81	0.4
MW88-10	2011	0.02	0.4	8	0.9	40	4.43	61	5.78	47.7	1.55	1.8
MW88-10	2012	0.49	1	16	0.56	40	1.61	124	5.74	146.6	0.66	32
MW88-10	2013	1.04	2.9	8	0.03	70	3.64	75	5.82	129.6	0.37	54
MW88-10	2014	--	0.2	5	0.02	40	2.86	--	5.55	148.7	1.63	14
MW88-10	2015	0.05	0.4	6	0.05	0	3.86	96	5.67	-158.2	1.64	6.2
MW88-10	2016	0.2	0.203	17.8	0.1	17.7	4.5	62	5.54	184.6	1.06	3.6
MW88-10	2018	<1	0.363	18.6	0.2	15.4	4.52	74	5.95	222.1	1.41	7.3
MW88-3	2014	0.11	0	4	0.03	70	2.89	--	5.36	175.5	4.73	1.8 J
MW88-3	2015	0.06	0.5	8	0.17	0	2.62	53	5.66	155.1	4.43	1.6 J
MW88-3	2016	<0.3	0.364	14.8	0	16	3.25	57	5	218.1	4.7	ND (0.63)
MW88-3	2018	<1	0.42	16.8	NR	11.2	10.77	84	5.5	205	1.79	ND (1.0)
MW88-4	2010	21.4	0.3	4	2	120	3.28	190	6.93	-72.1	0.68	1900
MW88-4	2011	3.3	0.4	1	0.2	180	1.16	173	6.8	-86.2	0.27	2100
MW88-4	2012	12.25	1.1	3	<0.01	80	2.01	230	6.41	-51.7	0.35	2300
MW88-5	2010	45.5	0.2	6	0.3	80	2.21	221	8.25	-69.3	0.81	99
MW88-5	2011	3.3	0.3	46	0.9	180	2.59	241	6.64	-100.3	0.58	630
MW88-5	2012	11.45	1.3	18	0.02	80	2.63	262	6.18	-25.4	0.49	360

Notes:

-- Not reported

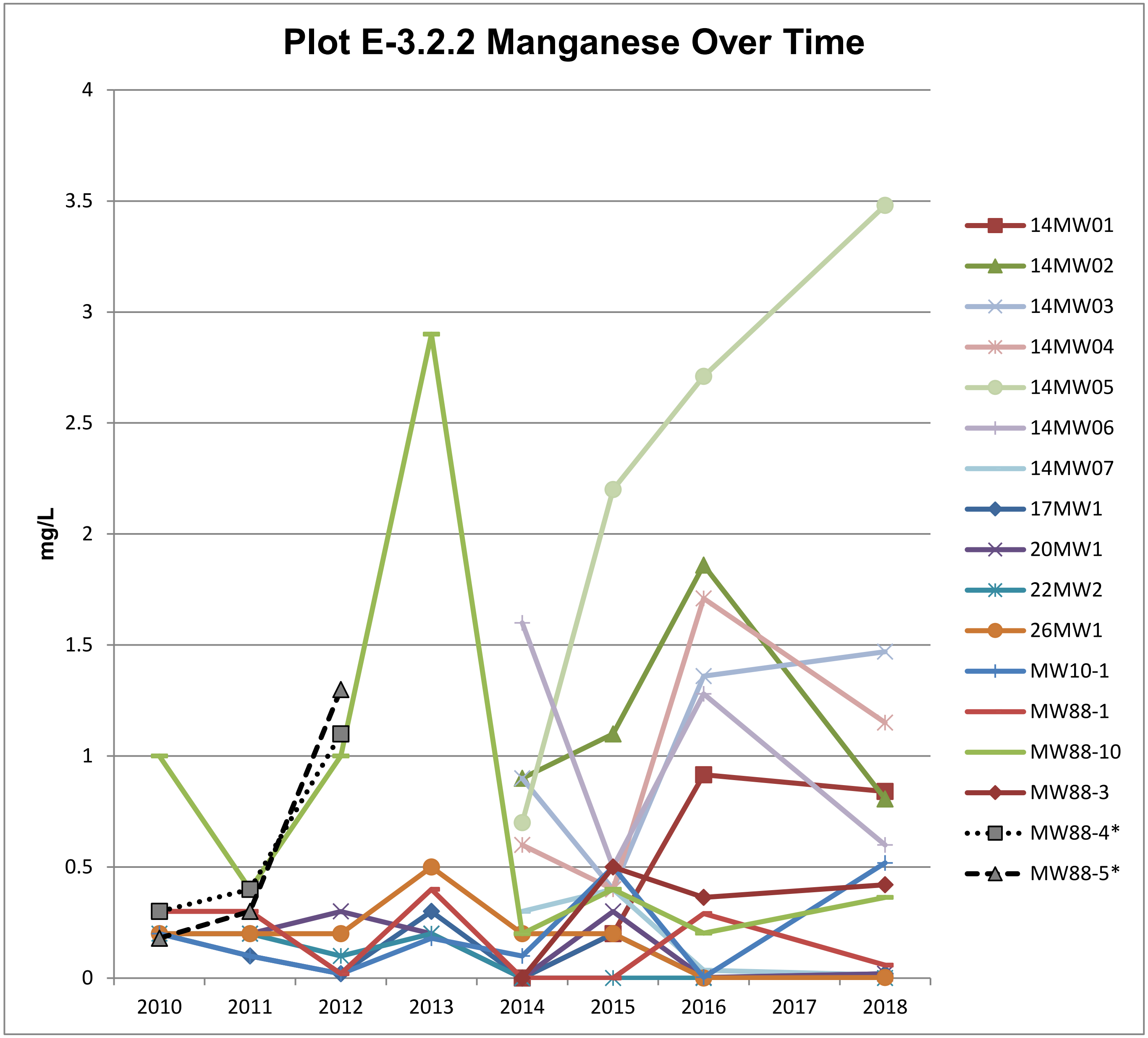
For definitions, refer to the Acronyms and Abbreviations section in the MOC report.

For data qualifiers, refer to the DQA in Attachment E-2.



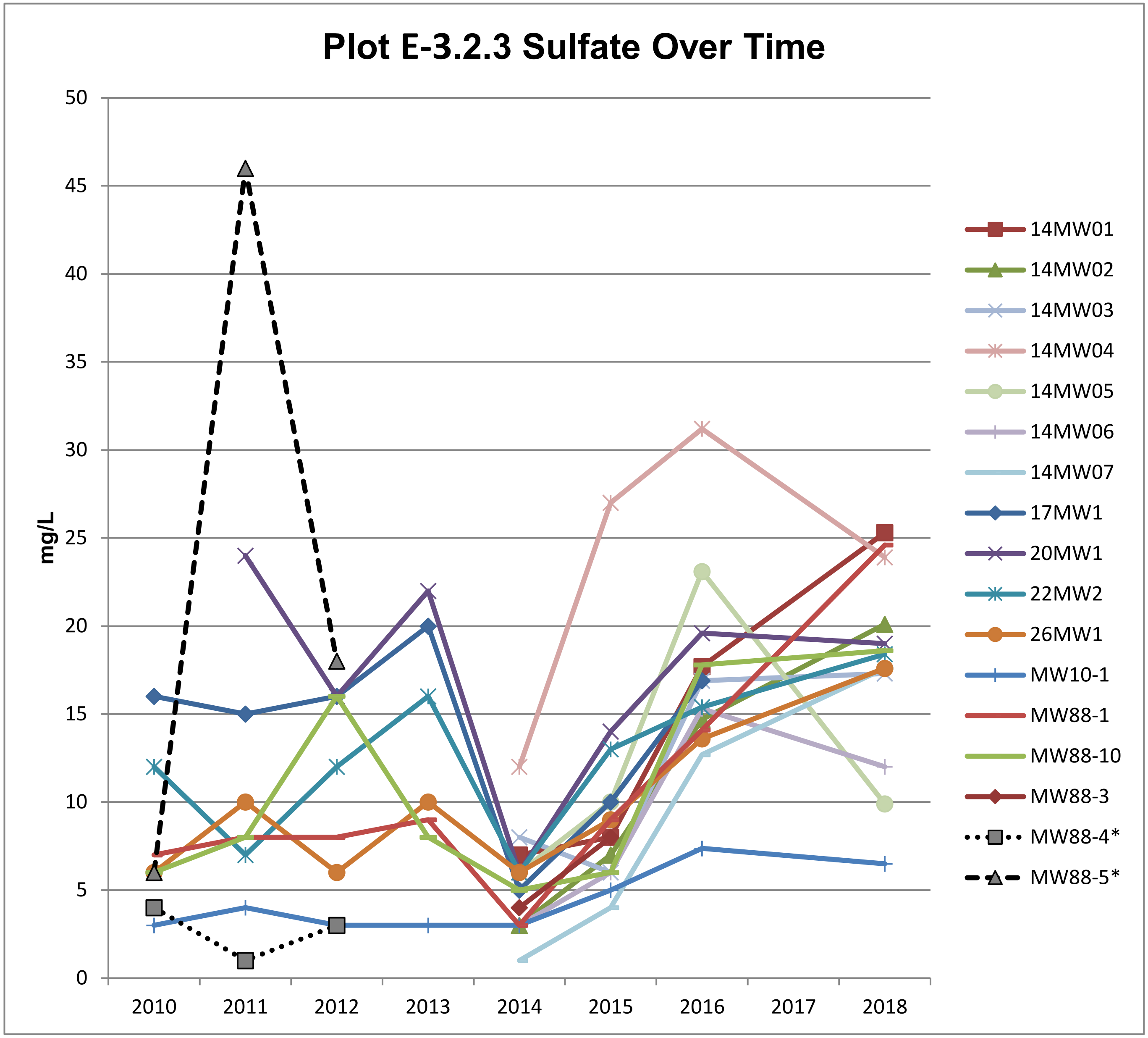
mg/L = milligram per liter

* = monitoring well no longer part of monitoring well network



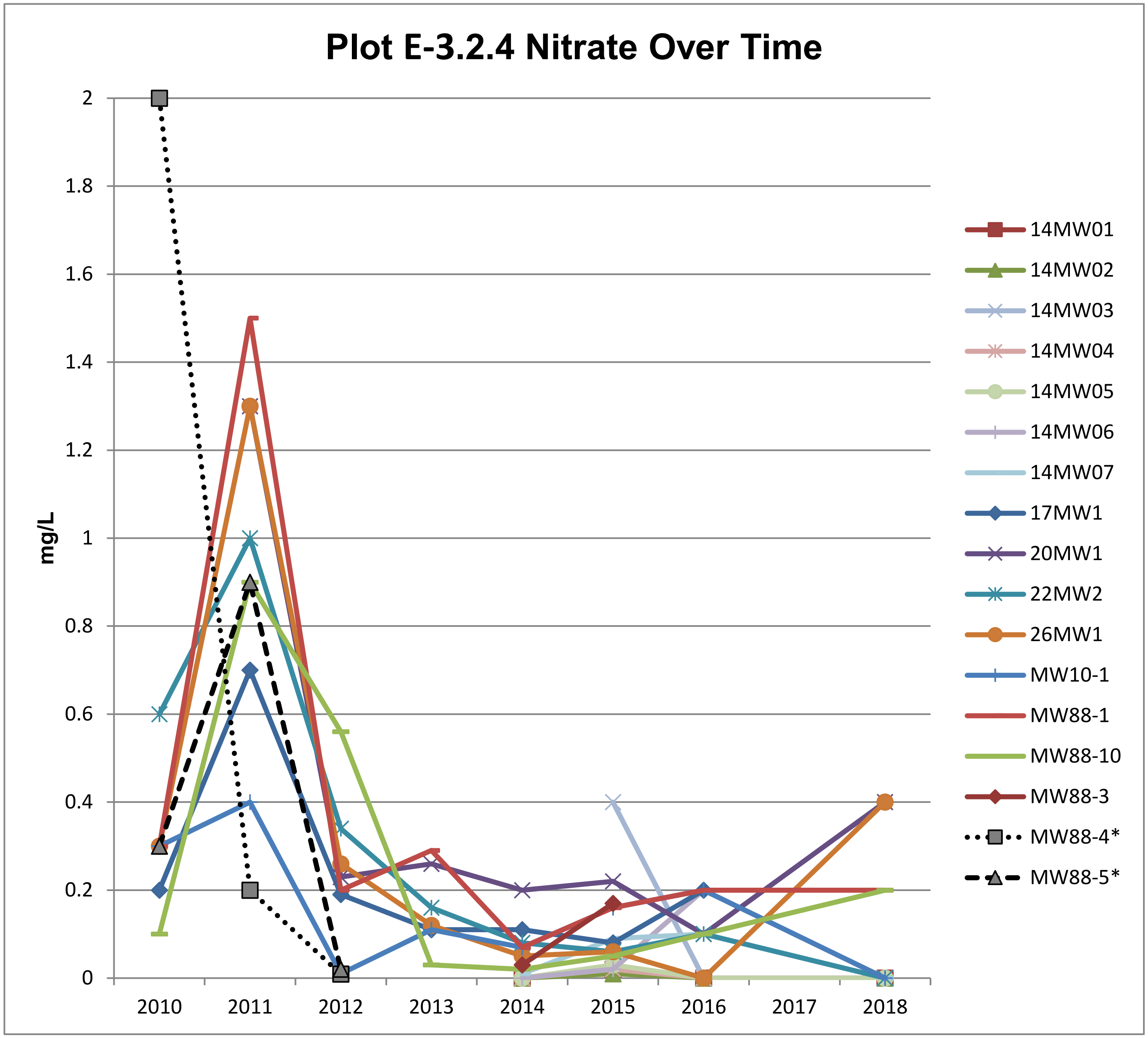
mg/L = milligram per liter

* = monitoring well no longer part of monitoring well network



mg/L = milligram per liter

* = monitoring well no longer part of monitoring well network



mg/L = milligram per liter

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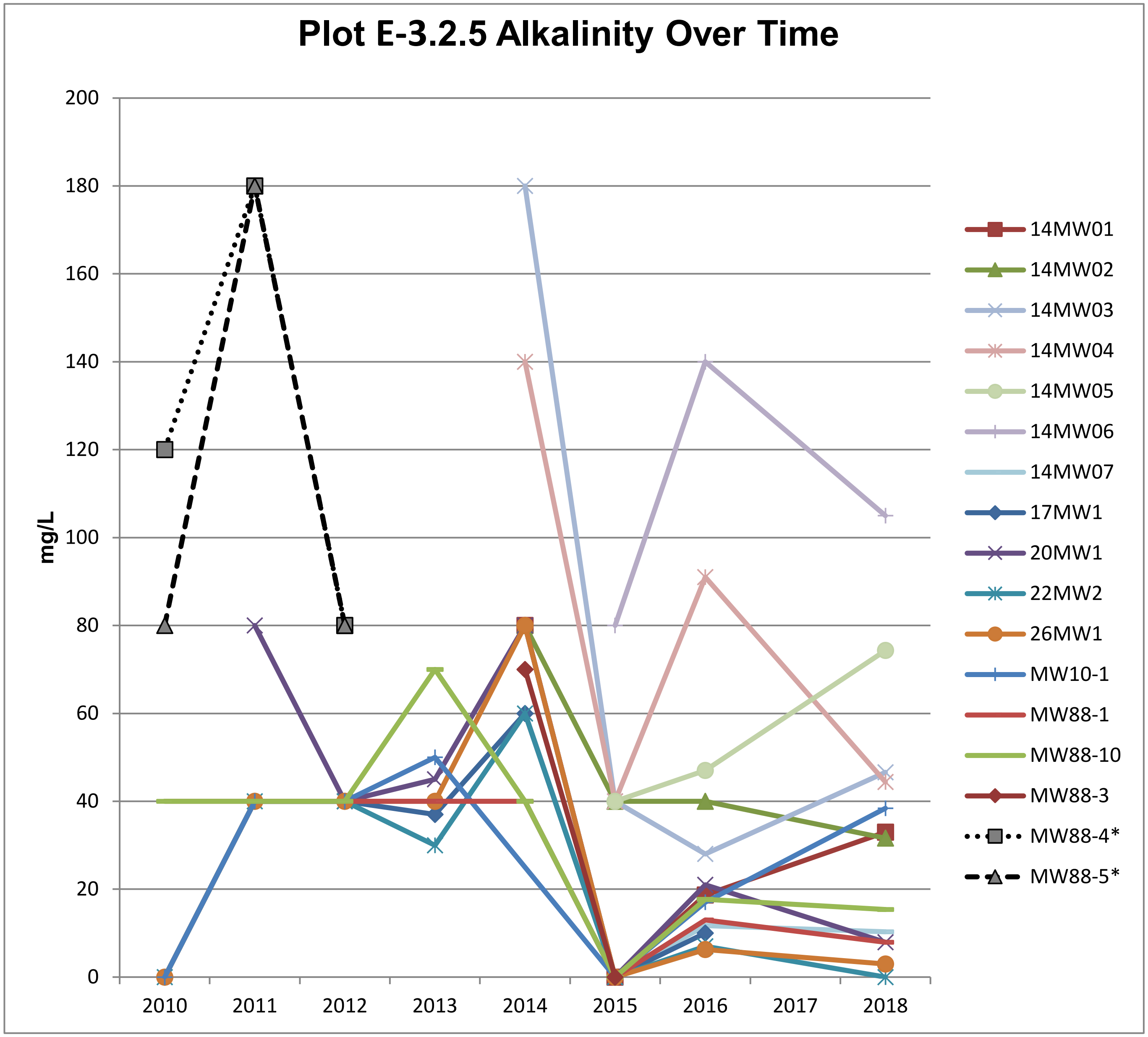
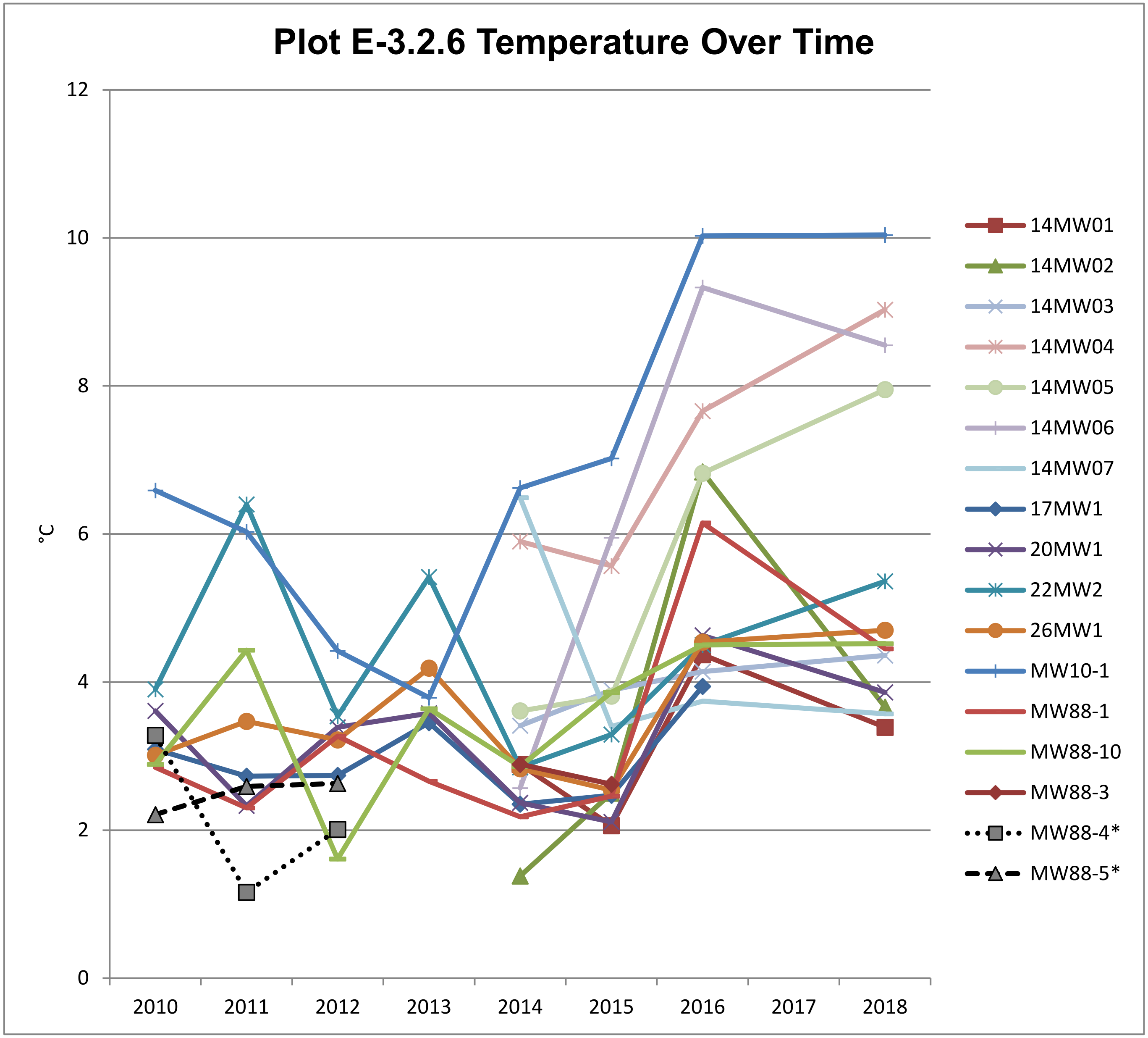


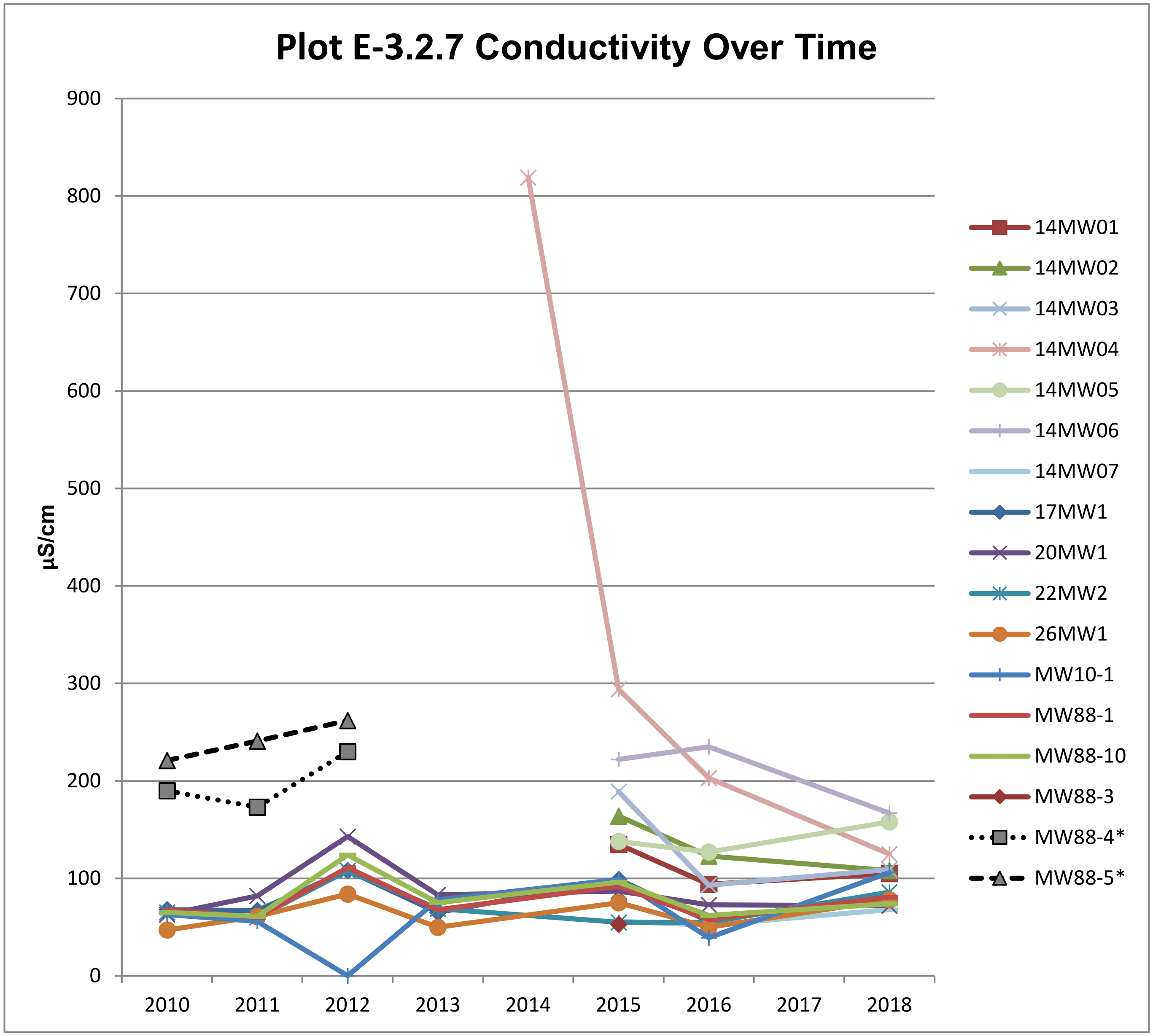
mg/L = milligram per liter

* = monitoring well no longer part of monitoring well network



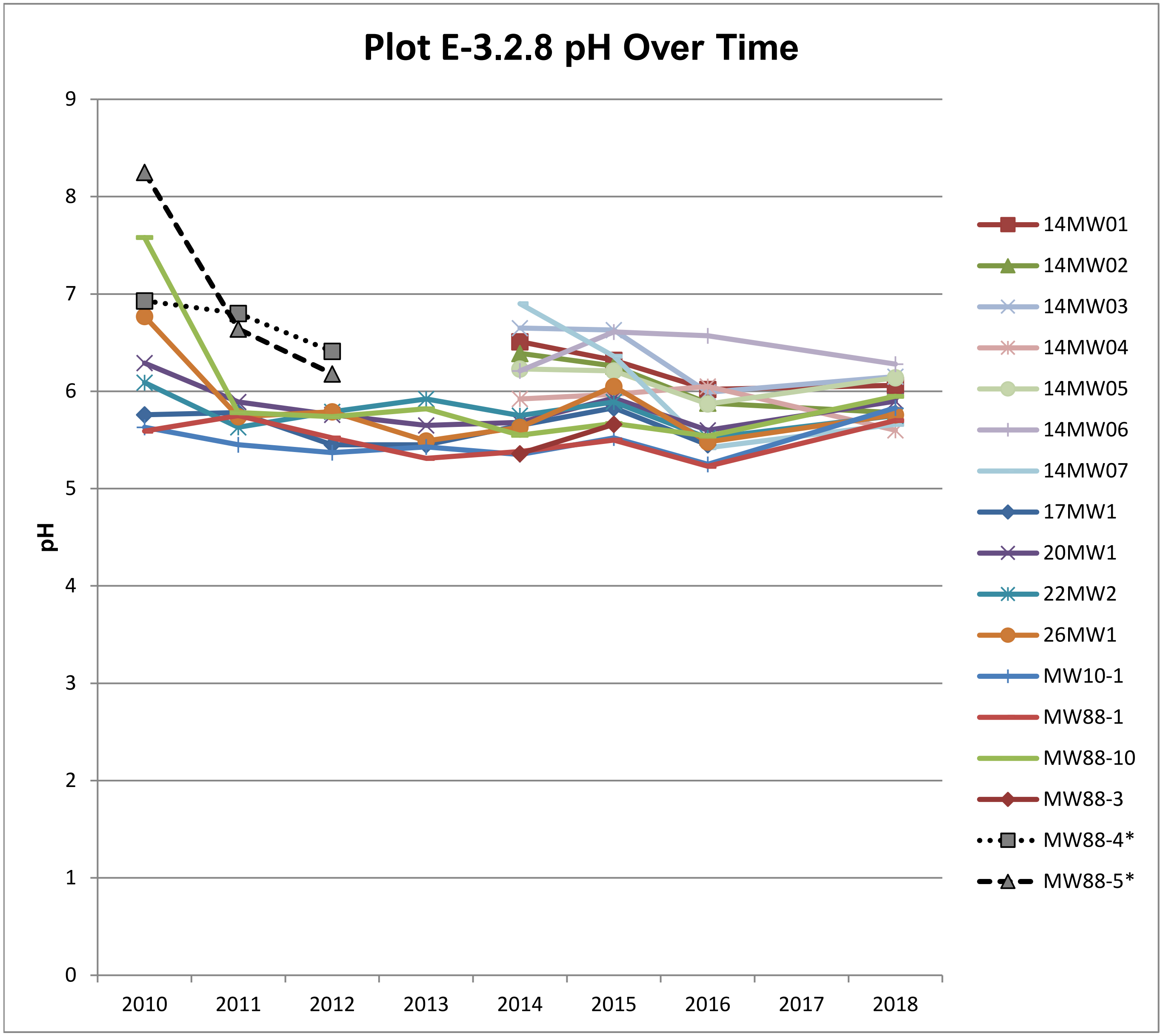
°C = Degrees Celsius

* = monitoring well no longer part of monitoring well network

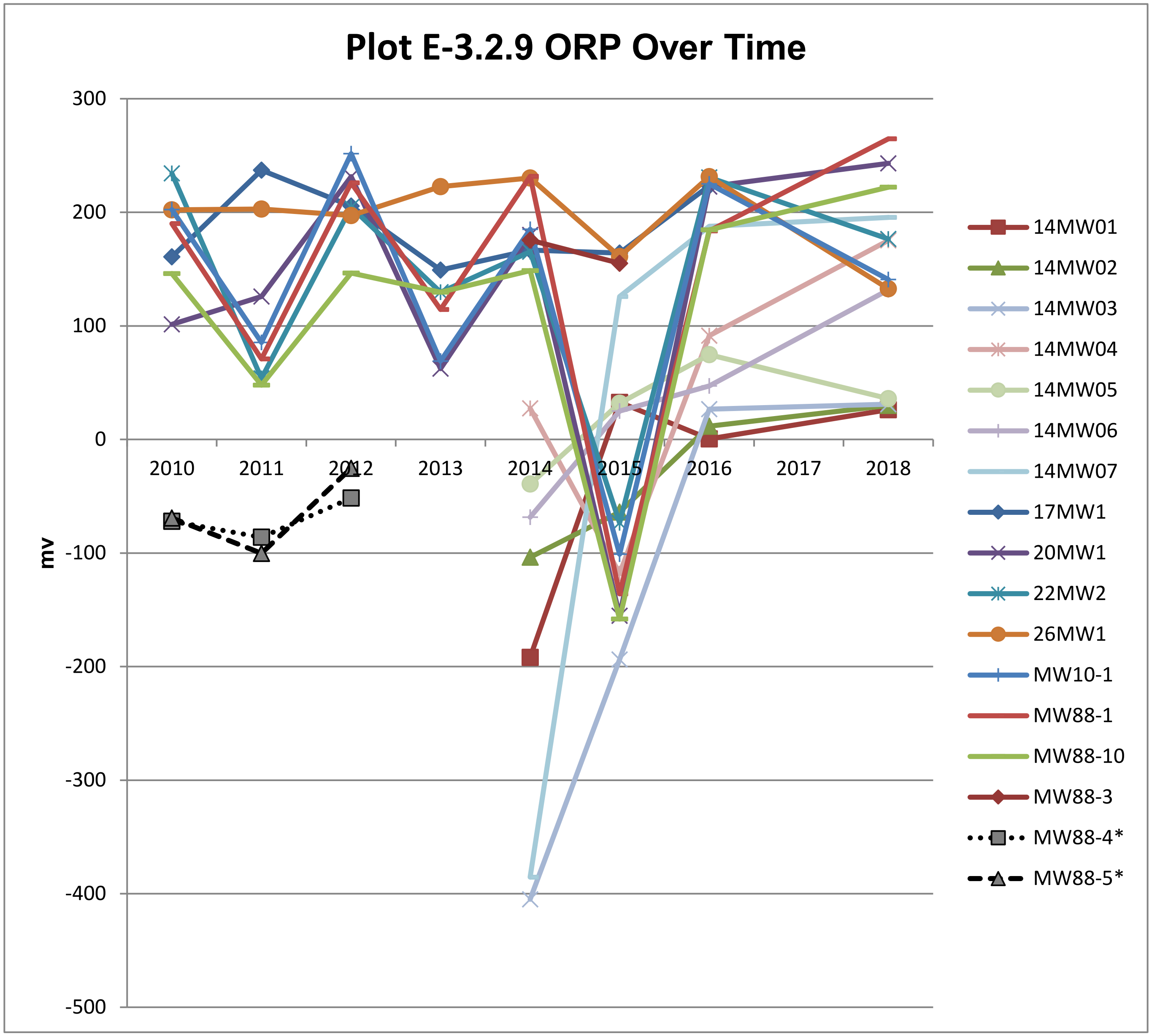


µS/cm = microsiemen per centimeter

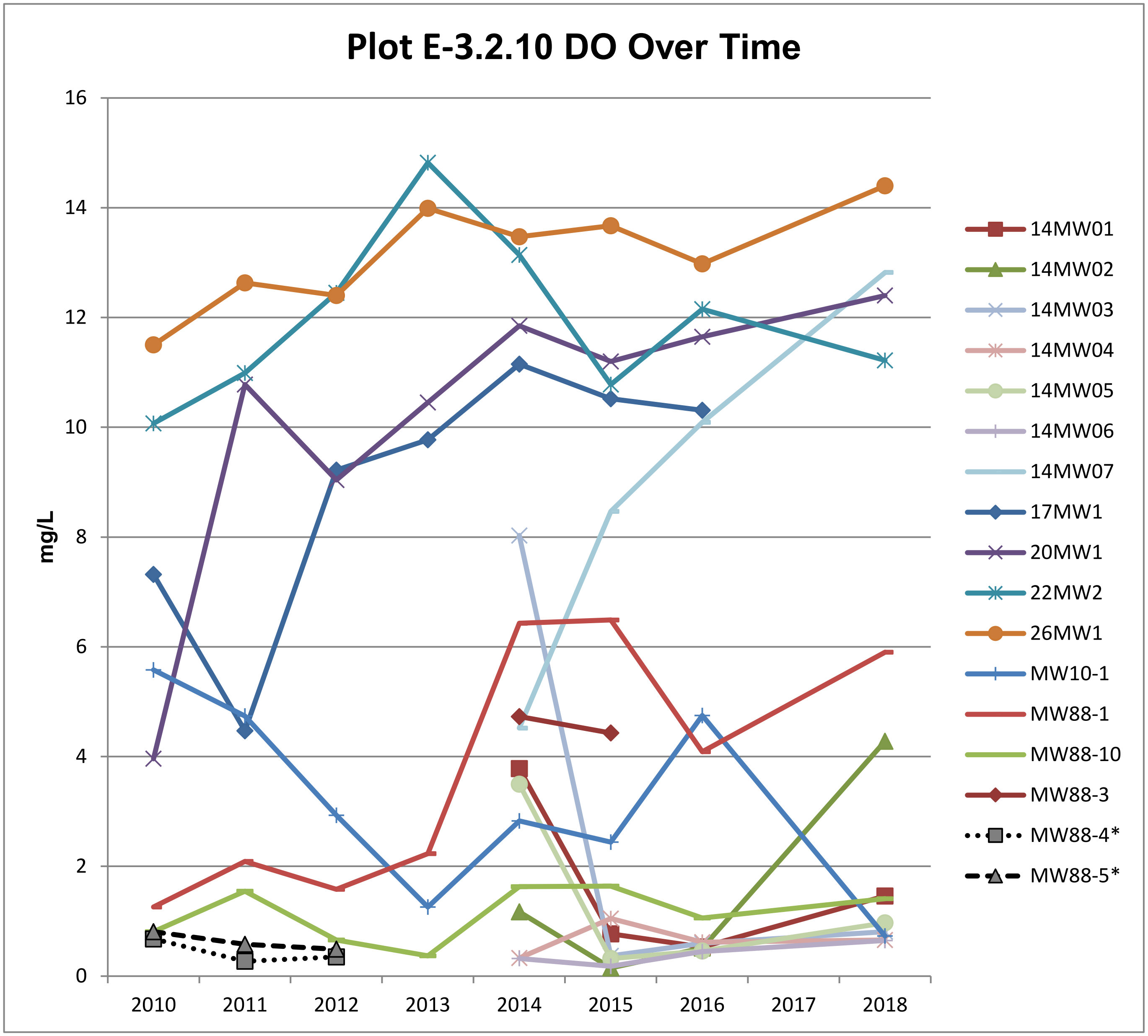
* = monitoring well no longer part of monitoring well network



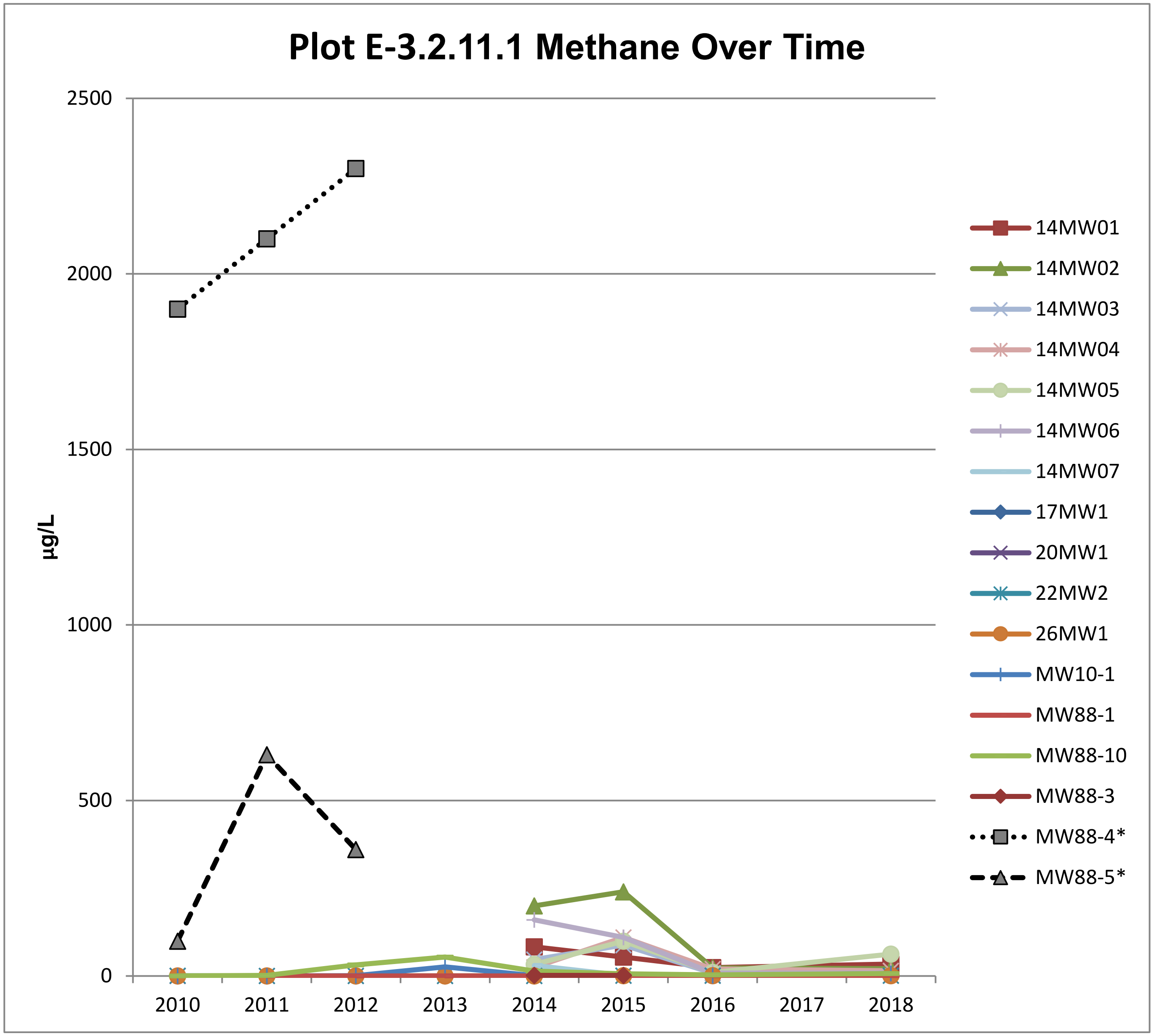
* = monitoring well no longer part of monitoring well network



ORP = oxidation-reduction potential
mV = millivolt
* = monitoring well no longer part of monitoring well network

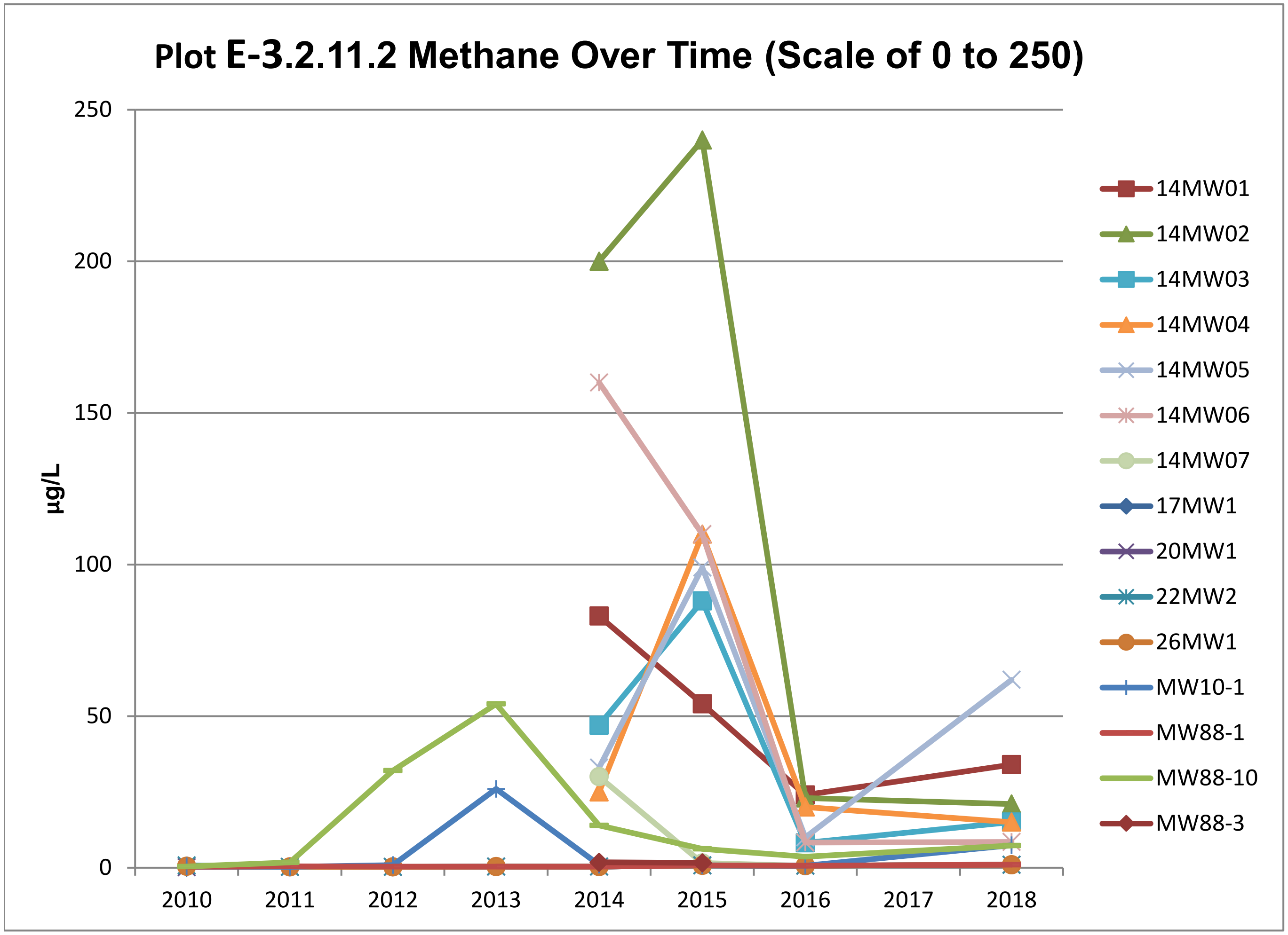


DO = dissolved oxygen
mg/L = milligram per liter
* = monitoring well no longer part of monitoring well network



µg/L microgram per liter

* = monitoring well no longer part of monitoring well network



µg/L microgram per liter

* = monitoring well no longer part of monitoring well network

EXHIBIT E-3.3

Results Above SSCLs and 2016 ADEC Criteria

2018 MNA Groundwater Annual Sampling Report at the Northeast Cape MOC

Table E-3.3 COCs and Analytes in Groundwater Above SSCLs and 2018 ADEC Method Two Table C Groundwater Cleanup Levels

Well	Year	GRO	DRO	RRO	Benzene	Arsenic-Total	Arsenic-Dissolved	Lead-Total	Lead-Dissolved	Naphthalene	1-Methylnaphthalene	2-Methylnaphthalene
	SSCL	1.3 mg/L	1.5 mg/L	1.1 mg/L	0.005 mg/L	0.01 mg/L	0.01 mg/L	0.015 mg/L	0.015 mg/L			
	2018 ADEC [1]	*2.2 mg/L*	*1.5 mg/L*	*1.1 mg/L*	*0.0046 mg/L*	*0.00052 mg/L*	*0.00052 mg/L*	*0.015 mg/L*	*0.015 mg/L*	*0.0017 mg/L*	*0.011 mg/L*	*0.036 mg/L*
14MW01	2014	0.046 J,B	0.51 B	0.067 J	ND (0.0004)	***0.0061***	***0.0041 J***	0.011	0.00056 J	***0.0025***	0.0015	0.0007
14MW01	2015	0.026 J	0.51	ND (0.071)	ND (0.001)	***0.0042 J***	***0.0040 J***	0.00021 J	ND (0.0005)	0.0018	0.0027	ND (0.00001)
14MW01	2016	0.065 J	0.92	0.12 J,B	ND (0.0001)	***0.0046***	***0.00439***	0.00153	0.000159	***0.0075***	0.0083	0.0042
14MW01	2018	--	***1.8***	ND (0.2) QL	ND (0.0003) QN	***0.0039 J***	***0.0042 J***	0.0006 J,B,QN	0.00022 J,B,QN	***0.023 QN***	***0.022***	0.025
14MW01	2018	--	***2***	ND (0.2)	ND (0.0003)	***0.0038 J***	***0.0044 J***	0.0005 J,B,QN	0.00086 J,B,QN	***0.022 QN***	***0.022***	0.024
14MW02	2014	0.28	1.2	0.092 J	0.00014 J	***0.0058***	***0.0043 J***	0.0054	ND (0.00025)	0.000007	***0.016***	0.0046
14MW02	2014	0.27	1.3	0.094 J	ND (0.0004)	***0.0056***	***0.0046 J***	0.006	ND (0.00025)	***0.007***	***0.016***	0.0041
14MW02	2015	0.18	***1.6***	0.13	ND (0.001)	***0.0056***	***0.0056***	0.0010 J	ND (0.00050)	***0.005***	0.004	0.00059
14MW02	2016	0.14	***1.6***	0.18 J	ND (0.0001)	***0.00244***	***0.00241***	0.000496	0.000054 QN	***0.0037***	0.0035	0.00074
14MW02	2016	0.14	1.5	0.17 J	ND (0.0001)	***0.00235***	***0.00237***	0.00045	0.000083 QN	***0.0038***	0.0036	0.00075
14MW02	2018	--	***2.8***	ND (0.2)	ND (0.0003)	***0.0017 J***	***0.0018 J***	0.00074 J,B	ND (0.0004)	***0.029***	***0.03***	***0.041***
14MW03	2014	0.19	***2.4***	0.21	0.001	***0.0055***	*ND (0.004)*	***0.062***	ND (0.00025)	***0.029***	***0.019***	0.019
14MW03	2015	0.12	1.3	0.41 J	ND (0.001)	***0.0034 J***	***0.0024 J***	0.015	0.00049 J	0.00062	ND (0.0000053)	ND (0.000011)
14MW03	2016	0.075 J	0.99 QL	0.16 J,QL	ND (0.0001)	***0.00194***	***0.00186***	0.00318	0.00126	0.00072	0.000056	0.000015
14MW03	2018	--	1.3	ND (0.2)	ND (0.0003)	***0.0022 J***	***0.0019 J***	0.0023 J	ND (0.0004)	***0.0023 QN***	0.0007	0.00035
14MW04	2014	0.051 B	***2.5***	0.54	ND (0.0004)	*ND (0.004)*	*ND (0.004)*	0.0064	0.0014 J	0.0014	0.00028	0.00023
14MW04	2015	ND (0.044)	***1.6 QLQN***	0.18 QLQN	ND (0.001)	***0.0024 J***	***0.0014 J***	0.0063	0.00050 J	ND (0.00001)	0.00057 QN	0.00029
14MW04	2015	ND (0.044)	***2.8 QN***	0.37 QN	ND (0.001)	***0.0022 J***	***0.0014 J***	0.0064	0.00033 J	ND (0.00001)	0.0009 QN	0.00027
14MW04	2016	0.011 J	***2.2 QL***	0.61 QL	0.00013 J,QH	***0.00524***	***0.00387***	***0.0582***	***0.0349***	0.000022	0.00003	ND (0.000005)
14MW04	2018	--	***1.8***	ND (0.2)	0.00018 J	***0.00054 J***	***0.00033 J***	0.00095 J,B	ND (0.0004)	***0.0018***	0.00033	0.00011 J
14MW05	2014	0.36	***4.9***	0.55	ND (0.0004)	***0.0042 J***	*ND (0.004)*	0.01	0.00029 J	***0.093***	***0.077***	***0.055***
14MW05	2015	0.13	***12***	0.48	ND (0.001)	***0.0031 J***	***0.0028 J***	0.012	0.003	0.013 QN	***0.019 QN***	0.0025
14MW05	2015	0.11	***11***	0.51	ND (0.001)	***0.0032 J***	***0.0026 J***	0.013	0.0023	0.0059 QN	***0.013 QN***	ND (0.000011)
14MW05	2016	0.072 J	***3.2 QL***	0.61 QL	ND (0.0001)	***0.00207***	***0.00194***	0.00165	0.000252	0.00072	0.00012	0.000029
14MW05	2018	--	***3.1***	ND (0.2)	ND (0.0003)	***0.0029 J***	***0.0028 J***	0.0023 J	0.00021 J,B	0.0093	0.0062	0.0014
14MW06	2014	0.22	***5.2 QL***	0.28	0.00070 J	***0.0068***	***0.0062***	0.0027	ND (0.00025)	***0.033***	***0.024***	0.016
14MW06	2015	0.040 J	***2.3***	0.27	ND (0.001)	***0.0026 J***	***0.0024 J***	0.00064 J	ND (0.00050)	ND (0.00001)	0.00051	ND (0.00001)
14MW06	2016	0.011 J	1.4 QL	0.55 QL	ND (0.0001)	***0.00203***	***0.00203***	0.000861	0.000649 QN	0.00006 QN	ND (0.000005)	ND (0.000005)
14MW06	2016	0.011 J	1.4 QL	0.47 QL	ND (0.0001)	***0.00197***	***0.00197***	0.000817	0.000208 QN	0.000033 QN	ND (0.000005)	ND (0.000005)
14MW06	2018	--	1.5	ND (0.2)	ND (0.0003)	***0.00089 J***	***0.00098 J***	0.00058 J,B,QL	ND (0.0004) J,B	ND (0.0001)	ND (0.0001)	ND (0.0001)
14MW07	2014	0.026 J,B	0.15 B	0.043 J	0.00072 J	***0.0092***	*ND (0.004)*	***0.13***	0.0015 J	0.000011 J	0.0000089 J	ND (0.000015)
14MW07	2015	ND (0.044)	ND (0.10 QN)	ND (0.073)	ND (0.001)	*ND (0.0040)*	*ND (0.0040)*	0.00069 J	0.00069 J	ND (0.000011)	ND (0.0000055)	ND (0.000011)
14MW07	2016	ND (0.025)	0.12 J,B,QL	0.093 J,B,QL	ND (0.0001)	ND (0.00025)	ND (0.00025)	0.000338	0.000052	0.0000061 J	ND (0.000005)	ND (0.000005)
14MW07	2018	--	ND (0.05)	ND (0.2)	ND (0.0003)	*ND (0.001)*	*ND (0.001)*	0.00043 J,B	0.00035 J,B	ND (0.0001) QN	ND (0.0001)	ND (0.0001)
17MW1	2004	ND (0.090)	ND (0.337 B)	ND (0.562 B)	ND (0.0004)	--	--	0.00708	--	--	--	--
17MW1	2010	ND (0.05) B	ND (0.057)	ND (0.057)	ND (0.00015)	--	--	--	--	--	ND (0.000011)	ND (0.000028)
17MW1	2011	0.015 J,B	0.037 J	0.056 J	ND (0.00045)	*ND (0.0038)*	*ND (0.0038)*	0.00019 J	0.0003 J	ND (0.000072)	ND (0.000072)	ND (0.000072)
17MW1	2012	ND (0.044)	0.036 J	0.039 J	ND (0.00045)	*ND (0.004)*	*ND (0.004)*	0.00028 J	ND (0.00025)	ND (0.000072)	ND (0.000072)	ND (0.000072)
17MW1	2013	0.018 J	0.038 J	0.045 J	ND (0.00045)	*ND (0.004)*	*ND (0.004)*	ND (0.00025)	ND (0.00025)	ND (0.00003)	ND (0.00003)	ND (0.00003)
17MW1	2014	ND (0.044)	0.021 J	ND (0.049)	ND (0.0004)	*ND (0.004)*	*ND (0.004)*	ND (0.00025)	ND (0.00025)	ND (0.000016)	ND (0.000015)	ND (0.000015)
17MW1	2015	ND (0.044)	ND (0.10 QN)	ND (0.071)	ND (0.001)	*ND (0.0040)*	*ND (0.0040)*	0.00021 J	ND (0.00050)	ND (0.00001)	ND (0.0000051)	ND (0.00001)
17MW1	2016	ND (0.025)	0.092 J,B,QL	0.13 J,B,QL	ND (0.0001)	ND (0.00025)	ND (0.00025)	0.00025	0.000045	0.0000076 J	ND (0.000005)	ND (0.000005)
17MW1	2018	--	ND (0.05)	ND (0.2)	ND (0.0003)	*ND (0.001)*	*ND (0.001)*	0.00051 J,B	ND (0.0004)	ND (0.0001) QN	ND (0.0001)	ND (0.0001)
20MW1	2004	0.0194 J	ND (0.333 B)	ND (0.568 B)	ND (0.0004)	--	--	***0.0517***	--	--	--	--
20MW1	2010	ND (0.05) B	0.024 J	0.03 JM	ND (0.00015)	--	--	--	--	--	ND (0.000012)	ND (0.000029)
20MW1	2011	0.017 J,B	0.036 J	0.081 J	ND (0.00045)	*ND (0.0038)*	*ND (0.0038)*	0.00045 J	ND (0.00035)	ND (0.000072)	ND (0.000072)	ND (0.000072)
20MW1	2012	ND (0.044)	0.040 J	0.046 J	ND (0.00045)	*ND (0.004)*	*ND (0.004)*	ND (0.00025)	ND (0.00025)	ND (0.000072)	ND (0.000072)	ND (0.000072)
20MW1	2013	ND (0.044)	0.032 J	ND (0.048)	ND (0.00045)	*ND (0.004)*	*ND (0.004)*	ND (0.00025)	ND (0.00025)	ND (0.00003)	ND (0.00003)	ND (0.00003)
20MW1	2014	ND (0.044)	0.023 J	ND (0.052)	ND (0.0004)	*ND (0.004)*	*ND (0.004)*	0.00045 J	ND (0.00025)	ND (0.000016)	ND (0.000015)	ND (0.000015)
20MW1	2015	ND (0.044)	ND (0.10 QN)	ND (0.071)	ND (0.001)	***0.0014 J***	*ND (0.0040)*	0.0057	ND (0.00050)	ND (0.00001)	ND (0.0000052)	ND (0.00001)

2018 MNA Groundwater Annual Sampling Report at the Northeast Cape MOC

Table E-3.3 COCs and Analytes in Groundwater Above SSCLs and 2018 ADEC Method Two Table C Groundwater Cleanup Levels

Well	Year	GRO	DRO	RRO	Benzene	Arsenic-Total	Arsenic-Dissolved	Lead-Total	Lead-Dissolved	Naphthalene	1-Methylnaphthalene	2-Methylnaphthalene
	SSCL	1.3 mg/L	1.5 mg/L	1.1 mg/L	0.005 mg/L	0.01 mg/L	0.01 mg/L	0.015 mg/L	0.015 mg/L			
	2018 ADEC [1]	*2.2 mg/L*	*1.5 mg/L*	*1.1 mg/L*	*0.0046 mg/L*	*0.00052 mg/L*	*0.00052 mg/L*	*0.015 mg/L*	*0.015 mg/L*	*0.0017 mg/L*	*0.011 mg/L*	*0.036 mg/L*
20MW1	2016	ND (0.025)	0.09 J,B,QL	0.13 J,B,QL	ND (0.0001)	ND (0.00025)	ND (0.00025)	0.000866	0.000248	0.0000054 J	ND (0.000005)	ND (0.000005)
20MW1	2018	--	0.15 QL	ND (0.2)	ND (0.0003)	*ND (0.001)*	*ND (0.001)*	0.0036	0.0016 J	ND (0.0001) QN	ND (0.0001)	ND (0.0001)
22MW2	2010	ND (0.044)	ND (0.094)	0.027 J	ND (0.00015)	--	--	--	--	--	ND (0.000011)	ND (0.000029)
22MW2	2011	0.021	0.023	0.052 J	ND (0.00045)	*ND (0.0038)*	*ND (0.0038)*	0.0003 J	0.00017 J	ND (0.000073)	ND (0.000073)	ND (0.000073)
22MW2	2012	ND (0.044)	0.047 J	0.042 J	ND (0.00045)	*ND (0.004)*	*ND (0.004)*	ND (0.00025)	ND (0.00025)	ND (0.000072)	ND (0.000072)	ND (0.000072)
22MW2	2013	ND (0.044)	0.025 J	ND (0.047)	ND (0.00045)	*ND (0.004)*	*ND (0.004)*	ND (0.00025)	ND (0.00025)	ND (0.00003)	ND (0.00003)	ND (0.00003)
22MW2	2014	0.017 J,B	ND (0.049)	ND (0.049)	ND (0.0004)	*ND (0.004)*	*ND (0.004)*	ND (0.00025)	ND (0.00025)	ND (0.000016)	ND (0.000014)	ND (0.000014)
22MW2	2015	ND (0.044)	ND (0.10 QN)	ND (0.074)	ND (0.001)	*ND (0.0040)*	*ND (0.0040)*	0.00066 J	ND (0.00050)	ND (0.000012)	ND (0.0000058)	ND (0.000012)
22MW2	2016	ND (0.025)	0.1 J,B,QL	0.36 J,QL	ND (0.0001)	ND (0.00025)	ND (0.00025)	0.000085	0.000026	ND (0.0000051)	ND (0.0000051)	ND (0.0000051)
22MW2	2018	--	ND (0.05)	ND (0.2)	ND (0.0003)	*ND (0.001)*	*ND (0.001)*	0.0029 J,QN	0.00032 J,B	ND (0.0001) QN	ND (0.0001)	ND (0.0001)
22MW2	2018	--	0.13 QN	0.12 J,QN	ND (0.0003)	*ND (0.001)*	*ND (0.001)*	0.0017 J,QN	ND (0.0004) J,B	ND (0.0001) QN	ND (0.0001)	ND (0.0001)
26MW1	2004	0.0166 J	0.078 J	0.249 J	ND (0.0004)	--	--	--	--	ND (0.0000562)	--	--
26MW1	2004	--	--	--	--	--	--	--	--	ND (0.0000543)	--	--
26MW1	2004	--	--	--	--	--	--	--	--	ND (0.000111)	--	--
26MW1	2010	ND (0.044)	ND (0.057)	ND (0.057)	ND (0.00015)	--	--	--	--	--	ND (0.000012)	ND (0.000029)
26MW1	2011	ND (0.044)	0.083	0.073 J	ND (0.00045)	*ND (0.0038)*	*ND (0.0038)*	0.0006 J	ND (0.00035)	ND (0.000073)	ND (0.000073)	ND (0.000073)
26MW1	2012	ND (0.044)	0.029 J	0.030 J	ND (0.00045)	*ND (0.004)*	*ND (0.004)*	0.00019 J	ND (0.00025)	ND (0.000071)	ND (0.000071)	ND (0.000071)
26MW1	2013	ND (0.044)	0.029 J	ND (0.047)	ND (0.00045)	*ND (0.004)*	*ND (0.004)*	ND (0.00025)	*ND (0.015 B)*	ND (0.00003)	ND (0.00003)	ND (0.00003)
26MW1	2014	ND (0.044)	ND (0.050)	ND (0.050)	ND (0.0004)	*ND (0.004)*	*ND (0.004)*	ND (0.00025)	ND (0.00025)	ND (0.000016)	ND (0.000016)	ND (0.000016)
26MW1	2015	ND (0.044)	ND (0.10 QN)	ND (0.072)	ND (0.001)	*ND (0.0040)*	*ND (0.0040)*	ND (0.00050)	ND (0.00050)	ND (0.00001)	ND (0.0000051)	ND (0.00001)
26MW1	2016	ND (0.025)	0.11 J,B,QL	0.79 QL	ND (0.0001)	ND (0.00025)	ND (0.00025)	0.000474	0.000025	0.0000045 J	ND (0.000005)	ND (0.000005)
26MW1	2018	--	ND (0.05)	ND (0.2)	ND (0.0003)	*ND (0.001)*	*ND (0.001)*	0.00033 J,B	0.00022 J,B	ND (0.0001) QN	ND (0.0001)	ND (0.0001)
MW10-1	2004	ND (0.090)	ND (0.333 B)	ND (0.556 B)	ND (0.0004)	--	--	0.00457	--	--	--	--
MW10-1	2010	ND (0.044)	0.68	0.43	ND (0.00015)	--	--	--	--	--	ND (0.000011)	ND (0.000028)
MW10-1	2011	0.017 J	0.46	0.59	ND (0.00045)	*ND (0.0038)*	*ND (0.0038)*	0.00086 J	0.00038 J	ND (0.000071)	ND (0.000071)	ND (0.000071)
MW10-1	2012	ND (0.044)	0.64	0.28	ND (0.00045)	*ND (0.004)*	*ND (0.004)*	ND (0.00025)	ND (0.00025)	ND (0.000071)	ND (0.000071)	ND (0.000071)
MW10-1	2013	ND (0.044)	0.4	0.17	ND (0.00045)	*ND (0.004)*	*ND (0.004)*	*ND (0.015 B)*	*ND (0.015 B)*	ND (0.00003)	ND (0.00003)	ND (0.00003)
MW10-1	2014	ND (0.044)	0.8	0.37	ND (0.0004)	*ND (0.004)*	*ND (0.004)*	0.0011 J	ND (0.00025)	0.000016 J	0.000014 J	0.000012 J
MW10-1	2015	ND (0.044)	0.39	0.14	ND (0.001)	***0.0014 J***	*ND (0.0040)*	0.004	0.00028 J	ND (0.00001)	ND (0.0000052)	ND (0.00001)
MW10-1	2016	ND (0.025)	0.49 J, QL	0.32 J, QL	ND (0.0001)	ND (0.00025)	ND (0.00025)	0.000558	0.000042	0.0000046 J	0.0000048	0.0000049
MW10-1	2018	--	1	0.58	ND (0.0003)	***0.00054 J***	0.0004 J	0.0023 J	0.0012 J,B,QN	ND (0.0001) QN	ND (0.0001)	ND (0.0001)
MW10-1	2018	--	0.98	0.56	ND (0.0003)	***0.00065 J***	0.00034 J	0.0023 J	0.00084 J,B,QN	ND (0.0001) QN	ND (0.0001)	ND (0.0001)
MW88-1	2002	0.024 V,J	1.2	0.43	0.00058	--	--	--	--	--	--	--
MW88-1	2004	0.0141 J	ND (0.345 B)	0.168 J	ND (0.0004)	--	--	ND (0.004)	--	--	--	--
MW88-1	2010	ND (0.02) B	0.75	0.037 J,M	ND (0.00015)	--	--	--	--	--	ND (0.000012)	ND (0.000029 J)
MW88-1	2011	ND (0.044)	0.74	0.54	ND (0.00045)	*ND (0.0038)*	***ND (0.0038)***	0.0016 J	0.00035 J	ND (0.000072)	ND (0.000072)	ND (0.000072)
MW88-1	2012	ND (0.044)	***1.9***	0.15	ND (0.00045)	*ND (0.004)*	*ND (0.004)*	0.00041 J	ND (0.00025)	ND (0.000071)	0.000054 J	0.000043 J
MW88-1	2013	ND (0.044)	0.22	0.05 J	ND (0.00045)	*ND (0.004)*	*ND (0.004)*	ND (0.00025)	ND (0.00025)	0.000019 J	ND (0.00003)	ND (0.00003)
MW88-1	2014	ND (0.044)	0.26	0.049 J	ND (0.0004)	*ND (0.004)*	*ND (0.004)*	0.0027	0.00025 J	ND (0.000016)	0.000012 J	ND (0.000015)
MW88-1	2014	ND (0.044)	0.21	0.043 J	ND (0.0004)	*ND (0.004)*	*ND (0.004)*	0.003	0.00023 J	ND (0.000016)	ND (0.000015)	ND (0.000015)
MW88-1	2015	ND (0.044)	0.1 B	ND (0.071)	ND (0.001)	*ND (0.0040)*	*ND (0.0040)*	ND (0.00050)	ND (0.00050)	ND (0.000011)	ND (0.0000053)	ND (0.000011)
MW88-1	2016	ND (0.025)	0.52 J, QL	0.23 J, QL	ND (0.0001)	ND (0.00025)	ND (0.00025)	0.000301	0.000075	0.0000071 J	ND (0.000005)	ND (0.000005)
MW88-1	2018	--	0.42	ND (0.2)	ND (0.0003)	*ND (0.001)*	*ND (0.001)*	0.0024 J	0.00064 J,B	ND (0.0001) QN	ND (0.0001)	ND (0.0001)
MW88-10	2002	0.12	***55***	***1.3***	0.0027	--	--	--	--	--	--	--
MW88-10	2004	0.0357 J	1.38	ND (0.549 B)	ND (0.0004)	--	--	***0.0376***	--	--	--	--
MW88-10	2010	ND (0.044)	***1.6***	0.036 J	ND (0.00015)	--	--	0.00222 J	--	--	0.00023	0.000055 J
MW88-10	2011	ND (0.044)	0.54	0.15	ND (0.00045)	*ND (0.0038)*	*ND (0.0038)*	0.00083 J	0.00021 J	ND (0.000074)	ND (0.000074)	ND (0.000074)
MW88-10	2012	ND (0.044)	0.5	0.064 J	ND (0.00045)	*ND (0.004)*	*ND (0.004)*	0.00076 J	0.00022 J	0.00033	0.0001	ND (0.000072)
MW88-10	2013	ND (0.05 B)	0.97	0.042 J	ND (0.00045)	*ND (0.004)*	*ND (0.004)*	*ND (0.015 B)*	*ND (0.015 B)*	0.00074	0.00042 QN	0.000092
MW88-10	2013	ND (0.05 B)	0.94	0.043 J	ND (0.00045)	*ND (0.004)*	*ND (0.004)*	*ND (0.015 B)*	ND (0.00025)	0.00084	0.0006 QN	0.00011

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Table E-3.3 COCs and Analytes in Groundwater Above SSCLs and 2018 ADEC Method Two Table C Groundwater Cleanup Levels

Well	Year	GRO	DRO	RRO	Benzene	Arsenic-Total	Arsenic-Dissolved	Lead-Total	Lead-Dissolved	Naphthalene	1-Methylnaphthalene	2-Methylnaphthalene
	SSCL	**1.3 mg/L**	**1.5 mg/L**	**1.1 mg/L**	**0.005 mg/L**	**0.01 mg/L**	**0.01 mg/L**	**0.015 mg/L**	**0.015 mg/L**			
	2018 ADEC [1]	***2.2 mg/L***	***1.5 mg/L***	***1.1 mg/L***	***0.0046 mg/L***	***0.00052 mg/L***	***0.00052 mg/L***	***0.015 mg/L***	***0.015 mg/L***	***0.0017 mg/L***	***0.011 mg/L***	***0.036 mg/L***
MW88-10	**2014**	0.021 J,B	0.66	0.041 J	ND (0.0004)	*ND (0.004)*	*ND (0.004)*	0.0011 J	0.0020 J	0.000044	ND (0.000015)	ND (0.000015)
MW88-10	**2015**	ND (0.044)	0.43	ND (0.071)	ND (0.001)	*ND (0.0040)*	*ND (0.0040)*	0.00069 J	0.00026 J	ND (0.00001)	ND (0.0000052)	ND (0.00001)
MW88-10	**2016**	ND (0.025)	0.3 J, QL	0.16 J, QL	ND (0.0001)	0.00022 J	0.00023 J	0.00143	0.000227	0.0000088 J	ND (0.000005)	ND (0.000005)
MW88-10	**2018**	--	0.54	ND (0.2)	ND (0.0003)	*ND (0.001)*	*ND (0.001)*	0.00031 J,B	0.0017 J	ND (0.0001) QN	ND (0.0001)	ND (0.0001)
MW88-3	**2002**	0.42	***34***	0.22	0.00057	--	--	--	--	--	--	--
MW88-3	**2004**	0.104	0.768	ND (0.549 B)	ND (0.0004)	--	--	ND (0.004)	--	--	--	--
MW88-3	**2014**	0.018 J,B	0.46	0.030 J	ND (0.0004)	*ND (0.004)*	*ND (0.004)*	0.0010 J	ND (0.00025)	0.000019 J	***0.058***	0.000019 J
MW88-3	**2015**	ND (0.044)	0.38	ND (0.073)	ND (0.001)	*ND (0.0040)*	*ND (0.0040)*	0.00019 J	0.0031	ND (0.00001)	ND (0.0000051)	ND (0.00001)
MW88-3	**2016**	ND (0.025)	0.49 J, QL	0.15 J, QL	ND (0.0001)	ND (0.00025)	ND (0.00025)	0.000383	0.000158	0.000035	0.000012	0.0000058
MW88-3	**2018**	--	0.85	ND (0.2)	ND (0.0003)	*ND (0.001)*	*ND (0.001)*	0.0046	0.00034 J,B	ND (0.0001)	ND (0.0001)	ND (0.0001)
MW88-4*	**2002**	1.2	***72***	***1.9***	***0.03***	--	--	--	--	--	--	--
MW88-4*	**2002**	1.2	***56***	***1.3***	***0.03***	--	--	--	--	--	--	--
MW88-4*	**2004**	0.917	***3.82 J***	***1.46 B***	***0.0276***	--	--	0.00502	--	--	--	--
MW88-4*	**2004**	1.09 J	***3.49***	***1.11 B***	***0.0337***	--	--	0.00409 B	--	--	--	--
MW88-4*	**2004**	1.25	***3.89***	ND (0.750 B)	***0.03***	--	--	0.00423 B	--	--	--	--
MW88-4*	**2010**	0.23	***3.2***	0.38 M	0.0022	--	--	0.0025 J	--	--	***0.015***	0.013
MW88-4*	**2010**	0.24	***3.3***	0.43 M	0.0024	--	--	0.00266	--	--	***0.015***	0.011
MW88-4*	**2011**	0.4	***2.3***	0.55	***0.0094***	***0.01***	***0.011***	0.0013 J	0.00032 J	***0.075***	***0.025***	0.027
MW88-4*	**2012**	0.31	***2***	0.24	***0.0048***	***0.011***	***0.0038 J***	0.0019 J	ND (0.00025)	***0.089 D***	***0.031***	0.03
MW88-4*	**2012**	0.3	***1.8***	0.21	0.0042	***0.011***	***0.011***	ND (0.00025)	0.0019 J	***0.085 D***	***0.029***	0.029
MW88-5*	**2002**	1.3	***9.8***	***2.3***	***0.019***	--	--	--	--	--	--	--
MW88-5*	**2004**	**1.5 J**	***11.3***	***2.28 B***	***0.0297***	--	--	0.012	--	--	--	--
MW88-5*	**2010**	0.19	***12***	***1.6***	***0.0093***	--	--	0.004 J	--	--	0.00098	0.0003
MW88-5*	**2011**	0.23	***7.5***	***2***	***0.016***	***0.0058***	***0.0049 J***	0.0019 J	0000046 J	0.00084	ND (0.000071)	ND (0.000071)
MW88-5*	**2011**	0.25	***7.2***	***1.8***	***0.02***	***0.0057***	***0.0052***	0.0019 J	0.00049 J	0.00078	ND (0.000071)	ND (0.000071)
MW88-5*	**2012**	0.16	***4.6***	0.58	***0.0064***	***0.007***	***0.0055***	0.0021	0.00023 J	***0.029***	***0.023***	0.018

Notes:

* = Monitoring well not currently installed and sampled.

-- = Not Sampled

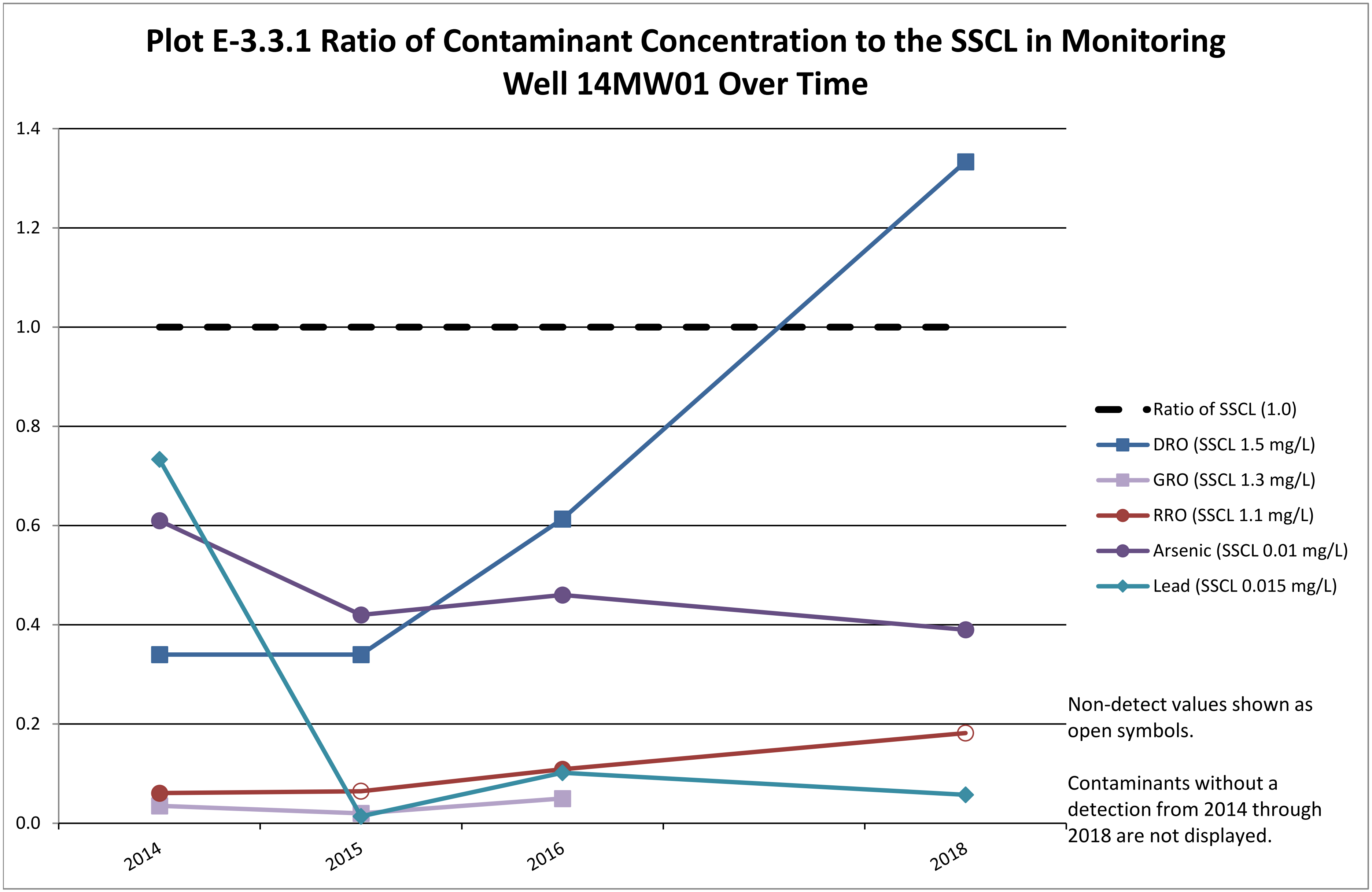
[1] 2018 ADEC Method Two Table C groundwater cleanup level.

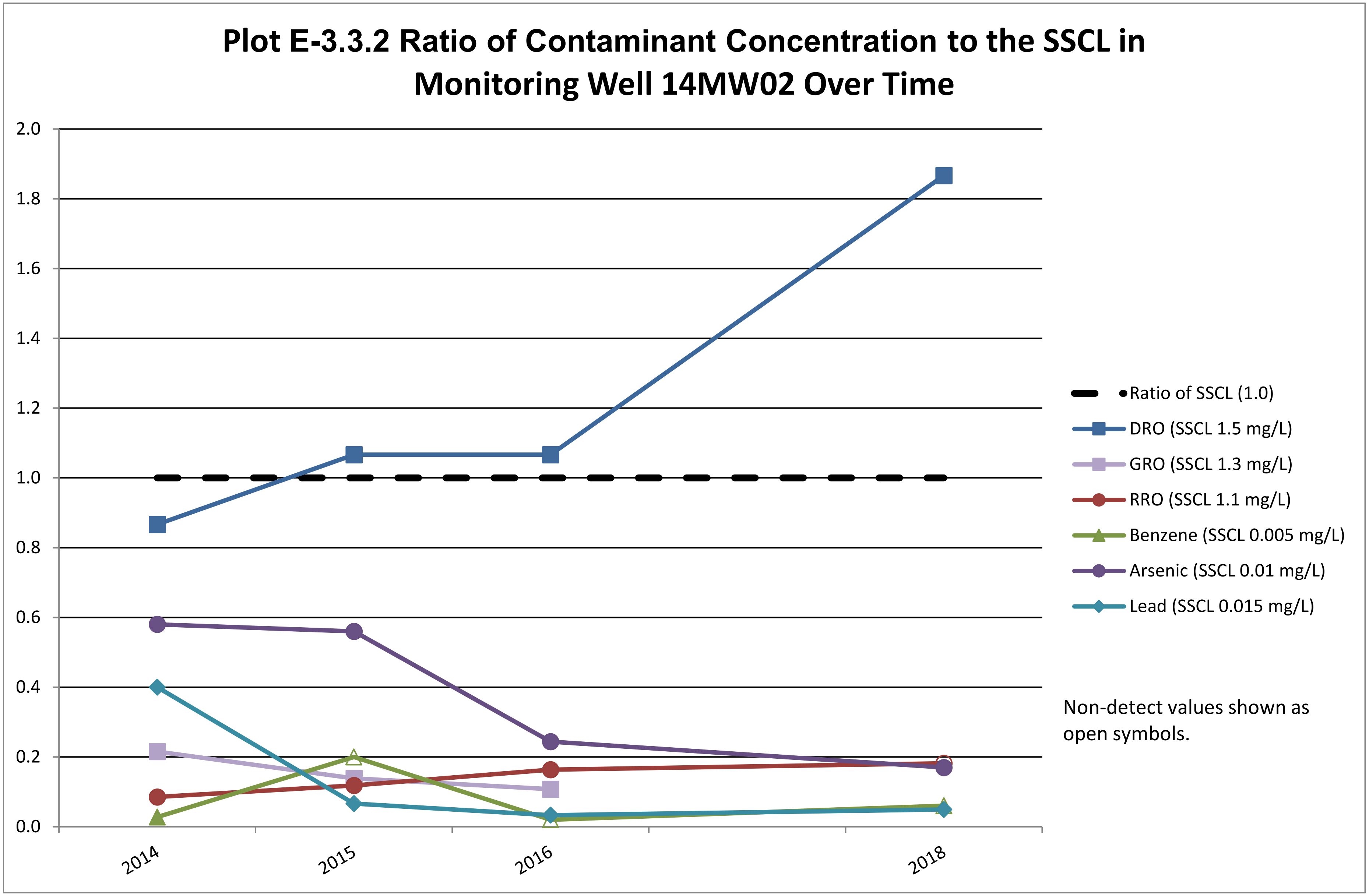
Bold and highlighted text indicates result exceeding the SSCL.

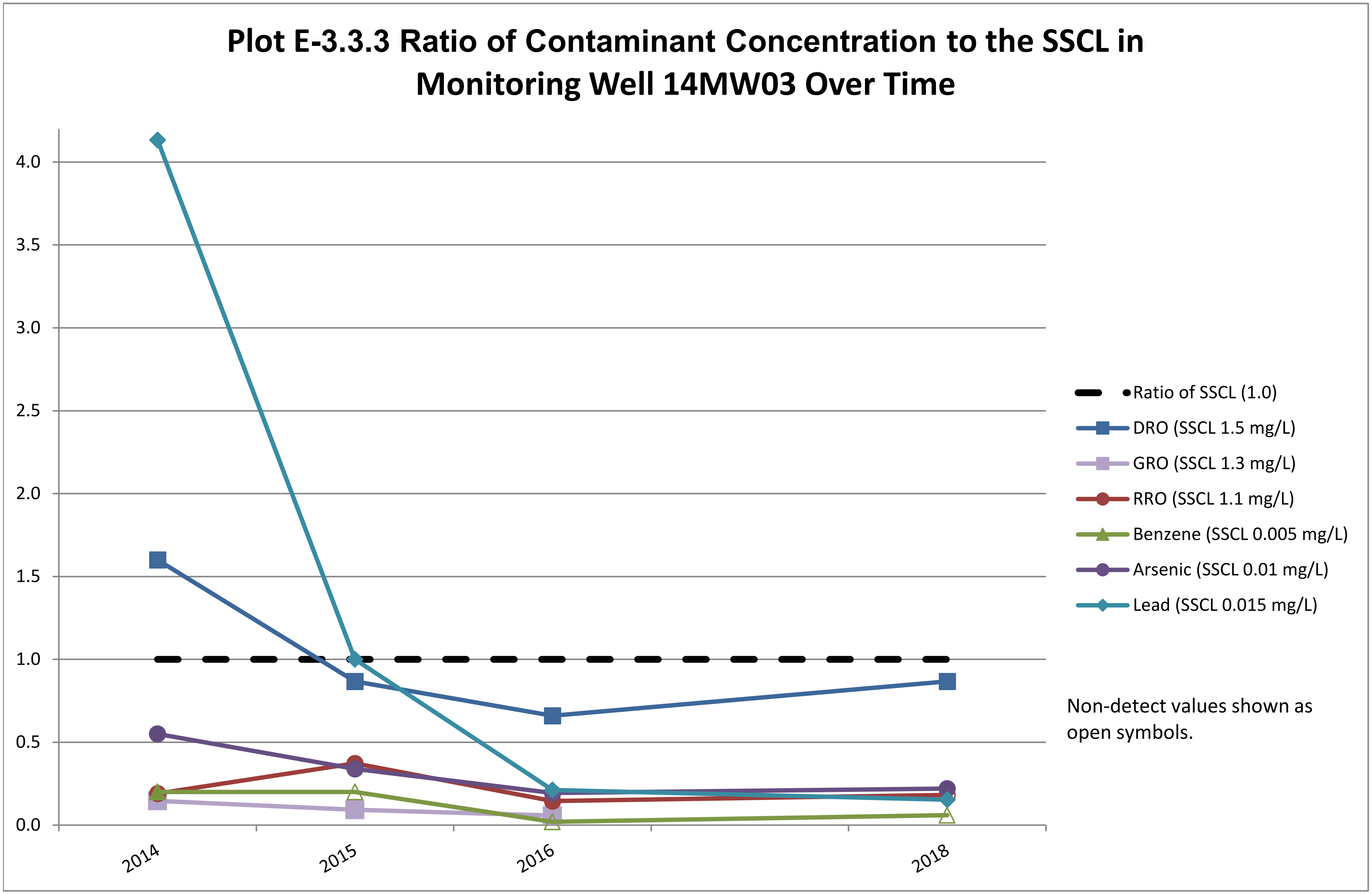
Bold and italicized text indicates result exceeding 2018 ADEC Method Two Table C groundwater cleanup level.

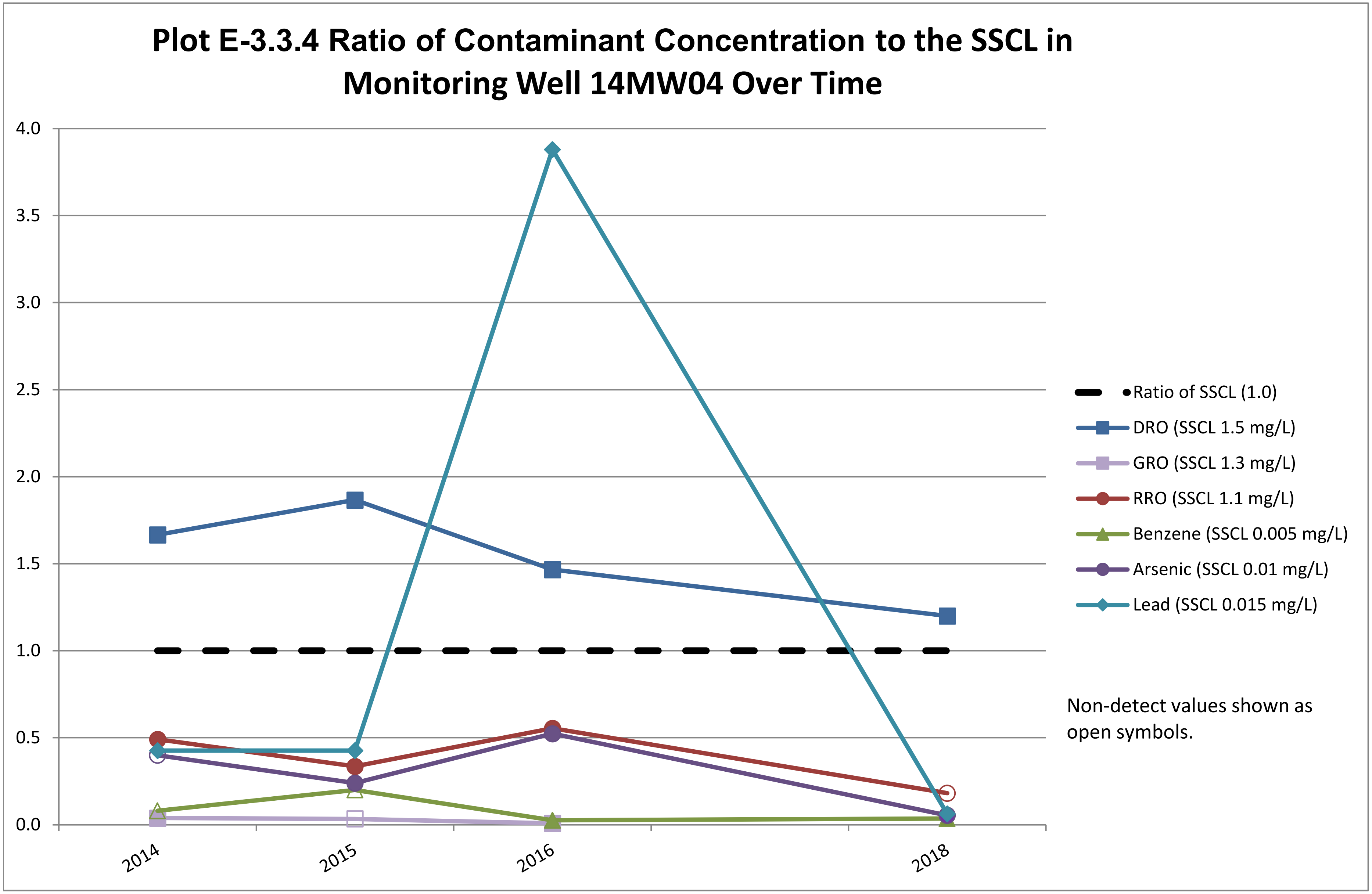
For definitions, refer to the Acronyms and Abbreviations section in the MOC report.

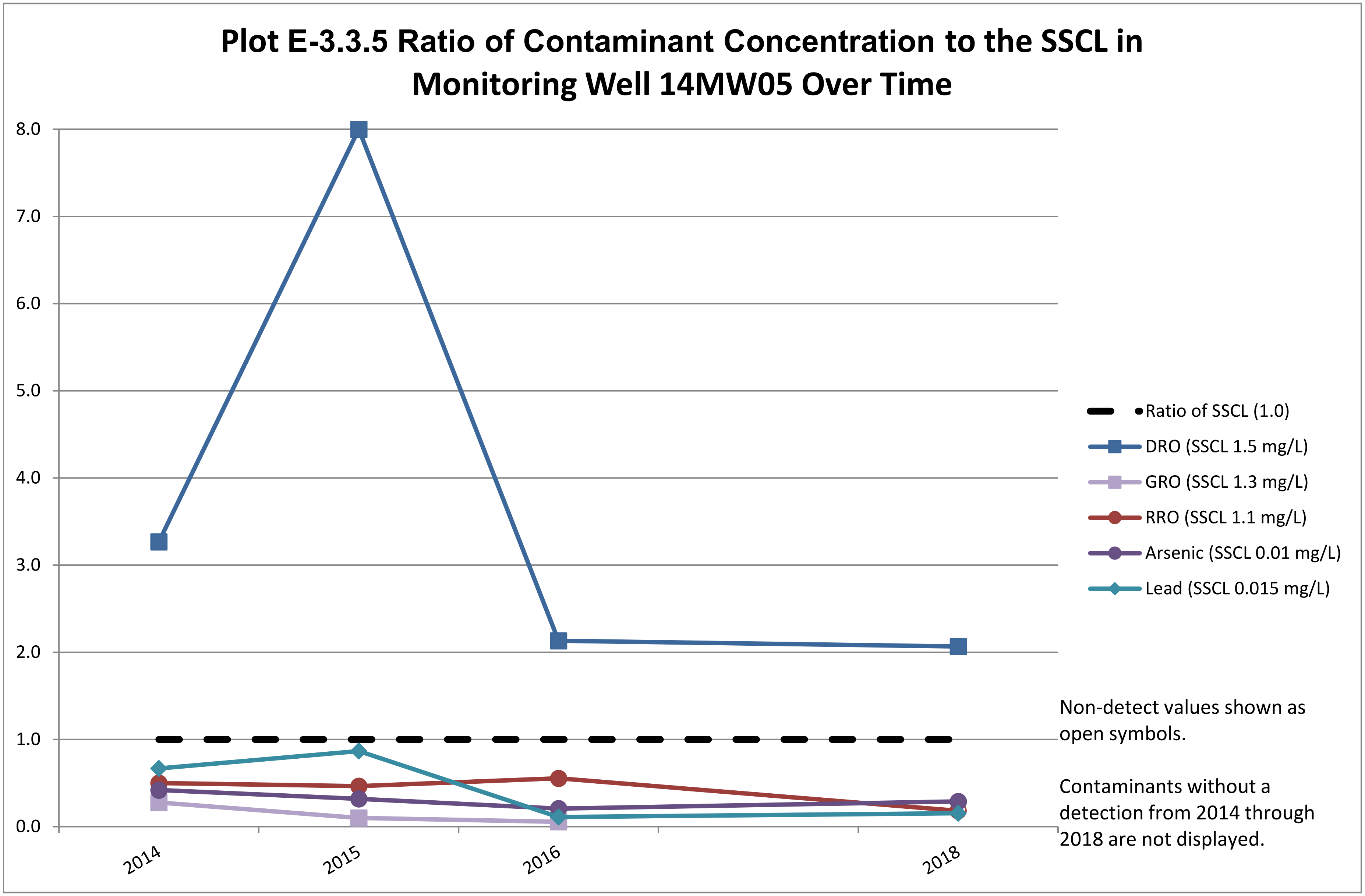
For data qualifiers, refer to the DQA in Attachment E-2.

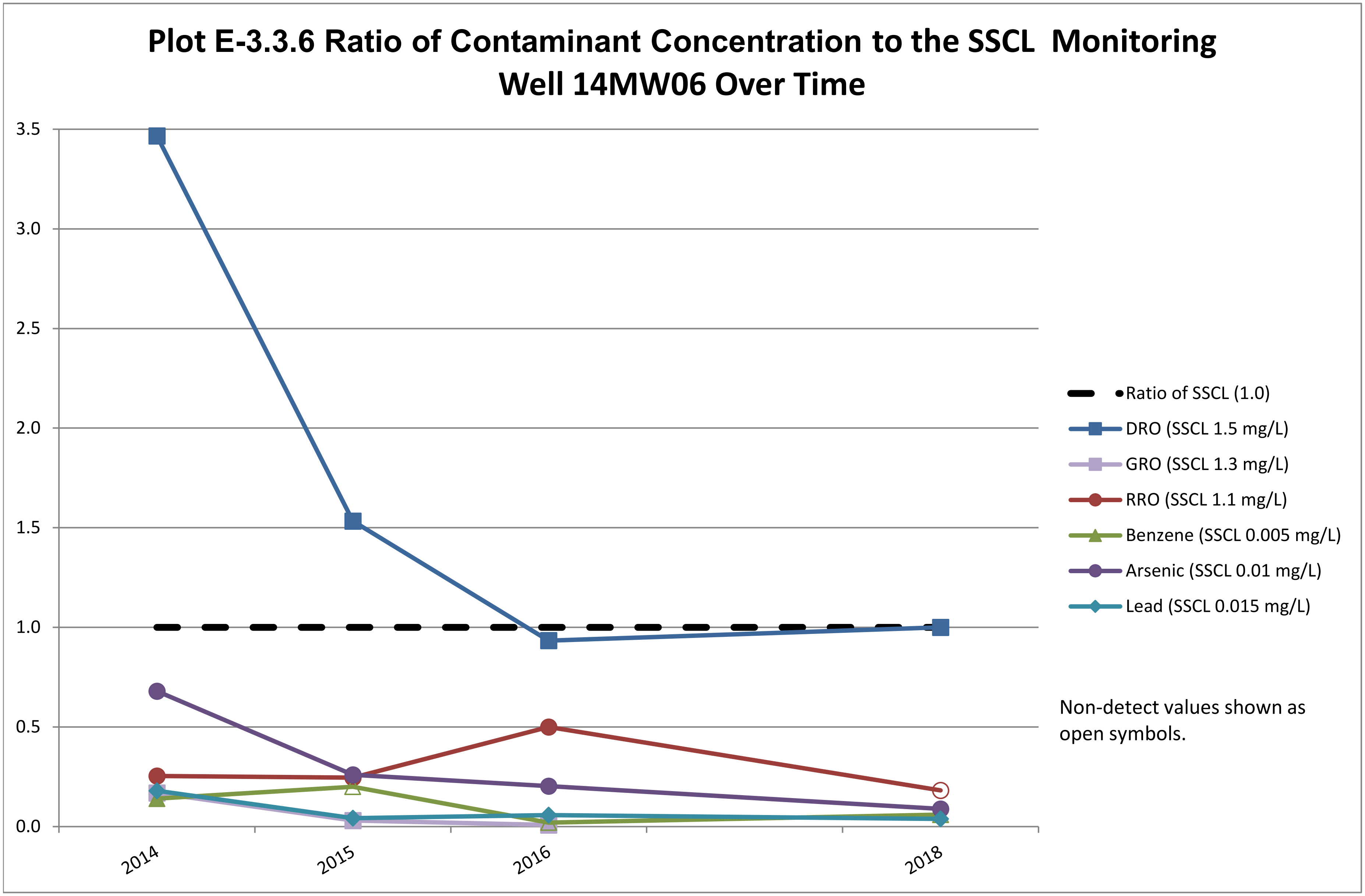

Plot E-3.3.1 Ratio of Contaminant Concentration to the SSCL in Monitoring Well 14MW01 Over Time
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
2014
2015
2016
2018
Ratio of SSCL (1.0)
DRO (SSCL 1.5 mg/L)
GRO (SSCL 1.3 mg/L)
RRO (SSCL 1.1 mg/L)
Arsenic (SSCL 0.01 mg/L)
Lead (SSCL 0.015 mg/L)
Non-detect values shown as open symbols.
Contaminants without a detection from 2014 through 2018 are not displayed.

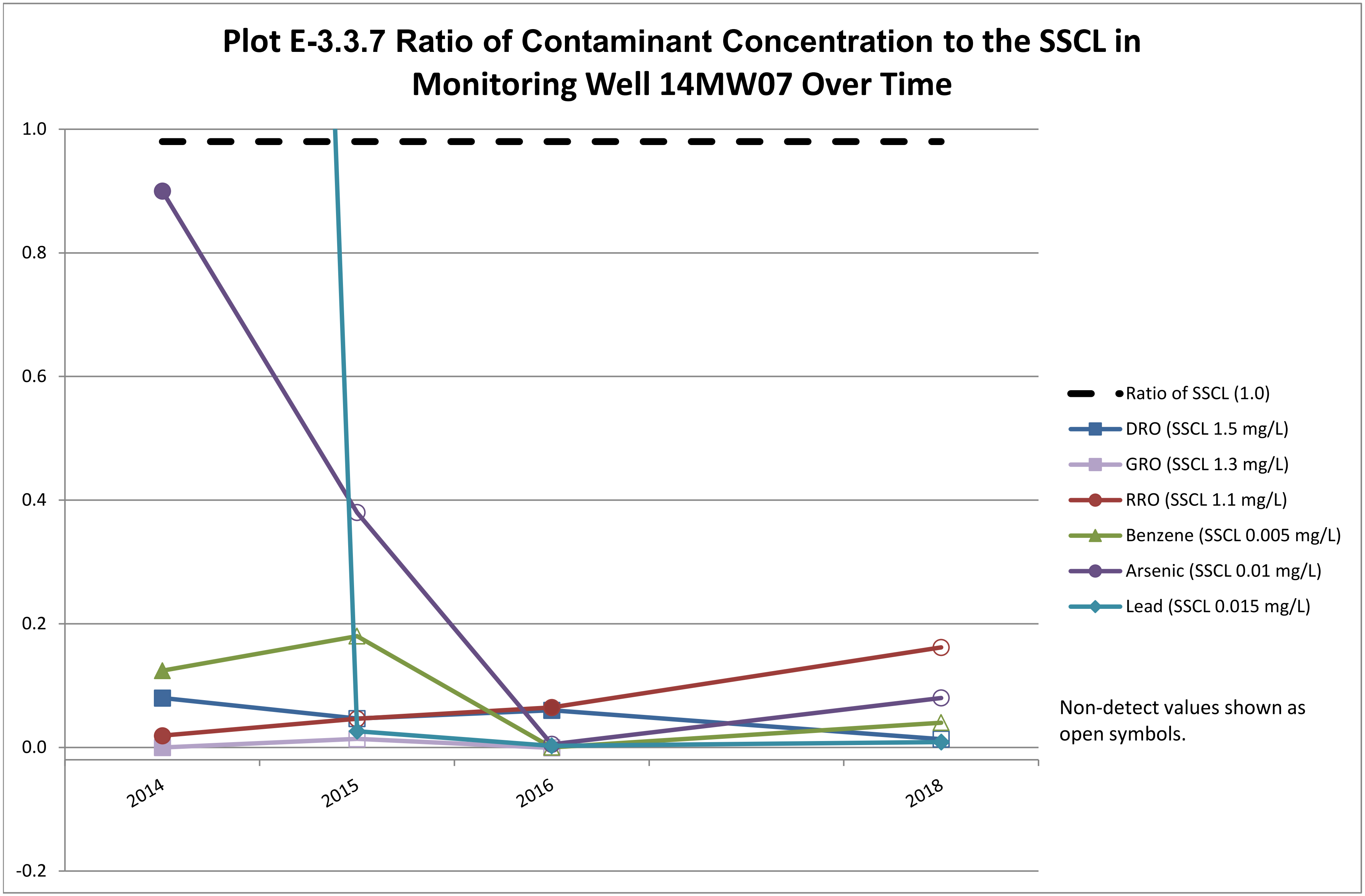

Plot E-3.3.2 Ratio of Contaminant Concentration to the SSCL in Monitoring Well 14MW02 Over Time
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
2014
2015
2016
2018
Ratio of SSCL (1.0)
DRO (SSCL 1.5 mg/L)
GRO (SSCL 1.3 mg/L)
RRO (SSCL 1.1 mg/L)
Benzene (SSCL 0.005 mg/L)
Arsenic (SSCL 0.01 mg/L)
Lead (SSCL 0.015 mg/L)
Non-detect values shown as open symbols.

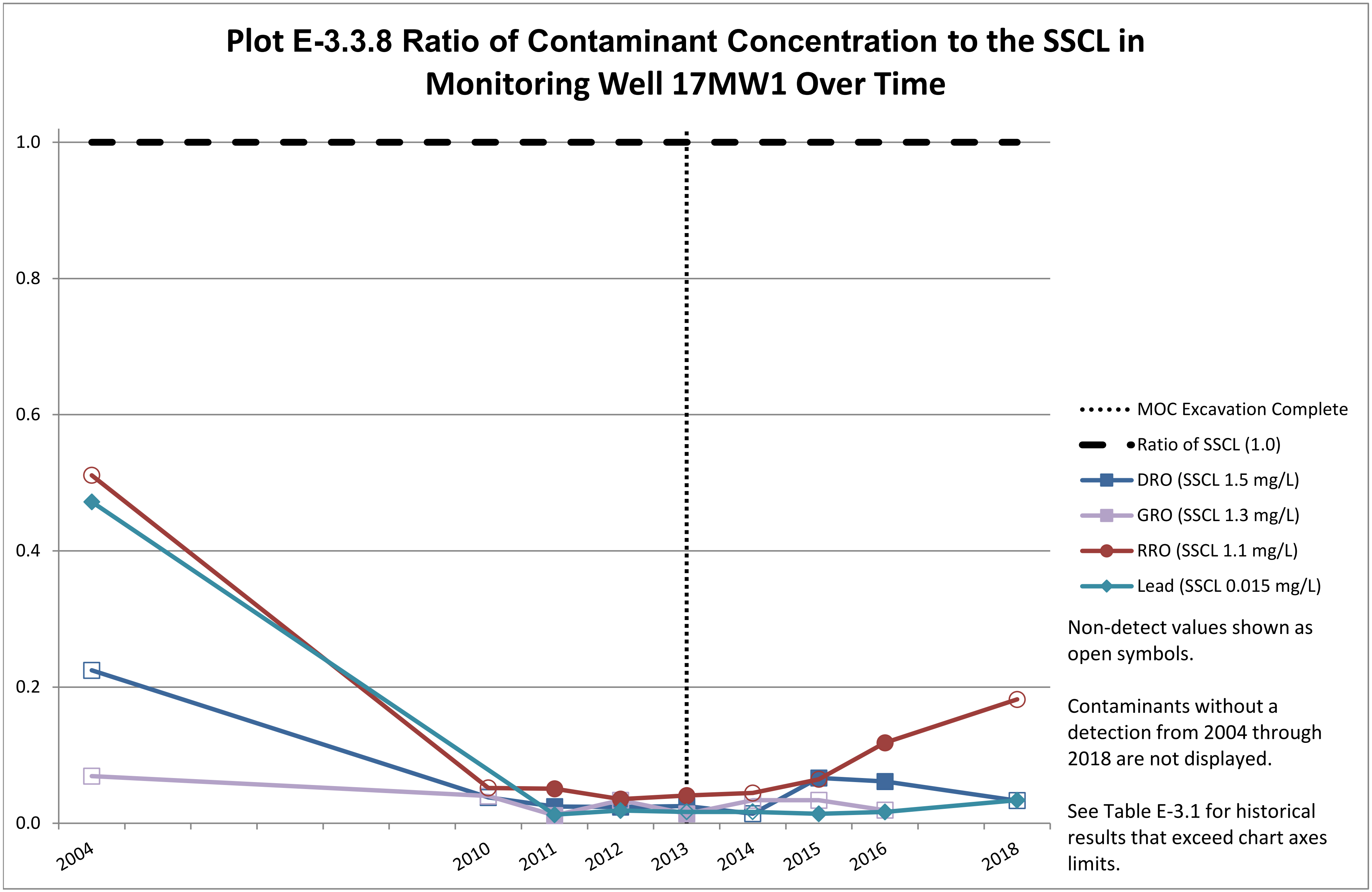

Plot E-3.3.3 Ratio of Contaminant Concentration to the SSCL in Monitoring Well 14MW03 Over Time
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
2014
2015
2016
2018
Ratio of SSCL (1.0)
DRO (SSCL 1.5 mg/L)
GRO (SSCL 1.3 mg/L)
RRO (SSCL 1.1 mg/L)
Benzene (SSCL 0.005 mg/L)
Arsenic (SSCL 0.01 mg/L)
Lead (SSCL 0.015 mg/L)
Non-detect values shown as open symbols.


Plot E-3.3.4 Ratio of Contaminant Concentration to the SSCL in Monitoring Well 14MW04 Over Time
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
2014
2015
2016
2018
Ratio of SSCL (1.0)
DRO (SSCL 1.5 mg/L)
GRO (SSCL 1.3 mg/L)
RRO (SSCL 1.1 mg/L)
Benzene (SSCL 0.005 mg/L)
Arsenic (SSCL 0.01 mg/L)
Lead (SSCL 0.015 mg/L)
Non-detect values shown as open symbols.

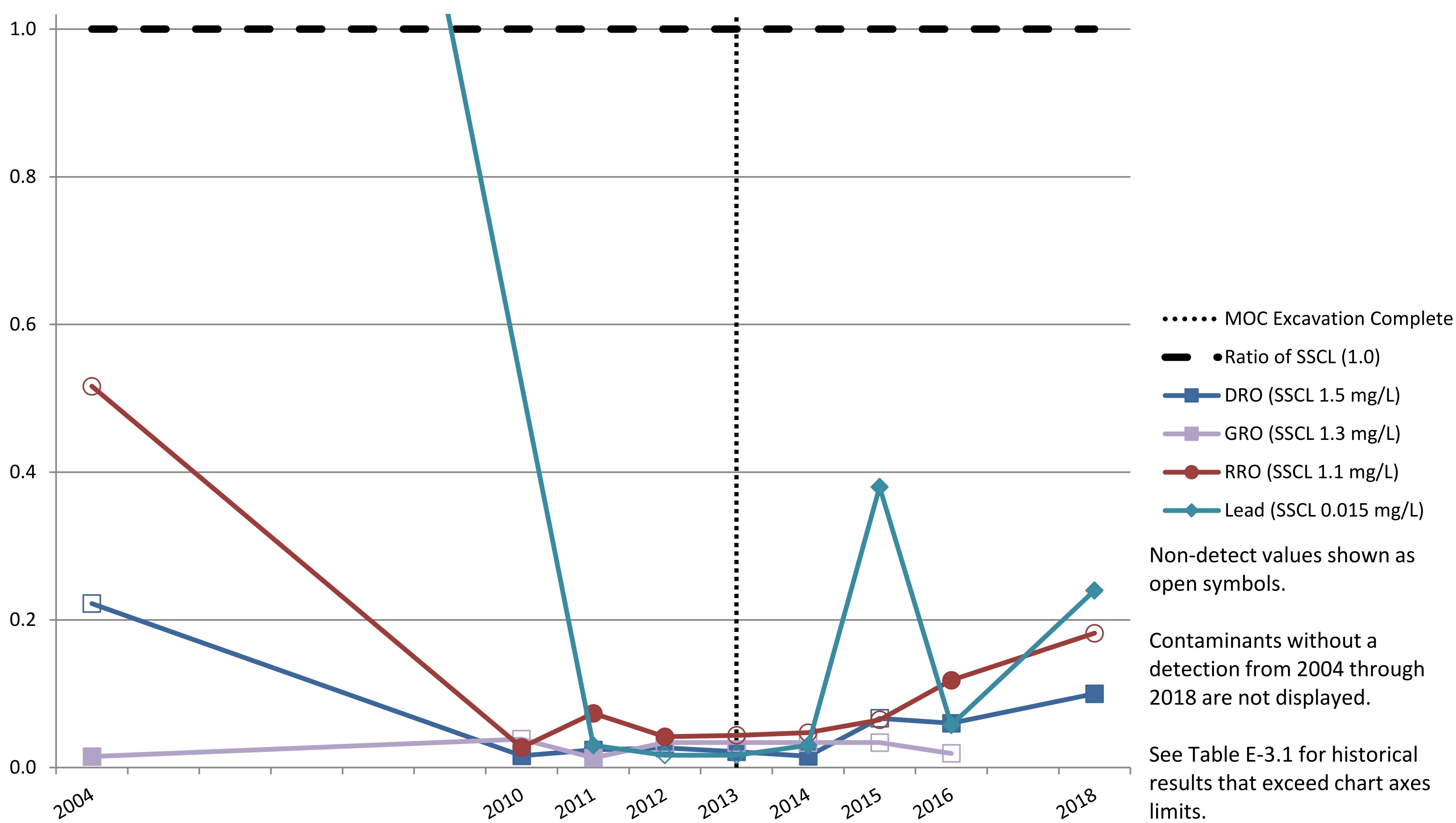

Plot E-3.3.5 Ratio of Contaminant Concentration to the SSCL in Monitoring Well 14MW05 Over Time
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
2014
2015
2016
2018
Ratio of SSCL (1.0)
DRO (SSCL 1.5 mg/L)
GRO (SSCL 1.3 mg/L)
RRO (SSCL 1.1 mg/L)
Arsenic (SSCL 0.01 mg/L)
Lead (SSCL 0.015 mg/L)
Non-detect values shown as open symbols.
Contaminants without a detection from 2014 through 2018 are not displayed.


Plot E-3.3.6 Ratio of Contaminant Concentration to the SSCL Monitoring Well 14MW06 Over Time
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
2014
2015
2016
2018
Ratio of SSCL (1.0)
DRO (SSCL 1.5 mg/L)
GRO (SSCL 1.3 mg/L)
RRO (SSCL 1.1 mg/L)
Benzene (SSCL 0.005 mg/L)
Arsenic (SSCL 0.01 mg/L)
Lead (SSCL 0.015 mg/L)
Non-detect values shown as open symbols.


Plot E-3.3.7 Ratio of Contaminant Concentration to the SSCL in Monitoring Well 14MW07 Over Time
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
2014
2015
2016
2018
Ratio of SSCL (1.0)
DRO (SSCL 1.5 mg/L)
GRO (SSCL 1.3 mg/L)
RRO (SSCL 1.1 mg/L)
Benzene (SSCL 0.005 mg/L)
Arsenic (SSCL 0.01 mg/L)
Lead (SSCL 0.015 mg/L)
Non-detect values shown as open symbols.


Plot E-3.3.8 Ratio of Contaminant Concentration to the SSCL in Monitoring Well 17MW1 Over Time
1.0
0.8
0.6
0.4
0.2
0.0
2004
2010
2011
2012
2013
2014
2015
2016
2018
MOC Excavation Complete
Ratio of SSCL (1.0)
DRO (SSCL 1.5 mg/L)
GRO (SSCL 1.3 mg/L)
RRO (SSCL 1.1 mg/L)
Lead (SSCL 0.015 mg/L)
Non-detect values shown as open symbols.
Contaminants without a detection from 2004 through 2018 are not displayed.
See Table E-3.1 for historical results that exceed chart axes limits.

Plot E-3.3.9 Ratio of Contaminant Concentration to the SSCL in Monitoring Well 20MW1 Over Time

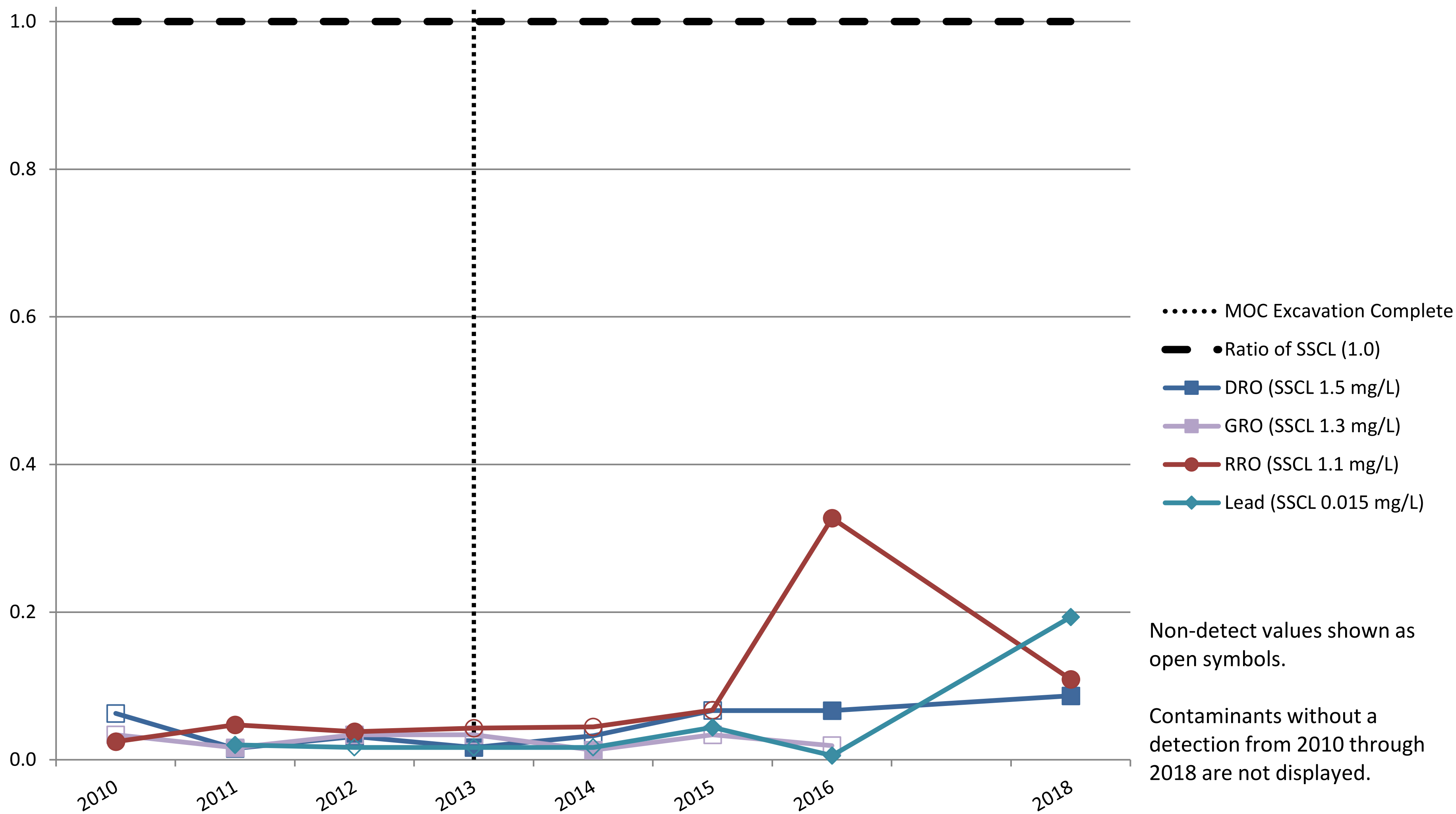


Non-detect values shown as open symbols.

Contaminants without a detection from 2004 through 2018 are not displayed.

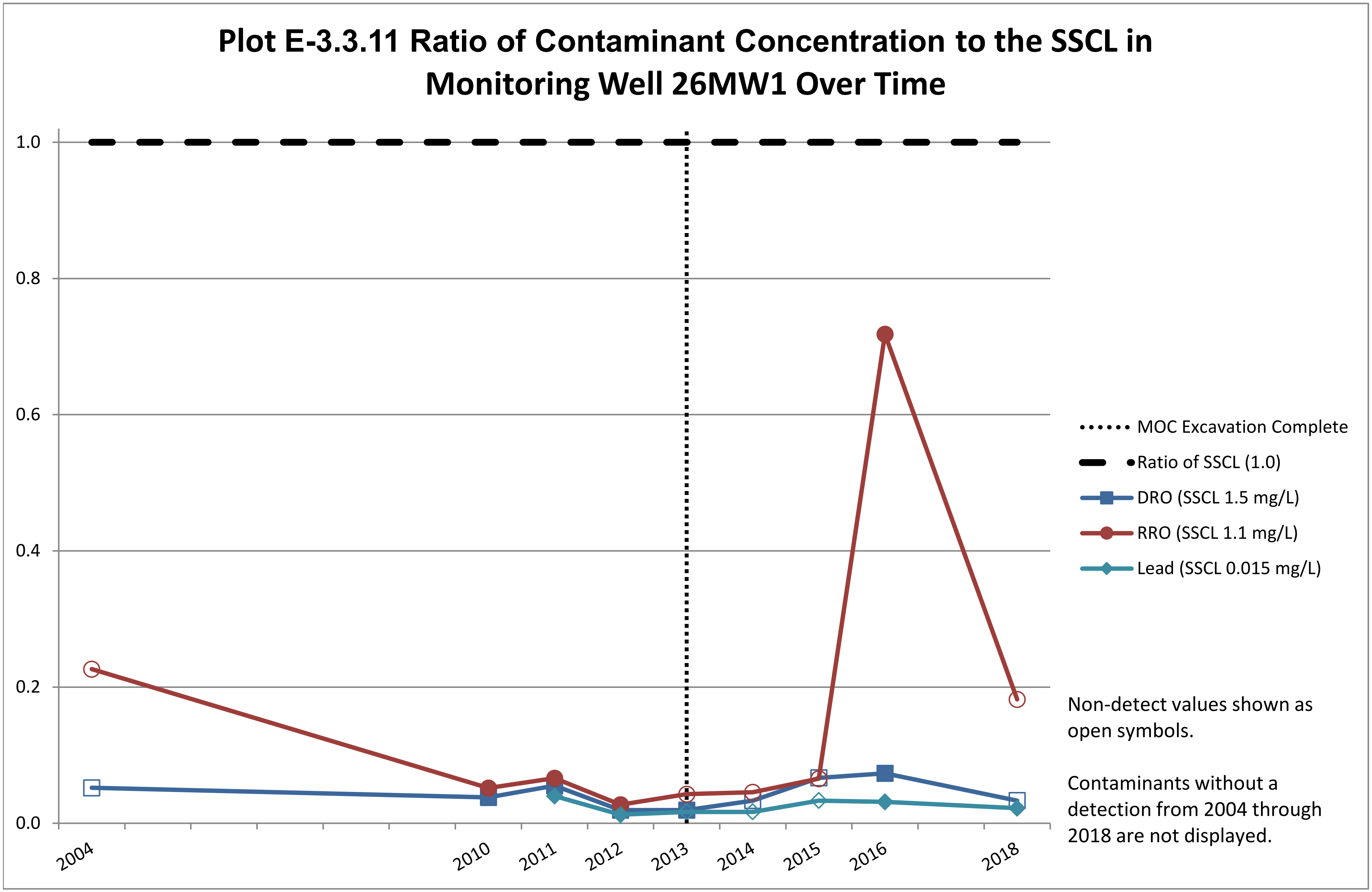
See Table E-3.1 for historical results that exceed chart axes limits.

Plot E-3.3.10 Ratio of Contaminant Concentration to the SSCL in Monitoring Well 22MW2 Over Time

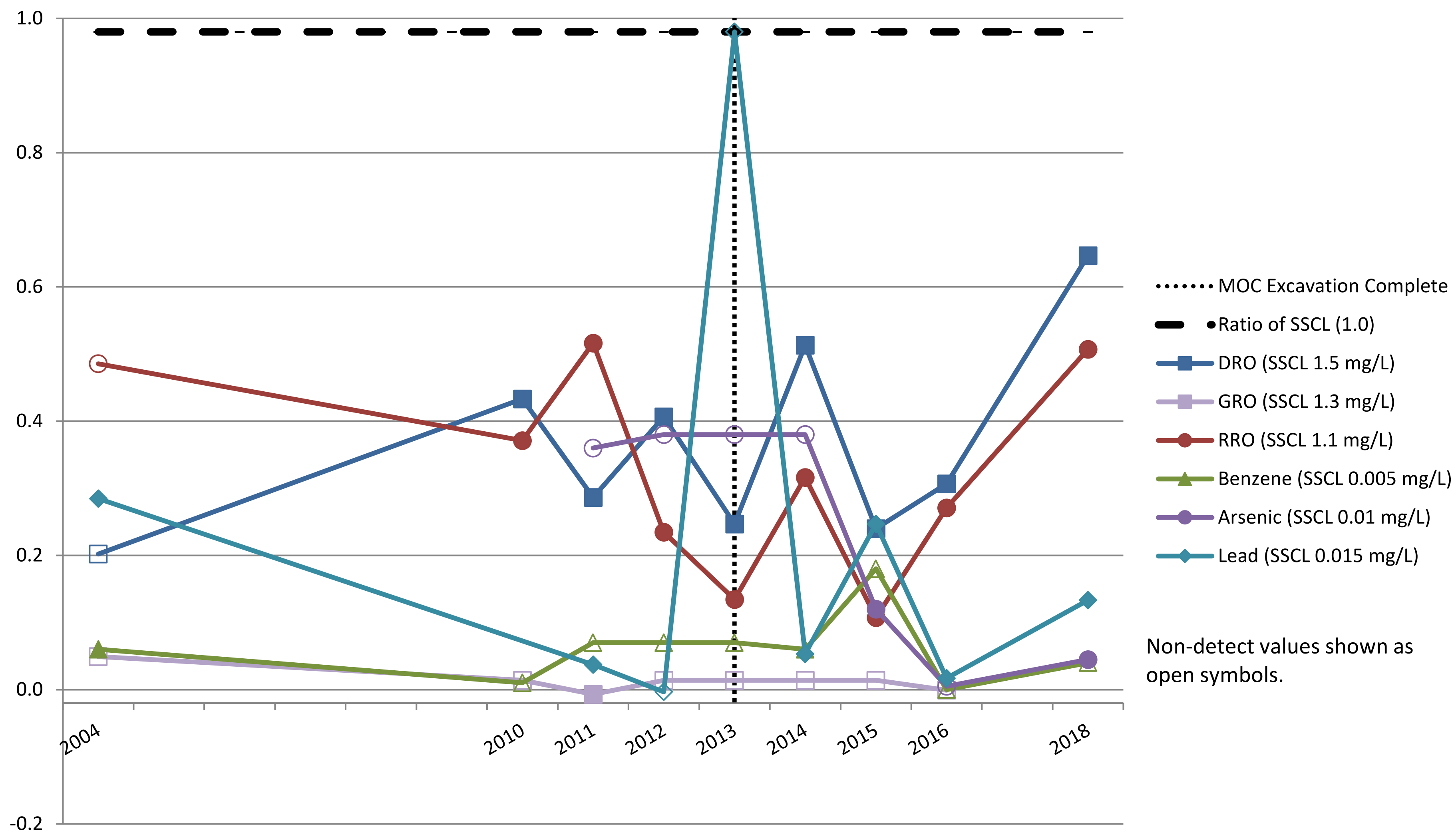


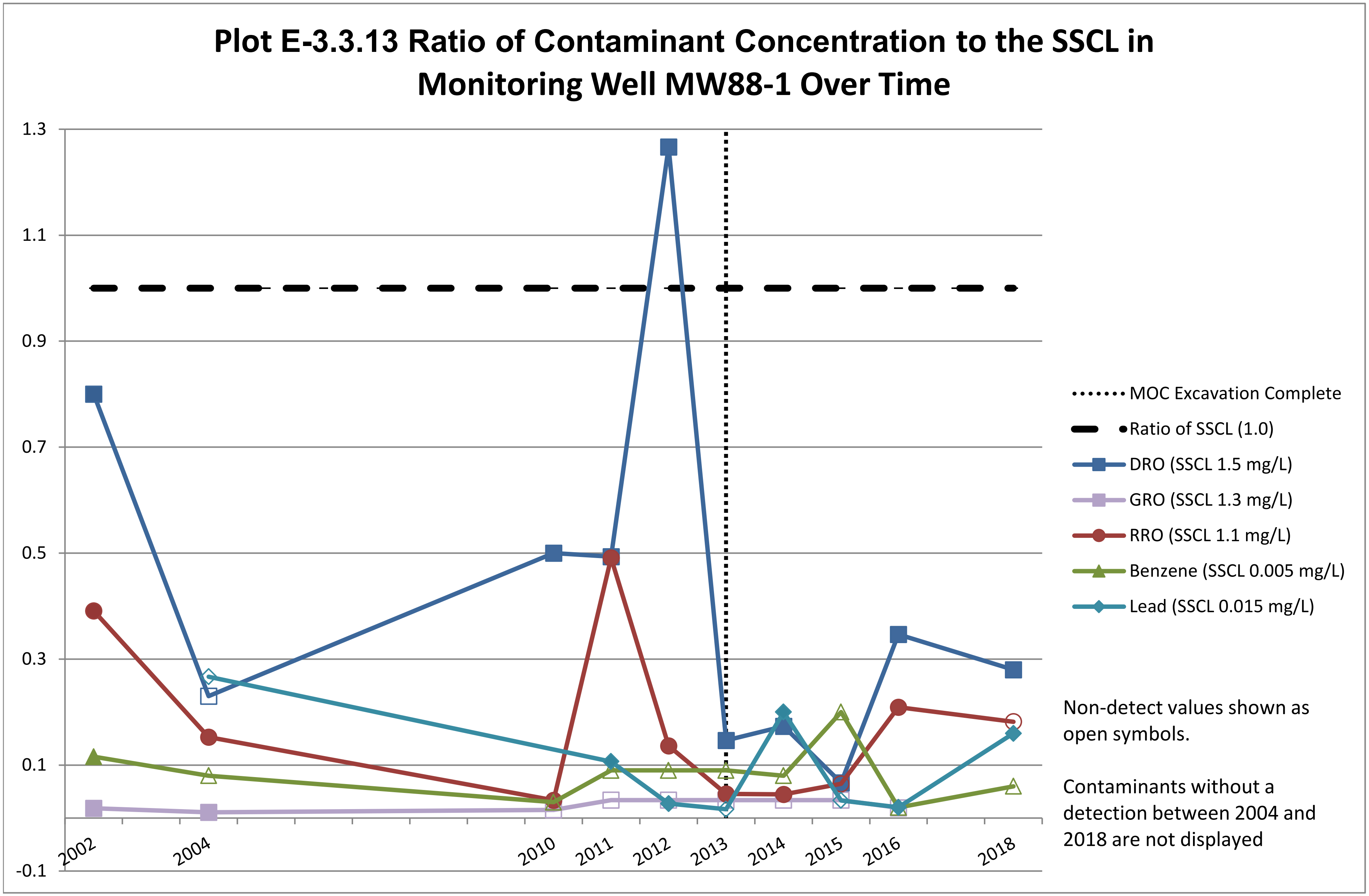
Non-detect values shown as open symbols.

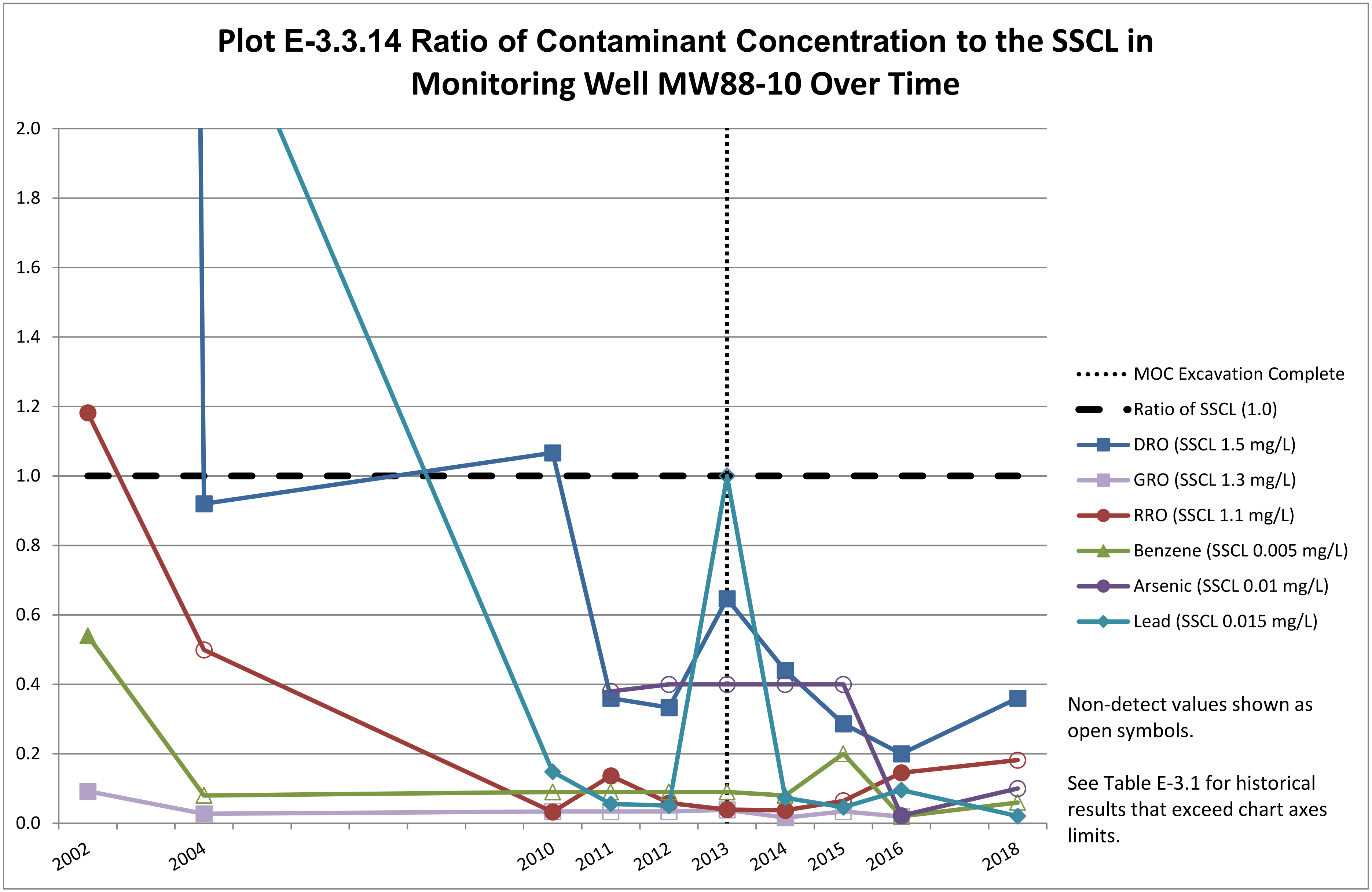
Contaminants without a detection from 2010 through 2018 are not displayed.

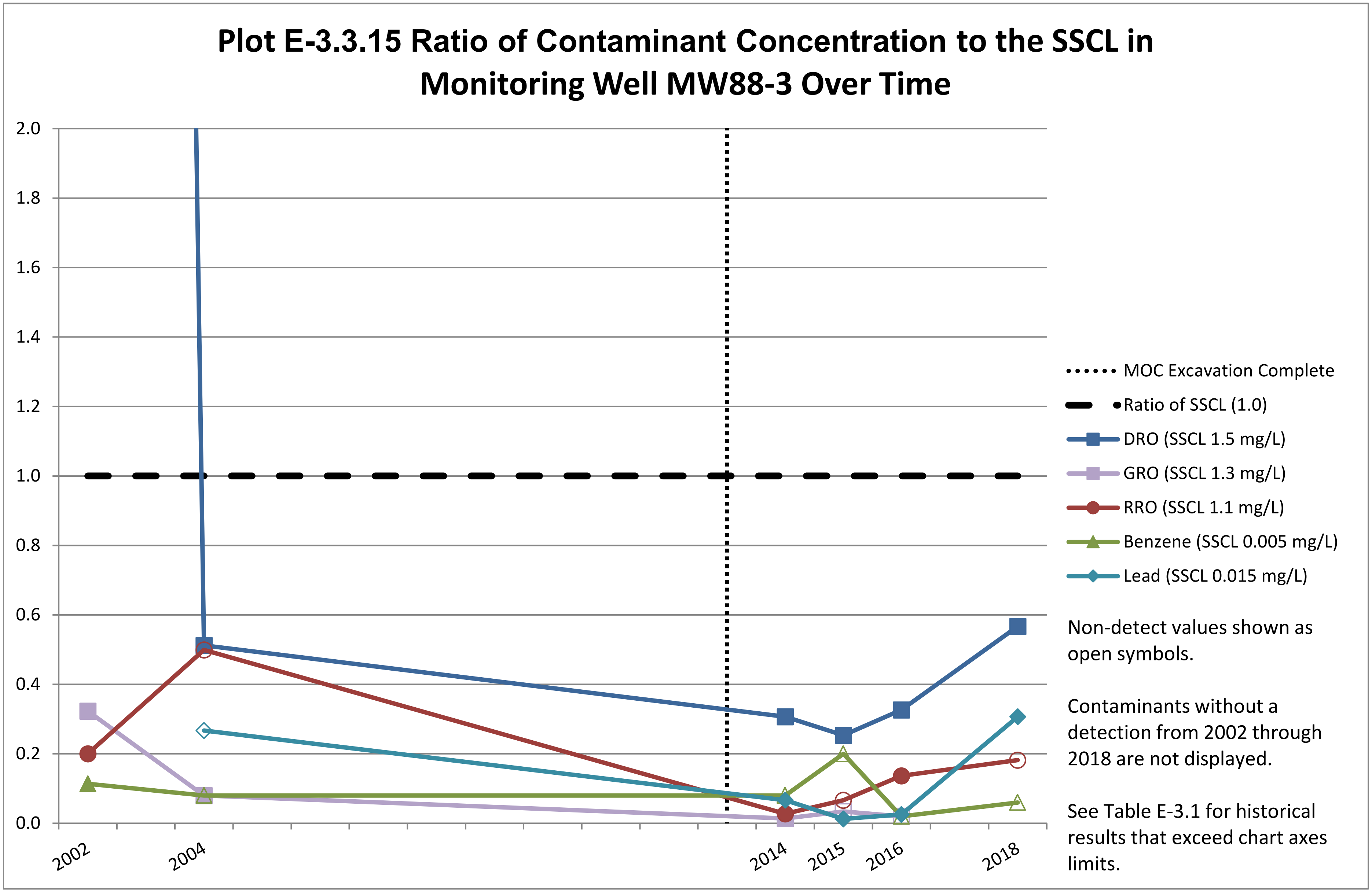

Plot E-3.3.11 Ratio of Contaminant Concentration to the SSCL in Monitoring Well 26MW1 Over Time
1.0
0.8
0.6
0.4
0.2
0.0
2004
2010
2011
2012
2013
2014
2015
2016
2018
MOC Excavation Complete
Ratio of SSCL (1.0)
DRO (SSCL 1.5 mg/L)
RRO (SSCL 1.1 mg/L)
Lead (SSCL 0.015 mg/L)
Non-detect values shown as open symbols.
Contaminants without a detection from 2004 through 2018 are not displayed.

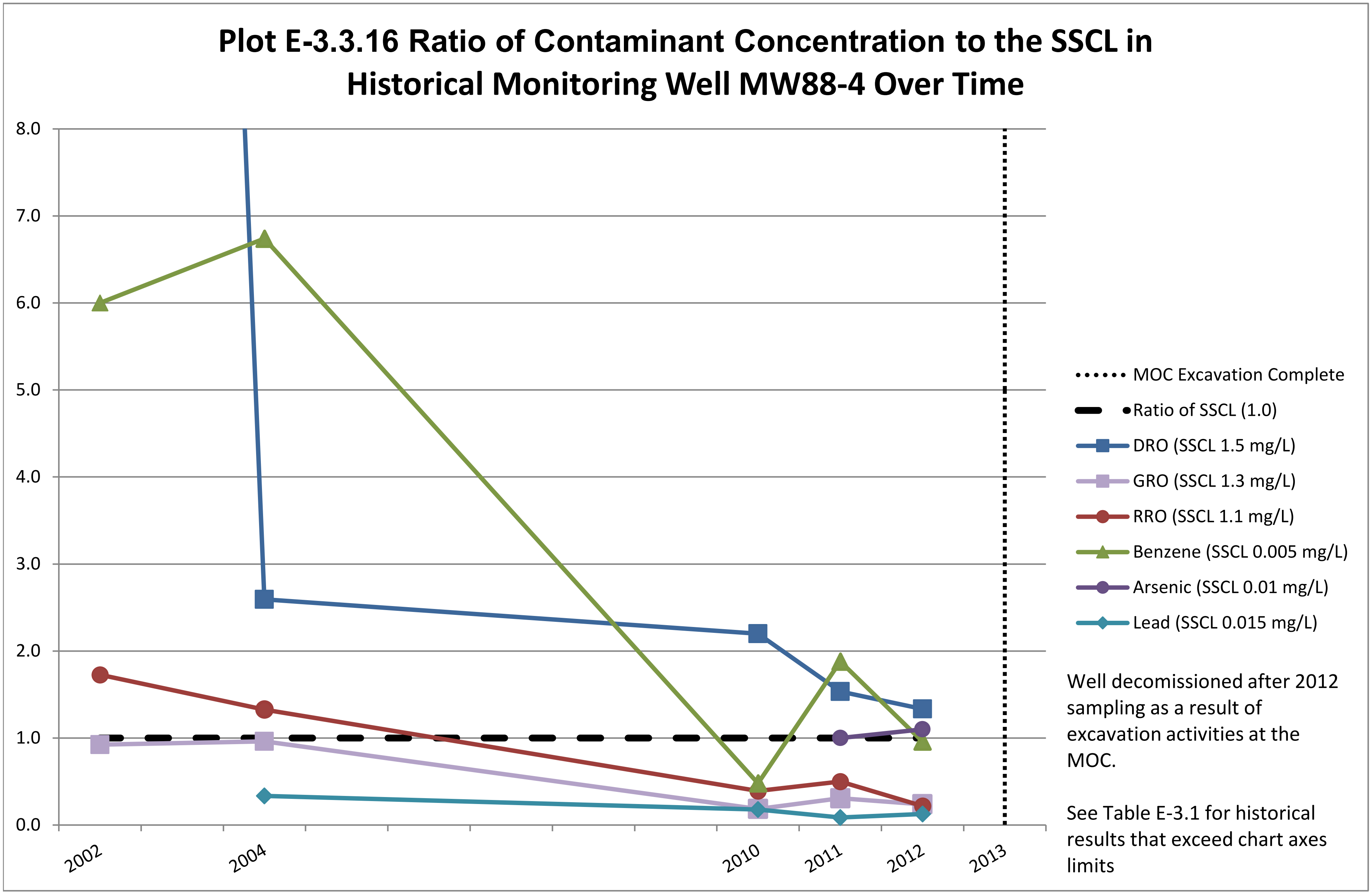
Plot E-3.3.12 Ratio of Contaminant Concentration to the SSCL in Monitoring Well MW10-1 Over Time

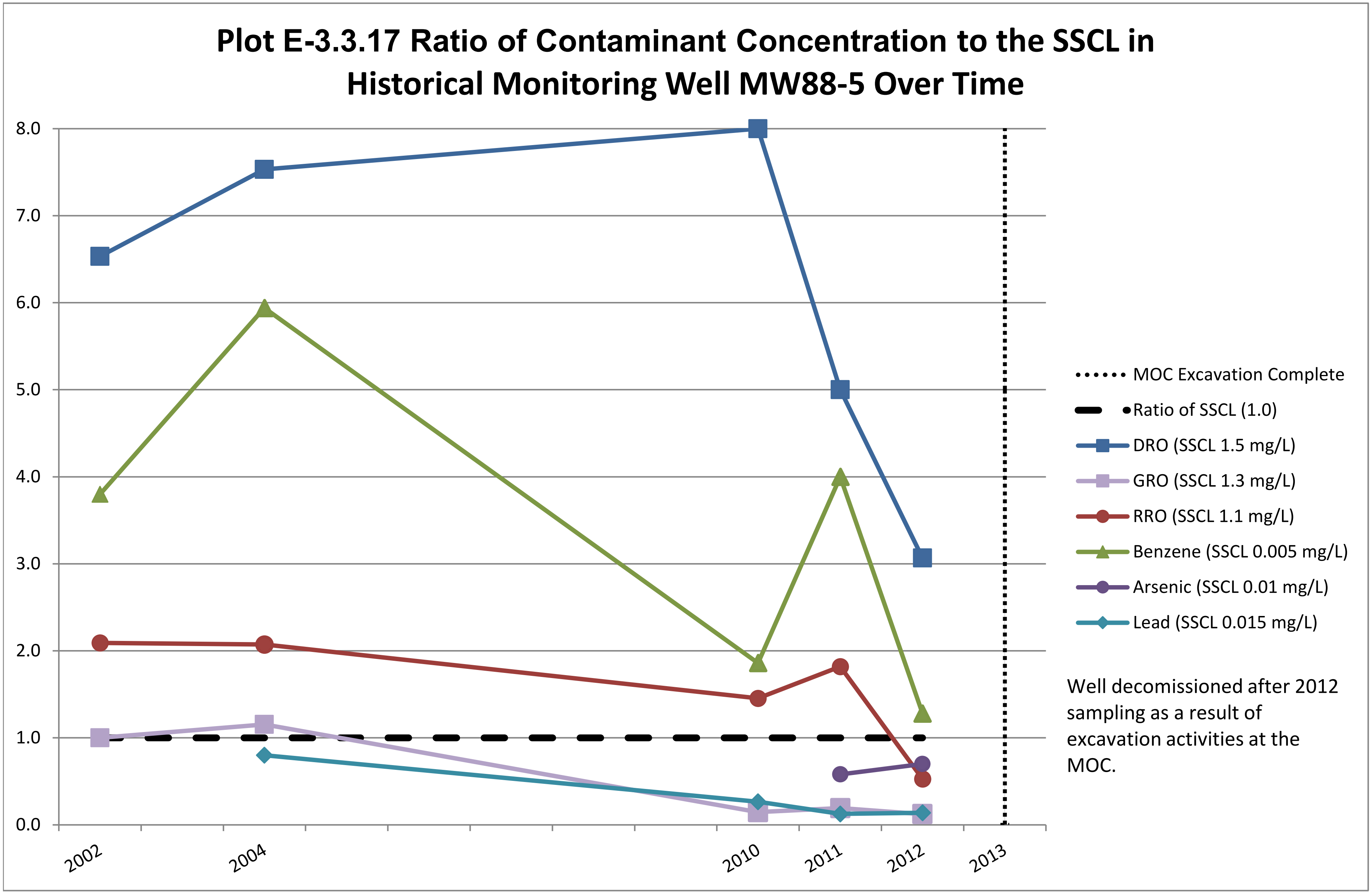


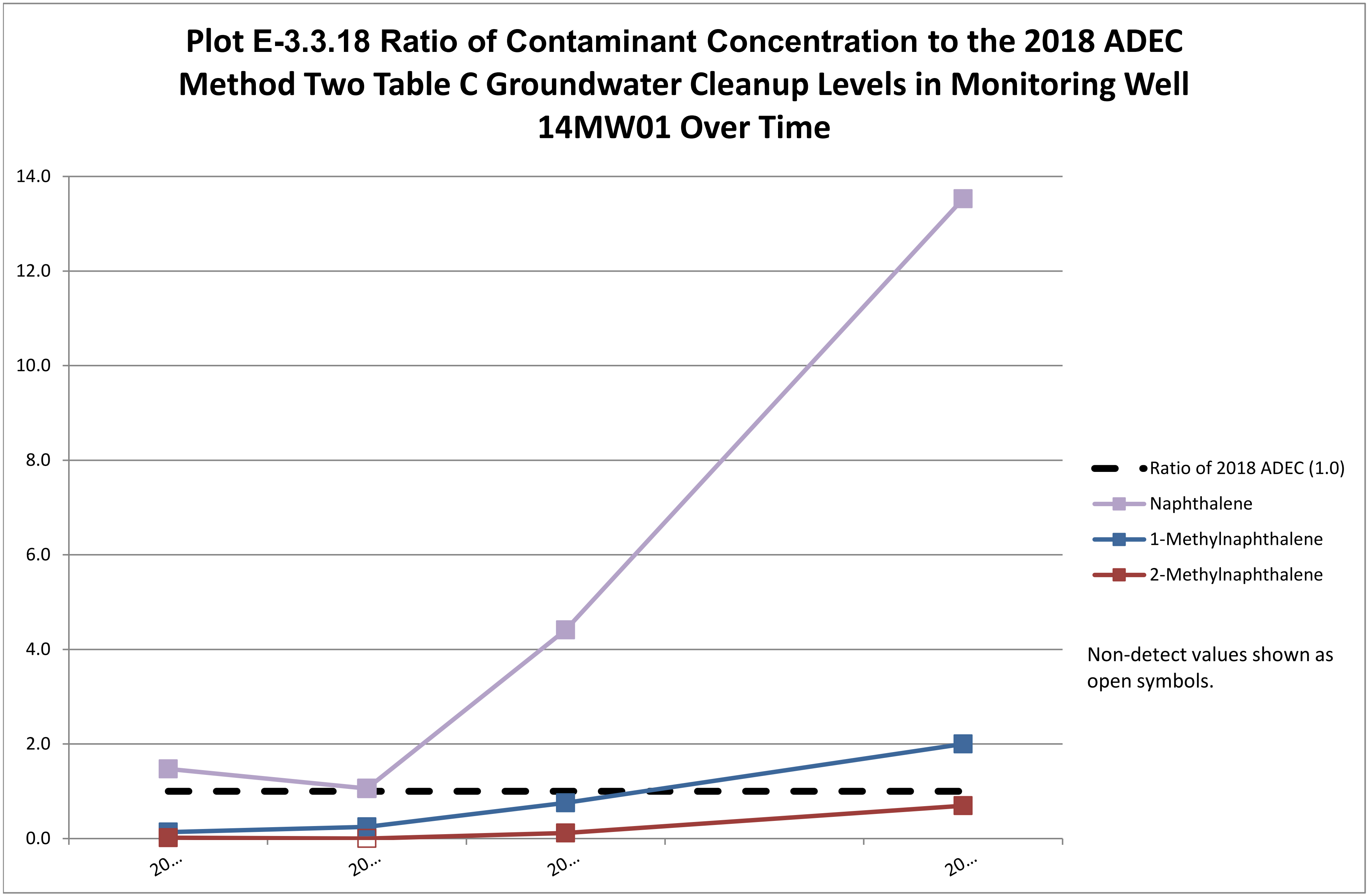

Plot E-3.3.13 Ratio of Contaminant Concentration to the SSCL in Monitoring Well MW88-1 Over Time
1.3
1.1
0.9
0.7
0.5
0.3
0.1
-0.1
2002
2004
2010
2011
2012
2013
2014
2015
2016
2018
MOC Excavation Complete
Ratio of SSCL (1.0)
DRO (SSCL 1.5 mg/L)
GRO (SSCL 1.3 mg/L)
RRO (SSCL 1.1 mg/L)
Benzene (SSCL 0.005 mg/L)
Lead (SSCL 0.015 mg/L)
Non-detect values shown as open symbols.
Contaminants without a detection between 2004 and 2018 are not displayed

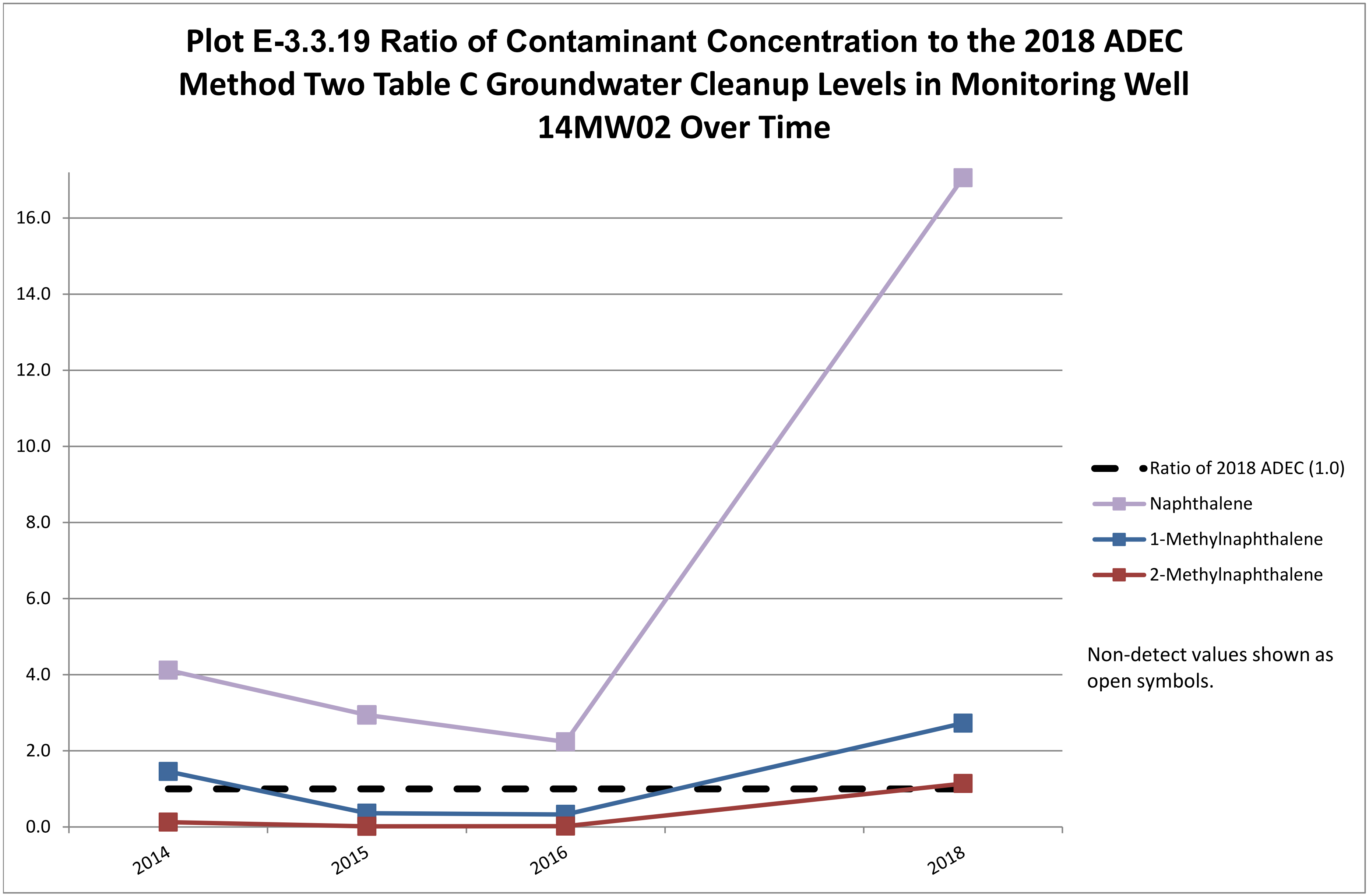

Plot E-3.3.14 Ratio of Contaminant Concentration to the SSCL in Monitoring Well MW88-10 Over Time
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
2002
2004
2010
2011
2012
2013
2014
2015
2016
2018
MOC Excavation Complete
Ratio of SSCL (1.0)
DRO (SSCL 1.5 mg/L)
GRO (SSCL 1.3 mg/L)
RRO (SSCL 1.1 mg/L)
Benzene (SSCL 0.005 mg/L)
Arsenic (SSCL 0.01 mg/L)
Lead (SSCL 0.015 mg/L)
Non-detect values shown as open symbols.
See Table E-3.1 for historical results that exceed chart axes limits.

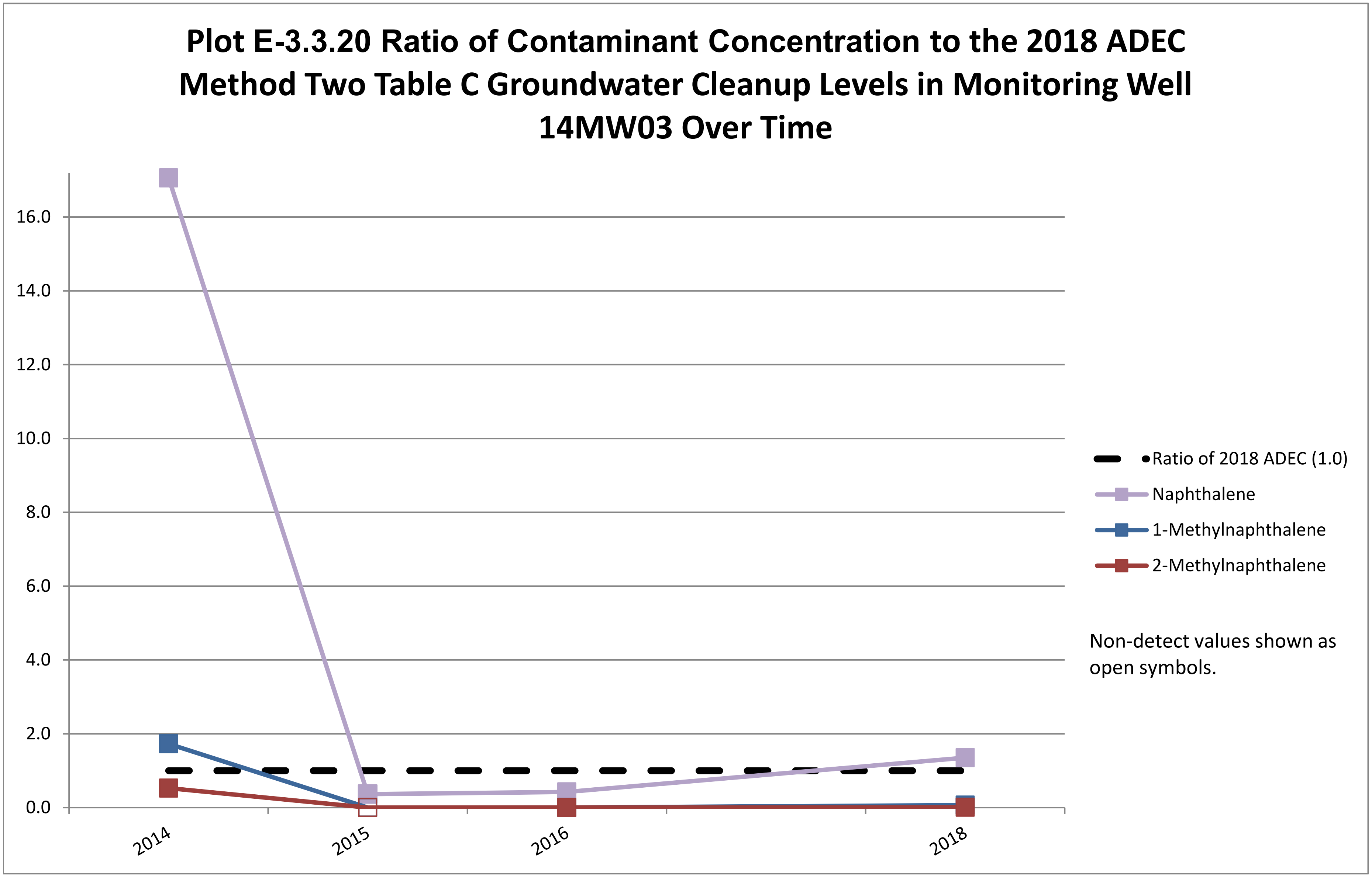

Plot E-3.3.15 Ratio of Contaminant Concentration to the SSCL in Monitoring Well MW88-3 Over Time
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
2002
2004
2014
2015
2016
2018
MOC Excavation Complete
Ratio of SSCL (1.0)
DRO (SSCL 1.5 mg/L)
GRO (SSCL 1.3 mg/L)
RRO (SSCL 1.1 mg/L)
Benzene (SSCL 0.005 mg/L)
Lead (SSCL 0.015 mg/L)
Non-detect values shown as open symbols.
Contaminants without a detection from 2002 through 2018 are not displayed.
See Table E-3.1 for historical results that exceed chart axes limits.


Plot E-3.3.16 Ratio of Contaminant Concentration to the SSCL in Historical Monitoring Well MW88-4 Over Time
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
2002
2004
2010
2011
2012
2013
MOC Excavation Complete
Ratio of SSCL (1.0)
DRO (SSCL 1.5 mg/L)
GRO (SSCL 1.3 mg/L)
RRO (SSCL 1.1 mg/L)
Benzene (SSCL 0.005 mg/L)
Arsenic (SSCL 0.01 mg/L)
Lead (SSCL 0.015 mg/L)
Well decomissioned after 2012 sampling as a result of excavation activities at the MOC.
See Table E-3.1 for historical results that exceed chart axes limits

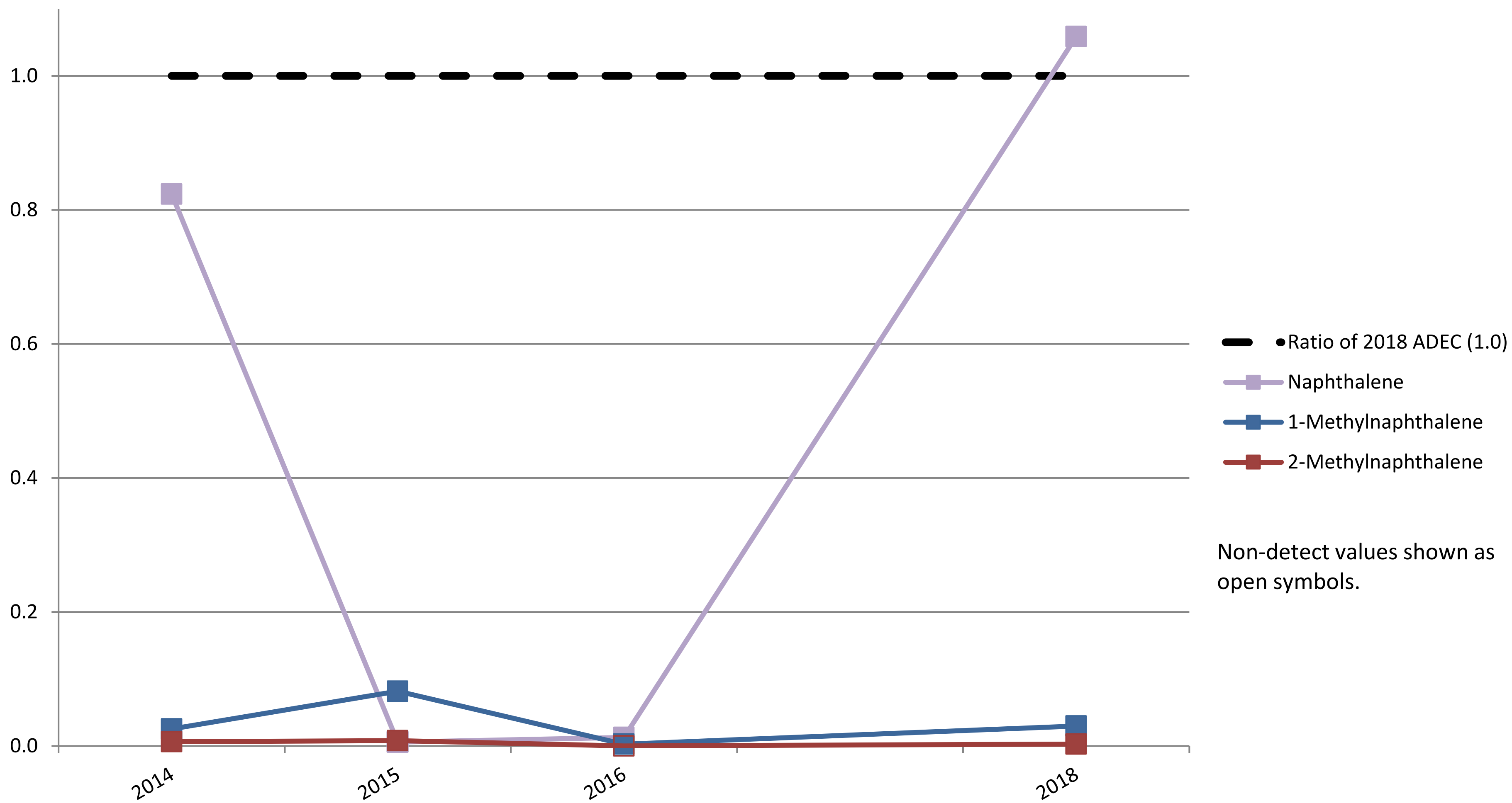

Plot E-3.3.17 Ratio of Contaminant Concentration to the SSCL in Historical Monitoring Well MW88-5 Over Time
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
2002
2004
2010
2011
2012
2013
MOC Excavation Complete
Ratio of SSCL (1.0)
DRO (SSCL 1.5 mg/L)
GRO (SSCL 1.3 mg/L)
RRO (SSCL 1.1 mg/L)
Benzene (SSCL 0.005 mg/L)
Arsenic (SSCL 0.01 mg/L)
Lead (SSCL 0.015 mg/L)
Well decomissioned after 2012 sampling as a result of excavation activities at the MOC.

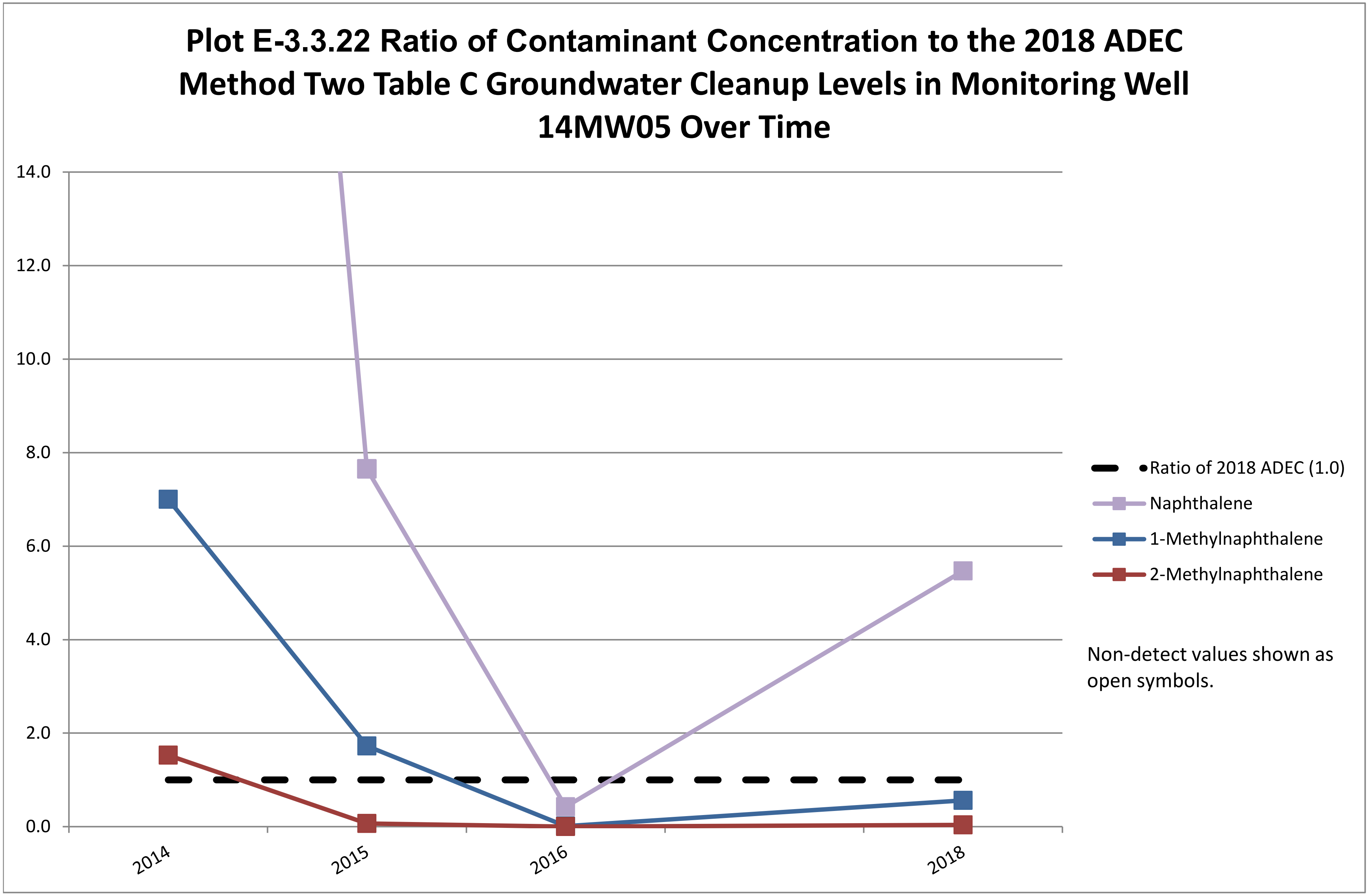

Plot E-3.3.18 Ratio of Contaminant Concentration to the 2018 ADEC Method Two Table C Groundwater Cleanup Levels in Monitoring Well 14MW01 Over Time
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
20...
20...
20...
20...
Ratio of 2018 ADEC (1.0)
Naphthalene
1-Methylnaphthalene
2-Methylnaphthalene
Non-detect values shown as open symbols.


Plot E-3.3.19 Ratio of Contaminant Concentration to the 2018 ADEC Method Two Table C Groundwater Cleanup Levels in Monitoring Well 14MW02 Over Time
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
2014
2015
2016
2018
Ratio of 2018 ADEC (1.0)
Naphthalene
1-Methylnaphthalene
2-Methylnaphthalene
Non-detect values shown as open symbols.

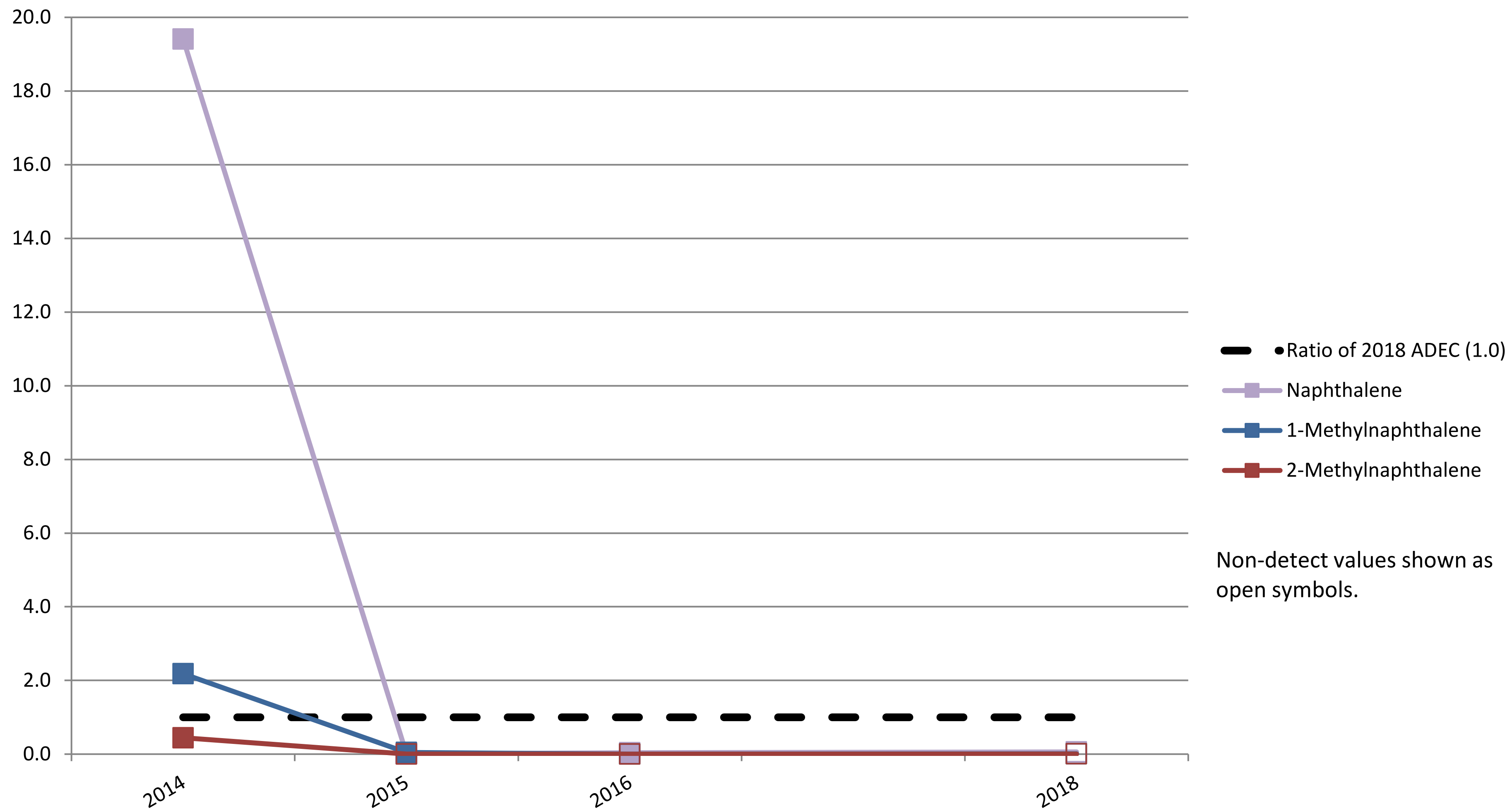

Plot E-3.3.20 Ratio of Contaminant Concentration to the 2018 ADEC Method Two Table C Groundwater Cleanup Levels in Monitoring Well 14MW03 Over Time
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
2014
2015
2016
2018
Ratio of 2018 ADEC (1.0)
Naphthalene
1-Methylnaphthalene
2-Methylnaphthalene
Non-detect values shown as open symbols.

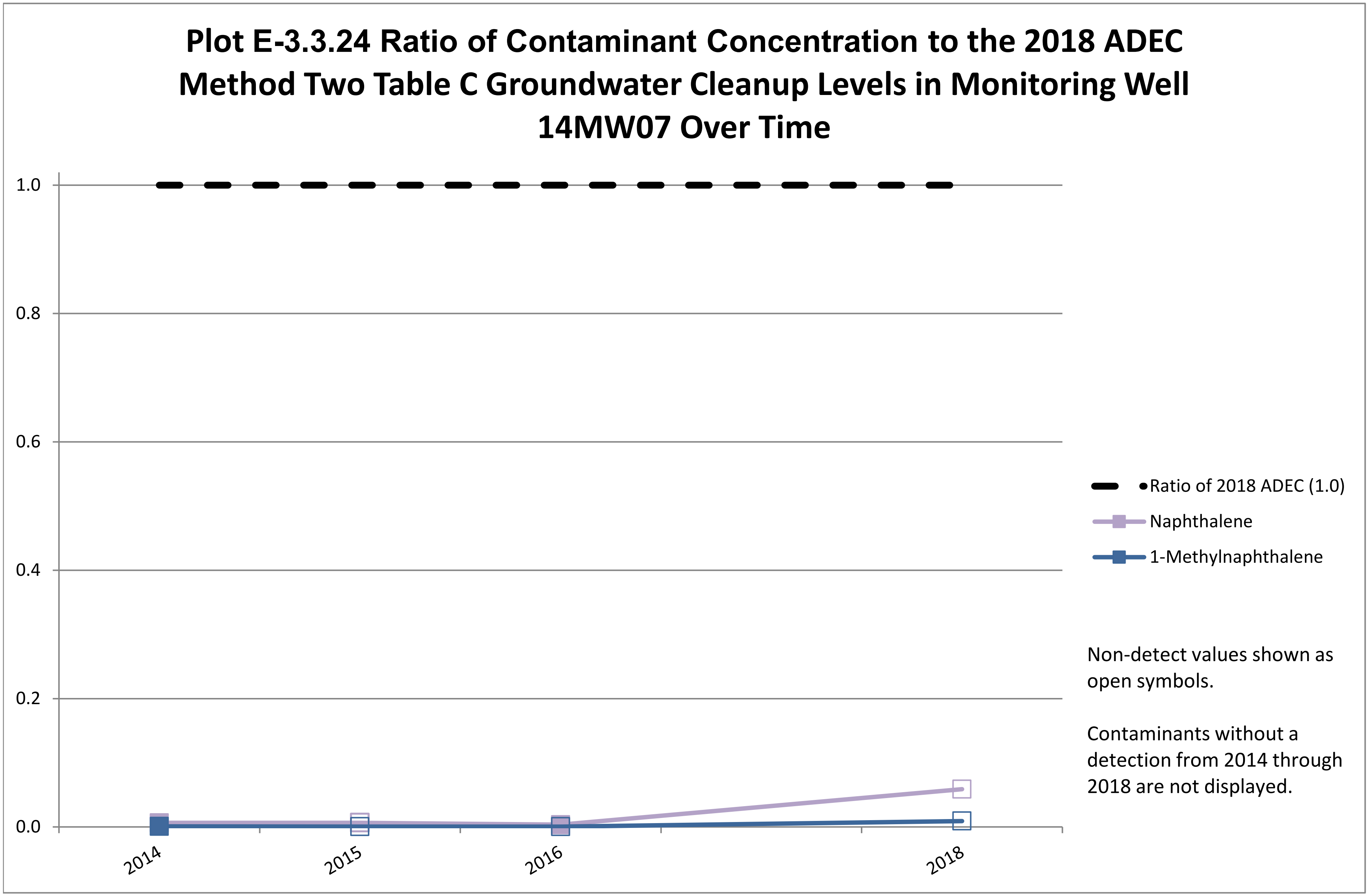
Plot E-3.3.21 Ratio of Contaminant Concentration to the 2018 ADEC Method Two Table C Groundwater Cleanup Levels in Monitoring Well 14MW04 Over Time

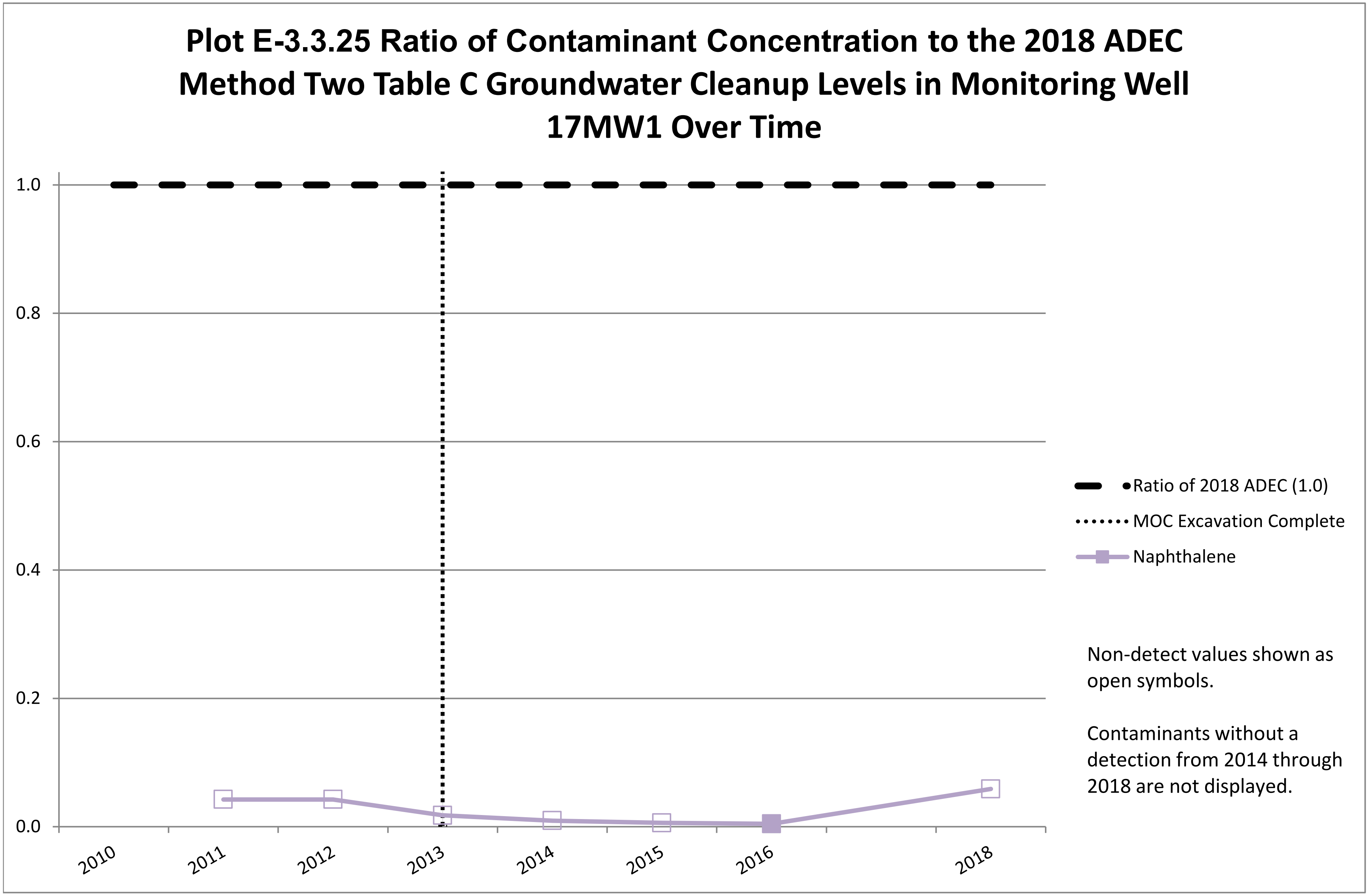


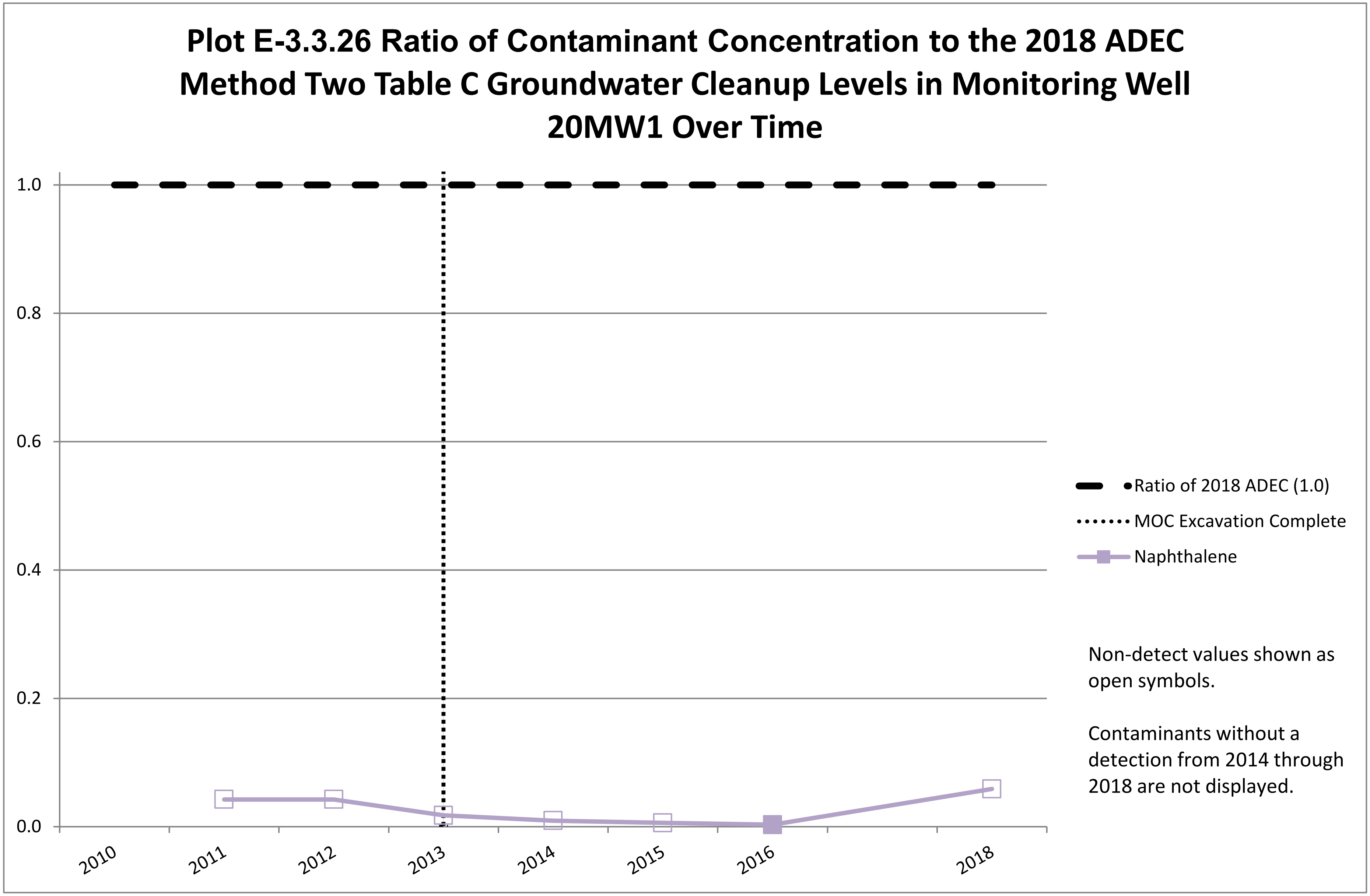

Plot E-3.3.22 Ratio of Contaminant Concentration to the 2018 ADEC Method Two Table C Groundwater Cleanup Levels in Monitoring Well 14MW05 Over Time
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
2014
2015
2016
2018
Ratio of 2018 ADEC (1.0)
Naphthalene
1-Methylnaphthalene
2-Methylnaphthalene
Non-detect values shown as open symbols.

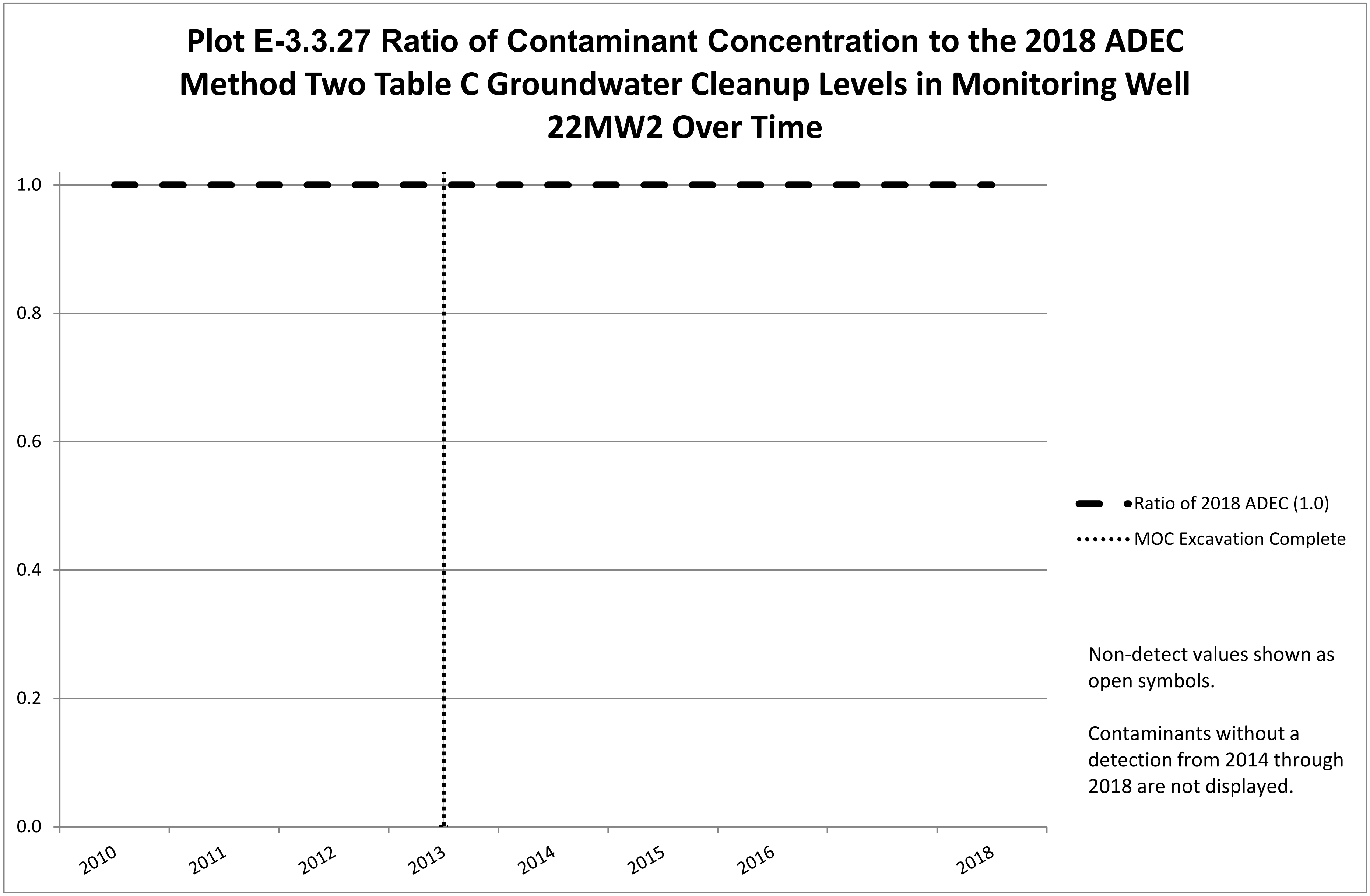
Plot E-3.3.23 Ratio of Contaminant Concentration to the 2018 ADEC Method Two Table C Groundwater Cleanup Levels in Monitoring Well 14MW06 Over Time

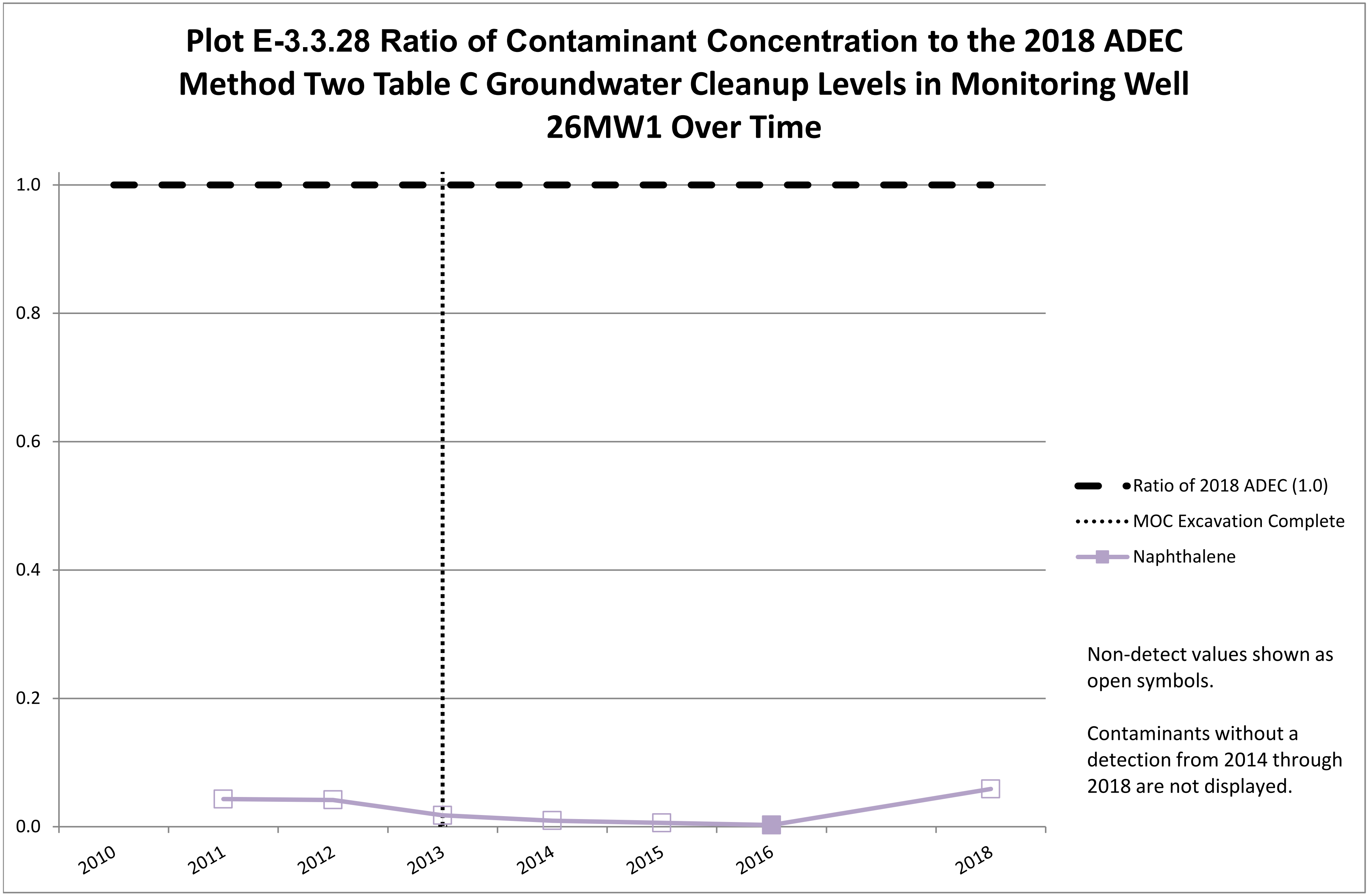



Plot E-3.3.24 Ratio of Contaminant Concentration to the 2018 ADEC Method Two Table C Groundwater Cleanup Levels in Monitoring Well 14MW07 Over Time
1.0
0.8
0.6
0.4
0.2
0.0
2014
2015
2016
2018
Ratio of 2018 ADEC (1.0)
Naphthalene
1-Methylnaphthalene
Non-detect values shown as open symbols.
Contaminants without a detection from 2014 through 2018 are not displayed.

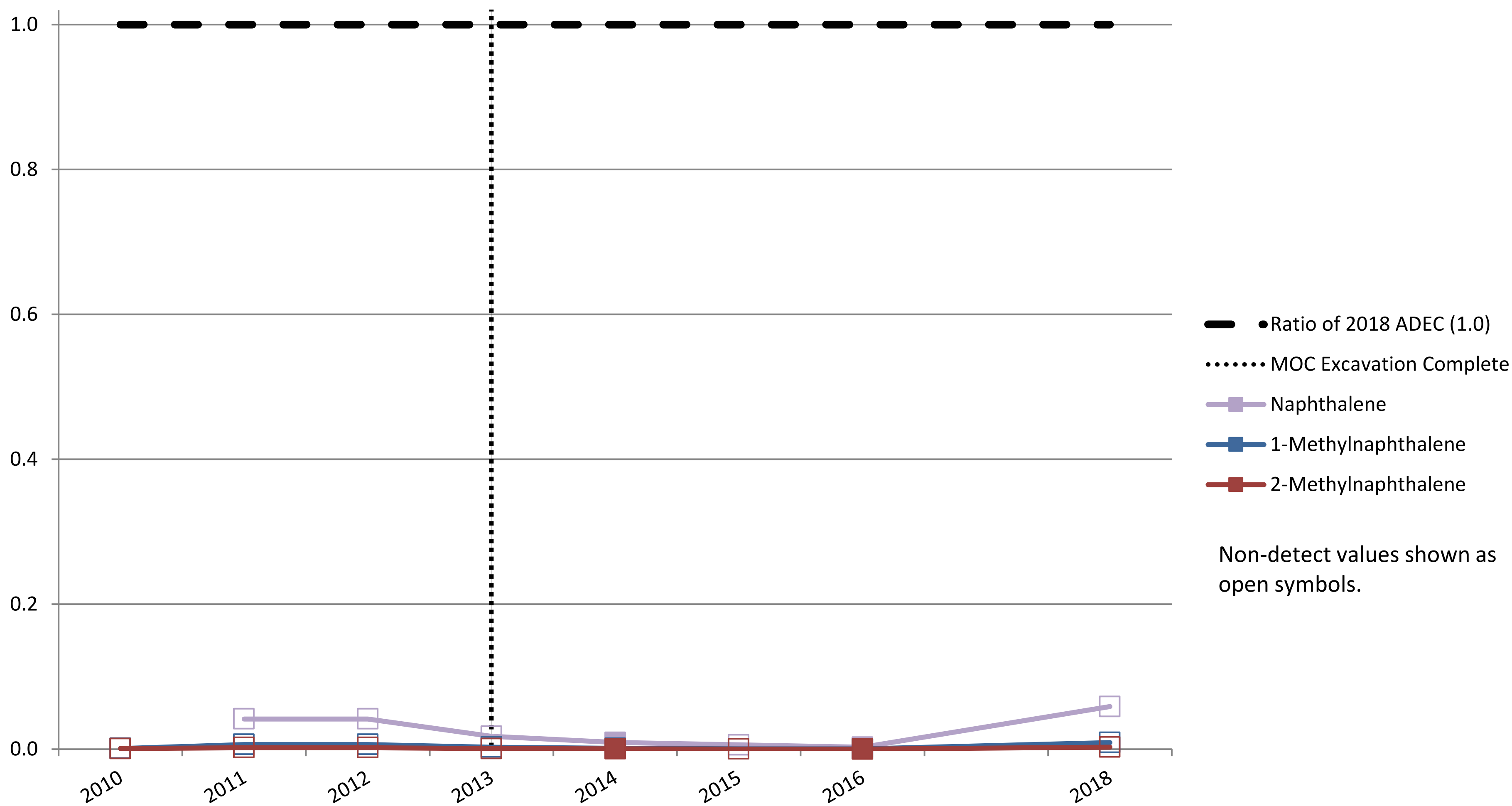

Plot E-3.3.25 Ratio of Contaminant Concentration to the 2018 ADEC Method Two Table C Groundwater Cleanup Levels in Monitoring Well 17MW1 Over Time
1.0
0.8
0.6
0.4
0.2
0.0
2010
2011
2012
2013
2014
2015
2016
2018
Ratio of 2018 ADEC (1.0)
MOC Excavation Complete
Naphthalene
Non-detect values shown as open symbols.
Contaminants without a detection from 2014 through 2018 are not displayed.

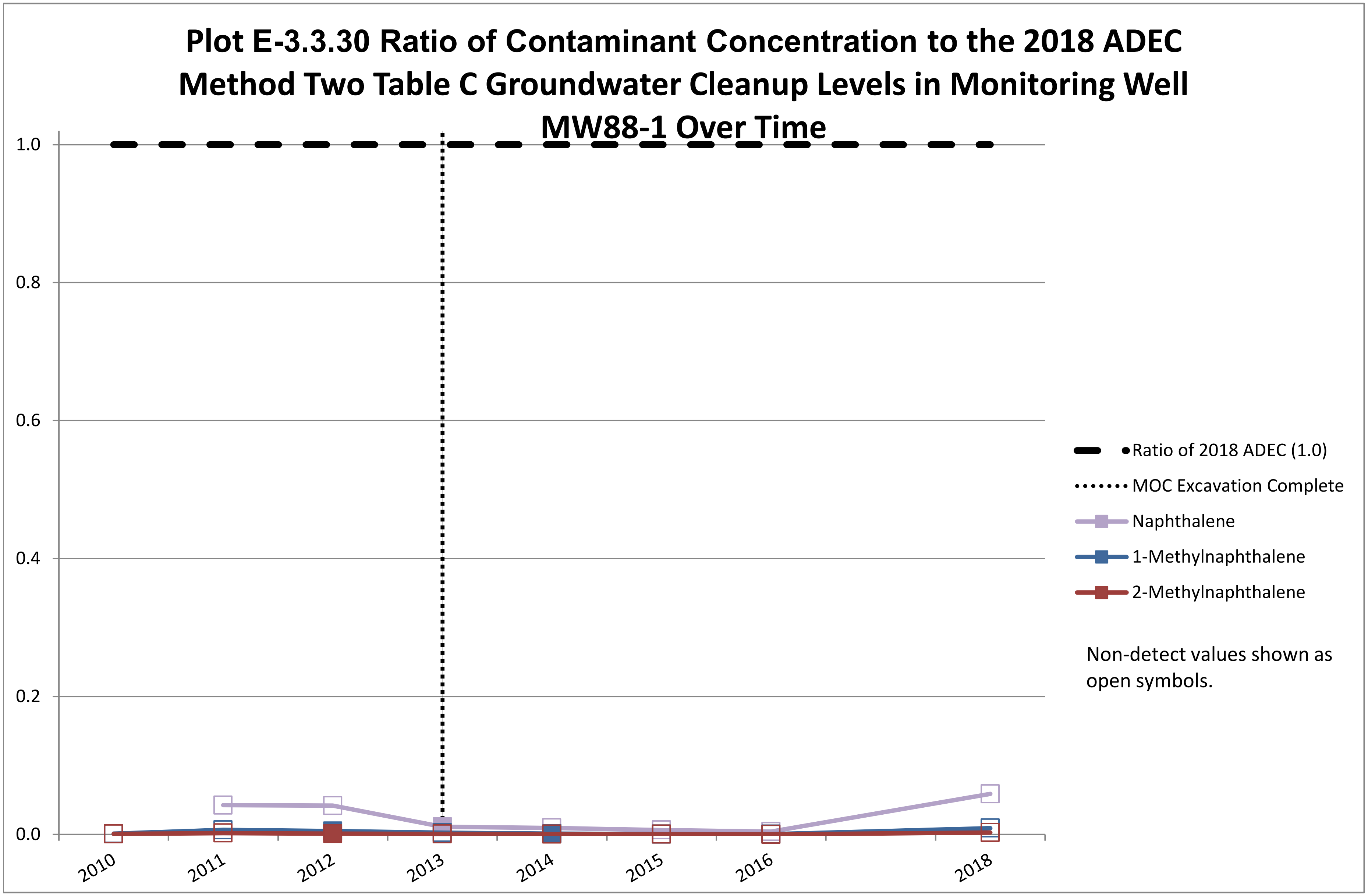

Plot E-3.3.26 Ratio of Contaminant Concentration to the 2018 ADEC Method Two Table C Groundwater Cleanup Levels in Monitoring Well 20MW1 Over Time
1.0
0.8
0.6
0.4
0.2
0.0
2010
2011
2012
2013
2014
2015
2016
2018
Ratio of 2018 ADEC (1.0)
MOC Excavation Complete
Naphthalene
Non-detect values shown as open symbols.
Contaminants without a detection from 2014 through 2018 are not displayed.


Plot E-3.3.27 Ratio of Contaminant Concentration to the 2018 ADEC Method Two Table C Groundwater Cleanup Levels in Monitoring Well 22MW2 Over Time
1.0
0.8
0.6
0.4
0.2
0.0
2010
2011
2012
2013
2014
2015
2016
2018
Ratio of 2018 ADEC (1.0)
MOC Excavation Complete
Non-detect values shown as open symbols.
Contaminants without a detection from 2014 through 2018 are not displayed.

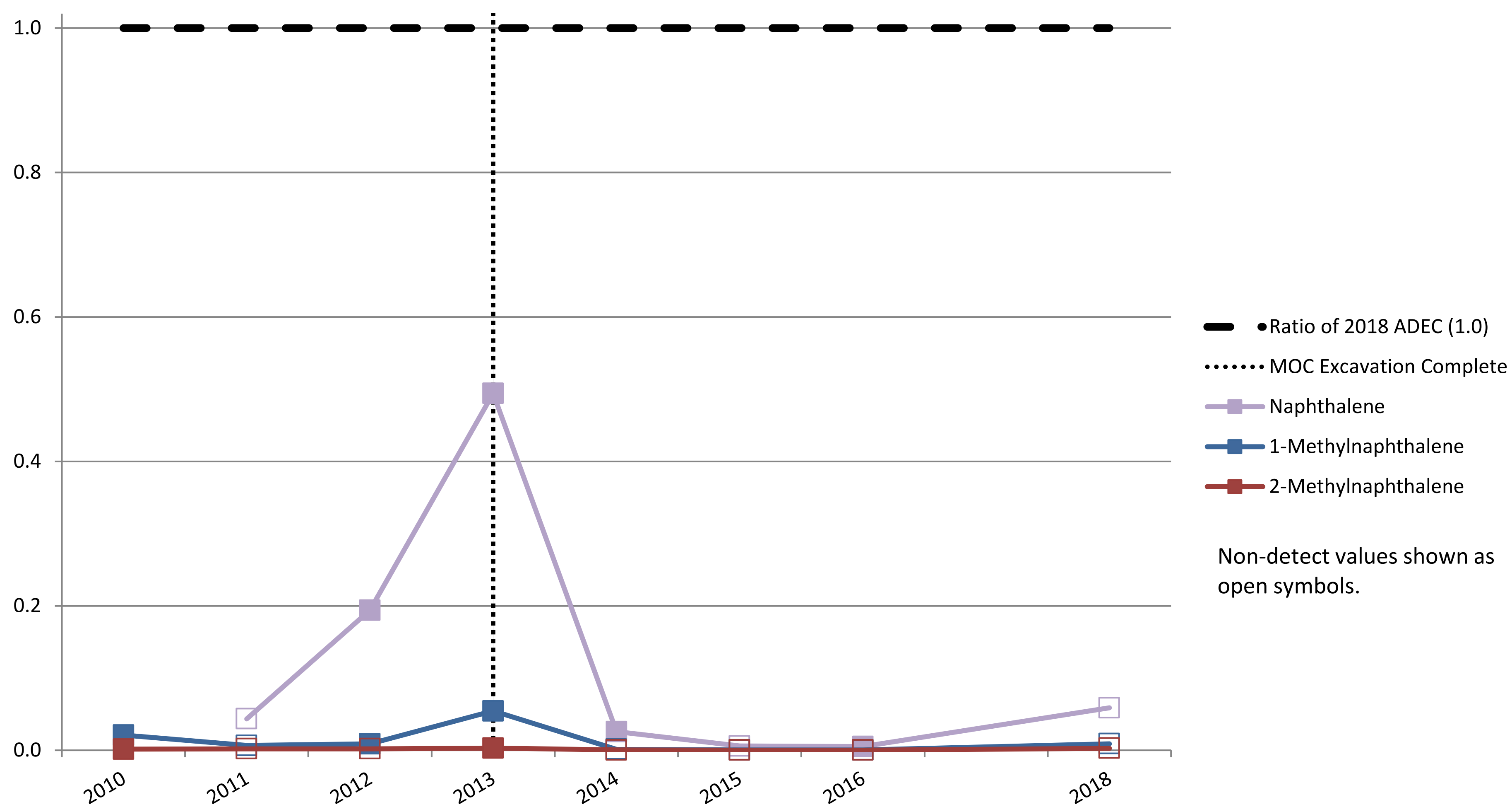

Plot E-3.3.28 Ratio of Contaminant Concentration to the 2018 ADEC Method Two Table C Groundwater Cleanup Levels in Monitoring Well 26MW1 Over Time
1.0
0.8
0.6
0.4
0.2
0.0
2010
2011
2012
2013
2014
2015
2016
2018
Ratio of 2018 ADEC (1.0)
MOC Excavation Complete
Naphthalene
Non-detect values shown as open symbols.
Contaminants without a detection from 2014 through 2018 are not displayed.

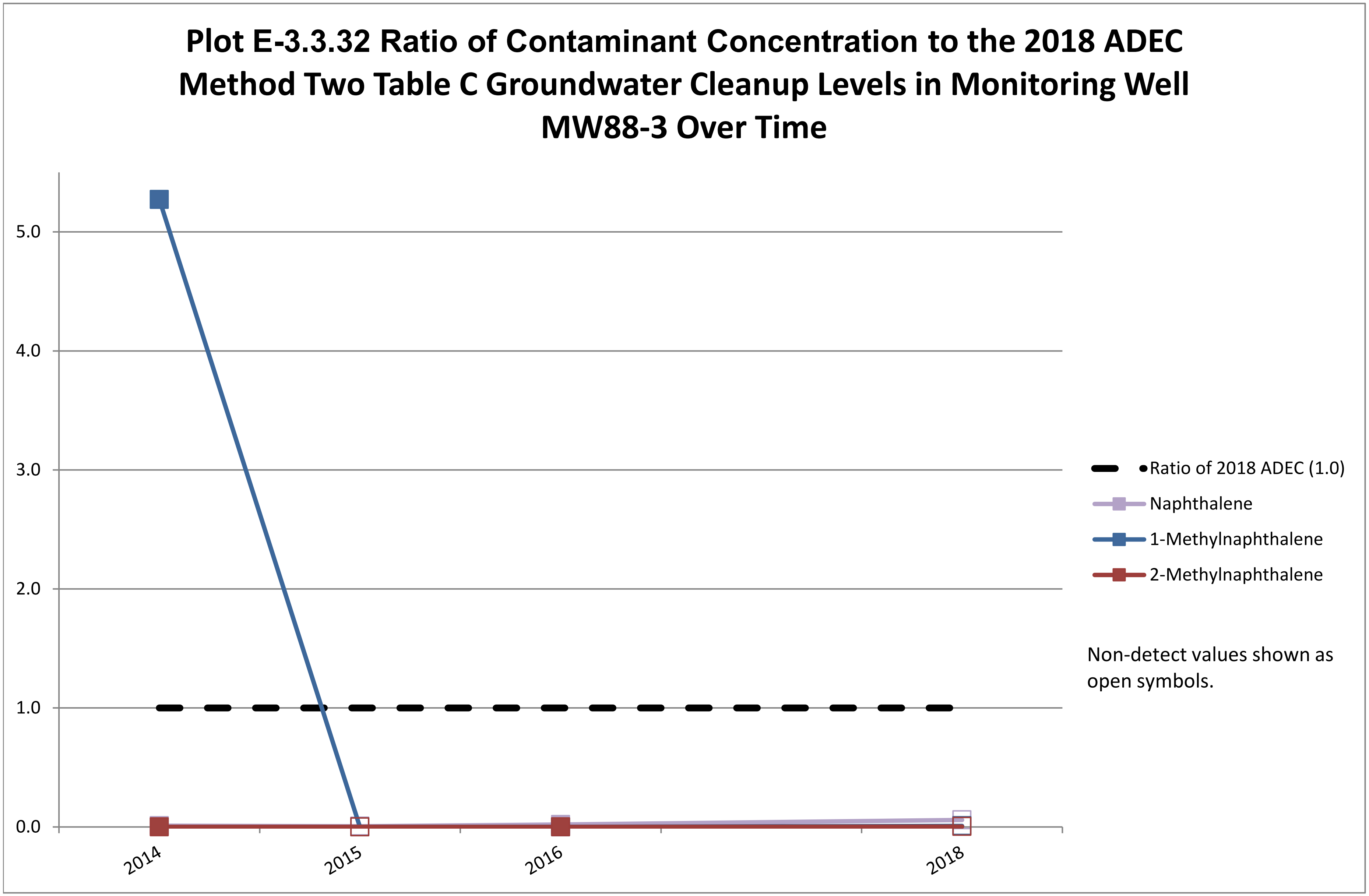
Plot E-3.3.29 Ratio of Contaminant Concentration to the 2018 ADEC Method Two Table C Groundwater Cleanup Levels in Monitoring Well MW10-1 Over Time

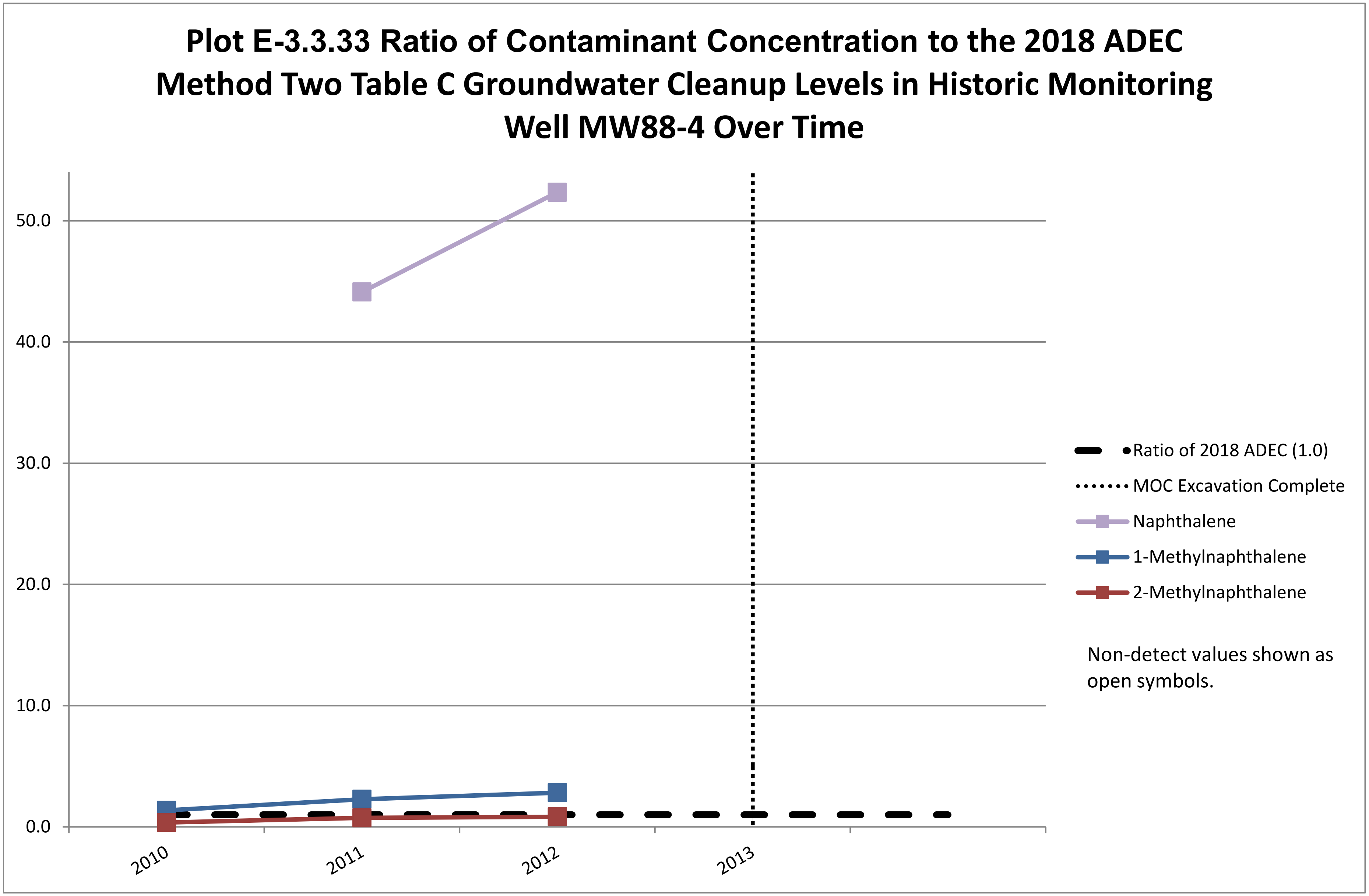



Plot E-3.3.30 Ratio of Contaminant Concentration to the 2018 ADEC Method Two Table C Groundwater Cleanup Levels in Monitoring Well MW88-1 Over Time
1.0
0.8
0.6
0.4
0.2
0.0
2010
2011
2012
2013
2014
2015
2016
2018
Ratio of 2018 ADEC (1.0)
MOC Excavation Complete
Naphthalene
1-Methylnaphthalene
2-Methylnaphthalene
Non-detect values shown as open symbols.

Plot E-3.3.31 Ratio of Contaminant Concentration to the 2018 ADEC Method Two Table C Groundwater Cleanup Levels in Monitoring Well MW88-10 Over Time




Plot E-3.3.32 Ratio of Contaminant Concentration to the 2018 ADEC Method Two Table C Groundwater Cleanup Levels in Monitoring Well MW88-3 Over Time
5.0
4.0
3.0
2.0
1.0
0.0
2014
2015
2016
2018
Ratio of 2018 ADEC (1.0)
Naphthalene
1-Methylnaphthalene
2-Methylnaphthalene
Non-detect values shown as open symbols.


Plot E-3.3.33 Ratio of Contaminant Concentration to the 2018 ADEC Method Two Table C Groundwater Cleanup Levels in Historic Monitoring Well MW88-4 Over Time
50.0
40.0
30.0
20.0
10.0
0.0
2010
2011
2012
2013
Ratio of 2018 ADEC (1.0)
MOC Excavation Complete
Naphthalene
1-Methylnaphthalene
2-Methylnaphthalene
Non-detect values shown as open symbols.

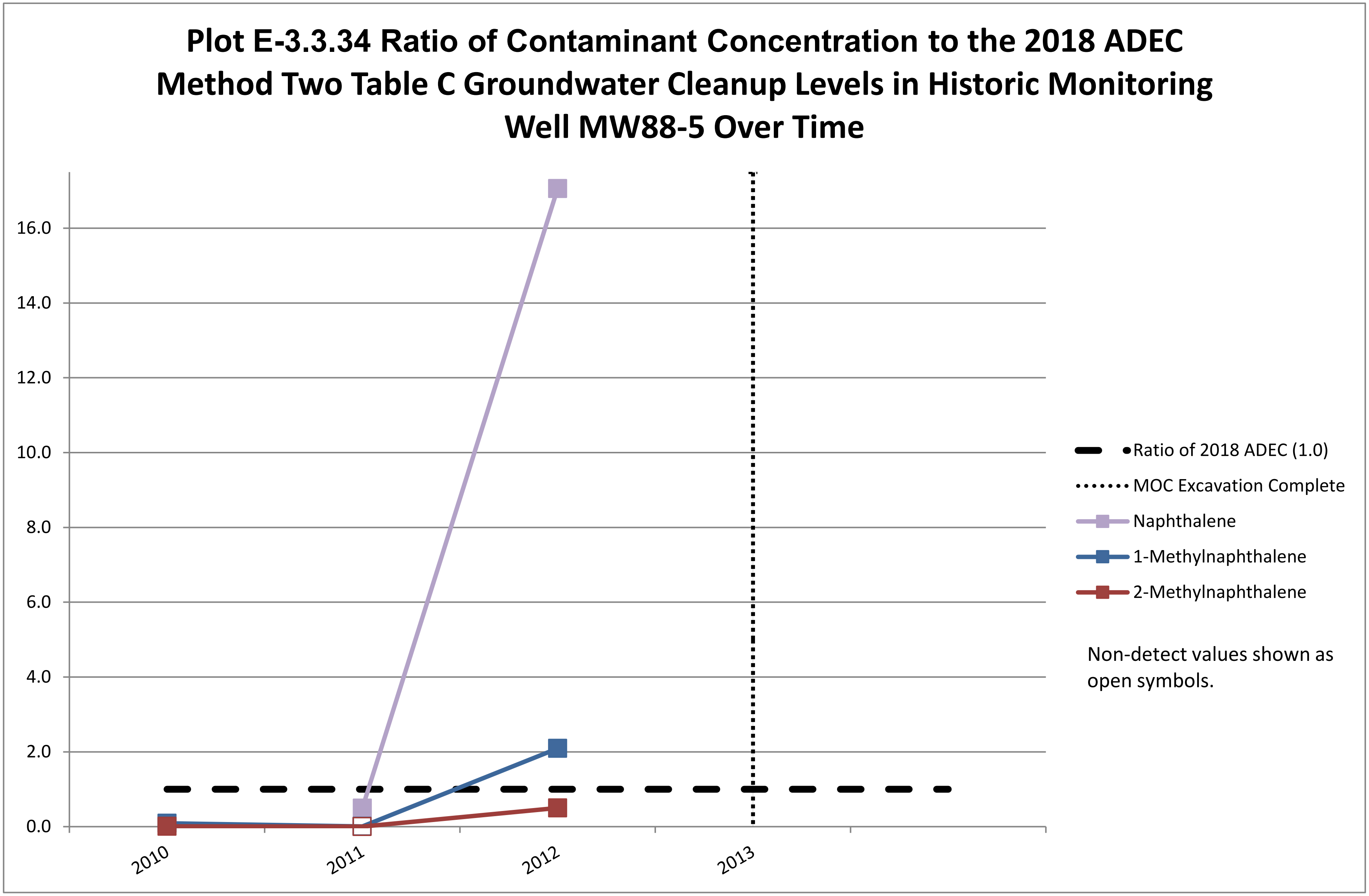

Plot E-3.3.34 Ratio of Contaminant Concentration to the 2018 ADEC Method Two Table C Groundwater Cleanup Levels in Historic Monitoring Well MW88-5 Over Time
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
2010
2011
2012
2013
Ratio of 2018 ADEC (1.0)
MOC Excavation Complete
Naphthalene
1-Methylnaphthalene
2-Methylnaphthalene
Non-detect values shown as open symbols.

EXHIBIT E-3.4

DRO Trends Over Time

2018 MNA Groundwater Annual Sampling Report at the Northeast Cape MOC
Table E-3.4.1.1 Input Data

Mann-Kendall Input Data				
Time	**14MW01**	**14MW02**	**14MW04**	**14MW05**
Year	**DRO (mg/L)**			
0	0.51	1.3	2.5	4.9
1	0.51	1.6	2.8	12
2	0.92	1.6	2.2	3.2
4	2	2.8	1.8	3.1

Notes:

DRO = diesel range organics

mg/L = milligram per liter

2018 MNA Groundwater Annual Sampling Report at the Northeast Cape MOC
Table E-3.4.1.2 Trend Test Analysis 14MW01

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	ProUCL 5.112/5/2018 12:03:24 PM
From File	NEC2018_ProUCL.xls
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

14MW01 - DRO

General Statistics

Number of Events Reported (m)	4
Number of Missing Events	0
Number or Reported Events Used	4
Number Values Reported (n)	4
Minimum	0.51
Maximum	2
Mean	0.985
Geometric Mean	0.832
Median	0.715
Standard Deviation	0.704
Coefficient of Variation	0.714

Mann-Kendall Test

M-K Test Value (S)	5
Tabulated p-value	0.167
Standard Deviation of S	2.769
Standardized Value of S	1.445
Approximate p-value	0.0743

Insufficient evidence to identify a significant trend at the specified level of significance.

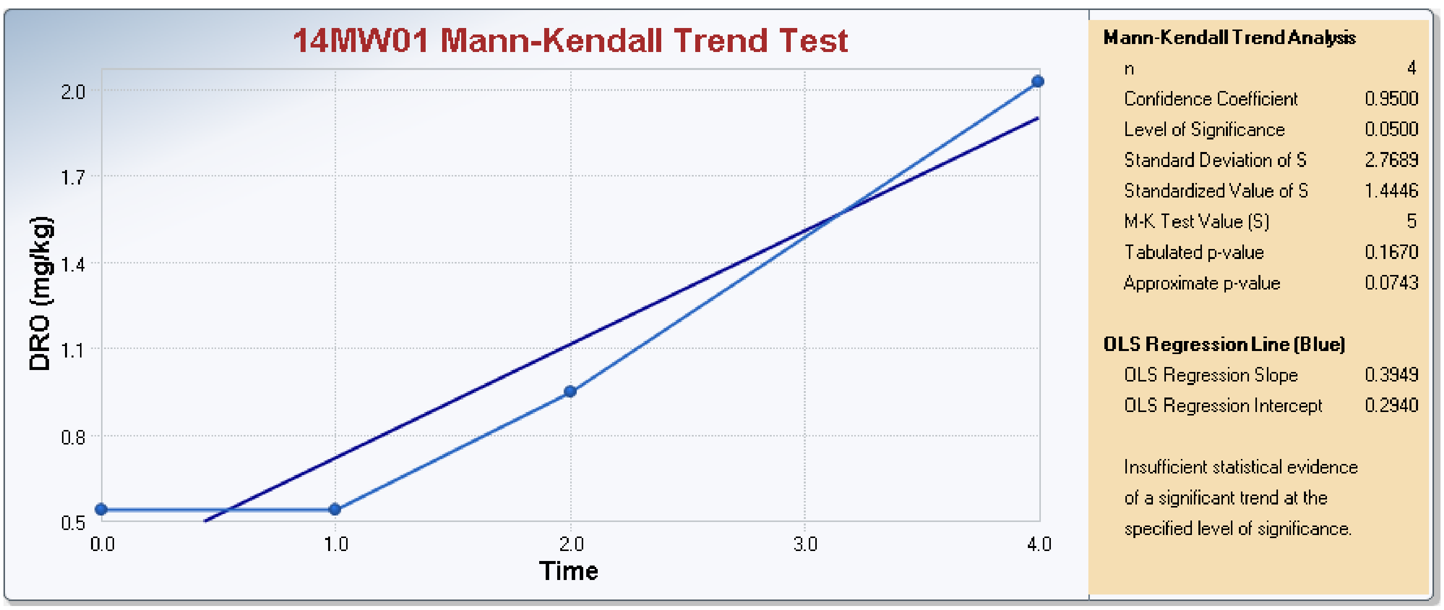


Table E-3.4.1.3 Trend Test Analysis 14MW02

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	ProUCL 5.112/5/2018 12:13:29 PM
From File	NEC2018_ProUCL.xls
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

14MW02 - DRO

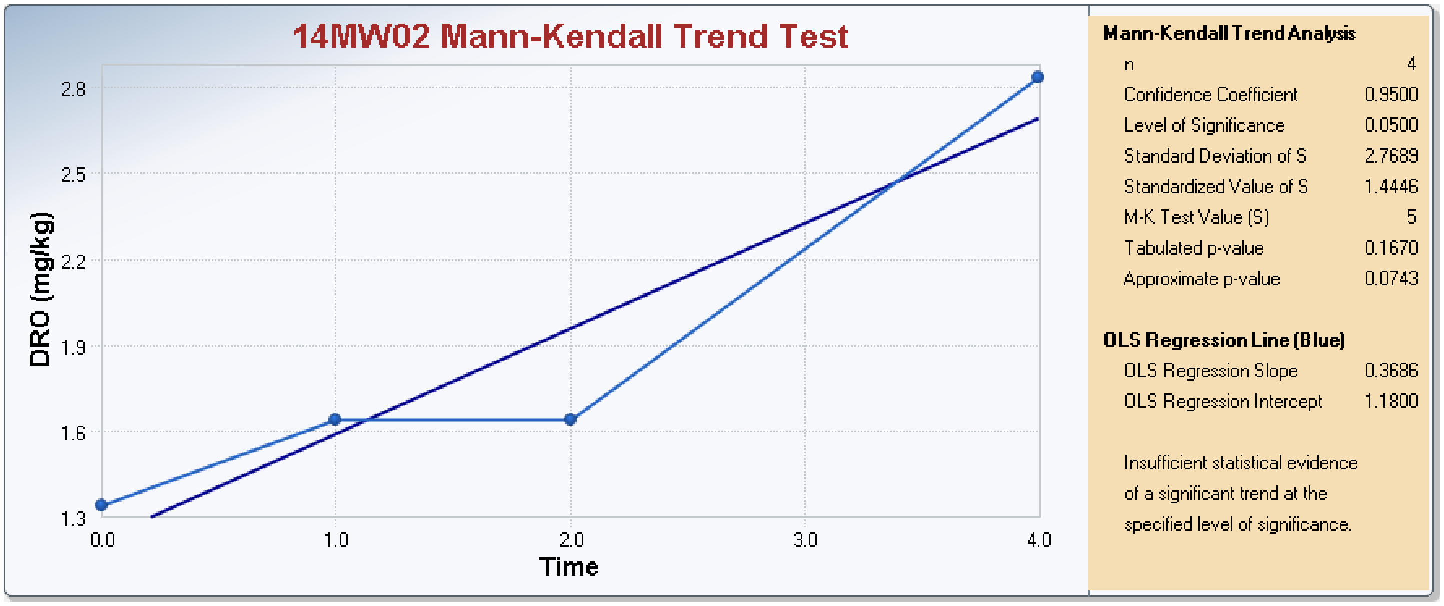
General Statistics

Number of Events Reported (m)	4
Number of Missing Events	0
Number or Reported Events Used	4
Number Values Reported (n)	4
Minimum	1.3
Maximum	2.8
Mean	1.825
Geometric Mean	1.747
Median	1.6
Standard Deviation	0.665
Coefficient of Variation	0.364

Mann-Kendall Test

M-K Test Value (S)	5
Tabulated p-value	0.167
Standard Deviation of S	2.769
Standardized Value of S	1.445
Approximate p-value	0.0743

Insufficient evidence to identify a significant trend at the specified level of significance.



2018 MNA Groundwater Annual Sampling Report at the Northeast Cape MOC
Table E-3.4.1.4 Trend Test Analysis 14MW04

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	ProUCL 5.112/5/2018 12:29:13 PM
From File	NEC2018_ProUCL.xls
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

14MW02 - DRO

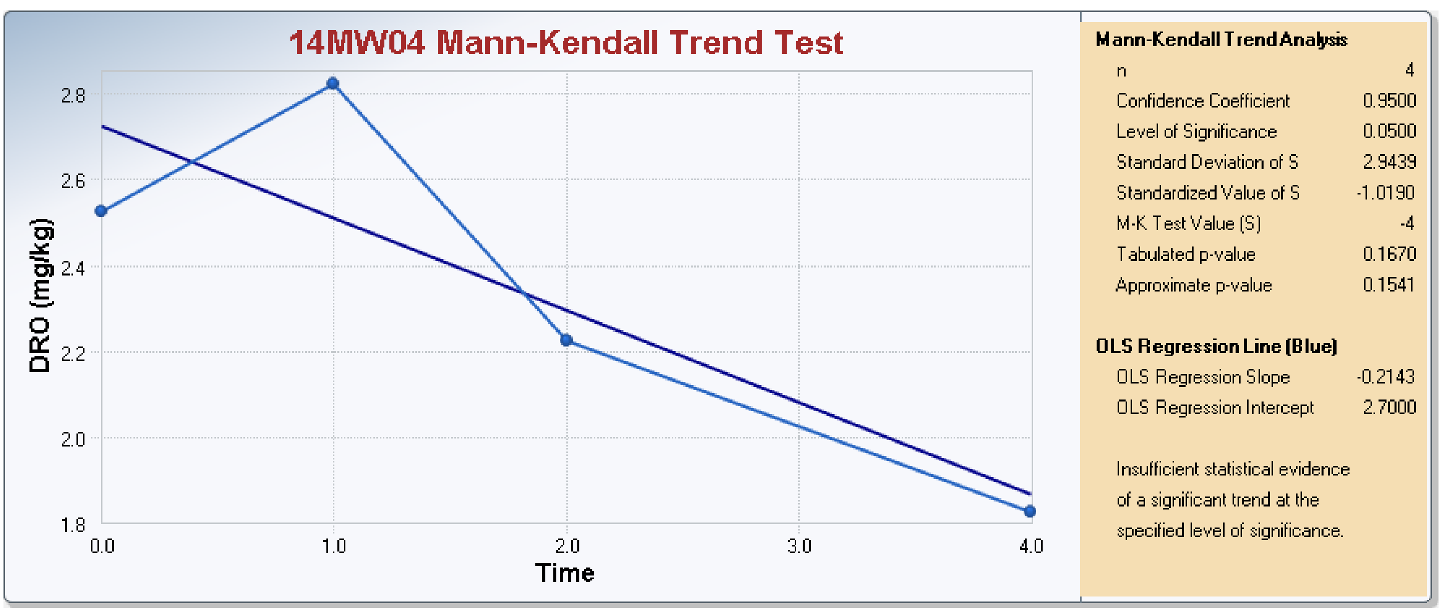
General Statistics

Number of Events Reported (m)	4
Number of Missing Events	0
Number or Reported Events Used	4
Number Values Reported (n)	4
Minimum	1.8
Maximum	2.8
Mean	2.325
Geometric Mean	2.295
Median	2.35
Standard Deviation	0.427
Coefficient of Variation	0.184

Mann-Kendall Test

M-K Test Value (S)	-4
Tabulated p-value	0.167
Standard Deviation of S	2.944
Standardized Value of S	-1.019
Approximate p-value	0.154

Insufficient evidence to identify a significant trend at the specified level of significance.



2018 MNA Groundwater Annual Sampling Report at the Northeast Cape MOC
Table E-3.4.1.5 Trend Test Analysis 14MW05

Mann-Kendall Trend Test Analysis

User Selected Options	
Date/Time of Computation	ProUCL 5.112/5/2018 4:17:21 PM
From File	NEC2018_ProUCL.xls
Full Precision	OFF
Confidence Coefficient	0.95
Level of Significance	0.05

14MW05 - DRO

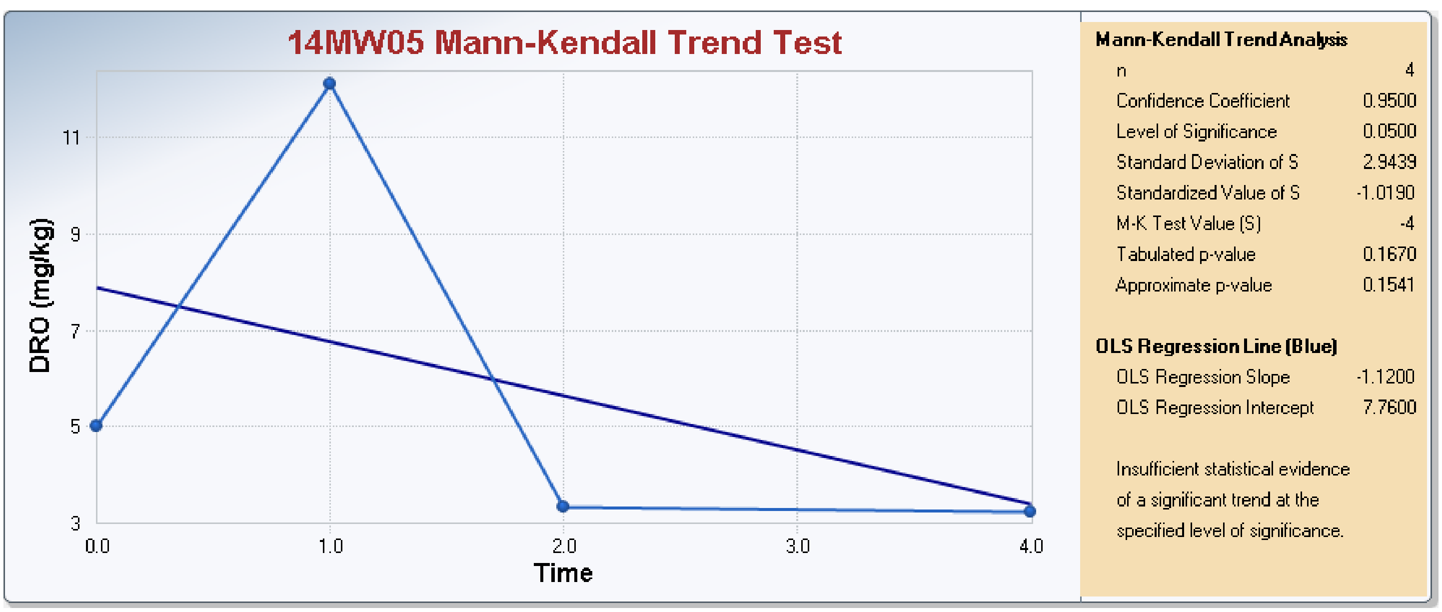
General Statistics

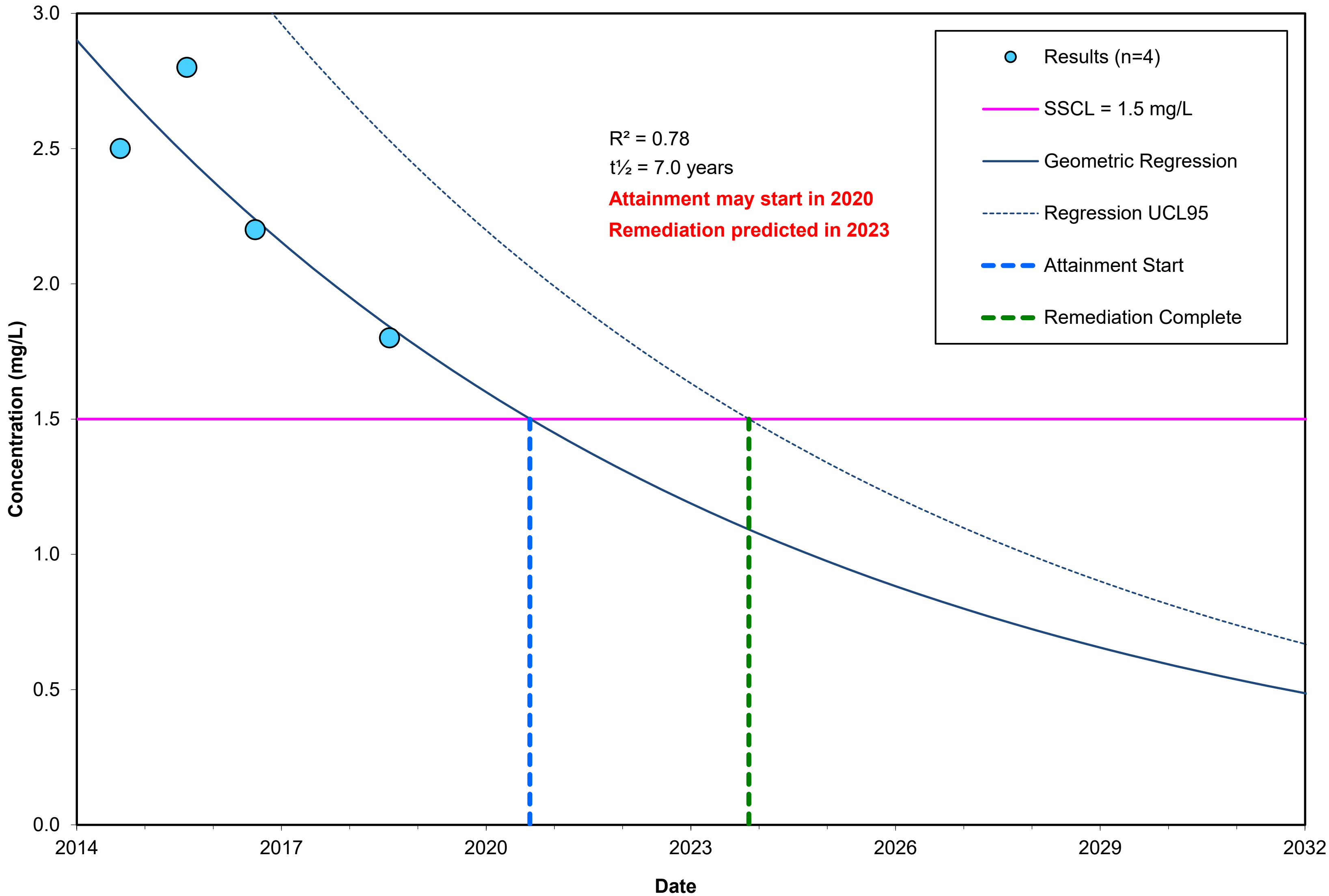
Number of Events Reported (m)	4
Number of Missing Events	0
Number or Reported Events Used	4
Number Values Reported (n)	4
Minimum	3.1
Maximum	12
Mean	5.8
Geometric Mean	4.914
Median	4.05
Standard Deviation	4.215
Coefficient of Variation	0.727

Mann-Kendall Test

M-K Test Value (S)	-4
Tabulated p-value	0.167
Standard Deviation of S	2.944
Standardized Value of S	-1.019
Approximate p-value	0.154

Insufficient evidence to identify a significant trend at the specified level of significance.





DATE:	PROJECT MANAGER:		Plot NO:
03 JAN 2019	K. MAHER	WELL 14MW04 DRO GEOMETRIC REGRESSION 2018 MNA GROUNDWATER ANNUAL SAMPLING REPORT AT THE NORTHEAST CAPE MOC	3.4.2

2018 MNA Groundwater Annual Sampling Report at the Northeast Cape MOC
Table E-3.4.2.1 Input Data

Statistical Geometric Regression to Evaluate Natural Attenuation

H. McLean; Jacobs Engineering November 2018

NEC			
14MW04			
DRO			
Date	mg/L	Qualifer	Log mg/L
Included			12
8/23/2014	2.5		0.40
8/15/2015	2.8	QN	0.45
8/15/2016	2.2	QL	0.34
8/4/2018	1.8		0.26
			#N/A
			#N/A
			#N/A
			#N/A
			#N/A
			#N/A
			#N/A
			#N/A
			#N/A
			#N/A
			#N/A
Excluded			
8/15/2015	1.6	QL QN	0.20
			#N/A

Plot Limits	Year	X	Max Y
Start	2012	40910	3
End	2040	51138	2.8

LinEst of Log COCs		
-1.18E-04	5.37	m (1/day), b
4.43E-05	1.88	se(m), se(b)
0.78	0.05	r², se(y intercept)
7.10	2	F,degrees of freedom
0.02	0.00	regression sum of squares, residual sum of squares
	0.05	Standard Deviation
	2.92	Student's t for one-tailed 95% confidence interval
	0.14	± for 95% CI

2018 MNA Groundwater Annual Sampling Report at the Northeast Cape MOC
Table E-3.4.2.1 Input Data

Cleanup Level	
Date	DRO
1/2/2012	1.5
1/3/2040	1.5

Goal Seek for Cleanup Dates

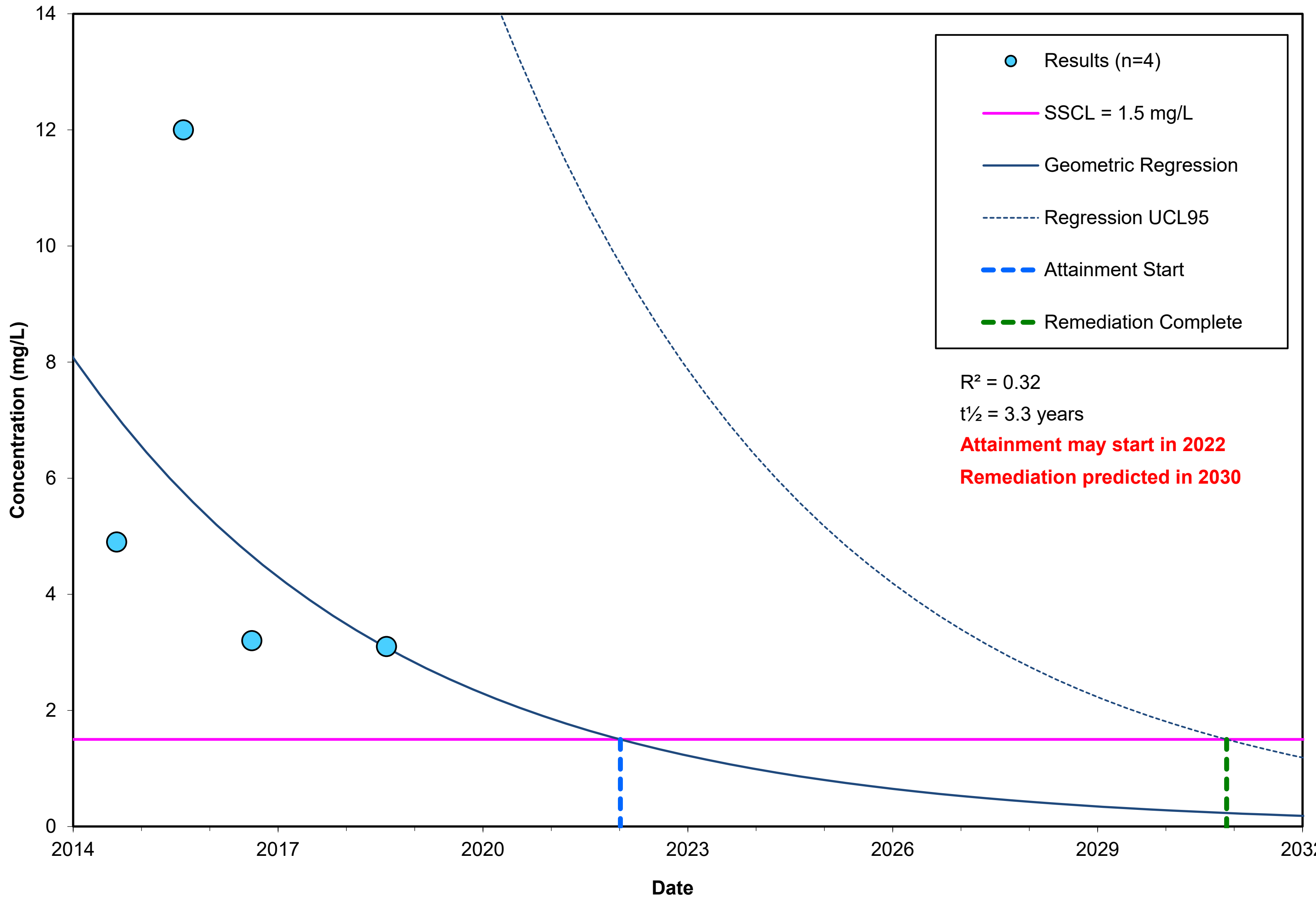
		Log			Linear			GoalSeek
Phase	Date	-95%	Trend	+95%	-95%	Trend	+95%	Target
Remed	11/8/2023	-0.10	0.04	0.18	7.95E-01	1.09E+00	1.50E+00	1.000325
Attain	8/23/2020	0.04	0.18	0.31	1.09E+00	1.50E+00	2.06E+00	1.000977

2018 MNA Groundwater Annual Sampling Report at the Northeast Cape MOC
Table E-3.4.2.2 Curve Data

Date	14MW04					
	Log			Linear		
	-95%	Trend	+95%	-95%	Trend	+95%
1/2/2012	0.41	0.55	0.69	2.574996165	3.537827322	4.86067604
5/5/2012	0.40	0.53	0.67	2.489241652	3.420007861	4.698802048
9/7/2012	0.38	0.52	0.66	2.406343001	3.306112115	4.542318908
1/10/2013	0.37	0.50	0.64	2.326205106	3.196009412	4.391047091
5/14/2013	0.35	0.49	0.63	2.248736024	3.089573435	4.244813045
9/16/2013	0.34	0.48	0.61	2.173846878	2.986682071	4.103448999
1/19/2014	0.32	0.46	0.60	2.101451748	2.887217275	3.966792767
5/24/2014	0.31	0.45	0.58	2.031467577	2.791064933	3.834687567
9/25/2014	0.29	0.43	0.57	1.963814073	2.69811473	3.706981836
1/28/2015	0.28	0.42	0.55	1.898413618	2.608260027	3.58352906
6/2/2015	0.26	0.40	0.54	1.83519118	2.521397734	3.464187604
10/5/2015	0.25	0.39	0.52	1.774074224	2.437428197	3.34882055
2/6/2016	0.23	0.37	0.51	1.714992632	2.356255079	3.237295538
6/10/2016	0.22	0.36	0.50	1.657878621	2.27778525	3.129484618
10/13/2016	0.20	0.34	0.48	1.602666665	2.201928684	3.025264102
2/14/2017	0.19	0.33	0.47	1.549293421	2.128598352	2.924514417
6/19/2017	0.18	0.31	0.45	1.497697653	2.057710124	2.827119976
10/22/2017	0.16	0.30	0.44	1.447820168	1.98918267	2.732969041
2/24/2018	0.15	0.28	0.42	1.399603741	1.92293737	2.641953592
6/28/2018	0.13	0.27	0.41	1.352993055	1.858898223	2.55396921
10/31/2018	0.12	0.25	0.39	1.307934634	1.796991757	2.468914953
3/5/2019	0.10	0.24	0.38	1.264376783	1.737146948	2.386693238
7/8/2019	0.09	0.23	0.36	1.22226953	1.679295137	2.307209734
11/9/2019	0.07	0.21	0.35	1.181564564	1.623369951	2.230373251
3/13/2020	0.06	0.20	0.33	1.142215188	1.56930723	2.156095636
7/16/2020	0.04	0.18	0.32	1.104176254	1.517044947	2.084291672
11/18/2020	0.03	0.17	0.30	1.067404123	1.466523143	2.014878979
3/22/2021	0.01	0.15	0.29	1.031856605	1.417683855	1.947777921
7/25/2021	0.00	0.14	0.27	0.997492918	1.370471051	1.882911514
11/27/2021	-0.02	0.12	0.26	0.964273638	1.324830564	1.820205339
3/31/2022	-0.03	0.11	0.25	0.932160652	1.280710032	1.759587453
8/3/2022	-0.05	0.09	0.23	0.901117117	1.238058836	1.700988311
12/6/2022	-0.06	0.08	0.22	0.871107418	1.196828044	1.644340683
4/10/2023	-0.07	0.06	0.20	0.842097125	1.156970351	1.589579578
8/12/2023	-0.09	0.05	0.19	0.814052955	1.118440029	1.53664217
12/15/2023	-0.10	0.03	0.17	0.786942734	1.081192875	1.485467724
4/18/2024	-0.12	0.02	0.16	0.760735359	1.045186153	1.435997529
8/21/2024	-0.13	0.00	0.14	0.735400761	1.010378556	1.388174829
12/23/2024	-0.15	-0.01	0.13	0.710909876	0.976730148	1.341944757
4/27/2025	-0.16	-0.02	0.11	0.687234606	0.944202325	1.297254275
8/30/2025	-0.18	-0.04	0.10	0.664347788	0.912757769	1.25405211
1/2/2026	-0.19	-0.05	0.08	0.642223164	0.882360404	1.212288697
5/6/2026	-0.21	-0.07	0.07	0.620835351	0.852975355	1.171916121
9/8/2026	-0.22	-0.08	0.05	0.600159813	0.824568911	1.132888064
1/11/2027	-0.24	-0.10	0.04	0.580172826	0.797108479	1.09515975
5/15/2027	-0.25	-0.11	0.02	0.560851462	0.770562556	1.058687893
9/17/2027	-0.27	-0.13	0.01	0.542173553	0.744900686	1.02343065
1/20/2028	-0.28	-0.14	0.00	0.52411767	0.720093427	0.989347571
5/24/2028	-0.30	-0.16	-0.02	0.506663098	0.696112319	0.956399553

2018 MNA Groundwater Annual Sampling Report at the Northeast Cape MOC
Table E-3.4.2.2 Curve Data

Date	14MW04					
	Log			Linear		
	-95%	Trend	+95%	-95%	Trend	+95%
9/25/2028	-0.31	-0.17	-0.03	0.489789812	0.672929848	0.924548796
1/28/2029	-0.32	-0.19	-0.05	0.473478453	0.650519418	0.893758757
6/2/2029	-0.34	-0.20	-0.06	0.457710307	0.628855317	0.863994111
10/5/2029	-0.35	-0.22	-0.08	0.442467285	0.607912691	0.835220711
2/6/2030	-0.37	-0.23	-0.09	0.427731897	0.587667513	0.807405545
6/11/2030	-0.38	-0.25	-0.11	0.413487239	0.568096555	0.780516701
10/14/2030	-0.40	-0.26	-0.12	0.399716967	0.549177364	0.754523331
2/15/2031	-0.41	-0.27	-0.14	0.386405283	0.530888235	0.729395611
6/20/2031	-0.43	-0.29	-0.15	0.373536916	0.513208184	0.705104715
10/23/2031	-0.44	-0.30	-0.17	0.3610971	0.496116928	0.681622772
2/25/2032	-0.46	-0.32	-0.18	0.349071566	0.479594859	0.658922843
6/28/2032	-0.47	-0.33	-0.20	0.337446514	0.46362302	0.636978885
10/31/2032	-0.49	-0.35	-0.21	0.32620861	0.448183088	0.615765722
3/5/2033	-0.50	-0.36	-0.23	0.315344958	0.433257348	0.595259016
7/8/2033	-0.52	-0.38	-0.24	0.304843096	0.418828677	0.57543524
11/9/2033	-0.53	-0.39	-0.25	0.294690976	0.40488052	0.55627165
3/14/2034	-0.55	-0.41	-0.27	0.284876949	0.391396876	0.537746262
7/17/2034	-0.56	-0.42	-0.28	0.275389757	0.378362274	0.51983782
11/19/2034	-0.57	-0.44	-0.30	0.266218514	0.365761761	0.502525779
3/23/2035	-0.59	-0.45	-0.31	0.257352699	0.35358088	0.485790277
7/26/2035	-0.60	-0.47	-0.33	0.248782141	0.341805656	0.469612113
11/28/2035	-0.62	-0.48	-0.34	0.240497005	0.33042258	0.453972727
3/31/2036	-0.63	-0.50	-0.36	0.232487788	0.319418592	0.438854176
8/3/2036	-0.65	-0.51	-0.37	0.2247453	0.308781067	0.424239115
12/6/2036	-0.66	-0.53	-0.39	0.217260658	0.298497801	0.410110776
4/10/2037	-0.68	-0.54	-0.40	0.210025276	0.288556996	0.39645295
8/12/2037	-0.69	-0.55	-0.42	0.203030852	0.278947248	0.383249967
12/15/2037	-0.71	-0.57	-0.43	0.196269361	0.269657531	0.37048668
4/19/2038	-0.72	-0.58	-0.45	0.189733047	0.260677188	0.358148447
8/22/2038	-0.74	-0.60	-0.46	0.183414411	0.251995914	0.34622111
12/24/2038	-0.75	-0.61	-0.48	0.177306202	0.243603751	0.334690987
4/28/2039	-0.77	-0.63	-0.49	0.171401414	0.235491071	0.323544849
8/31/2039	-0.78	-0.64	-0.50	0.165693271	0.227648565	0.312769908
1/3/2040	-0.80	-0.66	-0.52	0.160175226	0.220067237	0.302353803



DATE:	PROJECT MANAGER:		Plot NO:
03 JAN 2019	K. MAHER	WELL 14MW05 DRO GEOMETRIC REGRESSION 2018 MNA GROUNDWATER ANNUAL SAMPLING REPORT AT THE NORTHEAST CAPE MOC	3.4.3

2018 MNA Groundwater Annual Sampling Report at the Northeast Cape MOC
Table E-3.4.3.1 Input Data

Statistical Geometric Regression to Evaluate Natural Attenuation

H. McLean; Jacobs Engineering November 2018

NEC			
14MW05			
DRO			
Date	**mg/L**	**Qualifer**	**Log mg/L**
Included			12
8/23/2014	4.9		0.69
8/15/2015	12		1.08
8/15/2016	3.2	QL	0.51
8/5/2018	3.1		0.49
			#N/A
			#N/A
			#N/A
			#N/A
			#N/A
			#N/A
			#N/A
			#N/A
			#N/A
			#N/A
			#N/A
Excluded			
8/15/2015	11		1.04
			#N/A

Plot Limits	Year	X	Max Y
Start	2012	40910	3
End	2040	51138	12

LinEst of Log COCs		
-2.50E-04	11.31	m (1/day), b
2.60E-04	11.04	se(m), se(b)
0.32	0.28	r², se(y intercept)
0.93	2	F,degrees of freedom
0.07	0.15	regression sum of squares, residual sum of squares
	0.28	Standard Deviation
	2.92	Student's t for one-tailed 95% confidence interval
	0.81	± for 95% CI

Cleanup Level	
Date	**DRO**
1/2/2012	1.5
1/3/2040	1.5

2018 MNA Groundwater Annual Sampling Report at the Northeast Cape MOC
Table E-3.4.3.1 Input Data

Goal Seek for Cleanup Dates

Phase	Date	Log -95%	Log Trend	Log +95%	Linear -95%	Linear Trend	Linear +95%	GoalSeek Target
Remed	11/22/2030	-1.44	-0.63	0.18	3.60E-02	2.32E-01	1.50E+00	1.000010
Attain	1/6/2022	-0.63	0.18	0.99	2.32E-01	1.50E+00	9.68E+00	1.000141

2018 MNA Groundwater Annual Sampling Report at the Northeast Cape MOC
Table E-3.4.3.2 Curve Data

Date	14MW05					
	Log			Linear		
	-95%	Trend	+95%	-95%	Trend	+95%
1/2/2012	0.28	1.09	1.90	1.905308908	12.29918574	79.39393412
5/5/2012	0.25	1.06	1.87	1.773391555	11.44763038	73.89695799
9/7/2012	0.22	1.03	1.84	1.650607729	10.65503392	68.78057449
1/10/2013	0.19	1.00	1.81	1.536325052	9.917314246	64.01843264
5/14/2013	0.16	0.97	1.78	1.429954934	9.230671868	59.5860059
9/16/2013	0.12	0.93	1.74	1.330949535	8.591570361	55.46046588
1/19/2014	0.09	0.90	1.71	1.238798945	7.99671815	51.62056475
5/24/2014	0.06	0.87	1.68	1.153028561	7.44305156	48.04652581
9/25/2014	0.03	0.84	1.65	1.073196637	6.927719031	44.71994162
1/28/2015	0.00	0.81	1.62	0.998892015	6.448066441	41.62367924
6/2/2015	-0.03	0.78	1.59	0.929732001	6.001623426	38.74179193
10/5/2015	-0.06	0.75	1.56	0.865360401	5.586090664	36.05943706
2/6/2016	-0.09	0.72	1.53	0.805445679	5.19932803	33.56279966
6/10/2016	-0.13	0.68	1.49	0.749679256	4.839343575	31.23902127
10/13/2016	-0.16	0.65	1.46	0.697773918	4.504283265	29.07613368
2/14/2017	-0.19	0.62	1.43	0.649462336	4.192421435	27.06299736
6/19/2017	-0.22	0.59	1.40	0.60449569	3.902151897	25.189244
10/22/2017	-0.25	0.56	1.37	0.562642387	3.631979672	23.44522319
2/24/2018	-0.28	0.53	1.34	0.52368687	3.380513287	21.82195268
6/28/2018	-0.31	0.50	1.31	0.487428505	3.146457612	20.3110721
10/31/2018	-0.34	0.47	1.28	0.453680551	2.928607186	18.90479995
3/5/2019	-0.37	0.44	1.25	0.422269194	2.72584001	17.59589348
7/8/2019	-0.41	0.40	1.21	0.393032657	2.537111769	16.37761141
11/9/2019	-0.44	0.37	1.18	0.365820363	2.361450455	15.2436792
3/13/2020	-0.47	0.34	1.15	0.340492158	2.197951355	14.18825674
7/16/2020	-0.50	0.31	1.12	0.316917595	2.045772397	13.20590829
11/18/2020	-0.53	0.28	1.09	0.294975258	1.904129812	12.29157442
3/22/2021	-0.56	0.25	1.06	0.274552137	1.772294096	11.44054604
7/25/2021	-0.59	0.22	1.03	0.255543046	1.649586254	10.64844008
11/27/2021	-0.62	0.19	1.00	0.237850082	1.535374301	9.91117694
3/31/2022	-0.65	0.16	0.96	0.22138212	1.42907001	9.224959489
8/3/2022	-0.69	0.12	0.93	0.206054347	1.33012588	8.586253488
12/6/2022	-0.72	0.09	0.90	0.191787819	1.238032318	7.9917694
4/10/2023	-0.75	0.06	0.87	0.178509058	1.152315012	7.438445445
8/12/2023	-0.78	0.03	0.84	0.166149675	1.072532492	6.923431829
12/15/2023	-0.81	0.00	0.81	0.154646015	0.998273853	6.44407607
4/18/2024	-0.84	-0.03	0.78	0.143938831	0.929156639	5.997909335
8/21/2024	-0.87	-0.06	0.75	0.133972978	0.864824874	5.582633725
12/23/2024	-0.90	-0.09	0.72	0.124697127	0.804947231	5.196110438
4/27/2025	-0.94	-0.13	0.68	0.116063506	0.749215319	4.836348759
8/30/2025	-0.97	-0.16	0.65	0.108027649	0.697342103	4.501495801
1/2/2026	-1.00	-0.19	0.62	0.100548168	0.649060418	4.189826965
5/6/2026	-1.03	-0.22	0.59	0.093586542	0.604121599	3.89973706
9/8/2026	-1.06	-0.25	0.56	0.087106916	0.562294197	3.62973203
1/11/2027	-1.09	-0.28	0.53	0.081075918	0.523362787	3.378421265
5/15/2027	-1.12	-0.31	0.50	0.075462487	0.487126861	3.144510434
9/17/2027	-1.15	-0.34	0.47	0.070237712	0.453399791	2.926794824
1/20/2028	-1.18	-0.37	0.44	0.065374682	0.422007874	2.72415313
5/24/2028	-1.22	-0.41	0.40	0.060848353	0.39278943	2.535541684

2018 MNA Groundwater Annual Sampling Report at the Northeast Cape MOC
Table E-3.4.3.2 Curve Data

Date	14MW05					
	Log			Linear		
	-95%	Trend	+95%	-95%	Trend	+95%
9/25/2028	-1.25	-0.44	0.37	0.056635413	0.365593975	2.359989077
1/28/2029	-1.28	-0.47	0.34	0.052714162	0.340281445	2.196591158
6/2/2029	-1.31	-0.50	0.31	0.049064406	0.316721472	2.044506376
10/5/2029	-1.34	-0.53	0.28	0.045667347	0.294792714	1.902951446
2/6/2030	-1.37	-0.56	0.25	0.042505489	0.274382231	1.771197316
6/11/2030	-1.40	-0.59	0.22	0.039562548	0.255384903	1.648565412
10/14/2030	-1.43	-0.62	0.19	0.036823367	0.237702889	1.534424138
2/15/2031	-1.47	-0.66	0.15	0.034273838	0.221245119	1.428185633
6/20/2031	-1.50	-0.69	0.12	0.031900829	0.205926831	1.329302735
10/23/2031	-1.53	-0.72	0.09	0.02969212	0.191669131	1.237266164
2/25/2032	-1.56	-0.75	0.06	0.027636335	0.178398588	1.151601905
6/28/2032	-1.59	-0.78	0.03	0.025722886	0.166046853	1.071868758
10/31/2032	-1.62	-0.81	0.00	0.023941917	0.154550313	0.997656074
3/5/2033	-1.65	-0.84	-0.03	0.022284257	0.143849755	0.928581633
7/8/2033	-1.68	-0.87	-0.06	0.020741368	0.133890069	0.86428968
11/9/2033	-1.71	-0.90	-0.09	0.019305304	0.124619959	0.804449091
3/14/2034	-1.75	-0.94	-0.13	0.017968668	0.115991681	0.748751669
7/17/2034	-1.78	-0.97	-0.16	0.016724576	0.107960796	0.696910554
11/19/2034	-1.81	-1.00	-0.19	0.015566621	0.100485944	0.648658749
3/23/2035	-1.84	-1.03	-0.22	0.014488839	0.093528626	0.60374774
7/26/2035	-1.87	-1.06	-0.25	0.013485679	0.08705301	0.561946223
11/28/2035	-1.90	-1.09	-0.28	0.012551975	0.081025745	0.523038905
3/31/2036	-1.93	-1.12	-0.31	0.011682917	0.075415787	0.486825404
8/3/2036	-1.96	-1.15	-0.34	0.01087403	0.070194245	0.453119206
12/6/2036	-1.99	-1.18	-0.37	0.010121148	0.065334225	0.421746715
4/10/2037	-2.03	-1.22	-0.41	0.009420393	0.060810697	0.392546353
8/12/2037	-2.06	-1.25	-0.44	0.008768156	0.056600364	0.365367729
12/15/2037	-2.09	-1.28	-0.47	0.008161077	0.05268154	0.340070863
4/19/2038	-2.12	-1.31	-0.50	0.007596031	0.049034043	0.316525469
8/22/2038	-2.15	-1.34	-0.53	0.007070107	0.045639086	0.294610282
12/24/2038	-2.18	-1.37	-0.56	0.006580596	0.042479185	0.27421243
4/28/2039	-2.21	-1.40	-0.59	0.006124977	0.039538065	0.255226859
8/31/2039	-2.24	-1.43	-0.62	0.005700903	0.036800579	0.237555787
1/3/2040	-2.28	-1.47	-0.66	0.005306192	0.034252627	0.221108202

ATTACHMENT E-4
Field Documentation

Well Development Forms

Well Development Data Sheet

JACOBS

Site Name	Event	Well ID	Project Number
Nc Cape	2018 Field Event	14MW04	5FA4600
Weather Conditions	**PID Readings of Total VOCs (ppm)**	**Date**	**Developer Initials**
Overcast	Ambient 0.0 Breathing Zone 0.0 In Well 0.5	8/1/18	KM/JB

Well Information

Well Material / Size (in)	Drilling Water Added (gal)	As-Built TD of Casing (ft)	Lineal Volume
PVC / 2 SS / 2 ___/___	NONE	14.96	(borehole dia [in] | gal/ft; filter pack porosity = 0.3) 4.5 | 0.362 6 | 0.555 8 | 0.898 10 | 1.34
Depth to Product (ft TOC)	**Depth to GW (ft TOC)**	**Initial TD of Casing (ft)**	**Product Thickness (ft) and Volume Recovered (mL)**
None	2.21	12.2	None

Borehole Vol = (14.96 ft (TD of casing) – 2.21 (depth to water (water table well) / depth to top of filter pack (submerged well)) ft) * 0.555 gal/ft (Lineal Vol) = ~~18~~ 7.07 gal (Borehole Vol) 7.07 gall.

Min Purge Vol = 2 * None (Drilling Water Added) gal + 3 * ~~18~~ 7.07 (Borehole Vol) gal = 21.2 gal (Min Purge Vol)

Max Purge Vol = 21.2 (Min Purge Vol) gal + 7 * ~~49.5~~ 7.07 (Borehole Vol) gal = 49.5 gal (Max Purge Vol)

PID
BZ = 0.0
IN Well = 0.1

Well Purging Information

Start Time	Finish Time	Final TD of Casing (ft)	Equipment Used for Purging
1545	1845	14.96	foot valve w/ surge block; submersible pump + Bailer; peristaltic pump

Color	Odor	Sheen	Purged Dry	Stabilization Meters	Pump Intake Depth (ft btoc)
Clear Cloudy Brown Other:	None Faint Moderate Strong	Yes No	Yes No	YSI Multi Meter; Hach Turbidimeter	14.2 (during stabilization)

Purging reached: Stability Max Vol. Purge water was: Treated Stored Other Note:

Time (HH:mm)	Volume (Gallons or Liters) Change	Total	Flow (gpm or Lpm)	Temperature (°C)	Water Quality (three must stabilize; turbidity < 100 NTU) ± 3% Conductivity (µS/cm)	± 10% or 0.3 mg/L DO (mg/L)	± 0.1 pH (std units)	± 10 mV ORP (mV)	± 10% or ±1 NTU Turbidity (NTU)	Water Level (feet btoc)
15:45	0	0	Not measured	→						
~~3~~:34	20	20	200	8.95	112	6.27	5.66	137	99.7	2.30
1740/~~1540~~	1	21	200	9.02	112	2.77	5.61	138.2	83.59	2.29
1745	0.5	21.5	200	8.72	111	1.96	5.58	138.1	72.28	2.29
1750	0.5	22.0	200	8.72	110 ✓	1.84	5.60 ✓	135.3	59.89	2.28
1755	0.5	22.5	200	8.48	108 ✓	1.53	5.62 ✓	133	57.28	2.28
1800	0.5	23.0	200	8.58	109 ✓	1.33	5.65 ✓	131	53.15	2.28
1805	0.5	23.5	200	8.57	109	1.15	5.67	130.7	45.49	2.28
1810	0.25	23.75	200	8.72	110	0.96	5.69	129.8	39.37	2.28
1815	0.25	24.0	200	8.40	110	0.92	5.70	130.6	35.06	2.30
1820	0.25	24.25	200	8.10	108	0.88	5.68	132	26.63	2.31
1825	0.25	24.5	200	8.06	107 ✓	0.84 ✓	5.67 ✓	132.4 ✓	20.41	2.31
1830	0.25	~~25~~ 24.75	200	8.19	108 ✓	0.72 ✓	5.69 ✓	132.1 ✓	13.68	2.30
1835	0.25	25.0	200	8.44	109 ✓	0.91 ✓	5.69 ✓	131.8 ✓	12.47	2.30

→ Meter shut off and turned back on

End of Development

Kevin Mahan 8/1/18

Suggested Notation:
"——" = not measured "✓"= stable "+" = rising "-" = falling

____ Additional observations on back

Well Development Data Sheet

JACOBS

Site Name	Event	Well ID	Project Number
Ne Cape	2018 Field Sampling	MW10-1	5FA4600
Weather Conditions	**PID Readings of Total VOCs (ppm)**	**Date**	**Developer Initials**
Overcast	Ambient 0.0 Breathing Zone 0.0 In Well 0.0	8-1-31	SS / AA / KM

Well Information

Well Material / Size (in)	Drilling Water Added (gal)	As-Built TD of Casing (ft)	Lineal Volume (borehole dia [in] | gal/ft; filter pack porosity = 0.3)
PVC / 2 SS / 2	None	11.75	4.5 | 0.362 6 | 0.555 8 | 0.898 10 | 1.34
Depth to Product (ft TOC)	**Depth to GW (ft TOC)**	**Initial TD of Casing (ft)**	**Product Thickness (ft) and Volume Recovered (mL)**
None	2.71	11.21	None

Borehole Vol = (11.75 ft (TD of casing) – 2.71 (depth to water (water table well) / depth to top of filter pack (submerged well)) ft) * 0.555 gal/ft (Lineal Vol) = 5.02 gal (Borehole Vol)

Min Purge Vol = 2 * None gal (Drilling Water Added) + 3 * 5.02 gal (Borehole Vol) = 15.05 gal (Min Purge Vol)

Max Purge Vol = 15.05 gal (Min Purge Vol) + 7 * 5.02 gal (Borehole Vol) = 35.14 gal (Max Purge Vol)

Well Purging Information

Start Time	Finish Time	Final TD of Casing (ft)	Equipment Used for Purging
1630	1837	11.75	foot valve w/ surge block; submersible pump And Bailer; peristaltic pump

Color	Odor	Sheen	Purged Dry	Stabilization Meters	Pump Intake Depth (ft btoc)
Clear Cloudy Brown Other:	None Moderate Faint Strong	Yes No	Yes No	YSI Multi Meter; Hach Turbidimeter	6.0 (during stabilization) ~6 ft

Purging reached: Stability Max Vol. | Purge water was: Treated Stored Other | Note:

Time (HH:mm)	Volume (Gallons or Liters) Change	Total	Flow (gpm or Lpm)	Temperature (°C)	Conductivity (µS/cm) ± 3%	DO (mg/L) ± 10% or 0.3 mg/L	pH (std units) ± 0.1	ORP (mV) ± 10 mV	Turbidity (NTU) ± 10% or ±1 NTU	Water Level (feet btoc)
16:30	0	0	0	0	Not measured →					
18:30	20	20		10.6	69	5.51	5.62	133.9	121	~~12.1~~ 4.15 ft
Ending Parameters measured using cup										
Continued development on 8/2/18										
8-2-18 → 11:08	~~20~~	20 gal								2.55
1140 ~~1136~~	0	20 gal	0.5L	10.7	126	1.59	5.87	249.6	42.1	
1145 ~~1140~~	2.5L		0.5	10.7	117	1.12	5.91	245.8	33.2	2.82
1150	5		0.5	10.8	110	1.04	5.93	261.7	31.2	2.79
1155	7.5		0.5	10.6	105	1.05	5.94	261.4	31.0	2.94
1200	10		0.5	10.6	105	0.89	5.96	263.3	43.2	2.93
1205	12.5		0.5	10.8	105	0.87	5.95	265.2	43.7	2.91
1210	15		0.5	10.8	106	0.90	5.95	265.9	45.9	3.01
1215	17.5		0.5	10.9	106	0.79	5.94	266.2	48.3	2.97
1220	20		0.5	10.8	106	0.78	5.93	270.4	50.5	2.99
1225	22.5		0.5	11.0	108	0.70	5.93	270.4	51.0	3.03
1230	25		0.5	11.0	107	0.73	5.92	268.1	50.0	3.04
1235	27.5		0.5	11.0	108	0.75	5.92	273.6	48.9	3.03
1240	30		0.5	10.7	108	0.76	5.91	271.6	49.7	3.04

End of Development

Suggested Notation:

"——" = not measured "✓"= stable "+" = rising "-" = falling

____ Additional observations on back

Stopped purging @ 1243. Water in vial seemed to have a very faint yellowish tint to it.

415 DTW @ End

Groundwater Forms

Groundwater Sampling Data Sheet

JACOBS

Site Name	Event	Well ID	Project Number
NECape	2018 Sampling Event	26MW01	
Weather Conditions	**PID Readings of Total VOCs (ppm)**	**Date**	**Sampler Initials**
Mostly Cloudy 50°F	Ambient 0.0 Breathing Zone 0.0 In Well 0.0	8/2/2018	KM/JB

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
Good Fair Poor	Flushmount	PVC SS	1 / 0.041 2 / 0.163 4 / 0.653 6 / 1.47
Depth to Product (ft)	**Depth to GW (ft btoc)**	**Total Depth of Casing (ft btoc)**	**Product Thickness (ft) and Volume Recovered (mL)**
None	29.80	41.63 (final)	None

Max Purge Volume = (41.63 Previous Total Depth ft – 29.80 Depth to Water or Depth to Top of Filter Pack ft) * 0.163 Gallons per Ft gal/ft * 3 = 6 Max Purge Vol gal * 3.785 L/gal = 22 Max Purge Vol L

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)		Equipment Used for Purging
1157	13:15	31.0		Bailer Peristaltic Pump Submersible Pump
Color	**Odor**	**Sheen**	**Purged Dry**	**Meter Used During Purging**
Clear Cloudy Brown Other:	None Moderate Faint Strong	Yes No	Yes No	YSI Multi Meter Hach Turbidimeter

Purging reached: Stability Max Vol. Purge water was: Treated Stored Other Note:

Time (HH:mm)	Volume (Gallons or Liters) Change	Volume Total	Flow (0.013-0.13 gpm 50-500 mL/min)	Temperature (°C)	Water Quality (three must stabilize) ± 3% Conductivity (µS/cm)	± 10% or 0.1 mg/L DO (mg/L)	± 0.1 pH (std units)	± 10 mV ORP (mV)	± 10% or 0.5 NTU Turbidity (NTU)	Water Level Drawdown < 0.3 ft (feet btoc)
12:30										29.82
12:35		1	~~500~~ 0.13	3.16	76	24.01	5.31	148.3	20.89	29.81
12:40	1	2	0.13	3.88	77	20.95	5.42	142	11.74	29.81
12:45	0.5	2.5	0.13	4.59	78	16.75	5.55	137.5	10.16	29.81
12:50	0.5	3.0	0.13	5.37	80	15.34	5.67 ✓	134.3 ✓	8.16	29.82
12:55	0.5	3.5	0.13	3.59	76 ✓	15.00	5.68 ✓	133.3 ✓	7.33	29.82
13:00	0.5	4.0	0.13	3.60	76 ✓	14.70	5.71 ✓	133.1 ✓	7.56	29.82
13:05	0.5	4.5	0.13	4.60	77 ✓	14.38	5.74 ✓	132.6 ✓	5.62	29.82
13:10	0.5	9.0	0.13	4.71	77 ✓	14.86	5.75 ✓	132.4 ✓	5.05	29.2
13:15	0.5	5.0	0.13	4.70	78 ✓	14.40	5.76 ✓	132.6 ✓	5.24	29.2

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
13:25	13:57	31.0	Peristaltic Pump Submersible Pump
SAMPLE ID: 18NEC-26MW01-WG		QC: Dup MS/MSD	Ferrous Iron (Fe^{2+}) (mg/L) = See Below

Container/Preservative	Analysis Requested	Notes
2x 1L HCL		
4x 1L		
6x 40mL HCL	2x 250 Poly	
2x 250 HNO_3	1x 250 HNO_3 (Field Filtered)	

Suggested Notation:

"——" = not measured "✓"= stable "+" = rising "-" = falling

Ferrous Iron – No Color change (Z 1ppm)

Nitrate – Between 0 and 0.4 on color scale mg/L

Groundwater Sampling Data Sheet

JACOBS

Site Name	Event	Well ID	Project Number
Ne Cape	2018 Sampling Event	22MW2	
Weather Conditions	**PID Readings of Total VOCs (ppm)**	**Date**	**Sampler Initials**
Foggy, 50°F, light wind	Ambient 0.0 Breathing Zone 0.0 In Well 0.0	8/2/2018	JB/KM

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
Good (circled) Fair Poor	Flush Mount	PVC (circled) SS	1 / 0.041 2 / 0.163 (circled) 4 / 0.653 6 / 1.47
Depth to Product (ft)	**Depth to GW (ft btoc)**	**Total Depth of Casing (ft btoc)**	**Product Thickness (ft) and Volume Recovered (mL)**
NONE	22.99	34.38 (final)	NONE

Max Purge Volume = (34.38 ft – 22.99 ft) * 0.163 gal/ft * 3 = 5.5 gal * 3.785 L/gal = 21 L

(Previous Total Depth; Depth to Water or Depth to Top of Filter Pack; Gallons per Ft; Max Purge Vol; Max Purge Vol)

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)		Equipment Used for Purging
1554	1655	24.0		Bailer Peristaltic Pump Submersible Pump (circled)
Color	**Odor**	**Sheen**	**Purged Dry**	**Meter Used During Purging**
Clear (circled) Cloudy Brown Other:	None (circled) Moderate Faint Strong	Yes No (circled)	Yes No (circled)	YSI Multi Meter (circled) Hach Turbidimeter (circled)

Purging reached: Stability (circled) Max Vol. Purge water was: Treated Stored (circled) Other Note:

Time (HH:mm)	Volume (Gallons or Liters) Change	Volume Total	Flow (0.013-0.13 gpm, 50-500 mL/min)	Temperature (°C)	Conductivity (µS/cm) ± 3%	DO (mg/L) ± 10% or 0.1 mg/L	pH (std units) ± 0.1	ORP (mV) ± 10 mV	Turbidity (NTU) ± 10% or 0.5 NTU	Water Level Drawdown < 0.3 ft (feet btoc)
1625										~~23.29~~ 23.02
1630		1	0.13	5.17	86	21.47	5.54	179.1	2.22	23.02
1635	1	2	0.13	5.19	86	13.76	5.65	176	2.39	23.01
1640	1	3	0.13	5.18	86	12.34	5.69	173.8	0.66	23.01
1645	1	4	0.13	5.27	86	11.79	5.72	173.3	0.59	23.01
1650	1	5	0.13	4.86	85	11.77	5.74	175	0.00	23.01
1655	0.5	5.5	0.13	5.36	86	11.22	5.75	176.5	0.25	23.01

*Note DO began to fluctuate at end continued with sampling

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
17:05	18:20/8/31	24.5	Peristaltic Pump Submersible Pump (circled)
SAMPLE ID: 18NEC-22MW2/18NEC-22MW2-8		QC: Dup (circled) MS/MSD	Ferrous Iron (Fe^{2+}) (mg/L) = See Below

Container/Preservative Analysis Requested Notes

12x 40mL HCL
4x 1L HCL
8x 1L
4x 250 Pol

~~2~~ 2 x 250 HNO_3 Poly
2 x 250 HNO_3 Poly (filtered)

Suggested Notation:

"——" = not measured "✓" = stable "+" = rising "-" = falling

Ferrous Iron = No Color change (<1ppm) Nitrate = No Color Change = ND
Ferrous Iron Dup = ↓ ↓ ↓ (<1ppm) Nitrate Dup = No Color Change = ND

Groundwater Sampling Data Sheet

JACOBS

Site Name	Event	Well ID	Project Number
MOC, NE Cape	5-Year Review	MW 10-1	5FGA4600
Weather Conditions	**PID Readings of Total VOCs (ppm)**	**Date**	**Sampler Initials**
Cloudy, 50°F	Ambient 0.0 Breathing Zone 0.0 In Well 0.1	08/03/2018	JB/PM/HH

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
Good Fair Poor	2.3'	PVC SS	1 / 0.041 2 / 0.163 4 / 0.653 6 / 1.47
Depth to Product (ft)	**Depth to GW (ft btoc)**	**Total Depth of Casing (ft btoc)**	**Product Thickness (ft) and Volume Recovered (mL)**
N/A	2.68	11.6 (final)	None

Max Purge Volume = (~~2.68~~ 11.6 ft – 2.68 ft) * 0.163 gal/ft * 3 = 4.36 gal * 3.785 L/gal = ______ L

Previous Total Depth; Depth to Water or Depth to Top of Filter Pack; Gallons per Ft; Max Purge Vol; Max Purge Vol

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)		Equipment Used for Purging
1502	~~1605~~ 1805	3.68		Bailer Peristaltic Pump Submersible Pump
Color	**Odor**	**Sheen**	**Purged Dry**	**Meter Used During Purging**
Clear Cloudy Brown Other:	None Moderate Faint Strong	Yes No	Yes No	YSI Multi Meter ~~Hach Turbidimeter~~ Micro TPW Turbidimeter HH
Purging reached: Stability Max Vol.	Purge water was: Treated Stored Other	Note:		

Time (HH:mm)	Volume (Gallons or Liters) Change	Total	Flow (0.013-0.13 gpm, 50-500 mL/min)	Temperature (°C)	Water Quality (three must stabilize) ± 3% Conductivity (µS/cm)	± 10% or 0.1 mg/L DO (mg/L)	± 0.1 pH (std units)	± 10 mV ORP (mV)	± 10% or 0.5 NTU Turbidity (NTU)	Water Level Drawdown < 0.3 ft (feet btoc)
1540			0.05							2.95
1545 ~~1550~~	0.25	0.25	0.05	9.93	108	0.95	5.79	128.5	20.12	2.95
1550 ~~1555~~	~~0.5~~ 0.25	~~0.50~~ 0.50	0.05	9.91	107	0.93	5.80	133.2	20.84	2.95
1555	~~0.5~~ 0.25	~~0.75~~ 0.75	0.05	9.93	106	0.90	5.81	140.7	22.74	2.95
1600	~~0.5~~ 0.25	~~1.0~~ 1.00	0.05	9.91	106	0.82	5.82	156.2	24.18	2.95
1605	0.25	1.25	0.05	9.99	105	0.81	5.82	153.6	24.64	2.95
1610	0.25	1.5	0.05	10.00	106	0.81	5.83	148.4	24.29	2.95
1615	0.25	1.75	0.05	10.04	106	0.73	5.83	140.8	24.79	2.95
*Well water was a rust color likely a result from environment										

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
1620	~~1621~~ 1805 / 8/3/18	3.68	Peristaltic Pump Submersible Pump
SAMPLE ID: 18NEC-MW10-1-WG		QC: Dup MS/MSD	Ferrous Iron (Fe^{2+}) (mg/L) = 2

Container/Preservative 18NEC-MW 101-WG-8 **Analysis Requested** **Notes**

4- 1L HCl - DRO/RRO
4- 1L - Glycol
4- 1L - PCBs
4- 1L - PAHs
2- 250mL - Sulfate + Alkalinity
4- 250mL w/ HNO_3 - metals (filtered + dissolved)
6- 40mL voas - VOCs
6- 40mL voas - Methane

Suggested Notation:

"____" = not measured "✓" = stable "+" = rising "-" = falling

Nitrate 0ppm Ferrous Iron 2ppm
Nitrate Duplicate 0ppm Ferrous Iron Duplicate 2ppm

Groundwater Sampling Data Sheet

JACOBS

Site Name	Event	Well ID	Project Number
Ne Cape	2018 Sampling Event	14MW01	05FA4600
Weather Conditions	**PID Readings of Total VOCs (ppm)**	**Date**	**Sampler Initials**
Overcast, 53°F	Ambient 0.0 Breathing Zone 0.0 In Well 4.6	8/3/18	KWM

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
Good Fair Poor	Flush mount	PVC SS	1 / 0.041 2 / 0.163 4 / 0.653 6 / 1.47
Depth to Product (ft)	**Depth to GW (ft btoc)**	**Total Depth of Casing (ft btoc)**	**Product Thickness (ft) and Volume Recovered (mL)**
None	14.05	22.14 (final)	None

Max Purge Volume = (22.14 Previous Total Depth ft – 14.05 Depth to Water or Depth to Top of Filter Pack ft) * 0.163 Gallons per Ft gal/ft * 3 = 3.956 Max Purge Vol gal * 3.785 L/gal = 14.97 Max Purge Vol L

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)	Equipment Used for Purging
13:10	14:05	15.55	Bailer Peristaltic Pump Submersible Pump
Color	**Odor**	**Sheen** / **Purged Dry**	**Meter Used During Purging**
Clear Cloudy Brown Other:	None Moderate Faint Strong	Yes No / Yes No	YSI Multi Meter Hach Turbidimeter

Purging reached: Stability Max Vol. Purge water was: Treated Stored Other Note:

Time (HH:mm)	Volume (Gallons or Liters) Change	Total	Flow (0.013-0.13 gpm, 50-500 mL/min)	Temperature (°C)	± 3% Conductivity (µS/cm)	± 10% or 0.1 mg/L DO (mg/L)	± 0.1 pH (std units)	± 10 mV ORP (mV)	± 10% or 0.5 NTU Turbidity (NTU)	Water Level Drawdown < 0.3 ft (feet btoc)
13:20	6	6	500	2.83	103	3.70	5.71	80.1	25.05	14.10
13:25	2.5	8.5	500	3.28	104 ✓	2.65	5.86	59.2	11.29	14.10
13:30	2.5	10.5	500	3.48	105 ✓	2.13	5.96	56.3	8.12	14.10
13:40	~~5.0~~	15.0	500	3.48	105 ✓	1.81	6.01	46.3	5.54	14.10
13:45	2.5	17.5	500	3.59 ✓	105 ✓	1.72	6.04 ✓	36.4	3.52	14.10
13:50	2.5	20.0	500	3.57 ✓	105 ✓	1.62 ✓	6.06 ✓	31.5 ✓	2.33	14.10
13:55	2.5	22.5	500	3.42 ✓	105 ✓	1.55 ✓	6.07 ✓	29.2 ✓	1.72 ✓	14.10
14:00	2.5	25.0	500	3.44 ✓	105 ✓	1.53 ✓	6.07 ✓	27.5 ✓	1.45 ✓	14.10
14:05	2.5	27.5	500	3.41	105 ✓	1.49 ✓	6.07 ✓	26.8 ✓	1.39 ✓	14.10
14:10	2.5	30.0	500	3.39	105 ✓	1.46 ✓	6.06 ✓	26.2 ✓	1.37	14.10
						KM	8/3/18			

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
14:15	15:10 8/3/18	15.55	Peristaltic Pump Submersible Pump

SAMPLE ID: 18NEC-14MW01-WG/ QC: Dup MS/MSD Ferrous Iron (Fe^{2+}) (mg/L) =

Container/Preservative 18NEC-14MW01-WG-8 Analysis Requested Notes

8 ~~6~~ HH HCl preserved 1L - DRO/RRO
8 ~~6~~ HH non-preserved - 1L - PAHs
8 ~~6~~ HH non-preserved - 1L - PCBs

12 - 40mL voas w/ HCl - BTEX only
12 - 40mL voas w/ HCl - methane
8 - 250mL poly w/ HNO_3 - metals
4 - 250 mL poly - ~~metals~~ HH sulfate & alkalinity
~~1 - 250mL poly~~ - HH

Suggested Notation:

"——" = not measured "✓" = stable "+" = rising "-" = falling

Ferrous Iron: Primary <10ppm
Dup <10 ppm

Nitrate Primary: No color change
Duplicate: No color change
ND →

Groundwater Sampling Data Sheet

JACOBS

Site Name	Event	Well ID	Project Number
Ne Cape	2018 Sampling Event	20MW01	5FGA4600
Weather Conditions	**PID Readings of Total VOCs (ppm)**	**Date**	**Sampler Initials**
overcast	Ambient 0.0 Breathing Zone 0.0 In Well 0.0	8/3/18	JL

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
Good Fair Poor	flush mount	PVC SS	1 / 0.041 2 / 0.163 4 / 0.653 6 / 1.47
Depth to Product (ft)	**Depth to GW (ft btoc)**	**Total Depth of Casing (ft btoc)**	**Product Thickness (ft) and Volume Recovered (mL)**
NONE	18.94	29.04 (final)	NONE

Max Purge Volume = (29.04 ft – 18.94 ft) * 0.163 gal/ft * 3 = 4.94 gal * 3.785 L/gal = 18.69

(Previous Total Depth; Depth to Water or Depth to Top of Filter Pack; Gallons per Ft; Max Purge Vol; Max Purge Vol)

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)	Equipment Used for Purging
17:25	18:10	~~19~~, 20.20	Bailer Peristaltic Pump Submersible Pump
Color	**Odor**	**Sheen** / **Purged Dry**	**Meter Used During Purging**
Clear Cloudy Brown Other:	None Faint Moderate Strong	Yes No / Yes No	YSI Multi Meter Hach Turbidimeter

Purging reached: Stability Max Vol. Purge water was: Treated Stored Other Note:

Time (HH:mm)	Volume (Gallons or liters) Change	Volume Total	Flow (0.013-0.13 gpm, 50-500 mL/min)	Temperature (°C)	± 3% Conductivity (µS/cm)	± 10% or 0.1 mg/L DO (mg/L)	± 0.1 pH (std units)	± 10 mV ORP (mV)	± 10% or 0.5 NTU Turbidity (NTU)	Water Level Drawdown < 0.3 ft (feet btoc)
17:35	9	9	500	3.82	71	12.55	5.78	232.7	16.50	18.96
17:40	2.5	11.5	500	4.37	73	12.27	5.84	231.6	11.94	18.96
17:45	2.5	13.5	500	3.98 ✓	73 ✓	12.49 ✓	5.86 ✓	234.7 ✓	10.70	18.97
17:50	2.5	16.0	500	3.95 ✓	73 ✓	12.53 ✓	5.87 ✓	236.8 ✓	7.46	18.97
17:55	2.5	18.5	500	3.90 ✓	73 ✓	12.35 ✓	5.88 ✓	239.9 ✓	5.69	18.97
18:00	2.5	20.5	500	3.90 ✓	72 ✓	12.42 ✓	5.89 ✓	241.0	1.01	18.97
18:05	2.5	22.5	500	3.89 ✓	73 ✓	12.48 ✓	5.89 ✓	242.7	2.22	18.97
18:10	2.5	25.0	500	3.86	72	12.40	5.90	243.1	1.89	18.97

JL 8/3/18 Stability reached

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
18:15	18:43	20.20	Peristaltic Pump Submersible Pump
SAMPLE ID:		QC: Dup MS/MSD	Ferrous Iron (Fe^{2+}) (mg/L) = No color change ND

Container/Preservative	Analysis Requested	Notes
2x 1L HCL	– DRO/RRO	
2x 1L	– PAHs	
2 x 1L	– PCBs	
3 x 40 mL HCL VOC	– Btex only	
~~3 x 40 mL HCL VOC – methane~~		

Suggested Notation:

"——" = not measured "✓"= stable "+" = rising "-" = falling

1x 250 poly – sulfate & alkalinity

1x 250 Nitric Polly – metals Nitrite = 0.4 mg/L

X 250 Nitric poly field Filtered – metals

Groundwater Sampling Data Sheet

JACOBS

Site Name	Event	Well ID	Project Number
NMOC - Northeast Cape	Five-Year Review	14MW07	5FGA4600
Weather Conditions	**PID Readings of Total VOCs (ppm)**	**Date**	**Sampler Initials**
Overcast, light breeze, 50°F	Ambient 0.0 Breathing Zone 0.0 In Well 0.0	8/3/18	PM/KM

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
Good Fair Poor	flush mount	PVC SS	1 / 0.041 2 / 0.163 4 / 0.653 6 / 1.47
Depth to Product (ft)	**Depth to GW (ft btoc)**	**Total Depth of Casing (ft btoc)**	**Product Thickness (ft) and Volume Recovered (mL)**
none	21.40	33.14 (final)	none

Max Purge Volume = (33.14 ft – 21.40 ft) * 0.163 gal/ft * 3 = 5.74 gal * 3.785 L/gal = 21.73 L

(Previous Total Depth; Depth to Water or Depth to Top of Filter Pack; Gallons per Ft; Max Purge Vol; Max Purge Vol)

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)		Equipment Used for Purging
16:20	1700	22.90		Bailer Peristaltic Pump Submersible Pump
Color	**Odor**	**Sheen**	**Purged Dry**	**Meter Used During Purging**
Clear Cloudy Brown Other:	None Moderate Faint Strong	Yes No	Yes No	YSI Multi Meter Hach Turbidimeter

Purging reached: Stability Max Vol. Purge water was: Treated Stored Other Note:

Time (HH:mm)	Volume (Gallons or Liters) Change	Total	Flow (0.013-0.13 gpm, 50-500 mL/min)	Temperature (°C)	Conductivity (µS/cm) ± 3%	DO (mg/L) ± 10% or 0.1 mg/L	pH (std units) ± 0.1	ORP (mV) ± 10 mV	Turbidity (NTU) ± 10% or 0.5 NTU	Water Level Drawdown < 0.3 ft (feet btoc)
1635 ~~1435~~ PM	7.0	7.0	500	3.68	PM ~~0.111~~ 66	14.62	5.41	192.1	1.75	21.51
1640 ~~1440~~ PM	2.5	9.5	450	3.59	66	13.49	5.49	191.5	0.85	21.50
1645	2.25	11.75	400	3.69	67	13.02	5.55	191.7	0.73	21.51
1650	2.0	13.75	450	3.74	67	12.72	5.6	192.3	0.50	21.52
1655	2.25	16.0	450	3.61	68	12.70	5.63	194.0	0.52	21.51
1700	2.25	18.25	500	3.57	68	PM ~~13.~~ 12.82	5.66	195.5	0.57	21.53
~~171~~ PM										

PM 8/3/18

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
1713	1805	22.90	Peristaltic Pump Submersible Pump
SAMPLE ID: 18NEC-14MW07-WG		QC: Dup MS/MSD	Ferrous Iron (Fe^{2+}) (mg/L) = 2

Container/Preservative	Analysis Requested	Notes
2-1L HCl - DRO/RRO	3 - 40mL voas	1 = 250mL unfiltered metals
2-1L - PAHs	3 - 40mL voas	
2-1-L-PCBs	1- 250mL sulfate & alkalinity	
	1 - 250mL filtered metals (HNO_3)	

Nitrate 0 mg/L

Suggested Notation:

"——" = not measured "✓"= stable "+" = rising "-" = falling

Groundwater Sampling Data Sheet

JACOBS

Site Name	Event	Well ID	Project Number
Northeast Cape - MOC	Five-Year Review	MW88-10	5FGA4600
Weather Conditions	**PID Readings of Total VOCs (ppm)**	**Date**	**Sampler Initials**
Ovc., light breeze, 45°	Ambient 0.0 Breathing Zone 0.0 In Well 0.3	08/04/18	PM

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
Good Fair Poor	flush mount	PVC SS	1 / 0.041 2 / 0.163 4 / 0.653 6 / 1.47
Depth to Product (ft)	**Depth to GW (ft btoc)**	**Total Depth of Casing (ft btoc)**	**Product Thickness (ft) and Volume Recovered (mL)**
none	16.62	25.59 (final)	None

Max Purge Volume = (25.59 ft – 16.62 ft) * 0.183 gal/ft * 3 = 4.39 gal * 3.785 L/gal = 16.60 L

(Previous Total Depth; Depth to Water or Depth to Top of Filter Pack; Gallons per Ft; Max Purge Vol; Max Purge Vol)

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)		Equipment Used for Purging
1500	1555	18.12		Bailer Peristaltic Pump Submersible Pump
Color	**Odor**	**Sheen**	**Purged Dry**	**Meter Used During Purging**
Clear Cloudy Brown Other:	None Moderate Faint Strong	Yes No	Yes No	YSI Multi Meter Hach Turbidimeter

Purging reached: Stability Max Vol. | Purge water was: Treated Stored Other Note:

Time (HH;mm)	Volume (Gallons or Liters) Change	Volume Total	Flow (0.013-0.13 gpm, 50-500 mL/min)	Temperature (°C)	± 3% Conductivity (µS/cm)	± 10% or 0.1 mg/L DO (mg/L)	± 0.1 pH (std units)	± 10 mV ORP (mV)	± 10% or 0.5 NTU Turbidity (NTU)	Water Level Drawdown < 0.3 ft (feet btoc)
15:00	4	4	500	3.24	70	1.77	5.80	222.0	3.68	16.71
15:05	2	6	400	4.01	72	1.50	5.91	219.1	4.65	16.71
15 25	3	9	400	4.13	73	3.07	5.94	222.8	105.9	16.72
1535	4	13	400	4.55	75	2.28	5.95	225.4	22.65	16.75
1540	2	15	400	4.64	74	1.70	5.95	225.6	10.1	16.75
1545	2	17	400	4.57	74	1.57	5.95	226.0	7.91	16.75
1550	2	19	400	4.53	74	1.50	5.95	223.1	4.82	16.76
1555	2	21	375	4.52	74	1.41	5.95	222.1	5.08	16.76

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
16:02	1645	18.12	Peristaltic Pump Submersible Pump
SAMPLE ID: 18NEC-MW88-10-WG		QC: Dup MS/MSD	Ferrous Iron (Fe^{2+}) (mg/L) = 0.0

Container/Preservative	Analysis Requested	Notes
2 x 1 L HCL		
2 x 1L		
2 x 1L		
3 x 40 mL HCL VOC		
3 x 40 mL HCL VOC		

Suggested Notation:

"——" = not measured "✓"= stable "+" = rising "-" = falling

nitrate: 0.2 mg/L

1x 250 poly
1x 250 poly Nitric
1x 250 poly nitric field filtered

JACOBS

Groundwater Sampling Data Sheet

Site Name	Event	Well ID	Project Number
Ne Cope	2018 Sampling Event	14MW03	5FGAY600
Weather Conditions	**PID Readings of Total VOCs (ppm)**	**Date**	**Sampler Initials**
Overcast 48°F	Ambient 0.0 Breathing Zone 0.0 In Well 6.0	8/4/18	Kuh

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
Good (circled) Fair Poor	Flushmount	PVC (circled) SS	1 / 0.041 2 / 0.163 (circled) 4 / 0.653 6 / 1.47
Depth to Product (ft)	**Depth to GW (ft btoc)**	**Total Depth of Casing (ft btoc)**	**Product Thickness (ft) and Volume Recovered (mL)**
None	9.35	24.05 (final)	None

Max Purge Volume = (24.05 ft (Previous Total Depth) – ~~10.~~ 9.35 ft (Depth to Water or Depth to Top of Filter Pack)) * 0.163 (Gallons per Ft) gal/ft * 3 = 7.19 (Max Purge Vol) gal * 3.785 L/gal = 27.21 L (Max Purge Vol)

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)		Equipment Used for Purging
12:11	13:45	10.80		Bailer Peristaltic Pump Submersible Pump (circled)
Color	**Odor**	**Sheen**	**Purged Dry**	**Meter Used During Purging**
Clear (circled) Cloudy Brown Other:	None (circled) Moderate Faint Strong	Yes No (circled)	Yes No (circled)	YSI Multi Meter (circled) Hach Turbidimeter (circled)

Purging reached: Stability Max Vol. (circled) Purge water was: Treated Stored (circled) Other Note:

Time (HH:mm)	Volume (Gallons or Liters (circled)) Change	Volume Total	Flow (0.013-0.13 gpm, 50-500 mL/min)	Temperature (°C)	± 3% Conductivity (µS/cm)	± 10% or 0.1 mg/L DO (mg/L)	± 0.1 pH (std units)	± 10 mV ORP (mV)	± 10% or 0.5 NTU Turbidity (NTU)	Water Level Drawdown < 0.3 ft (feet btoc)
12:25	5	5	500	3.99	104	1.50	5.95	60.1	56.57	9.45
12:30	2.5	10	500	4.58	105	1.16	6.04	47.2	43.04	9.45
12:35	2.5	12.5	500	4.76	105	1.02	6.08	42.4	26.78	9.45
12:40	2.5	15.0	500	4.80	106	1.00	6.10	38.1	21.70	9.45
12:45	2.5	17.5	500	4.80	105✓	0.89✓	6.11✓	35.1	16.84	9.45
12:50	2.5	20.0	500	4.90	105	0.86	6.12	33.2	13.52	9.45
12:55	2.5	22.5	500	4.34	107✓	0.85✓	6.13✓	32.7✓	10.58	9.45
13:00	2.5	25.0	500	4.25	107✓	0.87✓	6.13✓	33.4✓	9.16	9.45
13:05	2.5	27.5	500	4.30	108	0.89	6.14	32.1	8.67	9.45
13:10	2.5	30.0	500	4.39	109	0.86	6.15	31.8	9.28	9.45
13:15	2.5	32.5	500	4.36	109	0.81	6.15	31.0	9.71	9.45
							Kuh 8/4/18			

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
13:20	14:46	10.80	Peristaltic Pump Submersible Pump (circled)
SAMPLE ID: 18NEC-14MW03-WG		QC: Dup MS/MSD	Ferrous Iron (Fe^{2+}) (mg/L) = greater than 10 mg/L

Container/Preservative	Analysis Requested	Notes
6x 40mL VOC HCL		
2x 1L Amber HCL		
1x 250 Poly HNO3		
1x 250 poly HNO3 (Field filtered)		
2x 1L unpreserved		
2x 1L unpreserved		

Suggested Notation:

"——" = not measured "✓" = stable "+" = rising "-" = falling

1x poly unpreserved

Nitrate = No color change Not Detected

Groundwater Sampling Data Sheet

JACOBS

Site Name	Event	Well ID	Project Number
NE Cape	MOC Groundwater Sampling	17MW01	5FG A4600
Weather Conditions	**PID Readings of Total VOCs (ppm)**	**Date**	**Sampler Initials**
Cloudy, light wind, 40°F	Ambient 0.0 Breathing Zone 0.0 In Well 0.0	08/4/2018	JB

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
Good Fair Poor	Flush Mount	PVC SS	1 / 0.041 2 / 0.163 4 / 0.653 6 / 1.47
Depth to Product (ft)	**Depth to GW (ft btoc)**	**Total Depth of Casing (ft btoc)**	**Product Thickness (ft) and Volume Recovered (mL)**
None	10.4	14.7 15.65 (final)	None

Max Purge Volume = (~~17.10~~ 15.65 ft – 10.40 ft) * 0.163 gal/ft * 3 = 2.56 gal * 3.785 L/gal = ____ L

Previous Total Depth; Depth to Water or Depth to Top of Filter Pack; Gallons per Ft; Max Purge Vol; Max Purge Vol

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)		Equipment Used for Purging
0922	1035	11.40		Bailer ~~Peristaltic Pump~~ Submersible Pump Submersible Pump
Color	**Odor**	**Sheen**	**Purged Dry**	**Meter Used During Purging**
Clear Cloudy Brown Other:	None Moderate Faint Strong	Yes No	Yes No	YSI Multi Meter ~~Hach Turbidimeter~~ MicroTPW

Purging reached: Stability Max Vol. Purge water was: Treated Stored Other Note:

Time (HH:mm)	Volume (Gallons or Liters) Change	Total	Flow (0.013-0.13 gpm, 50-500 mL/min)	Temperature (°C)	± 3% Conductivity (µS/cm)	± 10% or 0.1 mg/L DO (mg/L)	± 0.1 pH (std units)	± 10 mV ORP (mV)	± 10% or 0.5 NTU Turbidity (NTU)	Water Level Drawdown < 0.3 ft (feet btoc)
1000			400							10.42
1005	0.5	0.5	400	3.14	76	17.39	4.90	172.1	14.27	10.43
1010	0.5	1.0	400	3.09	74	13.22	5.18	173.0	6.81	10.43
1015	0.5	1.5	400	3.21	74	12.19	5.31	166.3	2.66	10.43
1020	1.0	2.5	400	3.26	74	11.57	5.43	153.4	0.68	10.43
1025	0.5	3.0	400	3.17	74✓	11.21	5.49✓	153.2	0.32	10.42
1030	0.5	3.5	400	3.27	74✓	11.28	5.52✓	154.1	1.30	10.42
1035	0.5	4.0	400	3.18	74✓	10.96	5.54	155.9	1.14	10.41

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
1045	1125	11.4	Peristaltic Pump Submersible Pump
SAMPLE ID: 18NEC-MW17-1-WG		QC: Dup MS/MSD	Ferrous Iron (Fe^{2+}) (mg/L) = ND (No Color Change)

Container/Preservative	Analysis Requested	Notes
3 40mL VOA / HCl	VOC 8260C	2 1L Amber PCB 8082
3 40mL VOA / HCl	Methane RSK 175	1 250mL Poly Sulfate/Alkalinity
2 1-L Amber / HCl	DRO/RRO AK102/AK103	2 250mL Poly HNO3 Metals (Filtered/Unfiltered)
2 1-L Amber	PAH 8270D-SIM	

Suggested Notation:

"——" = not measured "✓" = stable "+" = rising "-" = falling

Nitrate = 0.2 mg/L estimated
Between 0 and 0.4 on color scale

Groundwater Sampling Data Sheet

JACOBS

Site Name	Event	Well ID	Project Number
NE Cape	2018 Sampling	MW88-~~10~~ 11 HH	5FGAA600
Weather Conditions	**PID Readings of Total VOCs (ppm)**	**Date**	**Sampler Initials**
Overcast 45-50° F	Ambient 0.0 Breathing Zone 0.0 In Well 0.0	8-4-18	AA/SS

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
Good (circled) Fair Poor	Flush Mount	PVC (circled) SS	1 / 0.041 2 / 0.163 (circled) 4 / 0.653 6 / 1.47
Depth to Product (ft)	**Depth to GW (ft btoc)**	**Total Depth of Casing (ft btoc)**	**Product Thickness (ft) and Volume Recovered (mL)**
—	12.84	23.14 (final)	—

Max Purge Volume = (23.14 ft – 12.84 ft) * 0.163 gal/ft * 3 = 1.68 gal * 3.785 L/gal = ~~5.03~~ 6.35 L
(Previous Total Depth; Depth to Water or Depth to Top of Filter Pack; Gallons per Ft; Max Purge Vol; Max Purge Vol)

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)	Equipment Used for Purging
9:30	10:47	14.2	Bailer Peristaltic Pump Submersible Pump (circled)
Color	**Odor**	**Sheen** / **Purged Dry**	**Meter Used During Purging**
Clear (circled) Cloudy Brown Other:	None (circled) Moderate Faint Strong	Sheen: Yes No (circled) / Purged Dry: Yes No (circled)	YSI Multi Meter (circled) Hach Turbidimeter (circled)

Purging reached: Stability (circled) Max Vol. Purge water was: Treated Stored (circled) Other Note:

Time (HH:mm)	Volume (Gallons or Liters) Change	Volume Total	Flow (0.013-0.13 gpm, 50-500 mL/min) L	Temperature (°C)	Conductivity (µS/cm) ± 3%	DO (mg/L) ± 10% or 0.1 mg/L	pH (std units) ± 0.1	ORP (mV) ± 10 mV	Turbidity (NTU) ± 10% or 0.5 NTU	Water Level Drawdown < 0.3 ft (feet btoc)
10:25		0	.350 mL	3.97	83	7.05	5.58	294.9	31.9	12.85
10:30		0.75L	0.4L	4.07	80	6.69	5.65	280.3	19.9	12.85
10:33		2.0L	0.4	4.36	81	6.35	5.69	285.9	9.55	12.85
10:38		3.2	0.4	4.40	81	6.22	5.70	273.6	5.91	12.85
10:41		4.4	0.4	4.40	81	6.09	5.70	280.7	5.64	12.85
10:44		5.6	0.4	4.40	81	6.03	5.70	266.2	5.50	12.85
10:47		6.8	0.4	4.45	81	5.9	5.70	264.7	4.45	12.85
10:50										

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
10:50	11:30		Peristaltic Pump Submersible Pump (circled)

SAMPLE ID: 18NEC-MW88-~~10~~ 11 HH-WG QC: Dup MS/MSD Ferrous Iron (Fe^{2+}) (mg/L) = 0

Container/Preservative	Analysis Requested	Notes
3 40mL VOA / HCl	VOC 8260C	Nitrates: 0.2 mg/L
3 40mL VOA / HCl	Methane RSK175	
2 1-L Amber / HCl	DRO/RRO AK102/103	
2 1-L Amber	PAH 8270D-SIM	
2 1-L Amber	PCB 8082	

1 250mL Poly Sulfate/Alkalinity
2 250mL Poly Metals (Filtered, Unfiltered)

Suggested Notation: "——" = not measured "✓" = stable "+" = rising "-" = falling

Groundwater Sampling Data Sheet

JACOBS

Site Name	Event	Well ID	Project Number
Northeast Cape - MOC	Five-Year Review	14MW02	SFGA4600
Weather Conditions	**PID Readings of Total VOCs (ppm)**	**Date**	**Sampler Initials**
Overcast, light breeze, 50°F	Ambient 0.0 Breathing Zone 0.0 In Well 6.5	08/05/18	SJ PM

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
Good Fair Poor	flush mount	PVC SS	1 / 0.041 2 / 0.163 4 / 0.653 6 / 1.47
Depth to Product (ft)	**Depth to GW (ft btoc)**	**Total Depth of Casing (ft btoc)**	**Product Thickness (ft) and Volume Recovered (mL)**
none	7.84	16.85 (final)	None

Max Purge Volume = (16.85 Previous Total Depth ft – 7.84 Depth to Water or Depth to Top of Filter Pack ft) * 0.163 Gallons per Ft gal/ft * 3 = 4.41 Max Purge Vol gal * 3.785 L/gal = 16.68 Max Purge Vol L

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)		Equipment Used for Purging
1546	1635	9.34		Bailer Peristaltic Pump Submersible Pump
Color	**Odor**	**Sheen**	**Purged Dry**	**Meter Used During Purging**
Clear Cloudy Brown Other:	None Moderate Faint Strong	Yes No	Yes No	YSI Multi Meter Hach Turbidimeter

Purging reached: Stability Max Vol. Purge water was: Treated Stored Other Note:

Time (HH:mm)	Volume (Gallons or Liters) Change	Total	Flow (0.013-0.13 gpm, 50-500 mL/min)	Temperature (°C)	± 3% Conductivity (µS/cm)	± 10% or 0.1 mg/L DO (mg/L)	± 0.1 pH (std units)	± 10 mV ORP (mV)	± 10% or 0.5 NTU Turbidity (NTU)	Water Level Drawdown < 0.3 ft (feet btoc)
1550	3	3	400	3.66	107	7.12	3.88	142.2	1.27	7.84
1555	2	5	400	3.82	108	6.00	4.71	100.2	1.17	7.84
1600	2	7	400	3.80	108	5.27	5.15	PM ~~101.1~~ 76.3	1.00	7.84
1605	2	9	400	3.75	108	6.07	5.33	59.0	1.18	7.85
1610	2	11	400	3.75	107	6.06	5.44	38.2	0.26	7.85
1615	2	13	400	3.59	107	5.70	5.56	31.5	0.89	7.85
1620	2	15	400	3.67	107	3.58	5.65	24.6	0.78	7.85
1625	2	17	400	3.72	108	3.88	5.70	37.9	0.22	7.85
1630	2	19	400	3.81	108	4.35	5.73	37.5	0.00	7.85
1635	2	21	400	3.66	108 ✓	4.28	5.78 ✓	29.9 ✓	0.00 ✓	7.85
									PM	8/5/18

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
1642	1725	9.34	Peristaltic Pump Submersible Pump
SAMPLE ID: 18NEC - 14MW02		QC: Dup MS/MSD	Ferrous Iron (Fe^{2+}) (mg/L) = 10+ nitrate: 0mg/L

Container/Preservative	Analysis Requested	Notes
2 x 1L / HCL 2 x 1L 2 x 1L 2 x 250 / HNO_3 1 x 250		

Suggested Notation:

"____" = not measured "✓" = stable "+" = rising "-" = falling

3 x 40 mL / HCL
3 x 40mL / HCL

Groundwater Sampling Data Sheet

JACOBS

Site Name	Event	Well ID	Project Number
Ne Cape	2018 Sampling Event	14MW04	85FGA600
Weather Conditions	**PID Readings of Total VOCs (ppm)**	**Date**	**Sampler Initials**
Overcast, Intermittent Sun	Ambient 0.0 Breathing Zone 0.0 In Well 0.0	8/5/18	Keen

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
Good Fair Poor	flushmount	PVC SS	1 / 0.041 2 / 0.163 4 / 0.653 6 / 1.47
Depth to Product (ft)	**Depth to GW (ft btoc)**	**Total Depth of Casing (ft btoc)**	**Product Thickness (ft) and Volume Recovered (mL)**
None	2.05	14.96 (final)	None

Max Purge Volume = (14.96 ft – 2.05 ft) 0.163 gal/ft * 3 = 6.13 gal * 3.785 L/gal = 23.19 L

Previous Total Depth; Depth to Water or Depth to Top of Filter Pack; Gallons per Ft; Max Purge Vol; Max Purge Vol

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)		Equipment Used for Purging
10:50		~~16.49~~ 3.5'		Bailer Peristaltic Pump Submersible Pump
Color	**Odor**	**Sheen**	**Purged Dry**	**Meter Used During Purging**
Clear Cloudy Brown Other:	None Moderate Faint Strong	Yes No	Yes No	YSI Multi Meter Hach Turbidimeter

Purging reached: Stability Max Vol. Purge water was: Treated Stored Other Note:

Time (HH:mm)	Volume (Gallons or Liters) Change	Total	Flow (0.013-0.13 gpm, 50-500 mL/min)	Temperature (°C)	Water Quality (three must stabilize) ± 3% Conductivity (µS/cm)	± 10% or 0.1 mg/L DO (mg/L)	± 0.1 pH (std units)	± 10 mV ORP (mV)	± 10% or 0.5 NTU Turbidity (NTU)	Water Level Drawdown < 0.3 ft (feet btoc)
11:10	10	10	500	9.16	137	2.70	5.61	287.8	54.6	2.13
11:15	2.5	12.5	500	9.17	136	1.86	5.61	252.1	46.9	2.13
11:20	2.5	15.0	500	9.19	135	1.37	5.62	221.9	32.3	2.12
11:25	2.5	17.5	500	9.20	134	1.08	5.63	207.5	26.7	2.12
11:30	2.5	20.0	500	8.92	130	0.99	5.61	201.0	26.72	2.12
11:35	2.5	22.5	500	9.04	128	0.83	5.60 ✓	190.7	23.8	2.12
max 11:40	2.5	25.0	500	9.16	128	0.84	5.64	184.3	19.1	2.12
11:45	2.5	27.5	500	9.17	128	0.69	5.60	181.1	15.4	2.12
11:50	2.5	30	500	9.02	126 ✓	0.65	5.65	178.7	13.6	2.12
11:55	2.5	32.5	500	9.02	125	0.67	5.66	176.4	14.4	2.12
12:00	2.5	35	500	9.03	125 ✓	0.66 ✓	5.6 ✓	175.2 ✓	11.3	2.12

Keen 8/5/18

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
13:05	13:30	3.5'	Peristaltic Pump Submersible Pump
SAMPLE ID: 18NEC-14MW04-WG		QC: Dup MS/MSD	Ferrous Iron (Fe^{2+}) (mg/L) = 1 mg/L

Container/Preservative	Analysis Requested	Notes
6x 40mL VOC HCL 2x 1L HCL 4x 1L 1x 250 poly 1x 250 poly HNO_3 1x 250 poly HNO_3 Field Filtered	3x VOC (Full) 3x Methane DRO 2x PCB, 2x PAH	

Suggested Notation:

"——" = not measured "✓" = stable "+" = rising "-" = falling

Nitrate = No color change
Not Detected

Groundwater Sampling Data Sheet

JACOBS

Site Name	Event	Well ID	Project Number
NC Cope	2018 Sampling Event	14MW05	5FGA4600
Weather Conditions	**PID Readings of Total VOCs (ppm)**	**Date**	**Sampler Initials**
overcast	Ambient 0.0 Breathing Zone 0.0 In Well 23.8	8/5/18	KWM

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
Good Fair Poor	Flushmount	PVC SS	1 / 0.041 2 / 0.163 4 / 0.653 6 / 1.47
Depth to Product (ft)	**Depth to GW (ft btoc)**	**Total Depth of Casing (ft btoc)**	**Product Thickness (ft) and Volume Recovered (mL)**
None	1.67	15.49 (final)	None

Max Purge Volume = (15.49 ft – 1.67 ft) * ~~6.760~~ 0.163 gal/ft * 3 = 6.76 gal * 3.785 L/gal = 25.58 L

Previous Total Depth; Depth to Water or Depth to Top of Filter Pack; Gallons per Ft; Max Purge Vol; Max Purge Vol

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)	Equipment Used for Purging
16:55	17:50	6.60	Bailer Peristaltic Pump Submersible Pump
Color	**Odor**	**Sheen** / **Purged Dry**	**Meter Used During Purging**
Clear Cloudy Brown Other:	None Moderate Faint Strong	Sheen: Yes No / Purged Dry: Yes No	YSI Multi Meter Hach Turbidimeter

Purging reached: Stability Max Vol. Purge water was: Treated Stored Other Note:

Time (HH:mm)	Volume (Gallons or Liters) Change	Volume Total	Flow (0.013-0.13 gpm, 50-500 mL/min)	Temperature (°C)	± 3% Conductivity (µS/cm)	± 10% or 0.1 mg/L DO (mg/L)	± 0.1 pH (std units)	± 10 mV ORP (mV)	± 10% or 0.5 NTU Turbidity (NTU)	Water Level Drawdown < 0.3 ft (feet btoc)
17:05	1.25	1.25	125	8.34	158	7.40	5.83	75.9	23.4	1.78
17:10	125	1.38	125	8.02	158	2.67	5.89	64.4	24.73	1.78
17:15	125	1.51	125	7.91	157	2.09	5.95	57.8	20.04	1.78
17:20	125	1.76	125	7.67	157	1.65	6.00	54.2	9.16	1.78
17:25	125	1.89	125	7.68	157✓	1.39	6.03	45.3	11.99	1.78
17:30	125	2.02	125	7.64	157	1.10	6.07	40.2	12.72	1.77
17:35	125	2.20	125	7.70	157✓	.89	6.10	38.8	7.56	1.77
17:40	125	2.33	125	7.89	157	0.95	6.12	36.5	7.38	1.77
17.45	125	2.46	125	7.90	158✓	0.98	6.13✓	36.0✓	7.72	1.77
17.50	125	2.59	125	7.95	158✓	0.97	6.14	35.8	7.64	1.77
				KWM 8/5/18						

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
17:50	18:35	6.60	Peristaltic Pump Submersible Pump
SAMPLE ID: 18NCC-14MW05-WG		QC: Dup MS/MSD	Ferrous Iron (Fe^{2+}) (mg/L) = >10

Container/Preservative	Analysis Requested	Notes

Suggested Notation:

"——" = not measured "✓"= stable "+" = rising "-" = falling

Nitrate: No color change
Not Detected

JACOBS

Groundwater Sampling Data Sheet

Site Name	Event	Well ID	Project Number
Northeast Cape -MOC	Five-Year Review	14MW06	SFGA4600
Weather Conditions	**PID Readings of Total VOCs (ppm)**	**Date**	**Sampler Initials**
Overcast, 50°F, calm	Ambient 0.0 Breathing Zone 0.1 In Well 6.7	8/5/18	PM

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
Good Fair Poor	flush mount	PVC SS	1 / 0.041 2 / 0.163 4 / 0.653 6 / 1.47
Depth to Product (ft)	**Depth to GW (ft btoc)**	**Total Depth of Casing (ft btoc)**	**Product Thickness (ft) and Volume Recovered (mL)**
none	1.16	14.71 (final)	none

Max Purge Volume = (14.71 Previous Total Depth ft – 1.16 Depth to Water or Depth to Top of Filter Pack ft) * 0.163 Gallons per Ft gal/ft * 3 = 2.2 Max Purge Vol gal * 3.785 L/gal = 8.36 Max Purge Vol L

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)		Equipment Used for Purging
1050	1115	2.66		Bailer Peristaltic Pump Submersible Pump
Color	**Odor**	**Sheen**	**Purged Dry**	**Meter Used During Purging**
Clear Cloudy Brown Other:	PM None Moderate Faint Strong	Yes No	Yes No	YSI Multi Meter Hach Turbidimeter

Purging reached: Stability Max Vol. Purge water was: Treated Stored Other Note: faint to moderate odor, few spots of sheen

Time (HH:mm)	Volume (Gallons or Liters)		Flow (0.013-0.13 gpm, 50-500 mL/min)	Temperature (°C)	Water Quality (three must stabilize)					Water Level
					± 3%	± 10% or 0.1 mg/L	± 0.1	± 10 mV	± 10% or 0.5 NTU	Drawdown < 0.3 ft
	Change	Total			Conductivity (µS/cm)	DO (mg/L)	pH (std units)	ORP (mV)	Turbidity (NTU)	(feet btoc)
1050	3	3	500	8.18	145	1.33	6.18	269.6	2.59	1.30
1055	2.5	5.5	400	8.64	158	0.85	6.14	210.0	2.09	1.37
1100	2.0	7.5	400	8.49	160	0.79	6.21	153.7	1.62	1.36
1105	2.0	9.5	375	8.60	162	0.56	6.26	143.0	0.23	1.36
1110	1.8	11.3	375	8.47	164	0.58	6.27	135.8	0.00	1.37
1115	1.8	13.1	375	8.55	167 ✓	0.65 ✓	6.28 ✓	131.7	0.47 ✓	1.37

PM 8/5/18

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
1127	PM ~~1135~~ 1255	2.66	Peristaltic Pump Submersible Pump
SAMPLE ID: 18NEC-~~M~~ 14MW06-WG		QC: Dup MS/MSD	Ferrous Iron (Fe^{2+}) (mg/L) = 0.3 nitrate: 0.0

Container/Preservative	Analysis Requested	Notes

Suggested Notation:

"——" = not measured "✓"= stable "+" = rising "-" = falling

*Glycol well

Groundwater Sampling Data Sheet

JACOBS

Site Name	Event	Well ID	Project Number
NeCape	2018 Sampling Event	MW88-3	SFGA4600
Weather Conditions	**PID Readings of Total VOCs (ppm)**	**Date**	**Sampler Initials**
Overcast	Ambient 0.0 Breathing Zone 0.0 In Well 2.6	8/5	KWM

Well Information

Well Integrity	TOC Stickup (ft ags)	Well Casing Material	Casing Diameter(in) / Gallons per linear foot(gal/ft)
Good Fair Poor	Flushmount	PVC SS	1 / 0.041 2 / 0.163 4 / 0.653 6 / 1.47
Depth to Product (ft)	**Depth to GW (ft btoc)**	**Total Depth of Casing (ft btoc)**	**Product Thickness (ft) and Volume Recovered (mL)**
	8.18	19.49 (final)	

Max Purge Volume = (19.49 ft – 8.18 ft) * 0.163 gal/ft * 3 = 5.53 gal * 3.785 L/gal = 20.93

Previous Total Depth; Depth to Water or Depth to Top of Filter Pack; Gallons per Ft; Max Purge Vol; Max Purge Vol

Well Purging Information

Start Time	Finish Time	Depth of Tubing (ft btoc)	Equipment Used for Purging
13:50	14:50	9.63	Bailer Peristaltic Pump Submersible Pump
Color	**Odor**	**Sheen** / **Purged Dry**	**Meter Used During Purging**
Clear Cloudy Brown Other:	None Moderate Faint Strong	Yes No / Yes No	YSI Multi Meter Hach Turbidimeter

Purging reached: Stability Max Vol. Purge water was: Treated Stored Other Note:

3.0 1

Time (HH:mm)	Volume (Gallons or Liters) Change	Volume Total	Flow (0.013-0.13 gpm, 50-500 mL/min)	Temperature (°C)	Conductivity (µS/cm) ± 3%	DO (mg/L) ± 10% or 0.1 mg/L	pH (std units) ± 0.1	ORP (mV) ± 10 mV	Turbidity (NTU) ± 10% or 0.5 NTU	Water Level Drawdown < 0.3 ft (feet btoc)
14:10	2.0	2.0	200	8.23	85	2.60	5.19	246.4	42.3	8.29
14:15	[illegible]	[illegible]	200	9.06	85	2.10	5.34	230.2	37.02	8.34
14:20	4.0	4.0	200	8.16	80	1.97	5.40 ✓	222.8	37.09	8.34
14:25	1.0	5.0	200	8.76	81 ✓	1.70	5.41 ✓	215.8	39.8	8.34
14:30	1.0	6.0	200	9.02	82 ✓	1.60	5.45 ✓	210.5	40.33	8.34
14:35	1.0	7.0	200	9.56	83 ✓	1.68 ✓	5.47 ✓	212.9 ✓	39.29	8.34
14:40	1.0	8.0	200	9.05	82 ✓	1.79 ✓	5.47 ✓	209 ✓	35.38	8.34
14:45	1.0	9.0	200	9.68	83 ✓	1.77 ✓	5.49 ✓	205.6 ✓	35.21	8.34
14:50	1.0	10	200	10.77	84 ✓	1.79 ✓	5.50 ✓	205.0 ✓	30.07	8.34

KWM 8/5/18

Sample Collection Information

Start Time	Finish Time / Date	Depth of Tubing (ft btoc)	Equipment Used for Sampling
15:05	16:09	9.63	Peristaltic Pump Submersible Pump
SAMPLE ID: NEC-MW88-3WG		QC: Dup MS/MSD	Ferrous Iron (Fe^{2+}) (mg/L) = 0 (No color change)

Container/Preservative	Analysis Requested	Notes

Suggested Notation:

"——" = not measured "✓"= stable "+" = rising "-" = falling

Flow Rate Hard to keep steady due to low flow. This is affecting temperature and possibly other readings.

Calibration Logs

YSI Multimeter 556MPS Calibration Log

15 E 103128

					Confidence Solution Values		
Date	Time	Serial #	Calibrated (Y/N) /Parameter	Temperature (°C)	Specific conductivity (~~us~~ mS/cm °C)	pH	ORP (mV)
* 8/1/18	1345	15E103128	Y/Conductivity	15.2	~~7.338~~ 5.826	7.01	242
* 8/2/18	0730	15E103128	Y/Conductivity	13.93	8.108	7.06	239.2
8/3/18	0802	15E103128	Y/Specific Conductance	16.83	7.266	7.03	239.6
8/4/18	0815	15E103178	Y/Specific Conductance	10.84	7.460	7.06	246.8

* Attempted to read confidence solution but was not within parameters for specific conductivity. Used Conductivity calibration solution but specific conductivity was still off

YSI Multimeter 556MPS Calibration Log

04F10639AD

					Confidence Solution Values			
Date	Time	Serial #	Calibrated (Y/N) /Parameter	Temperature (°C)	Specific conductivity (uS/cm °C)	pH	ORP (mV)	
8/5/18	0847	04F10639AD	Y/ specific conductivity	~~12.80~~	~~6790~~	~~6.97~~	~~248.3~~	Pre-calibrati
				14.36	6193	7.06	239.4	

YSI Multimeter 556MPS Calibration Log

10E101899

					Confidence Solution Values		
Date	Time	Serial #	Calibrated (Y/N) /Parameter	Temperature (°C)	Specific conductivity (mS ~~uS~~/cm °C)	pH	ORP (mV)
8/1/18	1345	10E101899	Y/Conductivity	15.2	5.637	6.97	246
8/2/18	0756	10E101899	Y/Conductivity	14.87	8.054	6.96	245.1
8/3/18	0809	10E101899	Y/Specific Conductance	15.33	6.831	6.98	242.9
8/4/18	0829	10E101899	Y/Specific Conductance	10.20	6.983	7.01	250.8
8/5/18	0836	10E101899	Y/Specific Conductivity	13.29	7.225	6.95	248.1

Turbidity Calibration Sheet 11.201106168

Date/Time	Model	Low			Medium			High		
		Std	Reading	w/I 5%	Std	Reading	w/I 5%	Std	Reading	w/I 5%
8/1/18 1445	11.201106168	0.02	0.02	Yes	10.0	10.0	Yes	1000	1000	Yes
8/2/18 0845	11.201106168	0.02	0.00	Yes	10.0	9.15	Yes	1000	993	Yes
8/3/18 0803	11.201106168	0.02	0.01	Yes	10.0	9.13	Yes	1000	992	Yes
8/4/18 0732	HFTB WTMB	0.02	0.02	Yes	10.0	10.0	Yes	1000	1000	Yes
8/5/18 0827	HFTB WTMB	0.02	0.02	Yes	10.0	10.0	Yes	1000	1000	Yes

Turbidity Calibration Sheet 14.20140708|

Date/Time	Model	Low			Medium			High		
		Std	Reading	w/I 5%	Std	Reading	w/I 5%	Std	Reading	w/I 5%
8/1/18 ~~8-1-8~~ /1445	HFTB Wturb	0.02	0.02	Yes	10.0	10.0	Yes	1000	1000	Yes
8/2/18/ 0847	HFTB Wturb	0.02	0.02	Yes	10.0	10.0	Yes	1000	1000	Yes
8/3/18 0839	HFTB wturb	0.02	0.02	Yes	10.0	10.0	Yes	1000	1000	Yes
8/4/18 0721	HFTB wturb	0.02	0.02	Yes	10.0	10.0	Yes	1000	1000	Yes
8/5/18 0815	HFTB wturb	0.02	0.02	Yes	10.0	10.6	yes	1000	1060	Yes

Turbidity Calibration Sheet 201106173

Date/Time	Model	Low			Medium			High		
		Std	Reading	w/I 5%	Std	Reading	w/I 5%	Std	Reading	w/I 5%
8/2/18 0853	MicroTPW	0.02	0.02	Y	10.0	10.0	Y	1000	1000	Y
8/3/18 0836	MicroTPW	0.02	0.02	Y	10.0	10.0	Y	1000	1000	Y
8/4/18 0728	MicroTPW	0.02	0.02	Y	10.0	10.0	Y	1000	1000	Y
8/5/18 0821	MicroTPW	0.02	0.02	Y	10.0	10.0	Y	1000	1000	Y

PID MiniRae 3000 Calibration Sheet

910685 ±0.1 ±1.0

Date	Time	Model	Fresh Air (ppm)	Isobutylene (ppm)
8/1/2018	1345	MiniRae 3000	0.0	99.0
8/2/2018	0812	MiniRae 3000	0.0	100.1
8/3/2018	0825	MiniRae 3000	0.0	100.0
8/4/2018	0753	MiniRae 3000	0.0	100.0
8/5/2018	0920	MiniRae 3000	0.0	100.0

PID MiniRae ~~3000~~ 2000 Calibration Sheet PID1740

±0.1 ±1.0

Date	Time	Model	Fresh Air (ppm)	Isobutylene (ppm)
8/2/18	0800	MiniRae 2K	0.0	99.6
8/3/18	0830	MiniRae 2K	0.0	100.0
8/4/18	0802	MiniRae 2K	0.0	101.0
~~8/5/18~~	~~0920~~			

Groundwater Logbook

Groundwater Monitoring

Rite in the Rain.
ALL-WEATHER
ENVIRONMENTAL
№ 550F

Authors

Kevin Maher
Peter Mamrol

DCN: AE-ECC-J07-
5FGA4600-H04-0002

6 32281 55021 1
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PAGE	REFERENCE	DATE

Location Nc Cape (MOC) Date 8/1/18

Project / Client USACE

Recorded By Kevin Maher

Weather: Overcast 50°F
Light wind (≈ 5 mpH)

PPE: Level D (modified)

STAFF: Jessica Bray Kevin Maher
Shaun Seegers Admond Abuamsha

OBJECTIVES: Well Development.

Verified Calibration / Recalibrated
PID + YSI (x 2) 13:45

15:15
Loaded Equipment and Drove to MOC
and Set-Up on well 14MW04
checked Breathing Zone

15:45 Began development @ 14MW04
Alternated surging using a
Bailer + Purging
Removed approximately 5 gallons with
the Bailer in 30 minutes.

16:15 Switched to using a submersible
Pump for Surging + purging

over →

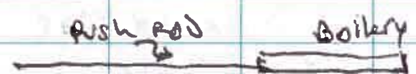
Location: NE Cape (MOC) Date: 8/1/18

Project / Client: Continued

Purged another 10 gallons of water + noticed turbidity was improving during purge cycles

16:20 Stopped purging to retrieve a push rod from camp.

16:30 Attached bailer to push rod and cut off ball valve from the bailer.



Used push rod to dislodge sediment felt at the bottom of well casing when measuring initial total casing depth

Dislodged sediment by working bailer up + down while in contact with the sediment layer.

Returned pump to well + continued purging. over →

Location: NE Cape (MOC) Date: 8/1/18

Project / Client: Continued

Heavy turbidity was observed during purging at this time.

Continued surging at lower end of casing (deepest) and purging.

total of 20 gallons purged prior to stabilization verification.

17:34 - Began stabilization verification all parameters stabilized (pH, ORP, Cond + DO) turbidity did not stabilize + last reading was 12.47 NTUs.
Development ended at 18:35 with a total of 25 gallons purged.

18:50 Left site

17:00 Staged purge water @ camp (waste area) and decontaminated pumps + water level meters.

[signature] 8/1/18 over →

Location Nc Cape (mac) Date 8/1/18 continued

Project / Client

16:00 Arrived at 16:00 and Set-up Equipment @ well MW10-1

16:30 Admond and Stan Began Development under Supervison of Kevin.

Alternate Surging + Purging with a Bailer continued for 30 minutes with a total of 5 gallons purged.

The submersible pump was then used for surging + purging and another 5 gallons was removed.

Similarly to well 14MW04, the push Rod and Bailer were used to dislodge sediment Layer @ the Bottom of the casing.

17:00 The pump was Lowered to the Bottom of the casing and

OVER →

Location Nc Cape (mac) Date 1 August 18 continued

Project / Client

Another 15 gallons was removed alternating surging + purging.

The End of work shift occured prior to stabilization monitoring, so a single set of parameters were measured using the stainless steel cup.

18:00 Removed equipment from Well and Returned to camp (Stan + Admond)

End of Day

Kevin Mattek 8/1/18

Location NE Cape (MOC) Date 8/2/18

Project / Client USACE

Weather: Overcast 50°F with light winds and rain

PPE: Level D (modified)

Staff: Maher, Bays, Admand AA

Objective: Well development and Sampling

Verified calibration and recalibrated PID and YSI (x2) 07:30 + turbidimeter

Organized cooler with sample containers

11:00 Arrived at MOC + Admand AA

set-up on MW10-1 to continue develope well.

Initial water purged with the submersible pump was fairly clear. Water also returned to starting depth from 8/1/18

Stabilization started @ 11:30

Location Ne Cape (moc) Date 8/2/18 continued

Project / Client USACE

11:45 Jessica Bays + Kevin M. Located ~~MW26~~ 26MW1 and set-up for sample collection.

13:00 Admand finished development MW10-1

14:00 GW sampling completed at 26MW01

Returned samples to camp.

15:15 Returned to MOC and set-up on well 22MW2

Purging started @ 16:20

~~1554 Arrived at MOC with Jessica Bays and Kevin Maher. Set up for sampling at MW22-2 22MW2~~ JB

Location NE Cape (MOC) Date 8/2/18

Project / Client USACE Continued

1700 Completed purge of 22MW02 and began Sampling set up. Collected a primary and duplicate sample starting at 17:05

1830 Completed primary and duplicate sampling. Arrived back at camp at 1835.

Placed all samples in Refrigerator temp of Refrigerator = 3.0°C

2 - 1L HCl 1 - HNO_3

2 - 1L UN 3 - 40mL VOAs

~~Site 9 S~~ 8/2

Site 9 Surface Water Sampling.

Upstream end of Diversion trench contained Similar levels of water As in 2014.

Collected SW-1 from this location At 16:43. Field Parameters were

Temp = 10.70 °C ph = 5.95

Cond = 68 µS/cm Orp = 218.5

DO = 10.95 mg/L Turbid = 4.6 NTU

Sample ID: 18NEC - S09 - WS - 01

Location NE Cape (MOC) Date 8/2/18

Project / Client Continued

SW-2 17:13

Collected Surface water from down stream outlet of Diversion trench.

Temp = 11.01 °C pH = 6.21

Cond = 65 µS/cm Orp = 216.8

Do = 11.04 mg/L Turbidity = 4.73 NTUs

Sample ID: 18NEC - S09 - WS - 02

Moved to SW-3 at 17:48. SW-3 ~~was~~ 8/2 is a standalone pond Downgradient of the Landfill

Temp = 14.32 °C ph = 6.37

Cond = 116 µS/cm ORP = 201.9

Do = 8.57 mg/L Turbid: 5.78 NTUs

Sample ID: 18NEC - S09 - WS - 03

Placed Samples in Refrigerator

End of day

8/2/18

Location NE Cape (MOC) Date 8-3-18

Project / Client USACE

Weather: Overcast 45-50°F with light winds and rain

PPE: Level D (modified)

Objective: Surface + Groundwater sampling

745 Verified and recalibrated YSI (x3), PID (x2), and turbidimeter (x 2)

Organized coolers with Sample containers

08:20 @ SW-03. SW-03 is a stand alone pond down gradient of the land Fill.

Recollecting SW-03 in order to include duplicate and MS/MSD samples

Sample ID Primary: 18NEC-509-WS-03

Duplicate: 18 NEC-509-WS-03-8

MS/MSD: 18 NEC-509-WS-03

Location NE Cape (MOC) Date 8-3-18

Project / Client USACE continued

Temp: 11.02°C	pH: 5.53
Cond: 83 µS/cm	ORP: 81.4
DO: 8.07 mg/L	Turbidity: 4.67 NTUs

Sample Time:

Placed Pin flags @ SW-01, SW-02, and SW-03

Back @ Camp at 9:48

12:30

Loaded Equipment And Set-up on well 14MW01. Kevin was Sampler

Well casing slight Jack up so that Flush mount lid would not completely Close.

Completed Sampling At 15:10 samplers return to camp.

15:00

Jessica Bay and Holey Huff set-up on well MW10-1.

Well flow need to be reduced to ≈200 mLs/min. to meet draw Down specifications.

over →

Location Ne Cape Date 8/3/18
Project / Client USACE

Well MW10-1 water color was
Tan and the color affected
Turbidity. Turbidity stabilized
at 24.7 NTUs and appeared to
Be free of particulates.
Sampling completed at 1805

Samples Returned to camp

16:00
Kevin and Peter set-up on well
14MW07.
Initial water quality looked good
(low turbidity) and no drawdown
issues.
Sampling completed at 18:05 and
Samples returned to camp

17:00 Kevin set-up on well
20MW01. well in good condition.

Sampling completed at 18:43 and
Samples returned to camp
over →

Location USACE Ne Cape Date 8/3/18
Project / Client

All Purge water placed in
Drum WW-3.

End of Day

[signature] 8/3/18

Location Ne Cape Date 8/4/18
Project / Client USACE

07:30
Check meter calibration
And Recalibrated YSIs x2
PIDs + turbidimeters were in
Range (see calibration Logs)

Organized Gear + UTVs

Weather: 44°F, Overcast 10mph wind
PPE: Level D (modified)
Objective: Groundwater Sampling
Staff: Admond A. Jessica B. and
Kevin Maher

09:00 Arrived at MOC And
Located MW88-4 and ~~MW88-~~ ~~[illegible]~~ 17MW1

Jessica Set up on well 17MW1
Almond Set-up on well MW88-4-1

17MW1 completed at 11:15
MW88-1 completed at 11:3

Location Ne Cape Date 8/4/18
Project / Client USACE

Samples returned to camp
Kevin Set-up on well
~~[illegible]~~ 14MW03 at 11:45

14:00 Kevin Departed MOC
And Returned Samples to camp
Jessica + Peter set up on well
MW88-10

1510 Pump quit working. Stopped power & shook pump. Applied power and now performing well.
1525 Turbid increased to 105 but dropping.

1600 Started sample collection.
1645 Completed sample collection Pump performing irregularly. Appears to be controller. Reading irregular output voltage but flow was steady. Fe/Nitrate test kits.
1700 Packing up and leaving for camp.

PETER MAMROL

18

Location NE Cape Date 8-5-18

Project / Client USACE / STGAHOD

0700 weather: Overcast 45°F, rained overnight
PPE: Level D (modified)
objectives: groundwater sampling
Personnel: Jessica (JB) and Peter (PM)
Safety tailgate: update site 28 SPA with necessary decon.

0755 Begin loading GW equipment.

0815 begin calibrating turbidity meter and other gw sampling equipment. Recalibrated conductivity (specific) for YSI.

1010 Arrive at 17MW06. Very shallow groundwater (1.1'), with groundwater seeping to surface 15' downhill to the North. Well in good condition.

1125 Finish purging. Faint to moderate odor. Few small spots of sheen in purge bucket.

1321 Completed sampling at 14MW06 & disassembly. Taking samples back to camp. Purge water has distinct fuel odor.

1445 leaving camp for MOC.

1515 Arrive at well 14MW02. water fills 1/2 of flush mount inside. Photo # 157.

1546 Began well purging.

Location Ne Cape Date 8-5-18 19

Project / Client USACE

1635 Achieve well stability. Begin collecting sample 18NEC-14MW02-WG. Well has moderate fuel odor in purge water.

1730 Complete sample collection. Decon & heading back to camp.

10:00
Kevin Arrived At Well 14MW04
Well water turbidity was Higher than Expected as this well was Re-Developed on 8/1/18.
turbidity Eventually decreased to 11 NTUs.
Completed Sample collection And Returned samples to camp Storage Refrigerator.

13:30 Kevin arrived at well MW88-3. Flow rate of ≈ 200 mls/min were Needed over →

to Keep Draw-Down within
Limits. Well stabilization
parameters were met.

Completed Sampling and
Returned Samples to camp
Refigerator.

16:30
Moved to well MW ~~140~~
14MW05 and set-up gear.
This well had a depth to
GW of 1.6" Below TOC and
A total Depth of 15'. it
Appeared that the screened
Interval was fully submerged

Checked construction Specs and
The screen was 5'-15' Below TOC.

Consulted with the QAR and
Determined that the pump
Intake would be placed

1.5 Feet Below the top
of the Screened Interval
(6.6').

this well would only support
A sustained flow rate of
125 mls/min while maintaining
draw down to less than
0.3 Feet.

14MW04 also is approx 60'
From A Spring which
discharges into Site 28.
It Appears that the
Spring is at the Same
Elevation as groundwater
in 14MW04.

18:00 Returned Samples to CAmp
Refrigerator.

End of Day

[signature] 8/5/18

ATTACHMENT E-5
Photograph Log

2018 MNA Groundwater Annual Sampling Report at the MOC – Northeast Cape, St. Lawrence Island, Alaska

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Photo No. 1 – 02 August 2018
Collecting natural attenuation parameters using a YSI flow-through cell prior to sampling at well 22MW2. View facing east.

Photo No. 2 – 01 August 2018
Re-development of well 14MW04 using a polyvinyl chloride bailer connected to twine. View facing southwest.

Photo No. 3 – 10 August 2018
Liquid waste storage area including several 55-gallon drums, located at the Site 6 gravel pad adjacent to camp. View facing north.

Photo No. 4 – 01 August 2018
Low levels of surface water observed across northeast cape, including dry former ponds near Site 3. View facing northwest.

Photo No. 5 – 02 August 2018
View across the MOC toward monitoring well MW10-1. View facing northeast.

Photo No. 6 – 02 August 2018
View of monitoring well 14MW06. View facing down.

Photo No. 7 – 02 August 2018
View of monitoring well 14MW05. View facing down.

Photo No. 8 – 02 August 2018
View south across the MOC from monitoring well 14MW05. View facing south.

Photo No. 9 – 02 August 2018
View of monitoring well MW88-3. View facing down.

Photo No. 10 – 02 August 2018
View of monitoring well 14MW04. View facing down.

Photo No. 11 – 02 August 2018
View of monitoring well 14MW03. View facing down.

Photo No. 12 – 02 August 2018
View of monitoring well 14MW02. View facing down.

Photo No. 13 – 02 August 2018
View of monitoring well 14MW01. View facing down.

Photo No. 14 – 02 August 2018
View of monitoring well 17MW1 affected by frost-jacking. View facing down.

Photo No. 15 – 04 August 2018
Purging groundwater at Monitoring Well 88-1. View facing north.

Photo No. 16 – 05 August 2018
Ponded water inside of well casing at flush mount monitoring well 14MW02. View facing down.

Photo No. 17 – 06 August 2018
Water seeping out of the north edge of the MOC pad along the border of site 28. Distance measured is 36 feet north of well 14MW04. View facing south.

Photo No. 18 – 06 August 2018
Water seeping out of the north edge of the MOC pad and start of surface water at Site 28 drainage. Distance measured is 44 feet north of well 14MW05. View facing south.

Photo No. 19 – 06 August 2018
Water seeping out of the north edge of the MOC pad and start of surface water at Site 28 drainage. Distance measured is 18 feet north of well 14M06. View facing south.

Photo No. 20 – 06 August 2018
View of monitoring well MW10-1. Ponded water observed along the border with the Site 28 wetland. View facing northeast.

Photo No. 21 – 02 August 2018
Central MOC area. View facing northwest.

Photo No. 22 – 31 July 2018
Camp. View facing north.

Photo No. 23 – Sinkhole discovered during demobilization site walk along Airport Access Road. View facing northwest.

APPENDIX F

SITE 28 SEDIMENT MAPPING AND SAMPLING REPORT

U.S. Army Corps of Engineers
Alaska District

SECOND PERIODIC REVIEW REPORT

APPENDIX F

2018 SITE 28 SEDIMENT MAPPING AND SAMPLING REPORT

NORTHEAST CAPE FUDS
ST. LAWRENCE ISLAND, ALASKA

FUDS No. F10AK0969-03

FINAL
SEPTEMBER 2020

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ACRONYMS AND ABBREVIATIONS

°F	degrees Fahrenheit
AC&WS	Aircraft Control and Warning Station
ADEC	Alaska Department of Environmental Conservation
bgs	below ground surface
CCV	continuing calibration verification
COC	contaminant of concern
cy	cubic yard(s)
DD	Decision Document
DoD	U.S. Department of Defense
DQA	data quality assessment
DRO	diesel-range organics
ECC	Environmental Compliance Consultants, Inc.
EPA	U.S. Environmental Protection Agency
FUDS	Formerly Used Defense Site
HPAH	high molecular weight polycyclic aromatic hydrocarbon
HTRW	hazardous, toxic, and radiological waste
Jacobs	Jacobs Engineering Group Inc.
LPAH	low molecular weight polycyclic aromatic hydrocarbon
mg/kg	milligrams per kilogram
MOC	Main Operations Complex
N/A	not applicable
NEC	Northeast Cape
NOAA	National Oceanic and Atmospheric Association
NOM	naturally occurring organic material
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PM	project manager
POL	petroleum, oil, and lubricants
QC	quality control
RRO	residual-range organics
SIM	selective-ion monitoring
SOP	standard operating procedure
SSCL	site-specific cleanup level
Site 28	Site 28 Drainage Basin
Suqi River	Suqitughneq River

ACRONYMS AND ABBREVIATIONS (Continued)

TAH	total aromatic hydrocarbons
TAqH	total aqueous hydrocarbons
USACE	U.S. Army Corps of Engineers
WACS	White Alice Communications System

EXECUTIVE SUMMARY

This Site 28 Drainage Basin (Site 28) report summarizes the 2018 sediment mapping field activities and analytical results and presents conclusions and recommendations. Site 28 is part of the Northeast Cape Formerly Used Defense Site on St. Lawrence Island, Alaska (Alaska Department of Environmental Conservation File No. 475.38.013). The 2018 activities were completed according to the *2018 Remedial Action Review Work Plan* (U.S. Army Corps of Engineers [USACE] 2018). Activities included surveying the extent of water bodies at Site 28, measuring extent and thickness of sediment in the selected waterbodies, and collecting sediment samples.

All analytical results were compared to site-specific cleanup levels (SSCLs) for sediment established in the 2009 Decision Document (DD) (USACE 2009).

The primary conclusions of the 2018 Site 28 field activities and analytical results include:

- A natural stilling area was found to be present between Area 9 and Area 10. The area appeared to be entirely composed of vegetative mat which dispersed flow channels observed in Area 10.
- A total of 281 cubic yards (cy) of sediment were estimated to be present at Site 28 water bodies in 2018. Based on a lines-of-evidence approach, re-accumulation of sediment is possible in certain areas of Site 28. However, estimating the amount of sediment which has re-accumulated is not possible currently due to procedural differences in the 2012 and 2018 mapping efforts and the 2013 post-removal estimating techniques.
- Target analytes exceeding the multi-site DD-based SSCLs in sediment samples were found in sediment samples across Areas 2 through 9 in 2018. Target analytes did not exceed the multi-site DD-specified SSCLs at the confluence with the Suqitughneq River (Suqi River) within Area 11 or immediately south of the Suqi River in Area 10 in 2018. Diesel-range organics (DRO), residual-range organics (RRO), 2-methylnaphthalene, and naphthalene are the most prevalent analytes exceeding SSCLs. Applying the analytical results to the estimated sediment volumes, 196 of the 281 cy of sediment contains compounds at levels above their respective SSCLs. Table F-ES-1 presents the analytes that exceeded SSCLs, the range of concentrations detected, the location of the maximum concentration, and number of locations exceeding SSCLs.
- Other polycyclic aromatic hydrocarbons were reported in the Site 28 sediment samples that do not have an SSCL, with 1-methylnaphthalene being the most frequently reported of these analytes in 2018.

- Sediment contamination greater than SSCLs were not found in Removal Areas 10 and 11 near the Suqi River in 2018.
- PCBs, reported as Aroclors, were not found at Site 28 above the SSCL in 2018.
- Naturally occurring organic material in sediment is contributing to the 2018 reported levels of DRO and RRO and causing a high bias. This observation is consistent with those reported in historical investigations at Site 28 and other Northeast Cape sites. Silica gel treatment is only partially effective in reducing this high bias.

Table F-ES-1
2018 Exceedances of SSCLs for Sediment at Site 28

Test Method	Analyte	Sediment SSCL (mg/kg)[1]	2018 Concentration Range of Results (mg/kg)	Location ID of Maximum Concentration	Number of Locations with Result Greater than Multi-Site DD-based SSCL
AK102	DRO	3,500	214 **– 105,000**	S28-15	36 of 54
AK102[2]	DRO – Silica Gel	3,500	102 – **94,100**	S28-28	32 of 54
AK103	RRO	3,500	844 – **127,000**	S28-42	35 of 54
AK103[2]	RRO – Silica Gel	3,500	296 – **106,000**	S28-42	18 of 54
SW8270D	2-Methylnaphthalene	0.6	ND - **529**	S28-49	35 of 54
	Acenaphthene	0.5	ND - **16 J**	S28-28	22 of 54
	Fluoranthene	2	ND - **3.42**	S28-52	1 of 54
	Fluorene	0.8	ND - **25.3**	S28-28	25 of 54
	Naphthalene	1.7	ND - **230**	S28-54	31 of 54
	Phenanthrene	4.8	ND - **13.3 J**	S28-53	9 of 54
	Total LPAH	7.8	ND - **266.65**	S28-54	25 of 54

Notes:
[1] Sediment SSCL as defined in the 2009 multi-site DD (USACE 2009).
[2] Performed using the silica gel cleanup method.
Bold = exceeded SSCL
J - The analyte was positively identified; however, the associated result was less than the limit of quantitation but greater than or equal to the detection limit.
For definitions, refer to the Acronyms and Abbreviations section.

1.0 INTRODUCTION

This report presents field activities and analytical results and presents conclusions from the sample collection effort at Site 28 Drainage Basin (Site 28) conducted in August 2018 at the Northeast Cape (NEC) Formerly Used Defense Site (FUDS) on St. Lawrence Island, Alaska (Alaska Department of Environmental Conservation [ADEC] File No. 475.38.013). Environmental Compliance Consultants, Inc. (ECC) and Jacobs Engineering Group Inc. (Jacobs) prepared the work plan, performed the fieldwork, and prepared this report for the U.S. Army Corps of Engineers (USACE) under Hazardous, Toxic, and Radiological Waste (HTRW) Contract No. W911KB-17-D-0017, Task Order No. W911KB18F0020. Field activities were performed in accordance with the *2018 Remedial Action Review Work Plan* (USACE 2018).

1.1 PROJECT GOALS AND OBJECTIVES

Project goals specific to the investigation at Site 28 were defined in the work plan (USACE 2018). The goal of the 2018 field investigation at Site 28 was to evaluate the post-removal quantity of sediment and compare analytical results to the previous 2012 sediment mapping effort described in the *Site 28 Technical Memorandum Addendum* (USACE 2013a). The 2018 objectives included the following:

- Measure (survey) the extent of water bodies;
- Measure extent and thickness of sediment within select waterbodies; and
- Collect sediment samples at Site 28 locations specified in the work plan and submit them for planned test procedures.

1.2 REPORT ORGANIZATION

This report is organized as follows:

- Section 1.0 introduces the project, describes the project goals, and outlines the report organization.
- Section 2.0 provides a physical description of the site and summarizes the site history.

- Section 3.0 defines project field investigation activities to include: deviations, project mobilization, land survey, water body mapping, sediment mapping, sampling activities, waste management, and demobilization activities.
- Section 4.0 presents investigation results and discussion.
- Section 5.0 presents conclusions and recommendations derived from the field investigation and analytical data review.
- Section 6.0 lists the references cited in this document.

In addition to the main report, the following attachments contain further information:

- Attachment F-1 provides figures of the site to include sediment transects, sampling locations, and sediment cross sections.
- Attachment F-2 provides the data quality assessment (DQA).
- Attachment F-3 provides copies of the field documentation.
- Attachment F-4 provides a photograph log for the 2018 activities described in this report.
- Attachment F-5 provides Standard Operating Procedure (SOP) NEC-SOP-02, *Site 28 Sediment Mapping and Sample Collection*.

2.0 SITE DESCRIPTION AND HISTORY

The following sections describe the location of NEC, information about the physical and ecological setting, site history, and Site 28 physical setting and history. The information in this section is compiled from previous historical NEC documents and includes citations where needed.

2.1 SITE DESCRIPTION

St. Lawrence Island, Alaska, is in the western portion of the Bering Sea, approximately 135 air miles southwest of Nome. The NEC FUDS is 9 miles west of the northeastern cape of the island at 63°19’ N, 168°58’ W. The NEC FUDS property originally encompassed approximately 4,800 acres (7.5 square miles) bordered by Kitnagak Bay to the northeast, Kangighsak Point to the northwest, and the Kinipaghulghat Mountains to the south (USACE 2015).

NEC FUDS consists mainly of rolling tundra rising from the Bering Sea toward the base of the Kinipaghulghat Mountains. The Kinipaghulghat Mountains rise abruptly to an elevation of approximately 1,800 feet above sea level roughly 3 miles from the coastline. The NEC FUDS is not connected to other permanent communities on the island by road and is only accessible by air, water, or utility task vehicle trails. The closest community is the Native Village of Savoonga, located approximately 60 miles to the northwest (Figure F-1 [Attachment F-1]).

2.1.1 Climate

St. Lawrence Island has a cool, moist, subarctic maritime climate, with some continental influences during winter when much of the Bering Sea is covered with pack ice. Winds and fog are common, and precipitation occurs approximately 300 days per year as light rain, mist, or snow. Annual snowfall is approximately 80 inches per year. Total annual precipitation is about 16 inches per year, and more than half falls as light rain between June and September. Summer temperatures average between 34 and 48 degrees Fahrenheit (°F), with a record high of 65°F. Winter temperatures range from -2 to 10°F, with an extreme low of -30°F. Freeze-up on the island normally occurs in October or November, and breakup normally occurs in June (USACE 2015).

2.1.2 Geology

St. Lawrence Island consists of isolated bedrock highlands of igneous, metamorphic, and older sedimentary rocks surrounded by unconsolidated alluvium overlying a relatively shallow erosional bedrock surface. The main area of operation, known as the Main Operations Complex (MOC) is located at approximately 100 feet in elevation. In the area of the MOC, shallow unconsolidated surficial materials overlie quartz monzonitic rocks of the Kinipaghulghat Pluton (Patton and Csejtey 1980). The pluton forms the mountainous area south of the NEC FUDS, which includes Kangukhsam Mountain. The Suqitughneq River (Suqi River) drainage in the Kinipaghulghat Pluton has created an erosional valley and alluvial fan of unconsolidated sediments. The NEC FUDS is located on this alluvial fan, which protrudes north from the mountain front toward the Bering Sea. Granitic bedrock materials are exposed at the coast north of the site at Kitnagak Bay, which suggests that the quartz monzonitic bedrock underlies the unconsolidated materials at a relatively shallow depth on a wave-cut erosional platform.

In general, the native soil stratigraphy at NEC is characterized by silts near the surface, overlying more sand-dominated soil at depth. The silt contains varying quantities of clay/sand/gravel and varies from 0 to 10 feet in thickness. The silt is dark brown to dark green, and sometimes exhibits a mottled texture. In some areas, the silt exhibits an aqua green or blue color. Dark brown silts are observed in outcrops. The sand at depth contains varying degrees of silt/gravel/cobbles that ranges from 2 feet to greater than 20 feet in thickness. These deeper, coarse-grained materials are generally unsorted and are likely to be of glaciofluvial origin. The depth to bedrock at the NEC FUDS is unknown (USACE 2009).

2.2 SITE HISTORY

NEC FUDS was constructed as an Aircraft Control and Warning Station (AC&WS) during 1950 and 1951 to provide radar coverage and surveillance for the Alaskan Air Command and later for the North American Air Defense Command, as part of the Alaska Early Warning

System. The site was activated in 1952 and a White Alice Communications System (WACS) station was added to the site in 1954. The AC&WS and WACS operations were supported by 212 personnel and were terminated in 1969 and 1972, respectively. The majority of military personnel were removed from the site by the end of 1969 (USACE 2015).

The NEC FUDS included areas for housing site personnel, power plant facilities, fuel storage tanks, distribution lines, maintenance shops, wastewater treatment facilities, and landfills. The buildings and majority of furnishings and equipment related to the AC&WS were initially abandoned in place due to the high cost of off-island transport (USACE 2015).

In 1971, the villages of Gambell and Savoonga opted out of the Alaska Native Claims Settlement Act, which allowed them to claim title to 1.136 million acres of land in the former St. Lawrence Island Reindeer Reserve, established in 1903. The Gambell Native Corporation and Savoonga Native Corporation (now known as Sivuqaq, Inc. and Kukulget, Inc., respectively) received titles to all of St. Lawrence Island (except U.S. Surveys 3728, 4235, 4237, 4340, and 4369) by Interim Conveyance No. 203, dated 21 June 1979 and finalized 2 December 1980. In 1982, the U.S. Navy obtained approximately 26 acres of land containing the former WACS. The land transfer was later deemed invalid and property ownership was reverted to Sivuqaq, Inc. and Kukulget, Inc.

Demolition of the buildings and most other structures was completed under multiple USACE contracts. The runway, improved gravel roads, and concrete slabs of some of the former structures remain intact. Four remedial investigations were conducted at 34 individual sites grouped by environmental concerns between 1994 and 2004 (USACE 2015). Following completion of the 2007 feasibility study (USACE 2007) and the 2009 multi-site Decision Document (DD) (USACE 2009), remedial actions occurred through 2014 (USACE 2015).

2.2.1 Site 28

Site 28 is located north of the MOC and south of the Suqi River (Figure F-2). The site has been affected by fuel releases from the bulk fuel storage tanks (Site 11) and other spills and releases discussed in the multi-site DD (USACE 2009). Site 28 contains wetlands, rolling tundra, and ponds, and surface water at Site 28 drains north into the Suqi River.

Surface water at Site 28 originates from surface water runoff (overland flow) from the MOC and groundwater seeps. Three distinct drainage areas near the MOC are present at the head of the drainage basin (south end), which contribute flow to Site 28 (USACE 2009). The eastern headwater drainage flows from the vegetated area adjacent to Sites 10 and 11, which are located north of the former fuel tanks; the middle headwater drainage originates from a small swale where a culvert directed flow from Site 27, and the western headwater drainage is located downgradient of Site 13 (USACE 2013a). The western drainage originated from a manhole and a small concrete supporting structure just north of the perimeter access road, which emptied into an artificially created swale. The manhole likely served as the drain leading from Building 110 (Heat and Electrical Power Building) at the MOC (USACE 2009).

The three drainage areas merge to form two flowing channels of water further downgradient (north) and eventually merge into one flowing channel. There are two distinct groundwater seeps at the head of the Site 28 drainage directly north of the gravel pad. Overland flow can contribute significant amounts of water to the basin during rainfall events (USACE 2013a). Sediment, soil, surface water, and shallow groundwater samples have been collected and analyzed beginning in 1994.

Site 28 Historical Contamination

Fuel-contaminated sediment was observed in each of the three drainages at the head of the drainage basin near the MOC, and they produced sheen when disturbed (USACE 2009). The primary contaminants of concern (COCs) in sediment at the time of the multi-site DD were diesel-range organics (DRO), residual-range organics (RRO), polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), chromium, lead, and zinc (USACE 2009).

As summarized by the multi-site DD (USACE 2009), surface water samples were collected from the drainage basin in 1994, 1996, and 2001. Concentrations of DRO, total recoverable petroleum hydrocarbons, PCBs, and lead were elevated in 1994 (USACE 2009). In 2001, DRO was detected at concentrations ranging from 0.39 to 2.3 milligrams per liter. PCBs and RRO were nondetect. The most heavily contaminated surface waters of the drainage basin were found at the terminus of the former culverts near the southern portion of Site 28 at the head of the western and middle drainages.

Groundwater samples collected in 1994 indicated the potential for DRO and lead contamination, but subsequent sampling in 2001 demonstrated that concentrations were below cleanup levels. No groundwater COCs were retained in the multi-site DD for Site 28 (USACE 2009).

Multi-Site DD-Selected Remedy for Site 28

The selected remedy for Site 28 in the multi-site DD consisted of three components:

1. Excavation and removal of petroleum-, metals- and PCB-contaminated sediment, including the removal of near-surface sediments from the narrow channel upgradient of the Suqi River.
2. Construction of a sedimentation pond or other appropriate controls. The ends of the culverts would also be cleaned out and removed or plugged to prevent direct outflows of upgradient residual sources of contamination.
3. Completion of Comprehensive Environmental Response, Compensation, and Liability Act Five-Year Reviews (USACE 2009).

An informational LUC, in accordance with UECA, describing residual POL-related contaminants in sediment within the Site 28 drainage basin is recommended to prohibit disturbance of Site 28 sediment. LUCs with regard to soil and groundwater POL-related contamination at the southern boundary of Site 28 and within the previously defined “UVOST plumes” are also recommended, however, these will be included within the Environmental Covenant for the MOC.

Site 28 Remedy Implementation

In 2010, approximately 95 feet of culvert were removed, and one culvert was capped (USACE 2011). The concrete manhole structure in the western headwater drainage was also cleaned and removed. Sludge inside the manhole contained concentrations of DRO up to 68,000 milligrams per kilogram (mg/kg), PCB Aroclor 1254 up to 20 mg/kg, arsenic up to 41 mg/kg, barium up to 820 mg/kg, cadmium up to 18 mg/kg, lead up to 5,000 mg/kg, mercury up to 15 mg/kg, and silver up to 16 mg/kg (USACE 2011). A 12-inch corrugated metal pipe that attached to the manhole and continued upgradient toward the MOC was cut, and 63 feet of the pipe was removed. The open end of the pipe was then filled with bentonite and welded shut. In the middle headwater drainage, another 12-inch corrugated metal pipe measuring 32 feet long was completely removed (USACE 2011).

In 2011, sediment sampling was conducted to further delineate the extent and magnitude of contamination at Site 28 between the southern end of Site 28 and its confluence with the Suqi River (to include areas where contamination was noted in the multi-site DD) (USACE 2009) to gain a better understanding of contaminant distribution throughout the drainage. Sediment results were compared to the site-specific cleanup level (SSCL) specified in the multi-site DD. If sediment criteria were not listed in the multi-site DD for a particular analyte, evaluation criteria were based on the National Oceanic and Atmospheric Administration (NOAA) Screening Quick Reference Tables for freshwater sediment at the probable effect level (Buchman 2008). Some of the samples collected in 2011 did not meet the project definition of sediment, so soil cleanup levels were used for screening purposes. Sediment is defined as all continuously submerged loose material and organic material, except that which is actively growing vegetation and is part of the vegetative mat. The results indicated that five additional contaminants in sediment were of potential concern: toluene, ethylbenzene, total xylenes, cadmium, and selenium (USACE 2013a).

In 2012, additional sediment mapping, sampling, and probing were conducted. Streams and ponds in the drainage basin were inspected to define the horizontal boundaries of the sediment accumulation areas and probing was conducted to determine the thickness of the sediment (USACE 2013b). The 2012 sediment probing effort was conducted using a 4-inch diameter hand auger with a T-handle. The probing depths were measured by marking the auger handle at 6-inch intervals. The reference marks were used to calculate the depth at 66 probing locations. Sediment thickness ranged from 0.5 foot to 2 feet throughout Site 28 in 2012. The mapping efforts identified approximately 400 cubic yards (cy) of sediment along the drainage basin (USACE 2013b).

In September 2012, following the mapping, sampling, and probing effort, Phase I of the sediment removal remedy was initiated in three areas. Two removal methods were evaluated for efficacy and implementability: excavation and a combination of a Venturi dredge and geotextile dewatering tube:

- An excavator removed sediment in Removal Areas 1 and 2, just north of the MOC gravel pad. This method allowed excavated sediment to be dewatered in place but was limited to areas with firm ground such as the MOC gravel pad or a road. The excavator removed approximately 5 cy of sediment from Removal Area 1 in the western headwater drainage and 16 cy from Removal Area 2 near the middle headwater drainage. In Removal Area 1, DRO, acenaphthylene, 2-methylnaphthalene, and naphthalene exceeded the multi-site DD-based SSCLs in both confirmation samples. In Removal Area 2, the same analytes plus RRO, acenaphthene, fluorene, and phenanthrene exceeded the multi-site DD-based SSCLs.
- The Venturi dredge was used in Removal Area 4 located in the main channel of the drainage. This method was used where the excavator could not travel but required large volumes of water to remove the sediment. Following removal, the sediment was separated from the water and the water was confirmed to meet discharge requirements presented in the State of Alaska Wastewater General Permit 2009DB0004 before release. The dredge removed approximately 18 cy of sediment from Removal Area 4 in 2012. No confirmation samples were collected from Removal Area 4. Approximately 135 cy of contaminated sediment remained at Removal Area 4 at the conclusion of 2012 field season (USACE 2013b).

In 2013, sediment removal continued within Removal Areas 3 through 11 (USACE 2015); for volume of sediment removed in 2013, refer to Table F-4-2 in Section 4.2.1:

- At Removal Areas 5, 6, and 7, vegetative material routinely clogged the in-line pumps. Sediment and vegetative material were removed by hand instead of using the dredge. Personnel donned dry suits, entered the shallow ponds, and rolled/scooped up the sediment/decaying plant material in large pieces. Material was placed at the edge of each pond and an excavator was used to place the material in bulk bags for disposal (USACE 2015).
- Removal Area 8 was a small pond in 2012; however, it was dry in 2013. Material from this area was removed by excavator and placed directly into a bulk bag for disposal (USACE 2015).
- Sediment was removed from Removal Areas 3, 4, 7, 9, 10, and 11 using the Venturi dredge and geotextile dewatering system (USACE 2015).

- Based on sediment results collected at the conclusion of the 2013 removal action, several analytes previously identified above the multi-site DD SSCLs for Site 28 (including DRO, RRO, acenaphthene, fluorene, 2-methylnaphthalene, naphthalene, phenanthrene, low molecular weight PAHs [LPAHs], arsenic, and chromium) remained at concentrations greater than the multi-site DD SSCLs for Site 28. Analytes exceeding the multi-site DD SSCLs for Site 28 remained within all 11 sediment removal areas. In addition, acenaphthylene, anthracene, and pyrene exceeded NOAA Screening Quick Reference Tables (USACE 2015).

Other significant parts of the 2013 removal effort included treatment of water produced during sediment removal, control measures, and surface water sampling.

Water and sediment removed using the dredge system was moved to a water processing area west of Site 28. The processing area consisted of two 20,000-gallon-capacity lined containment cells approximately 60 by 30 feet and 1.5 feet deep. The primary containment area consisted of a geotextile dewatering tube for sediment dewatering designed to contain the sediment while allowing water to pass through the pore spaces. The pore size ranged from 59 to 350 microns. Water was then treated through a scrubber, a natural cellulose fiber that selectively absorbs hydrocarbons inside high-density polyethylene containers with an inlet at the top. Water then flowed to the second set of containment cells to await analytical results below total aromatic hydrocarbons (TAH) and total aqueous hydrocarbons (TAqH) criteria identified in the State of Alaska Wastewater General Permit 2009DB0004-0216 prior to discharge. In 2012, samples collected from the treated water did not meet discharge criteria for TAH and TAqH (USACE 2013b). No water was discharged. Excavated sediment and treated water from Removal Area 4 remained within the lined containments over the winter of 2012/2013.

Following the 2012 field activities, changes to the sediment/water treatment system were made in order to implement this remedy effectively. In 2013, a SPINPRO HydroMizer polymer feed system with injection pump was introduced into the piping line prior to sediment capture in the geotextile tube to facilitate coagulation and settling (USACE 2013b). The water filtration system was modified to consist of two sock filters (water first flowed through a 25-micron-filter and then through a 5-micron-filter), followed by a scrubber containing hydrocarbon-absorbent cellulose fibers (USACE 2015). After the first batch of water was processed in 2013, analytical results indicated water remained above TAqH criteria (USACE 2015). A granular-activated carbon system was added as the last treatment step and the hydrocarbon scrubber was eliminated. Analytical results from the first batch of water processed using the modified treatment system were below discharge criteria presented in the State of Alaska Wastewater General Permit 2009DB0004-0216 and 18 Alaska Administrative Code 70. ADEC and USACE agreed that pre-treated water containment samples were no longer needed and treated water was discharged to the ground (USACE 2015).

Two methods were used to control and minimize downstream sediment migration during removal activities: silt fencing and an in-stream sediment trap. Silt fencing was used where there was no direct flow to the main channel of the Suqi River and was placed on the north side of the ponded area. The sediment trap was placed downstream of sediment Removal Area 4. The trap was a steel box, 8 feet wide by 4 feet deep, with the rear (downstream) height extending approximately 6 feet high and tapering to a front section approximately 4 feet high. Rectangular slots allowed water to flow down and through the box. Unrolled jute mats were placed inside, upstream, and downstream of the trap (USACE 2013b).

Surface water samples were collected at three locations before, during, and after sediment removal and at one location downstream of the sediment trap. Samples were analyzed for DRO, RRO, PAHs, PCBs, benzene, toluene, ethylbenzene, xylenes, and total and dissolved metals (Resource Conservation and Recovery Act metals plus nickel, vanadium, and zinc). All surface water samples were below applicable surface water criteria and no sheen was observed (USACE 2015).

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3.0 FIELD INVESTIGATION ACTIVITIES

Site 28 sediment mapping and sampling at the NEC FUDS Site 28 took place from 4 through 9 August 2018 and were one component of a larger NEC field effort which occurred from 31 July through 10 August 2018. Other field activities un-related to the Site 28 sediment effort will be described in other reports. This section discusses 2018 field activities at Site 28, which include mobilization and demobilization, surveying, waterbody mapping, sediment thickness measurements, sediment sampling, and managing waste.

3.1 WORK PLAN DEVIATIONS

Deviations from the 2018 work plan (USACE 2018) occurred during the execution of fieldwork. None of the deviations significantly affected the data usability. The work plan deviations were as follows:

- To meet the DQO for sediment sample collection at Site 28, two samples were collected as composite samples rather than grab samples. The volume of sediment present within the ponded area at surveyed locations 18NEC-S28-SD-36 and 18NEC-S28-SD-37 was limited; most of the substrate either consisted of rock or vegetative mat. The collection of two composite samples rather than grab samples did not affect data quality (Attachment F-2); however, results from the composite samples are representative of a larger spatial extent than the grab samples that were collected from other locations at Site 28.
- Some obstructions were present, which inhibited measuring and recording the lateral and vertical extent of sediment. This occurred at profile locations P15 and P17 (refer to the sediment transect summary in Attachment F-3). The obstructions are presumed to be debris, as discussed in Section 4.3.8; however, the obstructions were considered sediment for purposes of drawing sediment transect lines and no sediment depth was recorded at the two locations where obstructions were encountered.
- Seven sampling locations (locations S28-04, -11, -25, -38, -42, -43, and -51) were relocated in consultation with the USACE because the area did not contain sediment as defined by the project. The seven original locations were either vegetative mat or on dry land in 2018 and both from areas previously sampled and with prior removal actions. For each of the seven relocated sample locations the distance between the original sample location and relocated sample location was measured, and a compass reading was recorded from the original sample location to the relocated sample location.

- During waterbody mapping, the extent of the vegetative mat was not surveyed by professional surveyors as indicated in the 2018 work plan (USACE 2018). Instead, the field team collected measurements at each of the surveyed transect locations using a tape measure and projected the extent on the figures in Attachment F-1. This did not affect the DQO to map the extent of the vegetative mat, because the measurements were still collected.

3.2 MOBILIZATION AND DEMOBILIZATION

Mobilization and demobilization occurred during July and August 2018, respectively. Jacobs personnel traveled from Anchorage to Nome via commercial airline on 31 July 2018 and then to St. Lawrence Island via Bering Air charter. ECC and USACE traveled to St. Lawrence Island via Security Aviation charter on 31 July 2018. Supplies for the camp were barged to St. Lawrence Island prior to the commencement of fieldwork. PRL Logistics, Inc. provided services for a remote camp at NEC (Photograph F-3-1). Field gear was transported to NEC on 31 July 2018 via Bering Air charter. Travel at NEC was achieved using utility task vehicles. The USACE project manager (PM) and ADEC PM arrived by Security Aviation charter on 6 August 2018. The USACE PM departed the same day on a Security Aviation charter while the ADEC PM departed by Bering Air charter on 8 August. All personnel demobilized from NEC via Bering Air charter or Security Aviation charter by 10 August 2018. Personnel demobilized by Bering Air traveled to Nome and returned to Anchorage via commercial airline. All other personnel were demobilized by Security Aviation directly to Anchorage. Camp crew remained on site and deconstructed the facilities.

The remote camp was dismantled and prepared for the barge. The barge departed from NEC on 14 September 2018. A site walk was conducted by ECC and a PRL Logistics, Inc. representative on 14 September 2018. While conducting the site walk, a sinkhole was discovered along Airport Access Road (Photograph F-3-2). Some wood debris remained on the camp site and minor garbage was removed and disposed of in Nome. The water discharge area for the camp was inspected and there were no signs of damage from the associated camp activity.

Photograph F-3-1: Overview of camp set-up. View facing northeast.

Photograph F-3-2: Sinkhole discovered during demobilization site walk along Airport Access Road. View facing southwest.

The key project personnel that participated in the field effort along with responsibilities are provided in Table F-3-1.

Table F-3-1
Key Field Personnel

Title	Organizational Affiliation	Name	Responsibilities
Superintendent	Prime Contractor (ECC)	Stanley Seegars	Implements, oversees, and coordinates project activities and camp activities. Supports PM as needed.
Contractor QC System Manager	Subcontractor (Jacobs)	Kevin Maher Angela DiBerardino	Conducts field inspections and ensures field activities are in compliance with planning documents and approved contract.
Site Safety and Health Officer	Prime Contractor (ECC)	Stanley Seegars	Developed, implemented, and oversaw all safety and health-related project aspects.
Field Sampler	Prime Contractor (ECC) Subcontractor (Jacobs)	Admon Abuamsha Jessica Bay Haley Huff Peter Mamrol	Collected field screening and analytical samples and managed and shipped analytical samples.
Sample Expediter	Prime Contractor (ECC)	Dan Mcgauhey	Expedited coolers with analytical samples from Bering Air to Alaska Airlines GoldStreak in Nome, Alaska.
Project Chemist	Subcontractor (Jacobs)	Nathaniel Gingery	Coordinated with the laboratory, reviewed data, and ensured data quality objectives were met.
Analytical Laboratory PM	Laboratory Subcontractor Agriculture & Priority Pollutants Laboratories, Inc. SGS Environmental Services, Inc.	Greg Salata Justin Nelson	Analyzed the samples in accordance with contract and QC requirements.
Emergency Medical Professional	Medical Subcontractor (Beacon)	Zackery Bauder	Provided medical services in accordance with contract.

Note:
For definitions, refer to the Acronyms and Abbreviations section.

3.3 SURVEYING

NEC survey activities occurred from 1 through 4 August 2018. A survey was performed to identify the extent of water bodies, locate proposed sampling locations, and record positions of other features as needed. Surveying was conducted by Lounsbury & Associates, a professional land surveyor (Photograph F-3-3). Survey data tables relevant to sampling locations and compliant with the *Manual for Electronic Deliverables* (USACE 2017a) are included in Appendix H.

Lounsbury & Associates used the National Geodetic Survey Online Positioning User Service to process all static baselines and obtain the geodetic positions for project control. Values were obtained by averaging multiple solutions on each point, all of which were based upon at least two hours of static global positioning system observation time. Observations were obtained over multiple days and at different times each day to incorporate different satellite geometry. The integrity of the xyz positions on each control point were confirmed through multiple real-time kinetic check-shots on each point.

Photograph F-3-3: Surveying of a water body at Site 28. View facing east.

3.4 WATER BODY MAPPING

The surface water bodies measured in 2018 at Site 28 extended from the border of the MOC to the confluence with the Suqi River. The lateral and vertical extent of the surface water bodies were surveyed if they appeared greater than 30 feet in diameter. The surface water bodies at

Site 28 are presented on Figure F-3 (Attachment F-1) along with the surface water elevation contours.

Real-time kinetic global positioning system was used to collect survey positions around the edge of major water bodies at Site 28. The depth of the water body was collected during the sediment mapping activities, as described in Section 3.5, and are displayed on the cross sections presented in Attachment F-1 for each transect profile. All recorded water body depths are provided in Attachment F-3.

3.5 SEDIMENT MAPPING

Site 28 sediment mapping activities occurred from 4 through 6 August 2018. Submerged areas were characterized as sediment or vegetative mat within the surveyed water bodies. For this characterization, sediment was defined as all continuously submerged loose material and organic material, except that which is actively growing vegetation as part of the vegetative mat. If no sediment was identified (e.g., only vegetative mat present), the lack of sediment was documented, and no further evaluation occurred. When sediment was identified, the vertical extent of sediment was measured in accordance with Jacobs SOP NEC-SOP-02. NEC-SOP-02 as presented in the 2018 work plan (USACE 2018). Suggested changes to the field SOP were identified after the field effort for future activities at the request of the USACE. The revised SOP is included as Attachment F-5.

Some obstructions were present, which inhibited measuring and recording the lateral and vertical extent of sediment. This occurred at profile locations P15 and P17 (refer to Attachment F-3). The obstructions are presumed to be debris as discussed in Section 4.3.8.

Two types of water bodies contained sediment at Site 28: discrete ponds and elongated interconnected water features. Discrete ponds did not directly interconnect to other surface water features at the time of the sampling event. Elongated, interconnected, and flowing surface water features made up most of the surface water features in the drainage. These features were generally oriented on a north/south axis and flowing water ran in a north direction toward the Suqi River.

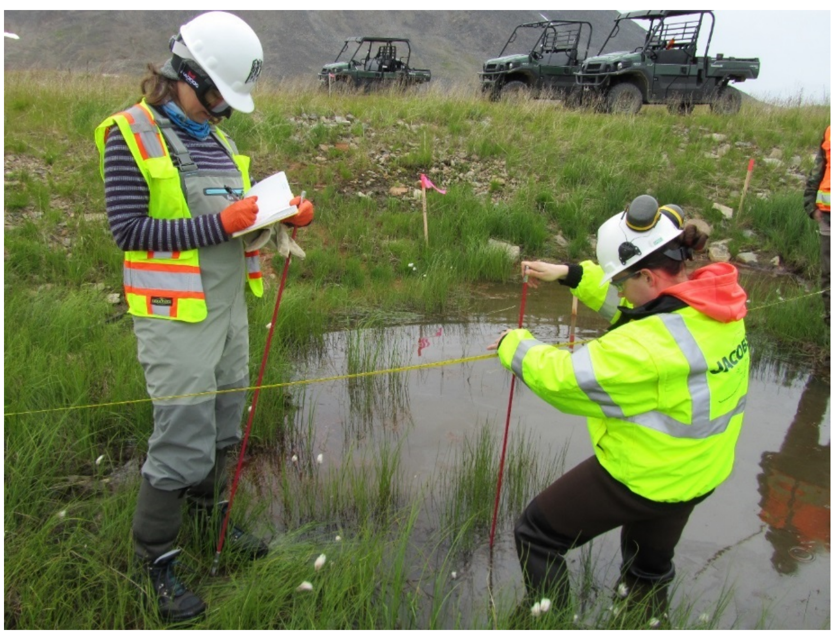
For discrete water bodies containing sediment, north/south and east/west transects were established using a compass with a declination set to 8 degrees east. Transects crossed approximately at the center of the water body to measure thickness (Photograph F-3-4) according to the work plan.

Photograph F-3-4: Transects at a discrete water body at Site 28. View facing southwest.

For linear water bodies that contained sediment, an east/west profile transect was established every 30 feet along across the north/south axis (Photograph F-3-5). The areas where sediment was present in the linear water bodies occurred in narrow sections; therefore, thickness measurements occurred by evenly-spacing three or more measurements at each transect.

Photograph F-3-5: Surveyed linear water body at Site 28. View facing south.

A graduated hand probe was used to measure sediment thickness to the nearest 0.1 foot starting from the edge of the sediment area and at intervals not exceeding 10 feet (Photograph F-3-6).



Photograph F-3-6: Collecting sediment thickness measurements using a graduated hand probe at a discrete water body at Site 28. View facing southwest.

Multiple measurements were collected at each location using the graduated probe (e.g., sediment thickness, water depth, and depth at which resistance of the subsurface underlying sediment was noted) and were recorded in the field log book presented in Attachment F-3. Sediment thickness measurements are the basis of the transect profile cross sections included in Attachment F-1. Figures F-4a through F-4i present the transects and the sediment measurement from each probing location.

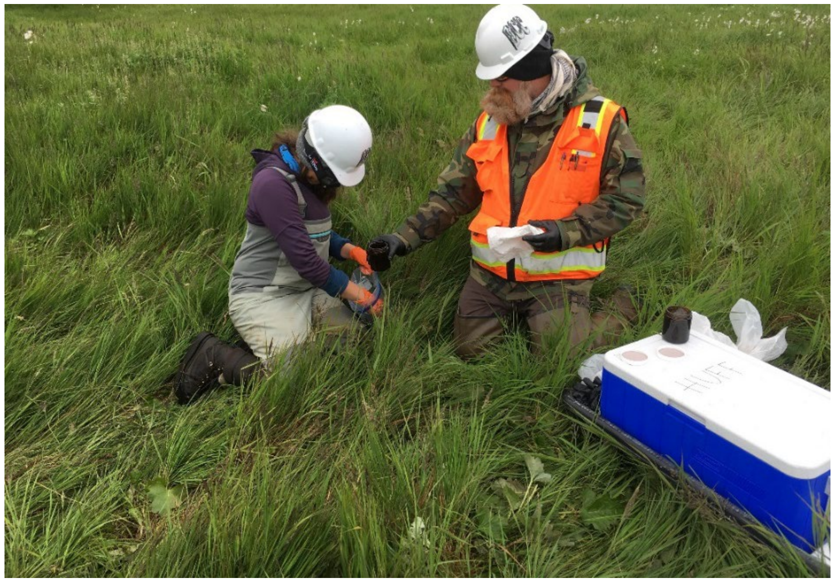
3.6 SAMPLING ACTIVITIES

Site 28 sediment sampling activities occurred from 7 through 9 August 2018. Field documentation, including logbooks and sediment boring logs from each sample location, are included in Attachment F-3. All samples were collected, labeled, stored, and shipped in accordance with Jacobs SOPs JE-SOP-2000, JE-SOP-5300, JE-SOP-7000, and NEC-SOP-2 provided in the 2018 work plan (USACE 2018). Samples were thermally preserved in the field using gel ice immediately after collection and then stored in a temperature regulated refrigerator maintained at 0 to 6 degrees Celsius until offsite shipment to the laboratory. All samples were shipped via Bering Air from NEC to Nome. In Nome the coolers were transferred to Alaska Airlines GoldStreak priority cargo for shipment to SGS Environmental Services, Inc. of Anchorage, Alaska. The sample summary is provided in Attachment F-2.

Reusable sampling tools (hand auger) were decontaminated before use with Alconox and deionized water rinses (Photograph F-3-7) and one-time-use equipment was disposed of after use. Personal protective equipment, such as waders and gloves, were decontaminated after exiting water bodies that had fuel sheen or odor. Decontamination water was collected and shipped offsite (refer to Section 3.7 and Attachment F-3).

Photograph F-3-7: Decontaminating sample collection equipment during sediment sampling at Site 28. View facing west.

A total of 54 sediment samples were collected using a hand auger, sampling spoons, and gloved hands (Photograph F-3-8). A total of 44 samples were collected from surveyed locations based on previous sample locations from the 2012 sediment mapping effort (USACE 2013a). Seven additional locations (locations S28-04, -11, -25, -38, -42, -43, and -51) were originally staked out in either vegetative mat or on dry land (Photograph F-3-9). These seven locations were relocated from previously sampled locations with prior removal actions to suitable sample locations in consultation with the USACE because the original location did not contain sediment in 2018 as defined by the project. The new locations were recorded using a tape measure and compass (Photographs F-3-9 and F-3-10). Three samples of opportunity were collected from water bodies that contained a fuel odor or sheen (locations S28-52, -53, and -54). Sediment samples were collected from depths up to 2 feet deep in the sediment layer or shallower if refusal was met with the hand auger. Because limited thickness of a sediment layer was present at locations S28-SD-36 and S28-SD-37, composite sediment samples were collected by gathering small amounts of sediment from within one foot of each of the location's survey lathe. Sample classification, sample ID, sample depth, and other observations were recorded in field documentation (Attachment F-3).



Photograph F-3-8: Collecting a sediment sample at Site 28. View facing down.

Photograph F-3-9: Vegetative mat at surveyed and staked location S28-04 at Site 28; sample location was relocated. View facing south.

Photograph F-3-10: Measuring distance to relocated sample location S28-04 from survey lathe at Site 28. View facing west.

Photograph F-3-11: Compass reading to relocated sample location S28-04 from survey lathe at Site 28. View facing west.

Sediment samples collected from Site 28 were analyzed for DRO by method AK102 (with and without silica gel cleanup), RRO by method AK103 (with and without silica gel cleanup), total organic carbon by method SW9060A, PAHs by method SW8270 selective-ion monitoring

(SIM), PCBs by method SW8082A, and select metals (arsenic, chromium, lead, selenium, and zinc) by method SW6020A.

3.7 WASTE MANAGEMENT

Investigation-derived waste was transported and disposed of in accordance with all applicable local, state, and federal regulations. Investigation-derived waste, including used nitrile gloves, sampling spoons, and general refuse were incinerated at the camp site. Extra sediment not utilized for sample collection was returned to the location in which it was collected. Wastewater generated during decontamination of equipment and personal protective equipment was collected in a 5-gallon bucket on site. Liquid waste was transferred from Site 28 to a waste collection area near the main camp and combined with wastewater from other NEC activities into 55-gallon drums. A total of four 55-gallon drums was transported offsite via barge at the end of the field effort. Table F-3-2 identifies the waste water quantities generated at Site 28. Waste disposal documentation is included in Attachment F-3.

Table F-3-2
Site 28 Project-Specific Waste Quantities

Waste Type	Generation Date	Approximate Disposal Quantity[1]
Nonhazardous decontamination wastewater	6 August 2018	2 gallons
	7 August 2018	2 gallons
	8 August 2018	3 gallons

Note:
[1] Site 28 wastewater was combined with wastewater from MOC field activities.

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4.0 INVESTIGATION RESULTS AND DISCUSSION

This section summarizes and interprets analytical results and field measurements for the 2018 sampling activities conducted at Site 28 by ECC and Jacobs.

4.1 EXTENT OF WATER BODIES

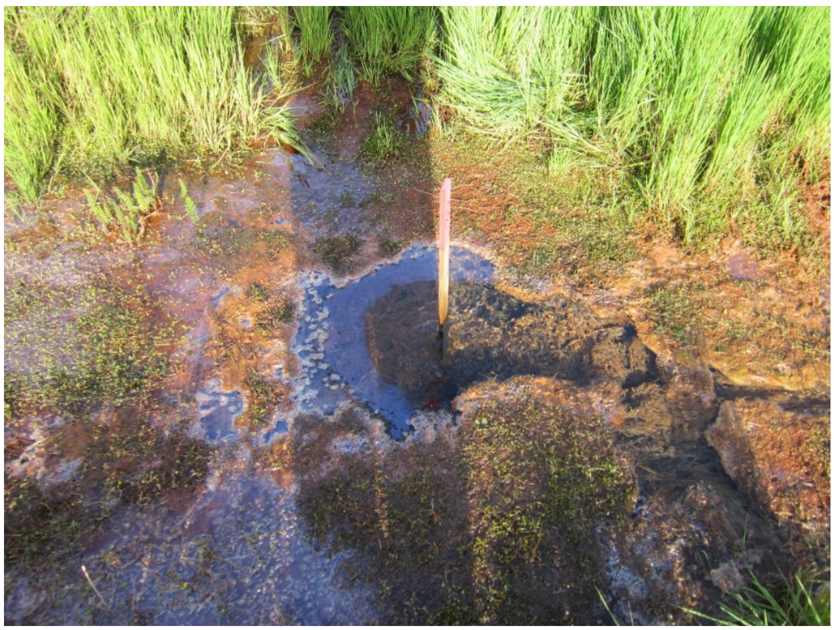
The data generated by the 2018 waterbody mapping effort described in Section 3.4 is presented on Figure F-3. The surface water elevation contours confirm field observations that surface water flow is occurring from the south in a northward direction toward the Suqi River. The extent of surface water in 2018 appeared to be less than the extent of surface water reported in 2012. The type of waterbodies varies by geographical location within Site 28.

Surface water in the southern portion of Site 28, nearest to the MOC, is comprised of discrete ponded water bodies with little apparent connection (observable flow) to other surface water features. These surface water features were most evident in Removal Areas 2, 5, 6, 7, and 8 (Figure F-4). Groundwater seeps emanating from the gravel pad were observed near Removal Area 2.

Water from an upwelling, present at the southern point of Removal Area 3 near sample location S28-35 (Photograph F-4-1), flows north through an elongated feature that is interconnected within Removal Areas 3, 4, and 9 (Photograph F-4-2). Naturally occurring iron staining was present within Removal Areas 3 and 4. The northern portion of Removal Area 9, near sample location S28-13, has an abundant vegetative mat and an apparent decelerated water flow (Photograph F-4-3).

A natural stilling area was observed between Removal Areas 9 and 10. The likely stilling area appears to be created by a slight elevation change which has the effect of spreading out surface flow over a wider area than that observed in Removal Area 9 or Removal Area 10. No primary flow channel was found, and the submerged areas were entirely made up of vegetative mat.

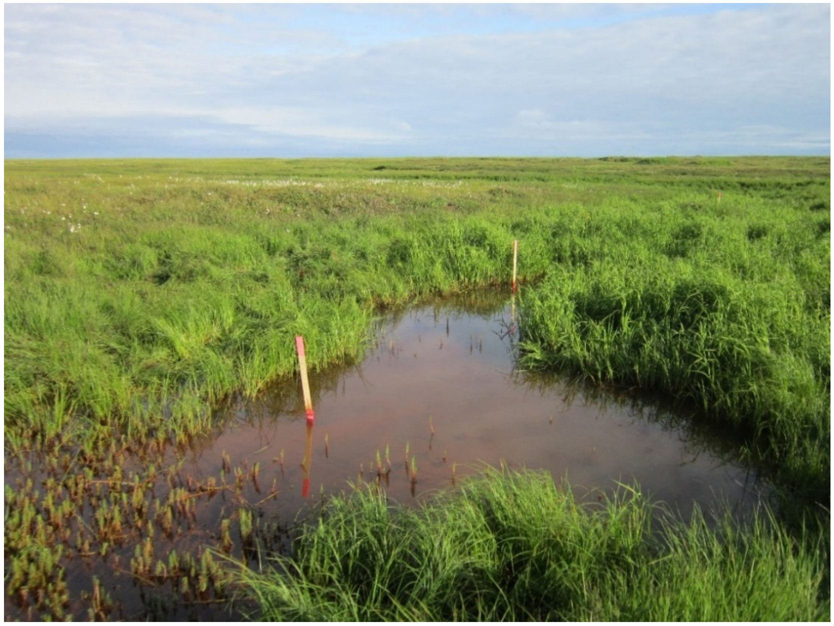
Removal Areas 10 and 11 include ponded areas interconnected by elongated features. This area also contained an abundance of tall grass and a vegetative mat (Photograph F-4-4). A small section of stream is found in the vegetative mat in Removal Area 10 south of sample location S28-12 (Photograph F-4-5). The main Site 28 confluence with the Suqi River occurs at sample location S28-1 (Photograph F-4-6) where a narrow flowing water feature is observed. Flow measurements recorded from the Suqi River in 2016 concluded that both velocity and discharge increased downstream of the Site 28 confluence as a result of in-flow from Site 28 (USACE 2017b).



Photograph F-4-1: Artesian upwelling at S28-35. View facing down.

Photograph F-4-2: Naturally occurring mottled iron present in the flowing stream of Removal Areas 3 and 4. View facing south.

Photograph F-4-3: Sample location S28-13, in Removal Area 9, with an abundant vegetative mat. View facing north.



Photograph F-4-4: Interconnected, ponded water bodies at Removal Areas 10 and 11 with elongated features containing an abundant vegetative mat (S28-5 and S28-6). View facing north.

Photograph F-4-5: Abundant vegetative mat at Removal Area 10 containing a small section of stream upgradient from sample location S28-12. View facing southwest.

Photograph F-4-6: The confluence of Site 28 with the Suqi River at sample location S28-1. View facing east.

4.2 SEDIMENT EXTENT AND THICKNESS

In 2012, a sediment mapping effort to measure sediment extent and thickness occurred at Site 28. Sediment thickness was measured in 66 locations throughout Site 28 and ranged from 0.5 foot to 2 feet. Approximately 400 cy of sediment were estimated to be present within the Site 28 waterbodies based on the 2012 measurements (USACE 2013a).

Site 28 sediment removal actions occurred in 2012 and 2013. An estimated total of 284.6 cy of contaminated sediment were removed in 2012 and 2013; two locations in 2012 (20.6 cy from Removal Areas 1 and 2) and nine locations in 2013 (264 cy from Removal Areas 3 through 11) (USACE 2015). The volume of sediment removed during these activities was estimated by using AutoCAD to compare the pre- and post-removal square footage of the waterbodies multiplied by the pre-removal estimate of sediment thickness (USACE 2015). No direct measurements were taken at that time.

In 2018, the extent and thickness of sediment were measured as described in Section 3.5. A total of 51 profile transects were established and 207 locations were measured for sediment thickness across the transects. Sediment thickness in 2018 ranged from 0.1 foot to 3.4 at Site 28 with a total estimated volume of 281 cy across all water bodies. A comparison of the 2012 versus the 2018 estimated volumes of sediment by removal area is presented in Table F-4-1. Figures F-4a through F-4i display the location of 2018 transect, thickness measurement locations, and areas where sediment removal occurred in 2013.

Table F-4-1
Summary of Sediment Quantities Mapped and Removed from Site 28

<table>
<tr><th>Area</th><th>Estimated Sediment Volume in 2012 (cy)</th><th>Volume of Sediment Removed in 2012 and 2013 (cy)</th><th>Estimated Sediment Volume in 2018 (cy)</th><th>Estimated Volume of Contaminated Sediment in 2018 (cy)</th></tr>
<tr><td>Area 1</td><td>1.6</td><td>5</td><td>Not measured[1]</td><td>Not measured[1]</td></tr>
<tr><td>Area 2</td><td>7.2</td><td>16</td><td>3.62</td><td>3.62</td></tr>
<tr><td>Area 3</td><td>73.9</td><td>64.6</td><td>26.99</td><td>26.99</td></tr>
<tr><td>Area 4</td><td>153.3</td><td>98.4</td><td>122.84</td><td>122.84</td></tr>
<tr><td>Area 5 North</td><td>9.3</td><td>3.1</td><td>0.02</td><td>0.02</td></tr>
<tr><td>Area 5 South</td><td>29.3</td><td>6.5</td><td>0.02</td><td>0</td></tr>
<tr><td>Area 6</td><td>6.9</td><td>21.3</td><td>6.4</td><td>6.4</td></tr>
<tr><td>Area 7</td><td>6.2</td><td>12.3</td><td>10.48</td><td>3.2</td></tr>
<tr><td>Area 8</td><td>0.5</td><td>1.8</td><td>1.01</td><td>0.44</td></tr>
<tr><td>Area 9</td><td>63.6</td><td>23.4</td><td>32.15</td><td>32.15</td></tr>
<tr><td>Area 10-1</td><td>4.2</td><td>3.9</td><td rowspan="3">20.9</td><td rowspan="3">0</td></tr>
<tr><td>Area 10-2</td><td>1.3</td><td>0.4</td></tr>
<tr><td>Area 10-3</td><td>7.2</td><td>5.1</td></tr>
<tr><td>Area 10-4</td><td>16.9</td><td>11.5</td><td rowspan="2">43.91</td><td rowspan="2">0</td></tr>
<tr><td>Area 10-5</td><td>8.5</td><td>7.5</td></tr>
<tr><td>Area 11-1</td><td>2.7</td><td>2.2</td><td rowspan="2">12.91</td><td rowspan="2">0</td></tr>
<tr><td>Area 11-2</td><td>6.8</td><td>2.4</td></tr>
<tr><td>Totals</td><td>399.4</td><td>285.4</td><td>281.25</td><td>195.66</td></tr>
</table>

Notes:
[1] Sediment volume was not measured in 2018 because sediment probing was not performed in 2012 (USACE 2013a).
For definitions, refer to the Acronyms and Abbreviations section.

Sediment profile cross sections were created from 2018 measurements for each of the 51 transects to illustrate the sediment distribution encountered. The cross sections also identify the water depth encountered and vegetative mat areas. Bathymetry and sediment thicknesses measurements were linearly interpolated between measurements points across the transect to produce the cross section illustrations in Attachment F-1, numbered P-1 through P-53.

Sediment volume was calculated using the area of sediment within each water body as mapped in plan-view, multiplied by the average thickness of sediment as illustrated on the cross sections. An average sediment thickness was approximated for each sediment transect using the distribution as shown on each cross section in Attachment F-1. Where multiple transects were collected to represent an elongated water body, the sediment thickness averaged from each transect was further weighted to account for differences in the width of the waterbody.

4.2.1 Post-Removal Sediment Quantity Evaluation

Secondary goals for the 2018 sediment data assessment were to determine if significant re-accumulation of sediment occurred at Site 28 after 2013 removal efforts and what volume of contaminated sediment may have remained at Site 28. Although a direct comparison of overall 2012 and 2018 sediment volumes was attempted, it did not prove fruitful. Comparability issues were identified due to the differences in 2018 quantity and type of measurements when compared to the 2012 efforts. More sediment locations were measured in 2018 (207) than in 2012 (66). The reduced measurement density in 2012 resulted in a higher variability in the final estimate. Additionally, no direct measurements of sediment thickness occurred after the removal actions.

The following lines-of-evidence approach provided insight to possible sediment re-accumulation:

- Comparing the volume of sediment estimated in 2012, the volume of sediment removed in 2012 and 2013 and the volume of sediment estimated in 2018 by removal area;
- Comparing the sediment thickness from discrete locations within select removal areas measured during the 2012 and 2018 mapping effort; and
- Using visual field observations, such as surface evidence of sloughing.

As summarized in Table F-4-1, numerical comparisons for 2012, 2013, and 2018 sediment volumes did not compare well on a removal area basis. Therefore, the first line of evidence did not provide any insight other than identifying the need to use the 2018 measurement approach for future efforts at Site 28.

The second line of evidence comparison is summarized in Table F-4-2. There were 11 measurement locations between the 2012 and 2018 study where measurements occurred at similar locations.

Table F-4-2
Comparison of 2012 and 2018 Discrete Thickness Measurements

Removal Area	Water Body Type	2012 Probe Number	2018 Profile Transect Number	2012 Sediment Thickness (feet)	2018 Sediment Thickness (feet)	Comparison Outcome
3	Elongated	28-43	P34	1	0.7	2018 < 2012
3	Elongated	28-44	P35	1.5	2.1	2018 > 2012
3	Elongated	28-51	P40	0.75	0.4	2018 < 2012
4	Elongated	28-33	P25	1.75	2.3	2018 > 2012
4	Elongated	28-37	P27	1.5	0.3	2018 < 2012
5	Ponded	28-62	P49	1	vegetative mat	2018 < 2012
7	Ponded	28-55	P42	1	0.3	2018 < 2012
9	Ponded	28-22	P16	1	1.1	2018 > 2012
10	Ponded	28-10	P8	1.25	2.3	2018 > 2012
11	Ponded	28-1	P1	1	1	2018 = 2012
11	Ponded	28-4	P2	1.75	1.3	2018 < 2012

The evaluation of the second line of evidence showed that seven of the 11 locations had less sediment in 2018 when compared to 2012 and four locations had more sediment. Focusing on some of the discrete pond locations where sediment thickness was lower in 2018 identified that re-accumulation was not suspected. Remaining sediment was identified at 2018 location P42 (Removal Area 7). There was no re-accumulation mechanism to transport sediment to this location; therefore, it was suspected that the remaining sediment may be present due to incomplete removal. Other locations, such as P27 (Removal Area 3) and P34 (Removal Area 4), may be indicative of re-accumulation based on their presence in areas of higher water flow rates created by the narrow channel.

The final line of evidence reviewed were field observations. Some of the ponded water bodies observed in Removal Areas 2 and 8 appeared to have vertical edges. These vertical edges were likely effects of the removal activities and were not natural features. These waterbodies showed evidence of sloughing, which would be a possible re-accumulation mechanism.

Elongated features with flowing water through Removal Areas 3, 4, and 9 had the potential for sediment re-accumulation. The average sediment thickness measurement from upgradient to downgradient should have increased if sediment was reaccumulating through these elongated water body features. However, the average thickness measurements did not indicate this was occurring and no significant areas of sloughing were noted in 2018.

Based on the three lines of evidence reviewed, the procedural differences between 2012 and 2018 mapping efforts do not allow meaningful volume comparisons. Some limited re-accumulation of sediment was likely in areas of Site 28 where supported by flow conditions (Removal Areas 3 and 4). However, re-accumulation did not explain the volume of remaining sediment at Site 28 if it was assumed the 2013 removal action was complete.

4.3 NATURE AND LATERAL EXTENT OF CONTAMINATION AT SITE 28

Analytical results from the 2018 Site 28 sediment sampling effort were compared to the SSCLs for COCs identified in the work plan that originated in the 2009 multi-site DD (USACE 2009). Target analytes exceeding the multi-site DD-based SSCLs for sediment at Site 28 were present at the south portion of the site closest to the MOC and extending downgradient through Removal Area 9. The two removal areas closest to the Suqi River (Removal Areas 10 and 11) did not contain target analytes above the sediment SSCLs. Figures in Attachment F-1 present 2018 sample locations and analytical results for locations exceeding the SSCLs. Table F-4-3 presents a minimum and maximum sample concentration for each analyte, sample location of the maximum detected concentration, and number of locations with exceedances greater than the SSCLs.

Table F-4-3
2018 Exceedances of SSCLs for Sediment at Site 28

Test Method	Analyte	Sediment SSCL (mg/kg)[1]	2018 Concentration Range of Results (mg/kg)	Location of Maximum Concentration		Number of Locations with Result Greater than Multi-Site DD-based SSCL
				Location ID	Removal Area	
SW6020A	Arsenic	93	2.64 - 86.2	S28-34	Area 3	None
	Chromium	270	5.56 - 48.3	S28-42	Area 8	None
	Lead	530	5.41 - 98.9	S28-43	N/A	None
	Zinc	960	19.4 - 280	S28-42	Area 8	None
SW8082A	Total PCB	0.7	ND - 0.482	S28-17	Area 9	None
	Aroclor 1016	0.7	ND	N/A		None
	Aroclor 1221	0.7	ND	N/A		None
	Aroclor 1232	0.7	ND	N/A		None
	Aroclor 1242	0.7	ND	N/A		None
	Aroclor 1248	0.7	ND	N/A		None
	Aroclor 1254	0.7	ND - 0.2	S28-44	Area 6	None
	Aroclor 1260	0.7	ND - 0.482	S28-17	Area 9	None
SW8270D	2-Methylnaphthalene	0.6	ND - **529**	S28-49	Area 2	35 of 54
	Acenaphthene	0.5	ND – **16 J**	S28-28	Area 3	22 of 54
	Benzo(g,h,i)perylene	1.7	ND	N/A		None
	Fluoranthene	2	ND - **3.42**	S28-52	Area 4	1 of 54
	Fluorene	0.8	ND - **25.3**	S28-28	Area 3	25 of 54
	Indeno(1,2,3-cd)pyrene	3.2	ND	N/A		None
	Naphthalene	1.7	ND - **230**	S28-54	Area 2	31 of 54
	Phenanthrene	4.8	ND QN - **13.3 J**	S28-53	Area 7	9 of 54
	Total LPAH	7.8	ND - **266.65**	S28-54	Area 2	25 of 54
	Total HPAH	9.6	ND - 6.931	S28-52	Area 4	None
AK102	DRO	3,500	214 **– 105,000**	S28-15	Area 9	36 of 54
AK102[2]	DRO	3,500	102 – **94,100**	S28-28	Area 3	32 of 54
AK103	RRO	3,500	844 – **127,000**	S28-42	Area 8	35 of 54
AK103[2]	RRO	3,500	296 – **106,000**	S28-42	Area 8	18 of 54

Notes:
[1] Sediment SSCL as defined in the 2009 multi-site DD (USACE 2009).
[2] Performed using the silica gel cleanup method.
Bold = exceeded SSCL
J - The analyte was positively identified; however, the associated result was less than the limit of quantitation but greater than or equal to the detection limit.
QN – Analyte result is considered an estimated value (unknown bias) due to a QC failure.
For definitions, refer to the Acronyms and Abbreviations section.

In 2018, sediment samples exceeded the SSCLs for fuel and fuel-constituents including DRO, RRO, 2-methylnaphthalene, acenaphthene, fluoranthene, fluorene, naphthalene, phenanthrene, and LPAH. DRO and RRO results were elevated due to biogenic interference, discussed in Section 4.3.2. DRO, 2-methylnaphthalene, and naphthalene were the most prevalent analytes exceeding SSCLs. Of the estimated 281 cy of sediment currently present at Site 28, approximately 196 cy of that sediment appears to contain DRO/RRO and/or PAHs above the SSCLs.

4.3.1 Data Quality Assessment

The sample summary table, complete analytical results, and DQA are included in Attachment F-2. Data quality was assessed using the laboratory case narrative, laboratory data deliverables, and ADEC checklists. Reviews of the analytical results and associated quality control (QC) samples were performed by the Jacobs Project Chemist in accordance with the 2018 work plan (USACE 2018).

The 2018 DQA found the overall quality of the project data to be acceptable and no results were rejected. Data quality was evaluated against the following requirements: U.S. Department of Defense (DoD) Quality Systems Manual (DoD 2017); ADEC and U.S. Environmental Protection Agency (EPA) analytical methods (ADEC 2017; EPA 2014); and laboratory limits. Qualifiers were applied to sample results that did not meet the data quality objectives. Qualified results are considered estimated. PCB surrogate recovery was outside of QC goals, for sample 18NEC-S28-SD-42, but data were minimally affected. Field duplicate precision did not meet project goals for multiple analytes and those analytical results were qualified. For data qualifier definitions and details of the data validation, refer to the DQA (Attachment F-2).

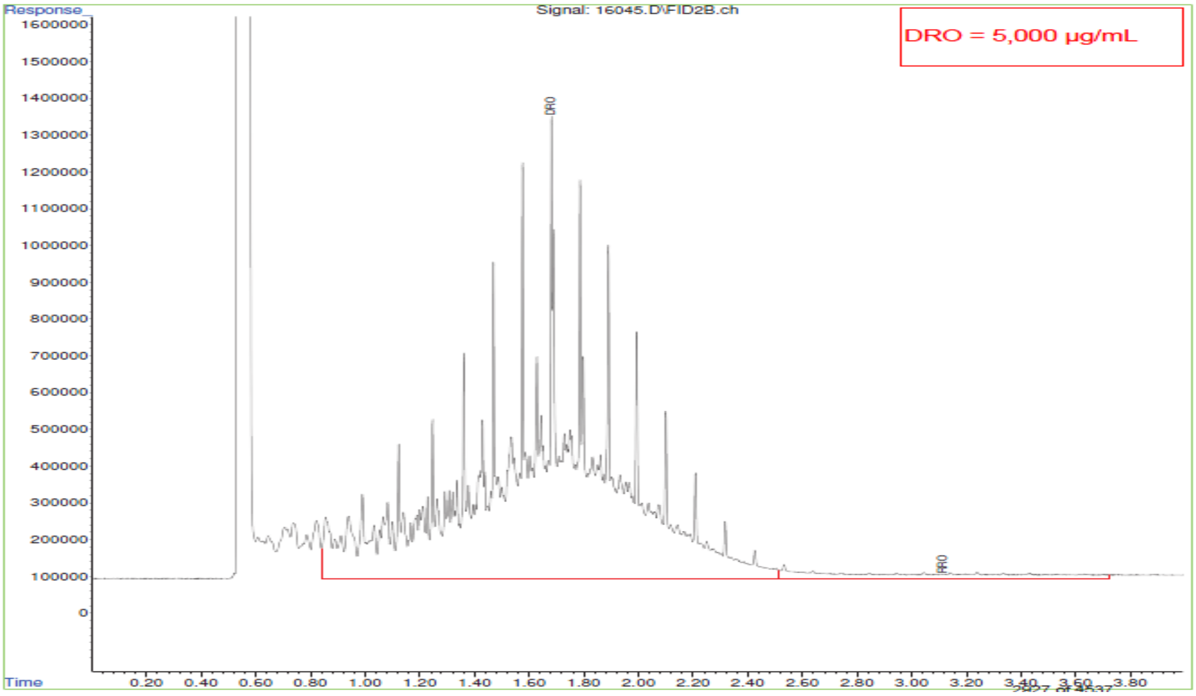
Biogenic interference from naturally occurring organic material (NOM) in soil and sediment had been reported in previous sampling efforts at NEC (USACE 2013a). NOM likely contributed to DRO and RRO concentrations in sediment collected in 2018 and biased the analytical results high (refer to Section 4.3.2). All DRO and RRO chromatograms were reviewed. After comprehensive review of all chromatograms and consultation with the USACE, silica gel-treated DRO results will be the only results presented on figures and used for data interpretation. Biogenic interference also significantly contributed to the RRO levels as the fingerprint observed in the RRO range is not consistent with the typical motor oil pattern seen in the RRO calibration chromatograms.

4.3.2 Evaluation of Biogenic Interference for Site 28 Sediment

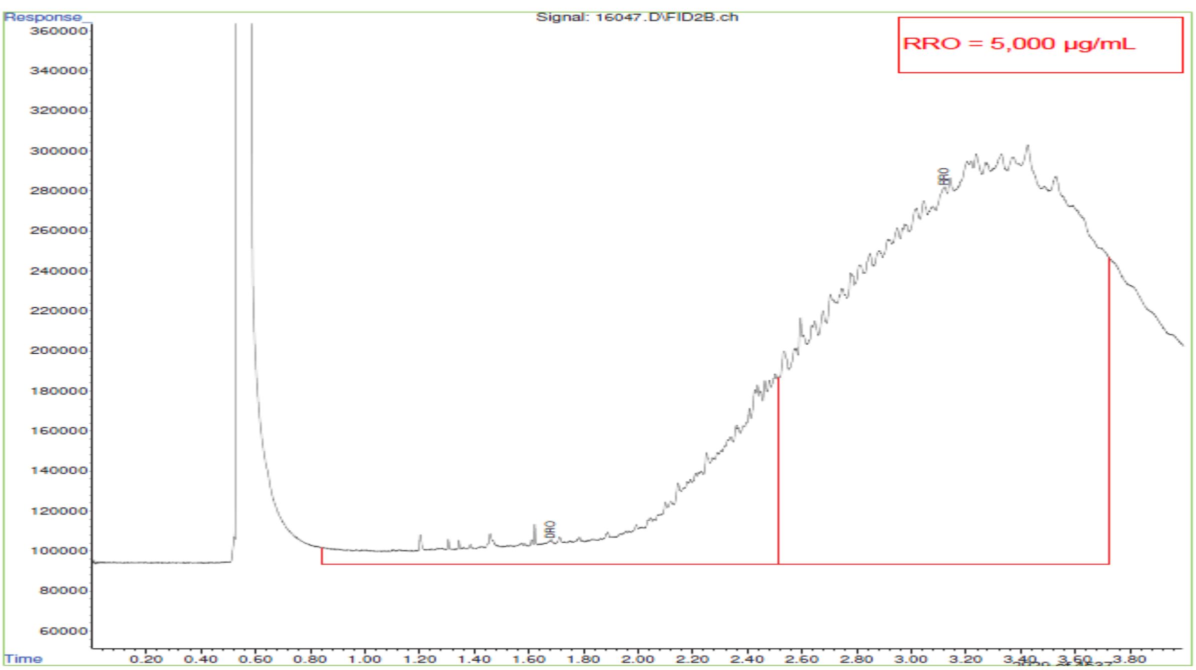
NOM in soil and sediment is encountered at many locations throughout Alaska especially in tundra peat and topsoil. These naturally occurring organics can be present at high levels (percent range) that are well above the NEC multi-site DD-based SSCLs for DRO and RRO reported by the AK102 and AK103 test methods (ADEC 2006). According to Technical Memorandum 06-001 (ADEC 2006), a silica gel cleanup procedure may be used as part of an evaluation process to determine the presence and degree of biogenic interference. The silica gel cleanup procedure is intended to remove NOM from the extracted analytical sample while leaving petrogenic organic contamination relatively unaffected.

The previous NEC soil data and Site 28 sediment data collected in 2012 described the presence of NOM causing biogenic interference, which affected RRO results (USACE 2013a). Site 28 contains lush vegetation with a thick organic mat near and within the waterbodies (USACE 2013a). To support the evaluation of NOM contribution to 2018 Site 28 sediment samples, sediment was analyzed for DRO and RRO with and without silica gel cleanup and total organic carbon. The assessment of biogenic interference and its affects was completed by a chromatographic assessment followed by a comparison of silica gel-treated and untreated DRO and RRO results. All chromatograms referenced in this section are provided in Attachment F-2. Select examples of chromatograms will be presented in this section for discussion purposes.

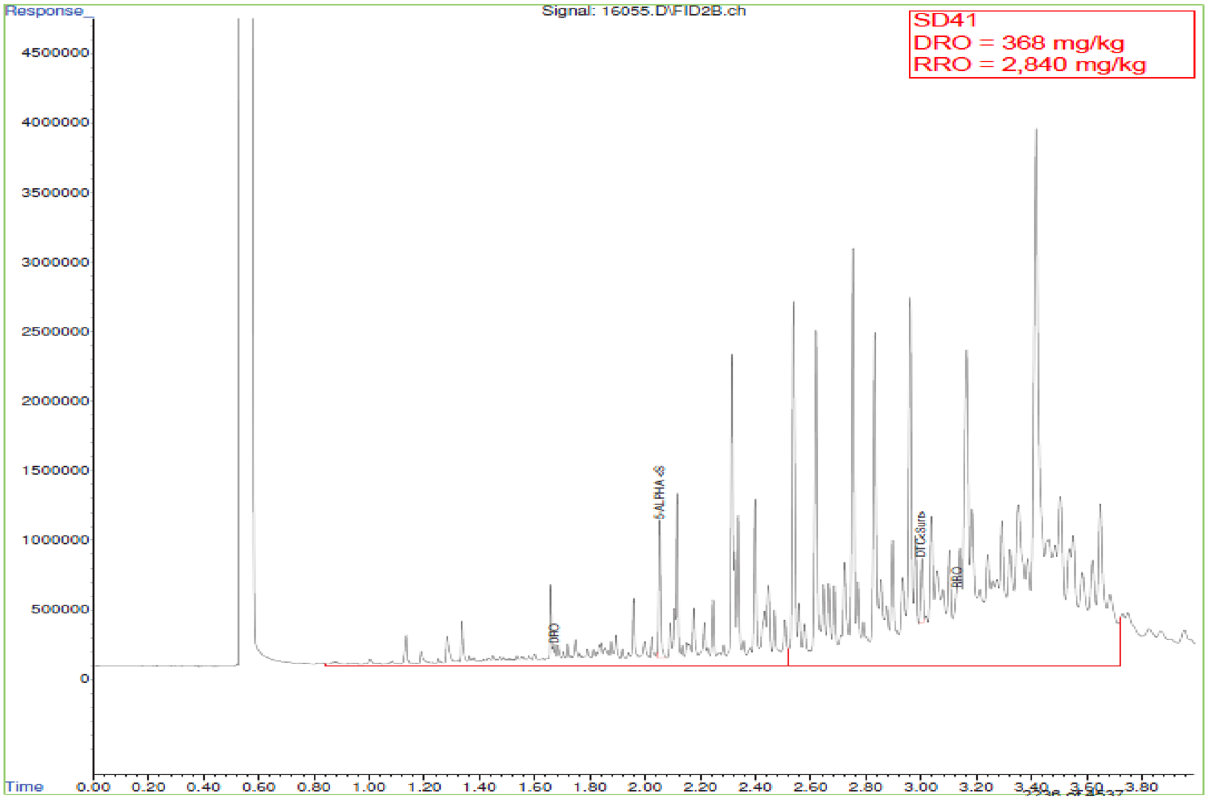
Calibration chromatograms for the normal alkane standard, the DRO reference standard, and the RRO reference standard form the foundation of fingerprint evaluation to establish retention time references (C_{10} to C_{25} for DRO and C_{25} to C_{36} for RRO) and define patterns typical for diesel fuel and motor oil under the condition used by the AK 102/103 test method. Examples of the typical DRO and RRO fingerprints, a Site 28 biogenic fingerprint, and the three fingerprints displayed on a single chromatogram are provided below.



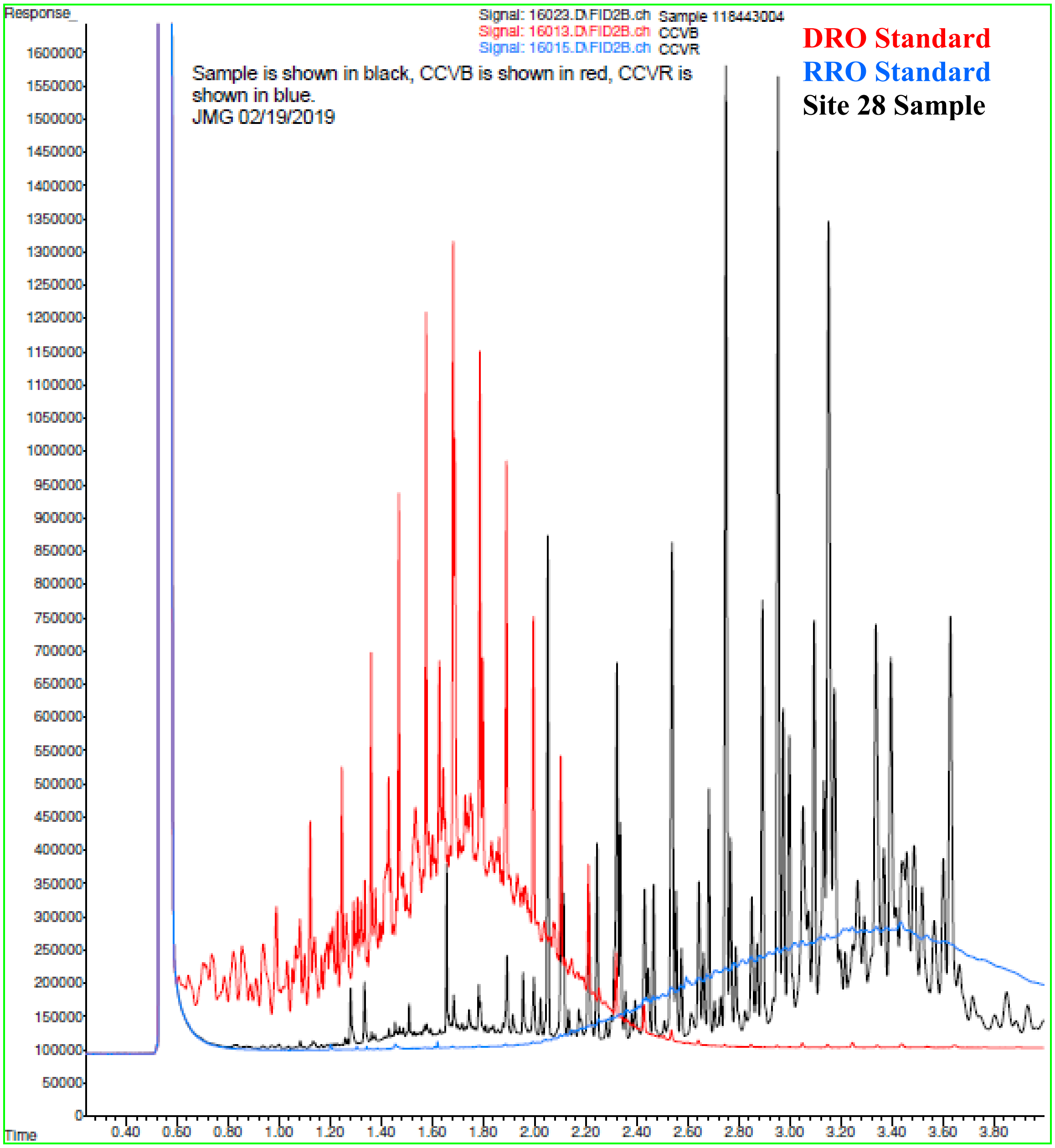
Chromatogram F-4-1: Example of a typical diesel fuel fingerprint



Chromatogram F-4-2: Example of typical motor oil fingerprint



Chromatogram F-4-3: Example of Site 28 biogenic fingerprint



Chromatogram F-4-4: Example of a DRO standard fingerprint, RRO standard fingerprint, and Site 28 biogenic fingerprint

The biogenic fingerprint is distinguishable from the typical DRO and typical RRO fingerprint as demonstrated by the example fingerprints. The Site 28 biogenic interference generally starts at C_{17} (1.7 minutes on the time axis) and continues through C_{36} (3.7 minutes on the time axis). It is noted that the biogenic pattern seen at Site 28 has the potential to affect both DRO and RRO with a higher potential affect in the RRO range.

Many of the 2018 Site 28 chromatograms were consistent with the typical DRO fingerprint, which was expected based on the historical sources of contamination upgradient of the site. All fingerprints in the RRO range were not consistent with the typical motor oil fingerprint but were consistent with the biogenic fingerprint (Chromatograms S28-21 and S28-36 in Attachment F-2). No known large spill of motor oil at NEC that would affect Site 28 exists. Based on the review of chromatogram fingerprints, NOM is present in all 2018 samples collected from Site 28.

The next step in the evaluation was to compare 2018 silica gel-treated DRO and RRO results to untreated results. The results comparison discussed in this section focused on those results where untreated results are above the SSCLs and treated results are below the SSCLs as they affect the definition of the extent of contamination. The locations where untreated DRO results were above the SSCL of 3,500 mg/kg but silica gel-treated DRO results were below the SSCL were S28-21, S28-24, S28-36, and S28-37 (four out of 53 locations).

The DRO results for these locations are summarized in Table F-4-4.

Table F-4-4
Untreated DRO Results Above SSCL With Silica Gel-Treated Results Below SSCL

Location ID	Sample ID	Untreated DRO (mg/kg)	Treated DRO (mg/kg)
S28-21	18NEC-S28-SD-21	4,000	3,390
S28-24	18NEC-S28-SD-24	4,390	3,460
S28-36	18NEC-S28-SD-36	4,120	2,960
S28-37	18NEC-S28-SD-37	4,490	3,440

Note:
For definitions, refer to the Acronyms and Abbreviations section.

The locations where untreated RRO results were above the SSCL of 3,500 mg/kg and silica gel-treated results were below the SSCL in 2018 are S28-11, S28-26, S28-30, S28-32, S28-33, S28-34, S28-35, S28-36, S28-37, S28-38, S28-39, S28-44, S28-45, S28-46, S28-48, S28-53, and S28-54 (17 of 53 locations).

The RRO results for these locations are summarized in Table F-4-5.

Table F-4-5
Untreated RRO Results Above SSCL With Silica Gel-Treated Results Below SSCL

Location ID	Sample ID	Untreated RRO (mg/kg)	Treated RRO (mg/kg)
S28-11	18NEC-S28-SD-11	3,840	1,660
S28-26	18NEC-S28-SD-26	3,640	2,780
S28-30	18NEC-S28-SD-30	7,060	3,400
S28-32	18NEC-S28-SD-32	4,010	2,020
S28-33	18NEC-S28-SD-33	7,180	2,800
S28-34	18NEC-S28-SD-34	5,290	3,030
S28-35	18NEC-S28-SD-35	4,080	1,960
S28-36	18NEC-S28-SD-36	7,990	1,720
S28-37	18NEC-S28-SD-37	5,660	1,430
S28-38	18NEC-S28-SD-38	7,580	2,000
S28-38 duplicate	18NEC-S28-SD-38-8	8,490	2,550
S28-39	18NEC-S28-SD-39	6,360	1,840
S28-44	18NEC-S28-SD-44	5,090	2,370
S28-45	18NEC-S28-SD-45	4,110	1,370
S28-46	18NEC-S28-SD-46	5,440	1,010
S28-48	18NEC-S28-SD-48	6,980	2,020
S28-48 duplicate	18NEC-S28-SD-48-8	6,050	2,230
S28-53	18NEC-S28-SD-53	10,600	1,870
S28-54	18NEC-S28-SD-54	7,040	2,290

Note:
For definitions, refer to the Acronyms and Abbreviations section.

The silica gel cleanup did not affect the overall contribution of diesel fuel to DRO concentrations in 2018 as demonstrated by the chromatograms for location S28-36. While the biogenic pattern is greatly reduced, as noted by the lower height of peaks on the y-axis from 2.2 to 3.7 minutes, the DRO pattern from 1 to 2.2 minutes is not affected. Additionally, it can be observed that the silica gel cleanup did not fully remove the biogenic interference in the

RRO range. The greater removal of biogenic contributions to the RRO range is also generally confirmed by the lower overall percent reduction of DRO concentrations in treated and untreated results (Table F-4-4) compared to the percent reduction in RRO concentrations for treated and untreated results (Table F-4-5).

This assessment of biogenic interference confirms that biogenic interference is present in Site 28 samples and that silica gel-treated DRO and RRO results should be utilized for site assessment of the extent of contamination. It is also noted that silica gel treatment may not fully remove the potential bias to DRO and RRO results.

4.3.3 DRO Analytical Results

DRO in sediment above the SSCL remains prevalent at Site 28. The previous sediment sampling effort in 2012 reported DRO and 2-methylnapthalene as the most prevalent fuel contaminants at Site 28 (USACE 2013a). In 2018, DRO above the SSCL was prevalent from the southern portion of Site 28 near the MOC to sample location SD28-14. There were no exceedances for DRO nearest to the Suqi River (locations S28-01 through S28-13) and in the southeastern water bodies of Removal Area 5 (locations S28-36, S28-37, and S28-41). The DRO silica gel cleanup exceedances for Site 28 are presented on Figure F-5.

The highest 2018 concentration for DRO silica gel cleanup (94,100 mg/kg) was at location S28-28 within Removal Area 3. The areas with DRO concentrations greater than 40,000 mg/kg were within Removal Areas 2, 3, 4, and 9. From location S28-13 and north to S28-01 at the confluence of the drainage basin and the Suqi River, a natural filtering process appeared to be occurring because sediment contamination had not accumulated into Removal Areas 10 or 11.

In 2012 the average DRO concentration for sediment samples was approximately 23,000 mg/kg before silica gel cleanup and approximately 21,000 mg/kg after silica gel cleanup (USACE 2013a). In 2018, the average DRO concentration before silica gel cleanup was approximately 24,600 mg/kg and approximately 20,000 mg/kg after silica gel cleanup. The

DRO concentrations are relatively similar between the 2012 and 2018 sediment mapping and sampling events.

4.3.4 RRO Analytical Results

The highest 2018 concentration for RRO silica gel cleanup (106,000 mg/kg) was at location S28-42 within Removal Area 8. This RRO concentration was elevated and related to high levels of NOM within the sample even after the silica gel cleanup process. The silica gel cleanup process could not remove all biogenic interference. In fuel-contaminated soil, fuel-related analytes such as PAHs were frequently collocated. PAHs did not exceed SSCLs at location S28-42; therefore, a residual-range fuel product was unlikely to be elevated to 106,000 mg/kg. The removal areas with RRO concentrations greater than 10,000 mg/kg are within Removal Areas 2, 3, 8, and 9. RRO was not exceeding the SSCL in Removal Areas 5, 6, 10, or 11. All RRO exceedances of the SSCL were collocated with DRO exceedances of the SSCL. The RRO exceedances for Site 28 are presented on Figure F-6.

In 2012 the average RRO concentration for sediment samples was approximately 5,200 mg/kg before silica gel cleanup and approximately 3,500 mg/kg after silica gel cleanup. In 2018, the average RRO concentration before silica gel cleanup was approximately 8,900 mg/kg and approximately 5,500 mg/kg after silica gel cleanup. The RRO concentrations are greater in the 2018 sediment mapping and sampling event than the 2012 event.

4.3.5 PAH Analytical Results

Eighteen PAHs were analyzed by method SW8270SIM for Site 28 in 2018. However, only 10 PAHs (eight individual analytes and two calculated PAHs) had multi-site DD-based SSCLs. PAHs with multi-site DD-based SSCLs included the following: 2-methylnaphtnalene, acenaphthene, benzo(g,h,i)perylene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, LPAH (PAHs with three or fewer rings), and high molecular weight PAHs (HPAHs) (PAHs with four or more rings). PAHs without multi-site DD-based SSCLs but analyzed by method SW8270SIM included the following: 1-methylnaphtnalene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and pyrene.

PAHs with SSCLs

The most frequently reported PAHs above SSCLs in sediment (exceedances in 22 or more locations) at Site 28 in 2018 were 2-methylnaphthalene, acenaphthene, fluorene, naphthalene, and LPAH. Locations with PAHs exceeding the SSCLs were collocated with DRO exceedances, with the exception of Removal Area 5 (Figure F-7), where DRO did not exceed the SSCL. Removal Area 5 contained PAH exceedances for 2-methylnapthalene and naphthalene.

PAHs without SSCLs

1-Methylnaphthalene, benzo(a)anthracene, chrysene, fluoranthene, and pyrene were detected in sediment at Site 28 in 2018 and do not have SSCLs. 1-Methylnaphthalene and pyrene were the most frequently detected compounds without an SSCL. All detections for 1-methylnaphthalene were collocated with 2-methylnaphthalene except for location S28-04, which had a detection of 0.106 J mg/kg for 1-methylnaphthalene and was nondetect for 2-methylnaphthalene.

4.3.6 PCB Analytical Results

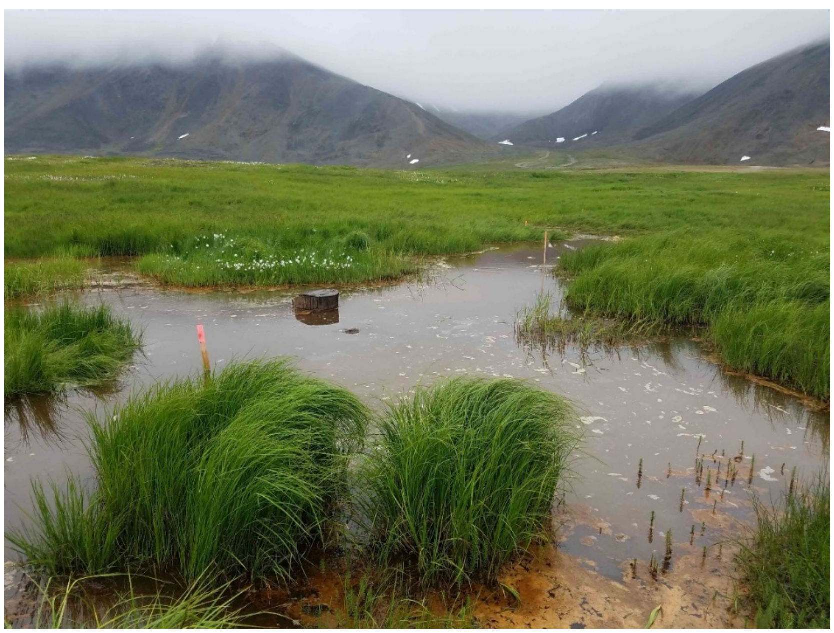
There were no 2018 sediment samples that exceeded the PCB SSCL of 0.7 mg/kg at Site 28. Low-level PCBs were reported at 29 locations; Aroclor-1260 accounted of the all but one of the reported detections. Aroclor-1254 was reported at one location, S28-44. Sampling locations with low-level PCB detections were found in Removal Areas 2, 3, 4, 6, 7, and 9. The highest concentration for total PCBs was 0.482 mg/kg at location S28-47, located within a pond in Removal Area 2 near the MOC. All locations closest to the Suqi River within Removal Areas 10 and 11 were nondetect for PCBs.

4.3.7 Metals Analytical Results

In 2018, no locations exceeded the SSCLs for metals (arsenic, chromium, lead, and zinc). Although selenium was not included in the 2009 multi-site DD (USACE 2009), it was analyzed. The highest detected concentration for selenium was 4.34 mg/kg. Figure F-8 presents the 2018 metals sample locations.

4.3.8 Debris at Site 28

Debris consisting of submerged utility poles, plywood, cable wire, and rubber rigging mats were scattered throughout Site 28 in 2018. The partially submerged utility poles were observed above the water line (Photograph F-4-7). Other obstructions were noted during the sediment mapping activities within transect profiles P15 and P17. The plywood, cable wire, and rubber rigging were observed both submerged and unsubmerged within Site 28 (Photograph F-4-8).



Photograph F-4-7: Partially submerged utility pole within Site 28 Drainage. View facing south.

Photograph F-4-8: Plywood debris within Site 28. View facing north.

5.0 CONCLUSIONS AND RECOMMENDATIONS

The conclusions and recommendations based on the data collected for the 2018 Site 28 sediment mapping and sampling are as follows:

- Conclusions:
  - A natural stilling area was found to be present between Area 9 and Area 10. The area appeared to be entirely composed of vegetative mat, which dispersed flow channels observed in Area 10.
  - A total of 281 cy of sediment were estimated to be present at Site 28 water bodies in 2018. Based on a lines-of-evidence approach, re-accumulation of sediment is possible in certain areas of Site 28. However, estimating the amount of sediment which has "re-accumulated" is not possible currently due to procedural differences in the 2012 and 2018 mapping efforts and the 2013 post-removal sediment volume estimating techniques.
  - Target analytes in 2018 exceeding the multi-site DD-based SSCLs in sediment samples were found in sediment samples across Areas 2 through 9. Target analytes in 2018 did not exceed the multi-site DD-specified SSCLs at the confluence with the Suqi River within Area 11 or immediately south of the Suqi River in Area 10. DRO, RRO, 2-methylnaphthalene, and naphthalene are the most prevalent analytes exceeding SSCLs in 2018. Applying the analytical results to the estimated sediment volumes, 196 of the 281 cy of sediment contains compounds at levels above their respective SSCLs in 2018.
  - Sediment contamination greater than SSCLs are not found in Removal Areas 10 and 11 near the Suqi River in 2018.
  - PCBs, reported as Aroclors, were not found at Site 28 above the SSCL in 2018.
  - NOM in sediment is contributing to the 2018 reported levels of DRO and RRO and causing a high bias. This observation is consistent with those reported in historical investigations at Site 28 and other NEC sites. Silica gel treatment is only partially effective in reducing this high bias.
- Recommendations:
  - Utilize the 2018 sediment measurement process for future sediment mapping efforts at Site 28.
  - Utilize silica gel-treated DRO and RRO results for future data evaluation, presentations, and site management decisions.

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ATTACHMENT F-1
Figures and Sediment Cross Sections

Figures

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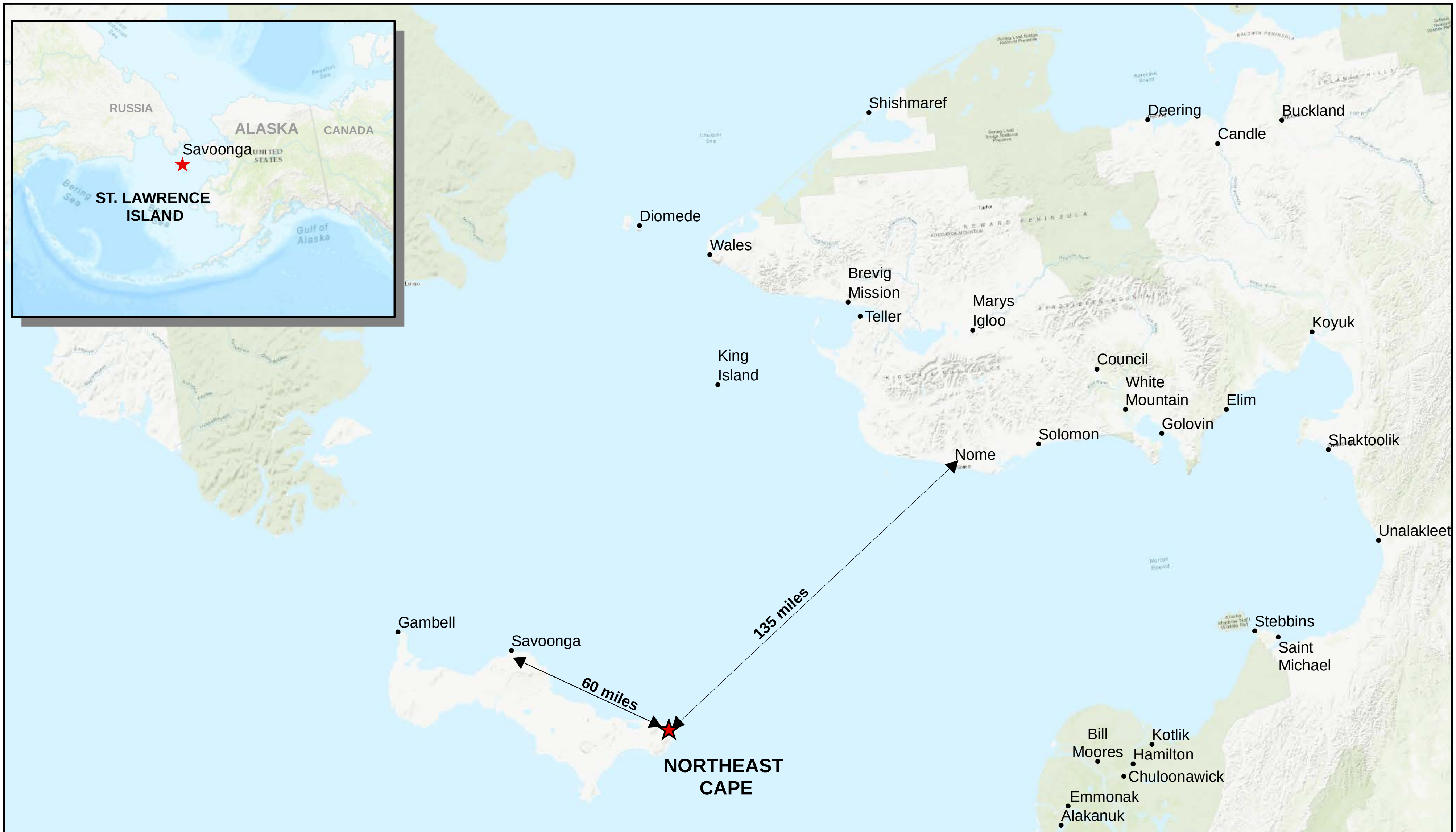

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

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NORTHEAST CAPE LOCATION AND VICINITY

U.S. Army Corps of Engineers Alaska District

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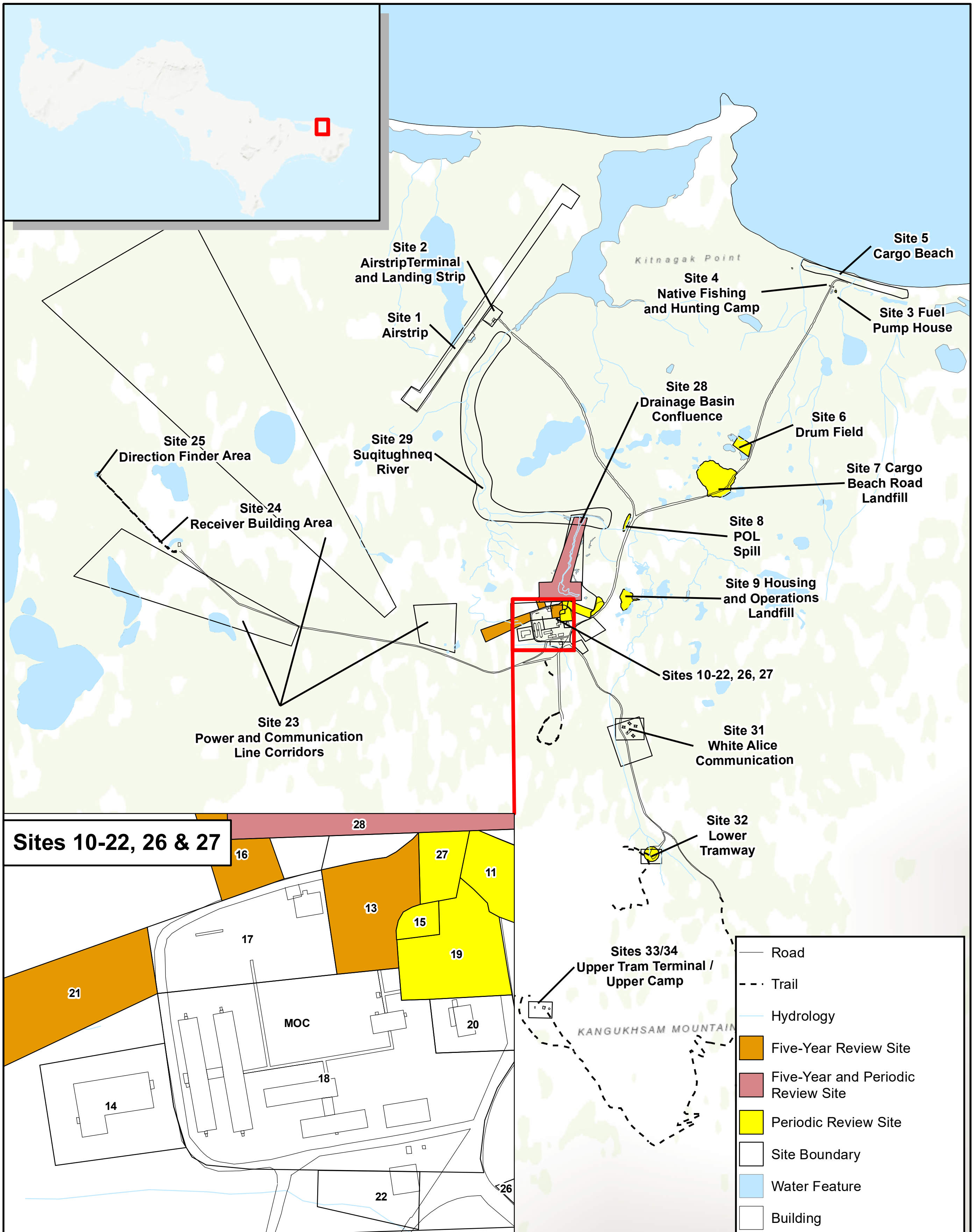
SAINT LAWRENCE ISLAND, ALASKA

FIGURE F-1



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PERIODIC REVIEW SITES
NORTHEAST CAPE PERIODIC REVIEW

U.S. Army
Corps of Engineers
Alaska District

FUDS PROPERTY - F10AK0969

SAINT LAWRENCE ISLAND, ALASKA

FIGURE F-2

P:\StLawrenceIsland_F10AK0969_NEC_Site28_SedSampRpt_Sup\01_MXD\FigF-3_WaterBodyExtents.mxd beatycj

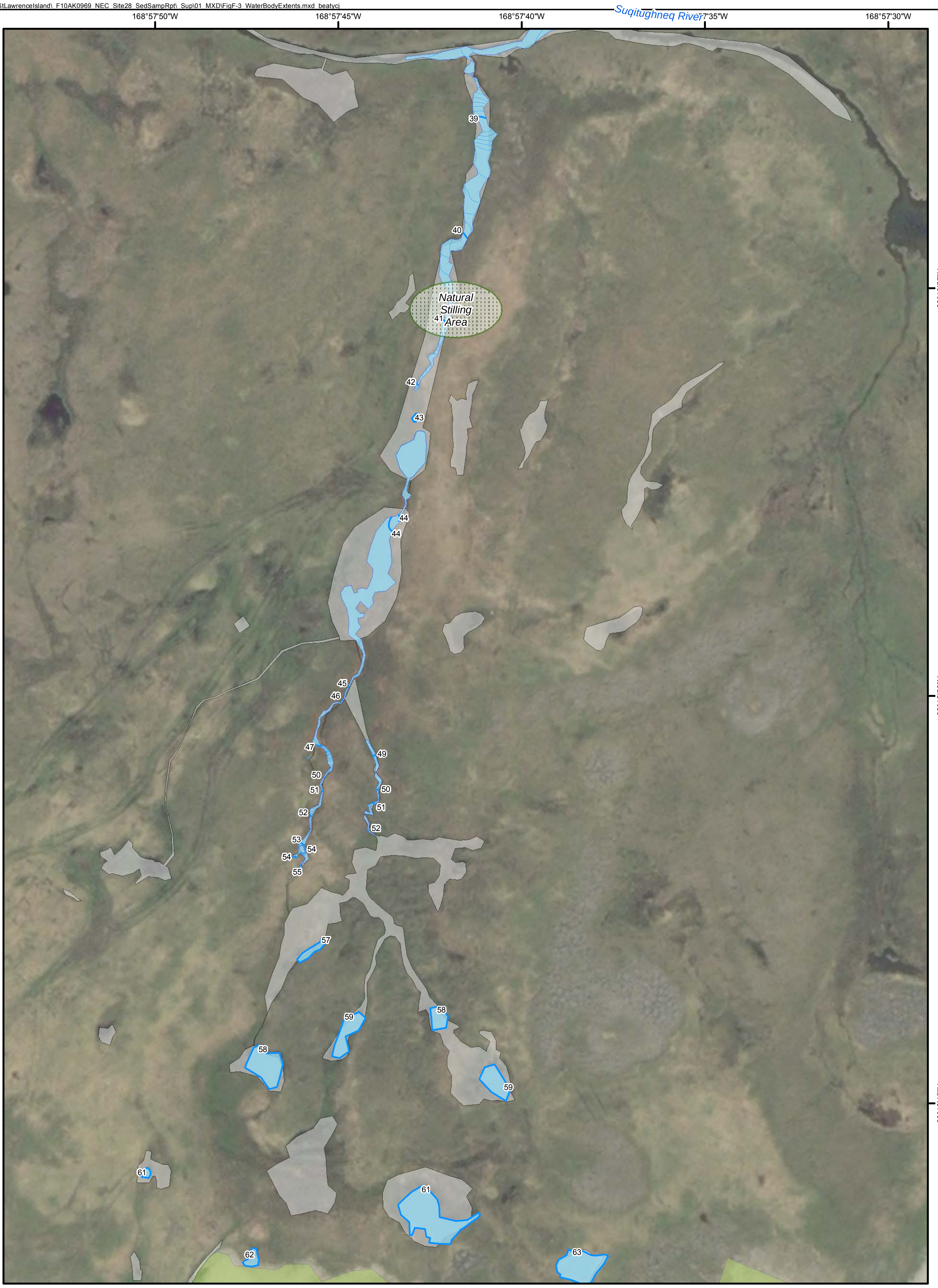


Image Source: ESRI Service Layer, Digital Globe. Vivid – Alaska. 2015 (23 June). *http://goto.arcgisonline.com/maps/World_Imagery.*

- Minor Surface Water Contour (0.1 foot intervall)
- Major Surface Water Contour (feet above Mean Sea Level)
- Natural Stilling Area
- 2018 Surveyed Water Body
- 2012 Surveyed Water Body
- MOC Boundary

0 60 120 180 240
Feet

N

WGS 1984 UTM Zone 2N
1 inch = 120 feet

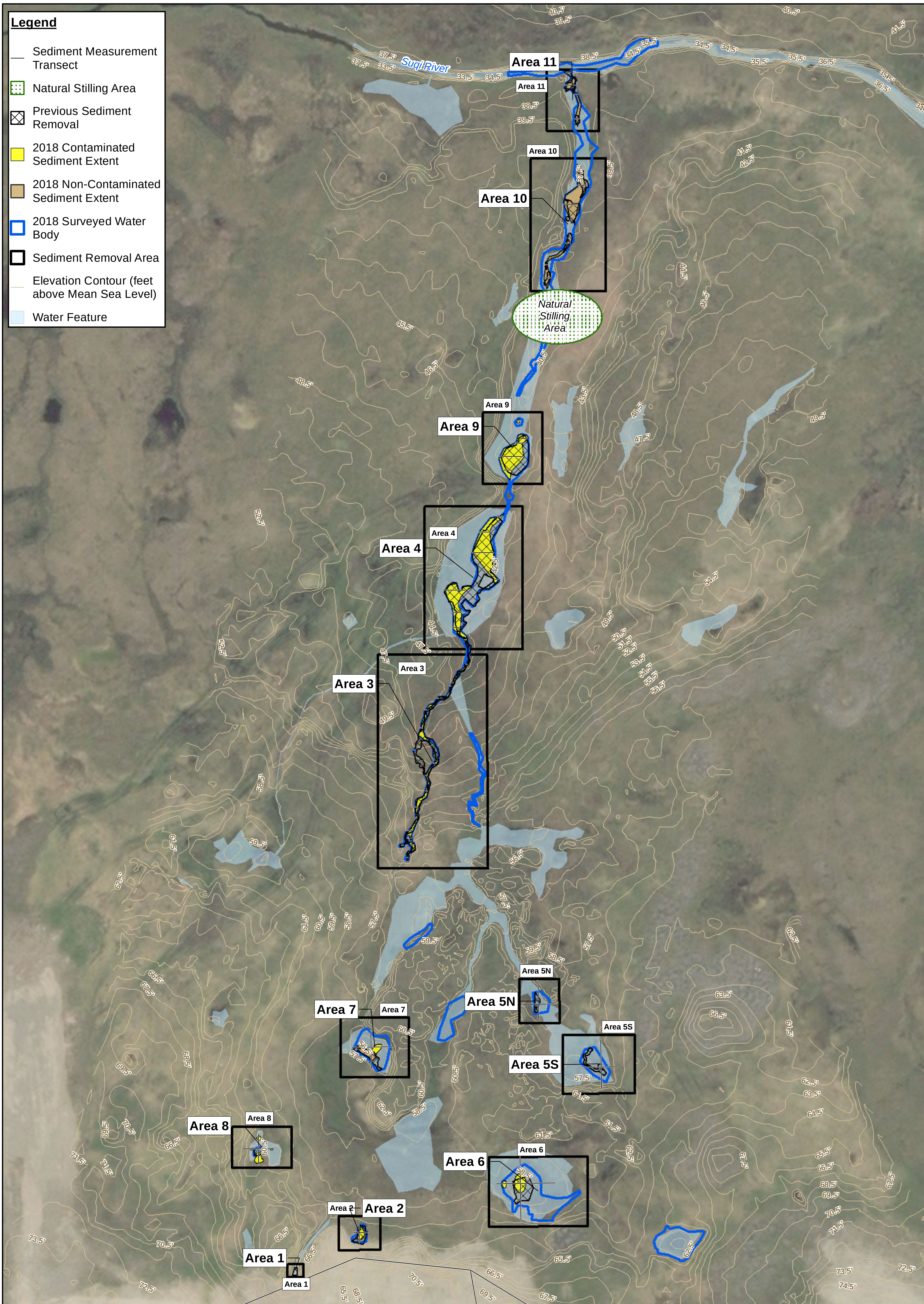
Note:
For definitions, refer to the Acronyms and Abbreviations section.

SITE 28
WATER BODY EXTENTS

SAINT LAWRENCE ISLAND, ALASKA

DATE:	PROJECT MANAGER:	FIGURE NO:
15 JAN 2020	K. MAHER	F-3

S:\U\USACE\AK_NortheastCape_FUDS_NEC_Site28_SedSampRpt_Sup\01_MXD\FigF-4_TransectOverview_NEW.mxd beatycj 6/25/2020



Approximate Groundwater Flow Direction

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

N

0 30 60 90 120
FEET

WGS 1984 UTM Zone 2N

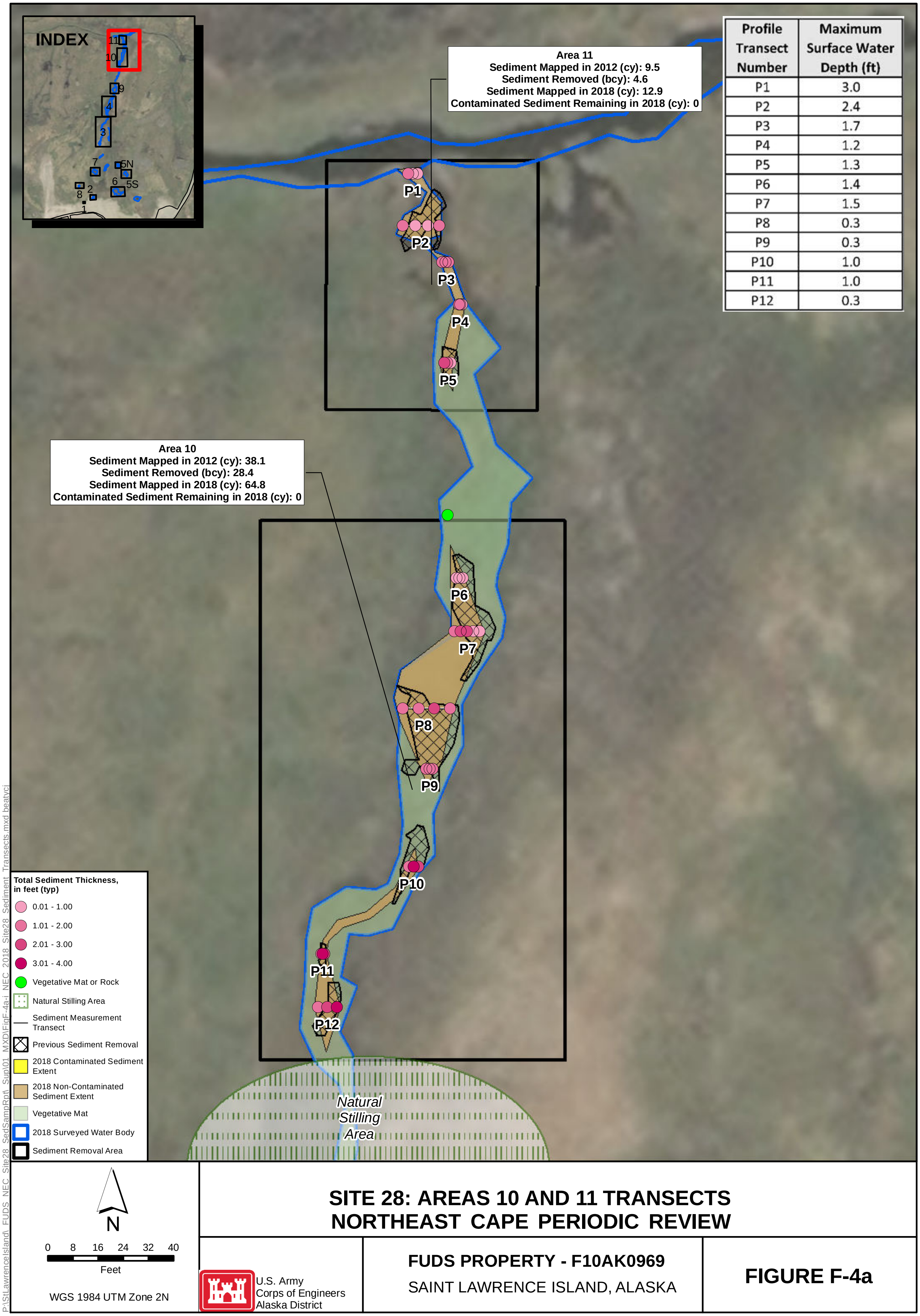
SITE 28
TRANSECT OVERVIEW

U.S. Army
Corps of Engineers
Alaska District

FUDS PROPERTY - F10AK0969

SAINT LAWRENCE ISLAND, ALASKA

FIGURE F-4



Profile Transect Number	Maximum Surface Water Depth (ft)
P1	3.0
P2	2.4
P3	1.7
P4	1.2
P5	1.3
P6	1.4
P7	1.5
P8	0.3
P9	0.3
P10	1.0
P11	1.0
P12	0.3

WGS 1984 UTM Zone 2N

SITE 28: AREAS 10 AND 11 TRANSECTS
NORTHEAST CAPE PERIODIC REVIEW

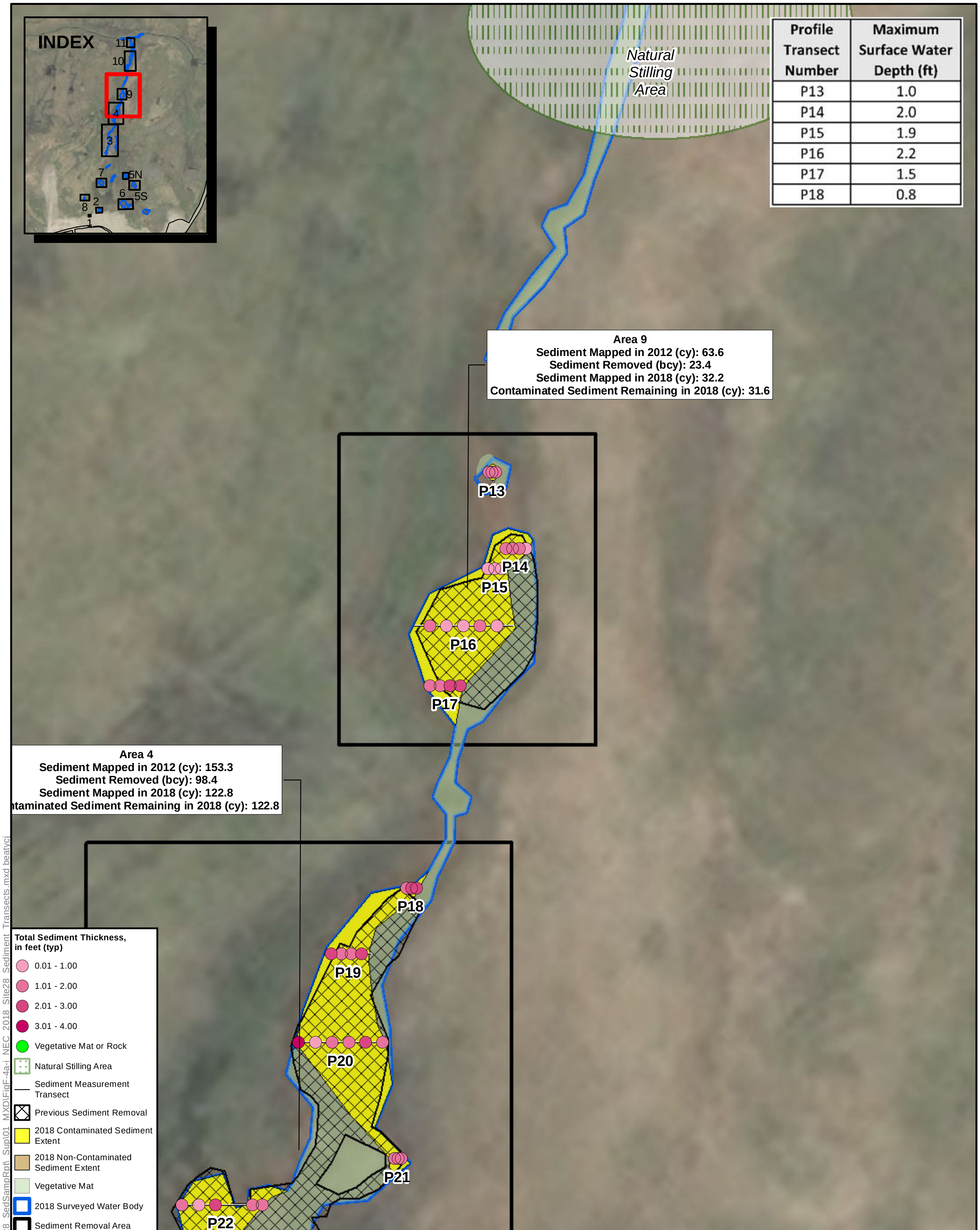
U.S. Army
Corps of Engineers
Alaska District

FUDS PROPERTY - F10AK0969

SAINT LAWRENCE ISLAND, ALASKA

FIGURE F-4a

P:\StLawrenceIsland\ FUDS NEC Site28 SedSampRpt\ Supp01 MXD\FigF-4a-l NEC 2018 Site28 Sediment Transects.mxd beatyci



Profile Transect Number	Maximum Surface Water Depth (ft)
P13	1.0
P14	2.0
P15	1.9
P16	2.2
P17	1.5
P18	0.8

SITE 28: AREA 9 TRANSECTS
NORTHEAST CAPE PERIODIC REVIEW

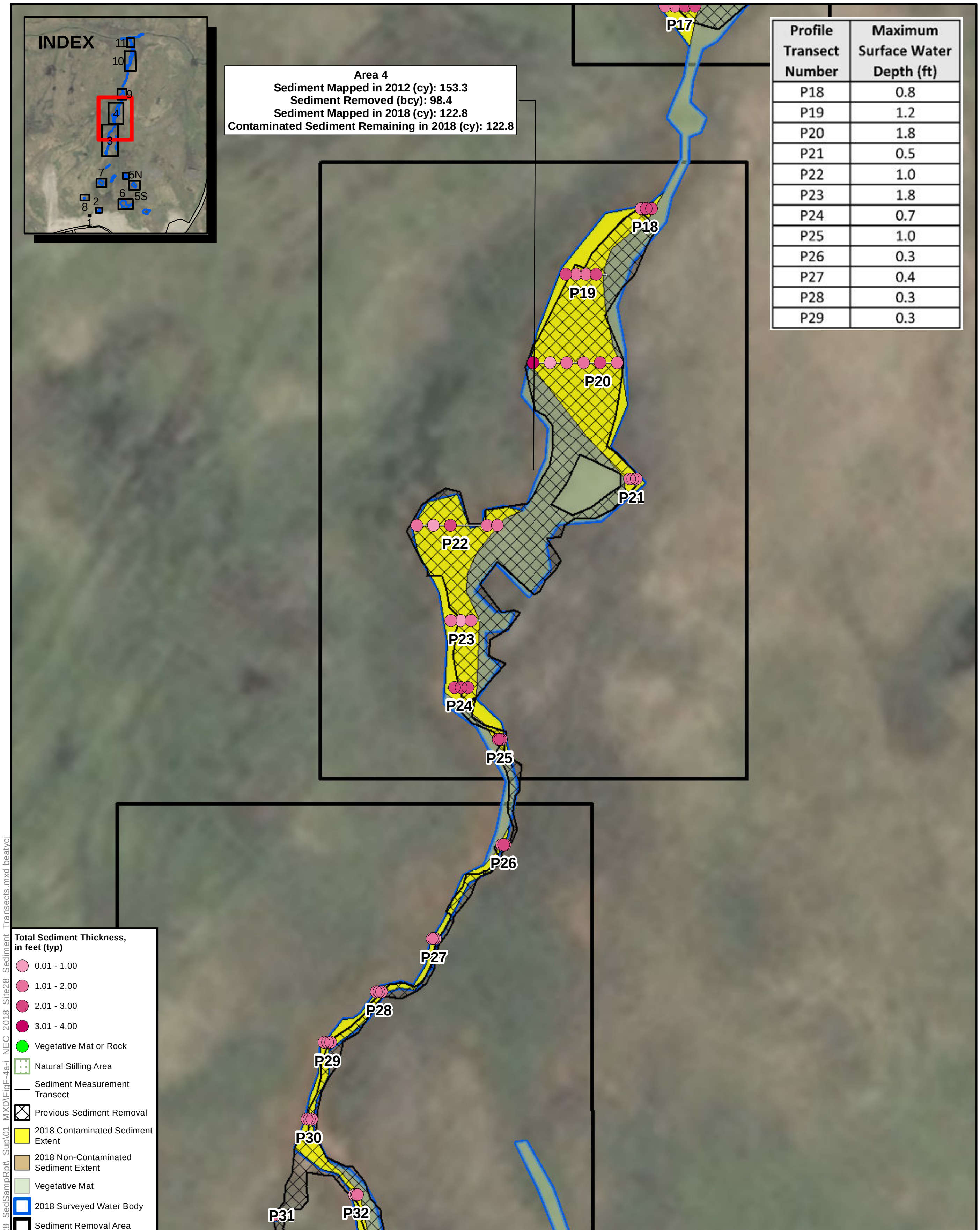
U.S. Army
Corps of Engineers
Alaska District

FUDS PROPERTY - F10AK0969

SAINT LAWRENCE ISLAND, ALASKA

FIGURE F-4b

P:\StLawrenceIsland_FUDS_NEC_Site28_SedSampRpt_Sup01_MXD\FigF-4a-l_NEC_2018_Site28_Sediment_Transects.mxd beatyci



Profile Transect Number	Maximum Surface Water Depth (ft)
P18	0.8
P19	1.2
P20	1.8
P21	0.5
P22	1.0
P23	1.8
P24	0.7
P25	1.0
P26	0.3
P27	0.4
P28	0.3
P29	0.3

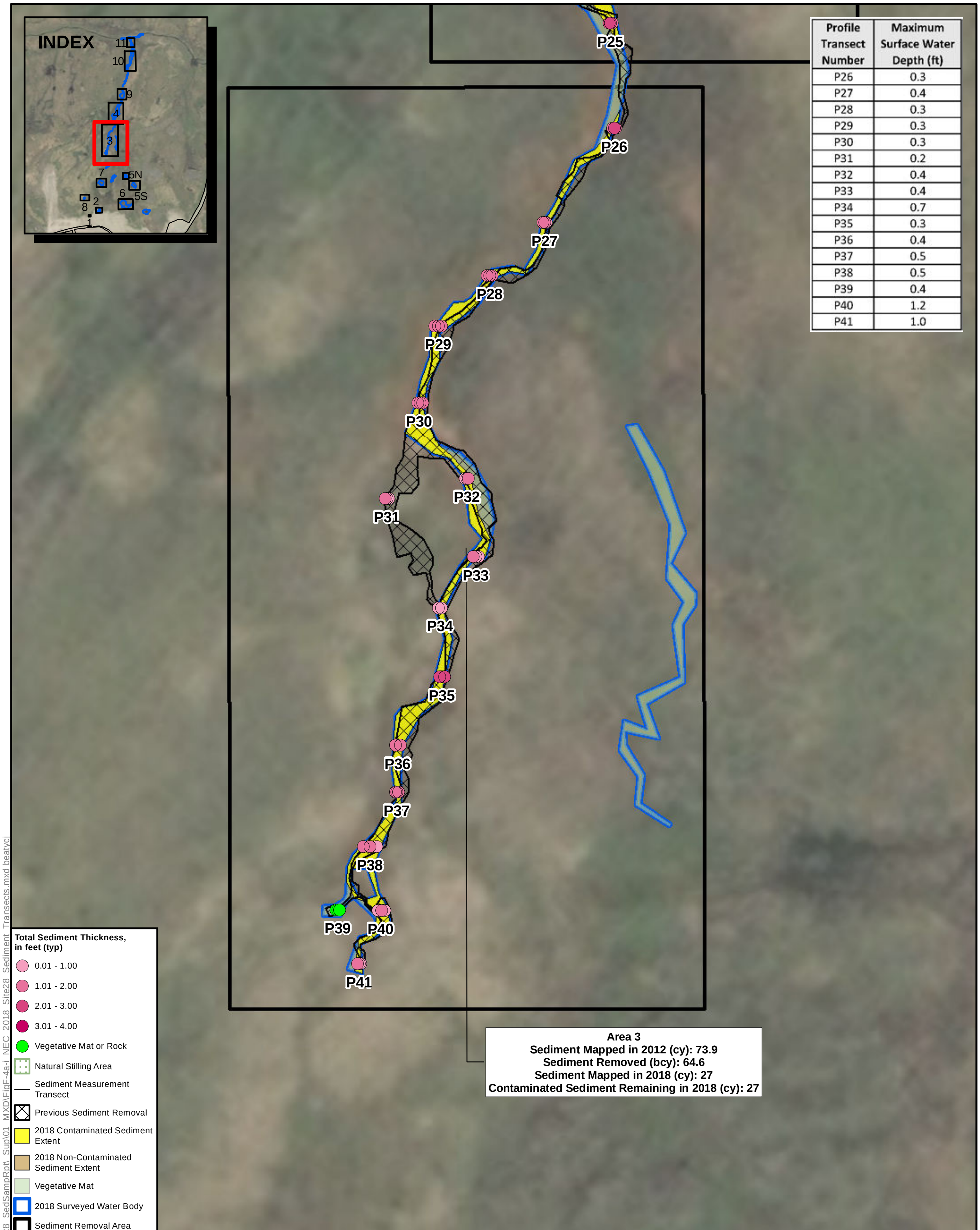
SITE 28: AREA 4 TRANSECTS
NORTHEAST CAPE PERIODIC REVIEW

U.S. Army
Corps of Engineers
Alaska District

FUDS PROPERTY - F10AK0969
SAINT LAWRENCE ISLAND, ALASKA

FIGURE F-4c

P:\StLawrenceIsland_FUDS_NEC_Site28_SedSampRpt_Sup01_MXD\FigF-4a-i_NEC_2018_Site28_Sediment_Transects.mxd beatyci



Profile Transect Number	Maximum Surface Water Depth (ft)
P26	0.3
P27	0.4
P28	0.3
P29	0.3
P30	0.3
P31	0.2
P32	0.4
P33	0.4
P34	0.7
P35	0.3
P36	0.4
P37	0.5
P38	0.5
P39	0.4
P40	1.2
P41	1.0

Area 3
Sediment Mapped in 2012 (cy): 73.9
Sediment Removed (bcy): 64.6
Sediment Mapped in 2018 (cy): 27
Contaminated Sediment Remaining in 2018 (cy): 27

Total Sediment Thickness, in feet (typ)
- 0.01 - 1.00
- 1.01 - 2.00
- 2.01 - 3.00
- 3.01 - 4.00
- Vegetative Mat or Rock
- Natural Stilling Area
- Sediment Measurement Transect
- Previous Sediment Removal
- 2018 Contaminated Sediment Extent
- 2018 Non-Contaminated Sediment Extent
- Vegetative Mat
- 2018 Surveyed Water Body
- Sediment Removal Area

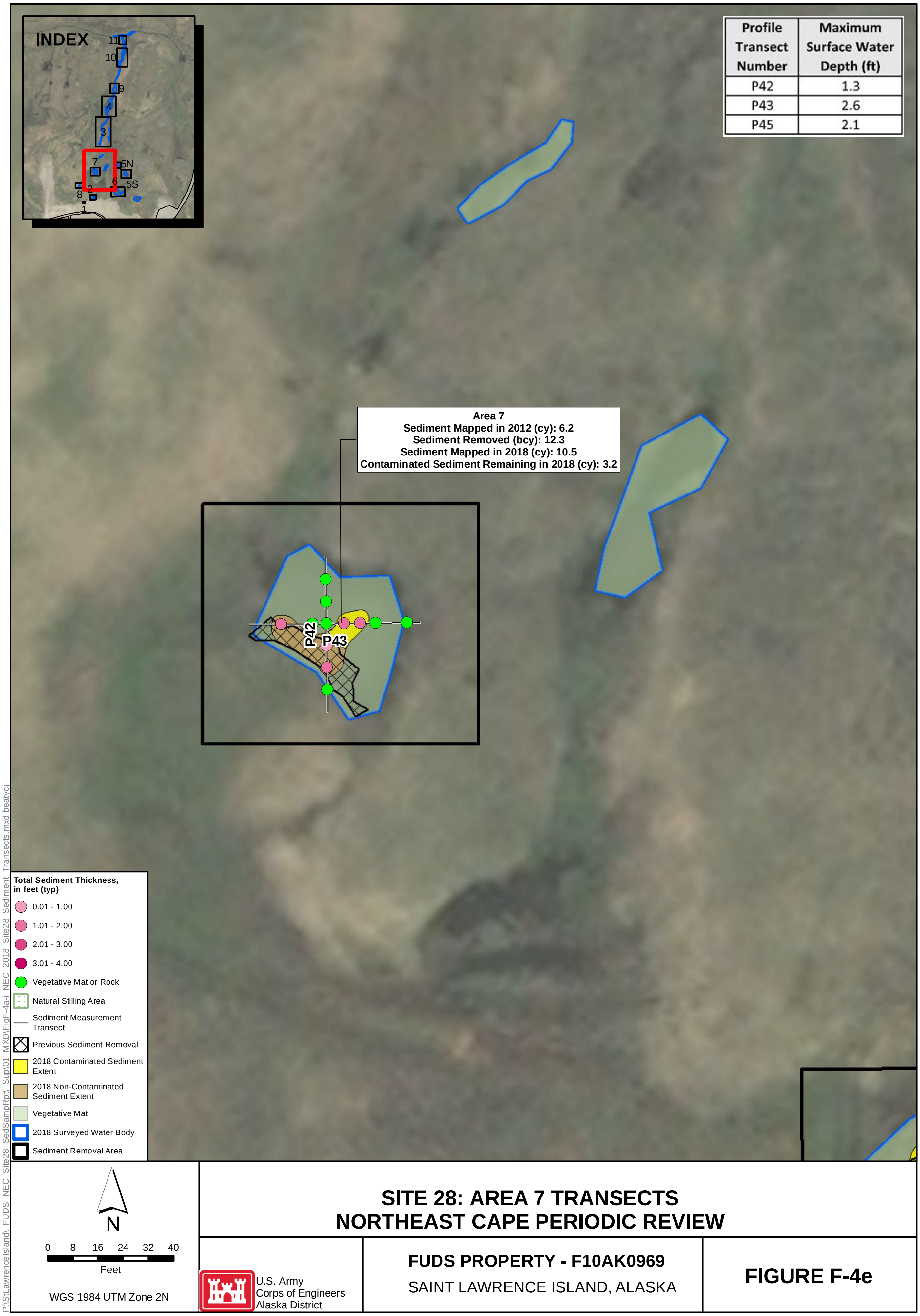
WGS 1984 UTM Zone 2N

SITE 28: AREA 3 TRANSECTS
NORTHEAST CAPE PERIODIC REVIEW

U.S. Army
Corps of Engineers
Alaska District

FUDS PROPERTY - F10AK0969
SAINT LAWRENCE ISLAND, ALASKA

FIGURE F-4d



Profile Transect Number	Maximum Surface Water Depth (ft)
P42	1.3
P43	2.6
P45	2.1

SITE 28: AREA 7 TRANSECTS
NORTHEAST CAPE PERIODIC REVIEW

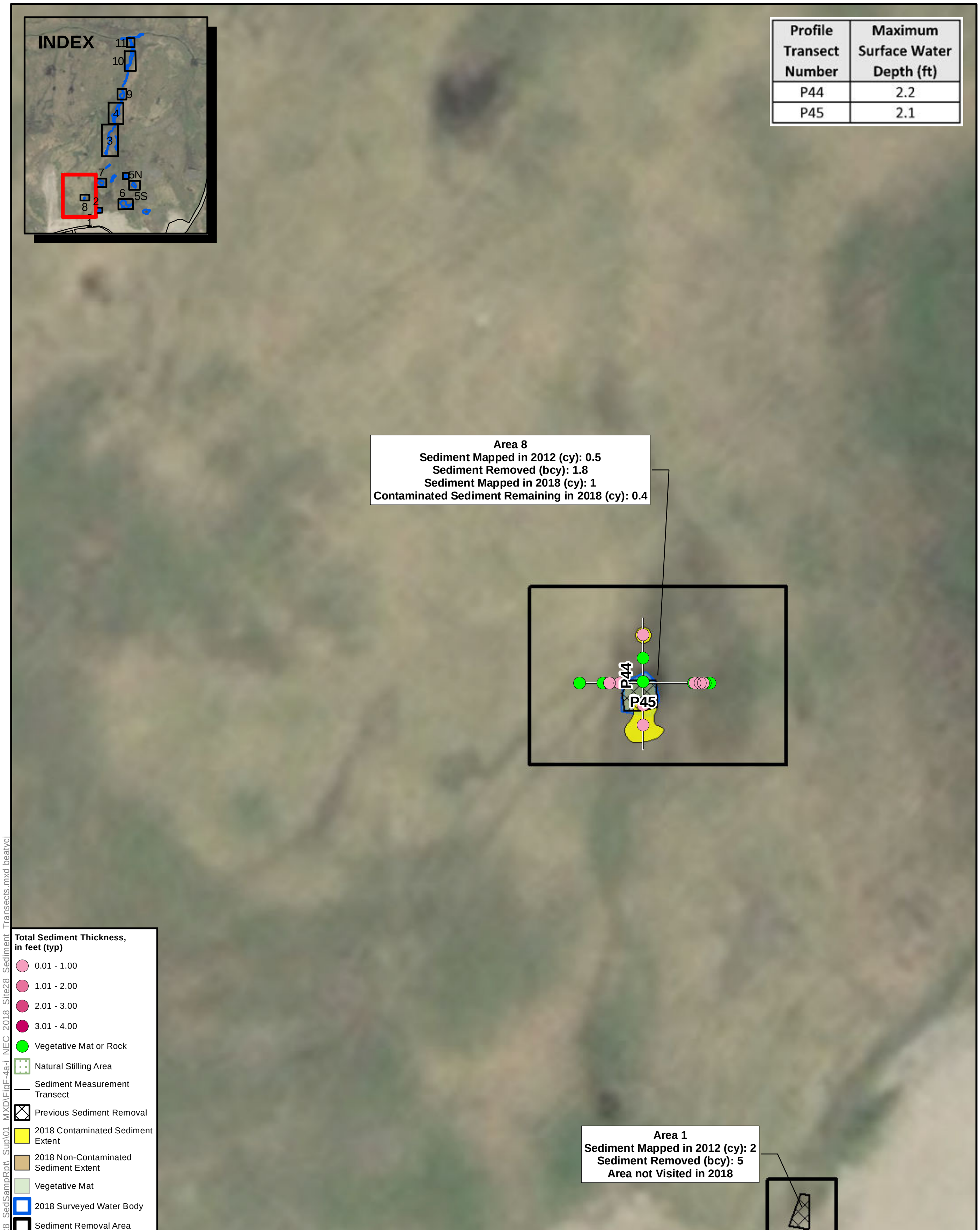
U.S. Army
Corps of Engineers
Alaska District

FUDS PROPERTY - F10AK0969

SAINT LAWRENCE ISLAND, ALASKA

FIGURE F-4e

P:\StLawrenceIsland_FUDS_NEC_Site28_SedSampRpt_Supl01_MXD\FigF-4a-l_NEC_2018_Site28_Sediment_Transects.mxd beatyci



Profile Transect Number	Maximum Surface Water Depth (ft)
P44	2.2
P45	2.1

SITE 28: AREA 8 TRANSECTS
NORTHEAST CAPE PERIODIC REVIEW

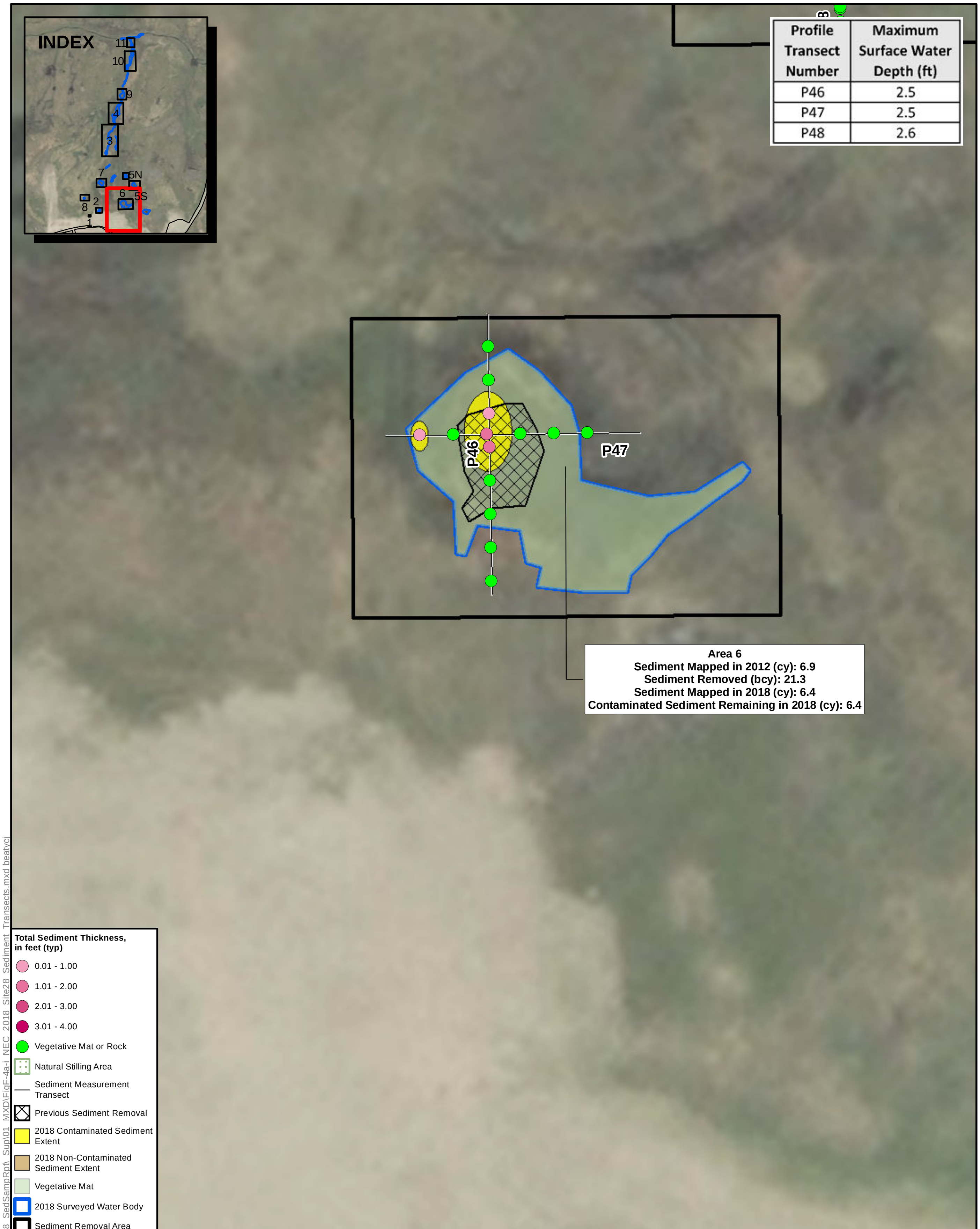
U.S. Army
Corps of Engineers
Alaska District

FUDS PROPERTY - F10AK0969

SAINT LAWRENCE ISLAND, ALASKA

FIGURE F-4f

P:\StLawrenceIsland\ FUDS NEC Site28 SedSampRpt\ Supl01 MXD\FigF-4a-i NEC 2018 Site28 Sediment Transects.mxd beatyci



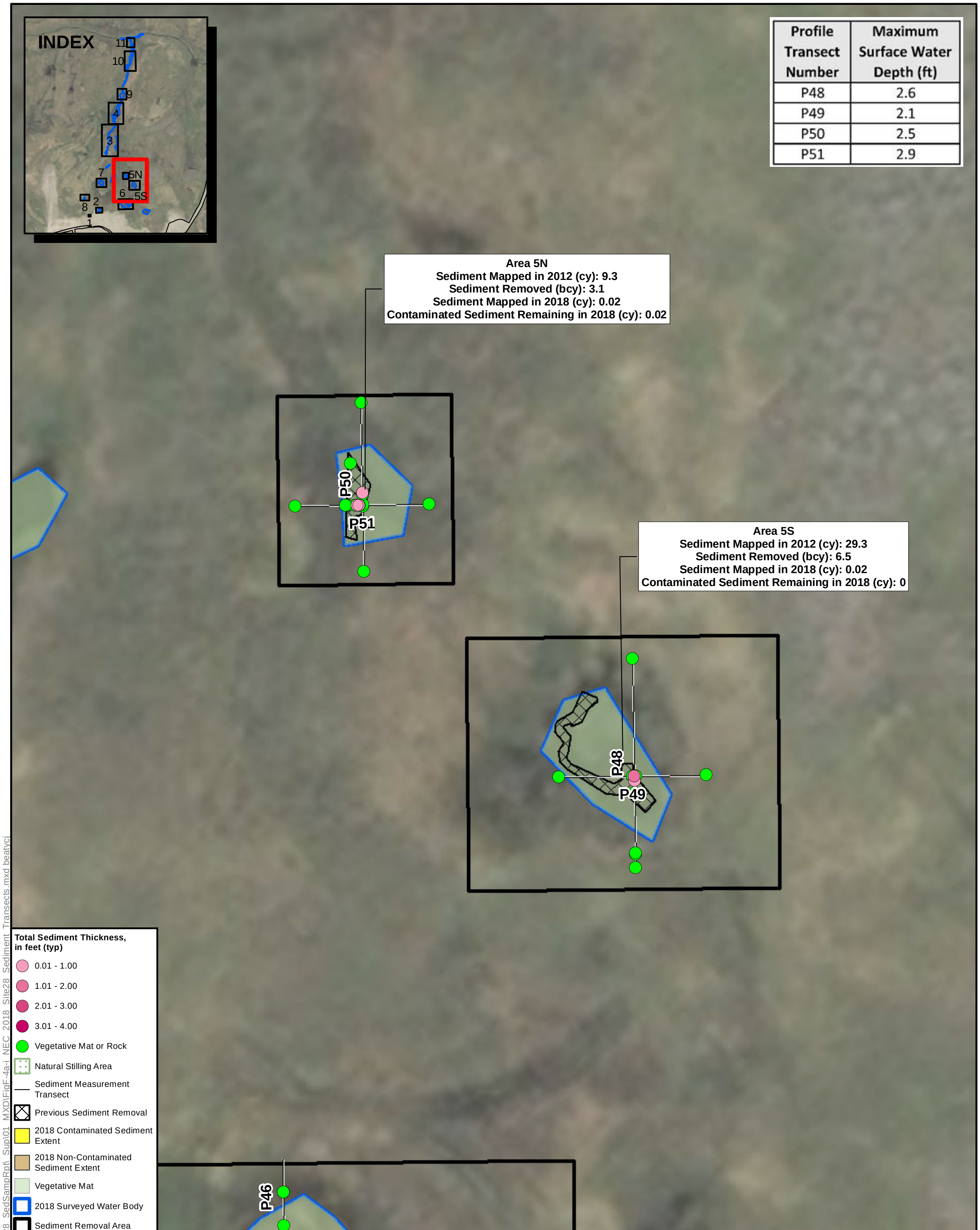
Profile Transect Number	Maximum Surface Water Depth (ft)
P46	2.5
P47	2.5
P48	2.6

SITE 28: AREA 6 TRANSECTS
NORTHEAST CAPE PERIODIC REVIEW

U.S. Army
Corps of Engineers
Alaska District

FUDS PROPERTY - F10AK0969
SAINT LAWRENCE ISLAND, ALASKA

FIGURE F-4g



Profile Transect Number	Maximum Surface Water Depth (ft)
P48	2.6
P49	2.1
P50	2.5
P51	2.9

N

0 8 16 24 32 40
Feet

WGS 1984 UTM Zone 2N

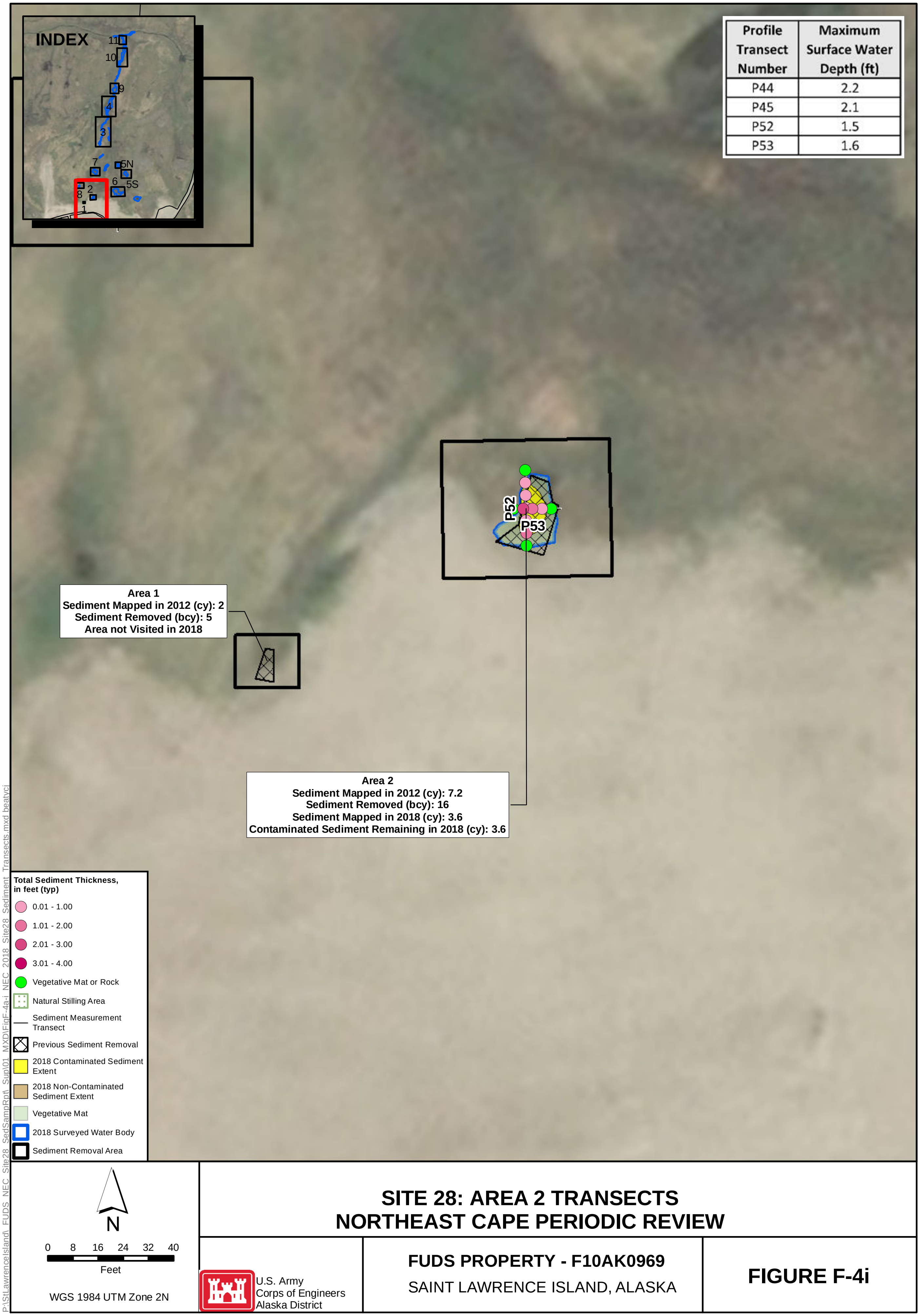
SITE 28: AREAS 5N AND 5S TRANSECTS
NORTHEAST CAPE PERIODIC REVIEW

U.S. Army
Corps of Engineers
Alaska District

FUDS PROPERTY - F10AK0969
SAINT LAWRENCE ISLAND, ALASKA

FIGURE F-4h

P:\StLawrenceIsland_FUDS_NEC_Site28_SedSampRpt_Supl01_MXD\FigF-4a-l_NEC_2018_Site28_Sediment_Transects.mxd beatycj



Profile Transect Number	Maximum Surface Water Depth (ft)
P44	2.2
P45	2.1
P52	1.5
P53	1.6

P:\StLawrenceIsland_FUDS_NEC_Site28_SedSampRpt_Supl01_MXD\FigF-4a-i_NEC_2018_Site28_Sediment_Transects.mxd beatyci

SITE 28: AREA 2 TRANSECTS
NORTHEAST CAPE PERIODIC REVIEW

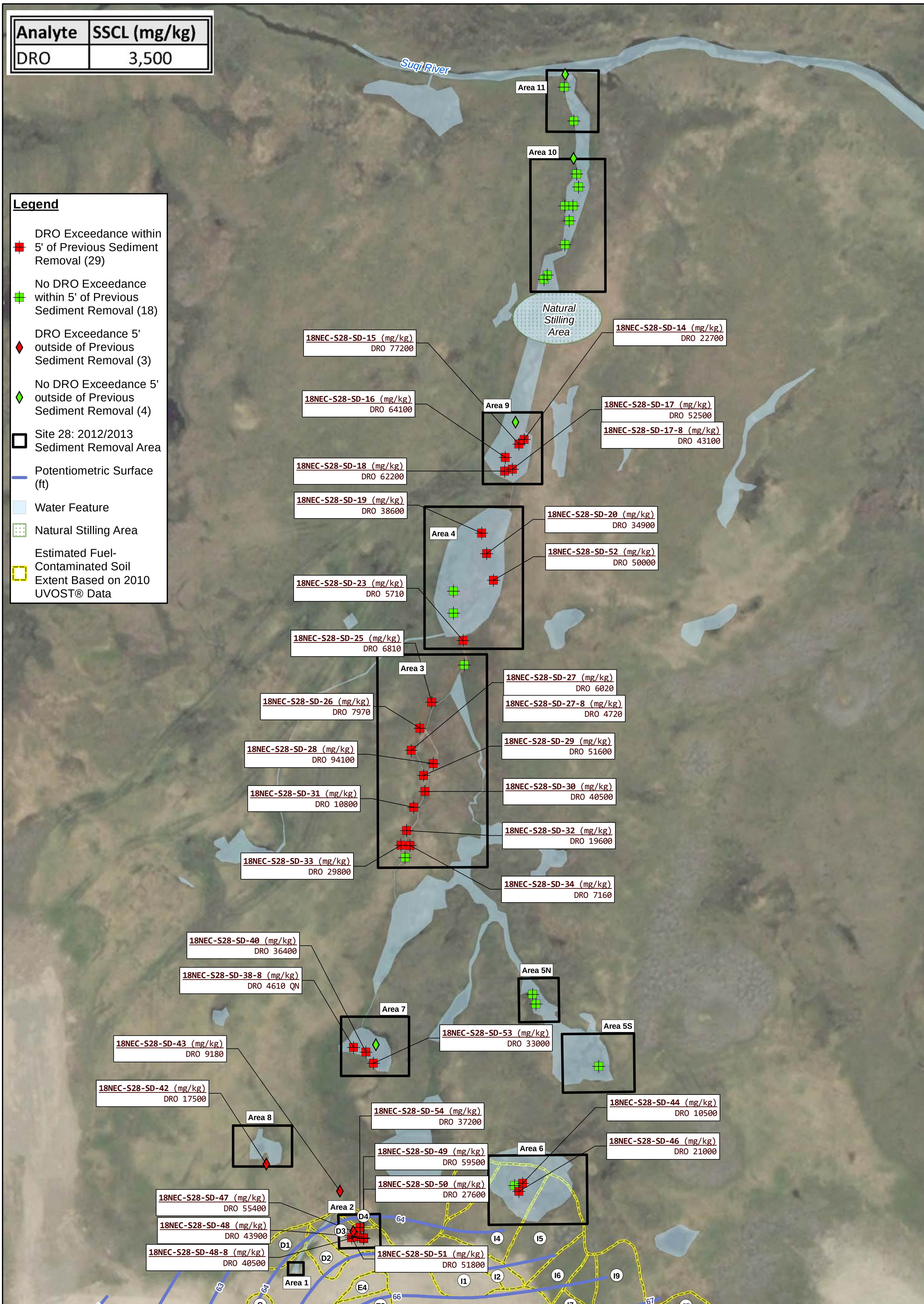
U.S. Army
Corps of Engineers
Alaska District

FUDS PROPERTY - F10AK0969

SAINT LAWRENCE ISLAND, ALASKA

FIGURE F-4i

P:\StLawrenceIsland_F10AK0969_NEC_2nd5YR_Sup\01_MXD\FigB-7toB-10_NEC_Site28_2018Results.mxd beatycj 1/9/2020



Approximate Groundwater Flow Direction

Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

N

0 30 60 90 120
FEET

WGS 1984 UTM Zone 2N

SITE 28: DRO IN SEDIMENT
2018 SAMPLING RESULTS AFTER SILICA GEL CLEANUP

NORTHEAST CAPE PERIODIC REVIEW

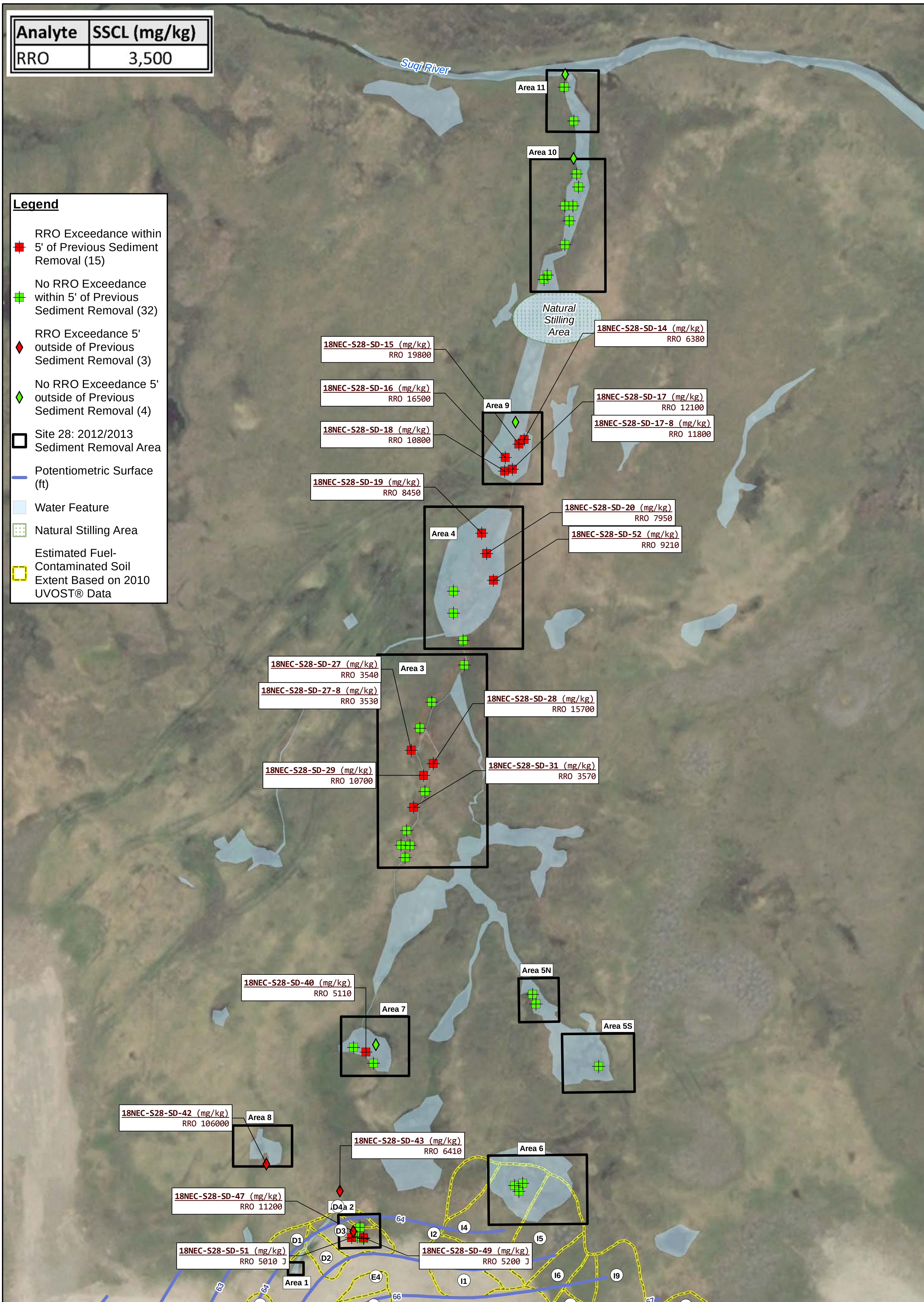
U.S. Army Corps of Engineers Alaska District

FUDS PROPERTY - F10AK0969

SAINT LAWRENCE ISLAND, ALASKA

FIGURE F-5

P:\StLawrenceIsland_F10AK0969_NEC_2nd5YR_Sup\01_MXD\FigB-7toB-10_NEC_Site28_2018Results.mxd beatycj 1/9/2020



Approximate Groundwater Flow Direction

Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

N

0 30 60 90 120
FEET

WGS 1984 UTM Zone 2N

SITE 28: RRO IN SEDIMENT
2018 SAMPLING RESULTS AFTER SILICA GEL CLEANUP

NORTHEAST CAPE PERIODIC REVIEW

U.S. Army
Corps of Engineers
Alaska District

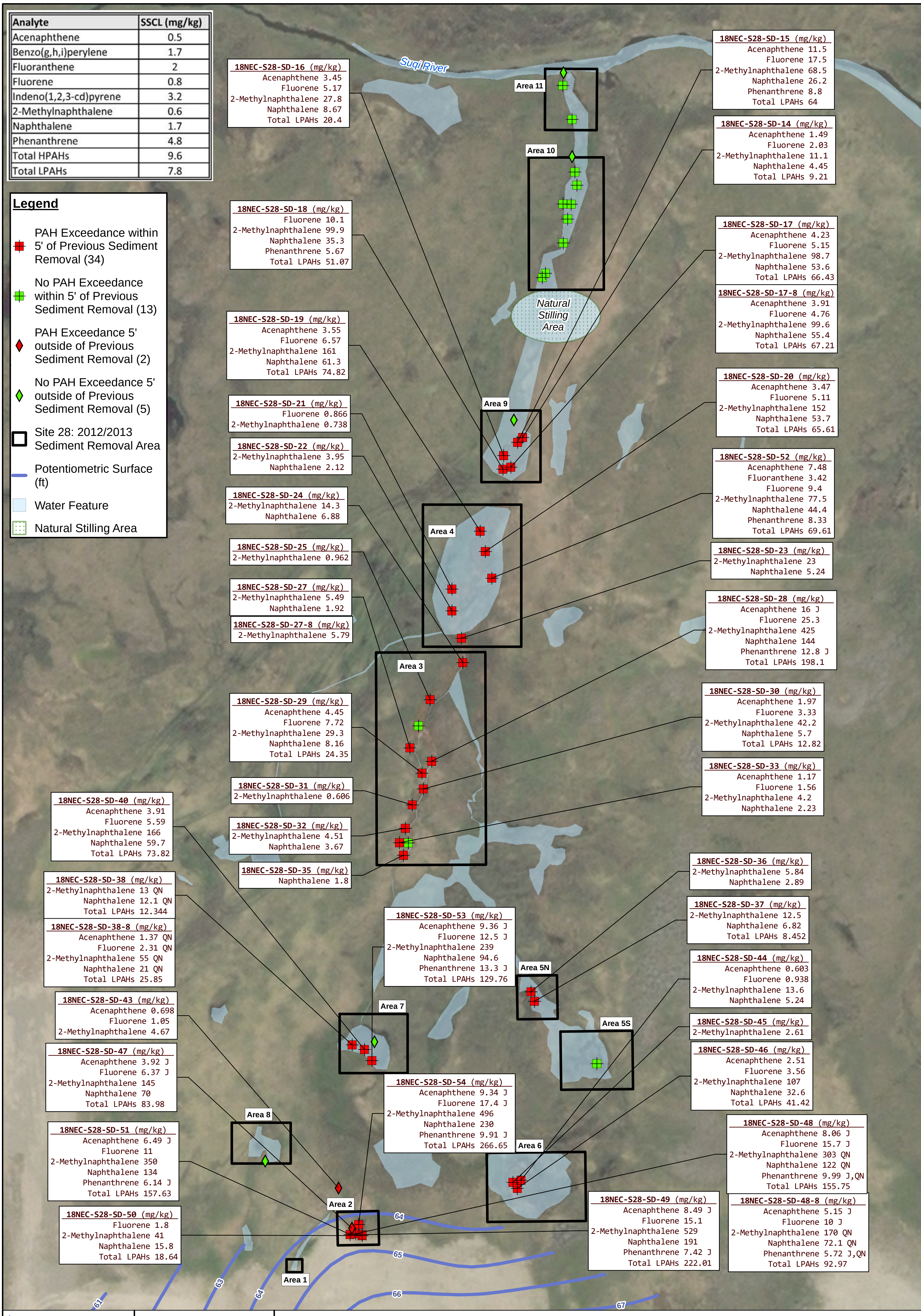
FUDS PROPERTY - F10AK0969

SAINT LAWRENCE ISLAND, ALASKA

FIGURE F-6

\\dc1vs01\GISProj\U\USACE\AK_NortheastCape_FUDS_NEC_Site28_SedSampRpt_Sup\01_MXD\FigF-5 to F-8_NEC_Site28_2018Results.mxd beatycj 8/19/2020

Analyte	SSCL (mg/kg)
Acenaphthene	0.5
Benzo(g,h,i)perylene	1.7
Fluoranthene	2
Fluorene	0.8
Indeno(1,2,3-cd)pyrene	3.2
2-Methylnaphthalene	0.6
Naphthalene	1.7
Phenanthrene	4.8
Total HPAHs	9.6
Total LPAHs	7.8



Approximate Groundwater Flow Direction

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

N

0 30 60 90 120
FEET

WGS 1984 UTM Zone 2N

SITE 28: PAHs IN SEDIMENT
2018 SAMPLING RESULTS
NORTHEAST CAPE PERIODIC REVIEW

U.S. Army
Corps of Engineers
Alaska District

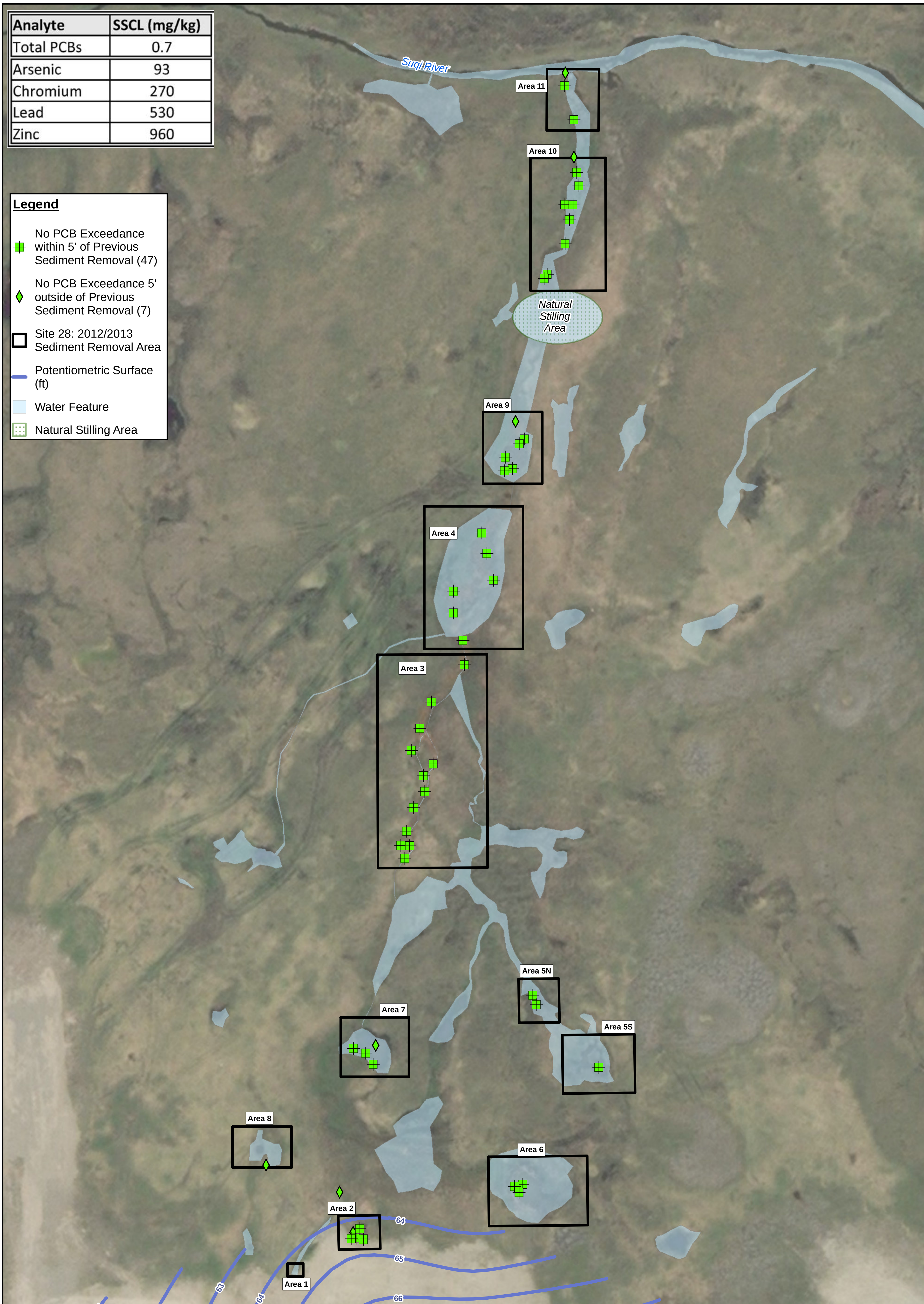
FUDS PROPERTY - F10AK0969

SAINT LAWRENCE ISLAND, ALASKA

FIGURE F-7

\\dc1vs01\GISProj\U\USACE\AK_NortheastCape_FUDS_NEC_Site28_SedSampRpt_Sup\01_MXD\FigF-5 to F-8_NEC_Site28_2018Results.mxd beatycj 8/19/2020

Analyte	SSCL (mg/kg)
Total PCBs	0.7
Arsenic	93
Chromium	270
Lead	530
Zinc	960



Approximate Groundwater Flow Direction

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

N

0 30 60 90 120
FEET

WGS 1984 UTM Zone 2N

SITE 28: PCBs AND METALS IN SEDIMENT
2018 SAMPLING RESULTS
NORTHEAST CAPE PERIODIC REVIEW

U.S. Army
Corps of Engineers
Alaska District

FUDS PROPERTY - F10AK0969

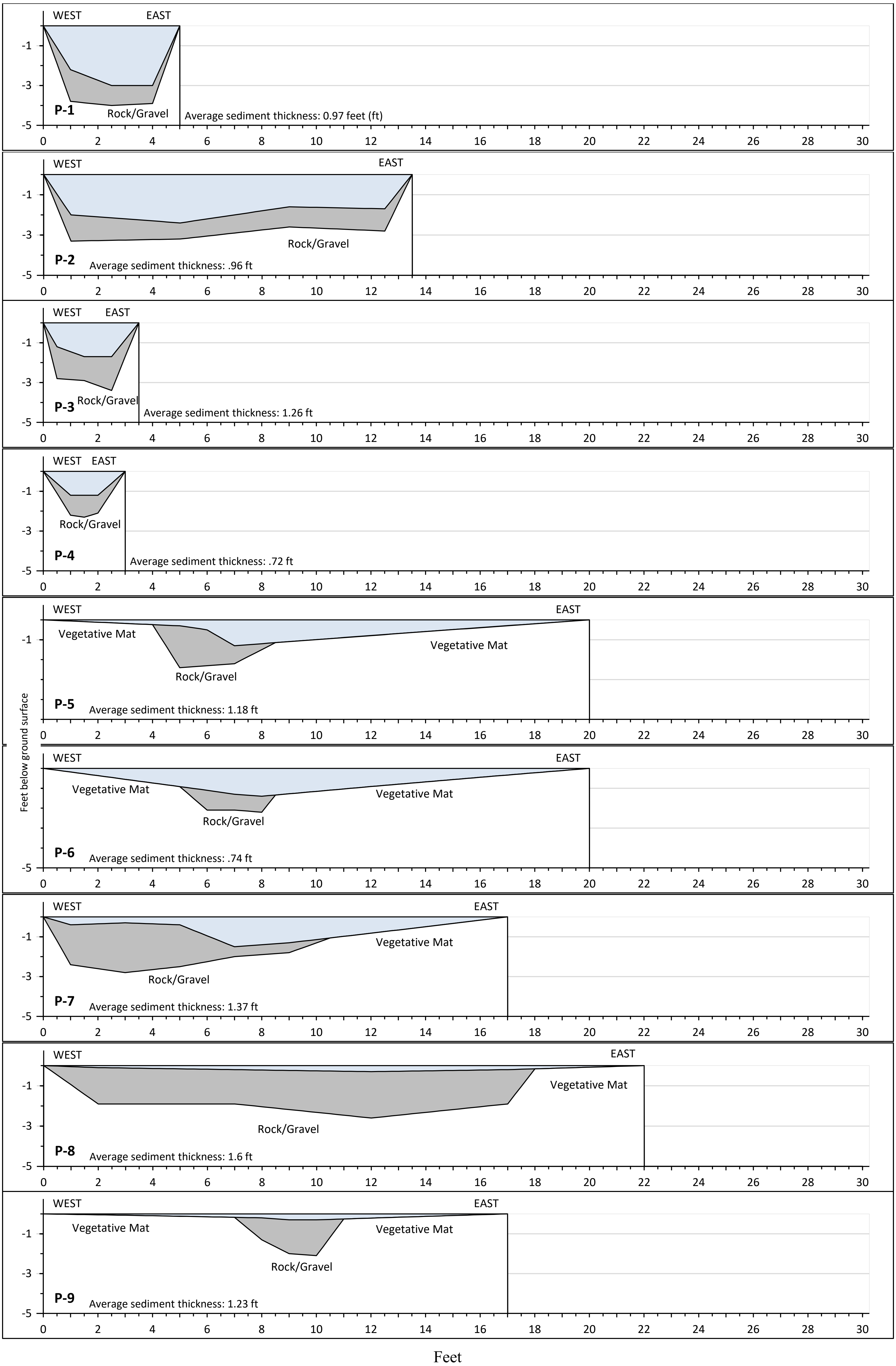
SAINT LAWRENCE ISLAND, ALASKA

FIGURE F-8

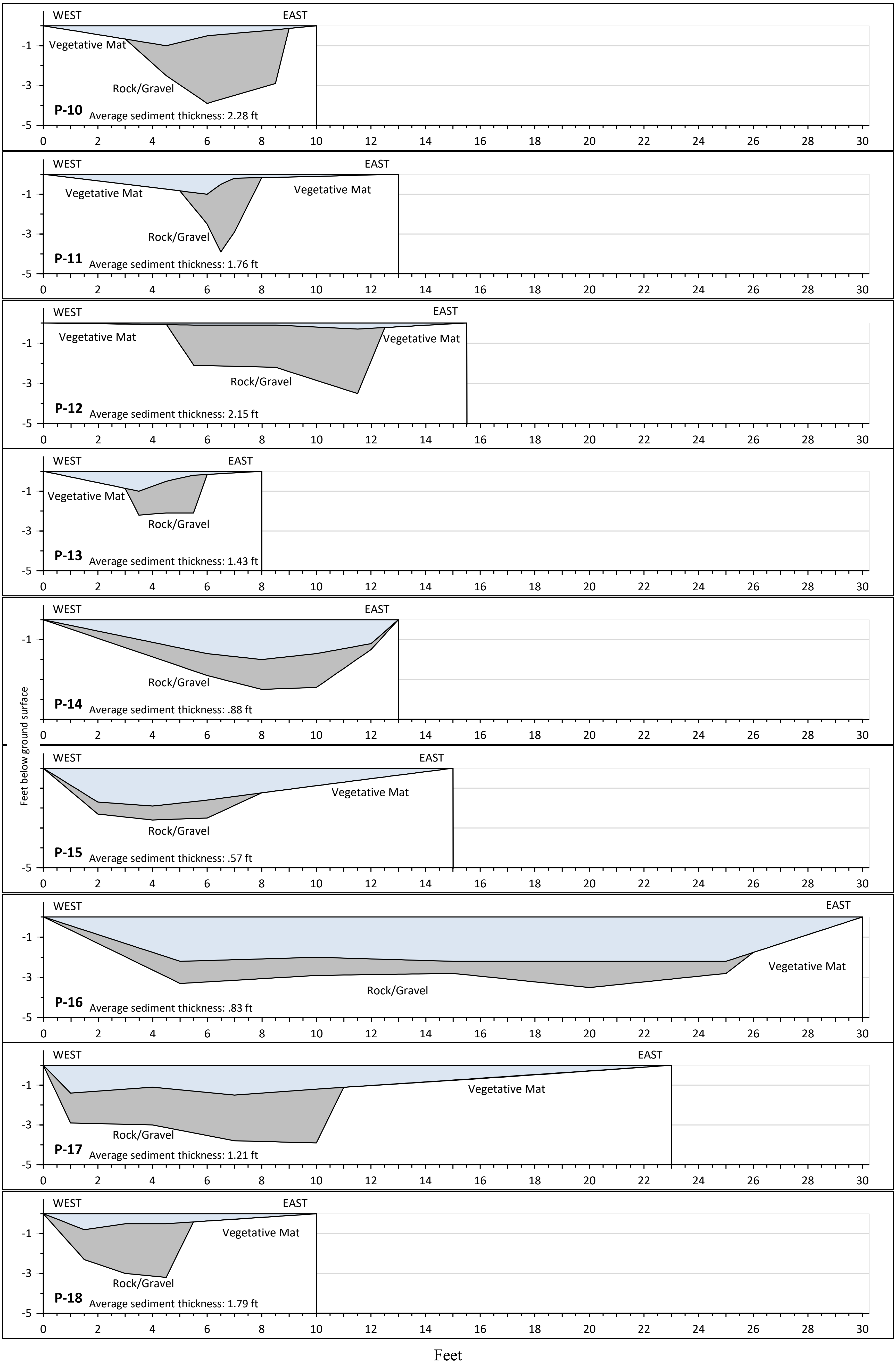
Sediment Transects

NORTHEAST CAPE FUDS 2018 SITE 28
SEDIMENT TRANSECT PROFILE

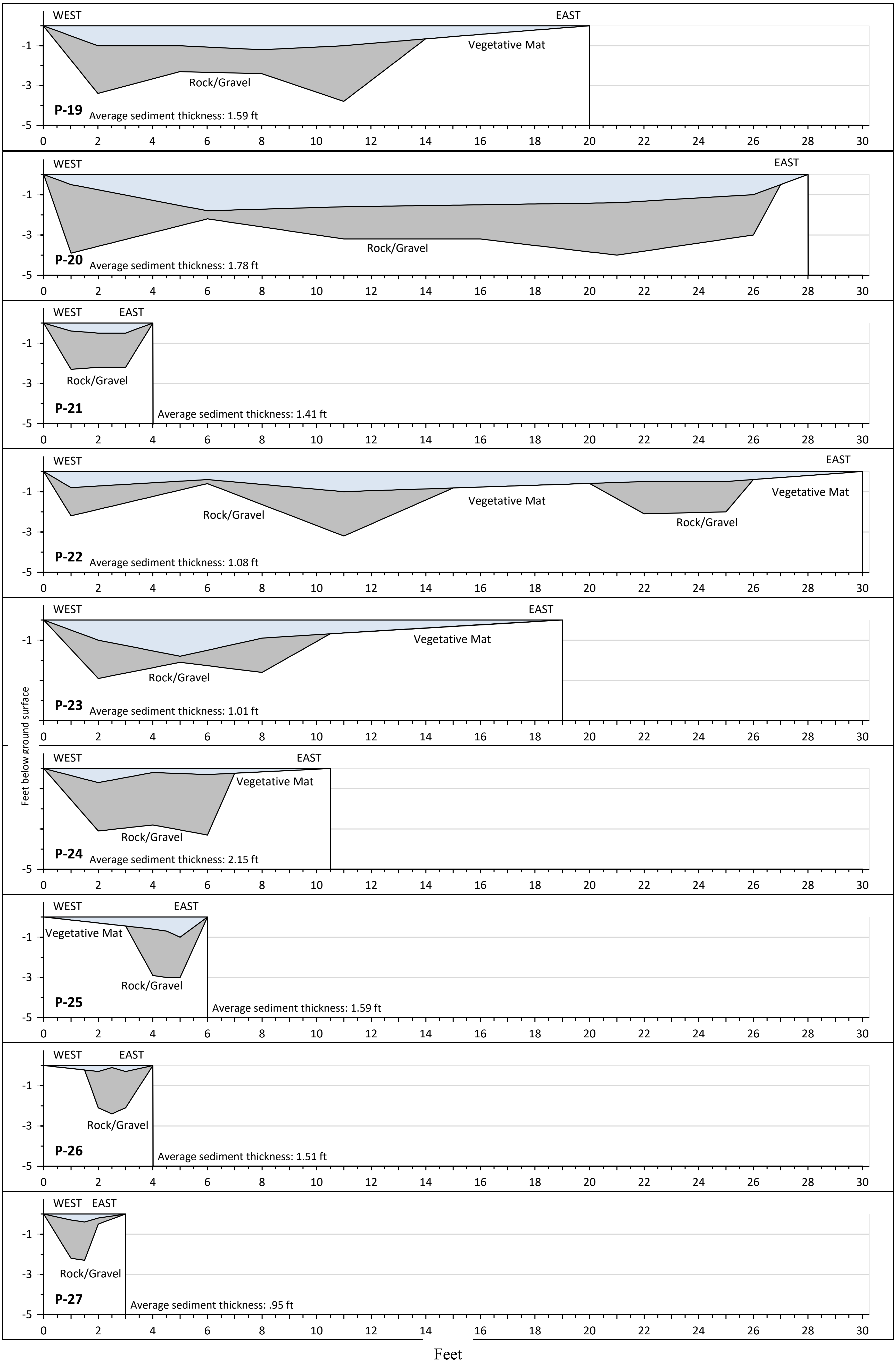
The cross sections provided in this attachment provide profiles for each sediment transect measured at Site 28. For linear water bodies, a profile transect was established every 30 feet along the length (north/south) of the area that contained sediment. Sediment thickness was measured across the width (east/west) of the profile transect with three or more evenly-spaced measurements. For discrete water bodies containing sediment, north/south and east/west transects were established. Transects crossed approximately at the center of the sediment area in the water body to measure thickness. Sediment thickness was measured to the nearest 0.1 foot starting from the edge of the sediment area and at intervals not exceeding 10 feet. The cross sections display the cardinal directions from which measurements were collected, show both the water (shaded blue) and sediment (shaded gray) thickness in feet, and note the presence of rock/gravel or vegetative mat where those features were recorded.

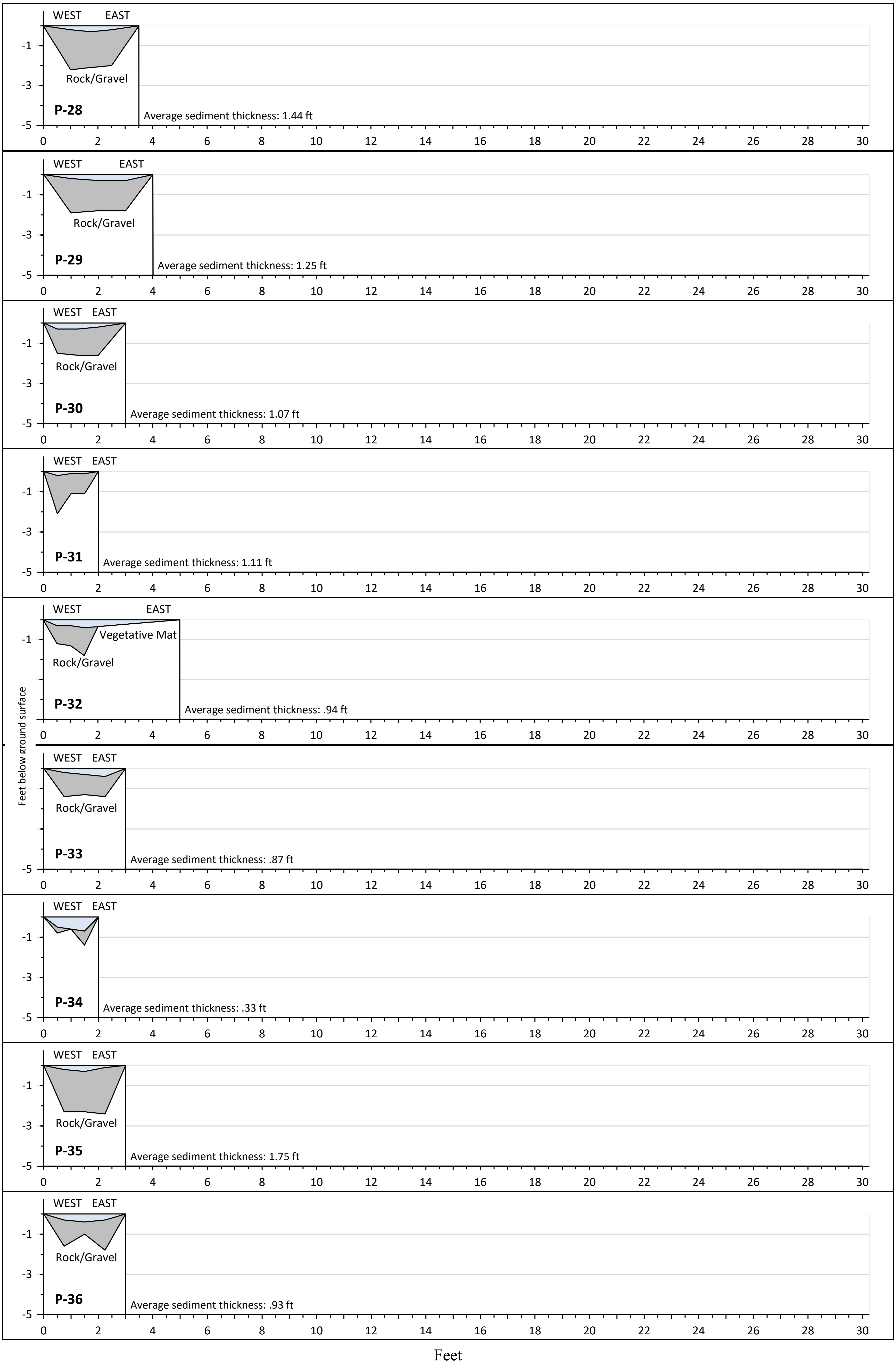


WEST
EAST
P-1
Rock/Gravel
Average sediment thickness: 0.97 feet (ft)
WEST
EAST
P-2
Rock/Gravel
Average sediment thickness: .96 ft
WEST
EAST
P-3
Rock/Gravel
Average sediment thickness: 1.26 ft
WEST
EAST
P-4
Rock/Gravel
Average sediment thickness: .72 ft
WEST
EAST
Vegetative Mat
Vegetative Mat
Rock/Gravel
P-5
Average sediment thickness: 1.18 ft
WEST
EAST
Vegetative Mat
Vegetative Mat
Rock/Gravel
P-6
Average sediment thickness: .74 ft
WEST
EAST
Vegetative Mat
Rock/Gravel
P-7
Average sediment thickness: 1.37 ft
WEST
EAST
Vegetative Mat
Rock/Gravel
P-8
Average sediment thickness: 1.6 ft
WEST
EAST
Vegetative Mat
Vegetative Mat
Rock/Gravel
P-9
Average sediment thickness: 1.23 ft
Feet below ground surface
-1
-3
-5
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
Feet

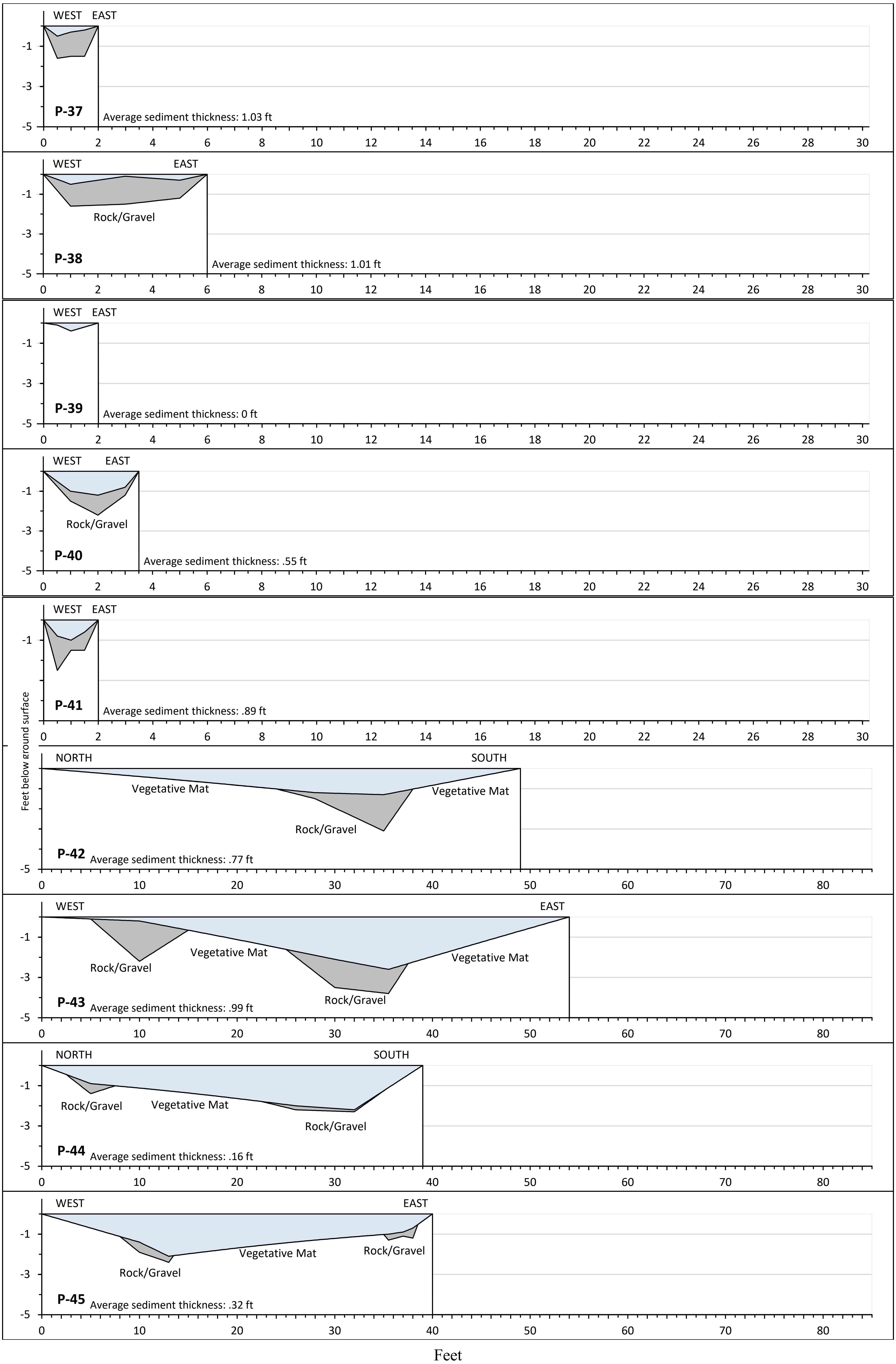


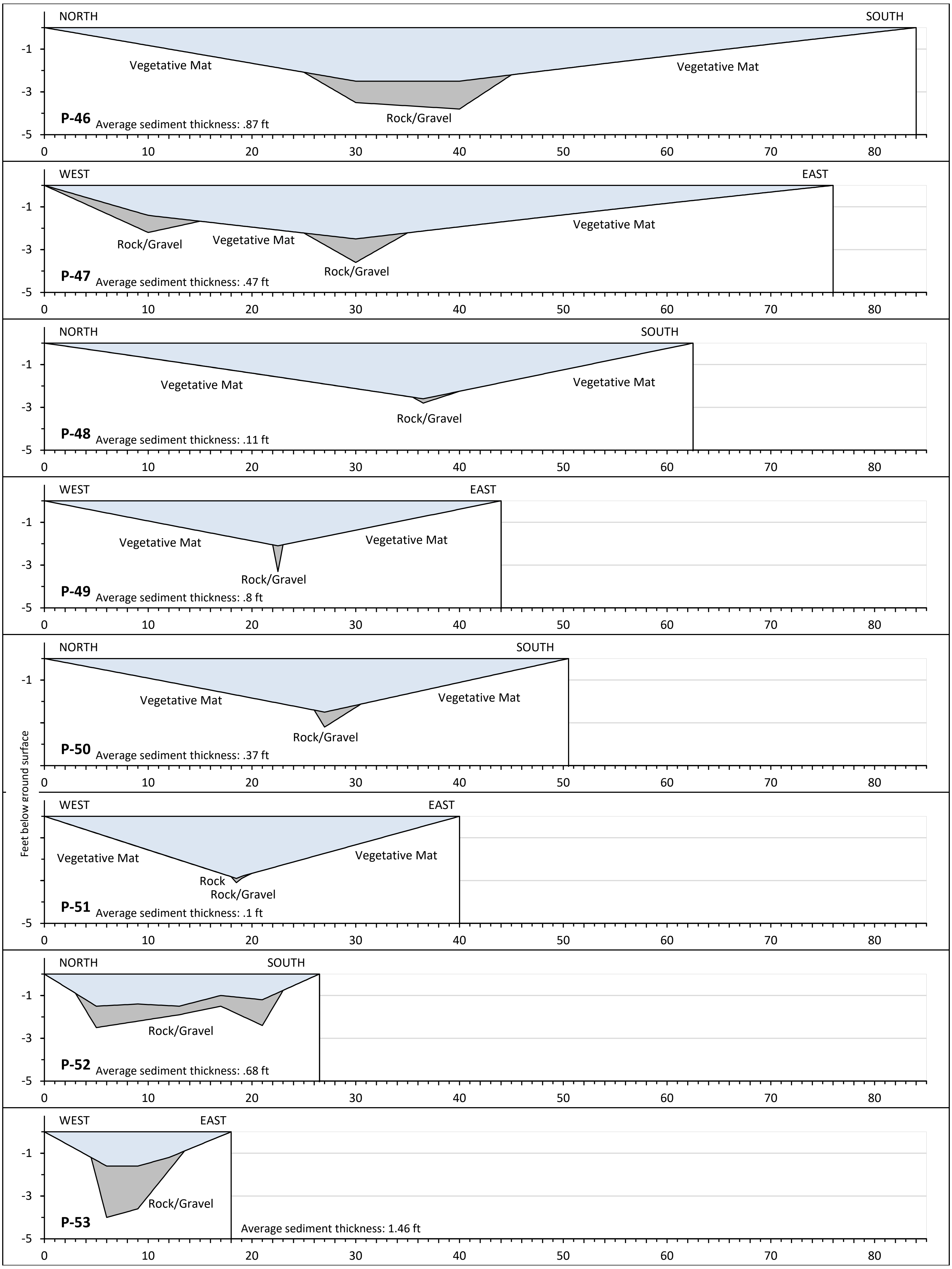
WEST
EAST
Vegetative Mat
Rock/Gravel
P-10 Average sediment thickness: 2.28 ft
P-11 Average sediment thickness: 1.76 ft
P-12 Average sediment thickness: 2.15 ft
P-13 Average sediment thickness: 1.43 ft
P-14 Average sediment thickness: .88 ft
P-15 Average sediment thickness: .57 ft
P-16 Average sediment thickness: .83 ft
P-17 Average sediment thickness: 1.21 ft
P-18 Average sediment thickness: 1.79 ft
Feet below ground surface
Feet


WEST
EAST
Vegetative Mat
Rock/Gravel
P-19
Average sediment thickness: 1.59 ft
WEST
EAST
Rock/Gravel
P-20
Average sediment thickness: 1.78 ft
WEST
EAST
Rock/Gravel
P-21
Average sediment thickness: 1.41 ft
WEST
EAST
Rock/Gravel
Vegetative Mat
Rock/Gravel
Vegetative Mat
P-22
Average sediment thickness: 1.08 ft
WEST
EAST
Vegetative Mat
Rock/Gravel
P-23
Average sediment thickness: 1.01 ft
WEST
EAST
Vegetative Mat
Rock/Gravel
P-24
Average sediment thickness: 2.15 ft
WEST
EAST
Vegetative Mat
Rock/Gravel
P-25
Average sediment thickness: 1.59 ft
WEST
EAST
Rock/Gravel
P-26
Average sediment thickness: 1.51 ft
WEST
EAST
Rock/Gravel
P-27
Average sediment thickness: .95 ft
Feet below ground surface
Feet



WEST EAST
Rock/Gravel
P-28
Average sediment thickness: 1.44 ft
WEST EAST
Rock/Gravel
P-29
Average sediment thickness: 1.25 ft
WEST EAST
Rock/Gravel
P-30
Average sediment thickness: 1.07 ft
WEST EAST
P-31
Average sediment thickness: 1.11 ft
WEST EAST
Vegetative Mat
Rock/Gravel
P-32
Average sediment thickness: .94 ft
Feet below ground surface
WEST EAST
Rock/Gravel
P-33
Average sediment thickness: .87 ft
WEST EAST
P-34
Average sediment thickness: .33 ft
WEST EAST
Rock/Gravel
P-35
Average sediment thickness: 1.75 ft
WEST EAST
Rock/Gravel
P-36
Average sediment thickness: .93 ft
Feet


WEST EAST
P-37
Average sediment thickness: 1.03 ft
WEST EAST
Rock/Gravel
P-38
Average sediment thickness: 1.01 ft
WEST EAST
P-39
Average sediment thickness: 0 ft
WEST EAST
Rock/Gravel
P-40
Average sediment thickness: .55 ft
WEST EAST
P-41
Average sediment thickness: .89 ft
Feet below ground surface
NORTH SOUTH
Vegetative Mat
Vegetative Mat
Rock/Gravel
P-42
Average sediment thickness: .77 ft
WEST EAST
Rock/Gravel
Vegetative Mat
Vegetative Mat
Rock/Gravel
P-43
Average sediment thickness: .99 ft
NORTH SOUTH
Rock/Gravel
Vegetative Mat
Rock/Gravel
P-44
Average sediment thickness: .16 ft
WEST EAST
Rock/Gravel
Vegetative Mat
Rock/Gravel
P-45
Average sediment thickness: .32 ft
Feet



NORTH
SOUTH
Vegetative Mat
Vegetative Mat
Rock/Gravel
P-46
Average sediment thickness: .87 ft
WEST
EAST
Rock/Gravel
Vegetative Mat
Vegetative Mat
Rock/Gravel
P-47
Average sediment thickness: .47 ft
NORTH
SOUTH
Vegetative Mat
Vegetative Mat
Rock/Gravel
P-48
Average sediment thickness: .11 ft
WEST
EAST
Vegetative Mat
Vegetative Mat
Rock/Gravel
P-49
Average sediment thickness: .8 ft
NORTH
SOUTH
Vegetative Mat
Vegetative Mat
Rock/Gravel
P-50
Average sediment thickness: .37 ft
Feet below ground surface
WEST
EAST
Vegetative Mat
Vegetative Mat
Rock
Rock/Gravel
P-51
Average sediment thickness: .1 ft
NORTH
SOUTH
Rock/Gravel
P-52
Average sediment thickness: .68 ft
WEST
EAST
Rock/Gravel
P-53
Average sediment thickness: 1.46 ft
-1
-3
-5
0
10
20
30
40
50
60
70
80

Feet

ATTACHMENT F-2
Data Quality Assessment

2018 SITE 28 SEDIMENT SAMPLING REPORT AT NORTHEAST CAPE

ATTACHMENT F-2
SEDIMENT DATA QUALITY ASSESSMENT

NORTHEAST CAPE, ST. LAWRENCE ISLAND, ALASKA

FINAL
SEPTEMBER 2020

TABLE OF CONTENTS

TABLES

EXHIBITS

(intentionally blank)

ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
ADEC	Alaska Department of Environmental Conservation
APPL	Agriculture & Priority Pollutants Laboratories, Inc. of Clovis, CA
BTEX	benzene, toluene, ethylbenzene, and xylenes
CoC	chain-of-custody
DD	Decision Document
DL	detection limit
DoD	U.S. Department of Defense
DQA	data quality assessment
DQO	data quality objective
DRO	diesel-range organics
Dup	duplicate
EB	equipment blank
EPA	U.S. Environmental Protection Agency
FD	field duplicate
GW	groundwater
HCL	hydrochloric acid
HNO_3	nitric acid
Jacobs	Jacobs Engineering Group Inc.
L	liter
LCL	lower control limit
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LOD	limit of detection
LOQ	limit of quantitation
mg/L	milligrams per liter
mL	milliliter
MOC	Main Operations Complex
MS	matrix spike
MSD	matrix spike duplicate

ACRONYMS AND ABBREVIATIONS (Continued)

N/A	not applicable
NEC	Northeast Cape
ND	nondetect
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
QA	quality assurance
QC	quality control
QSM	Quality Systems Manual
RCRA	Resource Conservation and Recovery Act (of 1976, amended in 1984)
RPD	relative percent difference
RRO	residual-range organics
SD	sediment
SDG	sample delivery group
SGS	SGS North America, Inc. of Anchorage, AK
SIM	selective ion monitoring
SSCL	site-specific cleanup level
SW	surface water
TAT	turnaround time
TB	trip blank
TOC	total organic carbon
UCL	upper control limit
USACE	U.S. Army Corps of Engineers
VOA	volatile organic analysis

ANALYTICAL DATA QUALIFIERS

The following data qualifiers are applicable to the 2018 Northeast Cape analytical data:

J The analyte was positively identified; however, the associated result was less than the LOQ but greater than or equal to the DL.

B The analyte was detected in the method blank, the trip blank, or EB above the DL and the concentration in the sample did not exceed the blank concentration by a factor of five (factor of 10 for common laboratory contaminants acetone, toluene, and methylene chloride).

QH Analyte result was considered an estimated value (biased high) due to a QC failure.

QL Analyte result was considered an estimated value (biased low) due to a QC failure.

QN Analyte result was considered an estimated value (unknown bias) due to a QC failure.

R Result is rejected and should not be used for reporting purposes.

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1.0 INTRODUCTION

This data quality assessment (DQA) and Alaska Department of Environmental Conservation (ADEC) laboratory data review checklists assess the overall quality and usability of data from the 2018 sampling events at Northeast Cape (NEC) on Saint Lawrence Island, Alaska. The sediment samples were analyzed by SGS North America, Inc. of Anchorage, AK (SGS). All samples are presented in Table F2-1-1, categorized by method and sample type.

The exhibits to this DQA present the sample summary table and analytical data table (Exhibit F2-1), tables of sample results that did not meet the project data quality objectives (DQOs) (Exhibit F2-2), ADEC laboratory data review checklists (Exhibit F2-3), laboratory deliverables (Exhibit F2-4), and chromatograms relevant to the discussion of biogenic interference (Exhibit F2-5).

Table F2-1-1
Field QC Sample Quantities

Matrix	Sample Type	PAHs 8270SIM	DRO/RRO AK102+3	DRO/RRO Silica Gel AK102SG	Metals E200.8	Metals SW6020	PCBs SW8082	TOC SW9060
Sediment	Primary	54	54	54	N/A	54	54	54
	Duplicate	6	6	6	N/A	6	6	6
	MS/MSD	6	6	6	N/A	6	6	10
	EB	1	1	N/A	1	N/A	1	N/A

Note:
For definitions, refer to the Acronyms and Abbreviations section.

1.1 QC CRITERIA

Jacobs Engineering Group Inc. (Jacobs) performed this DQA and completed ADEC laboratory data review checklists for records associated with the analytical data, as per the *2018 Remedial Action Review Work Plan* (U.S. Army Corps of Engineers [USACE] 2018). Data quality was evaluated against the following requirements: U.S. Department of Defense (DoD) Quality

Systems Manual (QSM) (DoD 2017); ADEC and U.S. Environmental Protection Agency (EPA) analytical methods (ADEC 2017a, EPA 2014); and laboratory limits.

The Jacobs project chemist performed a completeness check of the electronic data to verify that data packages and electronic files included all the requested information. All analytical data were reviewed, including the chain-of-custody (CoC) and sample receipt records, laboratory case narratives, and laboratory data. Analytical data were reviewed for methodology, sample holding times, laboratory blanks, limits of quantitation (LOQs), limits of detection (LODs), detection limits (DLs), surrogate recoveries, laboratory control sample (LCS) and LCS duplicate (LCSD) recovery accuracies, matrix spike (MS) and MS duplicate (MSD) recovery accuracies, and precision. Other quality control (QC) parameters (initial calibration, continuing calibration, tuning, internal standards, interference check solutions, post-digestion spikes, and serial dilutions) were reviewed by means of the laboratory case narrative. These QC parameters met acceptance criteria; any sample results outside QC parameters are listed in Section 1.2 or in the associated ADEC laboratory data review checklist (Exhibit F2-3). Analytical DQOs were considered met when the quality of the sample data met precision, accuracy, representativeness, completeness, comparability, and sensitivity requirements. The overall quality of the data was acceptable as qualified. Flagged data are considered usable but estimated.

Qualification was not required in the following circumstances:

- Surrogate or MS/MSD recoveries were outside QC limits, and the sample was diluted by a factor of five or greater.
- MS/MSD recoveries were outside QC limits, and the spiked concentration was less than that of the parent sample.
- An analyte was detected in the method blank, but there was no detection in the sample.
- Surrogate, MS, or LCS recoveries exceeded upper control limits (UCLs), and there was no detection in the sample(s).

1.2 DATA QUALITY SUMMARY

In general, the overall quality of project data was acceptable, and the completeness goal of 95 percent was met for all parameters. Complete details of the evaluation and associated samples are provided in the ADEC laboratory review checklists (Exhibit F2-3). The tables in Exhibit F2-2 include analytical results that did not meet project DQOs and required qualification.

The following anomalies were identified during the data review process as follows:

- Sample handling/preservation
- Method blank and trip blank contamination
- LCS accuracy and precision
- MS accuracy and precision
- Surrogate spike accuracy
- Field duplicate (FD) precision
- Calibration Verification Samples
- Reporting limit assessment
- EB contamination

Sections 1.2.1 through 1.2.9 describe anomalies and their effects on data quality and usability.

1.2.1 Sample Handling/Preservation

Five coolers were sent to SGS for the sediment sampling effort. All sample coolers were received within the acceptable temperature range of 0 to 6 degrees Celsius (°C). No sample handling anomalies affecting data quality or usability were identified by the laboratory on the cooler receipt form or during this data quality review.

1.2.2 Method Blank and Trip Blank Contamination

There were no detections in the method blanks that required qualification of associated samples. The sediment sampling event did not include the analysis for volatile organics that require a trip blank.

1.2.3 LCS Accuracy and Precision

All LCS and LCSD recoveries and relative percent differences (RPDs) were within laboratory and DoD QSM control limits; therefore, no sample qualification was required.

1.2.4 MS Accuracy and Precision

MS/MSDs were collected to evaluate the accuracy and precision of matrix and/or laboratory procedures. The DoD QSM requirement of one project MS/MSD set for each preparation batch of 20 samples was not met. Table F2-1-2 presents the preparation batch and the associated parent sample MS/MSD. The MS/MSD recoveries for several analytes and analyses were outside of the QC criteria; however, failing recoveries on samples that were diluted more than five times were not qualified.

Table F2-1-2
Preparation Batch and Associated MS/MSD

SDG	Analytical Batch Number	Method	Parent Sample ID
1184373	MXX31829	SW6020A	18NEC-S28-SD-03
1184430	MXX31835	SW6020A	**No SSQC**
1184430	MXX31836	SW6020A	18NEC-S28-SD-28
1184430	MXX31840	SW6020A	18NEC-S28-SD-54
1184430	MXX31843	E200.8	**No SSQC**
1184373	WXX12476	SW9060	18NEC-S28-SD-03
1184430	WXX12484	SW9060	18NEC-S28-SD-17
1184430	WXX12484	SW9060	18NEC-S28-SD-26
1184430	WXX12488	SW9060	18NEC-S28-SD-28
1184430	WXX12488	SW9060	18NEC-S28-SD-39
1184430	WXX12489	SW9060	18NEC-S28-SD-54
1184430	WXX12489	SW9060	18NEC-S28-SD-44
1184373	XXX40151	8270SIM	18NEC-S28-SD-03
1184373	XXX40152	SW8082A	18NEC-S28-SD-03
1184373	XXX40154	AK102	18NEC-S28-SD-03
1184373	XXX40154A	AK103	18NEC-S28-SD-03
1184373	XXX40155	AK102SG	18NEC-S28-SD-03
1184373	XXX40155A	AK103SG	18NEC-S28-SD-03
1184430	XXX40169	8270SIM	**No SSQC**
1184430	XXX40172	8270SIM	18NEC-S28-SD-28
1184430	XXX40174	8270SIM	**No SSQC**
1184430	XXX40175	SW8082A	**No SSQC**
1184430	XXX40176	SW8082A	18NEC-S28-SD-28

Table F2-1-2 (Continued)
Preparation Batch and Associated MS/MSD

SDG	Analytical Batch Number	Method	Parent Sample ID
1184430	XXX40178	AK102SG	18NEC-S28-SD-28
1184430	XXX40178A	AK103SG	18NEC-S28-SD-28
1184430	XXX40179	AK102	18NEC-S28-SD-28
1184430	XXX40179A	AK103	18NEC-S28-SD-28
1184430	XXX40180	SW8082A	**No SSQC**
1184430	XXX40183	SW8082A	18NEC-S28-SD-54
1184430	XXX40184	8270SIM	18NEC-S28-SD-54
1184430	XXX40192	AK102	18NEC-S28-SD-54
1184430	XXX40192A	AK103	18NEC-S28-SD-54
1184430	XXX40193	AK102SG	18NEC-S28-SD-54
1184430	XXX40193A	AK103SG	18NEC-S28-SD-54
1184430	XXX40205	AK102	**No SSQC**
1184430	XXX40205A	AK103	**No SSQC**
1184430	XXX40206	AK102SG	**No SSQC**
1184430	XXX40206A	AK103SG	**No SSQC**
1184430	XXX40207	AK102	**No SSQC**
1184430	XXX40207A	AK103	**No SSQC**
1184430	XXX40262	SW8082A	**No SSQC**

Note:
SSQC = site specific quality control

1.2.5 Surrogate Spike Accuracy

Sample results with surrogates outside of QC criteria were qualified as estimated except in the following cases: nondetect (ND) samples with high surrogate recoveries or samples with a dilution factor of five or greater. Sample results for SW8260, SW8270, and SW8270SIM were only qualified for surrogate recovery exceedances if two or more surrogates did not meet QC criteria. Sample results with low surrogate recoveries were qualified QL and are considered biased low.

Many sediment samples were diluted beyond five times during extraction and analysis, resulting in surrogate recoveries outside of control limits. These results did not require qualification. One sample, 18NEC-S28-SD-47, was diluted during the extraction process (final extract volume greater than standard final volume) for diesel-range organics (DRO) and reported with an analytical dilution of one. The sample results were not qualified as the extraction dilution occurred due to extract color (high levels of non-target organics) and the total dilution exceeded five times.

Only one project sample required qualification for surrogate recovery. The polychlorinated biphenyl (PCB) results in sample 18NEC-S28-SD-42 were qualified QL to indicate a possible low bias due to low surrogate recovery (39 percent). Data usability was minimally affected since the qualified results were ND with LODs significantly less than the associated site-specific cleanup level (SSCL). Table F-2.1 (Exhibit F2-2) provides a summary of the surrogate recovery outliers and the affected sample results.

1.2.6 FD Precision

FD samples were collected to evaluate the precision of matrix and/or laboratory procedures. The frequency criterion for FD, one per ten primary samples, was met for each analytical method, as outlined in the Section 2.3.1 of the quality assurance project plan (USACE 2018). Table F2-1-1 provides a summary of the FD quantities, summarized by analytical method.

FD precision was evaluated against the recommended RPD limit of 50 percent, as stated in the ADEC *Field Sampling Guidance* (ADEC 2017b). RPD values for sample/duplicate pair results, where one was ND and the other was detected, were calculated using the LOD value for the ND result. Results were qualified as estimated (QN) in several samples due to high FD RPD values. All qualified results were less than the respective SSCLs except for those listed in Table F2-1-3.

Table F2-1-3
Duplicate Results Exceeding DD Limits

Sample ID	Analyte	Result (mg/kg)	NE Cape DD SSCL (mg/kg)
18NEC-S28-SD-38	2-Methylnaphthalene	13	0.6
18NEC-S28-SD-38-8	2-Methylnaphthalene	55	0.6
18NEC-S28-SD-38-8	Acenaphthene	1.37	0.5
18NEC-S28-SD-38-8	DRO	6620	3500
18NEC-S28-SD-38-8	DRO-silica gel	4610	3500
18NEC-S28-SD-38-8	Fluorene	2.31	0.8
18NEC-S28-SD-38	Naphthalene	12.1	1.7
18NEC-S28-SD-38-8	Naphthalene	21	1.7
18NEC-S28-SD-48	2-Methylnaphthalene	303	0.6
18NEC-S28-SD-48-8	2-Methylnaphthalene	170	0.6
18NEC-S28-SD-48	Naphthalene	122	1.7
18NEC-S28-SD-48-8	Naphthalene	72.1	1.7
18NEC-S28-SD-48	Phenanthrene	9.99	4.8
18NEC-S28-SD-48-8	Phenanthrene	5.72	4.8

Note:
For definitions, refer to the Acronyms and Abbreviations section.

The high RPD values are attributed to the sample matrix, which contained high and variable levels of naturally occurring organics. Unless otherwise noted, the higher value between the sample and the FD will be used for reporting purposes. Table F-2.2 (Exhibit F2-2) provides a summary of sample results that were qualified QN due to FD RPD outliers.

1.2.7 Calibration Verification Samples

The laboratory did not identify any instrument QC issues that required qualification of associated samples.

1.2.8 Reporting Limit Assessment

Laboratory LODs for ND sample results were evaluated against the SSCLs defined in Table 2-1 of the quality assurance project plan (USACE 2018). The confidence level at the LOD was 99 percent (1 percent false negative rate) as per the DoD QSM definition. This level of uncertainty was deemed acceptable for this DQA.

The laboratory LODs were greater than the SSCLs for five analytes in seven instances. For sample 18NEC-S28-SD-34, 2-methlynaphthalene and acenaphthene were greater than the SSCLs due to a 10-fold dilution. For sample 18NEC-S28-SD-35, acenaphthene was greater than the SSCLs due to a 10-fold dilution. Aroclor 1221 was also greater than the total PCB SSCL for 8NEC-S28-SD-35 in an undiluted analysis. 18NEC-S28-SD-36, acenaphthene and fluorene were greater than the SSCLs due to a 10-fold dilution. Aroclor 1221 was also greater than the total PCB SSCL for 8NEC-S28-SD-36 in an undiluted analysis.

The overall data quality was not significantly affected for this issue because of the limited number of occurrences and the fact that sample dilution was the primary cause. Additionally, Aroclor 1221 was not found in any historical NEC samples above the total PCB SSCL. ND samples that had LODs exceeding the cleanup level are shown in italics in the analytical data tables (Exhibit F2-1) and listed in Table F-2.3 (Exhibit F2-2).

1.2.9 EB Contamination

One equipment blank (EB) was collected during this project for the sediment effort. Naphthalene and zinc were detected above the DL in the EB; however, samples were not qualified unless the result was within five times the EB contamination. EB detections are shown in Table F-2.4 (Exhibit F2-2). There were no results that required qualification due to EB detections.

2.0 CONCLUSION

In general, the overall quality of project data was acceptable. The completeness goal of 95 percent for all parameters was met as no results were rejected (100 percent completeness). Seven ND LOD values exceeded the SSCLs but did not significantly affect data usability due to the limited extent of occurrences and the analytes involved.

A review of the chromatographs led to the conclusion that the DRO and residual-range organics (RRO) results in the sediment samples are elevated due to naturally occurring biogenic interference. A silica gel cleanup applied during the sample extraction reduced but did not eliminate the interference. See Section 4.3.2 of the 2018 Site 28 Sediment Mapping and Sampling Report (Appendix F) and the Biogenic Chromatograms (Exhibit F2-5) for more discussion of the impacts of biogenic interference.

The qualifications applied during data validation did not adversely affect data usability. Limitations are discussed in this DQA and ADEC laboratory data review checklists (Exhibit F2-3).

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3.0 REFERENCES

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EPA (U.S. Environmental Protection Agency). 2014 (July). *Test Methods for Evaluating Solid Waste*. SW846, Third Edition, Update V.

USACE (U.S. Army Corps of Engineers) 2009 (September). *Decision Document: Hazardous, Toxic, and Radioactive Waste Project #F10AK096903. Northeast Cape Formerly Used Defense Site St. Lawrence Island, Alaska*. Signed 3 September 2009. F10AK09603_05.09_0500_a.

USACE 2018 (July). *2018 Remedial Action Review Work Plan*. Final. Prepared by Jacobs Engineering Group Inc. F10AK096903_07.04_0514_a.

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EXHIBIT F2-1

Sample Summary Table and Analytical Data Tables

2018 Site 28 Sediment Mapping and Sampling Report at Northeast Cape
Table F-1.1 Sediment Results

Method	Group	Analyte	Units	Screening Level[1]	S28-01	S28-02	S28-02	S28-03	S28-04	S28-05	S28-06
				Sample ID:	18NEC-S28-SD-01	18NEC-S28-SD-02	18NEC-S28-SD-02-8	18NEC-S28-SD-03	18NEC-S28-SD-04	18NEC-S28-SD-05	18NEC-S28-SD-06
				Sample Date:	8/7/2018	8/7/2018	8/7/2018	8/7/2018	8/7/2018	8/7/2018	8/7/2018
				Sample Type:	SD	SD	SD	SD	SD	SD	SD
				SDG:	1184373	1184373	1184373	1184373	1184373	1184373	1184373
				Laboratory:	SGSA	SGSA	SGSA	SGSA	SGSA	SGSA	SGSA
				QAQC:	Primary	Primary	Duplicate	Primary	Primary	Primary	Primary
Fuels											
AK102_103	Fuels	DRO	mg/kg	3500	717 [44.6]	786 [42.4]	853 [38]	375 [29.4]	519 [31.6]	1540 [54]	429 [57]
AK102_103_SG	Fuels	DRO	mg/kg	3500	414 [44.6]	546 [42.4]	484 [38]	265 [29.4]	387 [31.6]	1110 [54]	237 [57]
AK102_103	Fuels	RRO	mg/kg	3500	2430 [44.6]	2270 [42.4]	2310 [38]	1060 [29.4]	1100 [31.6]	2220 [54]	1020 [57]
AK102_103_SG	Fuels	RRO	mg/kg	3500	984 [44.6]	785 [42.4]	727 [38]	396 [29.4]	396 [31.6]	835 [54]	351 [57]
PAHs											
8270SIM	PAHs	Acenaphthene	mg/kg	0.5	ND [0.279]	ND [0.266]	ND [0.234]	ND [0.181]	ND [0.199]	ND [0.335]	ND [0.353]
8270SIM	PAHs	Acenaphthylene	mg/kg	–	ND [0.279]	ND [0.266]	ND [0.234]	ND [0.181]	ND [0.199]	ND [0.335]	ND [0.353]
8270SIM	PAHs	Anthracene	mg/kg	–	ND [0.279]	ND [0.266]	ND [0.234]	ND [0.181]	ND [0.199]	ND [0.335]	ND [0.353]
8270SIM	PAHs	Benzo(a)anthracene	mg/kg	–	ND [0.279]	ND [0.266]	ND [0.234]	ND [0.181]	ND [0.199]	ND [0.335]	ND [0.353]
8270SIM	PAHs	Benzo(a)pyrene	mg/kg	–	ND [0.279]	ND [0.266]	ND [0.234]	ND [0.181]	ND [0.199]	ND [0.335]	ND [0.353]
8270SIM	PAHs	Benzo(b)fluoranthene	mg/kg	–	ND [0.279]	ND [0.266]	ND [0.234]	ND [0.181]	ND [0.199]	ND [0.335]	ND [0.353]
8270SIM	PAHs	Benzo(g,h,i)perylene	mg/kg	1.7	ND [0.279]	ND [0.266]	ND [0.234]	ND [0.181]	ND [0.199]	ND [0.335]	ND [0.353]
8270SIM	PAHs	Benzo(k)fluoranthene	mg/kg	–	ND [0.279]	ND [0.266]	ND [0.234]	ND [0.181]	ND [0.199]	ND [0.335]	ND [0.353]
8270SIM	PAHs	Chrysene	mg/kg	–	ND [0.279]	ND [0.266]	ND [0.234]	ND [0.181]	ND [0.199]	ND [0.335]	ND [0.353]
8270SIM	PAHs	Dibenzo(a,h)anthracene	mg/kg	–	ND [0.279]	ND [0.266]	ND [0.234]	ND [0.181]	ND [0.199]	ND [0.335]	ND [0.353]
8270SIM	PAHs	Fluoranthene	mg/kg	2	ND [0.279]	ND [0.266]	ND [0.234]	ND [0.181]	ND [0.199]	ND [0.335]	ND [0.353]
8270SIM	PAHs	Fluorene	mg/kg	0.8	ND [0.279]	ND [0.266]	ND [0.234]	ND [0.181]	ND [0.199]	ND [0.335]	ND [0.353]
8270SIM	PAHs	Indeno(1,2,3-cd)pyrene	mg/kg	3.2	ND [0.279]	ND [0.266]	ND [0.234]	ND [0.181]	ND [0.199]	ND [0.335]	ND [0.353]
8270SIM	PAHs	1-Methylnaphthalene	mg/kg	–	ND [0.279]	ND [0.266]	ND [0.234]	ND [0.181]	0.106 [0.199] J	ND [0.335]	ND [0.353]
8270SIM	PAHs	2-Methylnaphthalene	mg/kg	0.6	ND [0.279]	ND [0.266]	ND [0.234]	ND [0.181]	ND [0.199]	ND [0.335]	ND [0.353]
8270SIM	PAHs	Naphthalene	mg/kg	1.7	ND [0.223]	ND [0.212]	ND [0.187]	0.428 [0.145]	ND [0.159]	ND [0.268]	ND [0.283]
8270SIM	PAHs	Phenanthrene	mg/kg	4.8	ND [0.279]	ND [0.266]	ND [0.234]	ND [0.181]	ND [0.199]	ND [0.335]	ND [0.353]
8270SIM	PAHs	Pyrene	mg/kg	–	ND [0.279]	ND [0.266]	ND [0.234]	ND [0.181]	ND [0.199]	ND [0.335]	ND [0.353]
NR	PAHs	Total HPAHs	mg/kg	9.6	ND []	ND []	ND []	ND []	ND []	ND []	ND []
NR	PAHs	Total LPAHs	mg/kg	7.8	ND []	ND []	ND []	0.428 []	ND []	ND []	ND []
PCBs											
8082	PCBs	Aroclor-1016	mg/kg	0.7	ND [0.055]	ND [0.053]	ND [0.0468]	ND [0.0366]	ND [0.0399]	ND [0.067]	ND [0.072]
8082	PCBs	Aroclor-1221	mg/kg	0.7	ND [0.22]	ND [0.212]	ND [0.187]	ND [0.146]	ND [0.16]	ND [0.268]	ND [0.288]
8082	PCBs	Aroclor-1232	mg/kg	0.7	ND [0.055]	ND [0.053]	ND [0.0468]	ND [0.0366]	ND [0.0399]	ND [0.067]	ND [0.072]
8082	PCBs	Aroclor-1242	mg/kg	0.7	ND [0.055]	ND [0.053]	ND [0.0468]	ND [0.0366]	ND [0.0399]	ND [0.067]	ND [0.072]
8082	PCBs	Aroclor-1248	mg/kg	0.7	ND [0.055]	ND [0.053]	ND [0.0468]	ND [0.0366]	ND [0.0399]	ND [0.067]	ND [0.072]
8082	PCBs	Aroclor-1254	mg/kg	0.7	ND [0.055]	ND [0.053]	ND [0.0468]	ND [0.0366]	ND [0.0399]	ND [0.067]	ND [0.072]
8082	PCBs	Aroclor-1260	mg/kg	0.7	ND [0.055]	ND [0.053]	ND [0.0468]	ND [0.0366]	ND [0.0399]	ND [0.067]	ND [0.072]
8082	PCBs	PCBs	mg/kg	0.7	ND [0.055]	ND [0.053]	ND [0.0468]	ND [0.0366]	ND [0.0399]	ND [0.067]	ND [0.072]
Metals											
6020	Metals	Arsenic	mg/kg	93	5.88 [1.02]	7.76 [1.02]	6.28 [0.88]	2.64 [0.7]	3.21 [0.765]	19.7 [1.24]	30.3 [1.44]
6020	Metals	Chromium	mg/kg	270	15.5 [0.409]	15.3 [0.41]	12.6 [0.352]	8.6 [0.281]	6.77 [0.307]	11.4 [0.497]	6.73 [0.575]
6020	Metals	Lead	mg/kg	530	14.7 [0.205]	9.71 [0.205]	7.67 [0.176]	6.32 [0.141]	5.41 [0.154]	8.09 [0.249]	5.78 [0.287]
6020	Metals	Selenium	mg/kg	–	0.918 [1.02] J	1.37 [1.02] J,QN	0.804 [0.88] J,QN	0.522 [0.7] J	ND [0.765]	1.07 [1.24] J	ND [1.44]
6020	Metals	Zinc	mg/kg	960	47.3 [2.56]	35.3 [2.56]	29.2 [2.2]	22.8 [1.75]	19.4 [1.92]	39.8 [3.11]	32.2 [3.59]
IonsNutrients											
9060	IonsNutrients	TOC	percent	–	6.13	7.3	6.05	2.93	2.75	7.5	5.4
Other											
A2540G	Other	Total Solids	percent	–	44.5	46.9	52.5	67.6	62.7	37.1	34.6

Notes:
[1] Decision Document cleanup level (USACE 2009).
[ ] denotes the LOD or no number if no LOD was reported
Bold = Result is greater than or equal to the screening level[1]
= LOD greater than or equal to the screening level[1]
— = method or screening level not available or analysis not conducted
For data qualifiers, refer to the Analytical Data Qualifiers section of the DQA.
For definitions, refer to the Acronyms and Abbreviations section of the DQA.

Table F-1.1 Sediment Results

				Location ID:	S28-07	S28-08	S28-09	S28-10	S28-11	S28-12	S28-13
				Sample ID:	18NEC-S28-SD-07	18NEC-S28-SD-08	18NEC-S28-SD-09	18NEC-S28-SD-10	18NEC-S28-SD-11	18NEC-S28-SD-12	18NEC-S28-SD-13
				Sample Date:	8/7/2018	8/7/2018	8/7/2018	8/7/2018	8/7/2018	8/7/2018	8/7/2018
				Sample Type:	SD	SD	SD	SD	SD	SD	SD
				SDG:	1184373	1184373	1184373	1184373	1184373	1184373	1184373
				Laboratory:	SGSA	SGSA	SGSA	SGSA	SGSA	SGSA	SGSA
				QAQC:	Primary	Primary	Primary	Primary	Primary	Primary	Primary
Method	**Group**	**Analyte**	**Units**	**Screening Level[1]**							
Fuels											
AK102_103	Fuels	DRO	mg/kg	3500	214 [26.6]	300 [65.5]	445 [46.3]	617 [39.1]	1410 [70.5]	483 [51.5]	2230 [53.5]
AK102_103_SG	Fuels	DRO	mg/kg	3500	102 [26.6]	171 [65.5]	301 [46.3]	450 [39.1]	954 [70.5]	270 [51.5]	1890 [53.5]
AK102_103	Fuels	RRO	mg/kg	3500	1080 [26.6]	844 [65.5]	1280 [46.3]	1270 [39.1]	**3840 [70.5]**	1940 [51.5]	1280 [53.5]
AK102_103_SG	Fuels	RRO	mg/kg	3500	366 [26.6]	296 [65.5]	503 [46.3]	487 [39.1]	1660 [70.5]	656 [51.5]	698 [53.5]
PAHs											
8270SIM	PAHs	Acenaphthene	mg/kg	0.5	ND [0.167]	ND [0.407]	0.268 [0.291] J	ND [0.246]	ND [0.443]	ND [0.321]	ND [0.332]
8270SIM	PAHs	Acenaphthylene	mg/kg	–	ND [0.167]	ND [0.407]	ND [0.291]	ND [0.246]	ND [0.443]	ND [0.321]	ND [0.332]
8270SIM	PAHs	Anthracene	mg/kg	–	ND [0.167]	ND [0.407]	ND [0.291]	ND [0.246]	ND [0.443]	ND [0.321]	ND [0.332]
8270SIM	PAHs	Benzo(a)anthracene	mg/kg	–	ND [0.167]	ND [0.407]	ND [0.291]	ND [0.246]	ND [0.443]	ND [0.321]	ND [0.332]
8270SIM	PAHs	Benzo(a)pyrene	mg/kg	–	ND [0.167]	ND [0.407]	ND [0.291]	ND [0.246]	ND [0.443]	ND [0.321]	ND [0.332]
8270SIM	PAHs	Benzo(b)fluoranthene	mg/kg	–	ND [0.167]	ND [0.407]	ND [0.291]	ND [0.246]	ND [0.443]	ND [0.321]	ND [0.332]
8270SIM	PAHs	Benzo(g,h,i)perylene	mg/kg	1.7	ND [0.167]	ND [0.407]	ND [0.291]	ND [0.246]	ND [0.443]	ND [0.321]	ND [0.332]
8270SIM	PAHs	Benzo(k)fluoranthene	mg/kg	–	ND [0.167]	ND [0.407]	ND [0.291]	ND [0.246]	ND [0.443]	ND [0.321]	ND [0.332]
8270SIM	PAHs	Chrysene	mg/kg	–	ND [0.167]	ND [0.407]	ND [0.291]	ND [0.246]	ND [0.443]	ND [0.321]	ND [0.332]
8270SIM	PAHs	Dibenzo(a,h)anthracene	mg/kg	–	ND [0.167]	ND [0.407]	ND [0.291]	ND [0.246]	ND [0.443]	ND [0.321]	ND [0.332]
8270SIM	PAHs	Fluoranthene	mg/kg	2	ND [0.167]	ND [0.407]	0.437 [0.291] J	ND [0.246]	ND [0.443]	ND [0.321]	ND [0.332]
8270SIM	PAHs	Fluorene	mg/kg	0.8	ND [0.167]	ND [0.407]	0.238 [0.291] J	ND [0.246]	ND [0.443]	ND [0.321]	ND [0.332]
8270SIM	PAHs	Indeno(1,2,3-cd)pyrene	mg/kg	3.2	ND [0.167]	ND [0.407]	ND [0.291]	ND [0.246]	ND [0.443]	ND [0.321]	ND [0.332]
8270SIM	PAHs	1-Methylnaphthalene	mg/kg	–	ND [0.167]	ND [0.407]	0.17 [0.291] J	ND [0.246]	ND [0.443]	ND [0.321]	ND [0.332]
8270SIM	PAHs	2-Methylnaphthalene	mg/kg	0.6	ND [0.167]	ND [0.407]	0.232 [0.291] J	0.125 [0.246] J	0.233 [0.443] J	ND [0.321]	ND [0.332]
8270SIM	PAHs	Naphthalene	mg/kg	1.7	ND [0.133]	ND [0.326]	0.336 [0.233] J	ND [0.196]	ND [0.354]	ND [0.257]	ND [0.266]
8270SIM	PAHs	Phenanthrene	mg/kg	4.8	ND [0.167]	ND [0.407]	0.608 [0.291]	ND [0.246]	ND [0.443]	ND [0.321]	ND [0.332]
8270SIM	PAHs	Pyrene	mg/kg	–	ND [0.167]	ND [0.407]	0.28 [0.291] J	ND [0.246]	ND [0.443]	ND [0.321]	ND [0.332]
NR	PAHs	Total HPAHs	mg/kg	9.6	ND []	ND []	0.717 []	ND []	ND []	ND []	ND []
NR	PAHs	Total LPAHs	mg/kg	7.8	ND []	ND []	1.45 []	ND []	ND []	ND []	ND []
PCBs											
8082	PCBs	Aroclor-1016	mg/kg	0.7	ND [0.0333]	ND [0.082]	ND [0.0575]	ND [0.0494]	ND [0.0885]	ND [0.064]	ND [0.067]
8082	PCBs	Aroclor-1221	mg/kg	0.7	ND [0.133]	ND [0.327]	ND [0.23]	ND [0.198]	ND [0.353]	ND [0.256]	ND [0.269]
8082	PCBs	Aroclor-1232	mg/kg	0.7	ND [0.0333]	ND [0.082]	ND [0.0575]	ND [0.0494]	ND [0.0885]	ND [0.064]	ND [0.067]
8082	PCBs	Aroclor-1242	mg/kg	0.7	ND [0.0333]	ND [0.082]	ND [0.0575]	ND [0.0494]	ND [0.0885]	ND [0.064]	ND [0.067]
8082	PCBs	Aroclor-1248	mg/kg	0.7	ND [0.0333]	ND [0.082]	ND [0.0575]	ND [0.0494]	ND [0.0885]	ND [0.064]	ND [0.067]
8082	PCBs	Aroclor-1254	mg/kg	0.7	ND [0.0333]	ND [0.082]	ND [0.0575]	ND [0.0494]	ND [0.0885]	ND [0.064]	ND [0.067]
8082	PCBs	Aroclor-1260	mg/kg	0.7	ND [0.0333]	ND [0.082]	ND [0.0575]	ND [0.0494]	ND [0.0885]	ND [0.064]	ND [0.067]
8082	PCBs	PCBs	mg/kg	0.7	ND [0.0333]	ND [0.082]	ND [0.0575]	ND [0.0494]	ND [0.0885]	ND [0.064]	ND [0.067]
Metals											
6020	Metals	Arsenic	mg/kg	93	4.95 [0.615]	32.7 [1.5]	16.9 [1.12]	9.09 [0.95]	25.4 [1.66]	21.6 [1.18]	45.4 [1.3]
6020	Metals	Chromium	mg/kg	270	22.8 [0.246]	7.91 [0.6]	9.59 [0.446]	9.14 [0.379]	20 [0.665]	18.1 [0.47]	6.1 [0.525]
6020	Metals	Lead	mg/kg	530	9.45 [0.123]	6.62 [0.3]	7.63 [0.223]	7.27 [0.19]	13.3 [0.332]	9.78 [0.235]	5.74 [0.262]
6020	Metals	Selenium	mg/kg	–	0.472 [0.615] J	1.13 [1.5] J	ND [1.12]	ND [0.95]	1.66 [1.66] J	0.964 [1.18] J	1.5 [1.3] J
6020	Metals	Zinc	mg/kg	960	45 [1.54]	37.8 [3.75]	35.2 [2.79]	28.4 [2.37]	67.5 [4.14]	53.2 [2.94]	36 [3.27]
IonsNutrients											
9060	IonsNutrients	TOC	percent	–	3	6	5.85	3.49	13	6.47	6.7
Other											
A2540G	Other	Total Solids	percent	–	74.9	30.5	42.9	50.4	28	38.8	37

Notes:

[1] Decision Document cleanup level (USACE 2009).

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2018 Site 28 Sediment Mapping and Sampling Report at Northeast Cape
Table F-1.1 Sediment Results

				Location ID:	S28-14	S28-15	S28-16	S28-17	S28-17	S28-18	S28-19
				Sample ID:	18NEC-S28-SD-14	18NEC-S28-SD-15	18NEC-S28-SD-16	18NEC-S28-SD-17	18NEC-S28-SD-17-8	18NEC-S28-SD-18	18NEC-S28-SD-19
				Sample Date:	8/7/2018	8/7/2018	8/7/2018	8/7/2018	8/7/2018	8/7/2018	8/7/2018
				Sample Type:	SD	SD	SD	SD	SD	SD	SD
				SDG:	1184373	1184373	1184373	1184430	1184430	1184430	1184430
				Laboratory:	SGSA	SGSA	SGSA	SGSA	SGSA	SGSA	SGSA
				QAQC:	Primary	Primary	Primary	Primary	Duplicate	Primary	Primary
Method	**Group**	**Analyte**	**Units**	**Screening Level[1]**							
Fuels											
AK102_103	Fuels	DRO	mg/kg	3500	**27900 [600]**	**105000 [2665]**	**76000 [2375]**	**57800 [2185]**	**48700 [2910]**	**74600 [3265]**	**51600 [2315]**
AK102_103_SG	Fuels	DRO	mg/kg	3500	**22700 [600]**	**77200 [2665]**	**64100 [2375]**	**52500 [2185]**	**43100 [2910]**	**62200 [3265]**	**38600 [2315]**
AK102_103	Fuels	RRO	mg/kg	3500	**10300 [600]**	**28600 [2665]**	**23100 [2375]**	**15100 [2185]**	**14900 [2910]**	**14900 [3265]**	**13100 [2315]**
AK102_103_SG	Fuels	RRO	mg/kg	3500	**6380 [600]**	**19800 [2665]**	**16500 [2375]**	**12100 [2185]**	**11800 [2910]**	**10800 [3265]**	**8450 [2315]**
PAHs											
8270SIM	PAHs	Acenaphthene	mg/kg	0.5	**1.49 [0.373]**	**11.5 [4.17]**	**3.45 [0.37]**	**4.23 [0.273]**	**3.91 [0.366]**	ND [0.407]	**3.55 [0.284]**
8270SIM	PAHs	Acenaphthylene	mg/kg	–	ND [0.373]	ND [4.17]	ND [0.37]	ND [0.273]	ND [0.366]	ND [0.407]	ND [0.284]
8270SIM	PAHs	Anthracene	mg/kg	–	ND [0.373]	ND [4.17]	ND [0.37]	ND [0.273]	ND [0.366]	ND [0.407]	ND [0.284]
8270SIM	PAHs	Benzo(a)anthracene	mg/kg	–	ND [0.373]	ND [0.416]	ND [0.37]	0.171 [0.273] J,QN	ND [0.366] QN	ND [0.407]	ND [0.284]
8270SIM	PAHs	Benzo(a)pyrene	mg/kg	–	ND [0.373]	ND [0.416]	ND [0.37]	ND [0.273]	ND [0.366]	ND [0.407]	ND [0.284]
8270SIM	PAHs	Benzo(b)fluoranthene	mg/kg	–	ND [0.373]	ND [0.416]	ND [0.37]	ND [0.273]	ND [0.366]	ND [0.407]	ND [0.284]
8270SIM	PAHs	Benzo(g,h,i)perylene	mg/kg	1.7	ND [0.373]	ND [0.416]	ND [0.37]	ND [0.273]	ND [0.366]	ND [0.407]	ND [0.284]
8270SIM	PAHs	Benzo(k)fluoranthene	mg/kg	–	ND [0.373]	ND [0.416]	ND [0.37]	ND [0.273]	ND [0.366]	ND [0.407]	ND [0.284]
8270SIM	PAHs	Chrysene	mg/kg	–	ND [0.373]	0.279 [0.416] J	0.226 [0.37] J	0.437 [0.273] J	0.332 [0.366] J	0.263 [0.407] J	0.196 [0.284] J
8270SIM	PAHs	Dibenzo(a,h)anthracene	mg/kg	–	ND [0.373]	ND [0.416]	ND [0.37]	ND [0.273]	ND [0.366]	ND [0.407]	ND [0.284]
8270SIM	PAHs	Fluoranthene	mg/kg	2	0.262 [0.373] J	0.596 [0.416] J	0.621 [0.37] J	1.4 [0.273]	1.03 [0.366]	ND [0.407]	0.677 [0.284]
8270SIM	PAHs	Fluorene	mg/kg	0.8	**2.03 [0.373]**	**17.5 [4.17]**	**5.17 [0.37]**	**5.15 [0.273]**	**4.76 [0.366]**	**10.1 [0.407]**	**6.57 [0.284]**
8270SIM	PAHs	Indeno(1,2,3-cd)pyrene	mg/kg	3.2	ND [0.373]	ND [0.416]	ND [0.37]	ND [0.273]	ND [0.366]	ND [0.407]	ND [0.284]
8270SIM	PAHs	1-Methylnaphthalene	mg/kg	–	9.44 [0.373]	67.2 [4.17]	26.5 [1.85]	62.4 [2.73]	62.2 [3.67]	73.2 [4.07]	103 [5.7]
8270SIM	PAHs	2-Methylnaphthalene	mg/kg	0.6	**11.1 [0.373]**	**68.5 [4.17]**	**27.8 [1.85]**	**98.7 [2.73]**	**99.6 [3.67]**	**99.9 [4.07]**	**161 [5.7]**
8270SIM	PAHs	Naphthalene	mg/kg	1.7	**4.45 [0.298]**	**26.2 [3.33]**	**8.67 [0.295]**	**53.6 [2.18]**	**55.4 [2.94]**	**35.3 [3.26]**	**61.3 [4.54]**
8270SIM	PAHs	Phenanthrene	mg/kg	4.8	1.24 [0.373]	**8.8 [4.17]**	3.11 [0.37]	3.45 [0.273]	3.14 [0.366]	**5.67 [0.407]**	3.4 [0.284]
8270SIM	PAHs	Pyrene	mg/kg	–	0.427 [0.373] J	1.17 [0.416]	0.951 [0.37]	1.28 [0.273]	0.937 [0.366]	0.649 [0.407] J	0.623 [0.284]
NR	PAHs	Total HPAHs	mg/kg	9.6	0.689 []	2.045 []	1.798 []	3.288 []	2.299 []	0.912 []	1.496 []
NR	PAHs	Total LPAHs	mg/kg	7.8	**9.21 []**	**64 []**	**20.4 []**	**66.43 []**	**67.21 []**	**51.07 []**	**74.82 []**
PCBs											
8082	PCBs	Aroclor-1016	mg/kg	0.7	ND [0.0745]	ND [0.0825]	ND [0.073]	ND [0.055]	ND [0.0735]	ND [0.0825]	ND [0.058]
8082	PCBs	Aroclor-1221	mg/kg	0.7	ND [0.298]	ND [0.331]	ND [0.292]	ND [0.221]	ND [0.293]	ND [0.329]	ND [0.231]
8082	PCBs	Aroclor-1232	mg/kg	0.7	ND [0.0745]	ND [0.0825]	ND [0.073]	ND [0.055]	ND [0.0735]	ND [0.0825]	ND [0.058]
8082	PCBs	Aroclor-1242	mg/kg	0.7	ND [0.0745]	ND [0.0825]	ND [0.073]	ND [0.055]	ND [0.0735]	ND [0.0825]	ND [0.058]
8082	PCBs	Aroclor-1248	mg/kg	0.7	ND [0.0745]	ND [0.0825]	ND [0.073]	ND [0.055]	ND [0.0735]	ND [0.0825]	ND [0.058]
8082	PCBs	Aroclor-1254	mg/kg	0.7	ND [0.0745]	ND [0.0825]	ND [0.073]	ND [0.055]	ND [0.0735]	ND [0.0825]	ND [0.058]
8082	PCBs	Aroclor-1260	mg/kg	0.7	0.196 [0.0745]	0.349 [0.0825]	0.331 [0.073]	0.482 [0.055]	0.367 [0.0735]	0.284 [0.0825]	0.127 [0.058]
8082	PCBs	PCBs	mg/kg	0.7	0.196 [0.0745]	0.349 [0.0825]	0.331 [0.073]	0.482 [0.055]	0.367 [0.0735]	0.284 [0.0825]	0.127 [0.058]
Metals											
6020	Metals	Arsenic	mg/kg	93	9.83 [1.5]	16.3 [1.56]	26.4 [1.38]	10.7 [1.08]	16.9 [1.44]	31.9 [1.65]	6.92 [1.14]
6020	Metals	Chromium	mg/kg	270	20.7 [0.595]	31.5 [0.625]	23.1 [0.55]	27.2 [0.431]	24 [0.575]	18.8 [0.66]	21.2 [0.455]
6020	Metals	Lead	mg/kg	530	19.3 [0.298]	58.5 [0.312]	35.7 [0.276]	33.3 [0.216]	27.8 [0.288]	31.5 [0.329]	21.5 [0.227]
6020	Metals	Selenium	mg/kg	–	1.72 [1.5] J	1.66 [1.56] J	1.56 [1.38] J	1.82 [1.08] J	2.23 [1.44] J	1.73 [1.65] J	2.02 [1.14] J
6020	Metals	Zinc	mg/kg	960	82.2 [3.73]	192 [3.9]	165 [3.44]	168 [2.69]	178 [3.6]	116 [4.11]	81.4 [2.84]
IonsNutrients											
9060	IonsNutrients	TOC	percent	–	15.7	17.9	11.6	15.2	13.1	16.8	14.2
Other											
A2540G	Other	Total Solids	percent	–	33.2	29.9	33.6	45.2	34.1	30.3	43.1

Notes:

[1] Decision Document cleanup level (USACE 2009).

[ ] denotes the LOD or no number if no LOD was reported

Bold = Result is greater than or equal to the screening level[1]

= LOD greater than or equal to the screening level[1]

— = method or screening level not available or analysis not conducted

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Table F-1.1 Sediment Results

				Location ID:	S28-20	S28-21	S28-22	S28-23	S28-24	S28-25	S28-26
				Sample ID:	18NEC-S28-SD-20	18NEC-S28-SD-21	18NEC-S28-SD-22	18NEC-S28-SD-23	18NEC-S28-SD-24	18NEC-S28-SD-25	18NEC-S28-SD-26
				Sample Date:	8/7/2018	8/7/2018	8/7/2018	8/7/2018	8/7/2018	8/8/2018	8/8/2018
				Sample Type:	SD	SD	SD	SD	SD	SD	SD
				SDG:	1184430	1184430	1184430	1184430	1184430	1184430	1184430
				Laboratory:	SGSA	SGSA	SGSA	SGSA	SGSA	SGSA	SGSA
				QAQC:	Primary	Primary	Primary	Primary	Primary	Primary	Primary
Method	**Group**	**Analyte**	**Units**	**Screening Level[1]**							
Fuels											
AK102_103	Fuels	DRO	mg/kg	3500	**44800 [2135]**	**4000 [365]**	2420 [685]	**7210 [482]**	**4390 [433]**	**8730 [695]**	**8970 [675]**
AK102_103_SG	Fuels	DRO	mg/kg	3500	**34900 [2135]**	3390 [365]	1910 [685]	**5710 [482]**	3460 [433]	**6810 [695]**	**7970 [675]**
AK102_103	Fuels	RRO	mg/kg	3500	**12200 [2135]**	1900 [365]	3370 [685]	3300 [482]	2170 [433]	1670 [695]	**3640 [675]**
AK102_103_SG	Fuels	RRO	mg/kg	3500	**7950 [2135]**	850 [365]	1150 [685] J	985 [482]	634 [433] J	563 [695] J	2780 [675]
PAHs											
8270SIM	PAHs	Acenaphthene	mg/kg	0.5	**3.47 [0.267]**	0.364 [0.227] J	ND [0.426]	0.427 [0.301] J	0.234 [0.267] J	ND [0.435]	ND [0.423]
8270SIM	PAHs	Acenaphthylene	mg/kg	–	ND [0.267]	ND [0.227]	ND [0.426]	ND [0.301]	ND [0.267]	ND [0.435]	ND [0.423]
8270SIM	PAHs	Anthracene	mg/kg	–	ND [0.267]	ND [0.227]	ND [0.426]	ND [0.301]	ND [0.267]	ND [0.435]	ND [0.423]
8270SIM	PAHs	Benzo(a)anthracene	mg/kg	–	ND [0.267]	ND [0.227]	ND [0.426]	ND [0.301]	ND [0.267]	ND [0.435]	ND [0.423]
8270SIM	PAHs	Benzo(a)pyrene	mg/kg	–	ND [0.267]	ND [0.227]	ND [0.426]	ND [0.301]	ND [0.267]	ND [0.435]	ND [0.423]
8270SIM	PAHs	Benzo(b)fluoranthene	mg/kg	–	ND [0.267]	ND [0.227]	ND [0.426]	ND [0.301]	ND [0.267]	ND [0.435]	ND [0.423]
8270SIM	PAHs	Benzo(g,h,i)perylene	mg/kg	1.7	ND [0.267]	ND [0.227]	ND [0.426]	ND [0.301]	ND [0.267]	ND [0.435]	ND [0.423]
8270SIM	PAHs	Benzo(k)fluoranthene	mg/kg	–	ND [0.267]	ND [0.227]	ND [0.426]	ND [0.301]	ND [0.267]	ND [0.435]	ND [0.423]
8270SIM	PAHs	Chrysene	mg/kg	–	0.203 [0.267] J	0.231 [0.227] J	ND [0.426]	ND [0.301]	ND [0.267]	ND [0.435]	ND [0.423]
8270SIM	PAHs	Dibenzo(a,h)anthracene	mg/kg	–	ND [0.267]	ND [0.227]	ND [0.426]	ND [0.301]	ND [0.267]	ND [0.435]	ND [0.423]
8270SIM	PAHs	Fluoranthene	mg/kg	2	0.682 [0.267]	1.87 [0.227]	ND [0.426]	ND [0.301]	ND [0.267]	ND [0.435]	ND [0.423]
8270SIM	PAHs	Fluorene	mg/kg	0.8	**5.11 [0.267]**	**0.866 [0.227]**	ND [0.426]	0.503 [0.301] J	0.311 [0.267] J	0.252 [0.435] J	ND [0.423]
8270SIM	PAHs	Indeno(1,2,3-cd)pyrene	mg/kg	3.2	ND [0.267]	ND [0.227]	ND [0.426]	ND [0.301]	ND [0.267]	ND [0.435]	ND [0.423]
8270SIM	PAHs	1-Methylnaphthalene	mg/kg	–	97.1 [5.35]	0.531 [0.227]	2.89 [0.426]	12.7 [0.301]	8.68 [0.267]	0.821 [0.435] J	ND [0.423]
8270SIM	PAHs	2-Methylnaphthalene	mg/kg	0.6	**152 [5.35]**	**0.738 [0.227]**	**3.95 [0.426]**	**23 [1.21]**	**14.3 [0.535]**	**0.962 [0.435]**	ND [0.423]
8270SIM	PAHs	Naphthalene	mg/kg	1.7	**53.7 [4.28]**	0.491 [0.181]	**2.12 [0.342]**	**5.24 [0.24]**	**6.88 [0.213]**	0.372 [0.348] J	0.476 [0.339] J
8270SIM	PAHs	Phenanthrene	mg/kg	4.8	3.33 [0.267]	4.02 [0.227]	ND [0.426]	0.202 [0.301] J	ND [0.267]	ND [0.435]	ND [0.423]
8270SIM	PAHs	Pyrene	mg/kg	–	0.567 [0.267]	1.05 [0.227]	ND [0.426]	ND [0.301]	ND [0.267]	ND [0.435]	ND [0.423]
NR	PAHs	Total HPAHs	mg/kg	9.6	1.452 []	3.151 []	ND []	ND []	ND []	ND []	ND []
NR	PAHs	Total LPAHs	mg/kg	7.8	**65.61 []**	5.741 []	2.12 []	6.372 []	7.425 []	0.624 []	0.476 []
PCBs											
8082	PCBs	Aroclor-1016	mg/kg	0.7	ND [0.0535]	ND [0.0456]	ND [0.085]	ND [0.06]	ND [0.0535]	ND [0.0865]	ND [0.0845]
8082	PCBs	Aroclor-1221	mg/kg	0.7	ND [0.213]	ND [0.183]	ND [0.341]	ND [0.24]	ND [0.214]	ND [0.347]	ND [0.339]
8082	PCBs	Aroclor-1232	mg/kg	0.7	ND [0.0535]	ND [0.0456]	ND [0.085]	ND [0.06]	ND [0.0535]	ND [0.0865]	ND [0.0845]
8082	PCBs	Aroclor-1242	mg/kg	0.7	ND [0.0535]	ND [0.0456]	ND [0.085]	ND [0.06]	ND [0.0535]	ND [0.0865]	ND [0.0845]
8082	PCBs	Aroclor-1248	mg/kg	0.7	ND [0.0535]	ND [0.0456]	ND [0.085]	ND [0.06]	ND [0.0535]	ND [0.0865]	ND [0.0845]
8082	PCBs	Aroclor-1254	mg/kg	0.7	ND [0.0535]	ND [0.0456]	ND [0.085]	ND [0.06]	ND [0.0535]	ND [0.0865]	ND [0.0845]
8082	PCBs	Aroclor-1260	mg/kg	0.7	0.177 [0.0535]	ND [0.0456]	ND [0.085]	ND [0.06]	ND [0.0535]	ND [0.0865]	0.0669 [0.0845] J
8082	PCBs	PCBs	mg/kg	0.7	0.177 [0.0535]	ND [0.0456]	ND [0.085]	ND [0.06]	ND [0.0535]	ND [0.0865]	0.0669 [0.0845]
Metals											
6020	Metals	Arsenic	mg/kg	93	8.99 [1.05]	20.1 [0.87]	22.7 [1.65]	20.5 [1.14]	20.9 [1.04]	52.7 [1.69]	60.1 [1.61]
6020	Metals	Chromium	mg/kg	270	24.6 [0.42]	8.27 [0.347]	13.9 [0.66]	16.9 [0.454]	12.3 [0.416]	17.6 [0.675]	11.1 [0.64]
6020	Metals	Lead	mg/kg	530	23.6 [0.21]	10.4 [0.173]	8.32 [0.33]	8.05 [0.227]	6.01 [0.208]	12.6 [0.339]	13.1 [0.321]
6020	Metals	Selenium	mg/kg	–	2.01 [1.05] J	0.708 [0.87] J	2.01 [1.65] J	1.89 [1.14] J	1.57 [1.04] J	1.49 [1.69] J	2.09 [1.61] J
6020	Metals	Zinc	mg/kg	960	103 [2.63]	83.7 [2.17]	30.8 [4.12]	37.4 [2.84]	31.7 [2.6]	52 [4.23]	53.4 [4]
IonsNutrients											
9060	IonsNutrients	TOC	percent	–	11.6	3.74	12.8	10	7.17	8.36	7.88
Other											
A2540G	Other	Total Solids	percent	–	46.6	54	29.2	41	46	28.5	29.4

Notes:

[1] Decision Document cleanup level (USACE 2009).
[ ] denotes the LOD or no number if no LOD was reported
Bold = Result is greater than or equal to the screening level[1]
= LOD greater than or equal to the screening level[1]
— = method or screening level not available or analysis not conducted
For data qualifiers, refer to the Analytical Data Qualifiers section of the DQA.
For definitions, refer to the Acronyms and Abbreviations section of the DQA.

2018 Site 28 Sediment Mapping and Sampling Report at Northeast Cape
Table F-1.1 Sediment Results

				Location ID:	S28-27	S28-27	S28-28	S28-29	S28-30	S28-31	S28-32
				Sample ID:	18NEC-S28-SD-27	18NEC-S28-SD-27-8	18NEC-S28-SD-28	18NEC-S28-SD-29	18NEC-S28-SD-30	18NEC-S28-SD-31	18NEC-S28-SD-32
				Sample Date:	8/8/2018	8/8/2018	8/8/2018	8/8/2018	8/8/2018	8/8/2018	8/8/2018
				Sample Type:	SD	SD	SD	SD	SD	SD	SD
				SDG:	1184430	1184430	1184430	1184430	1184430	1184430	1184430
				Laboratory:	SGSA	SGSA	SGSA	SGSA	SGSA	SGSA	SGSA
				QAQC:	Primary	Duplicate	Primary	Primary	Primary	Primary	Primary
Method	**Group**	**Analyte**	**Units**	**Screening Level[1]**							
Fuels											
AK102_103	Fuels	DRO	mg/kg	3500	**9770 [775]**	**6890 [805]**	**101000 [4990]**	**62100 [2535]**	**38000 [2775]**	**12200 [443]**	**23400 [500]**
AK102_103_SG	Fuels	DRO	mg/kg	3500	**6020 [775]**	**4720 [805]**	**94100 [4990]**	**51600 [5050]**	**40500 [555]**	**10800 [443]**	**19600 [500]**
AK102_103	Fuels	RRO	mg/kg	3500	**12100 [775]**	**11000 [805]**	**16700 [4990]**	**13400 [2535]**	**7060 [2775]**	**5700 [443]**	**4010 [500]**
AK102_103_SG	Fuels	RRO	mg/kg	3500	**3540 [775]**	**3530 [805]**	**15700 [4990]**	**10700 [5050]**	3400 [555]	**3570 [443]**	2020 [500]
PAHs											
8270SIM	PAHs	Acenaphthene	mg/kg	0.5	ND [0.491]	ND [0.499]	**16 [12.5] J**	**4.45 [0.314]**	**1.97 [0.344]**	ND [0.276]	ND [0.314]
8270SIM	PAHs	Acenaphthylene	mg/kg	–	ND [0.491]	ND [0.499]	ND [12.5]	ND [0.314]	ND [0.344]	ND [0.276]	ND [0.314]
8270SIM	PAHs	Anthracene	mg/kg	–	ND [0.491]	ND [0.499]	ND [12.5]	ND [0.314]	ND [0.344]	ND [0.276]	ND [0.314]
8270SIM	PAHs	Benzo(a)anthracene	mg/kg	–	ND [0.491]	ND [0.499]	ND [0.251]	ND [0.314]	ND [0.344]	ND [0.276]	ND [0.314]
8270SIM	PAHs	Benzo(a)pyrene	mg/kg	–	ND [0.491]	ND [0.499]	ND [0.251]	ND [0.314]	ND [0.344]	ND [0.276]	ND [0.314]
8270SIM	PAHs	Benzo(b)fluoranthene	mg/kg	–	ND [0.491]	ND [0.499]	ND [0.251]	ND [0.314]	ND [0.344]	ND [0.276]	ND [0.314]
8270SIM	PAHs	Benzo(g,h,i)perylene	mg/kg	1.7	ND [0.491]	ND [0.499]	ND [0.251]	ND [0.314]	ND [0.344]	ND [0.276]	ND [0.314]
8270SIM	PAHs	Benzo(k)fluoranthene	mg/kg	–	ND [0.491]	ND [0.499]	ND [0.251]	ND [0.314]	ND [0.344]	ND [0.276]	ND [0.314]
8270SIM	PAHs	Chrysene	mg/kg	–	ND [0.491]	ND [0.499]	0.16 [0.251] J	ND [0.314]	ND [0.344]	ND [0.276]	ND [0.314]
8270SIM	PAHs	Dibenzo(a,h)anthracene	mg/kg	–	ND [0.491]	ND [0.499]	ND [0.251]	ND [0.314]	ND [0.344]	ND [0.276]	ND [0.314]
8270SIM	PAHs	Fluoranthene	mg/kg	2	ND [0.491]	ND [0.499]	ND [0.251]	ND [0.314]	ND [0.344]	ND [0.276]	ND [0.314]
8270SIM	PAHs	Fluorene	mg/kg	0.8	0.253 [0.491] J,QN	ND [0.499] QN	**25.3 [12.5]**	**7.72 [0.314]**	**3.33 [0.344]**	0.176 [0.276] J	0.519 [0.314] J
8270SIM	PAHs	Indeno(1,2,3-cd)pyrene	mg/kg	3.2	ND [0.491]	ND [0.499]	ND [0.251]	ND [0.314]	ND [0.344]	ND [0.276]	ND [0.314]
8270SIM	PAHs	1-Methylnaphthalene	mg/kg	–	6.68 [0.491]	6.34 [0.499]	310 [12.5]	49.4 [3.14]	33.1 [1.72]	0.97 [0.276]	4.67 [0.314]
8270SIM	PAHs	2-Methylnaphthalene	mg/kg	0.6	**5.49 [0.491]**	**5.79 [0.499]**	**425 [12.5]**	**29.3 [3.14]**	**42.2 [1.72]**	**0.606 [0.276]**	**4.51 [0.314]**
8270SIM	PAHs	Naphthalene	mg/kg	1.7	**1.92 [0.393]**	1.69 [0.399]	**144 [10]**	**8.16 [0.251]**	**5.7 [0.275]**	0.94 [0.221]	**3.67 [0.251]**
8270SIM	PAHs	Phenanthrene	mg/kg	4.8	ND [0.491]	ND [0.499]	**12.8 [12.5] J**	4.02 [0.314]	1.82 [0.344]	ND [0.276]	0.242 [0.314] J
8270SIM	PAHs	Pyrene	mg/kg	–	ND [0.491]	ND [0.499]	0.431 [0.251] J	0.336 [0.314] J	ND [0.344]	ND [0.276]	ND [0.314]
NR	PAHs	Total HPAHs	mg/kg	9.6	ND []	ND []	0.591 []	0.336 []	ND []	ND []	ND []
NR	PAHs	Total LPAHs	mg/kg	7.8	2.173 []	1.69 []	**198.1 []**	**24.35 []**	**12.82 []**	1.116 []	4.431 []
PCBs											
8082	PCBs	Aroclor-1016	mg/kg	0.7	ND [0.0985]	ND [0.1]	ND [0.0497]	ND [0.063]	ND [0.0695]	ND [0.0545]	ND [0.063]
8082	PCBs	Aroclor-1221	mg/kg	0.7	ND [0.394]	ND [0.401]	ND [0.199]	ND [0.253]	ND [0.279]	ND [0.219]	ND [0.252]
8082	PCBs	Aroclor-1232	mg/kg	0.7	ND [0.0985]	ND [0.1]	ND [0.0497]	ND [0.063]	ND [0.0695]	ND [0.0545]	ND [0.063]
8082	PCBs	Aroclor-1242	mg/kg	0.7	ND [0.0985]	ND [0.1]	ND [0.0497]	ND [0.063]	ND [0.0695]	ND [0.0545]	ND [0.063]
8082	PCBs	Aroclor-1248	mg/kg	0.7	ND [0.0985]	ND [0.1]	ND [0.0497]	ND [0.063]	ND [0.0695]	ND [0.0545]	ND [0.063]
8082	PCBs	Aroclor-1254	mg/kg	0.7	ND [0.0985]	ND [0.1]	ND [0.0497]	ND [0.063]	ND [0.0695]	ND [0.0545]	ND [0.063]
8082	PCBs	Aroclor-1260	mg/kg	0.7	0.0928 [0.0985] J	0.108 [0.1] J	0.218 [0.0497]	0.107 [0.063] J	0.0514 [0.0695] J	0.0835 [0.0545] J	0.0464 [0.063] J
8082	PCBs	PCBs	mg/kg	0.7	0.0928 [0.0985]	0.108 [0.1]	0.218 [0.0497]	0.107 [0.063]	0.0514 [0.0695]	0.0835 [0.0545]	0.0464 [0.063]
Metals											
6020	Metals	Arsenic	mg/kg	93	7.5 [1.9]	6.81 [1.93]	5.34 [0.925]	7.99 [1.2]	17.5 [1.35]	11.1 [1.03]	24.5 [1.17]
6020	Metals	Chromium	mg/kg	270	12.8 [0.755]	8.84 [0.77]	5.56 [0.37]	15.5 [0.478]	13 [0.54]	17.7 [0.412]	9.71 [0.469]
6020	Metals	Lead	mg/kg	530	16.1 [0.379] QN	8.17 [0.386] QN	5.53 [0.185]	18.8 [0.239]	13.4 [0.269]	19.9 [0.206]	8.47 [0.234]
6020	Metals	Selenium	mg/kg	–	2.2 [1.9] J	3.26 [1.93] J	1.21 [0.925] J	2.11 [1.2] J	2.24 [1.35] J	1.76 [1.03] J	1.36 [1.17] J
6020	Metals	Zinc	mg/kg	960	51.1 [4.74] QN	24.8 [4.83] QN	28.2 [2.31]	60.4 [2.99]	84.4 [3.36]	91.9 [2.58]	46.4 [2.93]
IonsNutrients											
9060	IonsNutrients	TOC	percent	–	29.3	27.9	18.8	18.1	15.2	6.23	8.82
Other											
A2540G	Other	Total Solids	percent	–	25.3	24.6	49.8	39.3	35.9	44.9	39.4

Notes:

[1] Decision Document cleanup level (USACE 2009).

[ ] denotes the LOD or no number if no LOD was reported

Bold = Result is greater than or equal to the screening level[1]

= LOD greater than or equal to the screening level[1]

— = method or screening level not available or analysis not conducted

For data qualifiers, refer to the Analytical Data Qualifiers section of the DQA.

For definitions, refer to the Acronyms and Abbreviations section of the DQA.

2018 Site 28 Sediment Mapping and Sampling Report at Northeast Cape
Table F-1.1 Sediment Results

Method	Group	Analyte	Units	Screening Level[1]	S28-33	S28-34	S28-35	S28-36	S28-37	S28-38	S28-38
				Sample ID:	18NEC-S28-SD-33	18NEC-S28-SD-34	18NEC-S28-SD-35	18NEC-S28-SD-36	18NEC-S28-SD-37	18NEC-S28-SD-38	18NEC-S28-SD-38-8
				Sample Date:	8/8/2018	8/8/2018	8/8/2018	8/8/2018	8/8/2018	8/8/2018	8/8/2018
				Sample Type:	SD	SD	SD	SD	SD	SD	SD
				SDG:	1184430	1184430	1184430	1184430	1184430	1184430	1184430
				Laboratory:	SGSA	SGSA	SGSA	SGSA	SGSA	SGSA	SGSA
				QAQC:	Primary	Primary	Primary	Primary	Primary	Primary	Duplicate
Fuels											
AK102_103	Fuels	DRO	mg/kg	3500	**45300 [1970]**	**8780 [1320]**	1270 [1515] J	**4120 [1675]**	**4490 [1200]**	3230 [525] QN	**6620 [520] QN**
AK102_103_SG	Fuels	DRO	mg/kg	3500	**29800 [394]**	**7160 [1320]**	1330 [1515] J	2960 [1675] J	3440 [1200]	2120 [525] QN	**4610 [520] QN**
AK102_103	Fuels	RRO	mg/kg	3500	**7180 [1970]**	**5290 [1320]**	**4080 [1515]**	**7990 [1675]**	**5660 [1200]**	**7580 [525]**	**8490 [520]**
AK102_103_SG	Fuels	RRO	mg/kg	3500	2800 [394]	3030 [1320]	1960 [1515] J	1720 [1675] J	1430 [1200] J	2000 [525]	2550 [520]
PAHs											
8270SIM	PAHs	Acenaphthene	mg/kg	0.5	**1.17 [0.246]**	*ND [0.82]*	*ND [0.935]*	*ND [1.04]*	0.422 [0.75] J	ND [0.329] QN	**1.37 [0.329] QN**
8270SIM	PAHs	Acenaphthylene	mg/kg	–	ND [0.246]	ND [0.82]	ND [0.935]	ND [1.04]	ND [0.75]	ND [0.329]	ND [0.329]
8270SIM	PAHs	Anthracene	mg/kg	–	ND [0.246]	ND [0.82]	ND [0.935]	ND [1.04]	ND [0.75]	ND [0.329]	ND [0.329]
8270SIM	PAHs	Benzo(a)anthracene	mg/kg	–	ND [0.246]	ND [0.82]	ND [0.935]	ND [1.04]	ND [0.75]	ND [0.329]	ND [0.329]
8270SIM	PAHs	Benzo(a)pyrene	mg/kg	–	ND [0.246]	ND [0.82]	ND [0.935]	ND [1.04]	ND [0.75]	ND [0.329]	ND [0.329]
8270SIM	PAHs	Benzo(b)fluoranthene	mg/kg	–	ND [0.246]	ND [0.82]	ND [0.935]	ND [1.04]	ND [0.75]	ND [0.329]	ND [0.329]
8270SIM	PAHs	Benzo(g,h,i)perylene	mg/kg	1.7	ND [0.246]	ND [0.82]	ND [0.935]	ND [1.04]	ND [0.75]	ND [0.329]	ND [0.329]
8270SIM	PAHs	Benzo(k)fluoranthene	mg/kg	–	ND [0.246]	ND [0.82]	ND [0.935]	ND [1.04]	ND [0.75]	ND [0.329]	ND [0.329]
8270SIM	PAHs	Chrysene	mg/kg	–	ND [0.246]	ND [0.82]	ND [0.935]	ND [1.04]	ND [0.75]	ND [0.329]	ND [0.329]
8270SIM	PAHs	Dibenzo(a,h)anthracene	mg/kg	–	ND [0.246]	ND [0.82]	ND [0.935]	ND [1.04]	ND [0.75]	ND [0.329]	ND [0.329]
8270SIM	PAHs	Fluoranthene	mg/kg	2	ND [0.246]	ND [0.82]	ND [0.935]	ND [1.04]	ND [0.75]	ND [0.329]	ND [0.329]
8270SIM	PAHs	Fluorene	mg/kg	0.8	**1.56 [0.246]**	0.497 [0.82] J	0.705 [0.935] J	*ND [1.04]*	0.754 [0.75] J	0.244 [0.329] J,QN	**2.31 [0.329] QN**
8270SIM	PAHs	Indeno(1,2,3-cd)pyrene	mg/kg	3.2	ND [0.246]	ND [0.82]	ND [0.935]	ND [1.04]	ND [0.75]	ND [0.329]	ND [0.329]
8270SIM	PAHs	1-Methylnaphthalene	mg/kg	–	6.04 [0.246]	ND [0.82]	1.14 [0.935] J	4.42 [1.04]	8.74 [0.75]	7.79 [0.329] QN	34.2 [3.29] QN
8270SIM	PAHs	2-Methylnaphthalene	mg/kg	0.6	**4.2 [0.246]**	*ND [0.82]*	0.511 [0.935] J	**5.84 [1.04]**	**12.5 [0.75]**	**13 [0.329] QN**	**55 [3.29] QN**
8270SIM	PAHs	Naphthalene	mg/kg	1.7	**2.23 [0.197]**	0.857 [0.655] J	**1.8 [0.745]**	**2.89 [0.835]**	**6.82 [0.6]**	**12.1 [0.263] QN**	**21 [2.63] QN**
8270SIM	PAHs	Phenanthrene	mg/kg	4.8	0.651 [0.246]	ND [0.82]	ND [0.935]	ND [1.04]	0.456 [0.75] J	ND [0.329] QN	1.17 [0.329] QN
8270SIM	PAHs	Pyrene	mg/kg	–	ND [0.246]	ND [0.82]	ND [0.935]	ND [1.04]	ND [0.75]	ND [0.329]	ND [0.329]
NR	PAHs	Total HPAHs	mg/kg	9.6	ND []	ND []	ND []	ND []	ND []	ND []	ND []
NR	PAHs	Total LPAHs	mg/kg	7.8	5.611 []	1.354 []	2.505 []	2.89 []	**8.452 []**	**12.344 []**	**25.85 []**
PCBs											
8082	PCBs	Aroclor-1016	mg/kg	0.7	ND [0.0499]	ND [0.164]	ND [0.189]	ND [0.208]	ND [0.149]	ND [0.065]	ND [0.065]
8082	PCBs	Aroclor-1221	mg/kg	0.7	ND [0.2]	ND [0.655]	*ND [0.755]*	*ND [0.835]*	ND [0.595]	ND [0.26]	ND [0.26]
8082	PCBs	Aroclor-1232	mg/kg	0.7	ND [0.0499]	ND [0.164]	ND [0.189]	ND [0.208]	ND [0.149]	ND [0.065]	ND [0.065]
8082	PCBs	Aroclor-1242	mg/kg	0.7	ND [0.0499]	ND [0.164]	ND [0.189]	ND [0.208]	ND [0.149]	ND [0.065]	ND [0.065]
8082	PCBs	Aroclor-1248	mg/kg	0.7	ND [0.0499]	ND [0.164]	ND [0.189]	ND [0.208]	ND [0.149]	ND [0.065]	ND [0.065]
8082	PCBs	Aroclor-1254	mg/kg	0.7	ND [0.0499]	ND [0.164]	ND [0.189]	ND [0.208]	ND [0.149]	ND [0.065]	ND [0.065]
8082	PCBs	Aroclor-1260	mg/kg	0.7	0.0621 [0.0499] J	0.118 [0.164] J	0.106 [0.189] J	ND [0.208]	ND [0.149]	ND [0.065] QN	0.056 [0.065] J,QN
8082	PCBs	PCBs	mg/kg	0.7	0.0621 [0.0499]	0.118 [0.164]	0.106 [0.189]	ND [0.208]	ND [0.149]	ND [0.065]	0.056 [0.065]
Metals											
6020	Metals	Arsenic	mg/kg	93	6.36 [0.995]	86.2 [3.27]	47.5 [3.71]	10.6 [3.89]	8 [2.83]	8.1 [1.23]	7.99 [1.23]
6020	Metals	Chromium	mg/kg	270	16.9 [0.399]	11.9 [1.3]	14.1 [1.49]	13 [1.55]	16.3 [1.14]	25.7 [0.491]	24.1 [0.491]
6020	Metals	Lead	mg/kg	530	9.95 [0.199]	15.9 [0.655]	24.6 [0.74]	18 [0.78]	18.7 [0.565]	13.1 [0.246]	14.3 [0.246]
6020	Metals	Selenium	mg/kg	–	1.35 [0.995] J	4.34 [3.27] J	3.07 [3.71] J	3 [3.89] J	3.05 [2.83] J	2.74 [1.23]	2.42 [1.23] J
6020	Metals	Zinc	mg/kg	960	47.8 [2.49]	122 [8.15]	217 [9.25]	57.8 [9.7]	42.9 [7.1]	42.3 [3.08]	46.8 [3.07]
IonsNutrients											
9060	IonsNutrients	TOC	percent	–	8.51	23.8	23.3	26	29.7	18.5	15.7
Other											
A2540G	Other	Total Solids	percent	–	50.1	15	13.1	11.9	16.6	37.9	38

Notes:
[1] Decision Document cleanup level (USACE 2009).
[ ] denotes the LOD or no number if no LOD was reported
Bold = Result is greater than or equal to the screening level[1]
= LOD greater than or equal to the screening level[1]
— = method or screening level not available or analysis not conducted
For data qualifiers, refer to the Analytical Data Qualifiers section of the DQA.
For definitions, refer to the Acronyms and Abbreviations section of the DQA.

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Table F-1.1 Sediment Results

				Location ID:	S28-39	S28-40	S28-41	S28-41	S28-42	S28-43	S28-44
				Sample ID:	18NEC-S28-SD-39	18NEC-S28-SD-40	18NEC-S28-SD-41	18NEC-S28-SD-41-8	18NEC-S28-SD-42	18NEC-S28-SD-43	18NEC-S28-SD-44
				Sample Date:	8/8/2018	8/8/2018	8/8/2018	8/8/2018	8/8/2018	8/8/2018	8/8/2018
				Sample Type:	SD	SD	SD	SD	SD	SD	SD
				SDG:	1184430	1184430	1184430	1184430	1184430	1184430	1184430
				Laboratory:	SGSA	SGSA	SGSA	SGSA	SGSA	SGSA	SGSA
				QAQC:	Primary	Primary	Primary	Duplicate	Primary	Primary	Primary
Method	**Group**	**Analyte**	**Units**	**Screening Level[1]**							
Fuels											
AK102_103	Fuels	DRO	mg/kg	3500	1450 [550]	**45400 [765]**	368 [39]	425 [41.8]	**21100 [5650]**	**12500 [473]**	**13500 [545]**
AK102_103_SG	Fuels	DRO	mg/kg	3500	1020 [550] J	**36400 [765]**	115 [39] QN	195 [41.8] QN	**17500 [5650]**	**9180 [473]**	**10500 [545]**
AK102_103	Fuels	RRO	mg/kg	3500	**6360 [550]**	**10800 [765]**	2840 [39]	1950 [41.8]	**127000 [5650]**	**12300 [473]**	**5090 [545]**
AK102_103_SG	Fuels	RRO	mg/kg	3500	1840 [550]	**5110 [765]**	813 [39]	493 [41.8]	**106000 [5650]**	**6410 [473]**	2370 [545]
PAHs											
8270SIM	PAHs	Acenaphthene	mg/kg	0.5	ND [0.347]	**3.91 [0.478]**	ND [0.0965]	ND [0.105]	ND [0.284]	**0.698 [0.292]**	**0.603 [0.136]**
8270SIM	PAHs	Acenaphthylene	mg/kg	–	ND [0.347]	ND [0.478]	ND [0.0965]	ND [0.105]	ND [0.284]	ND [0.292]	ND [0.136]
8270SIM	PAHs	Anthracene	mg/kg	–	ND [0.347]	ND [0.478]	ND [0.0965]	ND [0.105]	ND [0.284]	ND [0.292]	ND [0.136]
8270SIM	PAHs	Benzo(a)anthracene	mg/kg	–	ND [0.347]	ND [0.478]	ND [0.0965]	ND [0.105]	ND [0.284]	ND [0.292]	ND [0.136]
8270SIM	PAHs	Benzo(a)pyrene	mg/kg	–	ND [0.347]	ND [0.478]	ND [0.0965]	ND [0.105]	ND [0.284]	ND [0.292]	ND [0.136]
8270SIM	PAHs	Benzo(b)fluoranthene	mg/kg	–	ND [0.347]	ND [0.478]	ND [0.0965]	ND [0.105]	ND [0.284]	ND [0.292]	ND [0.136]
8270SIM	PAHs	Benzo(g,h,i)perylene	mg/kg	1.7	ND [0.347]	ND [0.478]	ND [0.0965]	ND [0.105]	ND [0.284]	ND [0.292]	ND [0.136]
8270SIM	PAHs	Benzo(k)fluoranthene	mg/kg	–	ND [0.347]	ND [0.478]	ND [0.0965]	ND [0.105]	ND [0.284]	ND [0.292]	ND [0.136]
8270SIM	PAHs	Chrysene	mg/kg	–	ND [0.347]	ND [0.478]	ND [0.0965]	ND [0.105]	ND [0.284]	0.21 [0.292] J	ND [0.136]
8270SIM	PAHs	Dibenzo(a,h)anthracene	mg/kg	–	ND [0.347]	ND [0.478]	ND [0.0965]	ND [0.105]	ND [0.284]	ND [0.292]	ND [0.136]
8270SIM	PAHs	Fluoranthene	mg/kg	2	ND [0.347]	ND [0.478]	ND [0.0965]	ND [0.105]	ND [0.284]	0.187 [0.292] J	0.159 [0.136] J
8270SIM	PAHs	Fluorene	mg/kg	0.8	ND [0.347]	**5.59 [0.478]**	ND [0.0965]	ND [0.105]	ND [0.284]	**1.05 [0.292]**	**0.938 [0.136]**
8270SIM	PAHs	Indeno(1,2,3-cd)pyrene	mg/kg	3.2	ND [0.347]	ND [0.478]	ND [0.0965]	ND [0.105]	ND [0.284]	ND [0.292]	ND [0.136]
8270SIM	PAHs	1-Methylnaphthalene	mg/kg	–	0.339 [0.347] J	105 [4.78]	ND [0.0965]	ND [0.105]	ND [0.284]	4.84 [0.292]	9.65 [0.68]
8270SIM	PAHs	2-Methylnaphthalene	mg/kg	0.6	0.471 [0.347] J	**166 [4.78]**	ND [0.0965]	ND [0.105]	ND [0.284]	**4.67 [0.292]**	**13.6 [0.68]**
8270SIM	PAHs	Naphthalene	mg/kg	1.7	0.226 [0.277] J	**59.7 [3.83]**	0.0674 [0.077] J	0.0581 [0.0835] J	ND [0.227]	0.876 [0.234]	**5.24 [0.109]**
8270SIM	PAHs	Phenanthrene	mg/kg	4.8	ND [0.347]	4.62 [0.478]	ND [0.0965]	ND [0.105]	ND [0.284]	0.845 [0.292]	0.724 [0.136]
8270SIM	PAHs	Pyrene	mg/kg	–	ND [0.347]	0.304 [0.478] J	ND [0.0965]	ND [0.105]	ND [0.284]	0.295 [0.292] J	0.195 [0.136] J
NR	PAHs	Total HPAHs	mg/kg	9.6	ND []	0.304 []	ND []	ND []	ND []	0.692 []	0.354 []
NR	PAHs	Total LPAHs	mg/kg	7.8	0.226 []	**73.82 []**	0.0674 []	0.0581 []	ND []	3.469 []	7.505 []
PCBs											
8082	PCBs	Aroclor-1016	mg/kg	0.7	ND [0.069]	ND [0.095]	ND [0.0488]	ND [0.0525]	ND [0.056] QL	ND [0.0595]	ND [0.0675]
8082	PCBs	Aroclor-1221	mg/kg	0.7	ND [0.277]	ND [0.38]	ND [0.195]	ND [0.209]	ND [0.225] QL	ND [0.237]	ND [0.269]
8082	PCBs	Aroclor-1232	mg/kg	0.7	ND [0.069]	ND [0.095]	ND [0.0488]	ND [0.0525]	ND [0.056] QL	ND [0.0595]	ND [0.0675]
8082	PCBs	Aroclor-1242	mg/kg	0.7	ND [0.069]	ND [0.095]	ND [0.0488]	ND [0.0525]	ND [0.056] QL	ND [0.0595]	ND [0.0675]
8082	PCBs	Aroclor-1248	mg/kg	0.7	ND [0.069]	ND [0.095]	ND [0.0488]	ND [0.0525]	ND [0.056] QL	ND [0.0595]	ND [0.0675]
8082	PCBs	Aroclor-1254	mg/kg	0.7	ND [0.069]	ND [0.095]	ND [0.0488]	ND [0.0525]	ND [0.056] QL	ND [0.0595]	0.2 [0.0675]
8082	PCBs	Aroclor-1260	mg/kg	0.7	ND [0.069]	0.228 [0.095]	ND [0.0488]	ND [0.0525]	ND [0.056] QL	0.361 [0.0595]	0.0843 [0.0675] J
8082	PCBs	PCBs	mg/kg	0.7	ND [0.069]	0.228 [0.095]	ND [0.0488]	ND [0.0525]	ND [0.056]	0.361 [0.0595]	0.2843 [0.0675]
Metals											
6020	Metals	Arsenic	mg/kg	93	6.12 [1.39]	6.69 [1.79]	5.46 [0.98]	4.48 [1]	14.5 [1.1]	9.41 [1.13]	7.68 [1.3]
6020	Metals	Chromium	mg/kg	270	23.2 [0.555]	16.6 [0.72]	26.3 [0.392]	19 [0.402]	48.3 [0.441]	30.7 [0.453]	19.4 [0.52]
6020	Metals	Lead	mg/kg	530	16 [0.277]	22.2 [0.359]	17.9 [0.196]	16 [0.201]	57.8 [0.221]	98.9 [0.227]	26.6 [0.261]
6020	Metals	Selenium	mg/kg	–	2.82 [1.39]	3.09 [1.79] J	1.92 [0.98] J	1.39 [1] J	1.63 [1.1] J	1.66 [1.13] J	1.12 [1.3] J
6020	Metals	Zinc	mg/kg	960	71.1 [3.46]	90.5 [4.49]	57 [2.45]	42 [2.51]	280 [2.75]	219 [2.83]	71 [3.25]
IonsNutrients											
9060	IonsNutrients	TOC	percent	–	14.6	21.8	7.47	8.17	17.9	12.8	11.5
Other											
A2540G	Other	Total Solids	percent	–	35.9	26	51	47.2	43.8	42.1	36.4

Notes:

[1] Decision Document cleanup level (USACE 2009).

[ ] denotes the LOD or no number if no LOD was reported

Bold = Result is greater than or equal to the screening level[1]

= LOD greater than or equal to the screening level[1]

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Table F-1.1 Sediment Results

				Location ID:	S28-45	S28-46	S28-47	S28-48	S28-48	S28-49	S28-50
				Sample ID:	18NEC-S28-SD-45	18NEC-S28-SD-46	18NEC-S28-SD-47	18NEC-S28-SD-48	18NEC-S28-SD-48-8	18NEC-S28-SD-49	18NEC-S28-SD-50
				Sample Date:	8/8/2018	8/8/2018	8/8/2018	8/8/2018	8/8/2018	8/8/2018	8/8/2018
				Sample Type:	SD	SD	SD	SD	SD	SD	SD
				SDG:	1184430	1184430	1184430	1184430	1184430	1184430	1184430
				Laboratory:	SGSA	SGSA	SGSA	SGSA	SGSA	SGSA	SGSA
				QAQC:	Primary	Primary	Primary	Primary	Duplicate	Primary	Primary
Method	**Group**	**Analyte**	**Units**	**Screening Level[1]**							
Fuels											
AK102_103	Fuels	DRO	mg/kg	3500	2670 [314]	**26900 [402]**	**55300 [810]**	**50400 [2515]**	**49900 [2295]**	**72400 [4400]**	**34700 [3115]**
AK102_103_SG	Fuels	DRO	mg/kg	3500	1870 [314]	**21000 [402]**	**55400 [810]**	**43900 [2515]**	**40500 [459]**	**59500 [4400]**	**27600 [3115]**
AK102_103	Fuels	RRO	mg/kg	3500	**4110 [314]**	**5440 [402]**	**13300 [810]**	**6980 [2515]**	**6050 [2295]**	**6390 [4400] J**	3460 [3115] J
AK102_103_SG	Fuels	RRO	mg/kg	3500	1370 [314]	1010 [402]	**11200 [810]**	2020 [2515] J	2230 [459]	**5200 [4400] J**	3260 [3115] J
PAHs											
8270SIM	PAHs	Acenaphthene	mg/kg	0.5	0.132 [0.0785] J	**2.51 [0.251]**	**3.92 [4.07] J**	**8.06 [15.7] J**	**5.15 [5.7] J**	**8.49 [4.42] J**	ND [0.383]
8270SIM	PAHs	Acenaphthylene	mg/kg	–	ND [0.0785]	ND [0.251]	ND [4.07]	ND [15.7]	ND [5.7]	ND [4.42]	ND [0.383]
8270SIM	PAHs	Anthracene	mg/kg	–	ND [0.0785]	ND [0.251]	ND [4.07]	ND [15.7]	ND [5.7]	ND [4.42]	ND [0.383]
8270SIM	PAHs	Benzo(a)anthracene	mg/kg	–	ND [0.0785]	ND [0.251]	ND [0.204]	ND [0.315]	ND [0.286]	ND [0.111]	ND [0.0765]
8270SIM	PAHs	Benzo(a)pyrene	mg/kg	–	ND [0.0785]	ND [0.251]	ND [0.204]	ND [0.315]	ND [0.286]	ND [0.111]	ND [0.0765]
8270SIM	PAHs	Benzo(b)fluoranthene	mg/kg	–	ND [0.0785]	ND [0.251]	ND [0.204]	ND [0.315]	ND [0.286]	ND [0.111]	ND [0.0765]
8270SIM	PAHs	Benzo(g,h,i)perylene	mg/kg	1.7	ND [0.0785]	ND [0.251]	ND [0.204]	ND [0.315]	ND [0.286]	ND [0.111]	ND [0.0765]
8270SIM	PAHs	Benzo(k)fluoranthene	mg/kg	–	ND [0.0785]	ND [0.251]	ND [0.204]	ND [0.315]	ND [0.286]	ND [0.111]	ND [0.0765]
8270SIM	PAHs	Chrysene	mg/kg	–	ND [0.0785]	ND [0.251]	ND [0.204]	ND [0.315]	ND [0.286]	ND [0.111]	ND [0.0765]
8270SIM	PAHs	Dibenzo(a,h)anthracene	mg/kg	–	ND [0.0785]	ND [0.251]	ND [0.204]	ND [0.315]	ND [0.286]	ND [0.111]	ND [0.0765]
8270SIM	PAHs	Fluoranthene	mg/kg	2	ND [0.0785]	ND [0.251]	ND [0.204]	ND [0.315]	ND [0.286]	ND [0.111]	ND [0.0765]
8270SIM	PAHs	Fluorene	mg/kg	0.8	0.234 [0.0785]	**3.56 [0.251]**	**6.37 [4.07] J**	**15.7 [15.7] J**	**10 [5.7] J**	**15.1 [4.42]**	**1.8 [0.383]**
8270SIM	PAHs	Indeno(1,2,3-cd)pyrene	mg/kg	3.2	ND [0.0785]	ND [0.251]	ND [0.204]	ND [0.315]	ND [0.286]	ND [0.111]	ND [0.0765]
8270SIM	PAHs	1-Methylnaphthalene	mg/kg	–	2.01 [0.0785]	69.5 [5]	91.1 [4.07]	213 [15.7] QN	121 [5.7] QN	317 [22.1]	26.7 [1.92]
8270SIM	PAHs	2-Methylnaphthalene	mg/kg	0.6	**2.61 [0.0785]**	**107 [5]**	**145 [4.07]**	**303 [15.7] QN**	**170 [5.7] QN**	**529 [22.1]**	**41 [1.92]**
8270SIM	PAHs	Naphthalene	mg/kg	1.7	1.62 [0.063]	**32.6 [4.02]**	**70 [3.25]**	**122 [12.6] QN**	**72.1 [4.58] QN**	**191 [3.54]**	**15.8 [0.306]**
8270SIM	PAHs	Phenanthrene	mg/kg	4.8	0.134 [0.0785] J	2.75 [0.251]	3.69 [4.07] J	**9.99 [15.7] J,QN**	**5.72 [5.7] J,QN**	**7.42 [4.42] J**	1.04 [0.383]
8270SIM	PAHs	Pyrene	mg/kg	–	ND [0.0785]	ND [0.251]	0.357 [0.204] J	0.25 [0.315] J	0.236 [0.286] J	0.172 [0.111] J	0.109 [0.0765] J
NR	PAHs	Total HPAHs	mg/kg	9.6	ND []	ND []	0.357 []	0.25 []	0.236 []	0.172 []	0.109 []
NR	PAHs	Total LPAHs	mg/kg	7.8	2.12 []	**41.42 []**	**83.98 []**	**155.75 []**	**92.97 []**	**222.01 []**	**18.64 []**
PCBs											
8082	PCBs	Aroclor-1016	mg/kg	0.7	ND [0.0388]	ND [0.0498]	ND [0.0403]	ND [0.062]	ND [0.057]	ND [0.054]	ND [0.0389]
8082	PCBs	Aroclor-1221	mg/kg	0.7	ND [0.155]	ND [0.199]	ND [0.162]	ND [0.249]	ND [0.229]	ND [0.217]	ND [0.156]
8082	PCBs	Aroclor-1232	mg/kg	0.7	ND [0.0388]	ND [0.0498]	ND [0.0403]	ND [0.062]	ND [0.057]	ND [0.054]	ND [0.0389]
8082	PCBs	Aroclor-1242	mg/kg	0.7	ND [0.0388]	ND [0.0498]	ND [0.0403]	ND [0.062]	ND [0.057]	ND [0.054]	ND [0.0389]
8082	PCBs	Aroclor-1248	mg/kg	0.7	ND [0.0388]	ND [0.0498]	ND [0.0403]	ND [0.062]	ND [0.057]	ND [0.054]	ND [0.0389]
8082	PCBs	Aroclor-1254	mg/kg	0.7	ND [0.0388]	ND [0.0498]	ND [0.0403]	ND [0.062]	ND [0.057]	ND [0.054]	ND [0.0389]
8082	PCBs	Aroclor-1260	mg/kg	0.7	ND [0.0388]	ND [0.0498]	0.482 [0.0403]	0.0426 [0.062] J,QN	0.246 [0.057] QN	0.0728 [0.054] J	0.15 [0.0389]
8082	PCBs	PCBs	mg/kg	0.7	ND [0.0388]	ND [0.0498]	0.482 [0.0403]	0.0426 [0.062]	0.246 [0.057]	0.0728 [0.054]	0.15 [0.0389]
Metals											
6020	Metals	Arsenic	mg/kg	93	5.32 [0.76]	5.43 [0.985]	5.21 [0.79]	4.26 [1.21]	5.92 [1.1]	3.03 [1.02]	5.29 [0.73]
6020	Metals	Chromium	mg/kg	270	26.3 [0.304]	20.6 [0.395]	29.5 [0.317]	17.5 [0.482]	23.1 [0.441]	12.2 [0.408]	23.3 [0.292]
6020	Metals	Lead	mg/kg	530	22.9 [0.152]	18.3 [0.198]	81 [0.158]	15.7 [0.241] QN	32.2 [0.22] QN	13 [0.204]	60.3 [0.146]
6020	Metals	Selenium	mg/kg	–	1.47 [0.76] J	1.87 [0.985] J	0.738 [0.79] J	1.9 [1.21] J	1.57 [1.1] J	1.37 [1.02] J	0.829 [0.73] J
6020	Metals	Zinc	mg/kg	960	62.2 [1.9]	41.6 [2.47]	145 [1.98]	29.4 [3.02] QN	65.3 [2.75] QN	24.1 [2.55]	86 [1.83]
IonsNutrients											
9060	IonsNutrients	TOC	percent	–	8.63	15.2	8.49	20.6	14.4	13.8	4.23
Other											
A2540G	Other	Total Solids	percent	–	63.1	49.2	61.1	39.5	43.2	45.3	64

Notes:

[1] Decision Document cleanup level (USACE 2009).

[ ] denotes the LOD or no number if no LOD was reported

Bold = Result is greater than or equal to the screening level[1]

= LOD greater than or equal to the screening level[1]

— = method or screening level not available or analysis not conducted

For data qualifiers, refer to the Analytical Data Qualifiers section of the DQA.

For definitions, refer to the Acronyms and Abbreviations section of the DQA.

Table F-1.1 Sediment Results

				Location ID:	S28-51	S28-52	S28-53	S28-54
				Sample ID:	18NEC-S28-SD-51	18NEC-S28-SD-52	18NEC-S28-SD-53	18NEC-S28-SD-54
				Sample Date:	8/8/2018	8/8/2018	8/8/2018	8/8/2018
				Sample Type:	SD	SD	SD	SD
				SDG:	1184430	1184430	1184430	1184430
				Laboratory:	SGSA	SGSA	SGSA	SGSA
				QAQC:	Primary	Primary	Primary	Primary
Method	**Group**	**Analyte**	**Units**	**Screening Level¹**				
Fuels								
AK102_103	Fuels	DRO	mg/kg	3500	**61100 [2130]**	**62000 [2240]**	**58100 [3065]**	**51900 [2480]**
AK102_103_SG	Fuels	DRO	mg/kg	3500	**51800 [4265]**	**50000 [2240]**	**33000 [615]**	**37200 [496]**
AK102_103	Fuels	RRO	mg/kg	3500	**5330 [2130]**	**13400 [2240]**	**10600 [3065]**	**7040 [2480]**
AK102_103_SG	Fuels	RRO	mg/kg	3500	**5010 [4265] J**	**9210 [2240]**	1870 [615]	2290 [496]
PAHs								
8270SIM	PAHs	Acenaphthene	mg/kg	0.5	**6.49 [4.26] J**	**7.48 [2.8]**	**9.36 [7.65] J**	**9.34 [15.5] J**
8270SIM	PAHs	Acenaphthylene	mg/kg	–	ND [4.26]	ND [2.8]	ND [7.65]	ND [15.5]
8270SIM	PAHs	Anthracene	mg/kg	–	ND [4.26]	ND [2.8]	ND [7.65]	ND [15.5]
8270SIM	PAHs	Benzo(a)anthracene	mg/kg	–	ND [0.107]	0.359 [0.28] J	ND [0.383]	ND [0.311]
8270SIM	PAHs	Benzo(a)pyrene	mg/kg	–	ND [0.107]	ND [0.28]	ND [0.383]	ND [0.311]
8270SIM	PAHs	Benzo(b)fluoranthene	mg/kg	–	ND [0.107]	ND [0.28]	ND [0.383]	ND [0.311]
8270SIM	PAHs	Benzo(g,h,i)perylene	mg/kg	1.7	ND [0.107]	ND [0.28]	ND [0.383]	ND [0.311]
8270SIM	PAHs	Benzo(k)fluoranthene	mg/kg	–	ND [0.107]	ND [0.28]	ND [0.383]	ND [0.311]
8270SIM	PAHs	Chrysene	mg/kg	–	ND [0.107]	0.702 [0.28]	ND [0.383]	ND [0.311]
8270SIM	PAHs	Dibenzo(a,h)anthracene	mg/kg	–	ND [0.107]	ND [0.28]	ND [0.383]	ND [0.311]
8270SIM	PAHs	Fluoranthene	mg/kg	2	0.0937 [0.107] J	**3.42 [0.28]**	ND [0.383]	ND [0.311]
8270SIM	PAHs	Fluorene	mg/kg	0.8	**11 [4.26]**	**9.4 [2.8]**	**12.5 [7.65] J**	**17.4 [15.5] J**
8270SIM	PAHs	Indeno(1,2,3-cd)pyrene	mg/kg	3.2	ND [0.107]	ND [0.28]	ND [0.383]	ND [0.311]
8270SIM	PAHs	1-Methylnaphthalene	mg/kg	–	224 [21.4]	58.5 [2.8]	170 [7.65]	301 [15.5]
8270SIM	PAHs	2-Methylnaphthalene	mg/kg	0.6	**350 [21.4]**	**77.5 [2.8]**	**239 [7.65]**	**496 [15.5]**
8270SIM	PAHs	Naphthalene	mg/kg	1.7	**134 [3.42]**	**44.4 [2.24]**	**94.6 [6.15]**	**230 [12.4]**
8270SIM	PAHs	Phenanthrene	mg/kg	4.8	**6.14 [4.26] J**	**8.33 [2.8]**	**13.3 [7.65] J**	**9.91 [15.5] J**
8270SIM	PAHs	Pyrene	mg/kg	–	0.173 [0.107] J	2.45 [0.28]	0.391 [0.383] J	0.235 [0.311] J
NR	PAHs	Total HPAHs	mg/kg	9.6	0.2667 []	6.931 []	0.391 []	0.235 []
NR	PAHs	Total LPAHs	mg/kg	7.8	**157.63 []**	**69.61 []**	**129.76 []**	**266.65 []**
PCBs								
8082	PCBs	Aroclor-1016	mg/kg	0.7	ND [0.053]	ND [0.056]	ND [0.077]	ND [0.0625]
8082	PCBs	Aroclor-1221	mg/kg	0.7	ND [0.212]	ND [0.224]	ND [0.308]	ND [0.249]
8082	PCBs	Aroclor-1232	mg/kg	0.7	ND [0.053]	ND [0.056]	ND [0.077]	ND [0.0625]
8082	PCBs	Aroclor-1242	mg/kg	0.7	ND [0.053]	ND [0.056]	ND [0.077]	ND [0.0625]
8082	PCBs	Aroclor-1248	mg/kg	0.7	ND [0.053]	ND [0.056]	ND [0.077]	ND [0.0625]
8082	PCBs	Aroclor-1254	mg/kg	0.7	ND [0.053]	ND [0.056]	ND [0.077]	ND [0.0625]
8082	PCBs	Aroclor-1260	mg/kg	0.7	0.117 [0.053]	0.174 [0.056]	0.0677 [0.077] J	0.0532 [0.0625] J
8082	PCBs	PCBs	mg/kg	0.7	0.117 [0.053]	0.174 [0.056]	0.0677 [0.077]	0.0532 [0.0625]
Metals								
6020	Metals	Arsenic	mg/kg	93	3.33 [1.01]	9.06 [1.06]	6.64 [1.52]	4.02 [1.19]
6020	Metals	Chromium	mg/kg	270	10.9 [0.404]	22.6 [0.426]	25.2 [0.61]	17.2 [0.475]
6020	Metals	Lead	mg/kg	530	15.5 [0.202]	28.2 [0.213]	17 [0.305]	20.7 [0.237]
6020	Metals	Selenium	mg/kg	–	1.06 [1.01] J	1.01 [1.06] J	2.27 [1.52] J	1.9 [1.19] J
6020	Metals	Zinc	mg/kg	960	29.1 [2.52]	120 [2.66]	55.8 [3.82]	39 [2.97]
IonsNutrients								
9060	IonsNutrients	TOC	percent	–	9.13	10.2	21.4	15.6
Other								
A2540G	Other	Total Solids	percent	–	46.8	44.6	32.3	39.8

Notes:
¹ Decision Document cleanup level (USACE 2009).
[ ] denotes the LOD or no number if no LOD was reported
Bold = Result is greater than or equal to the screening level¹
= LOD greater than or equal to the screening level¹
— = method or screening level not available or analysis not conducted
For data qualifiers, refer to the Analytical Data Qualifiers section of the DQA.
For definitions, refer to the Acronyms and Abbreviations section of the DQA.

2018 Site 28 Sediment Mapping and Sampling Report at Northeast Cape
Table F-1.2 Sample Summary

COC Sample ID	Location ID	Collection Date	Collection Time	Sampler	Qty	Container Type	Container Volume	Preservative	Matrix	Analytical Method Requested	QC Type	TAT	Site	COC Number	Cooler Name	CoolerDate	Laboratory	SDG Number	Sample Depth (feet)
18NEC-S28-SD-01	S28-01	7-Aug-18	1017	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-29	Snuggie	8-Aug-18	SGS	1184373	0 - 1.0
18NEC-S28-SD-02	S28-02	7-Aug-18	1035	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-29	Snuggie	8-Aug-18	SGS	1184373	0 - 0.7
18NEC-S28-SD-02-8	S28-02	7-Aug-18	1035	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A	DUP	14 Days	Site 28	18NEC-29	Snuggie	8-Aug-18	SGS	1184373	0 - 0.7
18NEC-S28-SD-03	S28-03	7-Aug-18	1050	AD/JB	4	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A	MS/MSD	14 Days	Site 28	18NEC-29	Snuggie	8-Aug-18	SGS	1184373	0 - 1.8
18NEC-S28-SD-04	S28-04	7-Aug-18	1108	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-29	Snuggie	8-Aug-18	SGS	1184373	0 - 0.8
18NEC-S28-SD-05	S28-05	7-Aug-18	1115	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-29	Snuggie	8-Aug-18	SGS	1184373	0 - 0.8
18NEC-S28-SD-06	S28-06	7-Aug-18	1125	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-29	Snuggie	8-Aug-18	SGS	1184373	0 - 2.0
18NEC-S28-SD-07	S28-07	7-Aug-18	1133	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-29	Snuggie	8-Aug-18	SGS	1184373	0 - 1.0
18NEC-S28-SD-08	S28-08	7-Aug-18	1145	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-29	Snuggie	8-Aug-18	SGS	1184373	0 - 2.0
18NEC-S28-SD-09	S28-09	7-Aug-18	1153	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-29	Snuggie	8-Aug-18	SGS	1184373	0 - 2.0
18NEC-S28-SD-10	S28-10	7-Aug-18	1201	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-29	Snuggie	8-Aug-18	SGS	1184373	0 - 2.0
18NEC-S28-SD-11	S28-11	7-Aug-18	1211	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-29	Snuggie	8-Aug-18	SGS	1184373	0 - 2.0
18NEC-S28-SD-12	S28-12	7-Aug-18	1221	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-29	Snuggie	8-Aug-18	SGS	1184373	0 - 2.0
18NEC-S28-SD-13	S28-13	7-Aug-18	1448	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-29	Snuggie	8-Aug-18	SGS	1184373	0 - 2.0
18NEC-S28-SD-14	S28-14	7-Aug-18	1500	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-29	Snuggie	8-Aug-18	SGS	1184373	0 - 1.5
18NEC-S28-SD-15	S28-15	7-Aug-18	1517	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-29	Snuggie	8-Aug-18	SGS	1184373	0 - 2.0
18NEC-S28-SD-16	S28-16	7-Aug-18	1528	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-29	Snuggie	8-Aug-18	SGS	1184373	0 - 2.0
18NEC-S28-SD-17	S28-17	7-Aug-18	1546	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-30	Pillow Pet	10-Aug-18	SGS	1184430	0 - 2.0
18NEC-S28-SD-17-8	S28-17	7-Aug-18	1546	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A	DUP	14 Days	Site 28	18NEC-30	Pillow Pet	10-Aug-18	SGS	1184430	0 - 2.0
18NEC-S28-SD-18	S28-18	7-Aug-18	1603	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-30	Pillow Pet	10-Aug-18	SGS	1184430	0 - 1.0
18NEC-S28-SD-19	S28-19	7-Aug-18	1625	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-30	Pillow Pet	10-Aug-18	SGS	1184430	0 - 2.0
18NEC-S28-SD-20	S28-20	7-Aug-18	1632	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-30	Pillow Pet	10-Aug-18	SGS	1184430	0 - 1.0
18NEC-S28-SD-21	S28-21	7-Aug-18	1644	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-30	Pillow Pet	10-Aug-18	SGS	1184430	0 - 1.0
18NEC-S28-SD-22	S28-22	7-Aug-18	1653	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-30	Pillow Pet	10-Aug-18	SGS	1184430	0 - 1.0
18NEC-S28-SD-23	S28-23	7-Aug-18	1702	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-30	Pillow Pet	10-Aug-18	SGS	1184430	0 - 2.0
18NEC-S28-SD-24	S28-24	7-Aug-18	1713	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-30	Pillow Pet	10-Aug-18	SGS	1184430	0 - 2.0

Table F-1.2 Sample Summary

COC Sample ID	Location ID	Collection Date	Collection Time	Sampler	Qty	Container Type	Container Volume	Preservative	Matrix	Analytical Method Requested	QC Type	TAT	Site	COC Number	Cooler Name	CoolerDate	Laboratory	SDG Number	Sample Depth (feet)
18NEC-S28-SD-25	S28-25	8-Aug-18	0920	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-30	Pillow Pet	10-Aug-18	SGS	1184430	0 - 1.0
18NEC-S28-SD-26	S28-26	8-Aug-18	0951	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-30	Pillow Pet	10-Aug-18	SGS	1184430	0 - 1.0
18NEC-S28-SD-27	S28-27	8-Aug-18	1001	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-30	Pillow Pet	10-Aug-18	SGS	1184430	0 - 1.5
18NEC-S28-SD-27-8	S28-27	8-Aug-18	1001	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A	DUP	14 Days	Site 28	18NEC-30	Pillow Pet	10-Aug-18	SGS	1184430	0 - 1.5
18NEC-S28-SD-28	S28-28	8-Aug-18	1012	AD/JB	4	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A	MS/MSD	14 Days	Site 28	18NEC-30	Pillow Pet	10-Aug-18	SGS	1184430	0 - 1.5
18NEC-S28-SD-29	S28-29	8-Aug-18	1025	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-30	Pillow Pet	10-Aug-18	SGS	1184430	0 - 1.0
18NEC-S28-SD-30	S28-30	8-Aug-18	1040	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-30	Pillow Pet	10-Aug-18	SGS	1184430	0 - 1.5
18NEC-S28-SD-31	S28-31	8-Aug-18	1048	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-30	Pillow Pet	10-Aug-18	SGS	1184430	0 - 1.5
18NEC-S28-SD-32	S28-32	8-Aug-18	1058	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-31	ShamWow	10-Aug-18	SGS	1184430	0 - 1.0
18NEC-S28-SD-33	S28-33	8-Aug-18	1106	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-31	ShamWow	10-Aug-18	SGS	1184430	0 - 0.8
18NEC-S28-SD-34	S28-34	8-Aug-18	1114	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-31	ShamWow	10-Aug-18	SGS	1184430	0 - 1.0
18NEC-S28-SD-35	S28-35	8-Aug-18	1125	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-31	ShamWow	10-Aug-18	SGS	1184430	0 - 1.0
18NEC-S28-SD-38	S28-38	8-Aug-18	1143	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-31	ShamWow	10-Aug-18	SGS	1184430	0 - 2.0
18NEC-S28-SD-38-8	S28-38	8-Aug-18	1143	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A	DUP	14 Days	Site 28	18NEC-31	ShamWow	10-Aug-18	SGS	1184430	0 - 2.0
18NEC-S28-SD-39	S28-39	8-Aug-18	1154	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-31	ShamWow	10-Aug-18	SGS	1184430	0 - 2.0
18NEC-S28-SD-40	S28-40	8-Aug-18	1202	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-31	ShamWow	10-Aug-18	SGS	1184430	0 - 1.0
18NEC-S28-SD-42	S28-42	8-Aug-18	1218	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-31	ShamWow	10-Aug-18	SGS	1184430	0 - 0.8
18NEC-S28-SD-52	S28-52	8-Aug-18	1440	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-31	ShamWow	10-Aug-18	SGS	1184430	0 - 1.0
18NEC-S28-SD-53	S28-53	8-Aug-18	1504	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-31	ShamWow	10-Aug-18	SGS	1184430	0 - 1.5
18NEC-S28-SD-37	S28-37	8-Aug-18	1540	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-31	ShamWow	10-Aug-18	SGS	1184430	0 - 0.2
18NEC-S28-SD-36	S28-36	8-Aug-18	1553	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-31	ShamWow	10-Aug-18	SGS	1184430	0 - 0.2
18NEC-S28-SD-41	S28-41	8-Aug-18	1605	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-32	Oxiclean	10-Aug-18	SGS	1184430	0 - 1.0
18NEC-S28-SD-41-8	S28-41	8-Aug-18	1605	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A	DUP	14 Days	Site 28	18NEC-32	Oxiclean	10-Aug-18	SGS	1184430	0 - 1.0
18NEC-S28-SD-44	S28-44	8-Aug-18	1624	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-32	Oxiclean	10-Aug-18	SGS	1184430	0 - 1.0
18NEC-S28-SD-45	S28-45	8-Aug-18	1640	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-32	Oxiclean	10-Aug-18	SGS	1184430	0 - 1.5
18NEC-S28-SD-46	S28-46	8-Aug-18	1646	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-32	Oxiclean	10-Aug-18	SGS	1184430	0 - 0.8

2018 Site 28 Sediment Mapping and Sampling Report at Northeast Cape
Table F-1.2 Sample Summary

COC Sample ID	Location ID	Collection Date	Collection Time	Sampler	Qty	Container Type	Container Volume	Preservative	Matrix	Analytical Method Requested	QC Type	TAT	Site	COC Number	Cooler Name	CoolerDate	Laboratory	SDG Number	Sample Depth (feet)
18NEC-S28-SD-43	S28-43	8-Aug-18	1700	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-32	Oxiclean	10-Aug-18	SGS	1184430	0 - 1.0
18NEC-S28-SD-54	S28-54	8-Aug-18	1710	AD/JB	4	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A	MS/MSD	14 Days	Site 28	18NEC-32	Oxiclean	10-Aug-18	SGS	1184430	0 - 1.0
18NEC-S28-SD-47	S28-47	8-Aug-18	1720	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-32	Oxiclean	10-Aug-18	SGS	1184430	0 - 1.0
18NEC-S28-SD-48	S28-48	8-Aug-18	1726	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-32	Oxiclean	10-Aug-18	SGS	1184430	0 - 1.0
18NEC-S28-SD-48-8	S28-48	8-Aug-18	1726	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A	DUP	14 Days	Site 28	18NEC-32	Oxiclean	10-Aug-18	SGS	1184430	0 - 1.0
18NEC-S28-SD-49	S28-49	8-Aug-18	1733	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-32	Oxiclean	10-Aug-18	SGS	1184430	0 - 1.0
18NEC-S28-SD-50	S28-50	8-Aug-18	1739	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-32	Oxiclean	10-Aug-18	SGS	1184430	0 - 1.0
18NEC-S28-SD-51	S28-51	8-Aug-18	1750	AD/JB	2	Amber Glass Jar	8 oz	0°C to 6°C	SD	AK102/103, AK102/103 w silica gel cleanup, SW8270DSIM, SW8082A, SW6020A (As, Cr, Pb, Se, Zn), SW9060A		14 Days	Site 28	18NEC-32	Oxiclean	10-Aug-18	SGS	1184430	0 - 1.0

Notes:
Project NPDL number 18-053
ID = identification
oz = ounce
qty = quantity
For additional definitions, refer to the Acronyms and Abbreviations section of the DQA.

EXHIBIT F2-2

Qualified Sample Results Tables

2018 Site 28 Sediment Mapping and Sampling Report at Northeast Cape
Table F-2.1 Surrogate Recoveries

SDG	Sample ID	Lab Sample ID	Method	Analyte	Result (mg/L)	LOD (mg/L)	LOQ (mg/L)	Recovery (%)	LCL (%)	UCL (%)	Units	Lab Lot Number	Qualifier
1184430	18NEC-S28-SD-42	1184430028	SW8082A	Aroclor-1016	0	0	0.112	--	--	--	mg/kg	XXX40262	QL
1184430	18NEC-S28-SD-42	1184430028	SW8082A	Aroclor-1221	0	0	0.449	--	--	--	mg/kg	XXX40262	QL
1184430	18NEC-S28-SD-42	1184430028	SW8082A	Aroclor-1232	0	0	0.112	--	--	--	mg/kg	XXX40262	QL
1184430	18NEC-S28-SD-42	1184430028	SW8082A	Aroclor-1242	0	0	0.112	--	--	--	mg/kg	XXX40262	QL
1184430	18NEC-S28-SD-42	1184430028	SW8082A	Aroclor-1248	0	0	0.112	--	--	--	mg/kg	XXX40262	QL
1184430	18NEC-S28-SD-42	1184430028	SW8082A	Aroclor-1254	0	0	0.112	--	--	--	mg/kg	XXX40262	QL
1184430	18NEC-S28-SD-42	1184430028	SW8082A	Aroclor-1260	0	0	0.112	--	--	--	mg/kg	XXX40262	QL
1184430	18NEC-S28-SD-42	1184430028	SW8082A	Decachlorobiphenyl	34.9	0	--	34.9	60	125	PERCENT	XXX40262	--

Notes:

For data qualifiers, refer to the Analytical Data Qualifiers section of the DQA.

For definitions, refer to the Acronyms and Abbreviations section of the DQA.

2018 Site 28 Sediment Mapping and Sampling Report at Northeast Cape
Table F-2.2 Duplicate Sample RPD

SDG	Parent Sample ID	Parent Lab Sample ID	Dup Sample ID	Dup Lab Sample ID	Method	Analyte	Parent Sample Result	Parent Sample Result Type	Duplicate Sample Result	Duplicate Sample Result Type	RPD (%)	Problem	matrix	Parent Sample Dilution Factor	Dup Sample Dilution Factor	Parent Sample Date	Dup Sample Date	Parent Qualifier	Duplicate Qualifier
1184373	18NEC-S28-SD-02	1184373002	18NEC-S28-SD-02-8	1184373003	SW6020A	Selenium	1.37	=	0.804	=	52.1	Over 50%	SD	10	10	07-Aug-18	07-Aug-18	J,QN	J,QN
1184430	18NEC-S28-SD-17	1184430001	18NEC-S28-SD-17-8	1184430002	8270SIM	Benzo(a)anthracene	0.171	=	0.366	ND	72.6	Over 50%	SD	10	10	07-Aug-18	07-Aug-18	J,QN	QN
1184430	18NEC-S28-SD-27	1184430012	18NEC-S28-SD-27-8	1184430013	8270SIM	Fluorene	0.253	=	0.499	ND	65.4	Over 50%	SD	10	10	08-Aug-18	08-Aug-18	J,QN	QN
1184430	18NEC-S28-SD-27	1184430012	18NEC-S28-SD-27-8	1184430013	SW6020A	Lead	16.1	=	8.17	=	65.3	Over 50%	SD	10	10	08-Aug-18	08-Aug-18	QN	QN
1184430	18NEC-S28-SD-27	1184430012	18NEC-S28-SD-27-8	1184430013	SW6020A	Zinc	51.1	=	24.8	=	69.3	Over 50%	SD	10	10	08-Aug-18	08-Aug-18	QN	QN
1184430	18NEC-S28-SD-38	1184430024	18NEC-S28-SD-38-8	1184430025	8270SIM	1-Methylnaphthalene	7.79	=	34.2	=	125.8	Over 50%	SD	10	100	08-Aug-18	08-Aug-18	QN	QN
1184430	18NEC-S28-SD-38	1184430024	18NEC-S28-SD-38-8	1184430025	8270SIM	2-Methylnaphthalene	13	=	55	=	123.5	Over 50%	SD	10	100	08-Aug-18	08-Aug-18	QN	QN
1184430	18NEC-S28-SD-38	1184430024	18NEC-S28-SD-38-8	1184430025	8270SIM	Acenaphthene	0.329	ND	1.37	=	122.5	Over 50%	SD	10	10	08-Aug-18	08-Aug-18	QN	QN
1184430	18NEC-S28-SD-38	1184430024	18NEC-S28-SD-38-8	1184430025	AK102SG	DRO	2120	=	4610	=	74.0	Over 50%	SD	1	1	08-Aug-18	08-Aug-18	QN	QN
1184430	18NEC-S28-SD-38	1184430024	18NEC-S28-SD-38-8	1184430025	AK102	DRO	3230	=	6620	=	68.8	Over 50%	SD	10	10	08-Aug-18	08-Aug-18	QN	QN
1184430	18NEC-S28-SD-38	1184430024	18NEC-S28-SD-38-8	1184430025	8270SIM	Fluorene	0.244	=	2.31	=	161.8	Over 50%	SD	10	10	08-Aug-18	08-Aug-18	J,QN	QN
1184430	18NEC-S28-SD-38	1184430024	18NEC-S28-SD-38-8	1184430025	8270SIM	Naphthalene	12.1	=	21	=	53.8	Over 50%	SD	10	100	08-Aug-18	08-Aug-18	QN	QN
1184430	18NEC-S28-SD-38	1184430024	18NEC-S28-SD-38-8	1184430025	8270SIM	Phenanthrene	0.329	ND	1.17	=	112.2	Over 50%	SD	10	10	08-Aug-18	08-Aug-18	QN	QN
1184430	18NEC-S28-SD-48	1184430039	18NEC-S28-SD-48-8	1184430040	8270SIM	1-Methylnaphthalene	213	=	121	=	55.1	Over 50%	SD	500	200	08-Aug-18	08-Aug-18	QN	QN
1184430	18NEC-S28-SD-48	1184430039	18NEC-S28-SD-48-8	1184430040	8270SIM	2-Methylnaphthalene	303	=	170	=	56.2	Over 50%	SD	500	200	08-Aug-18	08-Aug-18	QN	QN
1184430	18NEC-S28-SD-48	1184430039	18NEC-S28-SD-48-8	1184430040	SW8082A	Aroclor-1260	0.0426	=	0.246	=	141.0	Over 50%	SD	1	1	08-Aug-18	08-Aug-18	J,QN	QN
1184430	18NEC-S28-SD-48	1184430039	18NEC-S28-SD-48-8	1184430040	SW6020A	Lead	15.7	=	32.2	=	68.9	Over 50%	SD	10	10	08-Aug-18	08-Aug-18	QN	QN
1184430	18NEC-S28-SD-48	1184430039	18NEC-S28-SD-48-8	1184430040	8270SIM	Naphthalene	122	=	72.1	=	51.4	Over 50%	SD	500	200	08-Aug-18	08-Aug-18	QN	QN
1184430	18NEC-S28-SD-48	1184430039	18NEC-S28-SD-48-8	1184430040	8270SIM	Phenanthrene	9.99	=	5.72	=	54.4	Over 50%	SD	500	200	08-Aug-18	08-Aug-18	J,QN	J,QN
1184430	18NEC-S28-SD-48	1184430039	18NEC-S28-SD-48-8	1184430040	SW6020A	Zinc	29.4	=	65.3	=	75.8	Over 50%	SD	10	10	08-Aug-18	08-Aug-18	QN	QN
1184430	18NEC-S28-SD-41	1184430044	18NEC-S28-SD-41-8	1184430045	AK102SG	DRO	115	=	195	=	51.6	Over 50%	SD	1	1	08-Aug-18	08-Aug-18	QN	QN

Notes:

For data qualifiers, refer to the Analytical Data Qualifiers section of the DQA.

For definitions, refer to the Acronyms and Abbreviations section of the DQA.

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Table F-2.3 Nondetect Results with Reporting Limits Greater Than Cleanup Levels

SDG	Sample ID	Lab Sample ID	Method	Analyte	Cleanup Level	Result	LOD	LOQ	Units	Dilution Factor
1184430	18NEC-S28-SD-34	1184430022	8270SIM	2-Methylnaphthalene	0.6	ND	0.82	1.64	mg/kg	10
1184430	18NEC-S28-SD-34	1184430022	8270SIM	Acenaphthene	0.5	ND	0.82	1.64	mg/kg	10
1184430	18NEC-S28-SD-35	1184430023	8270SIM	Acenaphthene	0.5	ND	0.935	1.87	mg/kg	10
1184430	18NEC-S28-SD-35	1184430023	SW8082A	Aroclor-1221	0.7	ND	0.755	1.51	mg/kg	1
1184430	18NEC-S28-SD-36	1184430032	8270SIM	Acenaphthene	0.5	ND	1.04	2.09	mg/kg	10
1184430	18NEC-S28-SD-36	1184430032	8270SIM	Fluorene	0.8	ND	1.04	2.09	mg/kg	10
1184430	18NEC-S28-SD-36	1184430032	SW8082A	Aroclor-1221	0.7	ND	0.835	1.67	mg/kg	1

Notes:

For data qualifiers, refer to the Analytical Data Qualifiers section of the DQA.

For definitions, refer to the Acronyms and Abbreviations section of the DQA.

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Table F-2.4 Equipment Blank Results

SDG	Sample ID	Lab Sample ID	Method	Analyte	Result	Units
1184430	18NEC-EB01-WG	1184430048	8270SIM	Naphthalene	0.0000079	mg/L
1184430	18NEC-EB01-WG	1184430048	E200.8	Zinc	0.00622	mg/L

Notes:

For data qualifiers, refer to the Analytical Data Qualifiers section of the DQA.

For definitions, refer to the Acronyms and Abbreviations section of the DQA.

EXHIBIT F2-3

ADEC Laboratory Data Review Checklists

Laboratory Data Review Checklist

Completed by:

Nathaniel Gingery

Title:

Project Chemist

Date:

10/17/2018

CS Report Name:

Northeast Cape Five-Year Review

Report Date:

12/20/2018

Consultant Firm:

Jacobs

Laboratory Name:

SGS North America Inc.

Laboratory Report Number:

1184373

ADEC File Number:

ST LAW MOC 475.38.013

Hazard Identification Number:

221

1. Laboratory

a. Did an ADEC CS approved laboratory receive and perform all of the submitted sample analyses?

◉ Yes ◯ No Comments:

All analyses were performed by SGS North America Inc. in Anchorage, AK.

b. If the samples were transferred to another "network" laboratory or sub-contracted to an alternate laboratory, was the laboratory performing the analyses ADEC CD approved?

◯ Yes ◉ No Comments:

Not applicable.

2. Chain of Custody (CoC)

a. CoC information completed, signed, and dated (including released/received by)?

◉ Yes ◯ No Comments:

b. Correct analyses requested?

◉ Yes ◯ No Comments:

3. Laboratory Sample Receipt Documentation

a. Sample/cooler temperature documented and within range at receipt (0° ± 6° C)?

◉ Yes ◯ No Comments:

Cooler name, temperature blank temp °C
1. Snuggie 0.3 °C

b. Sample preservation acceptable - acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?

◉ Yes ◯ No Comments:

c. Sample condition documented - broken, leaking (Methanol), zero headspace (VOC vials)?

◉ Yes ◯ No Comments:

No discrepancies were noted.

d. If there were any discrepancies, were they documented? For example, incorrect sample containers/preservation, sample temperature outside of acceptable range, insufficient or missing samples, etc.?

○ Yes ○ No Comments:

N/A

e. Data quality or usability affected? Explain.

Comments:

Data quality and usability were not affected.

4. Case Narrative

a. Present and understandable?

◉ Yes ○ No Comments:

b. Discrepancies, errors or QC failures identified by the lab?

◉ Yes ○ No Comments:

c. Were all corrective actions documented?

◉ Yes ○ No Comments:

The lab noted all corrective actions taken.

d. What is the effect on data quality/usability according to the case narrative?

Comments:

Discrepancies will be discussed in their related sections below.

5. Samples Results

a. Correct analyses performed/reported as requested on COC?

◉ Yes ○ No Comments:

b. All applicable holding times met?

◉ Yes ○ No Comments:

c. All soils reported on a dry weight basis?

◉ Yes ○ No Comments:

d. Are the reported PQLs less than the Cleanup Level or the minimum required detection level for the project?

◉ Yes ○ No Comments:

All LODs for nondetect samples were less than the project cleanup level.

e. Data quality or usability affected? Explain.

Comments:

N/A

6. <u>QC Samples</u>

a. Method Blank

i. One method blank reported per matrix, analysis and 20 samples

◉ Yes ○ No Comments:

ii. All method blank results less than PQL?

◉ Yes ○ No Comments:

Chromium was detected above the detection limit in method blank 1466142 but all associated samples were greater than five times the method blank contamination.

iii. If above PQL, what samples are affected?

Comments:

N/A

iv. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

◉ Yes ○ No Comments:

N/A

v. Data quality or usability affected? Explain.

Comments:

The data quality and usability were not affected.

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics - One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)

◉ Yes ○ No Comments:

An LCS/LCSD was analyzed for all methods. A DoD QSM required MS/MSD was assigned to sample 18NEC-S28-SD-03.

ii. Metals/Inorganics - one LCS and one sample duplicate reported per matrix, analysis and 20 samples?

◉ Yes ○ No Comments:

An LCS/LCSD was analyzed for all methods. A DoD QSM required MS/MSD was assigned to sample 18NEC-S28-SD-03.

iii. Accuracy - All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods: AK101 60%-120%, AK102 75%-125%, AK103 60%-120%; all other analyses see the laboratory QC pages)

○ Yes ◉ No Comments:

All LCS/LCSD accuracy requirements were met.

SW8270SIM - The 18NEC-S28-SD-03 MS and MSD had several recoveries outside of control limit. However, the samples were diluted 10X, thus no qualification was needed.

AK103 - The 18NEC-S28-SD-03 MS failed high for RRO at 191%; however, the spike amount was less than the parent sample concentration, no samples were qualified.

iv. Precision - All relative percent differences (RPD) reported and less than method or laboratory limits? And project specified DQOs, if applicable. RPD reported from LCS/LCSD, MS/MSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)

◉ Yes ○ No Comments:

All LCS/LCSD precision requirements were met.

All MS/MSD precision requirements were met with the following exception.
SW8270SIM - the following analytes exceeded the RPD limit of 20%: fluoranthene (88%), phenanthrene (91%), and pyrene (56%). Samples were not qualified due to a dilution of 10X.

v. If %R or RPD is outside of acceptable limits, what samples are affected?

Comments:

N/A

vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

◉ Yes ○ No Comments:

N/A

vii. Data quality or usability affected? (Use comment box to explain)

Comments:

Data quality and usability were not affected.

c. Surrogates - Organics Only

i. Are surrogate recoveries reported for organic analyses - field, QC and laboratory samples?

◉ Yes ○ No Comments:

All organic analyses were reported with surrogates.

ii. Accuracy - All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods 50-150 %R; all other analyses see the laboratory report pages)

○ Yes ◉ No Comments:

SW8082: Samples 18NEC-S28-SD-01, 18NEC-S28-SD-08, and 18NEC-S28-SD-13 recovered high for Decachlorobiphenyl, however the results were nondetect and did not need qualification.

iii. Do the sample results with failed surrogate recoveries have data flags? If so, are the data flags clearly defined?

○ Yes ○ No Comments:

N/A

iv. Data quality or usability affected? (Use the comment box to explain.)

○ Yes ◉ No Comments:

Data quality and usability were not affected.

d. Trip blank - Volatile analyses only (GRO, BTEX, Volatile Chlorinated Solvents, etc.): Water and Soil

i. One trip blank reported per matrix, analysis and cooler?

○ Yes ◉ No Comments:

Volatile analyses were not included with this SDG, therefore a trip blank was not required.

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)

○ Yes ◉ No Comments:

N/A

iii. All results less than PQL?

○ Yes ◉ No Comments:

N/A

iv. If above PQL, what samples are affected?

Comments:

N/A

v. Data quality or usability affected? Explain.

Comments:

Data quality and usability were not affected.

e. Field Duplicate

i. One field duplicate submitted per matrix, analysis and 10 project samples?

○ Yes ◉ No Comments:

One duplicate was included with 16 primary samples, though the requirement for one FD per 10 project samples was met. See SDG 1184430.

ii. Submitted blind to lab?

◉ Yes ○ No Comments:

Sample / Duplicate:
18NEC-S28-SD-02 / 18NEC-S28-SD-02-8

iii. Precision - All relative percent differences (RPD) less than specified DQOs?
(Recommended: 30% water, 50% soil)

$$\text{RPD (\%)} = \text{Absolute value of:} \frac{(R_1-R_2)}{(R_1+R_2)} \times 100$$

Where: R_1 = Sample Concentration
R_2 = Field Duplicate Concentration (R_1-R_2)

○ Yes ◉ No Comments:

The following analyte had RPDs greater than 50% in the sample/duplicate 18NEC-S28-SD-02 / 18NEC-S28-SD-02-8:
Selenium (52%)

iv. Data quality or usability affected? (Use the comment box to explain why or why not.)

◉ Yes ○ No Comments:

Data quality and usability are minimally affected. The analytes listed above are flagged QN in both the parent and duplicate samples to indicate an unknown bias. The higher result will be used for reporting.

f. Decontamination or Equipment Blank (If not applicable, a comment stating why must be entered below.)

○ Yes ◉ No Comments:

No equipment blanks were submitted with this SDG. See the checklist for SDG 1184430.

i. All results less than PQL?

○ Yes ○ No Comments:

N/A

ii. If above PQL, what samples are affected?

Comments:

N/A

iii. Data quality or usability affected? Explain.

Comments:

Data quality and usability were not affected.

7. Other Data Flags/Qualifiers (ACOE, AFCEE, Lab Specific, etc.)

a. Defined and appropriate?

◉ Yes ○ No Comments:

Qualifiers applied to this data are defined in the Data Quality Assessment appendix of this report.

Laboratory Data Review Checklist

Completed by:

Nathaniel Gingery

Title:

Project Chemist

Date:

10/19/2018

CS Report Name:

Northeast Cape Five-Year Review

Report Date:

12/20/2018

Consultant Firm:

Jacobs

Laboratory Name:

SGS North America Inc.

Laboratory Report Number:

1184430

ADEC File Number:

ST LAW MOC 475.38.013

Hazard Identification Number:

221

1. Laboratory

a. Did an ADEC CS approved laboratory receive and perform all of the submitted sample analyses?

◉ Yes ○ No Comments:

All analyses were performed by SGS North America Inc. in Anchorage, AK.

b. If the samples were transferred to another "network" laboratory or sub-contracted to an alternate laboratory, was the laboratory performing the analyses ADEC CD approved?

○ Yes ◉ No Comments:

Not applicable.

2. Chain of Custody (CoC)

a. CoC information completed, signed, and dated (including released/received by)?

◉ Yes ○ No Comments:

b. Correct analyses requested?

◉ Yes ○ No Comments:

3. Laboratory Sample Receipt Documentation

a. Sample/cooler temperature documented and within range at receipt (0° ± 6° C)?

◉ Yes ○ No Comments:

Cooler name, temperature blank temp °C
1. Pillow Pet 0.9 °C
2. Sham Wow 2.0 °C
3. Oxiclean 0.2 °C
4. Magic Mesh 0.8 °C

b. Sample preservation acceptable - acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?

◉ Yes ○ No Comments:

c. Sample condition documented - broken, leaking (Methanol), zero headspace (VOC vials)?

◉ Yes ○ No Comments:

No discrepancies were noted.

d. If there were any discrepancies, were they documented? For example, incorrect sample containers/preservation, sample temperature outside of acceptable range, insufficient or missing samples, etc.?

○ Yes ○ No Comments:

N/A

e. Data quality or usability affected? Explain.

Comments:

Data quality and usability were not affected.

4. Case Narrative

a. Present and understandable?

◉ Yes ○ No Comments:

b. Discrepancies, errors or QC failures identified by the lab?

◉ Yes ○ No Comments:

c. Were all corrective actions documented?

◉ Yes ○ No Comments:

The lab noted all corrective actions taken.

d. What is the effect on data quality/usability according to the case narrative?

Comments:

Discrepancies will be discussed in their related sections below.

5. Samples Results

a. Correct analyses performed/reported as requested on COC?

◉ Yes ○ No Comments:

b. All applicable holding times met?

◉ Yes ○ No Comments:

c. All soils reported on a dry weight basis?

(•) Yes ( ) No Comments:

d. Are the reported PQLs less than the Cleanup Level or the minimum required detection level for the project?

( ) Yes (•) No Comments:

The following analytes had LODs greater than the project cleanup level:
18NEC-S28-SD-34:
SW8270SIM: 2-Methylnaphthalene, Acenaphthene

18NEC-S28-SD-35:
SW8082: Aroclor-1221
SW8270SIM: Acenaphthene

18NEC-S28-SD-36:
SW8082: Aroclor-1221
SW8270SIM: Acenaphthene, Fluorene

e. Data quality or usability affected? Explain.

Comments:

The nondetect sample results with LODs greater than the project screening levels are italicized and highlighted in the results crosstab indicate a possible false nonexceedance.
Aroclor 1221 has not been found at Site 28 in the past or in current samples, so this analyte is not likely to be present and the data is not affected.

6. QC Samples

a. Method Blank

i. One method blank reported per matrix, analysis and 20 samples

(•) Yes ( ) No Comments:

ii. All method blank results less than PQL?

(•) Yes ( ) No Comments:

Zinc was detected in the method blank for batch MXX31843. The only sample associated with this method blank is the equipment blank.

iii. If above PQL, what samples are affected?

Comments:

N/A

iv. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

(•) Yes ( ) No Comments:

N/A

v. Data quality or usability affected? Explain.

Comments:

The data quality and usability were not affected.

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics - One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)

( ) Yes (•) No Comments:

An LCS/LCSD or LCS was analyzed for all methods as required.
DoD QSM required MS/MSDs were assigned to samples 18NEC-S28-SD-28 and 18NEC-S28-SD-54. A project specific MS/MSD was not analyzed in AK102 and AK103 batches XXX40205, XXX40206, and XXX40207. A project specific MS/MSD was not analyzed in SW8082 batches XXX40175, XXX40180 and XXX40262. A project specific MS/MSD was not analyzed in SW8270SIM batches XXX40169 and XXX40174.

ii. Metals/Inorganics - one LCS and one sample duplicate reported per matrix, analysis and 20 samples?

(•) Yes ( ) No Comments:

An LCS was analyzed for all methods. DoD QSM required MS/MSDs were assigned to samples 18NEC-S28-SD-28 and 18NEC-S28-SD-54.

iii. Accuracy - All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods: AK101 60%-120%, AK102 75%-125%, AK103 60%-120%; all other analyses see the laboratory QC pages)

( ) Yes (•) No Comments:

All LCS/LCSD accuracy requirements were met.

SW8270SIM - Both sets of MS and MSDs had several recoveries outside of control limits. However, the samples were diluted 10X or greater, thus no qualification was needed.

AK102/AK103 - Several AK102 and AK103 MS/MSD recoveries are outside of control limits. The spike amount is less than the parent sample concentration and no samples were qualified.

iv. Precision - All relative percent differences (RPD) reported and less than method or laboratory limits? And project specified DQOs, if applicable. RPD reported from LCS/LCSD, MS/MSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)

(•) Yes ( ) No Comments:

All LCS/LCSD precision requirements were met.

All MS/MSD precision requirements were met.

v. If %R or RPD is outside of acceptable limits, what samples are affected?

Comments:

N/A

vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

(•) Yes ( ) No Comments:

N/A

vii. Data quality or usability affected? (Use comment box to explain)

Comments:

Data quality and usability were not affected.

c. Surrogates - Organics Only

i. Are surrogate recoveries reported for organic analyses - field, QC and laboratory samples?

(•) Yes ( ) No Comments:

All organic analyses were reported with surrogates.

ii. Accuracy - All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods 50-150 %R; all other analyses see the laboratory report pages)

( ) Yes (•) No Comments:

SW8082: Sample 18NEC-S28-SD-42 recovered low for Decachlorobiphenyl (35%).

AK102 and AK103 - Several samples have surrogate failures but are not qualified due dilutions of 5X or greater.

iii. Do the sample results with failed surrogate recoveries have data flags? If so, are the data flags clearly defined?

(•) Yes ( ) No Comments:

SW8082: Sample 18NEC-S28-SD-42 was labeled QL to indicate a potential low bias.

AK102/103 - Samples are not qualified because they have a dilution 5X or greater.

iv. Data quality or usability affected? (Use the comment box to explain.)

( ) Yes (•) No Comments:

Data quality and usability were minimally affected. Results qualified QL are considered estimated with a low bias.

d. Trip blank - Volatile analyses only (GRO, BTEX, Volatile Chlorinated Solvents, etc.): Water and Soil

i. One trip blank reported per matrix, analysis and cooler?

○ Yes ◉ No Comments:

Volatile analyses were not included with this SDG, therefore a trip blank was not required.

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)

○ Yes ◉ No Comments:

N/A

iii. All results less than PQL?

○ Yes ◉ No Comments:

N/A

iv. If above PQL, what samples are affected?

Comments:

N/A

v. Data quality or usability affected? Explain.

Comments:

Data quality and usability were not affected.

e. Field Duplicate

i. One field duplicate submitted per matrix, analysis and 10 project samples?

○ Yes ◉ No Comments:

Five duplicates were included with 38 primary samples.

ii. Submitted blind to lab?

◉ Yes ○ No Comments:

Sample / Duplicate:
18NEC-S28-SD-17 / 18NEC-S28-SD-17-8
18NEC-S28-SD-27 / 18NEC-S28-SD-27-8
18NEC-S28-SD-38 / 18NEC-S28-SD-38-8
18NEC-S28-SD-41 / 18NEC-S28-SD-41-8
18NEC-S28-SD-48 / 18NEC-S28-SD-48-8

iii. Precision - All relative percent differences (RPD) less than specified DQOs?
(Recommended: 30% water, 50% soil)

$$\text{RPD (\%)} = \text{Absolute value of: } \frac{(R_1\text{-}R_2)}{(R_1+R_2)} \times 100$$

Where: R_1 = Sample Concentration
R_2 = Field Duplicate Concentration (R_1-R_2)

○ Yes ◉ No Comments:

The following analyte had RPDs greater than 50%:
18NEC-S28-SD-17 / 18NEC-S28-SD-17-8:
SW8270SIM:
Benzo(a)anthracene (72.6%)

18NEC-S28-SD-27 / 18NEC-S28-SD-27-8
SW6020:
Lead (65.3%)
Zinc (69.3%)
SW8270SIM:
Fluorene (65.4%)

18NEC-S28-SD-38 / 18NEC-S28-SD-38-8
AK102:
DRO (74%)
AK102SG:
DRO (68.8%)
SW8270SIM:
1-Methylnaphthalene (125.8%)
2-Methylnaphthalene (123.5%)
Acenaphthalene (122.5%)
Fluorene (161.8%)
Naphthalene (53.8%)
Phenanthrene (112.2%)

18NEC-S28-SD-41 / 18NEC-S28-SD-41-8
AK102SG:
DRO (51.6%)

18NEC-S28-SD-48 / 18NEC-S28-SD-48-8
SW6020:
Lead (68.9%)
Zinc (75.8%)
SW8082:
Aroclor-1260 (141%)
SW8270SIM:
1-Methylnaphthalene (55.1%)
2-Methylnaphthanele (56.2%)
Naphthalene (51.4%)
Phenanthrene (54.4%)

iv. Data quality or usability affected? (Use the comment box to explain why or why not.)

◉ Yes ○ No Comments:

Data quality and usability are minimally affected. The analytes listed above are flagged QN in both the parent and duplicate samples to indicate an unknown bias. The higher result will be used for reporting.

f. Decontamination or Equipment Blank (If not applicable, a comment stating why must be entered below.)

○ Yes ◉ No Comments:

One equipment blank, 18NEC-EB01-WG, was included with this SDG.

i. All results less than PQL?

◉ Yes ○ No Comments:

The equipment blank had detections of Naphthalene (0.0000079 mg/kg) and Zinc (0.00622 mg/kg). All samples were either nondetect or greater than 5 times the equipment blank contamination, thus no qualification was needed.

ii. If above PQL, what samples are affected?

Comments:

N/A

iii. Data quality or usability affected? Explain.

Comments:

Data quality and usability were not affected.

7. Other Data Flags/Qualifiers (ACOE, AFCEE, Lab Specific, etc.)

a. Defined and appropriate?

◉ Yes ○ No Comments:

Qualifiers applied to this data are defined in the Data Quality Assessment appendix of this report.

EXHIBIT F2-4

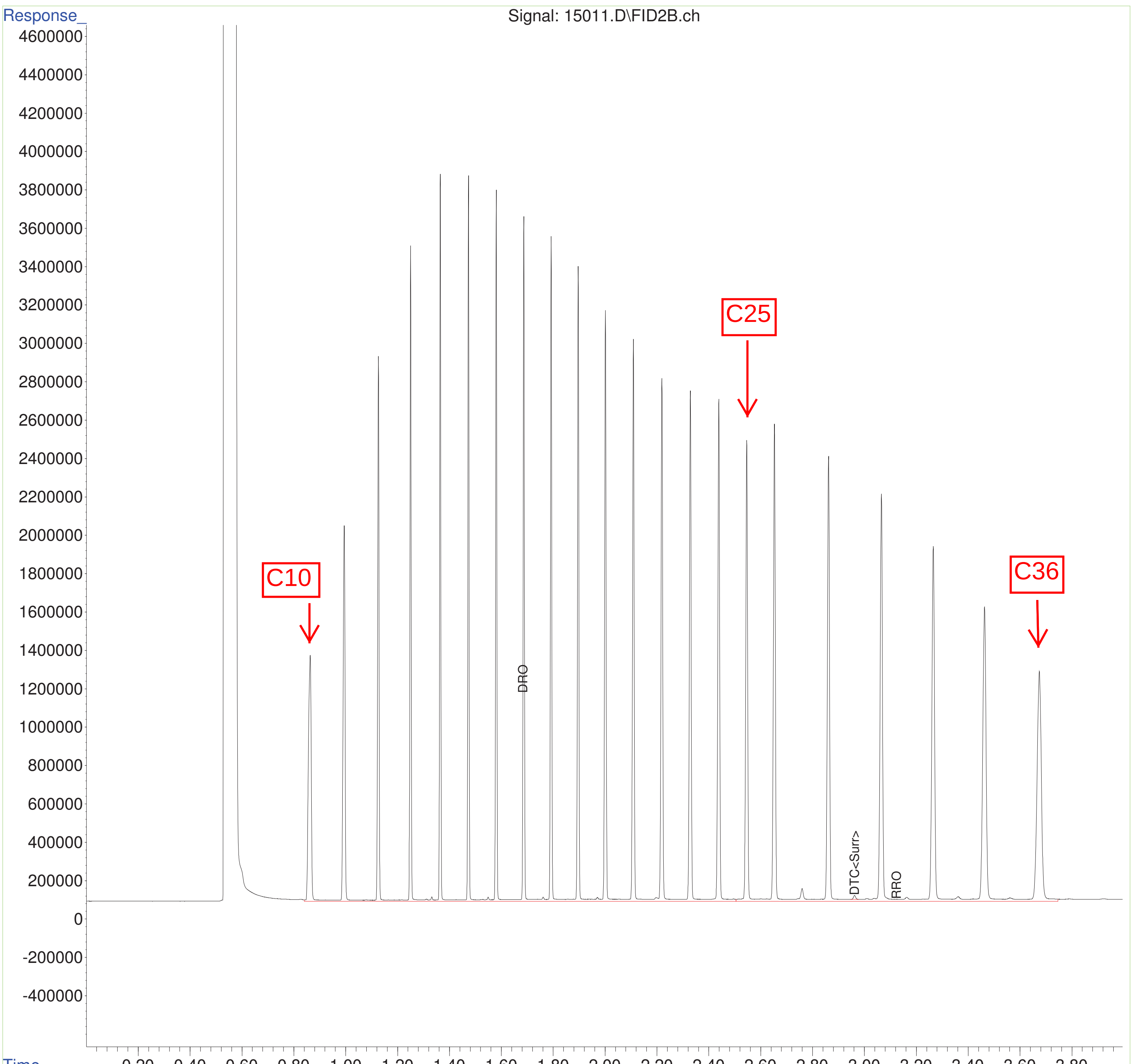
Laboratory Deliverables

(Provided electronically on CD)

EXHIBIT F2-5

Biogenic Chromatograms

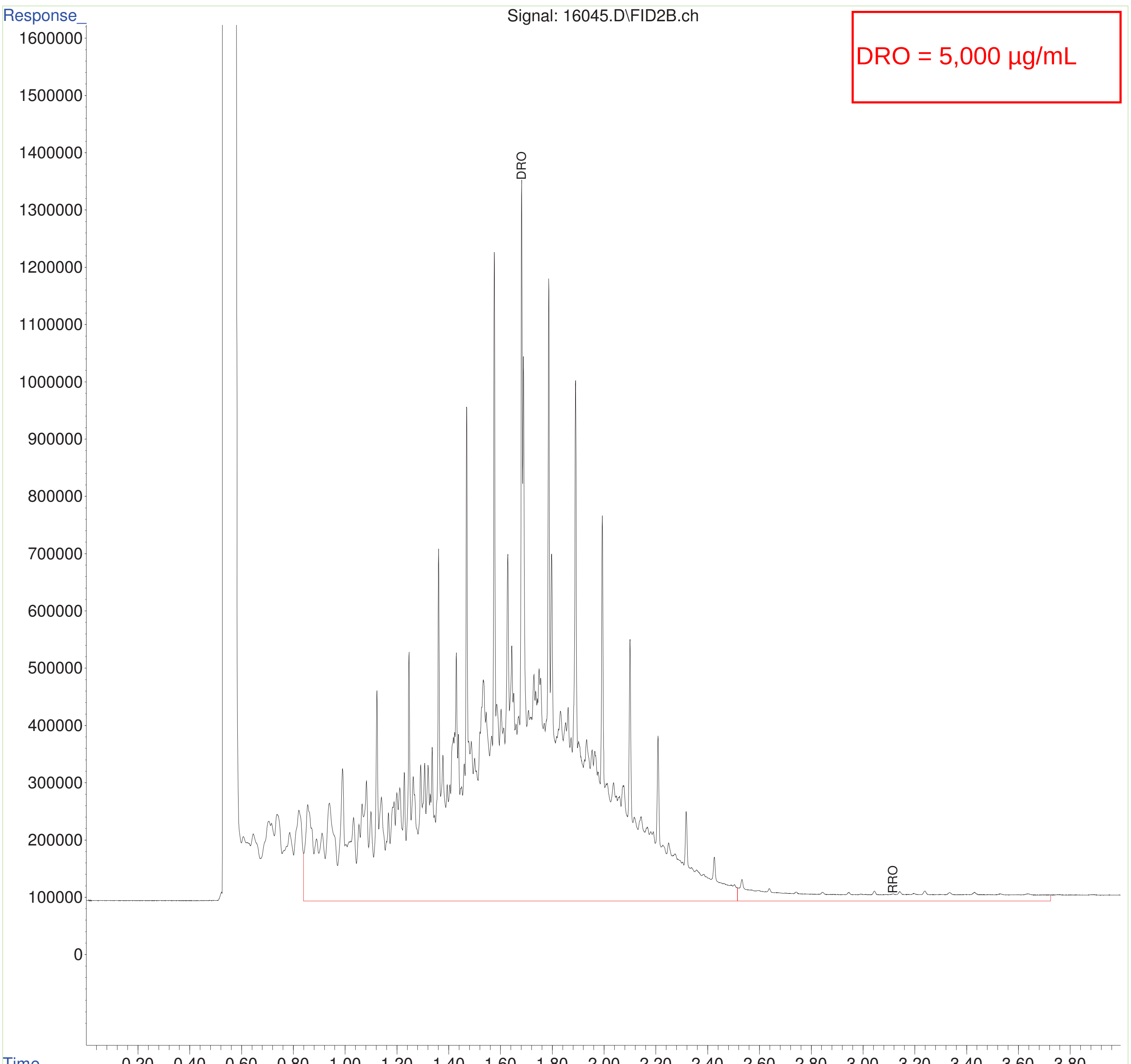
```
Data Path : Y:\08\SF\DATA\081518B.SEC\
Data File : 15011.D
Signal(s) : FID2B.ch
Acq On    : 15 Aug 2018   3:42 pm
Operator  : CMS
Sample    : NAS
Misc      :
ALS Vial  : 2   Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Aug 15 17:28:18 2018
Quant Method : Y:\08\SF\METHOD\SFR2018-0815A.M
Quant Title  : DRO/RRO by Method AK 102/103
QLast Update : Wed Aug 15 17:10:45 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj.  :
Signal Phase :
Signal Info  :
```



Data Path : Y:\08\SF\DATA\081618A.SEC\
Data File : 16045.D
Signal(s) : FID2B.ch
Acq On : 16 Aug 2018 6:47 pm
Operator : VDL
Sample : CCVB
Misc :
ALS Vial : 3 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Aug 20 10:37:46 2018
Quant Method : Y:\08\SF\METHOD\SFR2018-0815C.M
Quant Title : DRO/RRO by Method AK 102/103
QLast Update : Wed Aug 15 17:10:45 2018
Response via : Initial Calibration
Integrator: ChemStation

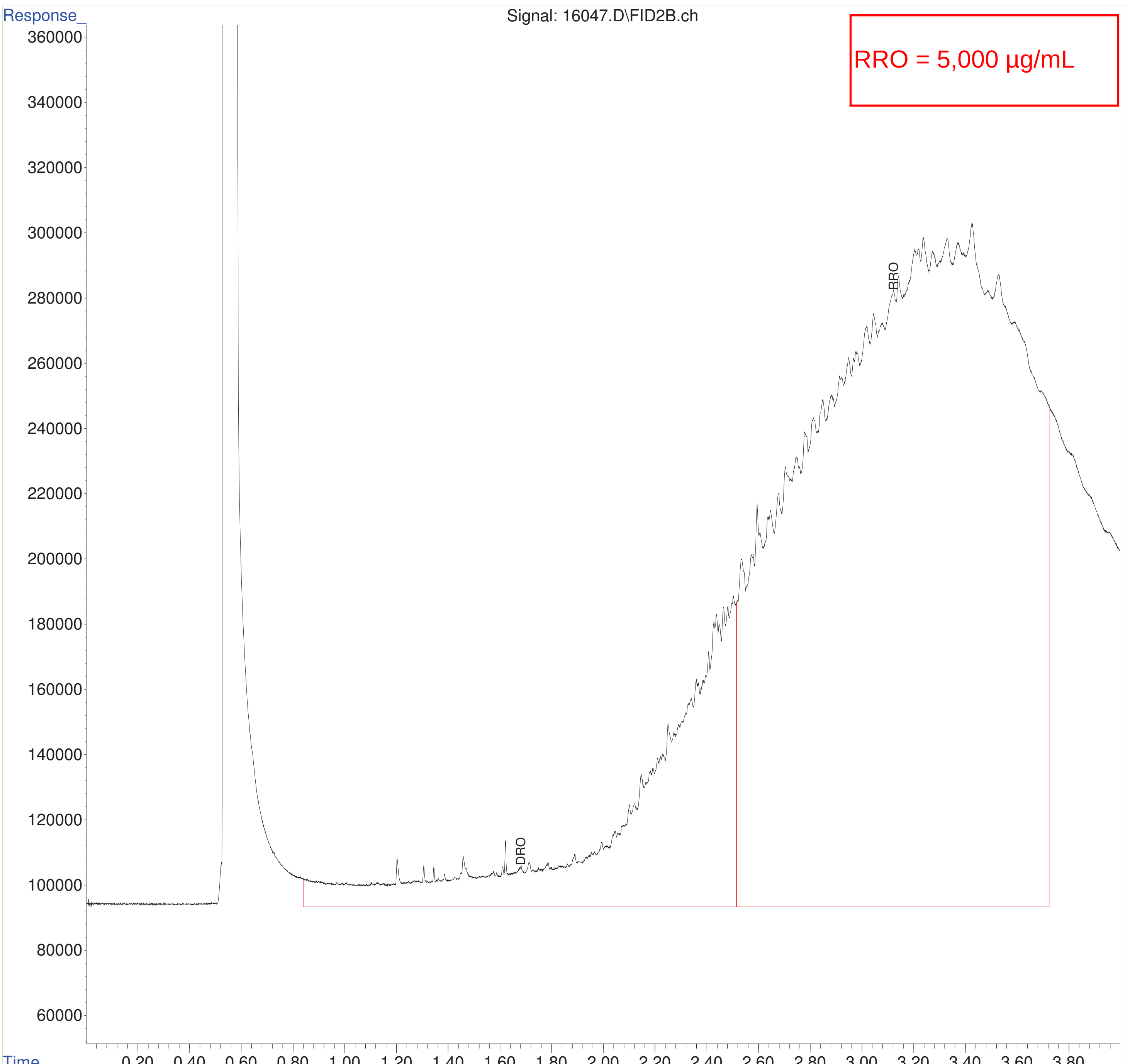
Volume Inj. :
Signal Phase :
Signal Info :



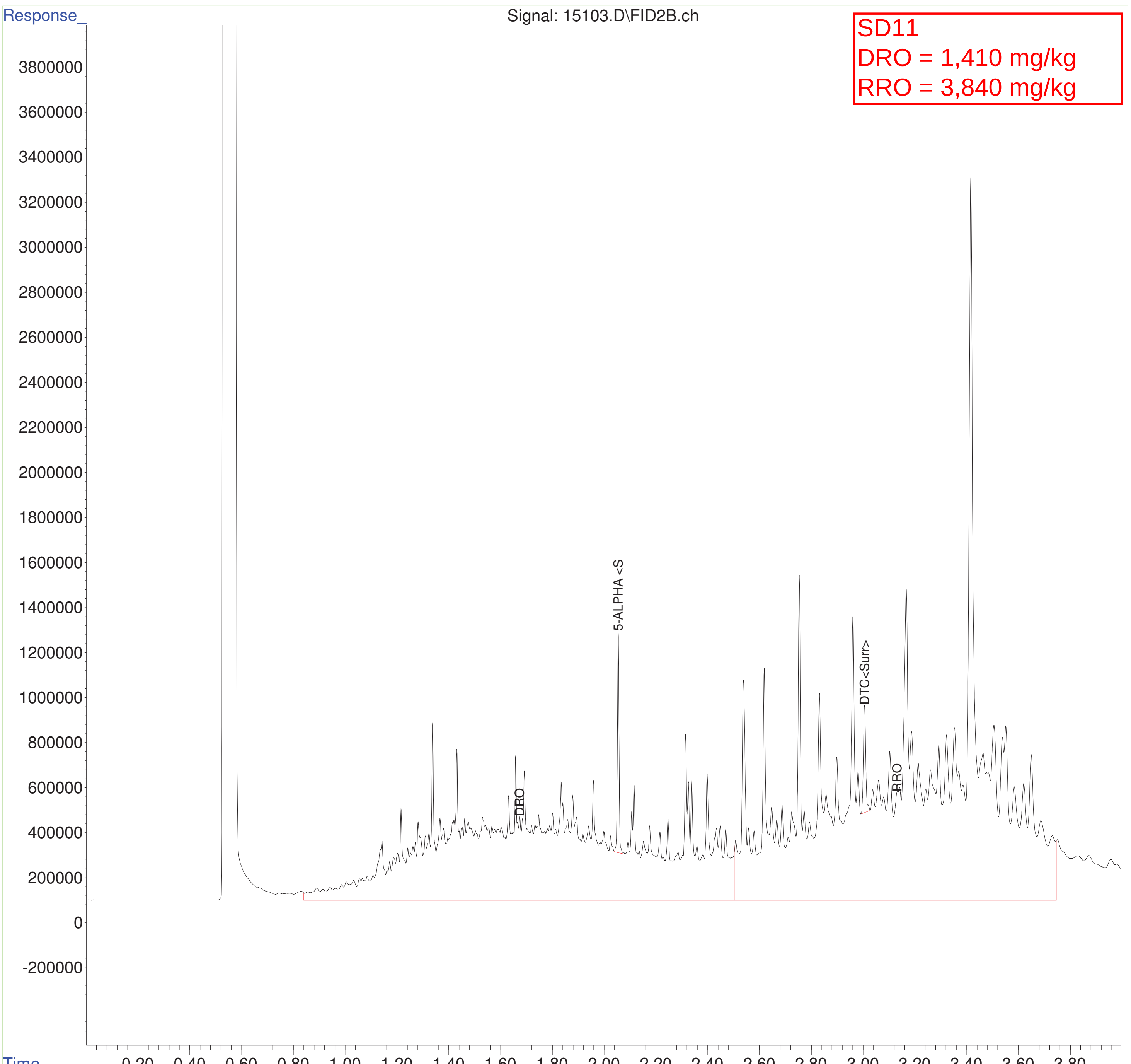
Data Path : Y:\08\SF\DATA\081618A.SEC\
Data File : 16047.D
Signal(s) : FID2B.ch
Acq On : 16 Aug 2018 6:56 pm
Operator : VDL
Sample : CCVR
Misc :
ALS Vial : 4 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Aug 20 10:38:07 2018
Quant Method : Y:\08\SF\METHOD\SFR2018-0815C.M
Quant Title : DRO/RRO by Method AK 102/103
QLast Update : Wed Aug 15 17:10:45 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :



```
Data Path : Y:\08\SF\DATA\081518B.SEC\
Data File : 15103.D
Signal(s) : FID2B.ch
Acq On    : 15 Aug 2018  11:17 pm
Operator  : CMS
Sample    : 1184373014
Misc      :
ALS Vial  : 92   Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Aug 16 12:38:08 2018
Quant Method : Y:\08\SF\METHOD\SFR2018-0815A.M
Quant Title  : DRO/RRO by Method AK 102/103
QLast Update : Wed Aug 15 17:10:45 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj.  :
Signal Phase :
Signal Info  :
```



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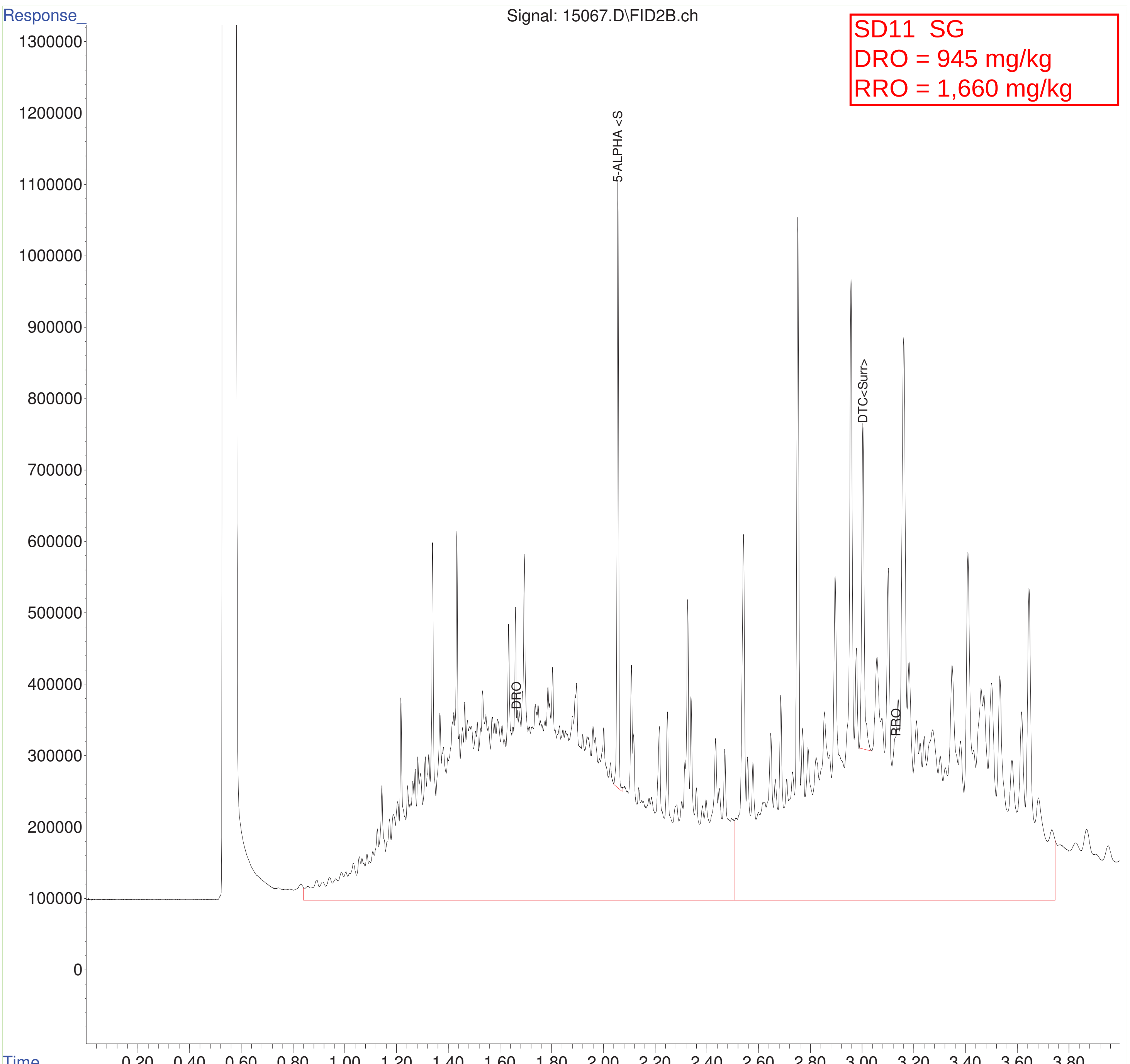
```
Data Path : Y:\08\SF\DATA\081518B.SEC\
Data File : 15067.D
Signal(s) : FID2B.ch
Acq On    : 15 Aug 2018   8:21 pm
Operator  : CMS
Sample    : 1184373014 SG
Misc      :
ALS Vial  : 76   Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Aug 16 12:10:56 2018
Quant Method : Y:\08\SF\METHOD\SFR2018-0815A.M
Quant Title  : DRO/RRO by Method AK 102/103
QLast Update : Wed Aug 15 17:10:45 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj.  :
Signal Phase :
Signal Info  :
```



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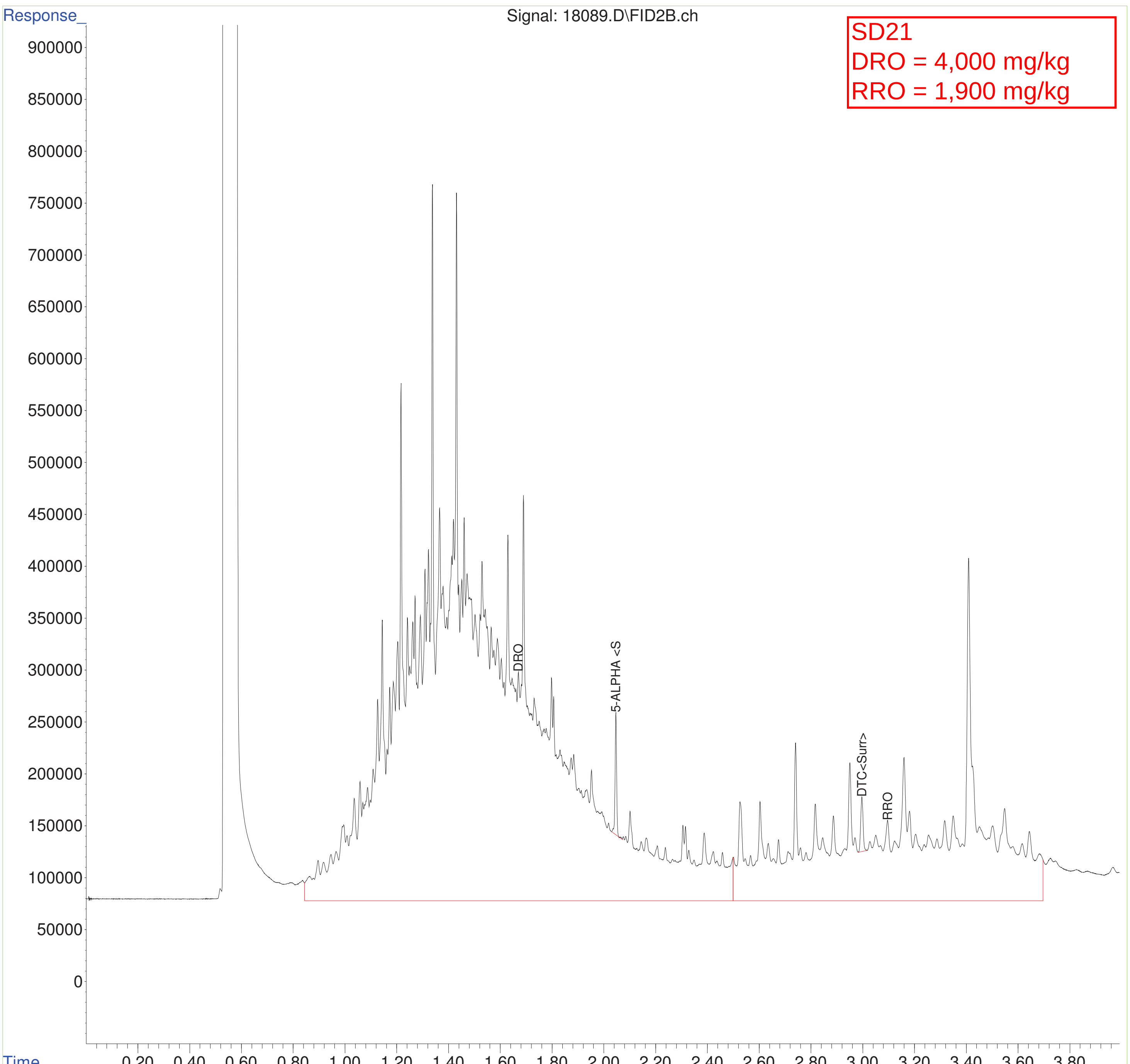
```
Data Path : Y:\08\SF\DATA\081818.SEC\
Data File : 18089.D
Signal(s) : FID2B.ch
Acq On    : 18 Aug 2018   4:41 pm
Operator  : VDL
Sample    : 1184430006 10X
Misc      :
ALS Vial  : 131   Sample Multiplier: 10

Integration File: autoint1.e
Quant Time: Aug 20 19:10:25 2018
Quant Method : Y:\08\SF\METHOD\SFR2018-0815E.M
Quant Title  : DRO/RRO by Method AK 102/103
QLast Update : Wed Aug 15 17:10:45 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj.  :
Signal Phase :
Signal Info  :
```



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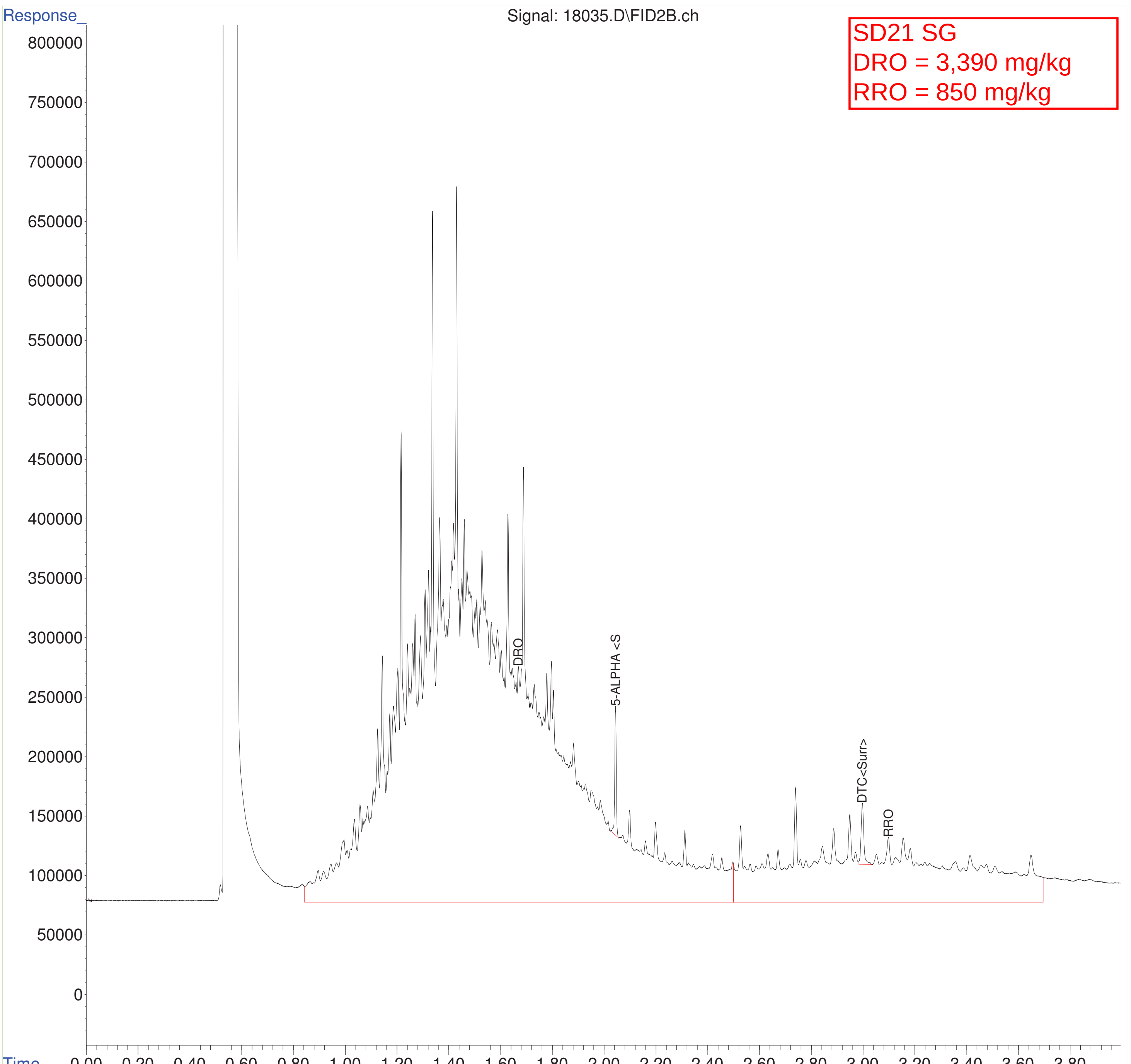
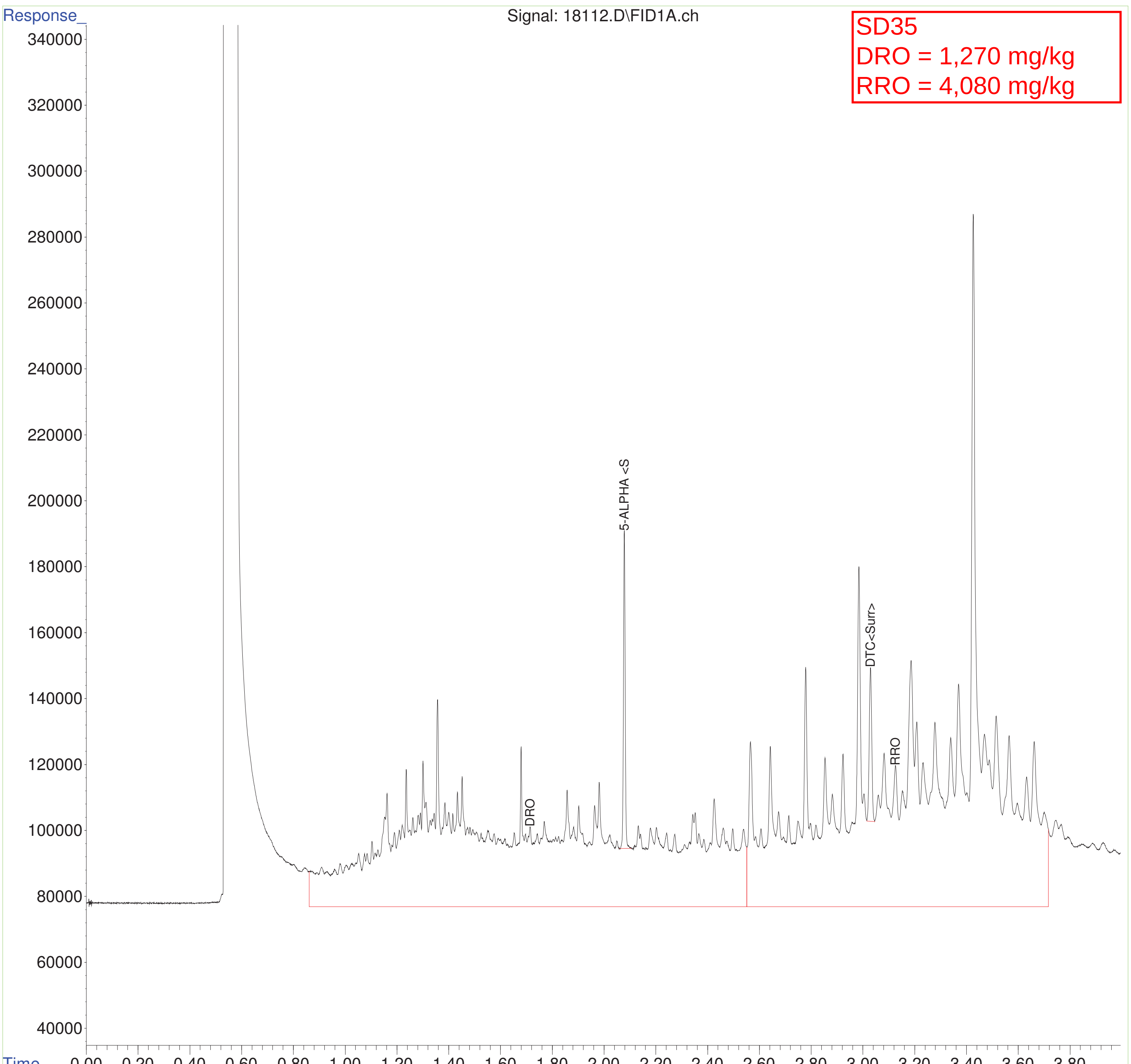
```
Data Path : Y:\08\SF\DATA\081818.SEC\
Data File : 18035.D
Signal(s) : FID2B.ch
Acq On    : 18 Aug 2018  12:11 pm
Operator  : VDL
Sample    : 1184430006 SG
Misc      :
ALS Vial  : 109   Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Aug 21 10:25:58 2018
Quant Method : Y:\08\SF\METHOD\SFR2018-0815E.M
Quant Title  : DRO/RRO by Method AK 102/103
QLast Update : Wed Aug 15 17:10:45 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj.  :
Signal Phase :
Signal Info  :
```



Data Path : Y:\08\SF\DATA\081818\
Data File : 18112.D
Signal(s) : FID1A.ch
Acq On : 18 Aug 2018 6:10 pm
Operator : VDL
Sample : 1184430023 10X
Misc :
ALS Vial : 43 Sample Multiplier: 10

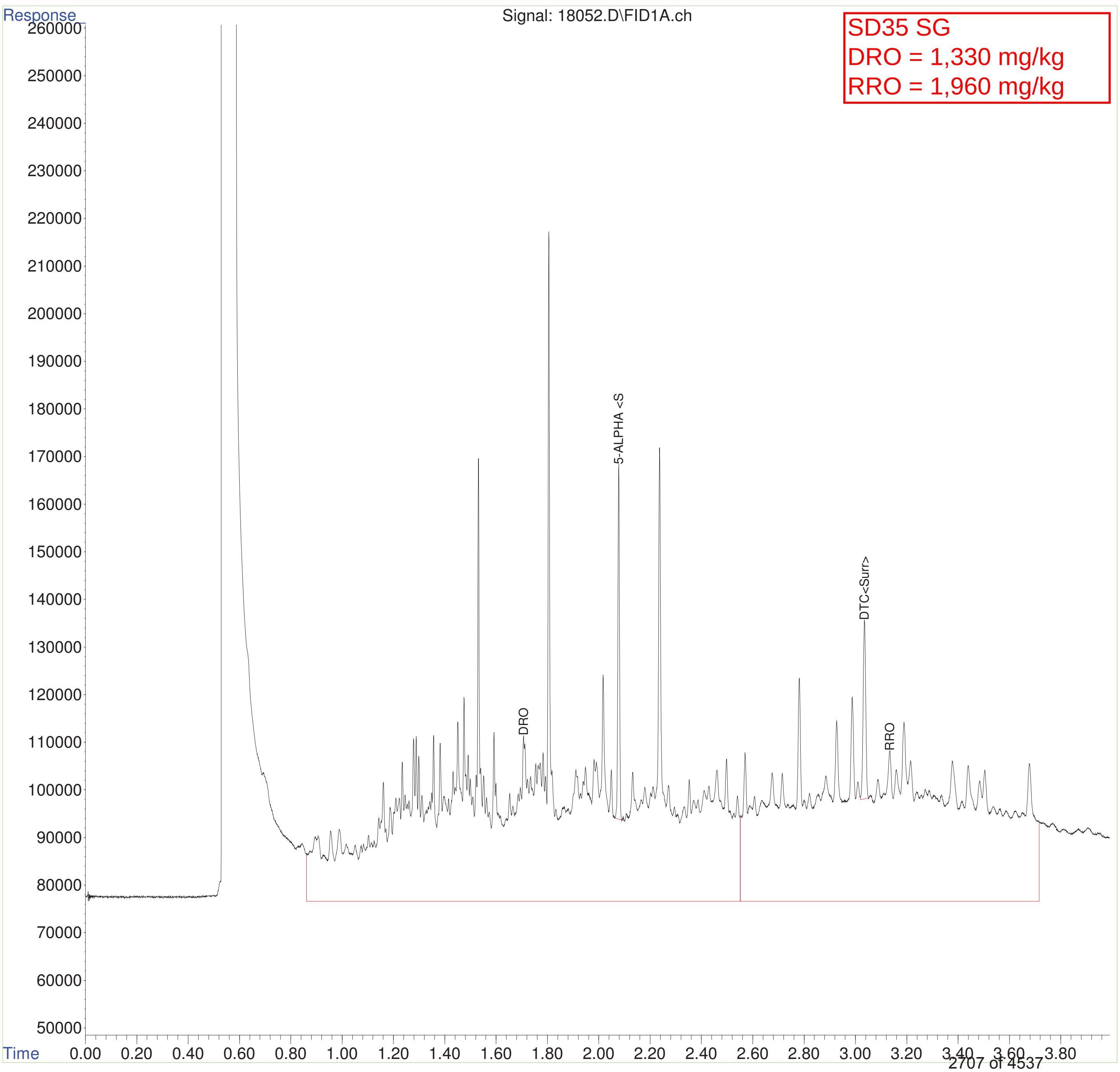
Integration File: autoint1.e
Quant Time: Aug 21 15:18:00 2018
Quant Method : Y:\08\SF\METHOD\SFF2018-0815F.M
Quant Title : DRO/RRO by Method AK 102/103
QLast Update : Wed Aug 15 13:06:29 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :



2018 of 4537

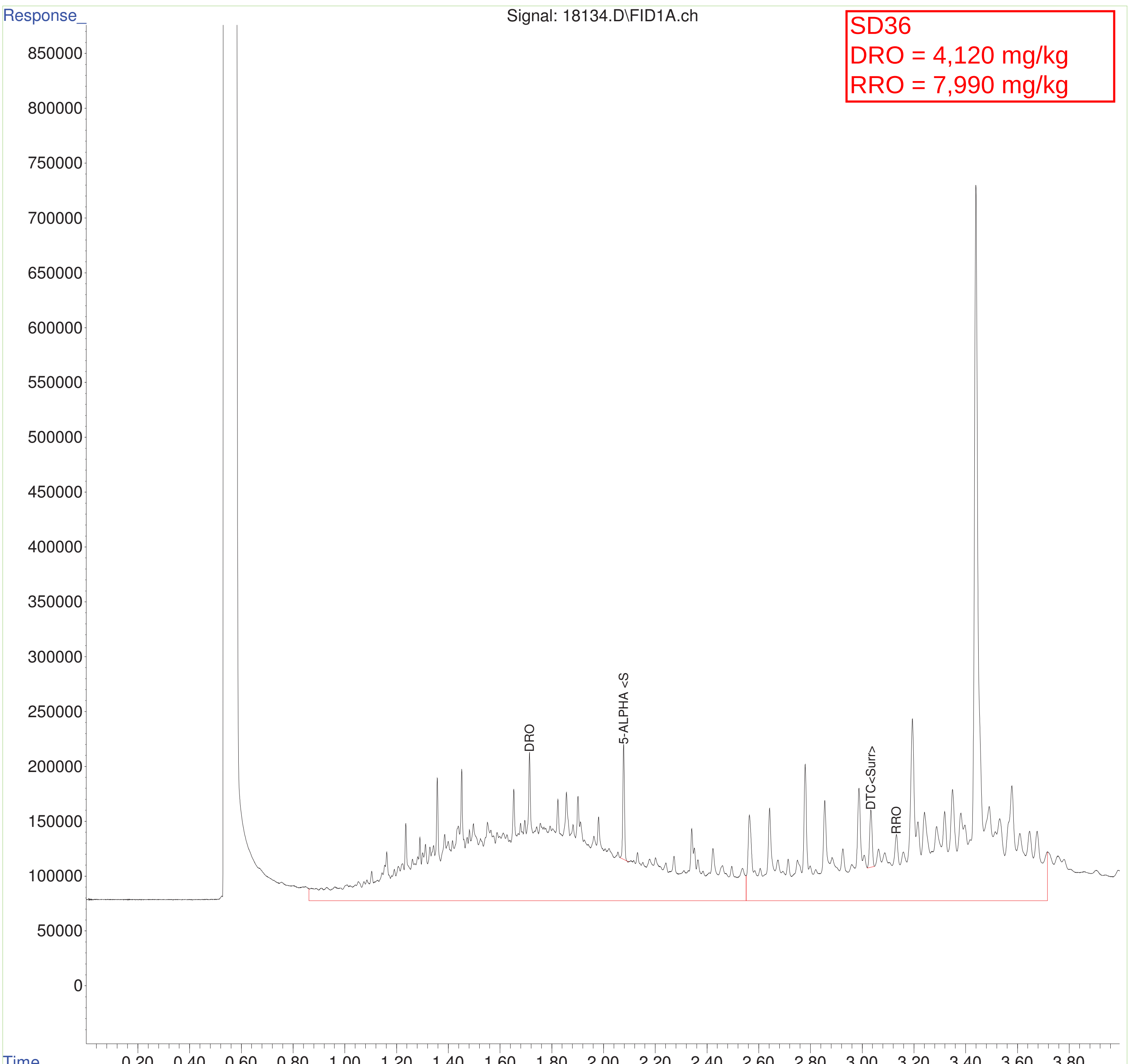
```
Data Path : Y:\08\SF\DATA\081818\
Data File : 18052.D
Signal(s) : FID1A.ch
Acq On    : 18 Aug 2018   1:31 pm
Operator  : VDL
Sample    : 1184430023 SG
Misc      :
ALS Vial  : 20   Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Aug 21 14:55:25 2018
Quant Method : Y:\08\SF\METHOD\SFF2018-0815F.M
Quant Title  : DRO/RRO by Method AK 102/103
QLast Update : Wed Aug 15 13:06:29 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj.  :
Signal Phase :
Signal Info  :
```



Data Path : Y:\08\SF\DATA\081818\
Data File : 18134.D
Signal(s) : FID1A.ch
Acq On : 18 Aug 2018 8:01 pm
Operator : VDL
Sample : 1184430032 10X
Misc :
ALS Vial : 62 Sample Multiplier: 10

Integration File: autoint1.e
Quant Time: Aug 21 15:27:29 2018
Quant Method : Y:\08\SF\METHOD\SFF2018-0815F.M
Quant Title : DRO/RRO by Method AK 102/103
QLast Update : Wed Aug 15 13:06:29 2018
Response via : Initial Calibration
Integrator: ChemStation

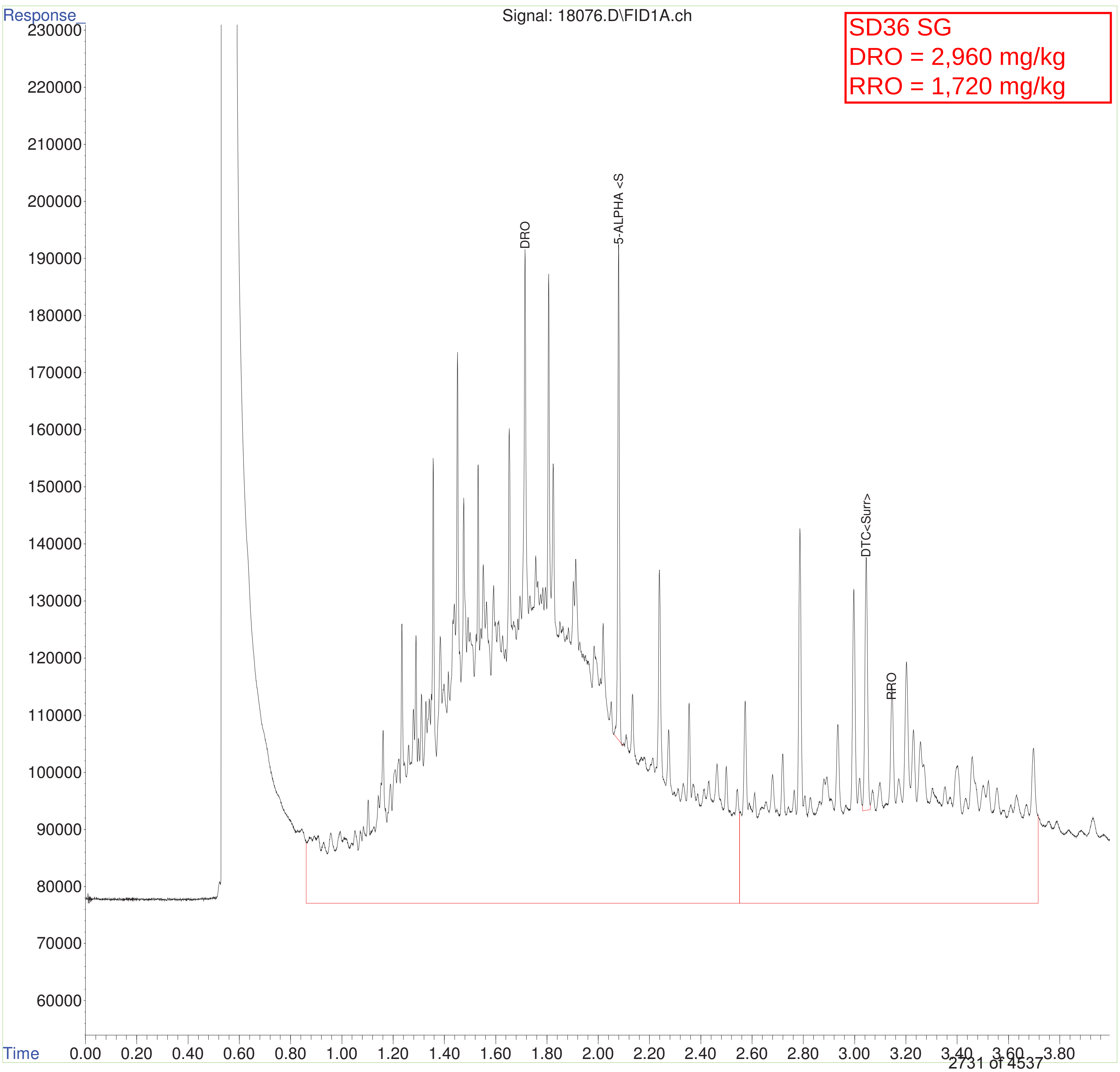
Volume Inj. :
Signal Phase :
Signal Info :



Data Path : Y:\08\SF\DATA\081818\
Data File : 18076.D
Signal(s) : FID1A.ch
Acq On : 18 Aug 2018 3:31 pm
Operator : VDL
Sample : 1184430032 SG
Misc :
ALS Vial : 29 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Aug 21 15:06:01 2018
Quant Method : Y:\08\SF\METHOD\SFF2018-0815F.M
Quant Title : DRO/RRO by Method AK 102/103
QLast Update : Wed Aug 15 13:06:29 2018
Response via : Initial Calibration
Integrator: ChemStation

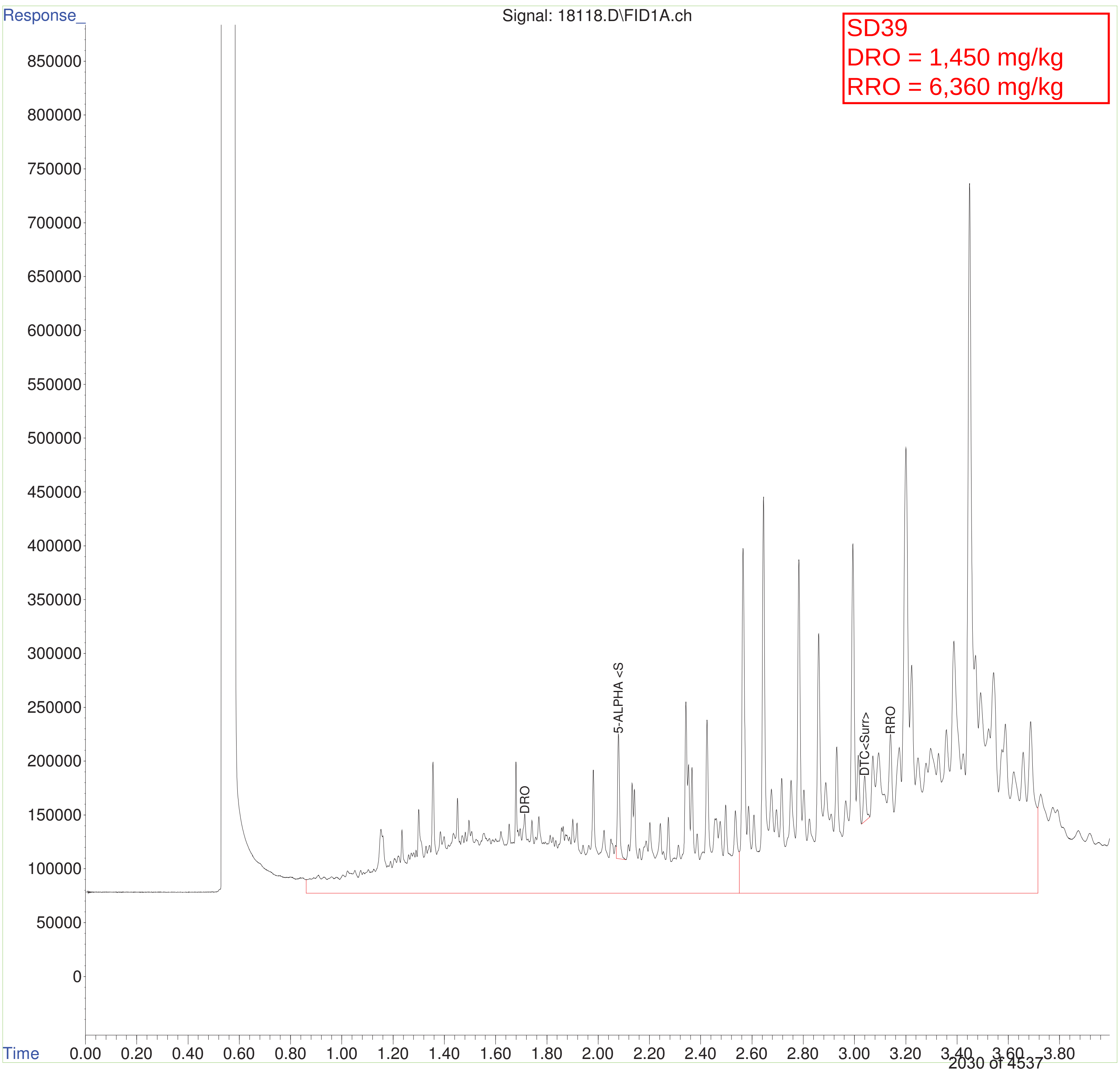
Volume Inj. :
Signal Phase :
Signal Info :



Data Path : Y:\08\SF\DATA\081818\
Data File : 18118.D
Signal(s) : FID1A.ch
Acq On : 18 Aug 2018 6:40 pm
Operator : VDL
Sample : 1184430026 10X
Misc :
ALS Vial : 46 Sample Multiplier: 10

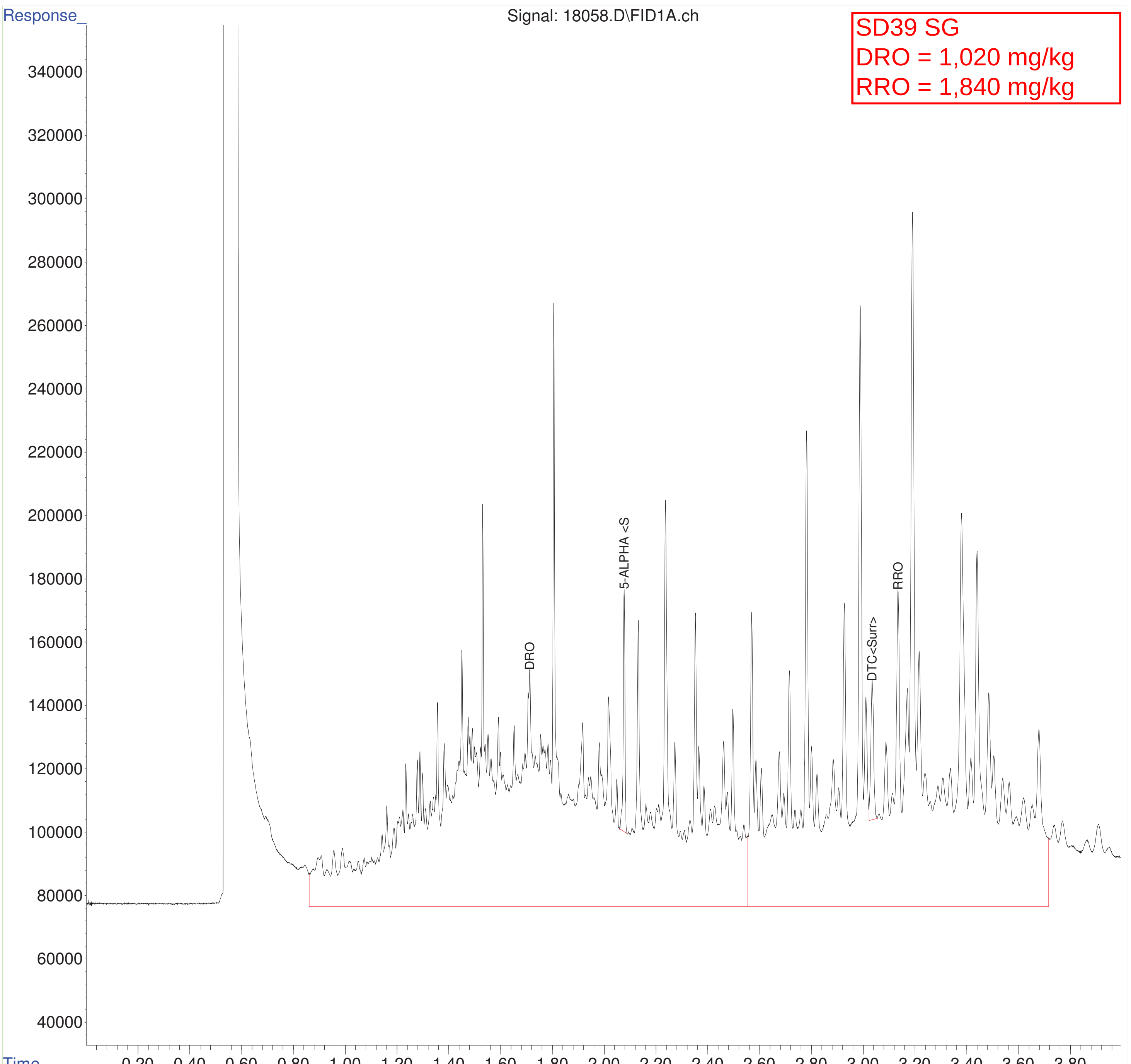
Integration File: autoint1.e
Quant Time: Aug 21 15:22:22 2018
Quant Method : Y:\08\SF\METHOD\SFF2018-0815F.M
Quant Title : DRO/RRO by Method AK 102/103
QLast Update : Wed Aug 15 13:06:29 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :



Quantitation Report (QT Reviewed)

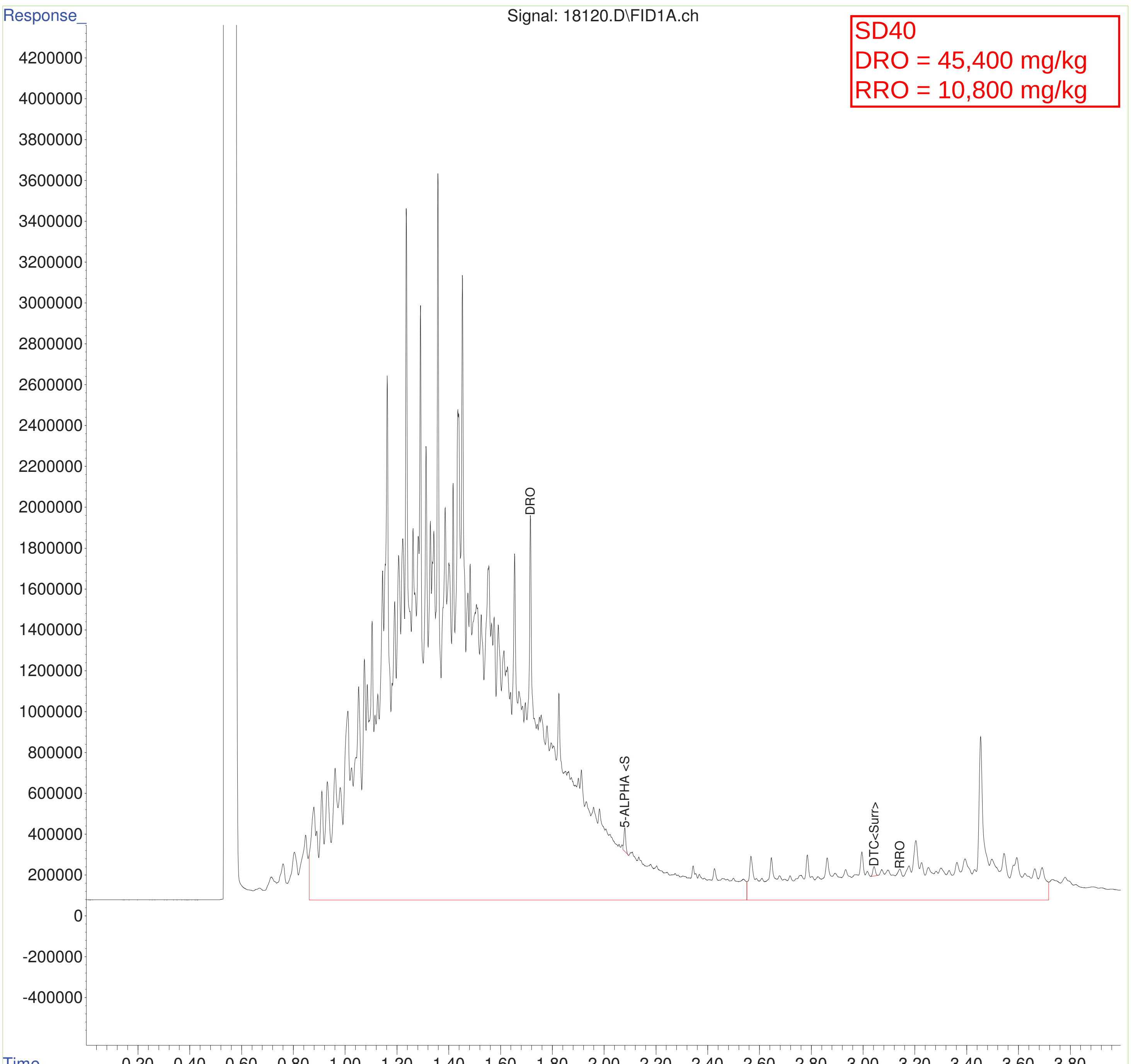
```
Data Path : Y:\08\SF\DATA\081818\
Data File : 18058.D
Signal(s) : FID1A.ch
Acq On    : 18 Aug 2018   2:01 pm
Operator  : VDL
Sample    : 1184430026 SG
Misc      :
ALS Vial  : 23   Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Aug 21 14:58:36 2018
Quant Method : Y:\08\SF\METHOD\SFF2018-0815F.M
Quant Title  : DRO/RRO by Method AK 102/103
QLast Update : Wed Aug 15 13:06:29 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj.  :
Signal Phase :
Signal Info  :
```



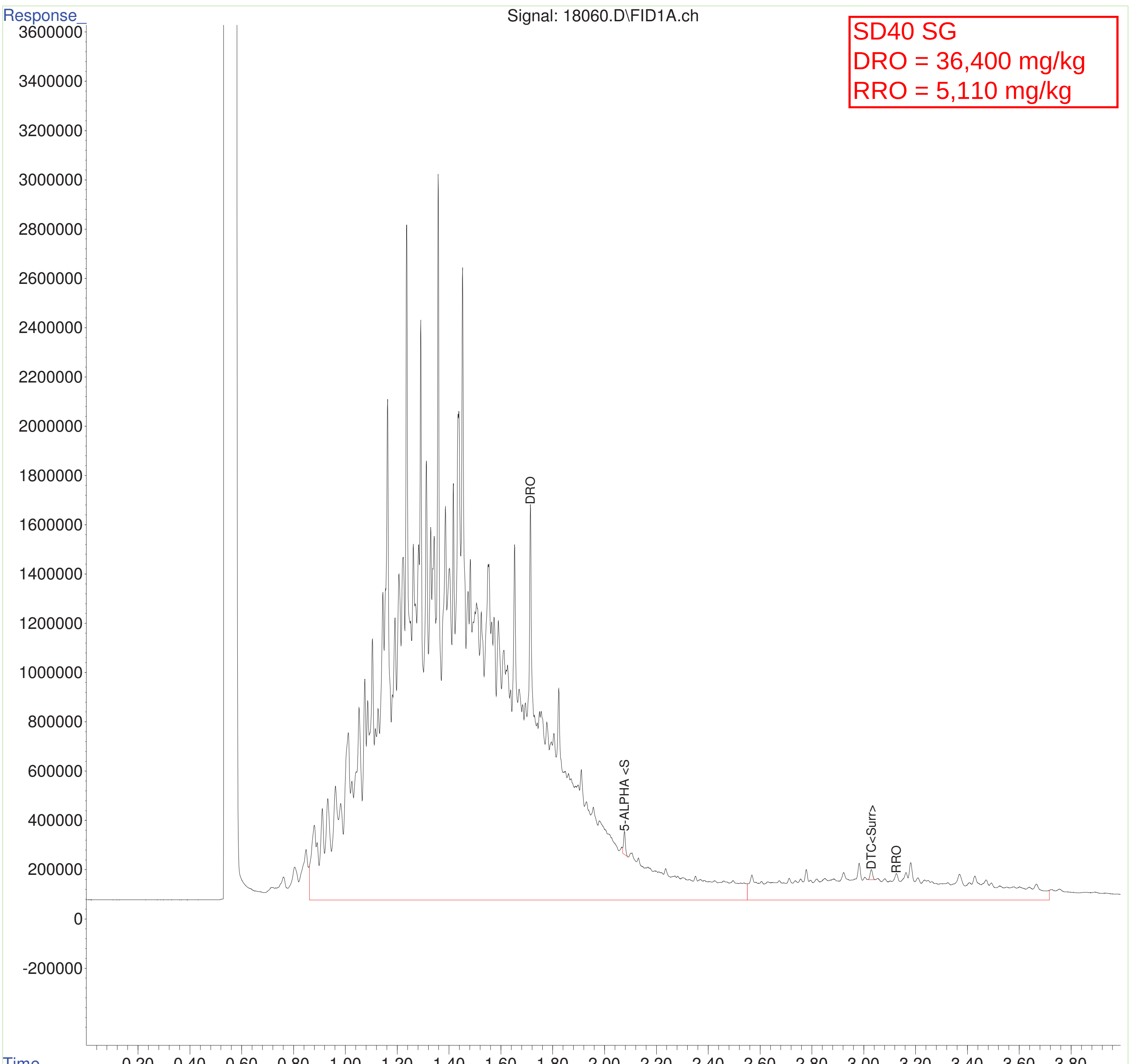
Data Path : Y:\08\SF\DATA\081818\
Data File : 18120.D
Signal(s) : FID1A.ch
Acq On : 18 Aug 2018 6:50 pm
Operator : VDL
Sample : 1184430027 10X
Misc :
ALS Vial : 47 Sample Multiplier: 10

Integration File: autoint1.e
Quant Time: Aug 21 15:24:10 2018
Quant Method : Y:\08\SF\METHOD\SFF2018-0815F.M
Quant Title : DRO/RRO by Method AK 102/103
QLast Update : Wed Aug 15 13:06:29 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :



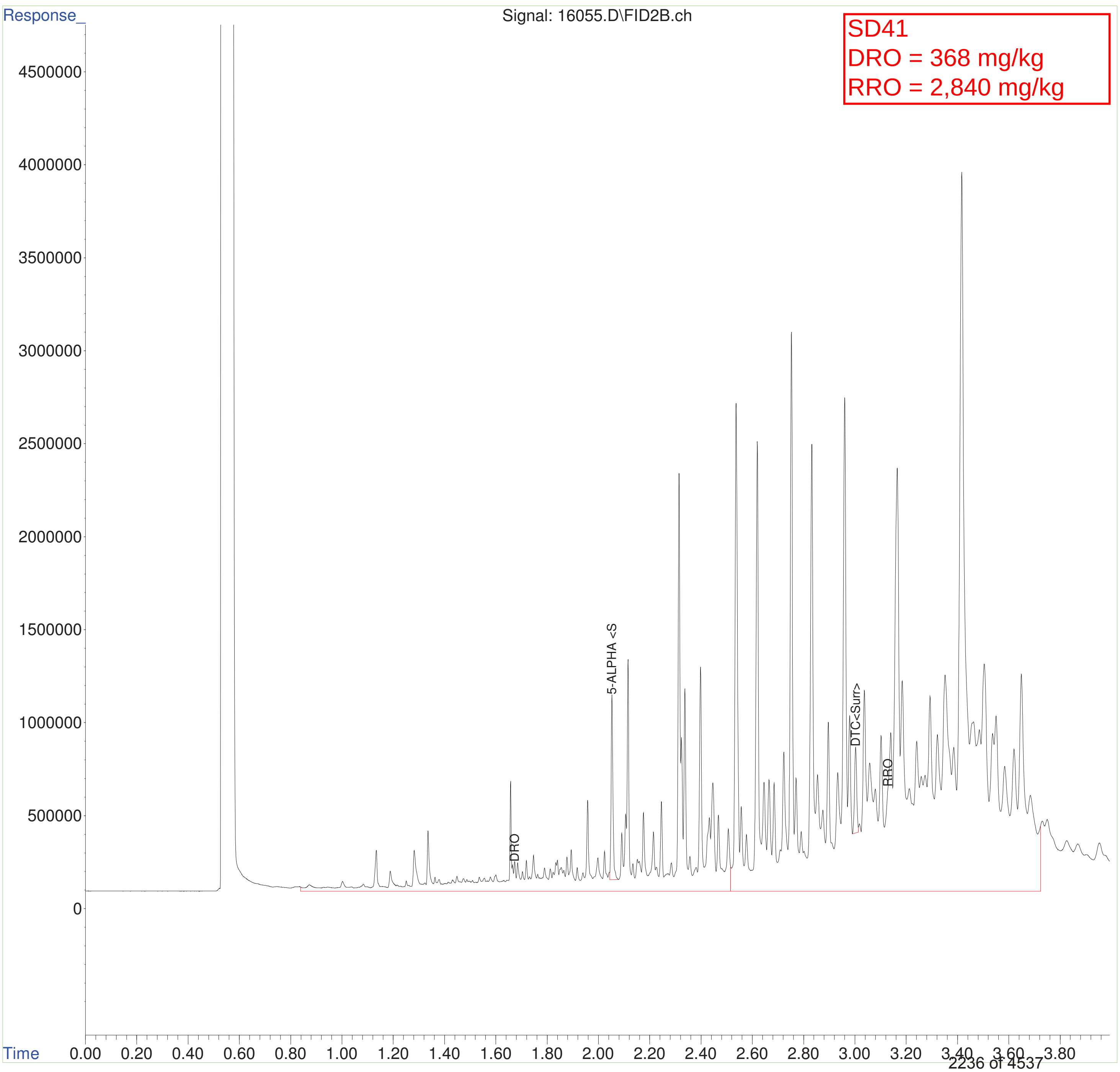
```
Data Path : Y:\08\SF\DATA\081818\
Data File : 18060.D
Signal(s) : FID1A.ch
Acq On    : 18 Aug 2018   2:11 pm
Operator  : VDL
Sample    : 1184430027 SG
Misc      :
ALS Vial  : 24   Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Aug 21 14:59:50 2018
Quant Method : Y:\08\SF\METHOD\SFF2018-0815F.M
Quant Title  : DRO/RRO by Method AK 102/103
QLast Update : Wed Aug 15 13:06:29 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj.  :
Signal Phase :
Signal Info  :
```



Data Path : Y:\08\SF\DATA\081618A.SEC\
Data File : 16055.D
Signal(s) : FID2B.ch
Acq On   : 16 Aug 2018   7:36 pm
Operator : VDL
Sample   : 1184430044
Misc   :
ALS Vial : 118   Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Aug 20 10:40:57 2018
Quant Method : Y:\08\SF\METHOD\SFR2018-0815C.M
Quant Title : DRO/RRO by Method AK 102/103
QLast Update : Wed Aug 15 17:10:45 2018
Response via : Initial Calibration
Integrator: ChemStation

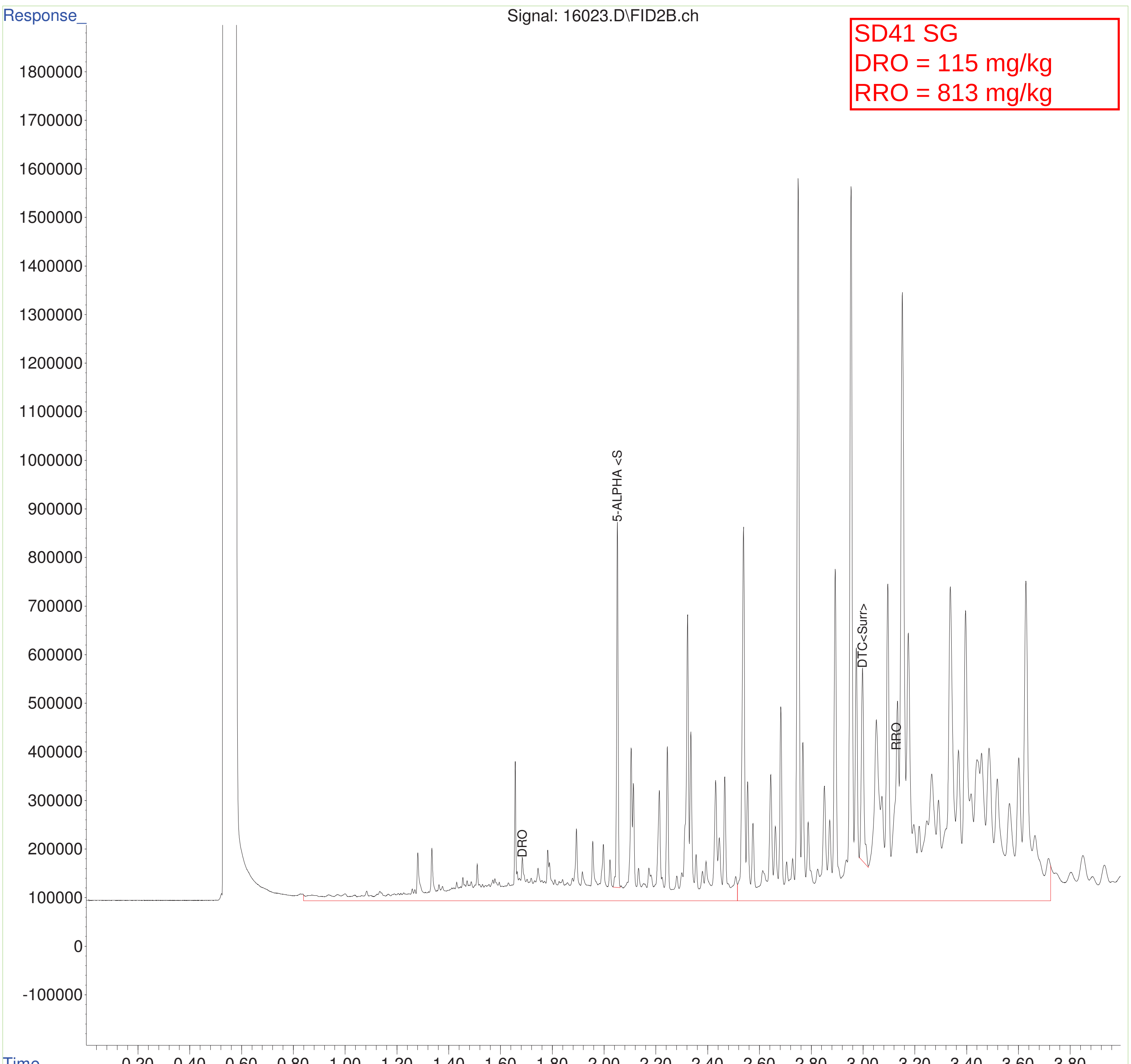
Volume Inj. :
Signal Phase :
Signal Info :



Data Path : Y:\08\SF\DATA\081618A.SEC\
Data File : 16023.D
Signal(s) : FID2B.ch
Acq On : 16 Aug 2018 4:59 pm
Operator : VDL
Sample : 1184430044 SG
Misc :
ALS Vial : 104 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Aug 20 14:51:19 2018
Quant Method : Y:\08\SF\METHOD\SFR2018-0815C.M
Quant Title : DRO/RRO by Method AK 102/103
QLast Update : Wed Aug 15 17:10:45 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :



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ATTACHMENT F-3
Field Documentation

Sediment Sampling Forms

JACOBS

SEDIMENT SAMPLING FORM

PROJECT: Northeast Cape

DATE: ~~8~~ 7 Aug 18 ap

SITE ID: Site 28

SITE LOCATION:

FIELD PERSONNEL:

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)
			Start time ~~H:TT~~ ap 1017
			Location ID: 18NEC-S28-SD-01
0.0			Saturated sandy silt, no odor or staining contains some root mass
0.5			
1.0			substrate (rock/gravel)
1.5			

ap te

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)
			Start time 1035
			Location ID: 18NEC-S28-SD-02
0.0			saturated sandy silt, no odor or staining (sheen) ~~limited~~ ap root mass minimal
0.5			sample ID 18NEC-S28-SD-02 Dup 18NEC-S28-SD-02-8
.7			
0.8			substrate (rock/gravel)
1.0			

JACOBS
SEDIMENT SAMPLING FORM

PROJECT: Northeast Cape DATE: 7 Aug. 2018

SITE ID: Site 28 SITE LOCATION:

FIELD PERSONNEL:

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)
			Start time 1050
			Location ID: -03
0.0			saturated silty sand no odor, no sheen
			no vegetation, ~~limited~~ ao minimal root mass
0.5			
auger— 0.7			sample ID 18NEC-S28-SD-03
ao ~~veg.~~ 1.0			collected MS/MSD total 4 8oz jars
1.8			substrate (rock/gravel)

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)
			Start time 1108
			Location ID: -04
0.0			Saturated silty sand no odor, no sheen
			minimal root mass
0.5			sample ID 18NEC-S28-SD-04
0.7			location moved see logbook (due to vegetation)
0.8			substrate (rock/gravel)

JACOBS

SEDIMENT SAMPLING FORM

PROJECT: Northeast Cape DATE: 7 Aug. 18

SITE ID: Site 28 SITE LOCATION:

FIELD PERSONNEL:

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)
			Sample time 1115
			Location ID: -05
0.0			saturated silty sand no odor, no sheen
			~~[illegible]~~ minimal root mass
0.5			Sample ID 18NEC-S28-SD-05
0.7			
0.8			substrate (rock, gravel)
1.0			

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)
			sample time 1125
			Location ID: -06
0.0			saturated silty sand no odor, no sheen
			minimal root mass
0.5			sample ID 18NEC-S28-SD-06
1.5			
2.0			substrate (rock, gravel)

JACOBS

SEDIMENT SAMPLING FORM

PROJECT: Northeast Cape DATE: 7 Aug. 2018

SITE ID: Site 28 SITE LOCATION:

FIELD PERSONNEL:

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)
			sample time 1133 — Location ID: -07
0.0			saturated silty sand no sheen, no odor
			some root mass
0.5			
0.6			sandy ~~+~~ silt
1.0			substrate Sample ID 18NEC-S28-SD-07
			rock/gravel

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)
			sample time 1145 — Location ID: -08
0.0			saturated sandy silt no odor, no sheen
0.5			some root mass
1.0			
1.5			
2.0			~~substra bottom ao~~ stopped - reached max depth according to workplan.
2.3			substrate (rock/gravel) sample ID 18NEC-S28-SD-08

JACOBS

SEDIMENT SAMPLING FORM

PROJECT: Northeast Cape

DATE: 8-7-18

SITE ID: Site 28

SITE LOCATION:

FIELD PERSONNEL:

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)	Location ID: -09
			sample time 1153	
0.0			saturated sandy silt	no odor, no sheen
			Some root mass	
0.5			saturated silty sand	
			some root mass	
1.0				
1.5				
2.0			stopped — reached max depth according to work plan; sample ID 18NEC-S28-SD-09	

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)	Location ID: -10
			sample time 1201	
0.0			saturated silty sand	no odor, no sheen
			some root mass	strong organic smell
0.5				
1.0				
1.5				
2.0			stopped — reached max depth according to work plan; sample ID 18NEC-S28-SD-10	

JACOBS

SEDIMENT SAMPLING FORM

PROJECT: Northeast Cape

DATE: 7 Aug. 18

SITE ID: Site 28

SITE LOCATION:

FIELD PERSONNEL:

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)
			sample time 1211 — Location ID: -11
0.0			saturated sandy silt no odor, no sheen
			some root mass
0.5			
1.0			
1.5			
2.0			stopped (reached max depth according to work plan) Sample ID: 18NEC-S28-SD-11
			location moved (see logbook) due to vegetation.

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)
			sample time 1221 — Location ID: -12
0.0			saturated sandy silt no odor, no sheen
			some root mass
0.5			
1.0			
1.5			
2.0			stopped Sample ID 18NEC-S28-SD-12
			(reached max depth according to work plan

JACOBS

SEDIMENT SAMPLING FORM

PROJECT: Northeast Cape DATE: 7 Aug. 18

SITE ID: Site 28 SITE LOCATION:

FIELD PERSONNEL:

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)
			sample time: 1448 — Location ID: -13
0.0			saturated sandy silt — petroleum odor sheen
0.5			some root ~~mats~~ mass
1.0			
1.5			
2.0			stop; reach max depth according to workplan
			sample ID: 18NEC-S28-SD-13

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)
			Sample time 1500 — Location ID: -14
0.0			saturated sandy silt — petroleum odor sheen
0.5			ao ~~some~~ moderate root mass
1.0			
1.5			refusal; ~~hard to sta~~ ao thick silt
			Sample ID 18NEC-S28-SD-14
2.0			

JACOBS

SEDIMENT SAMPLING FORM

PROJECT: Northeast Cape

DATE: 7 Aug. 18

SITE ID: Site 28

SITE LOCATION:

FIELD PERSONNEL:

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)
			sample time: 1517
			Location ID: -15
0.0			saturated sandy silt — petroleum odor, Sheen
			moderate root mass
0.5			
1.0			
1.5			
			sample ID: 18NEC-S28-SD-15
2.0			~~refusal~~ ~~ao~~ stopped, max depth according to workplan

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)
			sample time 1528
			Location ID: -16
0.0			saturated silty sand — petroleum odor, sheen
			~~mo~~ minimal root mass.
0.5			
1.0			
1.5			
			sample ID: 18NEC-S28-SD-16
2.0			stopped, max depth according to work plan

JACOBS

SEDIMENT SAMPLING FORM

PROJECT: Northeast Cape

DATE: 7 Aug. 18

SITE ID: Site 28

SITE LOCATION:

FIELD PERSONNEL:

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)
			Sample time: 1546
			Location ID: -17
0.0			saturated sandy silt — Strong petroleum odor, Sheen
			moderate root mass
0.5			
1.0			
1.5			
			Sample ID: 18NEC-S28-SD-17 Dup: 18NEC-S28-SD-17-8
2.0			stopped; max depth according to work plan

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)
			Sample time: 1603
			Location ID: -18
0.0			saturated silty sand — petroleum odor, sheen
			moderate root mass
0.5			
1.0			refusal vegetative mat
			Sample ID: 18NEC-S28-SD-18
			wooden debris - sampled within a foot of stake

JACOBS

SEDIMENT SAMPLING FORM

PROJECT: Northeast Cape DATE: 7 Aug. 18

SITE ID: Site 28 SITE LOCATION:

FIELD PERSONNEL:

depth (ft)	Lithology	Sample Int.	Sample time: 16 25 Description (lithology, odor/staining, sample ID)	Location ID: -19
0.0			saturated sandy silt moderate root mass	sheen, petroleum odor
0.5				
1.0				
1.5			sample ID: 18NEC-S28-SD-19	
2.0			stopped; max depth according to workplan	

depth (ft)	Lithology	Sample Int.	sample time: 1632 Description (lithology, odor/staining, sample ID)	Location ID: -20
0.0			saturate sandy silt	sheen petroleum odor
0.5			moderate root mass	
1.0			refusal - vegatative matt Sample ID: 18NEC-S28-SD-20	

JACOBS

SEDIMENT SAMPLING FORM

PROJECT: Northeast Cape DATE: 7 Aug. 18

SITE ID: Site 28 SITE LOCATION:

FIELD PERSONNEL:

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)	Location ID: -21
			Sample time 1644	
0.0			saturated silty sand	odor Sheen
			moderate root mass	
0.5				
0.9 1.0			refusal-rock	
			Sample ID: 18NEC-S28-SD-21	
1.5				
2.0				

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)	Location ID: -22
			Sample time: 1653	
0.0			saturated silty sand	slight odor no sheen
0.5			moderate root mass	
1.0			refusal - silt	
			sample ID: 18NEC-S28-SD-22	
1.5				
2.0				

JACOBS
SEDIMENT SAMPLING FORM

PROJECT: Northeast Cape DATE: 7 Aug. 18

SITE ID: Site 28 SITE LOCATION:

FIELD PERSONNEL:

depth (ft)	Lithology	Sample Int.	Sample time: 1702 Description (lithology, odor/staining, sample ID)	Location ID: -23
0.0			silty sand	no sheen no odor
			moderate root mass	
0.5				
1.0				
1.5			↓ sandy silt	
2.0			vegetative matt	
			sample ID: 18NEC-S28-SD-23	

depth (ft)	Lithology	Sample Int.	Sample time: 1713 Description (lithology, odor/staining, sample ID)	Location ID: -24
0.0			saturated silty sand	- odor - slight - no sheen
			moderate root mass	- iron ~~mottlet~~ ~~ao~~ mottle
0.5				
1.0				
1.5			↓ sandy silt	
2.0			refusal - silt sample ID: 18NEC-S28-SD-24	

JACOBS
SEDIMENT SAMPLING FORM

PROJECT: Northeast Cape DATE: 8 Aug 18
SITE ID: Site 28 SITE LOCATION:
FIELD PERSONNEL:

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)
			Sample time: 0920 — Location ID: -25
0.0			saturated silty sand. no sheen, no odor
			moderate root mass
0.5			-iron mottle
1.0			sample ID: 18NEC-S~~Z8~~-SD-25
			location moved see logbook. original location had veg. matt
1.5			
2.0			

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)
			Sample time 0951 — Location ID: -26
0.0			saturated silty sand. minimal odor, no sheen
			moderate root mass
0.5			-iron mottle
1.0			refusal - vegetative matt
			sample ID: 18NEC-S28-SD-26

JACOBS

SEDIMENT SAMPLING FORM

PROJECT: Northeast Cape DATE: 8-8-18

SITE ID: Site 28 SITE LOCATION:

FIELD PERSONNEL:

depth (ft)	Lithology	Sample Int.	sample time: 1001 Description (lithology, odor/staining, sample ID)	Location ID: -27
0.0			saturated silty sand moderate root	no sheen no odor
0.5				
1.0			saturated sandy silt	
1.5			— refusal - hard silt Sample ID: 18NEC-S28-SD-27 Dup 18NEC-S28-SD-27-8	

depth (ft)	Lithology	Sample Int.	sample time: 1012 Description (lithology, odor/staining, sample ID)	Location ID: -28
0.0			saturated silty sand minimal root mass	odor-petroleum no sheen
0.5			saturated sandy silt minimal root mass	
1.0				
1.5			refusal - hard silt sample ID: 18NEC-S28-SD-28 collected MS/D	
2.0				

JACOBS

SEDIMENT SAMPLING FORM

PROJECT: Northeast Cape

DATE: 8-8-18

SITE ID: Site 28

SITE LOCATION:

FIELD PERSONNEL:

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)	Location ID: -29
			Sample time 1025	
0.0			Saturated Silty sand	odor-petroleum
			minimal root mass	no sheen
0.5				
1.0			refusal - rock ——	
			sample ID 18NEC-S28-SD-29	
1.5				
2.0				

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)	Location ID: -30
			Sample time 1040	
0.0			saturated silty sand	light petroleum odor
			minimal root mass	no sheen
0.5				Iron mottle
1.0				
1.5			— refusal (rock)	
			Sample ID: 18NEC-S28-SD-30	
2.0				

JACOBS
SEDIMENT SAMPLING FORM

PROJECT: Northeast Cape DATE: 8-8-2018
SITE ID: Site 28 SITE LOCATION:
FIELD PERSONNEL:

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)
			Sample ~~ID~~ ao time 1048
			Location ID: -31
0.0			saturated silty sand; no sheen
			moderate root mass; light odor - petroleum
0.5			iron mottle
1.0			
1.2			sandy silt
1.5			refusal - silt
			Sample ID: 18NEC-S28-SD-31
2.0			

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)
			Sample time: 1058
			Location ID: -32
0.0			saturated silty sand; ao ~~AO~~ odor - yes
			moderate root mass; ao ~~AO~~ sheen - yes
0.5			iron mottle
1.0			refusal (rock)
			Sample ID: 18NEC-S28-SD-32
1.5			
2.0			

JACOBS
SEDIMENT SAMPLING FORM

PROJECT: Northeast Cape
DATE: 8-8-18
SITE ID: Site 28
SITE LOCATION:
FIELD PERSONNEL:

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)	Location ID: -33
			Sample time: 1106	
0.0			Saturated silty sand moderate root mass	odor-petroleum yes sheen
0.5				
0.8			refusal-rock	
1.0			Sample ID: 18NEC-S28-SD-33	
1.5				
2.0				

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)	Location ID: -34
			Sample time: 1114	
0.0			satuated silty sand minimal rootmass	odor-petroleum yes sheen
0.5				iron mottle
1.0			refusal-rock sample ID: 18NEC-S28-SD-34	

JACOBS
SEDIMENT SAMPLING FORM

PROJECT: Northeast Cape DATE: 8-8-18
SITE ID: site 28 SITE LOCATION:
FIELD PERSONNEL:

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)
			Sample time: 1125 — Location ID: -35
0.0			Saturated Silty sand — odor petroleum
			moderate root mass — sheen yes
0.5			iron mottle
1.0			vegetative mat - refusal
			Sample ID: 18NEC-S28-SD-35
1.5			This location is near the start of the spring
			~1 foot from spring.

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)
			Sample time: 1143 — Location ID: -38
0.0			Saturated silty sand — odor - petroleum
			moderate root mass — Sheen yes
0.5			iron mottle
1.0			
1.5			- Saturated sandy silt -
			- sample ID: 18NEC-S28-SD-38
			- sample location moved; see logbook
2.0			max depth according to workplan — due to vegetation
			- Dup collected 18NEC-S28-SD-38-8

JACOBS

SEDIMENT SAMPLING FORM

PROJECT: Northeast Cape DATE: 8-8-18

SITE ID: Site 28 SITE LOCATION:

FIELD PERSONNEL:

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)	Location ID: -39
			sample time : 1154	
0.0			saturated sandy silt	~~AO~~ Sheen - yes light odor
			moderate root mass	
0.5				
1.0				
1.5				
2.0			stopped max depth according to workplan	
			sample ID: 18NEC-S28-SD-39	

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)	Location ID: -40
			sample time: 1202	
0.0			saturated silty sand	heavy sheen odor - petroleum
0.5			minimal root mass	
1.0			refusal silt heavy	
			sample ID: 18NEC-S28-SD-40	
1.5				
2.0				

JACOBS

SEDIMENT SAMPLING FORM

PROJECT: Northeast Cape

DATE: 8-8-18

SITE ID: Site 28

SITE LOCATION:

FIELD PERSONNEL:

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)
			Sample time: 1218
			Location ID: -42
0.0			Saturated sandy silt — no sheen
			moderate root mass — no odor
0.5			
0.8			refusal - hard silt
1.0			Sample ID: 18NEC-S28-SD-42
			location moved due to vegetation;
1.5			see logbook

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)
			Location ID:

JACOBS
SEDIMENT SAMPLING FORM

PROJECT: Northeast Cape DATE: 8-8-18
SITE ID: Site 28 SITE LOCATION:
FIELD PERSONNEL:

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)	Location ID: -52
			Sample time: 1440	
0.0			saturated silty sand minimal root mass	yes-sheen petroleum odor
0.5				
1.0			refusal-vegetation mat Sample ID: 18NEC-S28-SD-52 - ~~Near~~ upgradient from stake 20 - location of opportunity in Area 2. - See logbook for measurements	

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)	Location ID: -53
			sample time: 1504	
0.0			saturated silty sand moderate root mass	
0.5			Sandy silt	
1.0				
1.5			vegetation bottom	
			sample ID: 18NEC-S28-SD-53 -sample of opportunity in Area ~~X~~ 4. -See log book for measurements.	

JACOBS

SEDIMENT SAMPLING FORM

PROJECT: Northeast Cape DATE: 8-8-18

SITE ID: Site 28 SITE LOCATION:

FIELD PERSONNEL:

depth (ft)	Lithology	Sample Int.	sample time 1540 Description (lithology, odor/staining, sample ID) Location ID: -37
0.0 0.2			silty sand (saturated) no odor no sheen moderate root mass rock at 0.2. limited sediment composite sample collected from within a foot of stake #37 Sample ID- 18NEC-S28-SD-37 used shovel

depth (ft)	Lithology	Sample Int.	sample time 1553 Description (lithology, odor/staining, sample ID) Location ID: -36
0.0 0.2 0.5 1.0			silty sand no odor moderater root mass no sheen rockat 0.2. limited sediment composite sample collected from within a foot of stake #36 sample ID 18NEC-S28-SD-36 shovel used

JACOBS

SEDIMENT SAMPLING FORM

PROJECT: Northeast Cape DATE: 8-8-18

SITE ID: Site 28 SITE LOCATION:

FIELD PERSONNEL:

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)
			Sample time 1605 — Location ID: -41
0.0			Silty sandy (saturated) moderate root mas — no odor, no sheen
0.5			↓ Sandy silt
1.0			refusal - rock
			Sample ID: 18NEC-S28-SD-41
			Dup 18NEC-S28-SD-41-8

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)
			Sample time 1646 — Location ID: 46
0.0			saturated sandy silt moderate rootmass — petroleum odor, no sheen
0.5			
0.8			— vegetative refusal
1.0			
			Sample ID: 18NEC-S28-SD-46

JACOBS
SEDIMENT SAMPLING FORM

PROJECT: Northeast Cape DATE: 8-8-18

SITE ID: Site 28 SITE LOCATION:

FIELD PERSONNEL:

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)
			Sample time 1624 — Location ID: -44
0.0			saturated silty sand — light petroleum, no sheen
			moderate root mass
0.5			iron mottle
1.0			vegetative matt — refusal
			sample ID: 18NEC-S28-SD-44

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)
			Sample time: 1640 — Location ID: -45
0.0			saturated sandy silt — light sheen
			moderate root mass — petroleum odor
0.5			
1.0			
1.5			vegetation matt - refusal
			sample ID 18NEC-S28-SD-45

JACOBS
SEDIMENT SAMPLING FORM

PROJECT: Northeast Cape
DATE: 8-8-18
SITE ID: Site 28
SITE LOCATION:
FIELD PERSONNEL:

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)
			sample time 1700
			Location ID: -43
0.0			saturated sandy silt — petroleum odor
			moderate root mass — light sheen
0.5			
1.0			refusal-silt
			Sample ID: 18NEC-S28-SD-43

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)
			sample time 1710
			Location ID: -54
0.0			Saturated sandy silt — Heavy sheen
			minimal root mass — Heavy petroleum odor
0.5			
1.0			— refusal — silt
1.5			– sample of opportunity in Area 6
			– see logbook for measurements
2.0			– Sample ID 18NEC-S28-SD-54
			MS/MSD – 4 x 8oz jars.

JACOBS
SEDIMENT SAMPLING FORM

PROJECT: Northeast Cape DATE: 8-8-18
SITE ID: Site 28 SITE LOCATION:
FIELD PERSONNEL:

depth (ft)	Lithology	Sample Int.	Sample time 1720 Description (lithology, odor/staining, sample ID)	Location ID: -47
0.0			saturated sandy silt	sheen
			moderate ~~veget~~ root mass	petroleum odor
0.5				
1.0			refusal - silt	
			Sample ID: 18NEC-S28-SD-47	

depth (ft)	Lithology	Sample Int.	Sample time 1726 Description (lithology, odor/staining, sample ID)	Location ID: -48
0.0			saturated sandy silt	sheen
				petroleum odor
			moderate root mass	
0.5				
1.0			refusal - silt	
1.5				
			Sample ID: 18NEC-S28-SD-48	
			Dup 18NEC-S28-SD-48-S	

JACOBS

SEDIMENT SAMPLING FORM

PROJECT: Northeast Cape DATE: 8-8-18

SITE ID: Site 28 SITE LOCATION:

FIELD PERSONNEL:

depth (ft)	Lithology	Sample Int.	Sample time 1733 Description (lithology, odor/staining, sample ID)	Location ID: -49
0.0			saturated Sandy silt moderate ~~vegetat~~ veg root mass	Sheen - yes petroleum odor
0.5				
1.0			refusal - silt sample ID: 18NEC-S28-SD-49	

depth (ft)	Lithology	Sample Int.	sample time 1739 Description (lithology, odor/staining, sample ID)	Location ID: -50
0.0			saturated silty sand moderate root mass	Sheen - yes petroleum odor
0.5				
1.0			refusal - silt sample ID: 18NEC-S28-SD-50	

JACOBS

SEDIMENT SAMPLING FORM

PROJECT: Northeast Cape DATE: 8-8-18

SITE ID: Site 28 SITE LOCATION:

FIELD PERSONNEL:

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)	Location ID: -51
			sample time: 1750	
0.0			saturated sandy silt sheen petroleum odor	
			moderate rootmass	
0.5				
1.0			refusal - silt	
			Sample ID: 18NEC-S28-SD-51	
1.5			- location moved due to original location on dry ground	
			- see logbook for measurement details	

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)	Location ID:

Logbook

Sediment Sampling

Rite in the Rain
ALL-WEATHER
ENVIRONMENTAL
№ 550F

Authors

Stan Seegers
Angela DiBerardino

DCN: AE-ECC-J07-5FGA4600
-H04-0004

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PAGE	REFERENCE	DATE

Location Ne Cape Date 8/4/18
Project / Client USACE

Weather: Overcast
Site 28
Location-Pond 1

Westward		Thalweg
Edge	6.5' from post	0
		Start – End
	8.5'	1.5 → 2.9
	10.5	1.6 → 2.3
	12.5	1.7 - 2.15
	14.5	1.4 - 1.95
	16.5	0.9 - 1.05
	18.5	0 at edge

End of transect 21.75

Test sediment mapping

Location NE Cape Date 8/4/2018
Project / Client USACE (continued)

North to South

Edge 1.3' depth 0

	Start	End
3.3	0.4	0.5
5.3	1.0	1.8
7.3	1.3	1.9
9.3	1.3	1.9
11.3	1.5	2.6
13.3	1.5	3.0
15.5	1.0	1.0

*No Sediment

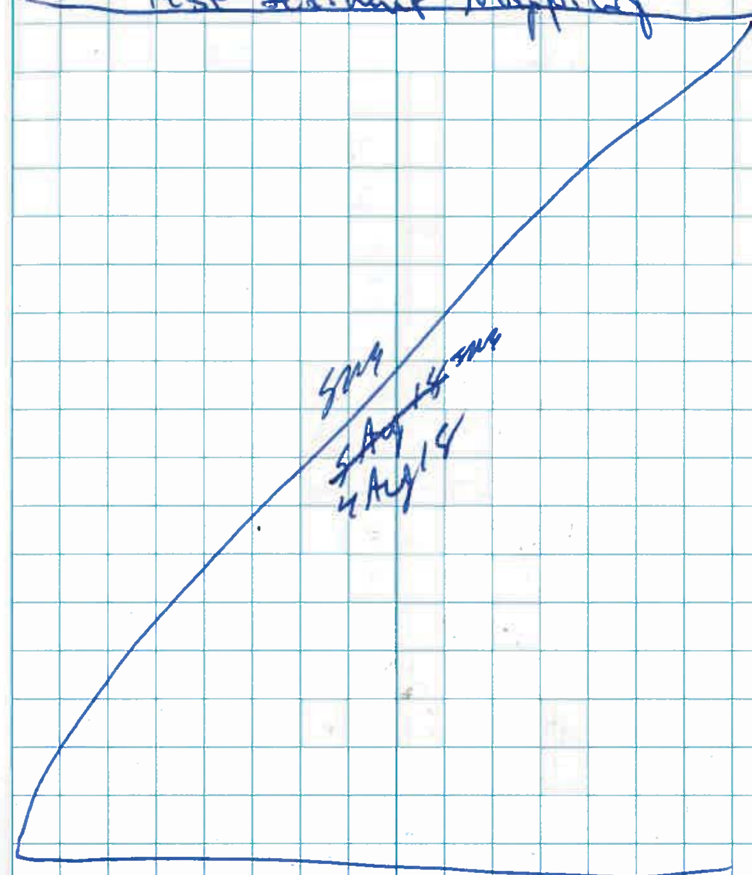
17.3	1.0	1.3
19.3	1.1	1.4
21.3	1.3	1.5

Location NE Cape Date 8/4/2018
Project / Client USACE (continued)

	Start	End
23.3	~~1.3~~ 0.9	1.15

Edge at 25.6', Final South Stake at 28.5'

Test Sediment Mapping



Location: Ne Cape — Date: 8/5/18

Project / Client: USACE

Position	DTS	DTB	
Profile 1 Stake 1	W-E		5 ft Across
~~2.5~~	2.2	3.8	
2.5	3.0	4.0	
4.0	3.0	3.9	

~~Sample 1 - 18NEC-SRS-SB-01~~ SRS Test Sample

Position	DTS	DTB	
Profile 2 Stake 2	W-E		13.0 ft
1.0	2.0	3.3	
5.0	2.4	3.2	
9.0	1.6	2.6	
~~12.5~~ SRS	~~13.0~~ SRS	~~0.8~~ SRS	
12.5	1.7	2.8	
Profile 3 30 ft from 1	W-E		3.5 ft
0.5	~~1.2~~ SRS 1.2	2.8	
1.5	1.7	2.9	
2.5	1.7	3.4	
Profile 4 15 ft South P3	W-E		1.0 ft
0.0	1.2	2.2	
0.5	1.2	2.3	
1.0	1.2	2.1	
Profile 5 Stake 3	W-E		4.5 ft
1.0	0.3	2.4	
2.0	0.5	2.3	
3.0	1.3	2.2	

Location: Ne Cape — Date: 8/5/18

Project / Client: USACE

Position DTS DTB

Stake 4 in veg. mat

Stake 5, light sheen and light odor

Position	DTS	DTB	
Profile 6 Stake 5	W-E		4.0 ft Across
1.0	1.1	2.1	
2.0	1.3	2.1	
3.0	1.4	2.2	
Profile 7 Stake 6	W-E		10.5 ft Across
1.0	0.4	2.4	
3.0	0.3	2.8	
5.0	0.4	2.5	
7.0	~~0.3~~ SRS 1.5	2.0	
9.0	1.3	1.8	
Profile 8 Stake 8	W-E		17.0 ft Across
2.0	0.1	1.9	
7.0	0.2	1.9	
12.0	0.3	2.6	
17.0	0.2	1.9	
Profile 9 Stake 9	W-E		4.0 ft Across
1.0	0.2	1.3	
2.0	0.3	2.0	
3.0	0.3	2.1	

Location Ne Cape Date 8/5/18

Project / Client USACE

	Position	DTS	DTB	
Profile 10	Stake 10	W-E		5ft Across
	1.5	1.0	2.5	
	3.0	0.5	3.9	
	4.5	0.2	2.9	
Profile 11	Stake 11	W-E		1.0 Ft Across
	0.0	0.2	1.4	
	0.5	1.1	2.5	
	1.0	1.0	2.0	
Profile 12	Stake 12	W-E		9.0 ft Across
	1.5	0.1	2.1	
	4.5	0.1	2.2	
	7.5	0.3	3.5	end of Area 1
Profile 13	Stake 13	W-E		3.0 Ft Across
Stand-alone	0.5	1.0	2.2	
	1.5	0.5	2.1	
	2.5	0.2	2.1	
Profile 14	Stake 14	W-E		8.5ft Across
	1.5	1.7	2.8	
	3.5	2.0	3.5	
	5.5	1.7	3.4	
	7.5	1.2	1.5	
Profile 15	Stake 15	W-E		8.0 Ft
Obstruction	2.0	1.7	2.3	
@ 8-11 Ft	4.0	1.9	2.6	
on E. Side	6.0	1.6	2.5	

Location Ne Cape Date 8/5/18

Project / Client USACE

	Position	DTS	DTB	
Profile 16	Stake 16	W-E		30.0 Ft
	5.0	~~0.0~~ SRS 2.2	3.3	
	10.0	~~1.0~~ SRS 2.0	2.9	
	15.0	~~1.~~ SRS 2.1	2.8	
	20.0	2.2	3.5	
	25.0	2.2	2.8	

Strong odor of Fuel @ Profile 16
large Fuel sheen

	Position	DTS	DTB	
Profile 17 Stake 18		W-E		11.0 Ft
obstruction				
East of Stake				
out to 4.0 ft East				
Fuel odor	1.0	1.4	2.9	
and sheen	4.0	1.1	3.0	
	7.0	1.5	3.8	
	10.0	1.2	3.9	
Profile 18 44° @ 27.5 Ft From Stake 19				5.5 Ft
to center of stream	1.5	0.8	2.3	
	3.0	0.5	3.0	
	4.5	0.5	3.2	
Profile 19 Stake 19		W-E		14.0 Ft
	2.0	1.0	3.4	
	5.0	1.0	2.3	
	8.0	1.2	2.4	
	11.0	1.0	3.8	

Location Ne Cape Date 8/5/18

Project / Client USACE

	Position	DTS	DTB
Profile 20 Stake	20		27 ft
large fuel	1.0	0.5	3.9
sheen	6.0	1.8 ~~2.8~~	2.2
and odor	11.0	~~1.1~~ 1.6	3.2
of fuel	16.0	1.5	3.2
	21.0	1.4	4.0
	26.0	1.0	3.0

Profile 21 located at stake marked out by surveyors, but not part of proposed sample locations. ~3.5 ft Across. West side channel is veg. mat.

	Position	DTS	DTB
	1.0	0.4	2.3
	2.0	0.5	2.2
	3.0	0.5	2.2

	Position	DTS	DTB
Profile 22 Stake 21	W-E		25.0 ft
wide section	1.0	0.8	2.2
w/ veg mat	6.0	0.4	0.6
sections in	11.0	1.0	3.2
between. Sediment	22.0	0.5	2.1
depths measured	25.0	0.5	2.0
when present.			
sheen present			

Location Ne Cape Date 8/5/18

Project / Client USACE

	Position	DTS	DTB	
Profile 23	Stake 22	W-E		10.5 ft
	2.0	1.0	2.9	
	5.0	1.8	2.1	
	8.0	0.9	2.6	

Profile 24 315° @ 22 ft from stake 23 to west edge of sediment 7 ft

	Position	DTS	DTB	
	2.0	0.7	3.1	
	4.0	0.2	2.8	
	6.0	0.3	3.3	
Profile 25	Stake 23			1.0 ft
	0.0	0.6	2.9	
	0.5	0.7	3.0	
	1.0	1.0	3.0	
Profile 26	Stake 24			1.0 ft
	0.0	0.3	2.1	
	0.5	0.1	2.4	
	1.0	0.3	2.1	

End of Area 2

SRS 5 Aug 18

Location Ne Cape Date 8/6/18
Project / Client USACE

Weather: 49°F, Cloudy
Staff: Stan Seegars, Jessica Bay, Admond Abuomsha

Task: Sediment Measurements

PPE: Modified Level D

Start 0845

Position	DTS	DTB
Profile 27 41° @ 26.5 ft from Stake 25 W-E 1.0 ft Across		
0.0	0.3	2.2
0.5	0.4	2.3
1.0	0.2	0.5
Profile 28 Stake 25 W-E 1.5 ft Across		
0.0	0.2	2.2
0.75	0.3	2.1
~~1.5~~ 1.5	0.2	2.0
Profile 29 2° @ 23.0 ft From Stake 26 W-E 2.0 ft Across		
0.0	0.2	1.9
1.0	0.3	1.8
2.0	0.3	1.8

Location NE Cape Date 8/6/2018
Project / Client USACE (Continued)

Position	DTS	DTB
Profile 30 Stake 26 W-E 2.5 ft Across		
0.5	0.3	1.5
1.25	0.3	1.6
2.0	0.2	1.6
Profile 31 Stake 27 W-E 2.0 ft Across		
0.5	0.2	2.1
1.0	0.1	1.1
1.5	0.1	1.1
Profile 32 347° @ 24.0 ft from Stake 28 2.0 ft Across W-E		
0.5	0.3	1.2
1.0	0.3	1.3
1.5	0.4	1.8
Profile 33 Stake 28 3.0 ft Across		
0.75	0.2	1.4
1.5	0.3	1.3
2.25	0.4	1.4
Profile 34 Stake 29 2.0 ft Across		
0.5	0.5	0.8
1.0	0.6	0.6
1.5	0.7	1.4
Profile 35 Stake 30 1.5 ft Across		
0.0	0.2	2.3
0.75	0.3	2.3
1.5	0.1	2.4

Location NE Cape Date 8/16/2018

Project / Client USACE (continued)

	Position	DTS	DTB	
Profile 36 stake 31				3.0 ft Across
	0.75	0.3	1.6	
	1.5	0.4	1.0	
	2.25	0.3	1.8	
Profile 37 stake 31 @ 19 ft from stake 32				
		1.0 Ft Across		
	0.0	0.5	1.6	
	0.5	0.3	1.5	
	1.0	0.2	1.5	
Profile 38 stake 32				6.0 Ft Across
light	1.0	0.5	1.6	
sheen	3.0	0.1	1.5	
	5.0	0.3	1.2	
Profile 39 stake 33				2.0 Ft Across
very light	0.5	0.1	0.1	
layer of	1.0	0.4	0.4	
sediment	1.5	0.2	0.2	
on rock				
Profile 40 stake 34				3.5 ft Across
	1.0	1.0	1.5	
	2.0	1.2	2.2	
	3.0	0.8	1.2	
Profile 41 stake 35				1.0 ft Across
	0.0	~~0.8~~ 0.8	2.5	
End Area 2	0.5	1.0	~~2.5~~ sed 1.5	
	1.0	0.6	1.5	

Location NE Cape Date 8/16/2018

Project / Client USACE (continued)

	Position	DTS	DTB	
Profile 42 N-S Transect				49.0 ft
	~~0~~ sps			
	7.0	Veg. mat		
	14.0	veg. mat		
	21.0	Veg. mat		
Sheen	28.0	1.2	1.5	
+ odor	35.0	1.3	3.1	
	42.0	veg. mat		
Profile 43 W-E Transect				54.0 ft
Sheen and	10.0	0.2	2.2	
odor	20.0	veg mat		
	30.0	2.1	3.5	
	35.5	2.6	3.8	
	40.0	Veg. mat		
	50.0	veg. mat		
Profile 44 N-S Transect				39.0 ft
	5.0	0.9	1.4	
	12.0	Veg. mat		
	19.0	veg. mat		
	26.0	2.0	2.2	
	32.0 ~~33.0~~ sps	2.2	2.3	

Location NE Cape Date 8/16/2018

Project / Client USACE (continued)

	Position	DTS	DTB	
Profile 45	W-E Transect			40.0 ft
	0.0-8.0	veg. mat		
	10.0	1.4	1.9	
13.0	~~13.0~~ sms	2.1	2.4	
	13.5-35.0	veg. mat		
	35.5	1.0	1.3	
	37.0	0.9	1.1	
	38.0	0.7	1.2	
	38.0-40.0	veg. mat		

Stake 43 veg. mat, no sediment
End of Area 4

	Position	DTS	DTB	
Profile 46	N-S Transect			84.0 ft
sheen	10.0	veg. mat		
and	20.0	veg. mat		
odor	30.0	2.5	3.5	
	40.0	2.5	3.8	
	50.0	veg. mat		
	60.0	veg. mat		
	70.0	no sediment		
	80.0	no sediment		

Location NE Cape Date 8/16/2018

Project / Client USACE (continued)

	Position	DTS	DTB	
Profile 47	W-E Transect			76.0 ft.
	10.0	1.4	2.2	
	20.0	veg. mat		
	30.0	2.5	3.6	
	40.0	veg. mat		
	50.0	veg. mat		
	60.0	veg. mat		

	Position	DTS	DTB	
Profile 48	N-S Transect			62.5 ft Across
	~~6.0~~ sms	0.0-35.0 veg. mat		
	~~14.0~~ sms	35.4 (Stake 41) veg. mat		
	~~18.0~~ sms	~~36.5~~ sms		
	36.5	2.6	2.8	
	40.0 - 58.0	veg. mat		
	58.0 - 62.5	no sediment		

	Position	DTS	DTB	
Profile 49	W-E Transect			44.0 ft Across
	0.0 - 22.0	veg. mat		
	22.5	2.1	3.3	at Stake 41
	23.0 - 44.0	veg. mat		

18

Location NE Cape   Date 8/6/2018

Project / Client USACE   (continued)

Position DTS DTB

Profile 50 N-S Transect 50.5 ft

~~27~~ sps 0.0-27.0 veg. mat

27.0 2.5 3.2

30.4 veg. mat at Stake 37

31.0 - 50.5 veg. mat

Profile 51 W-E Transect 40.0 ft

0.0 - 15.0 veg. mat

15.5 - 18.0 no sed., rock only

18.5 2.9 3.1

19.0 2.8 2.9

19.1 - 40.0 veg. mat

Stake 36 no sed., rock only   End Area 5

Profile 52 N-S Transect 26.5 ft Area 4

large 1.0 veg. mat

sheen 5.0 1.5 2.5

and 9.0 1.4 2.2

strong 13.0 1.5 1.9

odor 17.0 1.0 1.5

21.0 1.2 2.4

25.0 No sediment

19

Location NE Cape   Date 8/6/2018

Project / Client USACE   (continued)

Position DTS DTB

Profile 53 W-E Transect 18.0 ft

3.0 veg. mat

6.0 1.6 4.0

9.0 1.6 3.6

12.0 1.2 1.8

15.0 veg. mat

End of Area 6

End of Sediment Mapping

17:00 Walk through Site 28 with Angela (Jacobs) and Curtis (ADEC)

Consider Moving: Stake 4, Stake 11, Stake 31, Stake 33, Stake 38, Stake 39, Stake 43, Stake 47, Stake 49, Stake 50, Stake 51

End of day GRJ

6 Aug 18

Location NE Cape Date 8/7/18

Project / Client USACE

Weather: 49°F, ~~Partly Cloudy~~ Sunny
Staff: Angelo Diberardino, Adman Abuamsha, Jessica Bay, Stan Seegars
Task: Sediment Sampling Site 28
PPE: Modified Level D

Sediment Sampling Site 28
- All Samples will be collected in 2-8oz jars

18NEC-S28-SD-01 10:17
on Stake 1 Saturated sandy silt
with some root mass no odor or sheen

18NEC-S28-SD-02 10:35
on Stake 2 Saturated Sandy silt
with ~~trace~~ minimal root mass
no odor or sheen

18NEC-S28-SD-02-8 10:35 DUP

18NEC-S28-SD-03 10:50
on Stake 3 Saturated silty sand
with minimal root mass no odor or sheen
- collected MS/MSD

Sample 4 115° @ 15.7 ft from Stake 4
18NEC-S28-SD-04 11:08 moved due to veg. Saturated silty sand
with minimal root mass no odor or sheen

Location NE Cape Date 8/7/18

Project / Client USACE (continued)

18NEC-S28-SD-05 11:15
on Stake 5 Saturated silty sand
with minimal root mass no odor or sheen

18NEC-S28-SD-06 11:25
on Stake 6 Saturated silty sand
with minimal root mass, no odor or sheen

18NEC-S28-SD-07 11:33
on Stake 7 Saturated silty sand
with some root mass no odor or sheen

18NEC-S28-SD-08 11:45
on Stake 8 Saturated sandy silt
with some root mass no odor or sheen

18NEC-S28-SD-09 11:53
on Stake 9 Saturated ~~sandy silt~~ silty sand
with some root mass no odor or sheen

18NEC-S28-SD-10 12:01
on Stake 10 Saturated silty sand
with some root mass no odor or sheen

Sample 11 147° @ 12.5 ft from Stake 11
18NEC-S28-SD-11 12:11
moved due to veg. Saturated sandy silt
with some root mass no odor or sheen

~~Sample~~ SRS

Location NE Cape Date 8/7/2018
Project / Client USACE (Continued)

18NEC-S28-SD-12 12:21
on stake 12 saturated sandy silt
with some root mass no odor or sheen
End of Area 1
18NEC-S28-SD-13 14:48
on stake 13 saturated sandy silt
with some root mass petroleum odor and sheen
18 NEC-S28-SD-14 15:00
On stake 14 saturated sandy silt
with ~~some~~ moderate root mass petroleum odor and sheen
18 NEC-S28-SD-15 15:17
on stake 15 saturated sandy silt
with moderate root mass petroleum odor and sheen
18 NEC-S28-SD-16 15:28
on stake 16 saturated silty sand
with minimal root mass petroleum odor and sheen
18 NEC-S28-SD-17 15:46
on stake 17 saturated sandy silt
with moderate root mass petroleum odor and sheen
18 NEC-S28-SD-17-8 15:46 DUP
18NEC-S28-SD-18 16:03
on stake 18 saturated silty sand
with moderate root mass petroleum odor and sheen

Location NE Cape Date 8/7/2018
Project / Client USACE (Continued)

18 NEC-S28-SD-19 16:25
on stake 19 saturated sandy silt
with moderate root mass petroleum odor and sheen
18 NEC-S28-SD-20 16:32
on stake 20 saturated sandy silt
with moderate root mass petroleum odor and sheen
18 NEC-S28-SD-21 16:44
On stake 21 petroleum odor and sheen
with moderate root mass saturated silty sand
18 NEC-S28-SD-22 16:53
On stake 22 saturated silty sand
with moderate root mass slight odor no sheen
18 NEC-S28-SD-23 17:02
On stake 23 saturated silty sand
with moderate root mass no odor or sheen
18 NEC-S28-SD-24 17:13
on stake 24 saturated silty sand
with moderate root mass slight odor no sheen
and with iron mottle
End of Area 2
Equipment Blank 18:11
collected from auger tooling

Location NE Cape Date 8/7/2018
Project / Client USACE (continued)

- All samples collected in 2-8oz Amber Jars. Analysis will be PCBs, AK102, PAHs, Metals, and TOC

All samples stored in refrigerator until ready for shipment.
-18:25

SRS 7 Aug 18

Location NE Cape Date 8/8/2018
Project / Client USACE

Weather: 48°F Cloudy, Light Rain
Staff: Angela DiBerardino, Jessica Bay, Admon Abu Amsha, Stan Scoggins
Task: Sediment Samples Site 28
PPE: Modified D

NEC18-S28-SD-25 09:30
located 224° @ 7.0 ft due to veg mat from stake 25 saturated silty sand with moderate root mass no odor or sheen and iron mottle
NEC18-S28-SD-26 09:51
on stake 26 saturated silty sand with moderate root mass some odor no sheen iron mottle
NEC18-S28-SD-27 10:01
on stake 27 saturated silty sand with moderate root mass no odor or sheen
NEC18-S28-SD-27-8 10:01 DUP
NEC18-S28-SD-28 10:12
on stake 28 saturated sandy silt with minimal root mass some odor no sheen
- collected MS/MSD

Location NE Cape Date 8/8/2018
Project / Client USACE (continued)

NEC18 - S28 - SD - 29 10:25
On stake 29 saturated silty sand
with minimal root mass some odor no sheen
NEC18 - S28 - SD - 30 10:40
On stake 30 saturated silty sand
with minimal root mass some odor no sheen
iron mottle
NEC18 - S28 - SD - 31 10:48
on stake 31 saturated silty sand
with moderate root mass light odor no sheen
iron mottle
NEC18 - S28 - SD - 32 10:58
On stake 32 saturated silty sand
with moderate root mass some ~~no~~ SRS odor ~~or sheen~~ SRS some sheen
iron mottle
NEC18 - S28 - SD - 33 11:06
On stake 33 saturated silty sand
with minimal root mass some odor and sheen
NEC18 - S28 - SD - 34 11:14
On stake 34 saturated silty sand
with minimal root mass some odor and sheen
iron mottle
NEC18 - S28 - SD - 35 11:25
On stake 35 saturated silty sand
with moderate root mass light odor and sheen.

Location NE Cape Date 8/8/2018
Project / Client USACE (continued)

- stake 35 is at the spring
End of Area 3
NEC18 - S28 - SD - 38 from stake 38
157° @ 9.0ft moved due to
veg. mat 11:43
iron mottle saturated silty sand
with moderate root mass odor and sheen
NEC18 - S28 - SD - 38 - 8 11:43 DUP
NEC18 - S28 - SD - 39 11:54
On stake 39 saturated sandy silt
with moderate root mass sheen and odor
NEC18 - S28 - SD - 40 12:02
On stake 40 saturated silty sand
with minimal root mass heavy sheen and odor
NEC18 - S28 - SD - 42 12:18
~~On~~ SRS Stake 42 ~~saturated~~ SRS
~~with~~ SRS 139° @ 24.1ft from stake
42. moved due to veg. mat.
saturated sandy silt
with moderate root mass ~~some~~ no SRS sheen
no odor.
End of Area 4

Location NE Cape Date 8/8/2018
Project / Client USACE (continued)

NEC18-S28-SD-52 14:40
250° @ 5.9 Ft from unmarked
stake. 158° @ 35.7 Ft from stake 20.
this is 1 of 3 extra samples.
some sheen and odor.
saturated silty sand with
minimal root mass.
NEC18-S28-SD-53 15:04
138° @ 17.5 Ft from stake 40
this is 2 of 3 extra samples.
Fuel sheen and odor.
saturated sandy silt with
moderate root mass.
NEC18-S28-SD-37 15:40
composite sample around stake 37
saturated silty sand
with moderate root mass no odor no sheen
NEC18-S28-SD-36 15:53
Composite sample around stake 36
saturated silty sand
with moderate root mass no odor or sheen
NEC18-S28-SD-41 16:05
On stake 41 saturated silty sand
with moderate root mass no odor or sheen
NEC18-S28-SD-41-8 16:05 DUP

Location NE Cape Date 8/8/2018
Project / Client USACE (continued)

NEC18-S28-SD-44 16:24
on stake 44 saturated silty sand
with moderate root mass slight odor no sheen
iron mottle
NEC18-S28-SD-45 16:40
on stake 45 saturated sandy silt
with moderate root mass light odor light sheen
NEC18-S28-SD-46 16:46
on stake 46 saturated sandy silt
with moderate root mass light odor no sheen
End of Area 5

NEC18-S28-SD-43 17:00
138° @ 10.5 Ft From stake 43
moved due to veg mat
saturated sandy silt
with moderate root mass slight odor light sheen
NEC18-S28-SD-54 17:10
52° @ 10 Ft from stake 47
this is 3 of 3 extra samples
heavy fuel sheen and odor
saturated sandy silt
with minimal root mass
- collected MS/MSD

Location NE Cape Date 8/8/2018
Project / Client USACE (Continued)

NEC18-S28-SD-47 17:20
On Stake 47 Saturated sandy silt
with moderate root mass heavy odor heavy sheen
NEC18-S28-SD-48 17:26
On Stake 48 Saturated sandy silt
with moderate root mass heavy odor and heavy sheen
NEC18-S28-SD-48-8 17:26 DUP
NEC18-S28-SD-49 17:33
On Stake 49 Saturated sandy silt
with moderate root mass heavy odor and heavy sheen
NEC18-S28-SD-50 17:39
On Stake 50 Saturated silty sand
with moderate root mass heavy odor and heavy sheen
NEC18-S28-SD-51 17:50
57° @ 6.3 ft moved due to no water
and rocks.
Saturated sandy silt
with moderate root mass heavy odor heavy sheen
End of Area 6
End of Sediment Sampling
All compass headings are
magnetic. Estimated Declination
is 8° 10'

Location NE Cape Date 8/9/18
Project / Client USACE

0800 Daily tailgate
A. DiBerardino
J. Bay, S. Seegars, Admon
S. Benjamin
3 x PRL

Objective: prepare for Friday
sample shipment.
- prepare excess supplies for
~~San~~ demobilization

1230: Re-Collect Equipment blank
from Site 28 Sampling.

2 jars became unusable due
to freezing and breaking.

AD 8/9/18

Summary of Sediment Transect

Summary of Sediment Transect

Area	Sub Area	Profile #	Stake #	Transect Direction	Total Transect Distance (feet)	Distance Along Transect (feet)	Sediment Start Depth (feet bgs)	Sediment Refusal Depth (feet bgs)	Total Sediment Depth (feet)	Notes
Area 11	N/A	P1	S1	W-E	5.0	1.0	2.2	3.8	1.6	
		P1				2.5	3.0	4.0	1.0	
		P1				4.0	3.0	3.9	0.9	
Area 11	Area 11-2	P2	S2	W-E	13.0	1.0	2.0	3.3	1.3	
		P2				5.0	2.4	3.2	0.8	
		P2				9.0	1.6	2.6	1.0	
		P2				12.5	1.7	2.8	1.1	
Area 11	N/A	P3	-	W-E	3.5	0.5	1.2	2.8	1.6	30 feet from P1.
		P3				1.5	1.7	2.9	1.2	
		P3				2.5	1.7	3.4	1.7	
Area 11	N/A	P4	-	W-E	1.0	0.0	1.2	2.2	1.0	15 feet south of P3.
		P4				0.5	1.2	2.3	1.1	
		P4				1.0	1.2	2.1	0.9	
Area 11	Area 11-1	P5	S3	W-E	4.5	1.0	0.3	2.4	2.1	
		P5				2.0	0.5	2.3	1.8	
		P5				3.0	1.3	2.2	0.9	
Area 10		-	S4	-	-	-	-	-	-	In vegetation mat.
	Area 10-5	P6	S5	W-E	4.0	1.0	1.1	2.1	1.0	Light sheen and light odor.
		P6				2.0	1.3	2.1	0.8	
		P6				3.0	1.4	2.2	0.8	
Area 10	Area 10-5	P7	S6	W-E	10.5	1.0	0.4	2.4	2.0	
		P7				3.0	0.3	2.8	2.5	
		P7				5.0	0.4	2.5	2.1	
		P7				7.0	1.5	2.0	0.5	
		P7				9.0	1.3	1.8	0.5	
Area 10	Area 10-4	P8	S8	W-E	17.0	2.0	0.1	1.9	1.8	According to map, S7 and S8 are located horizontally from eachother.
		P8				7.0	0.2	1.9	1.7	
		P8				12.0	0.3	2.6	2.3	
		P8				17.0	0.2	1.9	1.7	
Area 10	Area 10-4	P9	S9	W-E	4.0	1.0	0.2	1.3	1.1	
		P9				2.0	0.3	2.0	1.7	
		P9				3.0	0.3	2.1	1.8	
Area 10	Area 10-3	P10	S10	W-E	5.0	1.5	1.0	2.5	1.5	
		P10				3.0	0.5	3.9	3.4	
		P10				4.5	0.2	2.9	2.7	
Area 10	Area 10-2	P11	S11	W-E	1.0	0.0	1.0	2.5	1.5	
		P11				0.5	0.5	3.9	3.4	
		P11				1.0	0.2	2.9	2.7	
Area 10	Area 10-1	P12	S12	W-E	9.0	1.5	0.1	2.1	2.0	
		P12				4.5	0.1	2.2	2.1	

Summary of Sediment Transect

Area	Sub Area	Profile #	Stake #	Transect Direction	Total Transect Distance (feet)	Distance Along Transect (feet)	Sediment Start Depth (feet bgs)	Sediment Refusal Depth (feet bgs)	Total Sediment Depth (feet)	Notes
		P12				7.5	0.3	3.5	3.2	
Area 9	N/A	P13	S13	W-E	3.0	0.5	1.0	2.2	1.2	Stand alone.
		P13				1.5	0.5	2.1	1.6	
		P13				2.5	0.2	2.1	1.9	
Area 9	N/A	P14	S14	W-E	8.5	1.5	1.7	2.8	1.1	
		P14				3.5	2.0	3.5	1.5	
		P14				5.5	1.7	3.4	1.7	
		P14				7.5	1.2	1.5	0.3	
Area 9	N/A	P15	S15	W-E	8.0	2.0	1.7	2.3	0.6	Obstruction at 8-11 feet on east side.
		P15				4.0	1.9	2.6	0.7	
		P15				6.0	1.6	2.5	0.9	
Area 9	N/A	P16	S16	W-E	30.0	5.0	2.2	3.3	1.1	Strong odor of fuel at profile 16. Large fuel sheen.
		P16				10.0	2.0	2.9	0.9	
		P16				15.0	2.2	2.8	0.6	
		P16				20.0	2.2	3.5	1.3	
		P16				25.0	2.2	2.8	0.6	
Area 9	N/A	P17	S18	W-E	11.0	1.0	1.4	2.9	1.5	Obstruction east of stake out to 4 feet east. Fuel odor and sheen.
		P17				4.0	1.1	3.0	1.9	According to map, S17 is horizontally located from S18.
		P17				7.0	1.5	3.8	2.3	
		P17				10.0	1.2	3.9	2.7	
Area 4	N/A	P18	-	-	5.5	1.5	0.8	2.3	1.5	44 degrees at 27.5 feet from S19, 5.5 feet to center of stream.
		P18				3.0	0.5	3.0	2.5	
		P18				4.5	0.5	3.2	2.7	
Area 4	N/A	P19	S19	W-E	14.0	2.0	1.0	3.4	2.4	
		P19				5.0	1.0	2.3	1.3	
		P19				8.0	1.2	2.4	1.2	
		P19				11.0	1.0	3.8	2.8	
Area 4	N/A	P20	S20	-	27.0	1.0	0.5	3.9	3.4	Large fuel sheen and odor of fuel.
		P20				6.0	1.8	2.2	0.4	
		P20				11.0	1.6	3.2	1.6	
		P20				16.0	1.5	3.2	1.7	
		P20				21.0	1.4	4.0	2.6	
		P20				26.0	1.0	3.0	2.0	
Area 4	N/A	P21	-	-	3.5	1.0	0.4	2.3	1.9	Located at stake marked by surveyors, but not part of proposed sample locations. West side channel 13 vegetation mat.
		P21				2.0	0.5	2.2	1.7	
		P21				3.0	0.5	2.2	1.7	

Summary of Sediment Transect

Area	Sub Area	Profile #	Stake #	Transect Direction	Total Transect Distance (feet)	Distance Along Transect (feet)	Sediment Start Depth (feet bgs)	Sediment Refusal Depth (feet bgs)	Total Sediment Depth (feet)	Notes
Area 4	N/A	P22	S21	W-E	25.0	1.0	0.8	2.2	1.4	Wide section with vegetation mat sections in between. Sediment depths measured where present. Sheen present.
		P22				6.0	0.4	0.6	0.2	
		P22				11.0	1.0	3.2	2.2	
		P22				22.0	0.5	2.1	1.6	
		P22				25.0	0.5	2.0	1.5	
Area 4	N/A	P23	S22	W-E	10.5	2.0	1.0	2.9	1.9	
		P23				5.0	1.8	2.1	0.3	
		P23				8.0	0.9	2.6	1.7	
Area 4	N/A	P24	-	-	7.0	2.0	0.7	3.1	2.4	315 degrees at 22 feet from S23 to west edge of sediment.
		P24				4.0	0.2	2.8	2.6	
		P24				6.0	0.3	3.3	3.0	
Area 4	N/A	P25	S23	-	1.0	0.0	0.6	2.9	2.3	
		P25				0.5	0.7	3.0	2.3	
		P25				1.0	1.0	3.0	2.0	
Area 4	N/A	P26	S24	-	1.0	0.0	0.3	2.1	1.8	
		P26				0.5	0.1	2.4	2.3	
		P26				1.0	0.3	2.1	1.8	
Area 4	N/A	P27	-	W-E	1.0	0.0	0.3	2.2	1.9	41 degrees at 26.5 feet from S25.
		P27				0.5	0.4	2.3	1.9	
		P27				1.0	0.2	0.5	0.3	
Area 3	N/A	P28	S25	W-E	1.5	0.0	0.2	2.2	2.0	
		P28				0.75	0.3	2.1	1.8	
		P28				1.5	0.2	2.0	1.8	
Area 3	N/A	P29	-	W-E	2.0	0.0	0.2	1.9	1.7	2 degrees at 23 feet from S26.
		P29				1.0	0.3	1.8	1.5	
		P29				2.0	0.3	1.8	1.5	
Area 3	N/A	P30	S26	W-E	2.5	0.5	0.3	1.5	1.2	
		P30				1.25	0.3	1.6	1.3	
		P30				2.0	0.2	1.6	1.4	
Area 3	N/A	P31	S27	W-E	2.0	0.5	0.2	2.1	1.9	
		P31				1.0	0.1	1.1	1.0	
		P31				1.5	0.1	1.1	1.0	
Area 3	N/A	P32	-	W-E	2.0	0.5	0.3	1.2	0.9	347 degrees at 24 feet from S28.
		P32				1.0	0.3	1.3	1.0	
		P32				1.5	0.4	1.8	1.4	
Area 3	N/A	P33	S28	-	3.0	0.75	0.2	1.4	1.2	
		P33				1.5	0.3	1.3	1.0	
		P33				2.25	0.4	1.4	1.0	
Area 3	N/A	P34	S29	-	2.0	0.5	0.5	0.8	0.3	
		P34				1.0	0.6	0.6	0.0	

Summary of Sediment Transect

Area	Sub Area	Profile #	Stake #	Transect Direction	Total Transect Distance (feet)	Distance Along Transect (feet)	Sediment Start Depth (feet bgs)	Sediment Refusal Depth (feet bgs)	Total Sediment Depth (feet)	Notes
		P34				1.5	0.7	1.4	0.7	
Area 3	N/A	P35	S30	-	1.5	0.0	0.2	2.3	2.1	
		P35				0.75	0.3	2.3	2.0	
		P35				1.5	0.1	2.4	2.3	
Area 3	N/A	P36	S31	-	3.0	0.75	0.3	1.6	1.3	
		P36				1.5	0.4	1.0	0.6	
		P36				2.25	0.3	1.8	1.5	
Area 3	N/A	P37	-	-	1.0	0.0	0.5	1.6	1.1	31 degrees at 19 feet from S32.
		P37				0.5	0.3	1.5	1.2	
		P37				1.0	0.2	1.5	1.3	
Area 3	N/A	P38	S32	-	6.0	1.0	0.5	1.6	1.1	Light sheen.
		P38				3.0	0.1	1.5	1.4	
		P38				5.0	0.3	1.2	0.9	
Area 3	N/A	P39	S33	-	2.0	0.5	0.1	0.1	0.0	Very light layer of sediment on rock.
		P39				1.0	0.4	0.4	0.0	
		P39				1.5	0.2	0.2	0.0	
Area 3	N/A	P40	S34	-	3.5	1.0	1.0	1.5	0.5	
		P40				2.0	1.2	2.2	1.0	
		P40				3.0	0.8	1.2	0.4	
Area 3	N/A	P41	S35	-	1.0	0.0	0.8	2.5	1.7	
		P41				0.5	1.0	1.5	0.5	
		P41				1.0	0.6	1.5	0.9	
Area 7	N/A	P42	-	N-S	49.0	7.0	-	-	-	Vegetation mat.
		P42				14.0	-	-	-	Vegetation mat.
		P42				21.0	-	-	-	Vegetation mat.
		P42				28.0	1.2	1.5	0.3	Sheen and odor.
		P42				35.0	1.3	3.1	1.8	Sheen and odor.
		P42				42.0			0.0	Vegetation mat.
Area 7	N/A	P43	-	W-E	54.0	10.0	0.2	2.2	2.0	
		P43				20.0	-	-	-	Vegetation mat. Sheen and odor.
		P43				30.0	2.1	3.5	1.4	
		P43				35.5	2.6	3.8	1.2	
		P43				40.0	-	-	-	Vegetation mat. Sheen and odor.
		P43				50.0	-	-	-	Vegetation mat. Sheen and odor.
Area 8	N/A	P44	-	N-S	39.0	5.0	0.9	1.4	0.5	
		P44				12.0	-	-	-	Vegetation mat.
		P44				19.0	-	-	-	Vegetation mat.
		P44				26.0	2.0	2.2	0.2	
		P44				32.0	2.2	2.3	0.1	
Area 8	N/A	P45	S42	W-E	40.0	0-8.0	-	-	-	Vegetation mat.

Summary of Sediment Transect

Area	Sub Area	Profile #	Stake #	Transect Direction	Total Transect Distance (feet)	Distance Along Transect (feet)	Sediment Start Depth (feet bgs)	Sediment Refusal Depth (feet bgs)	Total Sediment Depth (feet)	Notes
		P45				10.0	1.4	1.9	0.5	
		P45				13.0	2.1	2.4	0.3	
		P45				13.5-35.0	-	-	-	Vegetation mat.
		P45				35.5	1.0	1.3	0.3	
		P45				37.0	0.9	1.1	0.2	
		P45				38.0	0.7	1.2	0.5	
		P45				38-40	-	-	-	Vegetation mat. S43, vegetation mat no sediments.
Area 6	N/A	P46	-	N-S	84.0	10.0	-	-	-	Vegetation mat. Sheen and odor.
		P46				20.0	-	-	-	Vegetation mat. Sheen and odor.
		P46				30.0	2.5	3.5	1.0	
		P46				40.0	2.5	3.8	1.3	
		P46				50.0	-	-	-	Vegetation mat. Sheen and odor.
		P46				60.0	-	-	-	Vegetation mat. Sheen and odor.
		P46				70.0	-	-	-	No sediment. Sheen and odor.
		P46				80.0	-	-	-	No sediment. Sheen and odor.
Area 6	N/A	P47	-	W-E	76.0	10.0	1.4	2.2	0.8	
		P47				20.0	-	-	-	Vegetation mat.
		P47				30.0	2.5	3.6	1.1	
		P47				40.0	-	-	-	Vegetation mat.
		P47				50.0	-	-	-	Vegitation mat.
		P47				60.0	-	-	-	Vegitation mat.
Area 5	Area 5 South	P48	S41	N-S	62.5	0-35.0	-	-	-	Vegetation mat.
		P48				35.4	-	-	-	Vegetation mat. Stake 41
		P48				36.5	2.6	2.8	0.2	
		P48				40-58	-	-	-	Vegetation mat.
		P48				58-62.5	-	-	-	No sediment.
Area 5	Area 5 South	P49	S41	W-E	44.0	0-22.0	-	-	-	Vegetation mat.
		P49				22.5	2.1	3.3	1.2	At stake 41.
		P49				23.0-44.0	-	-	-	Vegetation mat.
Area 5	Area 5 North	P50	S37	N-S	50.5	0-27.0	-	-	-	Vegetation mat.
		P50				27.0	2.5	3.2	0.7	
		P50				30.4	-	-	-	Vegetation mat at S37.
		P50				31.0-50.5	-	-	-	Vegetation mat.
Area 5	Area 5 North	P51	S36	W-E	40.0	0-15.0	-	-	-	Vegetation mat.
		P51				15.5-18.0	-	-	-	No sediment, rock only.
		P51				18.5	2.9	3.1	0.2	
		P51				19.0	2.8	2.9	0.1	
		P51				19.1-40.0	-	-	-	Vegetation map. S36- no sed, rock only.
		-	S36	-	-	-	-	-	-	S36- no sed, rock only.
Area 2	N/A	P52	-	N-S	26.5	1.0	-	-	-	Vegetation mat. Large sheen and strong odor.

Summary of Sediment Transect

Area	Sub Area	Profile #	Stake #	Transect Direction	Total Transect Distance (feet)	Distance Along Transect (feet)	Sediment Start Depth (feet bgs)	Sediment Refusal Depth (feet bgs)	Total Sediment Depth (feet)	Notes
		P52				5.0	1.5	2.5	1.0	
		P52				9.0	1.4	2.2	0.8	
		P52				13.0	1.5	1.9	0.4	
		P52				17.0	1.0	1.5	0.5	
		P52				21.0	1.2	2.4	1.2	
		P52				25.0	-	-	-	No sediment.
Area 2	N/A	P53	-	W-E	18.0	3.0	-	-	-	Vegetation mat.
		P53				6.0	1.6	4.0	2.4	
		P53				9.0	1.6	3.6	2.0	
		P53				12.0	1.2	1.8	0.6	
		P53				15.0	-	-	-	Vegetation mat.

Note:

For definitions, refer to the Acronyms and Abbreviations section in Appendix F.

Waste

2018 Northeast Cape Second Periodic Review
Waste Summary

Container	Container ID	Quantity	Contents	Waste Characterization Result	Generation Date	Manifest #	Classification	Date Shipped offsite	Weight (pounds)
55-gallon drum	WW-1	50 gallons	well development and purge water	Non-Hazardous	8/1/2018	2018-00405	Non-Hazardous	9/14/18	1913
55-gallon drum	WW-2	50 gallons	well development and purge water	Non-Hazardous	8/2/2018	2018-00405	Non-Hazardous	9/14/18	
55-gallon drum	WW-3	Started	well development and purge water	Non-Hazardous	8/3/2018	2018-00405	Non-Hazardous	9/14/18	
55-gallon drum	WW-4	2 gallons	Site 28 Decon water	Non-Hazardous	8/6/2018	2018-00405	Non-Hazardous	9/14/18	
55-gallon drum	WW-4	2 gallons	Site 28 Decon water	Non-Hazardous	8/7/2018	2018-00405	Non-Hazardous	9/14/18	
55-gallon drum	WW-4	3 gallons	Site 28 Decon water	Non-Hazardous	8/8/2018	2018-00405	Non-Hazardous	9/14/18	

1805949847

NON-HAZARDOUS WASTE MANIFEST	1. Generator ID Number AK0000228395	2. Page 1 of 3	3. Emergency Response Phone (907)751-4493	4. Waste Tracking Number 2018-00405

5. Generator's Name and Mailing Address US ARMY ENGINEER DISTRICT, ALASKA
PO BOX 6898, CEPOA-EN-EE-ER
JBER, AK 99506-6898
Generator's Phone: (907) 753-2578

Generator's Site Address (if different than mailing address)
USACE, AK, NEC FACILITY WIDE
NE CAPE, ST. LAWRENCE ISLAND
SAVOONGA, AK 99769

6. Transporter 1 Company Name
RIDGE CONTRACTING (907) 222-7518
U.S. EPA ID Number

7. Transporter 2 Company Name
ECC, INC. (907) 644-0428
U.S. EPA ID Number AKR000202408

8. Designated Facility Name and Site Address
CLEAN HARBORS GRASSY MOUNTAIN LLC
3 MILES EAST 7 MILES NORTH OF KNOLLS
GRANTSVILLE, UT 84029
Facility's Phone: (435) 884-8900
U.S. EPA ID Number UTD991301748

HM	9. Waste Shipping Name and Description	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.
	1 NON-REGULATED LIQUID	4	DM	1913	P
	2.				
	3.				
	4.				

13. Special Handling Instructions and Additional Information
1) CH1458548 IDW WATER

TO# W911KB18F0020
Contract# W911KB-17-D-0017

14. GENERATOR'S/OFFEROR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to ~~applicable international and~~ national governmental regulations.

Generator's/Offeror's Printed/Typed Name: Stanley Seegars
Signature: [signature]
Month 8 Day 10 Year 18

15. International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit:
Transporter Signature (for exports only): Date leaving U.S.:

16. Transporter Acknowledgment of Receipt of Materials
Transporter 1 Printed/Typed Name: Cory Smith
Signature: [signature]
Month 9 Day 14 Year 18

Transporter 2 Printed/Typed Name: Don Malaney / Don Mangus
Signature: [signature]
Month 10 Day 11 Year 18

17. Discrepancy
1-979

17a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection

Manifest Reference Number:

17b. Alternate Facility (or Generator)
U.S. EPA ID Number
Facility's Phone:

17c. Signature of Alternate Facility (or Generator)
Month Day Year

H132

18. Designated Facility Owner or Operator: Certification of receipt of materials covered by the manifest except as noted in Item 17a
2019000279

Printed/Typed Name: [signature]
Signature: [signature]
Month 1 Day 16 Year 19

169-BLC-O 5 11977 (Rev. 9/09)

DESIGNATED FACILITY TO GENERATOR

CleanHarbors

Certificate of Disposal / Treatment - Storage and Transfer

Run Date: 3/6/2019

Manifested To Site: Grassy Mountain, UT Facility
3 Miles East 7 Miles North of KnollsExit 41 off I-80
Grantsville, UT 84029

EPA ID/Prov ID: UTD991301748

Generator ID	Manifest No.	Generation Date	Received Date
US31722	NH2018-00405	8/10/2018	1/16/2019

The above described waste, received at the Clean Harbors facility listed above pursuant to the manifest(s) listed above, has/will be treated and/or disposed of by Clean Harbors, or another licensed facility approved by Clean Harbors, in accordance with applicable federal, state and provincial laws and regulations. Any waste received by Clean Harbors and subsequently shipped to another licensed facility has been or shall be identified as being generated by Clean Harbors in accordance with 40CFR 264.71(c).

For waste imported/exported to/from Canada the waste has/will be disposed or recycled according to the Canadian export and import of hazardous waste or hazardous recyclable material regulation as published in the Canadian Gazette Part II, vol 139, No 11, SOR/2005-149 May 17, 2005

Under civil and criminal penalties of law for the making of submission of false or fraudulent statements or representations (18 U.S.C. 1001 and 15 U.S.C. 2615), I certify that the information contained in or accompanying this document is true, accurate, and complete. As to the identified section(s) of this document for which I cannot personally verify truth and accuracy, I certify as the company official having supervisory responsibility for the persons who, acting under my direct instructions, made the verification that this information is true, accurate, and complete.

Signed: Paul A. Mello

Date: **3/6/2019**

Title: **Director Facility Applications**

ATTACHMENT F-4
Photographic Log

PHOTOGRAPH LOG
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PHOTOGRAPH LOG
TABLE OF CONTENTS (Continued)

PHOTOGRAPH LOG
TABLE OF CONTENTS (Continued)

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Photo No. 1 – 07 August 2018
Sample location 01 and 02 (profile transect 1 and 2) confluence with the Suqi River at Site 28. View looking east.

Photo No. 2 – 07 August 2018
Sample location 01 and 02 (profile transect 1 and 2) within discrete pond at Site 28. View looking north.

Photo No. 3 – 07 August 2018
Sample location 03 at Site 28. View looking northeast.

Photo No. 4 – 07 August 2018
Profile transect 5; sample location 04 was relocated due to vegetative mat. View looking northeast.

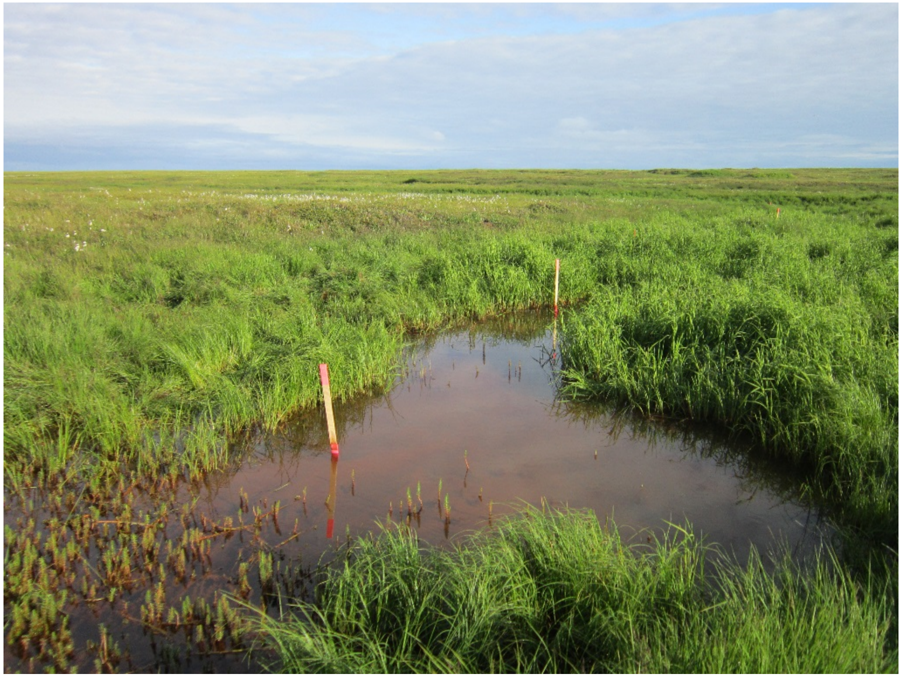

Photo No. 5 – 07 August 2018
Profile transect 6 and 7; sample locations 05 and 06, respectively. View looking north.

Photo No. 6 – 07 August 2018
Profile transects 8 and 9; sample locations 07, 08 and 09. View looking northeast.

Photo No. 7 – 07 August 2018
Profile transect 10; sample location 10. View looking north.

Photo No. 8 – 07 August 2018
Profile transect 12; sample locations 11 and 12. View looking northwest.

Photo No. 9 – 07 August 2018
Profile transect 13; sample location 13. View looking north.

Photo No. 10 – 07 August 2018
Profile transects 14, 15, 16 and 17; sample locations 14, 15, 16, 17 and 18. View looking north.

Photo No. 11 – 07 August 2018
Profile transects 19 and 20; sample locations 19 and 20. View looking north.

Photo No. 12 – 07 August 2018
Profile transects 22 and 23; sample locations 21 and 22. View looking north.

Photo No. 13 – 07 August 2018
Profile transects 25 and 26; sample locations 23 and 24. View looking north.

Photo No. 14 – 07 August 2018
Profile transect 28; sample location 25. View looking southwest.

Photo No. 15 – 07 August 2018
Profile transects 30, 32 and 33; sample locations 26 and 28. View looking south.

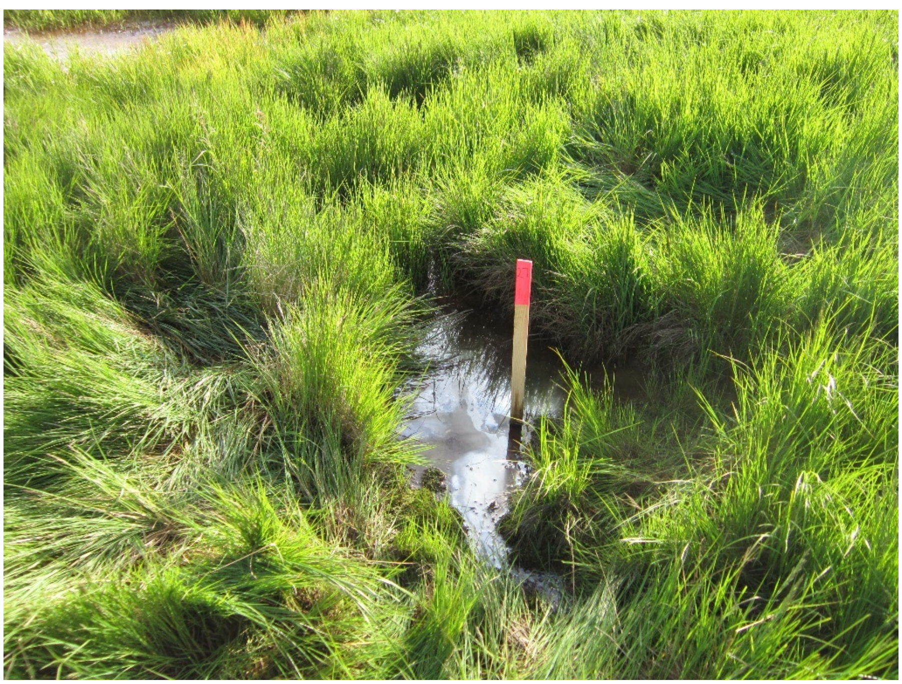

Photo No. 16 – 07 August 2018
Profile transect 31; sample location 27. View looking down.

Photo No. 17 – 07 August 2018
Profile transects 34 and 35; sample locations 29 and 30. View looking south.

Photo No. 18 – 07 August 2018
Profile transect 36; sample location 31. View looking south.

Photo No. 19 – 07 August 2018
Profile transects 38, 39, 40 and 41; sample locations 32, 33, 34 and 35. View looking south.

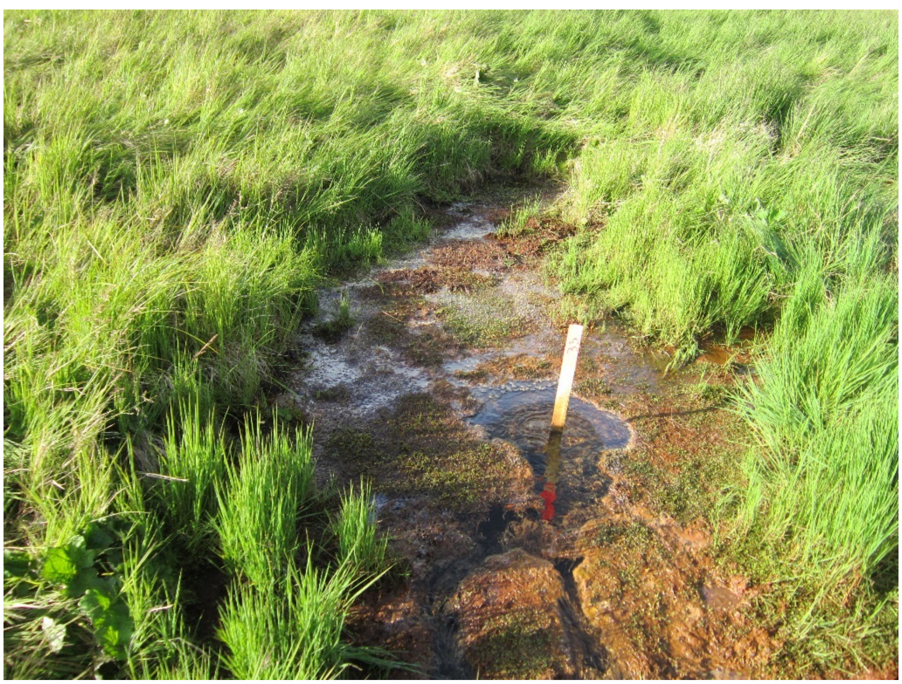

Photo No. 20 – 07 August 2018
Profile transect 41; sample location 35, an artesian upwelling. View looking down.

Photo No. 21 – 07 August 2018
Profile transects 50 and 51; sample locations 36 and 37. View looking north.

Photo No. 22 – 07 August 2018
Profile transects 42 and 43; pond containing sample locations 38, 39 and 40. View looking southwest.

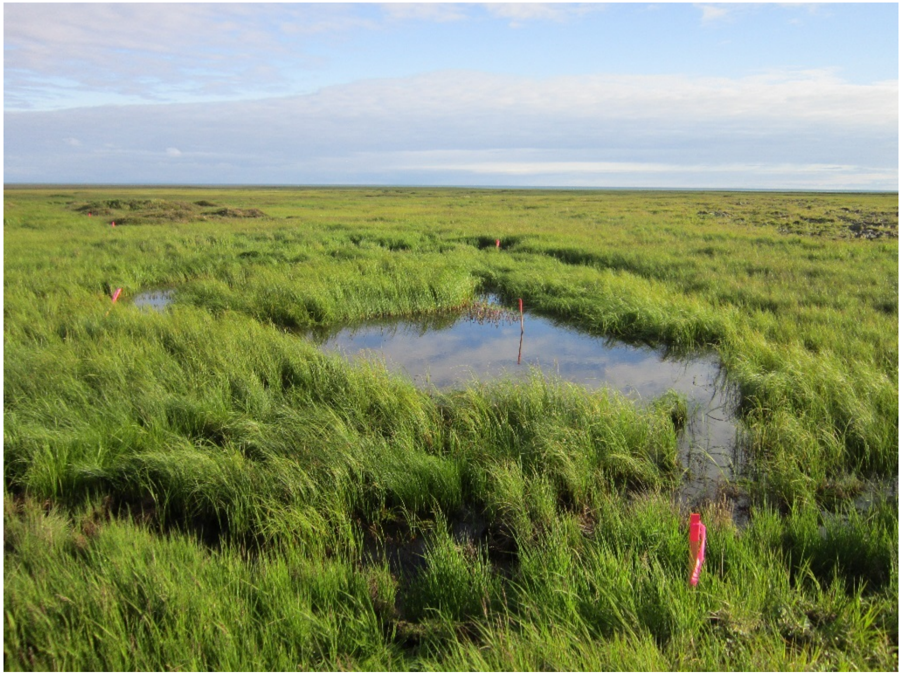

Photo No. 23 – 07 August 2018
Profile transects 48 and 49; sample location 41. View looking north.

Photo No. 24 – 07 August 2018
Profile transects 44 and 45; sample location 42. View looking north.

Photo No. 25 – 07 August 2018
Sample location 43. View looking north.

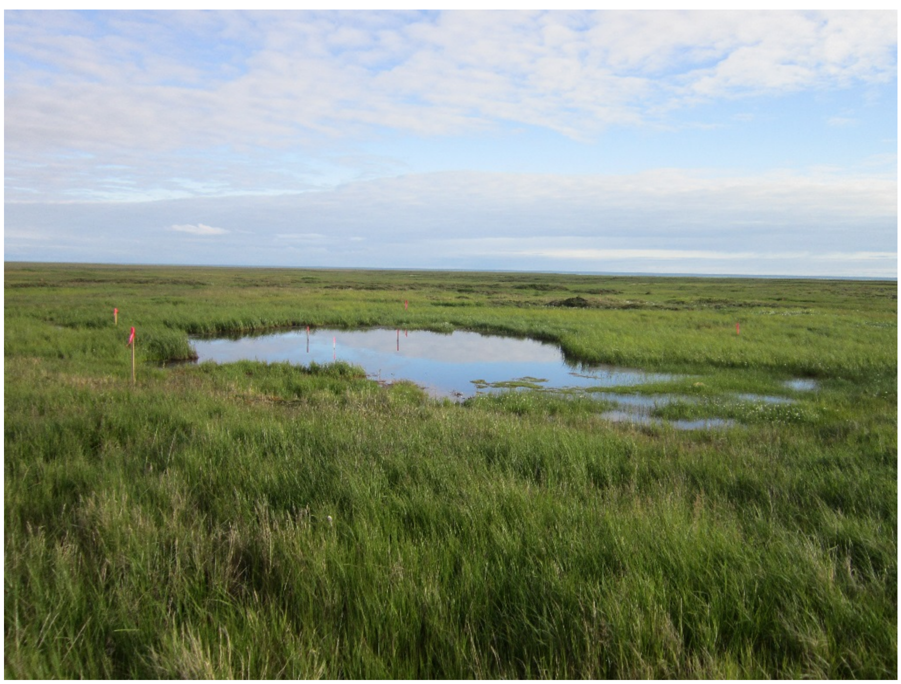

Photo No. 26 – 07 August 2018
Profile transects 46 and 47; sample locations 44, 45 and 46. View looking north.

Photo No. 27 – 07 August 2018
Profile transects 52 and 53; sample locations 47, 48, 49, 50 and 51. View looking southwest.

Photo No. 28 – 03 August 2018
View facing down of sheen on surface water at Site 28

Photo No. 29 – 03 August 2018
View facing north of pond with sheen at Site 28

Photo No. 30 – 7 August 2018
View facing north of pond containing sample locations #1 and #2. Stressed vegetation on the edge of the ponded water and low water level.

Photo No. 31 – 03 August 2018
View facing northeast of utility pole base in pond at Site 28.

Photo No. 32 – 03 August 2018
View facing down of a fallen utility pole with treated covering.

Photo No. 33 – 03 August 2018
View facing down of a fallen utility pole with treated covering.

Photo No. 34 – 03 August 2018
View facing down of a fallen utility pole with treated covering.

Photo No. 35 – 03 August 2018
View facing north of 1-inch electrical conduit at Site 28.

Photo No. 36 – 3 August 2018
View facing down of rubber tubing found at Site 28.

Photo No. 37 – 03 August 2018
View facing east of partially buried rubber matting at Site 28.

Photo No. 38 – 06 August 2018
View facing east of plywood at Site 28.

Photo No. 39 – 03 August 2018
View facing east of tarp material at Site 28.

Photo No. 40 – 6 August 2018
View facing east of an in-tact straw wattle at the MOC/Site 28 border.

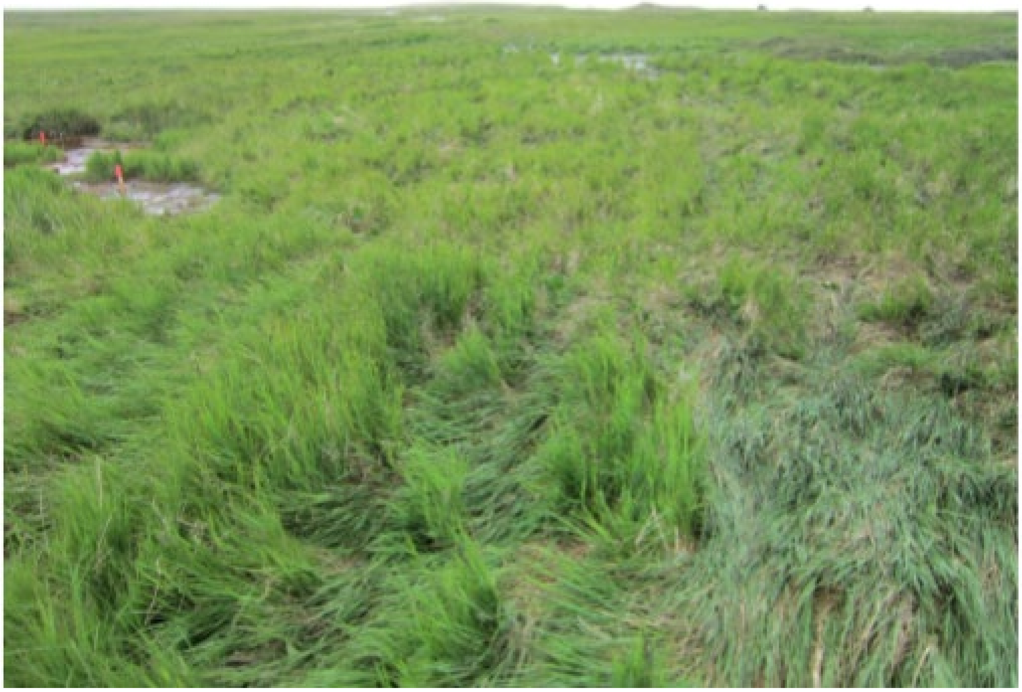

Photo No. 41 – 06 August 2018
View facing south of reindeer tracks through Site 28.

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ATTACHMENT F-5
Sediment Mapping and Sampling SOP

Site 28 Sediment Mapping and Sample Collection

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EXHIBITS

1.0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to describe the process for mapping the extent of sediment present at Northeast Cape Formerly Used Defense Site (Ne Cape FUDS) Site 28. The goal of the sediment mapping and sample collection effort will be to achieve comparable results to the previous sediment mapping effort conducted in 2018 and described in the *Site 28 Sediment Mapping and Sampling Report* (U.S. Army Corps of Engineers [USACE] 2018).

This SOP defines the procedures that will be applied to evaluate the lateral extent of sediment in a waterbody, estimating the sediment volume, and determining the location of sediment samples at Site 28. Once sampling locations are determined using this SOP, the field team will collect and store the samples according to the contractors work plan.

This plan may need to be revised if warranted by site conditions or other factors. Modifications to this plan will be coordinated with the USACE Quality Assurance representative (QAR) and documented in the field logbooks.

1.1. Background and Rationale

Sediment mapping and sampling occurred in 2012 at Site 28 prior to sediment removal activities (dredging). Another sediment mapping and sampling event occurred in 2018 to evaluate the post-removal quantity of sediment. A sediment mapping SOP was established to define an approach for the 2018 effort and potential future mapping efforts. This SOP has been refined since the 2018 sediment mapping and sampling event (USACE 2018) and was designed to use a similar approach to what was used in the 2012 sediment mapping and sampling effort, reported in *Site 28 Technical Memorandum Addendum* (USACE 2013).

The 2012 effort was completed in two distinct phases. The first phase included mapping activities such as the measuring the extent of waterbodies in the study area and measuring the thickness of sediment at discrete points within each waterbody. Locations for sediment thickness measurements were chosen at the discretion of field personnel based on observations. This discretionary approach in 2012 resulted in 66 measurements of sediment thickness for all of the waterbodies found in the Site 28 study area. The second phase included sediment sampling activities. Using the results of the sediment mapping effort, sediment sample locations were selected. Requirements for sample location density in 2012, as document in the Daily Quality Control Reports (DQCRs), were a minimum of three sediment samples per water body (where sediment is present), and within a maximum spacing of 50 feet (DQCR# NEC 2012-15). This approach generated 51 primary sediment sample locations. Sediment mapping locations and sediment sample locations in 2012 were not collocated.

The 2018 effort was completed in three phases. The first phase consisted of measuring the extent of waterbodies within the study area. The second phase consisted of mapping activities, as described in this SOP, to include measuring the thickness of sediment by probing along primary transects. The third phase consisted of sediment sampling activities. Samples were collected from the 2012 sample locations where possible but were moved if they were within vegetative mat or on dry land. When possible, the primary transects were collocated with sediment sample locations.

2.0 EQUIPMENT

Sediment sampling equipment may include, but is not limited to, the following items:

- Appropriate personal protective equipment (PPE). At minimum, PPE will include safety glasses and nitrile gloves. Refer to the project Accident Prevention Plan (APP) for details.
- Appropriate size and quantity of sample containers.
- Sample labels
- Camera
- Logbook
- Chain-of-custody (CoC)
- Survey stakes, pin flags, or similar to mark measurement and sample locations
- Tape measure
- Compass
- Graduated probe
- Stainless steel spoons or spatulas
- Aluminum pie pans, large bowl, or gallon Ziploc bags
- Shovel, trowel, or other digging tools
- Hand coring tool
- Hand auger
- Clam Gun
- Grab sampler
- Chest waders
- Elbow-length gloves
- Inflatable boat or plastic sled
- Equipment decontamination bucket, with Alconox® or similar detergent and stiff-bristled cleaning brush, and duck pond

3.0 SEDIMENT MAPPING AND SAMPLING APPROACH

During the 2018 field effort, sediment mapping and sediment sampling will occur at Site 28 to evaluate post-removal conditions and to determine volume of sediment at Site 28. For this evaluation, the following definition of sediment will be applied to differentiate soil and sediment: sediment is defined as all continuously submerged loose mineral and organic material, except that which is actively growing vegetation and is part of the vegetative mat.

Sediment mapping and sampling will include the following:

- Measure extent of waterbodies (lateral and vertical).
- Measure extent of sediment within all waterbodies greater than 30 feet in diameter (lateral and vertical).
- Collect sediment samples.

For sediment thickness measurements, this SOP will utilize a graduated hand probe that will be advanced through the sediment layer. The relative resistance of the sediment layer will be different from the native soil that underlies the sediment. The point at which this resistance is encountered will be deemed the bottom of the sediment layer. Photographs 1 through 3 from previous fieldwork portray general site conditions expected at Site 28, showing ponded and flowing surface waterbodies in a landscape predominately covered in vegetative mat.

Photo No. 1 – 15 September 2013
Overview of Site 28. View facing southwest.

Photo No. 2 – 15 September 2013
Overview of Site 28. View facing northeast.

Photo No. 3 – 07 August 2018
Ponded area within Site 28. View facing southwest.

3.1. Measure Extent of Waterbodies

The lateral and vertical extent of surface waterbodies encountered at the Site 28 study area (confluence with the Suqitughneq (Suqi) river to the border of the MOC) will be measured during field season for waterbodies greater than 30 feet in diameter. Surface waterbodies at Site 28 measured during the 2018 sediment mapping effort are presented on Figure 1 (Exhibit 1).

The perimeter of each waterbody will be surveyed at the waterline (shoreline) using survey-grade Global Positioning Systems (GPS) equipment. Elevation of the waterbody will also be established using a temporary survey control point of established elevation. Surveying will take the form of either “continuous” data collection, or as an assortment of discrete points collected at intervals along the shorelines. For continuous data collection, the surveyor will walk the shoreline of any encountered waterbodies, ensuring the GPS antenna traces over the water/land boundary. For discrete point collection, the surveyor will record the position of the water/land boundary at intervals along the shorelines. Spacing of GPS points will vary based on the intricacy of the shoreline. Generally, spacing of points 5-10 feet apart along the shoreline will adequately describe the extent of most surface waterbodies. Closer spacing may be used to capture more complex shorelines, and looser spacing may be used along straight sections of shorelines. Spacing greater than 30 feet will be avoided. The assortment of points can then be combined and processed using geographic information systems (GIS) software to display a continuous outline of measured waterbodies.

The depth of the waterbody will be measured by the field team using a graduate probe and will be collected from across the primary transect that is described within Section 3.2. The probe will be lowered into the water until it rests on the top of the sediment layer. While the probe is in a vertical position and resting on the sediment, the depth of the water will be recorded to the nearest 0.1 foot. Additional water depth measurements will be collected during sediment thickness probing described in Section 3.2.2.

3.2. Measure Extent of Sediment

Within the surveyed waterbodies from Section 3.1, submerged areas will be characterized and documented as sediment or vegetative mat. If there is no material that meets the Section 3 definition of sediment (only the vegetative mat present) no further evaluation will occur in that area of the waterbody. No assessment below the vegetative mat will occur. Submerged debris may be encountered during the sediment investigation; the location and description of any debris should be documented.

3.2.1. Lateral Extent of Sediment

When sediment is present, the lateral extent of sediment will be determined by visual inspection of submerged material. Hand tools will be used when needed to retrieve submerged material for evaluation to aid the visual inspection. The lateral extent of sediment will be recorded using survey-grade GPS equipment similarly to the lateral extent of surface water. The lateral extent of the sediment may not always extend the length of the surveyed surface water boundaries. Conditions between the sediment and surface water boundaries should be documented.

3.2.2. Vertical Extent of Sediment

Generally, two types of waterbodies are expected to contain sediment at Site 28. The first type of waterbody will be a discrete pond that is not interconnected to another surface water feature. The second type of waterbody will be an elongated feature that is interconnected to other surface water features typically observed at Site 28 in a north/south orientation with flowing water that runs towards the Suqi River.

For discrete waterbodies that contain sediment, a compass will be used to establish a north/south transect and an east/west transect crossing at the center of the sediment area to measure thickness. A graduated hand probe will be used to measure sediment thickness to the nearest 0.1 foot starting from the edge of the sediment area and at intervals not exceeding 10 feet. For smaller sediment areas, probe spacing should be reduced to provide a minimum of 5 evenly-spaced measurements for each transect. Following probing along the primary transects, additional measurements of thickness maybe be collected from the adjacent quadrants at the discretion of the field team (Photograph No. 4).

For linear waterbodies, sediment thickness will be evaluated every 30 feet along the length of area that contains sediment. At these intervals, sediment thickness will be measured across the width of the sediment area with 3 evenly-spaced measurements. Additional thickness measurements may be collected if significant variation in sediment thickness is encountered due to removal activities.

At both discrete and linear waterbodies, the water depth to the top of sediment (bathymetry) will be measured and recorded to the nearest 0.1 foot at each measurement location using the graduated markings along the probe. Depth of sediment will be recorded at both waterbodies to the nearest 0.1 foot when resistance of the subsurface underlying sediment is felt.

The 2018 transect locations and probe spacing are illustrated on Figure 1 (Exhibit 1). Note that these transect locations will not be strictly followed; similar transect and probe spacing will be used in the field, but specific locations will vary based on the sediment distribution encountered.

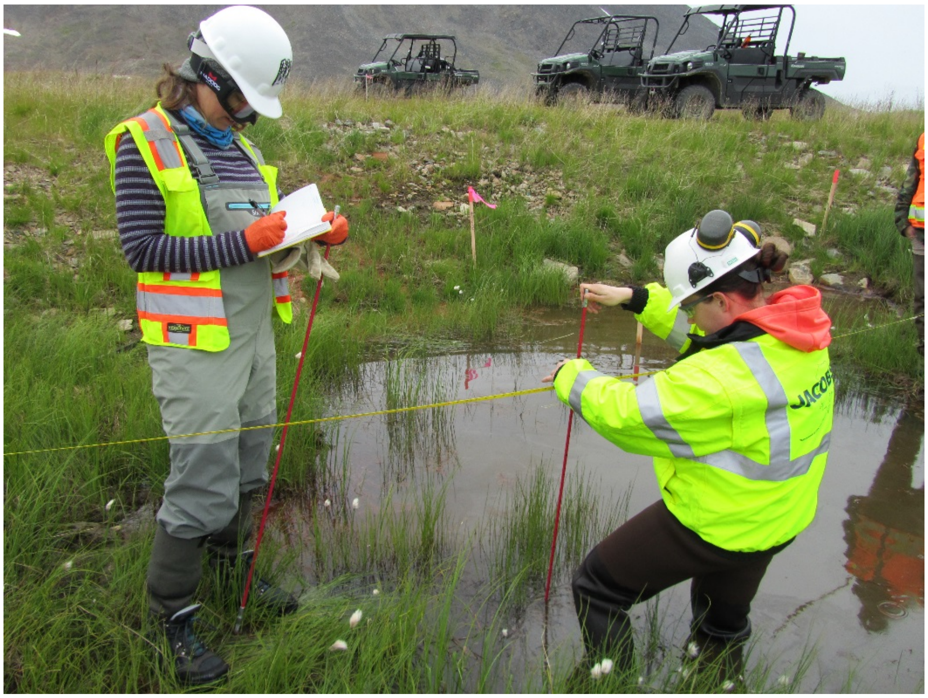


Photo No. 4 – 07 August 2018
Ponded area within Site 28. View facing southwest.

3.3. Collect Sediment Samples

Hand tools including (but not limited to) a hand auger, sludge and sediment sampler, clam gun, or shovel may be used to recover sediment. Hand tools and containers used for sample handling should be disposed of after each use, or properly decontaminated in between handling of analytical samples according to the procedures defined within the contractors work plan.

Sediment samples will be collected from within the submerged areas identified as sediment from 3.1 and 3.2. Sediment samples will be collected at a minimum of 3 samples per water body (where sediment is present), and at a maximum spacing of 50 linear feet. Approximately 54 locations are anticipated based on previous mapping efforts. Where possible, samples are to be collected from the identified sample locations from previous sample efforts. If significantly different quantities of sediment are encountered, an alternative sample plan or sample density will be discussed with the QAR. Sediment sampling locations will be determined in the field, with the objective to produce uniform spatial coverage and representative sampling of the observed distribution of sediment (based on sediment probing from 3.2.2). Sediment samples will target areas of thickest sediment deposits to ensure adequate quantities for analysis. Figure 1 (Exhibit 1) shows the 2018 sample locations. These locations may be adjusted in consultation with the USACE if needed based on actual field conditions found at the time of sample collection and contract requirements. If a new sample location is to be selected, attempts should be made to remain as close as possible to the original sample location identified from previous sample efforts.

Field personnel will inspect and describe the recovered material in field notes, using the sediment sampling form provided in Attachment 2 of this SOP. Sediment from each sample location will be evaluated to a depth of two feet or until substrate (such as underlying dense peat layer) is encountered (whichever occurs first).

Sediment thickness as described in recovered sediment cores should be compared to sediment THICKNESS AS MEASURED FROM PROBING LOCATIONS.

4.0 VOLUME ESTIMATION

Sediment mapping activities are conducted to build a volume estimate of sediment present at Site 28. Survey data recording the lateral extent of sediment areas and mapping locations will provide the spatial information necessary to calculate volume from the thickness measurements.

Volume of sediment will be estimated using an average thickness for each identified sediment area. The volume will be estimated as the average thickness multiplied by the surface area of the associated sediment (as mapped during 3.2.1). The volumes of sediment present at each sediment area will then be added for a total volume of sediment at Site 28. More complex estimates of volume can be conducted as requested, within the limits of the resolution of the dataset.

5.0 LABORATORY ANALYSIS

Sediment samples will be sent to an offsite laboratory and will be analyzed for DRO and RRO by AK102/AK103, PAHs by SW8270 selective ion monitoring (SIM), PCBs by SW8082, metals by SW6020 (arsenic, chromium, lead, selenium, and zinc only), and total organic carbon (TOC) by SW9060. TOC will be reported from a single run per sample. DRO and RRO sample extracts will be split by the laboratory and undergo silica gel cleanup procedure as described in ADEC Technical Memorandum 06-001 so that a before and after silica gel cleanup result is available. Quality Control samples will be collected at Site 28 based on the frequency presented in the contractors work plan.

6.0 HEALTH AND SAFETY

Procedures for working with potentially hazardous materials, as well as the relevant Safety Data Sheets (SDS) for each chemical that will be used at the site, should be included in the contractors work plan. Personnel using this procedure must be trained on the information contained in the SDSs, engineering controls, and the PPE outlined in this procedure.

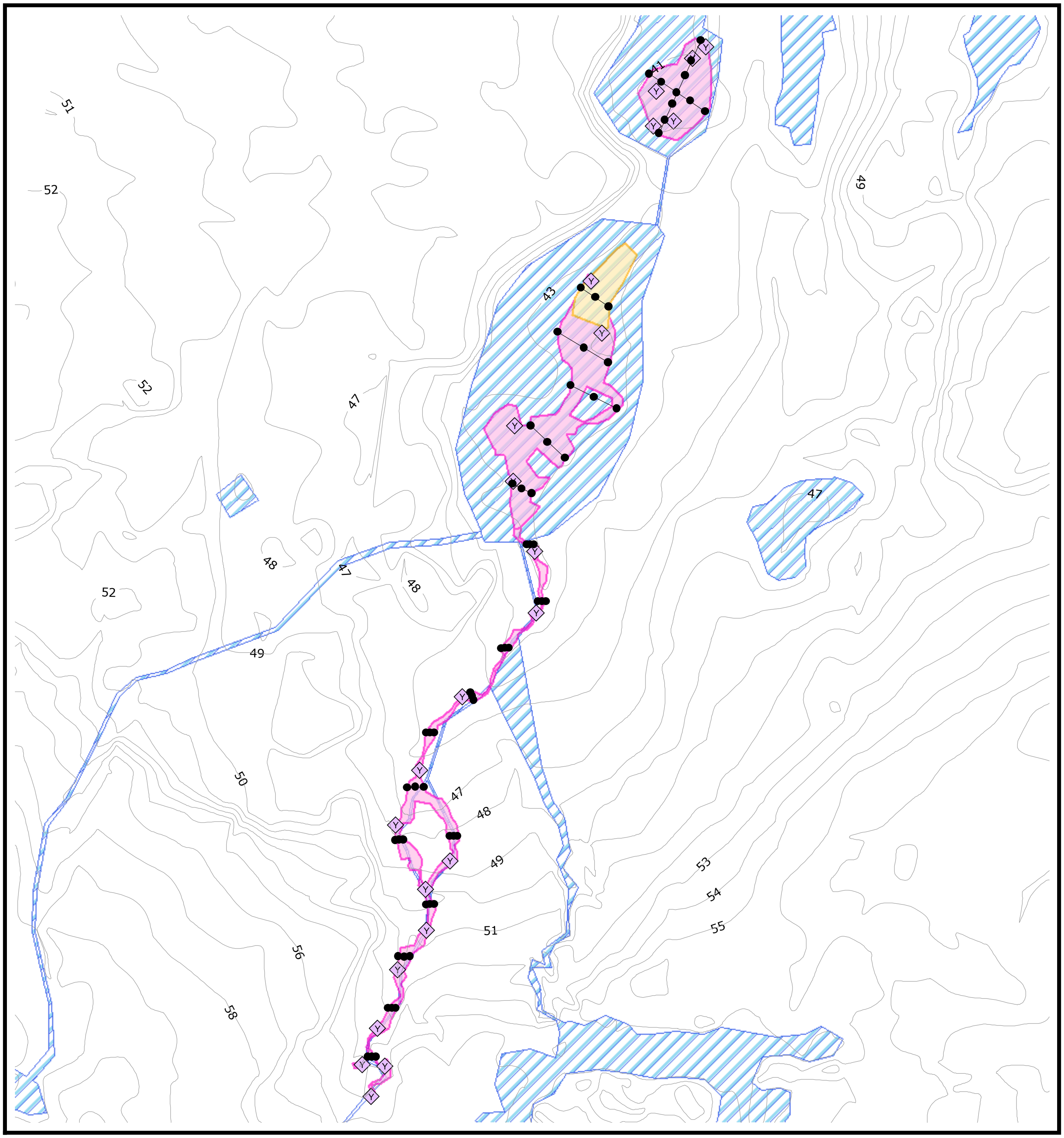
All sediment samples will be treated as potentially containing contaminants of concern. Care must be used when handling soil samples to prevent the possible spreading of contaminants in the work area. At a minimum, Level D PPE, including nitrile gloves and safety glasses, will be worn while collecting soil samples.

7.0 REFERENCES

USACE (U.S. Army Corps of Engineers). 2013 (January). *Site 28 Technical Memorandum Addendum.* Revision 1. St. Lawrence Island. Alaska. Prepared by Bristol Environmental Remediation Services, LLC. FRMD No. F10AK096903_03.10_0022_a.

USACE. 2018 (December). *2018 Site 28 Sediment Mapping and Sampling Report*, Pre-Draft. Northeast Cape, St. Lawrence Island, Alaska, Prepared by Jacobs Technology, Inc. FRMD No. F10AK096903_xx.xx_yyyy_a.

Exhibit F5-1
Figure



Proposed Sediment Sample Location

Sediment Thinckness Probe Location

Sediment Thickness Transect

Contour Line (ft)

2012 Sediment Removal

2013 Sediment Removal

Ponded Water

N

1 inch = 75 feet

0 30 60 90 120 150

Feet

NAD 1983 StatePlane Alaska 9 FIPS 5009 Feet

NORTHEAST CAPE 5 YEAR REVIEW
SITE 28 - TRANSECT EXAMPLE

NORTHEAST CAPE, SAINT LAWRENCE ISLAND, ALASKA

DATE:	PROJECT MANAGER:	FIGURE NO:
20 APR 2018	K. MAHER	1

P:\StLawrenceIsland\MXD\NEC_2018WP\SOP_Transect Example.mxd beatycj

Exhibit F5-2
Sediment Sampling Form

JACOBS

SEDIMENT SAMPLING FORM

PROJECT: ______________________ DATE: ______________________

SITE ID: ______________________ SITE LOCATION: ______________________

FIELD PERSONNEL: ______________________

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)	Location ID:

depth (ft)	Lithology	Sample Int.	Description (lithology, odor/staining, sample ID)	Location ID:

APPENDIX G

SAMPLING OF SURFACE WATER AT NEC SITE 9

U.S. Army Corps of Engineers
Alaska District

SECOND PERIODIC REVIEW REPORT

APPENDIX G

2018 SAMPLING OF SURFACE WATER AT NORTHEAST CAPE SITE 9

NORTHEAST CAPE FUDS
ST. LAWRENCE ISLAND, ALASKA

FUDS No. F10AK0969-03

FINAL
SEPTEMBER 2020

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TABLE

ATTACHMENTS

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ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
µS/cm	microSiemens per centimeter
ADEC	Alaska Department of Environmental Conservation
APPL	Agriculture & Priority Pollutants Laboratories, Inc.
BTEX	benzene, toluene, ethylbenzene, and xylenes
CoC	chain-of-custody
DO	dissolved oxygen
DoD	U.S. Department of Defense
DRO	diesel-range organics
Dup	duplicate
ECC	Environmental Compliance Consultants, Inc.
EPA	U.S. Environmental Protection Agency
FUDS	Formerly Used Defense Site
GW	groundwater
HPAH	high molecular weight polycyclic aromatic hydrocarbon
HTRW	hazardous, toxic, or radioactive waste
J	analyte result is estimated because detected result is reported below the limit of quantitation.
Jacobs	Jacobs Engineering Group Inc.
L	liter
LPAH	low molecular weight polycyclic aromatic hydrocarbon
mg/L	milligrams per liter
mL	milliliter
MOC	Main Operations Complex
MS/MSD	matrix spike/duplicate
mV	millivolts
ND	nondetect
NEC	Northeast Cape
NR	not reported
NTU	nephelometric turbidity units
ORP	oxidation reduction potential
PAH	polycyclic aromatic hydrocarbons
QA	quality assurance
QC	quality control
QN	result is estimated because the laboratory control sample/ laboratory control sample duplicate relative percent difference is greater than 20 percent.

ACRONYMS AND ABBREVIATIONS (Continued)

Qty	quantity
RCRA	Resource Conservation and Recovery Act
RRO	residual-range organics
SD	sediment
SDG	sample delivery group
Site 9	Northeast Cape Housing and Operations Landfill
SW	surface water
TAT	turnaround time
TB	trip blank
USACE	U.S. Army Corps of Engineers

EXECUTIVE SUMMARY

This report describes sample collection activities conducted at the Northeast Cape Housing and Operations Landfill Site (Site 9) on St. Lawrence Island, Alaska, in support of the second Periodic Review. Although both a Five-Year Review site inspection and sample collection were performed in 2018, the Five-Year Review site inspection will be described in a separate report (U. S. Army Corps of Engineers [USACE] 2019).

Sampling activities occurred on 2 and 3 August 2018 at approved locations, as identified in the *2018 Remedial Action Review Work Plan, Northeast Cape St. Lawrence Island, Alaska* (USACE 2018). Surface water was collected from three locations and submitted to an offsite analytical laboratory for analysis. The sampling occurred at the same locations as the 2013 sample collection effort for consistency. All 2018 surface water results were compared to the project cleanup levels and no exceedances were identified.

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1.0 INTRODUCTION

The Northeast Cape (NEC) site is located on St. Lawrence Island, Alaska approximately 135 air miles southwest of Nome (Figure G-1). The Village of Savoonga is the closest community and is located 60 miles northwest of the site (Figure G-1). The NEC site was constructed as an Aircraft Control and Warning Station during 1950 and 1951 and provided radar coverage and surveillance as part of the Alaska Early Warning System until 1972. The site encompasses approximately 4,800 acres (7.5 square miles) and is bounded by Kitnagak Bay to the northeast, Kangighsak Point to the northwest, and the Kinipaghulghat Mountains to the south. The NEC site, classified as a Formerly Used Defense Site (FUDS), is comprised of 34 individual sites. These individual sites have previously been subject to several phased remedial investigations and/or removal actions.

The Housing and Operations Landfill site (Site 9) was subject to remedial actions prior to 2018, including debris and drum removal, placement of a minimum 2-foot thick gravel landfill cap in 2010, construction of a diversion trench, and revegetation (Figure G-2) (USACE 2007, 2011).

Sampling of groundwater from 1994 through 2001 identified lead as the most frequently found constituent above screening levels (five locations). Diesel-range organics (DRO) was found at three locations, while residual-range organics (RRO), antimony, beryllium, and nickel were found at one location above the screening levels (USACE 2001). Figure G-3 shows historical sampling locations from 2001 that exceed screening levels. Historical analysis of surface water samples did not detect contaminants greater than cleanup levels (USACE 2009, 2014) (Figure G-3). 2018 sampling activities coincided with second Periodic and Five-Year Review site inspections for other sites; those inspections are described in the main text of this Periodic Review report and a separate Five-Year Review report (USACE 2019).

1.1 OBJECTIVES

The purpose of the 2018 sampling effort was to determine if site-specific contaminants of concern were present in surface water at the Housing and Operations Landfill (Site 9) and to determine if 2018 results were consistent with 2013 results.

1.2 SCOPE OF WORK

The definable features of work included the following:

- Collection of one surface water sample from each of three historic sampling locations within the Housing and Operations Landfill (Site 9)
- Collection of one field duplicate and a matrix spike (MS) and MS duplicate (MSD) as part of the Housing and Operations Landfill (Site 9) surface water sampling process

1.3 WORK PLAN DEVIATIONS

Work described in this report was conducted in accordance with the *Supplement to the 2018 Remedial Action Review Work Plan, Northeast Cape St. Lawrence Island, Alaska* (USACE 2018). No deviations from the work plan occurred associated with the Site 9 surface water collection effort.

2.0 FIELD INVESTIGATION ACTIVITIES

Surface water samples were collected from the NEC Housing and Operations Landfill site (Site 9) on St. Lawrence Island, Alaska, between 2 August 2018 and 3 August 2018. Environmental Compliance Consultants, Inc. (ECC)/Jacobs Engineering Group Inc. (Jacobs) personnel travelled from Anchorage to Nome via commercial airline, and from Nome to the NEC site via charter aircraft. While on site, personnel were housed within a temporary camp maintained by ECC/Jacobs. Throughout the duration of the sampling activities, ECC/Jacobs was on site completing work described in the *2018 Remedial Action Review Work Plan, Northeast Cape St. Lawrence Island, Alaska* (USACE 2018).

2.1 SAMPLING AND ANALYTICAL APPROACH

Surface water samples were collected from Site 9 at predetermined locations. 2013 sampling locations were identified using existing landmarks and verified with the onsite USACE Quality Assurance Representative prior to 2018 sampling. Additionally, the sampling team consisted of staff present during the 2013 sampling effort.

Samples were collected near the shoreline at the water surface. The sample containers were each directly filled by lowering them into the surface water until the opening of the container was slightly below the water surface in accordance with the procedures detailed in the *2018 Remedial Action Review Work Plan, Northeast Cape St. Lawrence Island, Alaska* (USACE 2018). Sampling locations are shown on Figure G-3.

Surface water samples were submitted to Agriculture & Priority Pollutants Laboratories, Inc. (APPL) for the analysis of DRO by AK102, RRO by AK103, benzene, toluene, ethylbenzene, and xylenes (BTEX) by U.S. Environmental Protection Agency (EPA) Method SW8260C, polycyclic aromatic hydrocarbons (PAH) by EPA Method SW8270-SIM, and lead by EPA Method SW6020A.

A pin flag or lathe was placed at the sampling location to allow for later identification during surveying. Observations, sampling information, and field parameter readings were recorded in the field logbook provided in Attachment G-3. The logbook was shared between two field teams during this field effort and includes additional field activity notes unrelated to surface water sampling efforts at Site 9.

2.2 LAND SURVEYING

Surveying of sampling locations was conducted by Lounsbury Inc., a professional land surveying company. Horizontal data are presented in feet, using the Alaska State Plane Zone 9 projection and the North American Datum of 1983. A survey data table relevant to sampling locations, and compliant with the *Manual for Electronic Deliverables* (USACE 2017), is provided in Attachment G-4.

2.3 WASTE MANAGEMENT

No significant liquid waste or refuse waste was generated for Site 9 as sample bottles were filled directly and only three primary samples were collected.

3.0 INVESTIGATION RESULTS

This section summarizes the field and analytical results for the 2018 surface water sampling activities, which were conducted at Site 9 by ECC/Jacobs. For the 2018 Site 9 surface water sampling effort, the presence of sheen was assessed and analytical results were compared to the site-specific cleanup levels for contaminants of concern identified in the 2009 Decision Document (USACE 2009). The sample summary table, complete analytical results, and data quality checklist are included in Attachment G-2. Sampling locations are shown on Figure G-3.

3.1 SURFACE WATER SAMPLING RESULTS

Figure G-3 identifies the Site 9 surface water sampling locations. Sampling location S09-WS01 was located at the inlet of the diversion trench and S09-WS02 was located at the outlet end of the diversion trench immediately adjacent to the landfill cap. Sampling location S09-WS03 was located at a surface pond directly north of the Site 9 landfill cap.

No sheen or odors were observed at the time of fieldwork. Prior to sample collection, field parameters were recorded directly from the water source using a YSI water quality meter and a Micro turbidimeter. Surface water parameters measured prior to sampling are provided in Table G-3-1.

Table G-3-1
Surface Water Parameters Prior to Sampling

Site ID	Sampling Location	Temperature (°C)	Conductivity (µS/cm)	DO (mg/L)	pH	ORP (mV)	Turbidity (NTU)
Site 9	S09-WS01	10.70	68	10.95	5.95	218.5	4.6
Site 9	S09-WS02	11.01	65	11.04	6.21	216.8	4.13
Site 9	S09-WS03[1]	11.02	83	8.07	5.53	81.4	4.67

Notes:
[1]A field duplicate and MS and MSD collected at this location.
For definitions, refer to the Acronyms and Abbreviations section.

Three primary surface water samples, one field duplicate sample, and an MS and MSD were collected and sent to APPL for analysis. Surface water samples were collected for analysis of

DRO, RRO, BTEX, PAHs, and lead. No analytes were reported above limit of detections. The total aromatic hydrocarbons and total aqueous hydrocarbons were calculated using the analyte and sample specific limit of detection for all samples and were below the site specific cleanup levels presented in the 2009 Decision Document (USACE 2009). The complete analytical results table is provided in Attachment G-2.

3.2 DATA EVALUATION

Data quality was assessed through the review of the laboratory case narrative, laboratory data deliverables, and completion of Alaska Department of Environmental Conservation (ADEC) checklists. A review of the analytical results and associated quality control (QC) samples was performed by the Jacobs Project Chemist, as per the work plan (USAF 2018).

Data quality was evaluated against the following requirements: U.S. Department of Defense (DoD) Quality Systems Manual (DoD 2017); ADEC and EPA analytical methods (ADEC 2017; EPA 2015); and laboratory limits. Qualifiers were applied to sample results that did not meet the project data quality objectives. Qualified results are considered estimated and, whenever possible, indicated as biased high or low.

The data assessment found the overall quality of the project data to be acceptable and no results were rejected. Low-level lead detections were qualified "J,B" as results were reported above the limit of detection and possibly biased high due to lead detections in the associated method blank. Naphthalene results were qualified "QN" because the LCS/LCSD relative percent difference was greater than 20 percent. Data usability was not significantly affected by the qualifiers as all results were well below the applicable screening levels. The complete dataset in addition to the ADEC checklists are provided in Attachment G-2.

4.0 CONCLUSIONS

Historical analysis of surface water samples did not detect contaminants greater than cleanup levels (USACE 2009). Surface water results from the 2018 Site 9 sampling locations did not contain contaminants greater than cleanup levels and are consistent with the 2013 surface water results.

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5.0 REFERENCES

ADEC (Alaska Department of Environmental Conservation). 2017 (July). Contaminated Sites Program Laboratory Data Review Checklist.

DoD (U.S. Department of Defense). 2017 (January). *Department of Defense (DoD)/Department of Energy (DOE) Consolidated Quality Systems Manual (QSM) for Environmental Laboratories*. Version 5.1

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ATTACHMENT G-1
Figures

P:\StLawrenceIsland_F10AK0969_2019_Site9_Sup\01_MXD\FigF-1_Location_Vicinity.mxd beatycj

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

N

0 10 20 30 40 50

Miles

WGS 1984 UTM Zone 2N

NORTHEAST CAPE LOCATION AND VICINITY

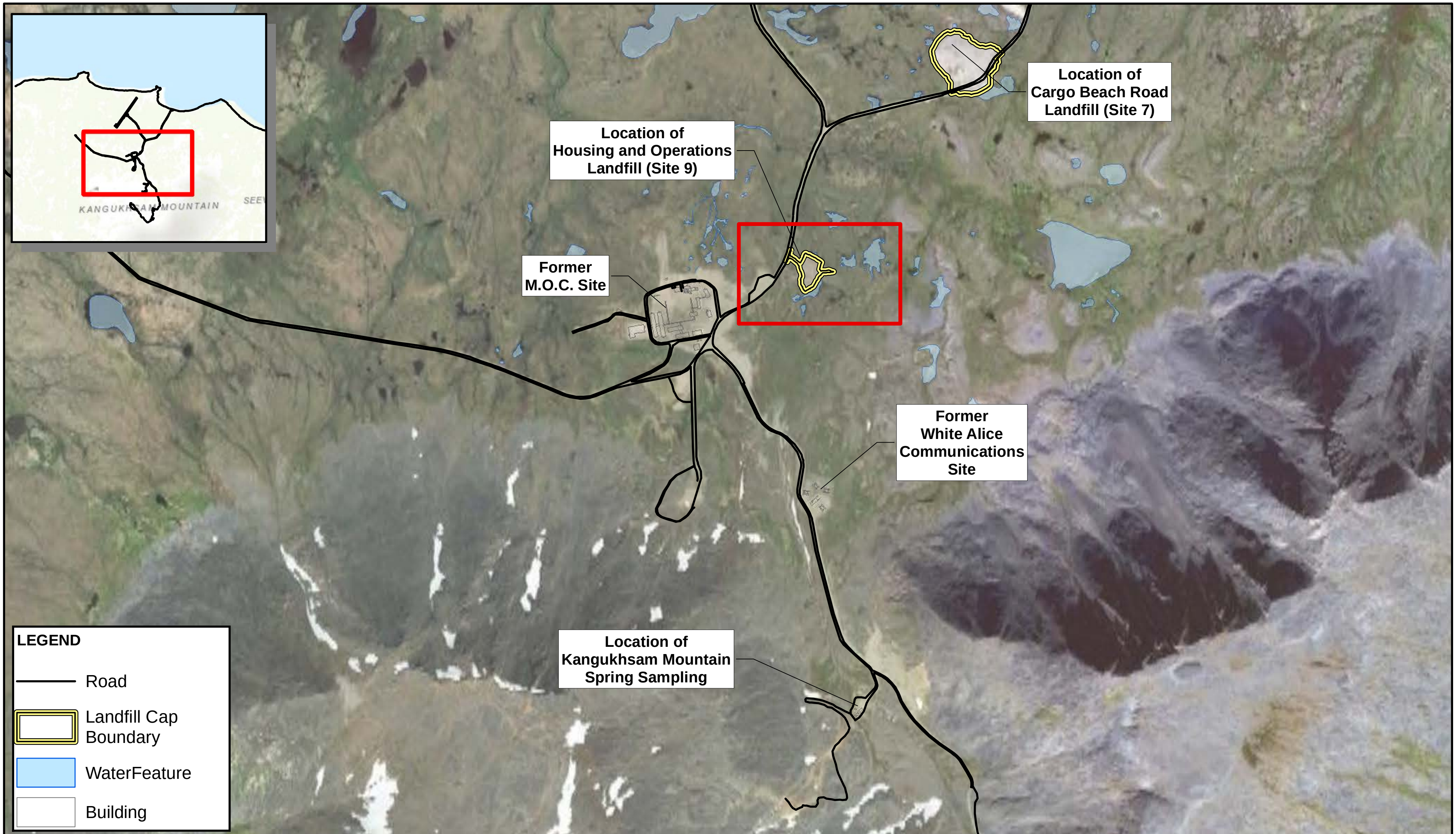
U.S. Army Corps of Engineers Alaska District

FUDS PROPERTY - F10AK0969

SAINT LAWRENCE ISLAND, ALASKA

FIGURE G-1

P:\StLawrenceIsland_F10AK0969_2019_Site9_Sup\01_MXD\FigF-2_Site9_VicinityMap.mxd beatycj



Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

N

0 500 1,000 1,500
Feet

WGS 1984 UTM Zone 2N

SITE 9 - VICINITY MAP

U.S. Army Corps of Engineers Alaska District

FUDS PROPERTY - F10AK0969

SAINT LAWRENCE ISLAND, ALASKA

FIGURE G-2

\\dc1vs01\gisproj\U\USACE\AK_NortheastCape_FUDS_2019_Site9_Sup\01_MXD\FigG-3_Site9_HousingAndOpsLandfill.mxd HuffHA

Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe,

Notes:
The differences in sampling locations from the 2013 and 2018 events were due to the variability in site conditions between years. The surface water was sampled at a representative location that could be collected with the sampling equipment without disturbing the underlying sediment and contained enough volume for a surface water sample.

N

0 20 40 60 80 100
Feet

WGS 1984 UTM Zone 2N

SITE 9 - HOUSING AND OPERATIONS LANDFILL

U.S. Army
Corps of Engineers
Alaska District

FUDS PROPERTY - F10AK0969

SAINT LAWRENCE ISLAND, ALASKA

FIGURE G-3

ATTACHMENT G-2
Chemistry

Sample Results

2018 Site 9 Surface Water Sampling Report at Northeast Cape
Table G-2.1 Sample Summary

CoC Sample ID	Location ID	Collection Date	Collection Time	Sampler	Qty	Container Type	Container Vol	Preservative	Matrix	Analytical Method Requested	QC Type	TAT	Notes	Site	CoC Number	Cooler Name	Cooler Date	Laboratory	SDG Number	Sample Depth
18NEC-S09-WS-03	S09-03	2-Aug-18	1748	KM/AA	1	Polyethylene Bottle	250 mL	HNO3, 0-6°C	SW	SW6020A (Pb Only)		Hold	Hold	S09	18NEC-07	Thigh Master	4-Aug-18	APPL	86483	surface
18NEC-S09-WS-01	S09-01	2-Aug-18	1643	KM/AA	2	Amber Glass Bottle	1 L	HCl, 0°C to 6°C	SW	AK102/103		14 Days		S09	18NEC-04	Vibrating Rollers	3-Aug-18	APPL	86487	surface
18NEC-S09-WS-01	S09-01	2-Aug-18	1643	KM/AA	2	Amber Glass Bottle	1 L	0°C to 6°C	SW	SW8270D SIM		14 Days		S09	18NEC-04	Vibrating Rollers	3-Aug-18	APPL	86487	surface
18NEC-S09-WS-01	S09-01	2-Aug-18	1643	KM/AA	3	VOAs	40 mL	HCl, 0°C to 6°C	SW	SW8260C (BTEX Only)		14 Days		S09	18NEC-05	Jump Soles	3-Aug-18	APPL	86487	surface
18NEC-S09-WS-01	S09-01	2-Aug-18	1643	KM/AA	1	Polyethylene Bottle	250 mL	HNO3, 0-6°C	SW	SW6020A (Pb Only)		14 Days		S09	18NEC-05	Jump Soles	3-Aug-18	APPL	86487	surface
18NEC-S09-WS-02	S09-02	2-Aug-18	1713	KM/AA	2	Amber Glass Bottle	1 L	HCl, 0°C to 6°C	SW	AK102/103		14 Days		S09	18NEC-04	Vibrating Rollers	3-Aug-18	APPL	86487	surface
18NEC-S09-WS-02	S09-02	2-Aug-18	1713	KM/AA	2	Amber Glass Bottle	1 L	0°C to 6°C	SW	SW8270D SIM		14 Days		S09	18NEC-04	Vibrating Rollers	3-Aug-18	APPL	86487	surface
18NEC-S09-WS-02	S09-02	2-Aug-18	1713	KM/AA	3	VOAs	40 mL	HCl, 0°C to 6°C	SW	SW8260C (BTEX Only)		14 Days		S09	18NEC-05	Jump Soles	3-Aug-18	APPL	86487	surface
18NEC-S09-WS-02	S09-02	2-Aug-18	1713	KM/AA	1	Polyethylene Bottle	250 mL	HNO3, 0-6°C	SW	SW6020A (Pb Only)		14 Days		S09	18NEC-05	Jump Soles	3-Aug-18	APPL	86487	surface
18NEC-S09-WS-03	S09-03	2-Aug-18	1748	KM/AA	2	Amber Glass Bottle	1 L	HCl, 0°C to 6°C	SW	AK102/103		Hold	Hold	S09	18NEC-05	Jump Soles	3-Aug-18	APPL	86483	surface
18NEC-S09-WS-03	S09-03	2-Aug-18	1748	KM/AA	2	Amber Glass Bottle	1 L	0°C to 6°C	SW	SW8270D SIM		Hold	Hold	S09	18NEC-06	Nordic Track	3-Aug-18	APPL	86483	surface
18NEC-S09-WS-03	S09-03	2-Aug-18	1748	KM/AA	3	VOAs	40 mL	HCl, 0°C to 6°C	SW	SW8260C (BTEX Only)		Hold	Hold	S09	18NEC-05	Jump Soles	3-Aug-18	APPL	86483	surface
18NEC-TB03	18NEC-TB03	2-Aug-18	0800	KM/JB/AA	3	VOAs	40 mL	HCl, 0°C to 6°C	TB	SW8260C	TB	14 Days		NEC	18NEC-15	Perfect Pushup	4-Aug-18	APPL	86483	not applicable
18NEC-TB04	18NEC-TB04	2-Aug-18	0800	KM/JB/AA	3	VOAs	40 mL	HCl, 0°C to 6°C	TB	RSK 175	TB	14 Days		NEC	18NEC-15	Perfect Pushup	4-Aug-18	APPL	86483	not applicable
18NEC-S09-WS-03	S09-03	3-Aug-18	0843	KM/AA	2	Amber Glass Bottle	1 L	HCl, 0°C to 6°C	SW	AK102/103	MS/MSD	14 Days		S09	18NEC-07	Thigh Master	4-Aug-18	APPL	86483	surface
18NEC-S09-WS-03	S09-03	3-Aug-18	0843	KM/AA	2	Amber Glass Bottle	1 L	0°C to 6°C	SW	SW8270D SIM	MS/MSD	14 Days		S09	18NEC-07	Thigh Master	4-Aug-18	APPL	86483	surface
18NEC-S09-WS-03	S09-03	3-Aug-18	0843	KM/AA	9	VOAs	40 mL	HCl, 0°C to 6°C	SW	SW8260C (BTEX Only)	MS/MSD	14 Days	Incl. Prim	S09	18NEC-15	Perfect Pushup	4-Aug-18	APPL	86483	surface
18NEC-S09-WS-03	S09-03	3-Aug-18	0843	KM/AA	3	Polyethylene Bottle	250 mL	HNO3, 0-6°C	SW	SW6020A (Pb Only)	MS/MSD	14 Days	Incl. Prim	S09	18NEC-07	Thigh Master	4-Aug-18	APPL	86483	surface
18NEC-S09-WS-03-8	S09-03	3-Aug-18	0843	KM/AA	2	Amber Glass Bottle	1 L	HCl, 0°C to 6°C	SW	AK102/103	Dup	14 Days		S09	18NEC-07	Thigh Master	4-Aug-18	APPL	86487	surface
18NEC-S09-WS-03-8	S09-03	3-Aug-18	0843	KM/AA	3	VOAs	40 mL	HCl, 0°C to 6°C	SW	SW8260C (BTEX Only)	Dup	14 Days		S09	18NEC-15	Perfect Pushup	4-Aug-18	APPL	86487	surface
18NEC-S09-WS-03-8	S09-03	3-Aug-18	0843	KM/AA	1	Polyethylene Bottle	250 mL	HNO3, 0-6°C	SW	SW6020A (Pb Only)	Dup	14 Days		S09	18NEC-07	Thigh Master	4-Aug-18	APPL	86487	surface
18NEC-TB01	18NEC-TB01	3-Aug-18	0800	KM/JB/AA	3	VOAs	40 mL	HCl, 0°C to 6°C	TB	SW8260C	TB	14 Days		NEC	18NEC-15	Perfect Pushup	4-Aug-18	APPL	86487	not applicable
18NEC-TB02	18NEC-TB02	3-Aug-18	0800	KM/JB/AA	3	VOAs	40 mL	HCl, 0°C to 6°C	TB	RSK 175	TB	14 Days		NEC	18NEC-15	Perfect Pushup	4-Aug-18	APPL	86487	not applicable
18NEC-S09-WS-03	S09-03	3-Aug-18	0843	KM/AA	2	Amber Glass Bottle	1 L	HCl, 0°C to 6°C	SW	AK102/103		14 Days		S09	18NEC-06	Nordic Track	3-Aug-18	APPL	86487	surface
18NEC-S09-WS-03	S09-03	3-Aug-18	0843	KM/AA	2	Amber Glass Bottle	1 L	0°C to 6°C	SW	SW8270D SIM		14 Days		S09	18NEC-06	Nordic Track	3-Aug-18	APPL	86487	surface
18NEC-S09-WS-03-8	S09-03	3-Aug-18	0843	KM/AA	2	Amber Glass Bottle	1 L	0°C to 6°C	SW	SW8270D SIM	Dup	14 Days		S09	18NEC-06	Nordic Track	3-Aug-18	APPL	86487	surface

Notes:
Project NPDL number 18-053
For definitions, refer to the Acronyms and Abbreviations section of the DQA.

2018 Site 9 Surface Water Sampling Report at Northeast Cape
Table G-2.2 Surface Water Results

				Location ID:	S09-01	S09-02	S09-03	S09-03
				Sample ID:	18NEC-S09-WS-01	18NEC-S09-WS-02	18NEC-S09-WS-03	18NEC-S09-WS-03-8
				Sample Date:	8/2/2018	8/2/2018	8/3/2018	8/3/2018
				Sample Type:	SW	SW	SW	SW
				SDG:	86487	86487	86483	86483/86487
				Laboratory:	APPL	APPL	APPL	APPL
				QAQC:	Primary	Primary	Primary	Duplicate
Method	**Group**	**Analyte**	**Units**	**Screening Level[1]**				
Fuels								
AK102_103	Fuels	DRO	mg/L	1.5	ND [0.05]	ND [0.05]	ND [0.05]	ND [0.05]
AK102_103	Fuels	RRO	mg/L	1.1	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]
VOCs								
8260	VOCs	Benzene	mg/L	0.005	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]
8260	VOCs	Ethylbenzene	mg/L	0.7	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]
8260	VOCs	Toluene	mg/L	–	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]
8260	VOCs	Xylene, m & p	mg/L	–	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]
8260	VOCs	Xylene, o	mg/L	–	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]
8260	VOCs	Xylenes	mg/L	–	ND [0.0003]	ND [0.0003]	ND [0.0003]	ND [0.0003]
PAHs								
8270SIM	PAHs	Acenaphthene	mg/L	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
8270SIM	PAHs	Acenaphthylene	mg/L	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
8270SIM	PAHs	Anthracene	mg/L	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
8270SIM	PAHs	Benzo(a)anthracene	mg/L	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
8270SIM	PAHs	Benzo(a)pyrene	mg/L	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
8270SIM	PAHs	Benzo(b)fluoranthene	mg/L	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
8270SIM	PAHs	Benzo(g,h,i)perylene	mg/L	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
8270SIM	PAHs	Benzo(k)fluoranthene	mg/L	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
8270SIM	PAHs	Chrysene	mg/L	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
8270SIM	PAHs	Dibenzo(a,h)anthracene	mg/L	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
8270SIM	PAHs	Fluoranthene	mg/L	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
8270SIM	PAHs	Fluorene	mg/L	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
8270SIM	PAHs	Indeno(1,2,3-cd)pyrene	mg/L	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
8270SIM	PAHs	1-Methylnaphthalene	mg/L	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
8270SIM	PAHs	2-Methylnaphthalene	mg/L	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
8270SIM	PAHs	Naphthalene	mg/L	–	ND [0.0001] QN	ND [0.0001] QN	ND [0.0001] QN	ND [0.0001] QN
8270SIM	PAHs	Phenanthrene	mg/L	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
8270SIM	PAHs	Pyrene	mg/L	–	ND [0.0001]	ND [0.0001]	ND [0.0001]	ND [0.0001]
NR	VOCs	Total aromatic hydrocarbons	mg/L	0.01	0.0014 [0.0014]	0.0014 [0.0014]	0.0014 [0.0014]	0.0014 [0.0014]
NR	VOCs	Total aqueous hydrocarbons	mg/L	0.015	0.0032 [0.0032]	0.0032 [0.0032]	0.0032 [0.0032]	0.0032 [0.0032]
NR	PAHs	Total HPAHs	mg/L	–	ND []	ND []	ND []	ND []
NR	PAHs	Total LPAHs	mg/L	–	ND []	ND []	ND []	ND []
Metals								
6020	Metals	Lead	mg/L	0.015	0.00033 [0.0004] J,B	0.00044 [0.0004] J,B	0.00068 [0.0004] J,B	0.00081 [0.0004] J,B

Notes:

[1] Decision Document cleanup level (USACE 2009).

[ ] denotes the limit of detection or no number if no limit of detection was reported

Bold = Result is greater than or equal to the screening level[1]

— = method or screening level not available or analysis not conducted

For definitions and data qualifiers, refer to the Acronyms and Abbreviations list in the Site 9 report.

ADEC Checklists

Laboratory Data Review Checklist

Completed by:

Nathaniel Gingery

Title:

Project Chemist

Date:

10/01/2018

CS Report Name:

Northeast Cape Periodic Review

Report Date:

12/20/2018

Consultant Firm:

Jacobs

Laboratory Name:

APPL Inc.

Laboratory Report Number:

86483

ADEC File Number:

ST LAW MOC 475.38.013

Hazard Identification Number:

221

1. Laboratory

a. Did an ADEC CS approved laboratory receive and perform all of the submitted sample analyses?

◉ Yes ○ No Comments:

All analyses were performed by APPL Inc. of Clovis, CA.

b. If the samples were transferred to another "network" laboratory or sub-contracted to an alternate laboratory, was the laboratory performing the analyses ADEC CD approved?

○ Yes ◉ No Comments:

Not applicable.

2. Chain of Custody (CoC)

a. CoC information completed, signed, and dated (including released/received by)?

◉ Yes ○ No Comments:

b. Correct analyses requested?

◉ Yes ○ No Comments:

3. Laboratory Sample Receipt Documentation

a. Sample/cooler temperature documented and within range at receipt (0° ± 6° C)?

◉ Yes ○ No Comments:

Cooler name, temperature blank temp °C/cooler temp °C:
1. Perfect Pushup 3.5/3.5
2. Thigh Master 3.9/4.0
3. Yoga Pants 3.5/3.3
4. Bowflex 4.7/4.5
5. Balance Board 4.6/5.0
6. Teeter Hang Up 4.2/4.0
7. Peleton 4.1/4.0
8. EZ Shaper 4.3/4.5
9. Medicine Ball 0.2/2.0

b. Sample preservation acceptable - acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?

◉ Yes ○ No Comments:

c. Sample condition documented - broken, leaking (Methanol), zero headspace (VOC vials)?

◉ Yes ○ No Comments:

Several samples were indicated to contain bubbles, however all were within acceptable limits.

d. If there were any discrepancies, were they documented? For example, incorrect sample containers/preservation, sample temperature outside of acceptable range, insufficient or missing samples, etc.?

○ Yes ○ No Comments:

N/A

e. Data quality or usability affected? Explain.

Comments:

Data quality and usability were not affected.

4. Case Narrative

a. Present and understandable?

◉ Yes ○ No Comments:

b. Discrepancies, errors or QC failures identified by the lab?

◉ Yes ○ No Comments:

Selenium recovered high (111%) in a CCV for SW6020. It only bracketed a passing LCS/LCSD, so no corrective action was required. During the extraction process for diesel-range organics (DRO), two sample bottles, 18NEC-20MW01-WG and an MS sample from 18NEC-14MW01-WG, were switched prior to spike and surrogate addition.

c. Were all corrective actions documented?

◉ Yes ○ No Comments:

Corrective action was completed; Both 18NEC-20MW01-WG and 18NEC-14MW01-WG were re-extracted outside of hold time for comparison to confirm the suspected bottle switch. The re-extraction occurred on 27 September (42 days past the 14-day hold time). The re-extracted DRO results for 18NEC-20MW01-WG and 18NEC-14MW01-WG are 0.15 mg/L and 1.6 mg/L, respectively, and confirm the bottle switch.

d. What is the effect on data quality/usability according to the case narrative?

Comments:

The original DRO result for 18NEC-20MW01-WG was rejected due to a sample switch during extraction. The re-extracted result is being reported and qualified as outside of hold time.

Other discrepancies will be discussed in their related sections below.

5. Samples Results

a. Correct analyses performed/reported as requested on COC?

○ Yes ◉ No Comments:

The laboratory incorrectly spiked 18NEC-20MW01-WG instead of the MS/MSD replicate container of 18NEC-14MW01-WG. This resulted in a MS recovery and RPD outside of control limits. The switch was detected after the hold time had passed, but 18NEC-20MW01-WG was extracted before twice the hold time had elapsed and the result is considered usabl

b. All applicable holding times met?

○ Yes ◉ No Comments:

The lab initially analyzed 18NEC-14MW07-WG and 18NEC-20MW01-WG for alkalinity within hold time, but did not reanalyze the samples by a titration method as is required for samples with less than 20ppb alkalinity within hold time.

The DRO sample result for 18NEC-20MW01-WG was re-extracted outside of hold time to confirm analytical results. The original analysis was rejected and the re-extracted result was reported and as outside of hold time with a low bias.

c. All soils reported on a dry weight basis?

○ Yes ○ No Comments:

No soil samples were part of this SDG.

d. Are the reported PQLs less than the Cleanup Level or the minimum required detection level for the project?

◉ Yes ○ No Comments:

All reporting limits were less than the Project Cleanup Levels.

e. Data quality or usability affected? Explain.

Comments:

The data quality and usability were not affected.
The DRO result for sample 18NEC-20MW01-WG is qualified with a low bias due to hold time but is 10 times less than the PAL and is minimally affected.

6. QC Samples

a. Method Blank

i. One method blank reported per matrix, analysis and 20 samples

◉ Yes ○ No Comments:

ii. All method blank results less than PQL?

◉ Yes ○ No Comments:

Chromium and Nickel were detected above the detection level but below the PQL in the method blanks for analytical batches 232278 and 232280.

iii. If above PQL, what samples are affected?

Comments:

The affected samples were:
18NEC-14MW01-WG-8
18NEC-14MW01-WG
18NEC-14MW07-WG
18NEC-20MW01-WG
18NEC-MW10-1-WG-8
18NEC-MW10-1-WG

iv. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

◉ Yes ○ No Comments:

Sample results within five times the method blank result were flagged B to indicate potentially elevated results due to method blank contamination.

v. Data quality or usability affected? Explain.

Comments:

The data quality and usability were minimally affected as all B qualified results were below the PQL and screening levels.

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics - One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)

○ Yes ◉ No Comments:

An LCS/LCSD was analyzed for all methods. DoD QSM required MS/MSDs were assigned to samples 18NEC-14MW01-WG and 18NEC-S09-WS-03.

An MS/MSD was not analyzed with VOC batch 232632.
All other analytical methods had the required batch MS/MSD analyzed.

ii. Metals/Inorganics - one LCS and one sample duplicate reported per matrix, analysis and 20 samples?

◉ Yes ○ No Comments:

MS/MSDs were assigned to samples 18NEC-14MW01-WG and 18NEC-S09-WS-03.

iii. Accuracy - All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods: AK101 60%-120%, AK102 75%-125%, AK103 60%-120%; all other analyses see the laboratory QC pages)

○ Yes ◉ No Comments:

All LCS/LCSD accuracy requirements were met.

The lab notified Jacobs staff of MS/MSD failures in the 8270SIM analysis (1 & 2 methylnaphthalene and naphthalene) and re-extracted/reanalyzed the affected samples within hold time. The second analysis is used for reporting.

AK103 - The 18NEC-14MW01-WG MS (52.9%) and MSD (57.5%) recovered outside of QC limits for RRO (60-120%).

SW8260 - The 18NEC-14MW01-WG MSD (79.3%) recovered outside of QC limits for Toluene (80-121%).

SW8270SIM - The 18NEC-14MW01-WG MSD (57.4%) recovered outside of QC limits for Benzo(a)anthracene (59-120%). 1-methylnaphthalene, 2-methylnaphthalene, and naphthalene had recoveries less than control limits; however, the spike amount was less the parent sample and no data was qualified.

iv. Precision - All relative percent differences (RPD) reported and less than method or laboratory limits? And project specified DQOs, if applicable. RPD reported from LCS/LCSD, MS/MSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)

○ Yes ◉ No Comments:

SW8270SIM - The LCS/LCSD RPD for Naphthalene (20.3%) exceeded the QC limit (20%)

The lab notified Jacobs staff of MS/MSD failures in the 8270SIM analysis and re-extracted/reanalyzed the affected samples within hold time. The second analysis is used for reporting. Both sets of results are included in the report from the lab.

The laboratory incorrectly spiked 18NEC-20MW01-WG instead of the MS/MSD replicate container of 18NEC-14MW01-WG. Therefore the AK102 batch 232437 does not have a valid MS/MSD pair and the precision cannot be calculated. The LCS/LCSD RPD passed however.

SW8260 - The 18NEC-14MW01-WG MS/MSD RPD for Benzene (32%), Ethylbenzene (21%), Toluene (27%), m&p-Xylenes (26%), o-Xylene (24%), and total Xylenes (25%) exceeded the allowable 20% QC limit.

v. If %R or RPD is outside of acceptable limits, what samples are affected?

Comments:

The following samples were affected by LCS/LCSD and/or MS/MSD failures:

18NEC-14MW01-WG
18NEC-14MW01-WG-8
18NEC-14MW03-WG
18NEC-14MW07-WG
18NEC-20MW01-WG
18NEC-22MW2-WG
18NEC-22MW2-WG-8
18NEC-26MW01-WG
18NEC-MW10-1-WG
18NEC-MW10-1-WG-8

18NEC-MW17-1-WG 18NEC-MW88-1-WG 18NEC-MW88-10-WG 18NEC-S09-WS-01 18NEC-S09-WS-02 18NEC-S09-WS-03 18NEC-S09-WS-03-8

vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

◉ Yes ◯ No Comments:

18NEC-14MW01-WG -the analytes listed in sections 6biii and 6biv were qualified QL for low MS and MSD recoveries to indicate a potential low bias or QN for the LCS/LCSD and MS/MSD RPD failures to indicate an unknown bias. All other samples listed in section 6bv were qualified QN for Naphthalene due to the LCS/LCSD RPD failure.

vii. Data quality or usability affected? (Use comment box to explain)

Comments:

Data quality and usability were minimally affected. Samples qualified QN are considered estimated with an unknown bias. Results with a QL qualifier are considered estimated with a low bias. The QL qualified results and detection limits (for nondetect results) were significantly less than the PALs. The affect on data is minimal for not having an MS/D analyzed with batch 232632. For laboratory batch 232626 two project samples were utilized for batch MS/MSD. The LCS was in control for batch 232632.

c. Surrogates - Organics Only

i. Are surrogate recoveries reported for organic analyses - field, QC and laboratory samples?

◉ Yes ◯ No Comments:

All organic analyses were reported with surrogates.

ii. Accuracy - All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods 50-150 %R; all other analyses see the laboratory report pages)

◉ Yes ◯ No Comments:

All surrogate recoveries were within laboratory and DoD QSM limits.

iii. Do the sample results with failed surrogate recoveries have data flags? If so, are the data flags clearly defined?

◯ Yes ◯ No Comments:

N/A

iv. Data quality or usability affected? (Use the comment box to explain.)

◯ Yes ◉ No Comments:

Data quality and usability were not affected.

d. Trip blank - Volatile analyses only (GRO, BTEX, Volatile Chlorinated Solvents, etc.): Water and Soil

i. One trip blank reported per matrix, analysis and cooler?

◉ Yes ○ No Comments:

Two trip blanks were included with this SDG, 18NEC-TB03 for SW8260 VOCs and 18NEC-TB04 for RSK175 methane.

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)

◉ Yes ○ No Comments:

Both trip blanks were included in cooler "Perfect Pushup" with all VOC and methane containers.

iii. All results less than PQL?

○ Yes ◉ No Comments:

18NEC-TB03 had a detection of Acetone above the LOD but below the LOQ.

iv. If above PQL, what samples are affected?

Comments:

18NEC-MW10-1-WG and 18NEC-MW10-1-WG-8 had Acetone recoveries of less than ten times the trip blank contamination and were qualified B to indicate a potential high bias.

v. Data quality or usability affected? Explain.

Comments:

Data quality and usability were minimally affected. The B qualified data was above the associated LODs but below the LOQs and screening levels.

e. Field Duplicate

i. One field duplicate submitted per matrix, analysis and 10 project samples?

◉ Yes ○ No Comments:

Three duplicates were submitted with five primary samples.

ii. Submitted blind to lab?

◉ Yes ○ No Comments:

Sample / Duplicate: 18NEC-14MW01-WG / 18NEC-14MW01-WG-8, 18NEC-10-1-WG / 18NEC-10-1-WG-8, 18NEC-S09-WS-03 / 18NEC-S09-WS-03-8 Several of the analyses for 18NEC-S09-WS-03 and 18NEC-S09-WS-03-8 were analyzed with SDG 86487.

iii. Precision - All relative percent differences (RPD) less than specified DQOs? (Recommended: 30% water, 50% soil)

$$RPD\ (\%) = \text{Absolute value of: } \frac{(R_1-R_2)}{(R_1+R_2)} \times 100$$

Where: R_1 = Sample Concentration
R_2 = Field Duplicate Concentration (R_1-R_2)

○ Yes ◉ No

Comments:

All precision requirements were met for 8NEC-S09-WS-03 / 18NEC-S09-WS-03-8.

The following analytes had RPDs greater than 30% in the sample/duplicate:
18NEC-MW10-1-WG / 18NEC-MW10-1-WG-8
Lead-dissolved (35.3%)

18NEC-14MW01-WG / 18NEC-14MW01-WG-8
Lead-dissolved (77.8%)
Nickel-dissolved (81.7%)
Silver-dissolved (41%)
Lead-total (35.6%)
Silver-total (32.1%)

iv. Data quality or usability affected? (Use the comment box to explain why or why not.)

◉ Yes ○ No

Comments:

Data quality and usability are minimally affected. The analytes listed above are flagged QG in both the parent and duplicate samples to indicate an unknown bias. The higher result will be used for reporting.

f. Decontamination or Equipment Blank (If not applicable, a comment stating why must be entered below.)

◉ Yes ○ No

Comments:

One equipment blank was submitted with SDG 86502 for the 2018 North East Cape groundwater sampling effort.

i. All results less than PQL?

◉ Yes ○ No

Comments:

See the checklist for SDG 86502 for more information.

ii. If above PQL, what samples are affected?

Comments:

Several samples from all four water SDGs were affected. Please see Table C-2-1 in Attachment C-2 for the list of affected samples.

iii. Data quality or usability affected? Explain.

Comments:

Data quality and usability were minimally affected. All affected results were qualified B to indicate a possible high bias.

7. Other Data Flags/Qualifiers (ACOE, AFCEE, Lab Specific, etc.)

a. Defined and appropriate?

(●) Yes ( ) No Comments:

Qualifiers applied to this data are defined in the Data Quality Assessment appendix of this report.

Laboratory Data Review Checklist

Completed by:

Nathaniel Gingery

Title:

Project Chemist

Date:

10/16/2018

CS Report Name:

Northeast Cape Periodic Review

Report Date:

12/20/2018

Consultant Firm:

Jacobs

Laboratory Name:

APPL Inc.

Laboratory Report Number:

86487

ADEC File Number:

ST LAW MOC 475.38.013

Hazard Identification Number:

221

1. Laboratory

a. Did an ADEC CS approved laboratory receive and perform all of the submitted sample analyses?

◉ Yes ○ No Comments:

All analyses were performed by APPL Inc. of Clovis, CA.

b. If the samples were transferred to another "network" laboratory or sub-contracted to an alternate laboratory, was the laboratory performing the analyses ADEC CD approved?

○ Yes ◉ No Comments:

Not applicable.

2. Chain of Custody (CoC)

a. CoC information completed, signed, and dated (including released/received by)?

◉ Yes ○ No Comments:

b. Correct analyses requested?

◉ Yes ○ No Comments:

3. Laboratory Sample Receipt Documentation

a. Sample/cooler temperature documented and within range at receipt (0° ± 6° C)?

◉ Yes ○ No Comments:

Cooler name, temperature blank temp °C
1. Vibro-Belt 6.0 °C
2. Shake Weight 4.3 °C
3. Ab Blaster 3.2 °C
4. Vibrating Rollers 2.8 °C
5. Jump Soles 4.8 °C
6. Nordic Track 6.0 °C

Coolers Vobro-Belt and Nordic Track were reported at 8.0 originally. The lab determined this was a recording error and that the actual temperature was 6.0. See the case narrative in the deliverable for SDG 86487 for further clarification.

b. Sample preservation acceptable - acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?

◉ Yes ○ No Comments:

c. Sample condition documented - broken, leaking (Methanol), zero headspace (VOC vials)?

◉ Yes ○ No Comments:

No discrepancies were noted.

d. If there were any discrepancies, were they documented? For example, incorrect sample containers/preservation, sample temperature outside of acceptable range, insufficient or missing samples, etc.?

○ Yes ○ No Comments:

N/A

e. Data quality or usability affected? Explain.

Comments:

Data quality and usability were not affected.

4. Case Narrative

a. Present and understandable?

◉ Yes ○ No Comments:

b. Discrepancies, errors or QC failures identified by the lab?

◉ Yes ○ No Comments:

Selenium recovered high (111%) in a CCV for SW6020. It only bracketed a passing LCS/LCSD, so no corrective action was required.

c. Were all corrective actions documented?

◉ Yes ○ No Comments:

The lab noted all corrective actions taken.

d. What is the effect on data quality/usability according to the case narrative?

Comments:

Discrepancies will be discussed in their related sections below.

5. Samples Results

a. Correct analyses performed/reported as requested on COC?

◉ Yes ○ No Comments:

b. All applicable holding times met?

○ Yes ● No Comments:

The lab initially analyzed 18NEC-22MW2-WG and 18NEC-22M21-WG-8 for alkalinity within hold time, but did not reanalyze the samples by a titration method as is required for samples with less than 20ppb alkalinity within hold time.

c. All soils reported on a dry weight basis?

○ Yes ○ No Comments:

No soil samples were part of this SDG.

d. Are the reported PQLs less than the Cleanup Level or the minimum required detection level for the project?

● Yes ○ No Comments:

All reporting limits were less than the Project Cleanup Levels.

e. Data quality or usability affected? Explain.

Comments:

The data quality and usability were not affected.

6. <u>QC Samples</u>

a. Method Blank

i. One method blank reported per matrix, analysis and 20 samples

● Yes ○ No Comments:

ii. All method blank results less than PQL?

● Yes ○ No Comments:

Chromium and Nickel were detected above the detection level but below the PQL in the method blanks for analytical batch 232278. Chromium was detected above the detection level but below the PQL in the method blank for batch 232341.

iii. If above PQL, what samples are affected?

Comments:

The affected samples were:
18NEC-22MW2-WG
18NEC-22MW2-WG-8
18NEC-26MW01-WG

iv. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

◉ Yes ○ No Comments:

Sample results within five times the method blank result were flagged B to indicate potentially elevated results due to method blank contamination.

v. Data quality or usability affected? Explain.

Comments:

The data quality and usability were minimally affected as all B qualified results were below the PQL and screening levels.

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics - One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)

◉ Yes ○ No Comments:

An LCS/LCSD was analyzed for all methods. DoD QSM required MS/MSDs were assigned to samples 18NEC-14MW01-WG and 18NEC-S09-WS-03. See the checklist for SDG 86483 for more details.

ii. Metals/Inorganics - one LCS and one sample duplicate reported per matrix, analysis and 20 samples?

◉ Yes ○ No Comments:

MS/MSDs were assigned to samples 18NEC-14MW01-WG and 18NEC-S09-WS-03. See the checklist for SDG 86483 for more details.

iii. Accuracy - All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods: AK101 60%-120%, AK102 75%-125%, AK103 60%-120%; all other analyses see the laboratory QC pages)

○ Yes ◉ No Comments:

All LCS/LCSD accuracy requirements were met. The lab notified Jacobs staff of MS/MSD failures in the 8270SIM analysis and re-extracted/reanalyzed the affected samples within hold time. The second analysis is used for reporting. See the checklist for SDG 86483 for more details.

iv. Precision - All relative percent differences (RPD) reported and less than method or laboratory limits? And project specified DQOs, if applicable. RPD reported from LCS/LCSD, MS/MSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)

○ Yes ◉ No Comments:

SW8270SIM - The LCS/LCSD RPD for Naphthalene (20.3%) exceeded the QC limit (20%) The lab notified Jacobs staff of MS/MSD failures in the 8270SIM analysis and re-extracted/reanalyzed the affected

samples within hold time. The second analysis is used for reporting. Both sets of results are included in the report from the lab.

See the checklist for SDG 86483 for more details.

v. If %R or RPD is outside of acceptable limits, what samples are affected?

Comments:

The following samples were affected by LCS/LCSD and/or MS/MSD failures:

18NEC-22MW2-WG
18NEC-22MW2-WG-8
18NEC-26MW01-WG
18NEC-S09-WS-01
18NEC-S09-WS-02
18NEC-S09-WS-03-8

vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

(●) Yes ( ) No Comments:

All affected samples were qualified QN for Naphthalene due to the LCS/LCSD RPD failure.

vii. Data quality or usability affected? (Use comment box to explain)

Comments:

Data quality and usability were minimally affected. Samples qualified QN are considered estimated with an unknown bias.

Due to the remote nature of St. Lawrence Island and the process of shipping samples on a daily basis it was not feasible to collect a MS/MSD on a daily basis; therefore, a MS/MSD did not get submitted with this grouping of samples. Two project samples were analyzed as an MS/MSD submitted with SDG 86483. A summary of batch QC and project MS/MSD are included in the DQA.

c. Surrogates - Organics Only

i. Are surrogate recoveries reported for organic analyses - field, QC and laboratory samples?

(●) Yes ( ) No Comments:

All organic analyses were reported with surrogates.

ii. Accuracy - All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods 50-150 %R; all other analyses see the laboratory report pages)

(●) Yes ( ) No Comments:

All surrogate recoveries were within laboratory and DoD QSM limits.

iii. Do the sample results with failed surrogate recoveries have data flags? If so, are the data flags clearly defined?

( ) Yes ( ) No Comments:

NA

iv. Data quality or usability affected? (Use the comment box to explain.)

○ Yes ◉ No Comments:

Data quality and usability were not affected.

d. Trip blank - Volatile analyses only (GRO, BTEX, Volatile Chlorinated Solvents, etc.): Water and Soil

i. One trip blank reported per matrix, analysis and cooler?

◉ Yes ○ No Comments:

Two trip blanks were included with this SDG, 18NEC-TB01 for SW8260 VOCs and 18NEC-TB02 for RSK175 methane.

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)

◉ Yes ○ No Comments:

Both trip blanks were included in cooler "Jump Soles" with all VOC and methane containers.

iii. All results less than PQL?

◉ Yes ○ No Comments:

There were no detections in the trip blanks for this SDG.

iv. If above PQL, what samples are affected?

Comments:

N/A

v. Data quality or usability affected? Explain.

Comments:

Data quality and usability were not affected.

e. Field Duplicate

i. One field duplicate submitted per matrix, analysis and 10 project samples?

◉ Yes ○ No Comments:

Two duplicates were submitted with four primary samples.

ii. Submitted blind to lab?

◉ Yes ○ No Comments:

Sample / Duplicate:
18NEC- 22WM2-WG / 18NEC-22MW2-WG-8, 18NEC-S09-WS-03 / 18NEC-S09-WS-03-8
Several of the analyses for 18NEC-S09-WS-03 and 18NEC-S09-WS-03-8 were analyzed with SDG 86483.

iii. Precision - All relative percent differences (RPD) less than specified DQOs?
(Recommended: 30% water, 50% soil)

$$\text{RPD (\%)} = \text{Absolute value of: } \frac{(R_1 - R_2)}{(R_1 + R_2)} \times 100$$

Where: R_1 = Sample Concentration
R_2 = Field Duplicate Concentration (R_1-R_2)

○ Yes ◉ No Comments:

The duplicate precision for 8NEC- 22WM2-WG / 18NEC-22MW2-WG-8 was not met for alkalinity and metals analysis.
Alkalinity RPD 85.7%
dissolved cadmium RPD 56.4%
chromium RPD 37%
lead RPD 52%
silver RPD 80%

iv. Data quality or usability affected? (Use the comment box to explain why or why not.)

◉ Yes ○ No Comments:

Data quality and usability are minimally affected. The higher result will be used for reporting. All data was less than the PALs.

f. Decontamination or Equipment Blank (If not applicable, a comment stating why must be entered below.)

◉ Yes ○ No Comments:

One equipment blank was submitted with SDG 86502 for the 2018 North East Cape groundwater sampling effort.

i. All results less than PQL?

◉ Yes ○ No Comments:

See the checklist for SDG 86502 for more information.

ii. If above PQL, what samples are affected?

Comments:

Several samples from all four water SDGs were affected. Please see Table C-2-1 in Attachment C-2 for the list of affected samples.

iii. Data quality or usability affected? Explain.

Comments:

Data quality and usability were minimally affected. All affected results were qualified B to indicate a possible high bias.

7. Other Data Flags/Qualifiers (ACOE, AFCEE, Lab Specific, etc.)

a. Defined and appropriate?

◉ Yes ○ No Comments:

Qualifiers applied to this data are defined in the Data Quality Assessment appendix of this report.

Laboratory Deliverables

(Provided electronically)

ATTACHMENT G-3
Field Documentation

Groundwater Monitoring

Rite in the Rain
ALL-WEATHER
ENVIRONMENTAL
№ 550F

Authors
Kevin Maher
Peter Mamrol

DCN: AE-ECC-J07-5FGA4600-H04-0002

ISBN 978-1-932149-50-0

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PAGE	REFERENCE	DATE

Location Nc Cape (MOC) Date 8/1/18

Project / Client USACE

Recorded By Kevin Maher

Weather: Overcast 50°F
Light wind (≈ 5mpH)

PPE: Level D (modified)

STAFF: Jessica Bray Kevin Maher
Sean Seegars Admond Abuhamsha

OBJECTIVE: Well Development

Verified Calibration / Recalibrated
PID + YSI (x 2) 13:45

15:15
Loaded Equipment and Drove to MOC
and Set-Up on Well 14MW04
Checked Breathing Zone

15:45 Began development @ 14MW04
Alternated Surging using a
Bailer + Purging
Removed approximately 5 gallons with
the Bailer in 30 minutes.

16:15 Switched to using a submersible
Pump for Surging + purging

over →

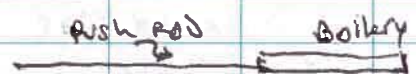
Location NE Cope (MOC) Date 8/1/18

Project / Client Continued

Purged another 10 gallons of water + noticed turbidity was improving during purge cycles

16:20 Stopped purging to retrieve a push rod from camp.

16:30 Attached bailer to push rod and cut off ball valve from the bailer.



Used push rod to dislodge sediment felt at the bottom of well casing when measuring initial total casing depth

Dislodged sediment by working bailer up + down while in contact with the sediment layer.

Returned pump to well + continued purging. over →

Location NE Cope (MOC) Date 8/1/18

Project / Client Continued

Heavy turbidity was observed during purging at this time.

Continued surging at lower end of casing (deepest) and purging.

total of 20 gallons purged prior to stabilization verification.

17:34 - Began stabilization verification

All parameters stabilized (pH, ORP, cond + DO) turbidity did not stabilize + last reading was 12.47 NTUs.

Development ended at 18:35 with a total of 25 gallons purged.

18:50 Left site

17:00 Staged purge water @ camp (waste area) and decontaminated pumps + water level meters.

8/1/18 over →

Location Ne Cape (mac) Date 8/1/18

Project / Client continued

16:00 Arrived at 16:00 and Set-up Equipment @ well MW10-1

16:30 Admond and Stan Began Development under Supervison of Kevin.

Alternate Surging + Purging with a Bailer continued for 30 minutes with a total of 5 gallons purged.

The submersible pump was then used for surging + purging and another 5 gallons was removed.

Similarly to well 14MW04, the push rod and bailer were used to dislodge sediment layer @ the bottom of the casing.

17:00 The pump was lowered to the bottom of the casing and

OVER →

Location Ne Cape (mac) Date 1 August 18

Project / Client Continued

Another 15 gallons was removed alternating surging + purging.

The End of work shift occured prior to stabilization monitoring, so a single set of parameters were measured using the stainless steel cup.

18:00 Removed equipment from well and returned to camp (Stan + Admond)

End of Day

Kevin Mottola
8/1/18

Location NE Cape (MOC) Date 8/2/18
Project / Client USACE

Weather: Overcast 50°F with light
winds and rain
PPE: Level D (modified)
Staff: Maher, Bay, Adnoray AR

Objective: Well development and Sampling

Verified calibration and recalibrated PID
and YSI (x2) 07:30 + turbidimeter

Organized cooler with sample containers

11:00 Arrived at MOC + Adnoray AR
set-up on MW10-1 to continue
Develope ment.

Initial water purged with the
submersible pump was fairly clear.
Water also returned to starting
Depth from 8/1/18

Stabilization Started @ 11:30

Location Ne Cape (MOC) Date 8/2/18
Project / Client USACE continued

11:45 Jessica Bay + Kevin M.
Located ~~MW26~~ @ 26MW1 and
Set-up for sample collection.

13:00 Adnoray finished development
MW10-1

14:00 GW Sampling completed at
26MW01

Returned samples to camp.

15:15 Returned to MOC and
Set-up on Well 22MW02

Purging Started @ 16:20

~~1554 Arrived at MOC with Jessica Bay and Kevin Maher. Set up for sampling at MW22-d 22MW2~~ JB

Location NE Cape (MOC) Date 8/2/18
Project / Client USACE Continued

1700 Completed purge of 22MW02 and began sampling set up. Collected a primary and duplicate sample starting at 17:05
1830 Completed primary and duplicate sampling. Arrived back at camp at 1835.

Placed all samples in Refrigerator
temp of Refrigerator = 3.0°C
2 - 1L HCl   1 - HNO_3
2 - 1L UN   3 - 40mL VOAs

~~Site 9 S~~ (MB) 8/2
Site 9 Surface Water Sampling.

Upstream end of Diversion trench contained similar levels of water as in 2014.
Collected SW-1 from this location At 16:43. Field Parameters were
Temp = 10.70 °C   ph: 5.95
Cond = 68 µS/cm   Orp: 218.5
DO = 10.95 mg/L   Turbid: 4.6 NTU
Sample ID: 18NEC-S09-WS-01

Location NE Cape (MOC) Date 8/2/18
Project / Client Continued

SW-2 17:13
Collected surface water from downstream outlet of Diversion trench.

Temp = 11.01 °C   pH = 6.21
Cond = 65 µS/cm   Orp = 216.8
DO = 11.04 mg/L   Turbidity = 4.73 NTUs

Sample ID: 18NEC-S09-WS-02
Moved to SW-3 at 17:48. SW-3 ~~was~~ (MB) 8/2 is a standalone pond ~~Downstream~~ Downgradient of the Landfill

Temp = 14.32 °C   ph = 6.37
Cond = 116 µS/cm   ORP = 201.9
DO = 8.57 mg/L   Turbid: 5.78 NTUs
Sample ID: 18NEC-S09-WS-03
Placed samples in Refrigerator

End of day

8/2/18

Location NE Cape (MOC) Date 8-3-18

Project / Client USACE

Weather: Overcast 45-50°F with light winds and rain
PPE: Level D (modified)
Objective: Surface + Groundwater sampling

745 Verified and recalibrated YSI (x3), PID (x2), and turbidimeter (x 2)

Organized coolers with sample containers

08:20 @ SW-03. SW-03 is a stand alone pond down gradient of the land fill.

Recollecting SW-03 in order to include duplicate and MS/MSD samples

Sample ID Primary: 18NEC-509-WS-03
Duplicate: 18NEC-509-WS-03-8
MS/MSD: 18 NEC-509-WS-03

Location NE Cape (MOC) Date 8-3-18

Project / Client USACE continued

Temp: 11.02°C	pH: 5.53
Cond: 83 μS/cm	ORP: 81.4
DO: 8.07 mg/L	Turbidity: 4.67 NTUs

Sample Time:
Placed pin flags @ SW-01, SW-02, and SW-03
Back @ camp at 9:48

12:30
Loaded equipment and set-up on well 14MW01. Kevin was sampler
Well casing slight jack up so that flush mount lid would not completely close.
Completed sampling at 15:10 samplers return to camp.
15:00
Jessica Bay and Holly Huff set-up on well MW10-1.
Well flow need to be reduced to ≈200 mLs/min. to meet draw down specifications.
over →

Location Ne Cape   Date 8/3/18
Project / Client USACE

Well MW10-1 water color was
Tan and the color affected
Turbidity. Turbidity stabilized
at 24.7 NTUs and appeared to
Be free of particulates.
Sampling completed at 1805

Samples Returned to camp

16:00

Kevin and Peter set-up on well
14MW07.
Initial water quality looked good
(low turbidity) and no drawdown
issues.
Sampling completed at 18:05 and
Samples returned to camp

17:00 Kevin Set-up on well
20MW01. well in good condition.

Sampling Completed at 18:43 and
Samples returned to camp
over →

Location USACE Ne Cape   Date 8/3/18
Project / Client

All Purge water placed in
Drum WW-3.

End of Day

[illegible] 8/3/18

Location Ne Cape Date 8/4/18
Project / Client USACE

07:30
Check meter calibration
And Recalibrated YSIs x2
PIDs + turbidimeters were in
Range (See calibration Logs)

Organized Gear + UTVs

Weather: 44°F, Overcast 10mph wind
PPE: Level D (modified)
Objective: Groundwater Sampling
Staff: Admond A. Jessica B. and
Kevin Maher

09:00 Arrived at MOC And
Located MW88-4 and ~~MW88~~ 17MW1
~~[illegible]~~

Jessica Set up on well 17MW1
Admond Set-up on Well MW88-4-1

17MW completed at 11:15
MW88-1 completed at 11:3

Location Ne Cape Date 8/4/18
Project / Client USACE

Samples returned to camp
Kevin Set-up on well
~~[illegible]~~ 14MW03 at 11:45

14:00 Kevin Departed MOC
And Returned Samples to camp
Jessica + Peter Set up on well
MW88-10

1510 Pump quit working. Stopped power & shook pump. Applied power and now performing well.
1525 Turbid increased to 105 but dropping.

1600 Started sample collection.
1645 Completed sample collection Pump performing irregularly. Appears to be controller. Reading irregular output voltage but flow was steady. Fe/Nitrate test kits.
1700 Packing up and leaving for camp.

PETER MAMROL

Location NE Cape Date 8-5-18

Project / Client USACE / STEADWOOD

0700 Weather: Overcast 45°F, rained overnight
PPE: Level D (modified)
objectives: groundwater sampling
Personnel: Jessica (JB) and Peter (PM)
Safety tailgate: update site 28 SPA with necessary decon.

0755 Begin loading GW equipment.

0815 begin calibrating turbidity meter and other gw sampling equipment. Recalibrated Conductivity (specific) for YSI.

1010 Arrive at 17MW06. Very shallow groundwater (1.1'), with groundwater seeping to surface 15' downhill to the North. Well in good condition.

1125 Finish purging. Faint to moderate odor. Few small spots of sheen in purge bucket.

1321 Completed sampling at 14MW06 & disassembly. Taking samples back to camp. Purge water has distinct fuel odor.

1445 leaving camp for MOC.

1515 Arrive at well 14MW02. Water fills 1/2 of flush mount inside. Photo #157.

1546 Began well purging.

Location Ne Cape Date 8-5-18

Project / Client USACE

1635 Achieve well stability. Begin collecting sample 18NEC-14MW02-WG. Well has moderate fuel odor in purge water.

1730 Complete sample collection. Decon & heading back to camp.

10:00
Kevin Arrived At Well 14MW04
Well water turbidity was Higher than Expected as this well was Re-Developed on 8/1/18
turbidity Eventually decreased to 11 NTUs.
Completed Sample collection And Returned samples to camp Storage Refrigerator.

13:30 Kevin arrived at well MW88-3. Flow rate of ≈ 200 mls/min were Needed over →

to Keep Draw-Down within Limits. Well stabilization parameters were met.

Completed Sampling and Returned Samples to camp Refrigerator.

16:30
Moved to well MW ~~140~~ 14MW05 and set-up gear. This Well had a depth to GW of 1.6' Below TOC and A total Depth of 15'. it Appeared that the Screened Interval was fully submerged

Checked construction Specs and The screen was 5'-15' Below TOC.

Consulted with the QAR and Determined that the pump Intake would Be placed

1.5 Feet Below the top of the Screened Interval (6.6').

This well would only support A sustained flow rate of 125 mls/min while maintaining draw down to less than 0.3 Feet.

14MW04 also is approx 60' From A Spring which discharges into Site 28. It Appears that the Spring is at the Same Elevation as groundwater in 14MW04.

18:00 Returned Samples to Camp Refrigerator.

End of Day

8/5/18

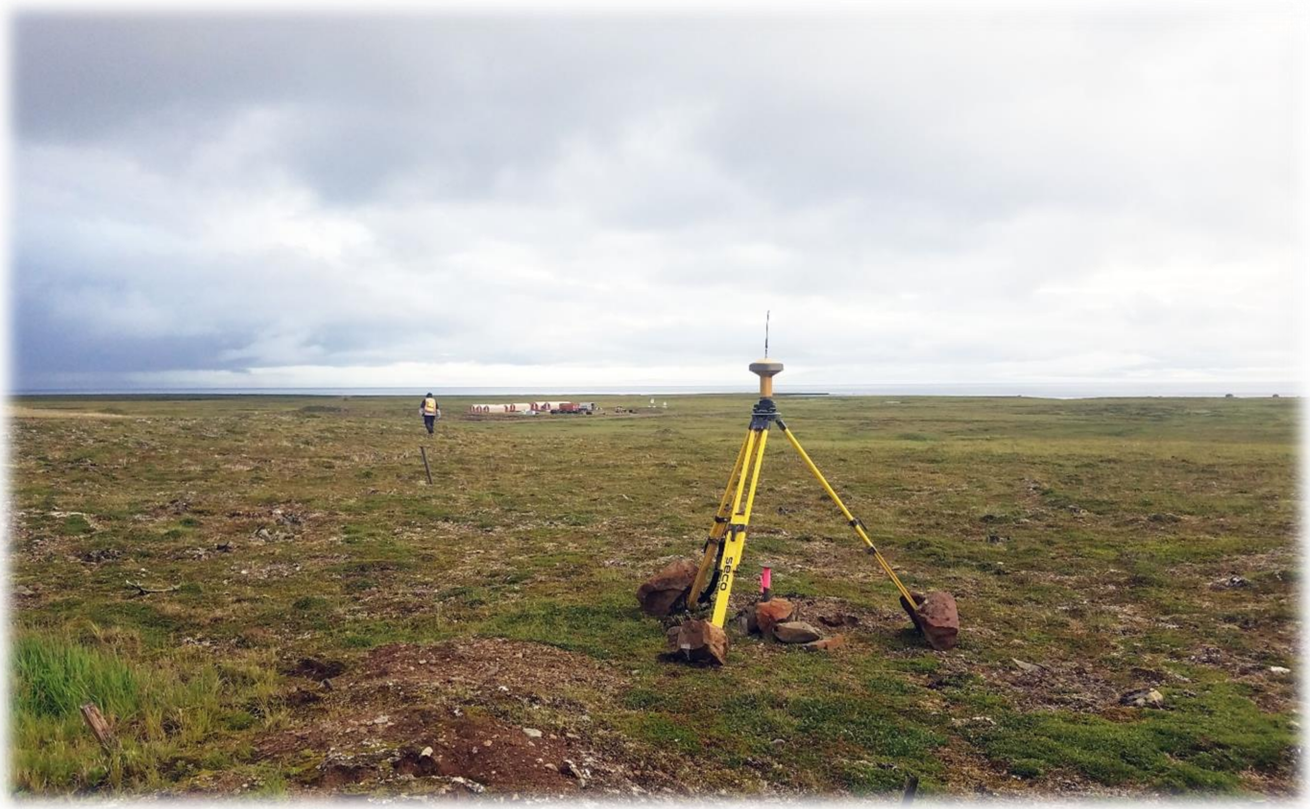
ATTACHMENT G-4
Survey Data

2018 Sampling of Surface Water at Northeast Cape Site 9
Survey Table

Field Survey Point ID	Feature Location ID	Latitude (WGS84)	Longitude (WGS84)	Latitude (NAD 83 (2011))	Longitude (NAD 83 [2011])	Northing (UTM Zone 2N)	Easting (UTM Zone 2N)	Northing - Alaska State (Plane Zone 9, U.S. Survey, Feet)	Easting - Alaska State (Plane Zone 9, U.S. Survey, Feet)	Elevation (NAVD88, GEOID12B, U.S. Survey Feet)	Elevation (NAVD88, GEOID12B, Meters)	Text Descriptor	Measurement Date/Time
5388	5388	63°18'44.29882"N	168°57'23.07316"W	63°18'44.31431"N	168°57'22.98738"W	7022018.3920	602393.9510	3404198.541	1812037.715	63.513	19.359	MP SW03	8/3/2018 15:27
5389	5389	63°18'42.00958"N	168°57'21.03215"W	63°18'42.02507"N	168°57'20.94635"W	7021948.4710	602424.6100	3403967.554	1812134.729	71.424	21.77	MP SW01	8/3/2018 15:30
5390	5390	63°18'43.19450"N	168°57'16.58994"W	63°18'43.20999"N	168°57'16.50414"W	7021987.1030	602485.2510	3404091.206	1812335.679	64.182	19.563	MP SW02	8/3/2018 15:33

APPENDIX H

TOPOGRAPHICAL SURVEY REPORT



Northeast Cape Remedial Action Topographic Survey

Final Project Report

August, 2018

Contractor Job Number:
W911KB18F0020

Project Coordinates:
Latitude: 63°18'37.79"N
Longitude: 168°57'47.72"W

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Table of Contents

1. Project Description

Project Overview and Summary

Work for this project will be performed by Lounsbury & Associates, Inc. (Lounsbury) under contract to Environmental Compliance Consultants (ECC). The purpose of this survey will be to provide surveying and mapping support as discussed in the Northeast Cape Remedial Action Statement of Work dated November 8, 2017. Specific survey goals included tying into existing survey control and supplementing it as necessary, perform cross sections and a small topographic survey at Site #7, stake sample spots at Sites #7 and #28, and survey the edge of water at Site #28. Fieldwork for this survey was completed by Lounsbury & Associates, Inc. during August 2018.

USACE Contract Number: W911KB-17-D-0017

Horizontal Datum and Epoch:

The horizontal datum and epoch for the Survey is NAD83 (2011) (EPOCH: 2010.00). Coordinates have been provided in UTM Zone 2N, Alaska State Plane Zone 9 (U.S. Survey Feet), and in other datums in the project data table, per agreed-upon scope of work.

Vertical Datum and Epoch:

The vertical datum for the survey is NAVD 88, GEOID 12B. Elevations on project control were determined by GPS elevation transfer. The average of multiple NGS OPUS solutions, observed over different days, was held fixed for each project control point. The integrity of these elevations were confirmed with multiple RTK and static GPS checks.

Number of New Monuments Set:

This survey set one new project control monument and provided updated coordinates on four existing project control monuments.

2. Survey Control Summary

Primary Horizontal and Vertical Control Points:

The table on the following page lists the project primary horizontal and vertical control points.

Primary Horizontal and Vertical Control Points											
Field Survey Point ID	Latitude (WGS84)	Longitude (WGS84)	Latitude (NAD 83 (2011))	Longitude (NAD 83 (2011))	Northing (UTM Zone 2N)	Easting (UTM Zone 2N)	Northing (Alaska State Plane Zone 9, U.S. Survey Feet)	Easting (Alaska State Plane Zone 9, U.S. Survey Feet)	Elevation (NAVD88, GEOID12B, U.S. Survey Feet)	Elevation (NAVD88, GEOID12B, Meters)	Text Descriptor
1	63°19'32.47895"N	168°58'15.32269"W	63°19'32.49446"N	168°58'15.23687"W	7023485.424	601618.564	3409053.356	1809572.561	28.409	8.659	CP 1 RTK BASE
2	63°18'57.69975"N	168°57'18.33986"W	63°18'57.71525"N	168°57'18.25406"W	7022434.584	602445.407	3405563.115	1812231.739	51.535	15.708	CRBC
59	63°20'08.83006"N	168°56'24.47121"W	63°20'08.84555"N	168°56'24.38532"W	7024659.259	603124.127	3412827.77	1814572.558	5.248	1.599	CBC
603	63°18'58.70241"N	168°56'27.27211"W	63°18'58.71790"N	168°56'27.18629"W	7022488.35	603154.891	3405703.216	1814562.383	78.814	24.023	BM B NGS
2600	63°18'42.73235"N	168°57'29.95052"W	63°18'42.74785"N	168°57'29.86474"W	7021966.361	602298.622	3404034.336	1811726.161	72.924	22.227	CRB

Static Processing

Lounsbury & Associates used the NGS OPUS Utility to process all static baselines and obtain the geodetic positions of project control. Values were obtained by averaging multiple solutions on each point, all of which were based upon at least two hours of static GPS observation time. Observations were obtained over multiple days and at different times each day in order to incorporate different satellite geometry. The integrity of the xyz positions on each control point were confirmed through multiple RTK checkshots on each point.

Checkshots / Other Control Points:

The primary control points listed in the table on the previous page were the only control points utilized for this survey.

3. Survey Reduction Narrative

Procedures Used and Survey Control Held:

The survey found several issues with the existing project control. Record coordinates on points derived from “Eco-Land” Surveys were listed as Alaska State Plane Zone 9, but initial field checks found this to be wrong. Most of the control set from that survey was found to be too sloppy to use. Furthermore, our OPUS solutions on Point #1 differed from the “Eco-Land” position by approximately 0.7’; while our OPUS solutions matched the published position of Point #59 by approximately 0.08’. It was determined that, given the issues with the existing control values and the high latitude of the project site, averaged OPUS solutions should be used on all project control in order to provide the most defensible, up-to-date geodetic coordinates of each control point. The coordinates of each project control point have thus been updated according to the mean OPUS values on each point.

RTK topographic survey data was processed using Topcon Magnet Ver 5.0.1 software. A large number of check shots were performed to ensure good on-the-fly initialization, and to rule out systematic errors. The vast majority of RTK check shots were under 0.10’ magnitude in XYZ with a small percentage of outliers, all within the RTK precision specifications of the equipment used. ASCII points were generated in Topcon Magnet software after reviewing the checkshot report and RTK system statistics reports. These reports have been included in the submitted deliverable package and are referenced in this report document.

Survey deliverables were then generated according to the specifications listed in the USACE Alaska District – Environmental Program Manual For Electronic Deliverables, April 2017.

4. Issues and Problems Encountered

Other than the discrepancies found with existing “Eco-Land” control described in Section 3 of this report, no significant issues or problems were encountered in this survey.

5. Check Shot / Quality Reports

5.1 RTK Check Shots on Project Control

From	To	Forward Azimuth	Backward Azimuth	Geodetic Dist. (USft)	Ground Dist. (USft)	Slope Dist. (USft)
5002	59_Mean_OPUS	305°20'12.0274"	125°20'12.0274"	0.016	0.016	0.02
5421	1_Mean_OPUS	70°09'22.3000"	250°09'22.3001"	0.028	0.028	0.038
10001	1_Mean_OPUS	65°16'41.7923"	245°16'41.7923"	0.011	0.011	0.041
10004	59_Mean_OPUS	322°11'09.9037"	142°11'09.9036"	0.014	0.014	0.05
5006	2600_Mean_OPUS	208°28'50.0765"	28°28'50.0763"	0.031	0.031	0.052
5115	59_Mean_OPUS	2°10'08.8688"	182°10'08.8688"	0.037	0.037	0.052
5228	1_Mean_OPUS	9°17'14.9805"	189°17'14.9806"	0.007	0.007	0.074
10136	59_Mean_OPUS	343°59'55.2779"	163°59'55.2778"	0.021	0.021	0.079
5009	1_Mean_OPUS	35°02'46.5820"	215°02'46.5820"	0.009	0.009	0.079
10236	2_Mean_OPUS	210°52'25.3985"	30°52'25.3984"	0.015	0.015	0.103
5231	2_Mean_OPUS	242°16'27.2284"	62°16'27.2283"	0.02	0.02	0.105
5229	2_Mean_OPUS	326°09'36.8126"	146°09'36.8123"	0.043	0.043	0.105
10519	GPS_2_OPUS	225°43'35.2393"	45°43'35.2389"	0.057	0.057	0.107
10003	2_Mean_OPUS	341°47'29.2983"	161°47'29.2981"	0.036	0.036	0.108
5114	2600_Mean_OPUS	287°32'45.0001"	107°32'45.0001"	0.03	0.03	0.117
10235	2_Mean_OPUS	293°36'20.6271"	113°36'20.6270"	0.05	0.05	0.12
5387	2600_Mean_OPUS	200°16'34.6263"	20°16'34.6260"	0.062	0.062	0.12
10234	2_Mean_OPUS	269°56'15.5115"	89°56'15.5115"	0.027	0.027	0.12
10002	2600_Mean_OPUS	218°10'29.4533"	38°10'29.4532"	0.023	0.023	0.12
10520	2600_Mean_OPUS	208°51'32.0517"	28°51'32.0514"	0.04	0.04	0.127
10135	2_Mean_OPUS	298°19'17.4252"	118°19'17.4251"	0.018	0.018	0.136
5391	GPS_2_OPUS	211°52'20.4448"	31°52'20.4442"	0.079	0.079	0.142

From	To	Forward Azimuth	Backward Azimuth	Geodetic Dist. (USft)	Ground Dist. (USft)	Slope Dist. (USft)
5394	2_Mean_OPUS	129°37'22.3715"	309°37'22.3716"	0.019	0.019	0.243
5420	2_Mean_OPUS	322°10'05.7059"	142°10'05.7057"	0.026	0.026	0.256
5392	2_Mean_OPUS	63°59'24.8944"	243°59'24.8945"	0.014	0.014	0.481
5393	2_Mean_OPUS	327°19'59.4012"	147°19'59.4010"	0.025	0.025	0.495

5.2 RTK Observation Quality

Name	dN (USft)	dE (USft)	dHt (USft)	Horz RMS	Vert RMS
1_Mean_OPUS–5002	3774.405	5000.011	-23.214	0.012	0.015
1_Mean_OPUS–5003	3575.944	4892.167	-23.431	0.013	0.016
1_Mean_OPUS–5003	3575.954	4892.157	-23.435	0.013	0.016
1_Mean_OPUS–5004	3322.317	4700.852	-23.927	0.012	0.015
1_Mean_OPUS–5004	3322.324	4700.84	-23.938	0.012	0.015
1_Mean_OPUS–5005	-5424.463	423.411	47.584	0.011	0.013
1_Mean_OPUS–5006	-5019.003	2153.621	45.16	0.012	0.014
1_Mean_OPUS–5006	-5018.993	2153.614	45.162	0.012	0.014
1_Mean_OPUS–5007	-5418.432	1702.719	66.116	0.013	0.017
1_Mean_OPUS–5008	-7878.646	2407.138	212.354	0.014	0.016
1_Mean_OPUS–5008	-7878.622	2407.162	212.356	0.013	0.015
603_Mean_OPUS–5001	3305.88	2620.741	-52.192	0.011	0.014
603_Mean_OPUS–5009	3350.133	-4989.827	-48.56	0.018	0.033
603_Mean_OPUS–5010	-1382.478	-3696.888	-19.087	0.017	0.027
603_Mean_OPUS–5011	-1394.685	-3677.133	-19.074	0.011	0.015
603_Mean_OPUS–5012	-1409.686	-3667.085	-19.055	0.011	0.014
603_Mean_OPUS–5013	-1407.245	-3657.459	-19.1	0.012	0.015
603_Mean_OPUS–5014	-1394.93	-3653.609	-19.138	0.012	0.015

Name	dN (USft)	dE (USft)	dHt (USft)	Horz RMS	Vert RMS
603_Mean_OPUS–5015	-1378.828	-3649.477	-19.098	0.011	0.014
603_Mean_OPUS–5016	-1364.455	-3653.827	-19.078	0.011	0.014
603_Mean_OPUS–5017	-1364.81	-3669.486	-19.119	0.012	0.015
603_Mean_OPUS–5018	-1354.356	-3678.788	-19.057	0.011	0.014
603_Mean_OPUS–5019	-1357.804	-3685.786	-19.109	0.011	0.014
603_Mean_OPUS–5020	-1377.675	-3695.28	-19.064	0.011	0.014
603_Mean_OPUS–5021	-1370.141	-3588.193	-18.173	0.018	0.026
603_Mean_OPUS–5022	-1372.319	-3578.998	-18.216	0.018	0.026
603_Mean_OPUS–5023	-1364.065	-3566.953	-18.177	0.018	0.026
603_Mean_OPUS–5024	-1345.531	-3571.082	-18.193	0.018	0.026
603_Mean_OPUS–5025	-1338.042	-3554.454	-18.149	0.018	0.026
603_Mean_OPUS–5026	-1322.789	-3545.684	-18.192	0.018	0.026
603_Mean_OPUS–5027	-1314.94	-3554.082	-18.216	0.018	0.026
603_Mean_OPUS–5028	-1324.361	-3572.78	-18.146	0.018	0.026
603_Mean_OPUS–5029	-1339.302	-3578.247	-18.079	0.018	0.026
603_Mean_OPUS–5030	-1356.395	-3585.042	-18.248	0.018	0.026
603_Mean_OPUS–5031	-1401.479	-3405.184	-18.522	0.013	0.018
603_Mean_OPUS–5032	-1386.454	-3398.304	-18.496	0.013	0.018
603_Mean_OPUS–5033	-1383.109	-3385.869	-18.522	0.013	0.018
603_Mean_OPUS–5034	-1400.734	-3375.255	-18.516	0.013	0.018
603_Mean_OPUS–5035	-1415.174	-3366.668	-18.41	0.014	0.019
603_Mean_OPUS–5036	-1428.924	-3372.479	-18.412	0.013	0.018
603_Mean_OPUS–5037	-1417.508	-3390.27	-18.498	0.013	0.018
603_Mean_OPUS–5038	-1339.349	-3462.828	-19.444	0.013	0.017
603_Mean_OPUS–5039	-1336.475	-3445.568	-19.413	0.013	0.017
603_Mean_OPUS–5040	-1321.827	-3442.687	-19.409	0.012	0.016

Name	dN (USft)	dE (USft)	dHt (USft)	Horz RMS	Vert RMS
603_Mean_OPUS–5041	-1309.704	-3454.94	-19.394	0.012	0.016
603_Mean_OPUS–5042	-1312.02	-3464.9	-19.539	0.012	0.016
603_Mean_OPUS–5043	-1324.833	-3463.467	-19.44	0.012	0.016
603_Mean_OPUS–5044	-1136.211	-3623.722	-21.98	0.011	0.013
603_Mean_OPUS–5045	-1138.433	-3622.075	-21.961	0.011	0.013
603_Mean_OPUS–5046	-1137.061	-3626.602	-21.982	0.011	0.013
603_Mean_OPUS–5047	-1127.568	-3622.953	-22.216	0.011	0.013
603_Mean_OPUS–5048	-1129.579	-3622.894	-22.237	0.011	0.013
603_Mean_OPUS–5049	-1128.093	-3619.089	-22.294	0.011	0.013
603_Mean_OPUS–5050	-1126.715	-3619.856	-22.364	0.011	0.013
603_Mean_OPUS–5051	-1122.438	-3617.869	-22.393	0.011	0.013
603_Mean_OPUS–5052	-1123.324	-3613.781	-22.462	0.012	0.014
603_Mean_OPUS–5053	-1118.008	-3614.809	-22.423	0.011	0.013
603_Mean_OPUS–5054	-1121.164	-3618.711	-22.42	0.011	0.013
603_Mean_OPUS–5055	-1118.112	-3621.759	-22.807	0.011	0.013
603_Mean_OPUS–5056	-1115.78	-3624.3	-23.326	0.011	0.013
603_Mean_OPUS–5057	-1116.777	-3626.413	-23.349	0.014	0.016
603_Mean_OPUS–5058	-1121.215	-3628.61	-23.183	0.011	0.013
603_Mean_OPUS–5059	-1120.948	-3633.823	-23.166	0.011	0.013
603_Mean_OPUS–5060	-1118.101	-3633.473	-23.25	0.011	0.013
603_Mean_OPUS–5061	-1118.076	-3630.257	-23.19	0.011	0.013
603_Mean_OPUS–5062	-1116.153	-3627.365	-23.394	0.011	0.013
603_Mean_OPUS–5063	-1114.449	-3626.483	-23.407	0.011	0.013
603_Mean_OPUS–5064	-1111.087	-3626.506	-23.466	0.012	0.014
603_Mean_OPUS–5065	-1106.492	-3626.128	-23.777	0.012	0.014
603_Mean_OPUS–5066	-1102.805	-3624.455	-24.138	0.011	0.012

Name	dN (USft)	dE (USft)	dHt (USft)	Horz RMS	Vert RMS
603_Mean_OPUS–5067	-1096.092	-3617.693	-24.241	0.011	0.012
603_Mean_OPUS–5068	-1114.508	-3616.996	-22.537	0.011	0.012
603_Mean_OPUS–5069	-1106.543	-3618.406	-24.148	0.011	0.012
603_Mean_OPUS–5070	-1098.799	-3615.287	-24.127	0.011	0.012
603_Mean_OPUS–5071	-1115.421	-3617.635	-22.482	0.011	0.012
603_Mean_OPUS–5072	-1116.27	-3620.644	-22.975	0.011	0.012
603_Mean_OPUS–5073	-1114.4	-3623.729	-23.441	0.011	0.012
603_Mean_OPUS–5074	-1111.307	-3625.126	-23.438	0.011	0.012
603_Mean_OPUS–5075	-1106.867	-3625.262	-23.858	0.011	0.012
603_Mean_OPUS–5076	-1106.827	-3620.298	-24.107	0.011	0.012
603_Mean_OPUS–5077	-1086.819	-3611.26	-24.716	0.01	0.011
603_Mean_OPUS–5078	-1077.356	-3612.344	-24.844	0.01	0.011
603_Mean_OPUS–5079	-1069.345	-3611.635	-25.117	0.011	0.012
603_Mean_OPUS–5080	-1061.414	-3611.136	-25.472	0.011	0.012
603_Mean_OPUS–5081	-1059.247	-3609.097	-25.485	0.011	0.012
603_Mean_OPUS–5082	-1058.097	-3604.481	-25.537	0.011	0.013
603_Mean_OPUS–5083	-1055.7	-3600.536	-25.557	0.011	0.013
603_Mean_OPUS–5084	-1038.943	-3596.017	-26.196	0.011	0.013
603_Mean_OPUS–5085	-1030.01	-3598.582	-26.898	0.011	0.013
603_Mean_OPUS–5086	-1017.539	-3591.352	-27.273	0.011	0.013
603_Mean_OPUS–5087	-1013.945	-3588.356	-27.487	0.011	0.013
603_Mean_OPUS–5088	-1011.797	-3586.312	-27.731	0.011	0.013
603_Mean_OPUS–5089	-1009.107	-3584.365	-27.968	0.011	0.013
603_Mean_OPUS–5090	-1004.523	-3588.091	-28.153	0.011	0.013
603_Mean_OPUS–5091	-995.181	-3588.872	-28.748	0.011	0.013
603_Mean_OPUS–5092	-996.649	-3611.306	-29.003	0.011	0.013

Name	dN (USft)	dE (USft)	dHt (USft)	Horz RMS	Vert RMS
603_Mean_OPUS–5093	-998.238	-3612.534	-29.046	0.011	0.013
603_Mean_OPUS–5094	-997.69	-3614.035	-29.073	0.011	0.013
603_Mean_OPUS–5095	-995.77	-3613.47	-29.094	0.011	0.013
603_Mean_OPUS–5096	-989.631	-3590.565	-29.6	0.011	0.013
603_Mean_OPUS–5097	-984.856	-3593.787	-29.998	0.011	0.013
603_Mean_OPUS–5098	-983.498	-3598.726	-30.14	0.011	0.013
603_Mean_OPUS–5099	-977.198	-3606.788	-30.209	0.011	0.013
603_Mean_OPUS–5100	-969.449	-3603.688	-30.282	0.012	0.013
603_Mean_OPUS–5101	-961.904	-3602.186	-30.275	0.011	0.013
603_Mean_OPUS–5102	-954.441	-3599.272	-30.505	0.011	0.013
603_Mean_OPUS–5103	-947.001	-3598.69	-30.738	0.011	0.013
603_Mean_OPUS–5104	-938.545	-3591.828	-30.858	0.011	0.013
603_Mean_OPUS–5105	-938.391	-3588.714	-30.897	0.011	0.013
603_Mean_OPUS–5106	-937.009	-3586.514	-30.891	0.011	0.013
603_Mean_OPUS–5107	-928.999	-3580.431	-30.919	0.011	0.013
603_Mean_OPUS–5108	-927.785	-3574.427	-30.921	0.011	0.013
603_Mean_OPUS–5109	-928.915	-3570.71	-31.052	0.011	0.013
603_Mean_OPUS–5110	-922.907	-3566.682	-31.391	0.011	0.013
603_Mean_OPUS–5111	-916.159	-3565.391	-31.579	0.011	0.013
603_Mean_OPUS–5112	-909.059	-3560.881	-32.198	0.011	0.013
603_Mean_OPUS–5113	-896.37	-3555.103	-32.389	0.012	0.014
603_Mean_OPUS–5114	-1668.888	-2836.194	-4.12	0.012	0.014
603_Mean_OPUS–5115	7124.517	10.174	-72.321	0.012	0.015
603_Mean_OPUS–5116	-893.294	-3548.971	-32.301	0.018	0.033
603_Mean_OPUS–5117	-883.178	-3545.074	-32.559	0.012	0.015
603_Mean_OPUS–5118	-868.317	-3541.973	-32.785	0.012	0.013

Name	dN (USft)	dE (USft)	dHt (USft)	Horz RMS	Vert RMS
603_Mean_OPUS–5119	-852.188	-3550.366	-33.011	0.012	0.014
603_Mean_OPUS–5120	-844.77	-3560.172	-33.122	0.012	0.014
603_Mean_OPUS–5121	-826.66	-3558.889	-33.141	0.012	0.014
603_Mean_OPUS–5122	-811.723	-3561.067	-33.122	0.012	0.014
603_Mean_OPUS–5123	-798.926	-3567.485	-33.014	0.013	0.015
603_Mean_OPUS–5124	-792.081	-3568.802	-33.128	0.012	0.014
603_Mean_OPUS–5125	-784.577	-3564.061	-33.001	0.012	0.014
603_Mean_OPUS–5126	-782.6	-3555.208	-32.996	0.013	0.015
603_Mean_OPUS–5127	-792.788	-3551.667	-33.039	0.013	0.015
603_Mean_OPUS–5128	-791.775	-3547.733	-33.049	0.013	0.015
603_Mean_OPUS–5129	-787.568	-3547.375	-33.035	0.012	0.014
603_Mean_OPUS–5130	-786.327	-3541.551	-33.054	0.012	0.014
603_Mean_OPUS–5131	-787.77	-3535.988	-33.03	0.012	0.014
603_Mean_OPUS–5132	-785.543	-3534.229	-33	0.012	0.014
603_Mean_OPUS–5133	-779.413	-3532.076	-33.074	0.013	0.015
603_Mean_OPUS–5134	-772.263	-3528.826	-33.033	0.012	0.014
603_Mean_OPUS–5135	-763.068	-3527.799	-33.069	0.012	0.014
603_Mean_OPUS–5136	-752.951	-3535.587	-33.097	0.012	0.014
603_Mean_OPUS–5137	-734.735	-3530.684	-33.137	0.013	0.015
603_Mean_OPUS–5138	-715.503	-3523.07	-33.088	0.012	0.014
603_Mean_OPUS–5139	-699.348	-3509.587	-33.066	0.012	0.014
603_Mean_OPUS–5140	-697.006	-3496.828	-33.018	0.012	0.014
603_Mean_OPUS–5141	-693.108	-3492.287	-33.076	0.013	0.015
603_Mean_OPUS–5142	-683.219	-3486.761	-33.131	0.012	0.014
603_Mean_OPUS–5143	-676.213	-3486.77	-33.283	0.012	0.014
603_Mean_OPUS–5144	-671.045	-3490.762	-33.266	0.012	0.015

Name	dN (USft)	dE (USft)	dHt (USft)	Horz RMS	Vert RMS
603_Mean_OPUS–5145	-666.97	-3489.181	-33.272	0.012	0.014
603_Mean_OPUS–5146	-658.941	-3485.506	-33.668	0.012	0.014
603_Mean_OPUS–5147	-649.812	-3483.815	-33.81	0.013	0.015
603_Mean_OPUS–5148	-638.075	-3492.344	-33.822	0.012	0.014
603_Mean_OPUS–5149	-622.415	-3497.149	-33.815	0.013	0.015
603_Mean_OPUS–5150	-610.348	-3490.814	-33.822	0.012	0.015
603_Mean_OPUS–5151	-602.534	-3474.776	-33.771	0.013	0.015
603_Mean_OPUS–5152	-593.093	-3471.612	-33.832	0.012	0.015
603_Mean_OPUS–5153	-591.393	-3467.056	-33.873	0.012	0.014
603_Mean_OPUS–5154	-570.064	-3471.118	-33.996	0.012	0.015
603_Mean_OPUS–5155	-576.138	-3476.597	-34.001	0.012	0.014
603_Mean_OPUS–5156	-580.907	-3473.834	-33.962	0.012	0.014
603_Mean_OPUS–5157	-578.96	-3467.721	-33.988	0.012	0.014
603_Mean_OPUS–5158	-572.755	-3466.313	-34.02	0.012	0.014
603_Mean_OPUS–5159	-541.862	-3470.672	-34.61	0.011	0.014
603_Mean_OPUS–5160	-540.416	-3473.298	-34.532	0.011	0.014
603_Mean_OPUS–5161	-527.058	-3467.105	-35.244	0.011	0.014
603_Mean_OPUS–5162	-515.909	-3459.041	-35.4	0.011	0.014
603_Mean_OPUS–5163	-507.494	-3451.465	-35.547	0.012	0.015
603_Mean_OPUS–5164	-500.96	-3455.601	-35.574	0.012	0.014
603_Mean_OPUS–5165	-496.568	-3453.221	-35.615	0.011	0.014
603_Mean_OPUS–5166	-494.836	-3447.873	-35.664	0.011	0.014
603_Mean_OPUS–5167	-486.092	-3442.67	-35.777	0.011	0.014
603_Mean_OPUS–5168	-471.822	-3438.634	-35.92	0.012	0.014
603_Mean_OPUS–5169	-455.168	-3435.699	-36.038	0.012	0.014
603_Mean_OPUS–5170	-440.391	-3430.205	-36.136	0.011	0.014

Name	dN (USft)	dE (USft)	dHt (USft)	Horz RMS	Vert RMS
603_Mean_OPUS–5171	-422.601	-3426.317	-36.449	0.011	0.014
603_Mean_OPUS–5172	-415.157	-3428.295	-36.589	0.011	0.014
603_Mean_OPUS–5173	-408.389	-3435.581	-36.66	0.011	0.013
603_Mean_OPUS–5174	-397.247	-3440.28	-36.731	0.011	0.014
603_Mean_OPUS–5175	-383.062	-3438.459	-36.756	0.011	0.014
603_Mean_OPUS–5176	-368.652	-3437.723	-36.871	0.011	0.014
603_Mean_OPUS–5177	-359.101	-3435.68	-36.871	0.011	0.013
603_Mean_OPUS–5178	-352.722	-3425.116	-36.934	0.011	0.013
603_Mean_OPUS–5179	-353.729	-3415.606	-36.984	0.011	0.013
603_Mean_OPUS–5180	-351.901	-3411.644	-36.973	0.011	0.014
603_Mean_OPUS–5181	-342.324	-3407.827	-37.086	0.011	0.013
603_Mean_OPUS–5182	-332.642	-3406.631	-37.142	0.011	0.014
603_Mean_OPUS–5183	-321.416	-3407.434	-37.249	0.011	0.013
603_Mean_OPUS–5184	-312.29	-3408.045	-37.331	0.011	0.013
603_Mean_OPUS–5185	-299.807	-3407.026	-37.326	0.011	0.013
603_Mean_OPUS–5186	-292.541	-3408.949	-37.334	0.011	0.013
603_Mean_OPUS–5187	-283.989	-3406.689	-37.375	0.011	0.014
603_Mean_OPUS–5188	-277.513	-3396.896	-37.397	0.011	0.013
603_Mean_OPUS–5189	-273.193	-3390.276	-37.438	0.011	0.013
603_Mean_OPUS–5190	-267.543	-3390.163	-37.458	0.011	0.014
603_Mean_OPUS–5191	-258.204	-3395.315	-37.431	0.011	0.013
603_Mean_OPUS–5192	-242.132	-3392.601	-37.468	0.011	0.013
603_Mean_OPUS–5193	-230.162	-3393.512	-37.717	0.011	0.013
603_Mean_OPUS–5194	-219.737	-3382.721	-37.978	0.011	0.013
603_Mean_OPUS–5195	-208.177	-3386.801	-37.959	0.011	0.014
603_Mean_OPUS–5196	-199.211	-3394.276	-38.099	0.011	0.014

Name	dN (USft)	dE (USft)	dHt (USft)	Horz RMS	Vert RMS
603_Mean_OPUS–5200	-154.486	-3391.835	-38.739	0.011	0.014
603_Mean_OPUS–5201	-147.566	-3397.81	-39.158	0.011	0.013
603_Mean_OPUS–5202	-147.443	-3400.386	-39.23	0.011	0.013
603_Mean_OPUS–5203	-145.248	-3405.768	-39.128	0.011	0.013
603_Mean_OPUS–5204	-139.293	-3403.147	-39.258	0.011	0.013
603_Mean_OPUS–5205	-136.156	-3398.004	-39.158	0.011	0.013
603_Mean_OPUS–5206	-131.886	-3396	-39.171	0.01	0.013
603_Mean_OPUS–5207	-128.426	-3400.179	-39.203	0.01	0.013
603_Mean_OPUS–5208	-124.775	-3405.059	-39.235	0.011	0.013
603_Mean_OPUS–5209	-129.204	-3417.298	-39.191	0.01	0.013
603_Mean_OPUS–5210	-129.915	-3436.061	-39.19	0.011	0.014
603_Mean_OPUS–5211	-126.13	-3454.833	-39.266	0.01	0.013
603_Mean_OPUS–5212	-129.436	-3477.167	-39.302	0.011	0.013
603_Mean_OPUS–5213	-124.746	-3478.003	-39.363	0.011	0.013
603_Mean_OPUS–5214	-123.263	-3455.612	-39.32	0.01	0.013
603_Mean_OPUS–5215	-121.545	-3437.907	-39.267	0.01	0.013
603_Mean_OPUS–5216	-117.155	-3419.169	-39.192	0.01	0.012
603_Mean_OPUS–5217	-113.139	-3401.519	-39.276	0.01	0.012
603_Mean_OPUS–5218	-116.661	-3391.81	-39.181	0.011	0.013
603_Mean_OPUS–5219	-117.414	-3381.691	-39.181	0.011	0.013
603_Mean_OPUS–5220	-114.586	-3368.255	-39.2	0.01	0.012
603_Mean_OPUS–5221	-113.192	-3360.555	-39.225	0.01	0.012
603_Mean_OPUS–5222	-108.652	-3339.991	-39.207	0.011	0.013
603_Mean_OPUS–5223	-108.133	-3332.361	-39.217	0.016	0.019
603_Mean_OPUS–5224	-93.92	-3322.583	-39.213	0.011	0.013
603_Mean_OPUS–5225	-85.385	-3309.439	-39.2	0.011	0.013

Name	dN (USft)	dE (USft)	dHt (USft)	Horz RMS	Vert RMS
603_Mean_OPUS–5226	-84.881	-3298.043	-39.203	0.01	0.012
603_Mean_OPUS–5227	-88.4	-3283.739	-39.082	0.01	0.012
603_Mean_OPUS–5228	3350.133	-4989.823	-47.442	0.011	0.014
603_Mean_OPUS–5229	-140.136	-2330.62	-24.661	0.013	0.019
603_Mean_OPUS–5230	-140.118	-2330.642	-24.673	0.012	0.015
603_Mean_OPUS–5231	-140.091	-2330.627	-25.209	0.014	0.022
603_Mean_OPUS–5232	506.914	-838.4	2.074	0.011	0.015
603_Mean_OPUS–5232_5233_stk	630.599	-815.911	1.849	0.012	0.015
603_Mean_OPUS–5232_5233_stk1	630.591	-815.941	1.811	0.011	0.014
603_Mean_OPUS–5233	604.423	-820.613	2.32	0.011	0.015
603_Mean_OPUS–5234	615.036	-818.699	2.386	0.011	0.014
603_Mean_OPUS–5235	625.476	-816.706	1.912	0.012	0.015
603_Mean_OPUS–5236	634.523	-815.115	1.83	0.011	0.014
603_Mean_OPUS–5237	644.097	-813.271	1.143	0.011	0.014
603_Mean_OPUS–5238	654.637	-811.633	0.355	0.011	0.014
603_Mean_OPUS–5239	664.759	-809.672	0.146	0.011	0.014
603_Mean_OPUS–5240	685.87	-805.79	-0.94	0.011	0.014
603_Mean_OPUS–5241	708.22	-801.644	-2.484	0.011	0.014
603_Mean_OPUS–5242	729.892	-797.719	-4.673	0.011	0.014
603_Mean_OPUS–5243	751.571	-793.769	-7.297	0.011	0.014
603_Mean_OPUS–5244	770.781	-790.187	-10.408	0.01	0.013
603_Mean_OPUS–5245	791.077	-786.605	-13.873	0.011	0.014
603_Mean_OPUS–5246	813.044	-782.532	-16.252	0.01	0.012
603_Mean_OPUS–5247	829.963	-779.51	-18.694	0.01	0.013
603_Mean_OPUS–5248	852.783	-775.149	-20.803	0.011	0.013
603_Mean_OPUS–5249	876.618	-770.98	-22.089	0.01	0.013

Name	dN (USft)	dE (USft)	dHt (USft)	Horz RMS	Vert RMS
603_Mean_OPUS–5250	899.881	-766.641	-22.778	0.011	0.014
603_Mean_OPUS–5251	925.072	-762.072	-23.958	0.011	0.014
603_Mean_OPUS–5252	601.315	-821.235	1.989	0.011	0.014
603_Mean_OPUS–5253	598.823	-821.663	1.518	0.01	0.013
603_Mean_OPUS–5254	595.964	-822.138	1.631	0.01	0.013
603_Mean_OPUS–5255	593.708	-822.62	1.838	0.011	0.014
603_Mean_OPUS–5256	590.281	-823.222	2.198	0.01	0.013
603_Mean_OPUS–5257	586.89	-823.736	2.323	0.01	0.013
603_Mean_OPUS–5258	584.475	-824.284	2.341	0.011	0.014
603_Mean_OPUS–5259	581.257	-824.855	2.113	0.011	0.014
603_Mean_OPUS–5260	577.808	-825.433	2.273	0.01	0.013
603_Mean_OPUS–5261	574.198	-826.112	2.648	0.01	0.013
603_Mean_OPUS–5262	569.458	-827.021	2.972	0.01	0.013
603_Mean_OPUS–5263	565.521	-827.744	2.967	0.011	0.014
603_Mean_OPUS–5264	561.238	-828.492	2.932	0.01	0.013
603_Mean_OPUS–5265	556.253	-829.325	2.835	0.011	0.014
603_Mean_OPUS–5266	552.553	-830.176	2.847	0.01	0.013
603_Mean_OPUS–5267	549.336	-830.645	2.63	0.011	0.013
603_Mean_OPUS–5268	545.978	-831.319	2.555	0.011	0.014
603_Mean_OPUS–5269	542.655	-831.831	2.213	0.011	0.013
603_Mean_OPUS–5270	539.891	-832.282	1.676	0.011	0.014
603_Mean_OPUS–5271	536.727	-832.942	1.654	0.011	0.013
603_Mean_OPUS–5272	533.832	-833.472	1.687	0.011	0.014
603_Mean_OPUS–5273	530.667	-834.044	1.684	0.011	0.014
603_Mean_OPUS–5274	527.881	-834.627	1.643	0.011	0.013
603_Mean_OPUS–5275	524.829	-835.074	1.654	0.011	0.013

Name	dN (USft)	dE (USft)	dHt (USft)	Horz RMS	Vert RMS
603_Mean_OPUS–5276	521.061	-835.772	1.582	0.011	0.013
603_Mean_OPUS–5277	518.21	-836.368	1.502	0.011	0.013
603_Mean_OPUS–5278	518.127	-836.464	1.487	0.01	0.012
603_Mean_OPUS–5279	514.338	-836.991	1.545	0.011	0.013
603_Mean_OPUS–5280	510.705	-837.78	1.921	0.01	0.012
603_Mean_OPUS–5281	503.733	-839.062	2.008	0.01	0.012
603_Mean_OPUS–5282	496.179	-840.36	1.854	0.01	0.012
603_Mean_OPUS–5283	491.344	-841.387	1.65	0.01	0.012
603_Mean_OPUS–5284	486.28	-842.209	1.57	0.01	0.012
603_Mean_OPUS–5285	481.286	-843.12	1.343	0.011	0.013
603_Mean_OPUS–5286	476.368	-843.969	1.345	0.011	0.013
603_Mean_OPUS–5287	466.517	-845.526	1.224	0.01	0.012
603_Mean_OPUS–5288	457.012	-847.581	1.091	0.01	0.012
603_Mean_OPUS–5289	447.18	-849.422	0.765	0.01	0.012
603_Mean_OPUS–5290	437.043	-851.066	0.377	0.01	0.012
603_Mean_OPUS–5291	427.206	-852.971	0.126	0.01	0.012
603_Mean_OPUS–5292	417.61	-854.683	-0.474	0.01	0.012
603_Mean_OPUS–5293	407.073	-856.46	-0.775	0.011	0.013
603_Mean_OPUS–5294	397.24	-858.546	-1.365	0.01	0.012
603_Mean_OPUS–5295	388.029	-860.125	-1.967	0.011	0.013
603_Mean_OPUS–5296	377.459	-862.228	-2.512	0.01	0.012
603_Mean_OPUS–5297	366.819	-863.948	-2.933	0.01	0.012
603_Mean_OPUS–5298	358.14	-865.593	-3.031	0.011	0.013
603_Mean_OPUS–5299	347.881	-867.476	-3.257	0.01	0.012
603_Mean_OPUS–5300	338.572	-869.075	-3.535	0.01	0.013
603_Mean_OPUS–5301	328.559	-870.886	-3.965	0.012	0.014

Name	dN (USft)	dE (USft)	dHt (USft)	Horz RMS	Vert RMS
603_Mean_OPUS–5302	318.972	-872.599	-4.232	0.018	0.022
603_Mean_OPUS–5303	308.531	-874.505	-4.763	0.012	0.014
603_Mean_OPUS–5304	299.138	-876.278	-5.507	0.012	0.014
603_Mean_OPUS–5305	290.156	-878.014	-6.093	0.014	0.016
603_Mean_OPUS–5306	286.724	-878.37	-6.916	0.014	0.016
603_Mean_OPUS–5307	282.31	-879.235	-6.53	0.013	0.016
603_Mean_OPUS–5308	269.633	-881.804	-6.671	0.016	0.019
603_Mean_OPUS–5309	255.537	-884.151	-7.541	0.01	0.012
603_Mean_OPUS–5310	250.737	-884.968	-8.778	0.031	0.036
603_Mean_OPUS–5311	237.524	-887.531	-9.737	0.017	0.021
603_Mean_OPUS–5312	231.955	-888.55	-10.347	0.015	0.018
603_Mean_OPUS–5313	215.913	-891.446	-13.164	0.015	0.018
603_Mean_OPUS–5314	543.099	-774.945	2.292	0.017	0.02
603_Mean_OPUS–5315	504.358	-912.197	0.967	0.02	0.023
603_Mean_OPUS–5316	439.097	-1143.861	-17.05	0.017	0.02
603_Mean_OPUS–5317	446.208	-1117.791	-15.748	0.016	0.018
603_Mean_OPUS–5318	451.824	-1097.952	-13.93	0.019	0.021
603_Mean_OPUS–5319	456.696	-1081.249	-12.024	0.013	0.015
603_Mean_OPUS–5320	460.269	-1068.298	-8.749	0.025	0.029
603_Mean_OPUS–5321	464.984	-1051.653	-5.734	0.011	0.013
603_Mean_OPUS–5322	470.133	-1033.431	-4.054	0.014	0.016
603_Mean_OPUS–5323	476.663	-1010.226	-2.732	0.01	0.012
603_Mean_OPUS–5324	482.888	-988.18	-1.944	0.011	0.013
603_Mean_OPUS–5325	489.632	-963.802	-0.561	0.011	0.014
603_Mean_OPUS–5326	495.801	-942.017	0.168	0.011	0.014
603_Mean_OPUS–5327	501.546	-921.991	0.776	0.011	0.014

Name	dN (USft)	dE (USft)	dHt (USft)	Horz RMS	Vert RMS
603_Mean_OPUS–5328	506.951	-903.218	1.222	0.011	0.014
603_Mean_OPUS–5329	510.193	-891.369	1.518	0.011	0.014
603_Mean_OPUS–5330	511.234	-887.334	1.596	0.011	0.014
603_Mean_OPUS–5331	512.212	-883.98	1.494	0.011	0.014
603_Mean_OPUS–5332	513.373	-880.365	1.329	0.011	0.014
603_Mean_OPUS–5333	514.286	-877.006	1.196	0.011	0.014
603_Mean_OPUS–5334	515.734	-872.328	1.348	0.011	0.014
603_Mean_OPUS–5335	516.828	-868.2	1.627	0.011	0.014
603_Mean_OPUS–5336	517.918	-864.386	1.821	0.011	0.014
603_Mean_OPUS–5337	519.113	-859.662	1.9	0.011	0.014
603_Mean_OPUS–5338	520.326	-855.685	1.992	0.011	0.014
603_Mean_OPUS–5339	521.489	-850.71	2.118	0.012	0.015
603_Mean_OPUS–5340	522.862	-846.673	1.98	0.012	0.015
603_Mean_OPUS–5341	523.946	-842.452	1.915	0.012	0.015
603_Mean_OPUS–5342	525.018	-838.81	1.718	0.012	0.015
603_Mean_OPUS–5343	526.164	-834.81	1.609	0.012	0.015
603_Mean_OPUS–5344	527.348	-830.977	1.512	0.012	0.015
603_Mean_OPUS–5345	528.441	-827.092	1.198	0.012	0.015
603_Mean_OPUS–5346	529.351	-823.585	1.019	0.012	0.015
603_Mean_OPUS–5347	530.312	-820.431	0.842	0.012	0.015
603_Mean_OPUS–5348	530.785	-818.386	0.918	0.012	0.015
603_Mean_OPUS–5349	531.861	-814.938	1.33	0.012	0.015
603_Mean_OPUS–5350	532.894	-811.538	1.714	0.012	0.015
603_Mean_OPUS–5351	534.822	-804.32	1.976	0.013	0.015
603_Mean_OPUS–5352	538.281	-792.012	2.329	0.013	0.015
603_Mean_OPUS–5353	542.224	-777.718	2.247	0.013	0.015

Name	dN (USft)	dE (USft)	dHt (USft)	Horz RMS	Vert RMS
603_Mean_OPUS–5354	546.198	-764.051	2.134	0.013	0.016
603_Mean_OPUS–5355	552.259	-743.303	1.688	0.013	0.016
603_Mean_OPUS–5356	558.014	-721.759	0.963	0.013	0.015
603_Mean_OPUS–5357	564.233	-700.004	0.024	0.013	0.015
603_Mean_OPUS–5358	570.755	-677.573	-1.477	0.013	0.015
603_Mean_OPUS–5359	576.733	-655.342	-2.313	0.013	0.015
603_Mean_OPUS–5360	582.882	-633.867	-3.518	0.013	0.015
603_Mean_OPUS–5361	589.89	-608.93	-4.827	0.013	0.016
603_Mean_OPUS–5362	596.388	-585.831	-6.414	0.012	0.015
603_Mean_OPUS–5363	602.503	-563.992	-8.096	0.012	0.015
603_Mean_OPUS–5364	608.605	-542.844	-10.108	0.012	0.015
603_Mean_OPUS–5365	614.481	-521.847	-11.841	0.012	0.015
603_Mean_OPUS–5366	620.72	-500.357	-13.026	0.012	0.015
603_Mean_OPUS–5367	626.885	-478.026	-14.166	0.012	0.015
603_Mean_OPUS–5368	632.694	-457.327	-15.529	0.012	0.015
603_Mean_OPUS–5369	639.717	-431.904	-15.818	0.013	0.016
603_Mean_OPUS–5370	647.109	-406.864	-17.316	0.013	0.016
603_Mean_OPUS–5371	654.143	-380.8	-22.46	0.013	0.017
603_Mean_OPUS–5372	662.063	-353.325	-24.391	0.014	0.017
603_Mean_OPUS–5373	669.939	-326.094	-24.942	0.011	0.012
603_Mean_OPUS–5374	-1625.326	-3703.424	-15.03	0.015	0.019
603_Mean_OPUS–5375	-1623.252	-3701.802	-15.089	0.011	0.014
603_Mean_OPUS–5376	-1621.225	-3697.62	-15.111	0.016	0.02
603_Mean_OPUS–5377	-1618.409	-3694.915	-15.128	0.013	0.017
603_Mean_OPUS–5378	-1612.648	-3694.572	-15.16	0.014	0.018
603_Mean_OPUS–5379	-1607.466	-3691.477	-15.081	0.015	0.019

Name	dN (USft)	dE (USft)	dHt (USft)	Horz RMS	Vert RMS
603_Mean_OPUS–5380	-1608.29	-3686.173	-15.136	0.012	0.015
603_Mean_OPUS–5381	-1614.763	-3685.498	-15.135	0.021	0.027
603_Mean_OPUS–5382	-1622.173	-3683.406	-15.052	0.013	0.016
603_Mean_OPUS–5383	-1626.028	-3684.226	-15.055	0.012	0.015
603_Mean_OPUS–5384	-1628.782	-3684.29	-15.065	0.013	0.016
603_Mean_OPUS–5385	-1630.428	-3692.149	-15.087	0.012	0.016
603_Mean_OPUS–5386	-1629.398	-3700.688	-15.078	0.011	0.014
603_Mean_OPUS–5387	-1668.821	-2836.202	-3.62	0.011	0.014
603_Mean_OPUS–5388	-1504.675	-2524.669	-13.137	0.019	0.022
603_Mean_OPUS–5389	-1735.662	-2427.654	-5.219	0.018	0.021
603_Mean_OPUS–5390	-1612.01	-2226.704	-12.463	0.032	0.037
603_Mean_OPUS–5391	702.114	-1018.341	-4.598	0.011	0.014
603_Mean_OPUS–10001	3350.135	-4989.832	-48.6	0.014	0.018
603_Mean_OPUS–10002	-1668.861	-2836.209	-4.316	0.012	0.015
603_Mean_OPUS–10003	-140.134	-2330.633	-25.053	0.011	0.013
603_Mean_OPUS–10004	7124.543	10.184	-71.793	0.011	0.013
603_Mean_OPUS–10005	-1661.034	-3276.737	-12.915	0.013	0.015
603_Mean_OPUS–10006	-1657.122	-3269.846	-12.931	0.012	0.015
603_Mean_OPUS–10007	-1645.964	-3263.625	-12.926	0.012	0.015
603_Mean_OPUS–10008	-1634.485	-3253.804	-12.934	0.012	0.015
603_Mean_OPUS–10009	-1624.055	-3247.82	-12.887	0.012	0.015
603_Mean_OPUS–10010	-1622.199	-3252.381	-12.964	0.013	0.016
603_Mean_OPUS–10011	-1623.731	-3263.992	-12.894	0.012	0.015
603_Mean_OPUS–10012	-1622.833	-3269.279	-12.925	0.012	0.015
603_Mean_OPUS–10013	-1617.634	-3278.867	-12.914	0.012	0.015
603_Mean_OPUS–10014	-1617.386	-3285.995	-12.923	0.012	0.015

Name	dN (USft)	dE (USft)	dHt (USft)	Horz RMS	Vert RMS
603_Mean_OPUS–10015	-1619.42	-3292.673	-12.951	0.013	0.016
603_Mean_OPUS–10016	-1615.483	-3295.377	-12.951	0.014	0.017
603_Mean_OPUS–10017	-1615.683	-3297.224	-12.915	0.013	0.016
603_Mean_OPUS–10018	-1622.362	-3299.737	-12.922	0.013	0.016
603_Mean_OPUS–10019	-1627.769	-3309.44	-12.94	0.012	0.015
603_Mean_OPUS–10020	-1635.502	-3313.371	-12.979	0.012	0.015
603_Mean_OPUS–10021	-1643.592	-3311.489	-12.994	0.013	0.016
603_Mean_OPUS–10022	-1645.98	-3308.165	-12.93	0.012	0.015
603_Mean_OPUS–10023	-1649.839	-3308.128	-12.937	0.012	0.015
603_Mean_OPUS–10024	-1652.912	-3295.855	-12.916	0.012	0.015
603_Mean_OPUS–10025	-1658.78	-3281.295	-12.953	0.012	0.015
603_Mean_OPUS–10026	-1660.838	-3279.023	-12.909	0.012	0.015
603_Mean_OPUS–10027	-1595.402	-3437.118	-15.631	0.013	0.016
603_Mean_OPUS–10028	-1588.859	-3431.576	-15.703	0.012	0.015
603_Mean_OPUS–10029	-1584.079	-3424.028	-15.625	0.016	0.02
603_Mean_OPUS–10030	-1579.093	-3417.445	-15.682	0.013	0.016
603_Mean_OPUS–10031	-1573.492	-3409.31	-15.689	0.012	0.015
603_Mean_OPUS–10032	-1570.5	-3406.814	-15.65	0.013	0.016
603_Mean_OPUS–10033	-1567.963	-3408.87	-15.696	0.013	0.016
603_Mean_OPUS–10034	-1576.582	-3423.122	-15.671	0.012	0.015
603_Mean_OPUS–10035	-1577.786	-3437.177	-15.698	0.013	0.016
603_Mean_OPUS–10036	-1573.999	-3452.214	-15.655	0.013	0.017
603_Mean_OPUS–10037	-1572.664	-3457.225	-15.629	0.013	0.017
603_Mean_OPUS–10038	-1558.441	-3457.64	-15.613	0.013	0.017
603_Mean_OPUS–10039	-1550.193	-3459.947	-15.65	0.013	0.017
603_Mean_OPUS–10040	-1539.644	-3469.363	-15.656	0.013	0.017

Name	dN (USft)	dE (USft)	dHt (USft)	Horz RMS	Vert RMS
603_Mean_OPUS–10041	-1532.924	-3478.339	-15.684	0.013	0.017
603_Mean_OPUS–10042	-1539.862	-3491.02	-15.659	0.013	0.016
603_Mean_OPUS–10043	-1547.136	-3499.174	-15.651	0.013	0.016
603_Mean_OPUS–10044	-1556.157	-3508.969	-15.619	0.013	0.017
603_Mean_OPUS–10045	-1568.957	-3505.493	-15.654	0.013	0.016
603_Mean_OPUS–10046	-1578.186	-3495.24	-15.622	0.012	0.016
603_Mean_OPUS–10047	-1593.795	-3494.811	-15.617	0.012	0.016
603_Mean_OPUS–10048	-1594.443	-3492.133	-15.565	0.013	0.017
603_Mean_OPUS–10049	-1585.288	-3488.322	-15.674	0.013	0.017
603_Mean_OPUS–10050	-1587.066	-3475.778	-15.723	0.013	0.017
603_Mean_OPUS–10051	-1596.854	-3473.996	-15.67	0.013	0.016
603_Mean_OPUS–10052	-1598.277	-3469.357	-15.638	0.012	0.016
603_Mean_OPUS–10053	-1604.162	-3470.854	-15.468	0.012	0.016
603_Mean_OPUS–10054	-1605.963	-3456.212	-15.511	0.012	0.016
603_Mean_OPUS–10055	-1606.169	-3443.918	-15.339	0.012	0.016
603_Mean_OPUS–10056	-1606.532	-3443.623	-15.239	0.011	0.015
603_Mean_OPUS–10057	-1601.155	-3442.741	-15.616	0.012	0.015
603_Mean_OPUS–10058	-1596.063	-3438.252	-15.647	0.011	0.014
603_Mean_OPUS–10059	-1508.037	-3817.532	-15.444	0.012	0.016
603_Mean_OPUS–10060	-1505.226	-3820.266	-15.425	0.012	0.016
603_Mean_OPUS–10061	-1508.241	-3826.832	-15.41	0.013	0.017
603_Mean_OPUS–10062	-1516.276	-3827.623	-15.41	0.012	0.016
603_Mean_OPUS–10063	-1518	-3819.073	-15.494	0.013	0.017
603_Mean_OPUS–10064	-1513.218	-3816.486	-15.439	0.012	0.016
603_Mean_OPUS–10065	-1252.711	-3626.835	-19.31	0.013	0.017
603_Mean_OPUS–10066	-1246.804	-3615.698	-19.313	0.012	0.016

Name	dN (USft)	dE (USft)	dHt (USft)	Horz RMS	Vert RMS
603_Mean_OPUS–10067	-1239.338	-3608.136	-19.354	0.012	0.016
603_Mean_OPUS–10068	-1235.89	-3600.412	-19.444	0.013	0.017
603_Mean_OPUS–10069	-1227.622	-3593.644	-19.479	0.012	0.016
603_Mean_OPUS–10070	-1221.191	-3593.014	-19.423	0.013	0.017
603_Mean_OPUS–10071	-1220.343	-3596.484	-19.527	0.013	0.017
603_Mean_OPUS–10072	-1227.675	-3601.708	-19.456	0.012	0.016
603_Mean_OPUS–10073	-1234.205	-3612.971	-19.36	0.012	0.016
603_Mean_OPUS–10074	-1240.568	-3622.754	-19.401	0.013	0.017
603_Mean_OPUS–10075	-1248.054	-3629.952	-19.307	0.012	0.016
603_Mean_OPUS–10076	-1095	-3529.345	-22.227	0.012	0.016
603_Mean_OPUS–10077	-1095.891	-3529.895	-22.17	0.012	0.016
603_Mean_OPUS–10078	-1088.692	-3538.539	-24.491	0.013	0.017
603_Mean_OPUS–10079	-1089.295	-3540.074	-24.422	0.012	0.016
603_Mean_OPUS–10080	-1080.708	-3539.169	-24.579	0.013	0.017
603_Mean_OPUS–10081	-1080.181	-3537.301	-24.53	0.012	0.016
603_Mean_OPUS–10082	-1072.855	-3544.526	-24.607	0.012	0.016
603_Mean_OPUS–10083	-1071.479	-3542.492	-24.627	0.013	0.017
603_Mean_OPUS–10084	-1067.468	-3542.694	-24.709	0.012	0.016
603_Mean_OPUS–10085	-1063.97	-3543.001	-24.692	0.012	0.016
603_Mean_OPUS–10086	-1066.657	-3536.153	-24.817	0.012	0.016
603_Mean_OPUS–10087	-1069.779	-3532.503	-24.751	0.012	0.016
603_Mean_OPUS–10088	-1059.346	-3536.043	-25.054	0.012	0.016
603_Mean_OPUS–10089	-1056.669	-3538.969	-25.175	0.013	0.017
603_Mean_OPUS–10090	-1051.296	-3526.173	-25.808	0.012	0.016
603_Mean_OPUS–10091	-1052.888	-3524.668	-25.853	0.011	0.013
603_Mean_OPUS–10092	-1035.869	-3527.972	-26.639	0.012	0.014

Name	dN (USft)	dE (USft)	dHt (USft)	Horz RMS	Vert RMS
603_Mean_OPUS–10093	-1035.568	-3525.125	-26.481	0.012	0.014
603_Mean_OPUS–10094	-1030.142	-3521.25	-26.511	0.011	0.013
603_Mean_OPUS–10095	-1026.356	-3520.903	-26.569	0.011	0.013
603_Mean_OPUS–10096	-1017.468	-3528.127	-26.648	0.012	0.014
603_Mean_OPUS–10097	-1028.893	-3524.659	-26.6	0.011	0.013
603_Mean_OPUS–10098	-1022.026	-3529.633	-26.621	0.012	0.014
603_Mean_OPUS–10099	-1005.955	-3528.461	-26.8	0.012	0.014
603_Mean_OPUS–10100	-1008.41	-3523.767	-26.735	0.012	0.014
603_Mean_OPUS–10101	-990.075	-3529.906	-27.791	0.013	0.016
603_Mean_OPUS–10102	-990.395	-3534.195	-27.845	0.011	0.013
603_Mean_OPUS–10103	-976.3	-3540.86	-28.295	0.012	0.014
603_Mean_OPUS–10104	-975.814	-3537.654	-28.307	0.011	0.013
603_Mean_OPUS–10105	-1087.623	-3609.921	-24.052	0.02	0.022
603_Mean_OPUS–10106	-1077.539	-3609.954	-24.214	0.01	0.011
603_Mean_OPUS–10107	-1070.205	-3609.147	-24.483	0.011	0.012
603_Mean_OPUS–10108	-1060.773	-3603.469	-24.811	0.011	0.012
603_Mean_OPUS–10109	-1057.279	-3597.628	-24.856	0.011	0.013
603_Mean_OPUS–10110	-1038.831	-3593.899	-25.486	0.011	0.013
603_Mean_OPUS–10111	-1030.179	-3596.425	-26.174	0.011	0.013
603_Mean_OPUS–10112	-1018.563	-3590.292	-26.575	0.011	0.013
603_Mean_OPUS–10113	-1015.136	-3587.233	-26.804	0.011	0.013
603_Mean_OPUS–10114	-1014.826	-3583.779	-27.11	0.011	0.013
603_Mean_OPUS–10115	-1009.48	-3581.967	-27.359	0.011	0.013
603_Mean_OPUS–10116	-1003.515	-3580.782	-27.431	0.011	0.013
603_Mean_OPUS–10117	-993.137	-3583.269	-28.121	0.011	0.013
603_Mean_OPUS–10118	-988.271	-3586.061	-28.839	0.011	0.013

Name	dN (USft)	dE (USft)	dHt (USft)	Horz RMS	Vert RMS
603_Mean_OPUS–10119	-983.432	-3590.811	-29.3	0.011	0.013
603_Mean_OPUS–10120	-981.068	-3596.853	-29.571	0.011	0.013
603_Mean_OPUS–10121	-974.128	-3600.373	-29.593	0.012	0.013
603_Mean_OPUS–10122	-970.309	-3601.41	-29.637	0.011	0.013
603_Mean_OPUS–10123	-962.706	-3600.103	-29.656	0.012	0.013
603_Mean_OPUS–10124	-955.509	-3596.433	-29.729	0.011	0.013
603_Mean_OPUS–10125	-947.708	-3596.385	-30.035	0.011	0.013
603_Mean_OPUS–10126	-941.016	-3587.067	-30.174	0.011	0.013
603_Mean_OPUS–10127	-938.831	-3584.462	-30.209	0.011	0.013
603_Mean_OPUS–10128	-930.993	-3579.21	-30.233	0.011	0.013
603_Mean_OPUS–10129	-929.597	-3574.984	-30.237	0.011	0.013
603_Mean_OPUS–10130	-930.325	-3570.13	-30.298	0.011	0.013
603_Mean_OPUS–10131	-923.594	-3565.331	-30.648	0.013	0.015
603_Mean_OPUS–10132	-916.936	-3563.684	-30.984	0.011	0.013
603_Mean_OPUS–10133	-909.799	-3559.813	-31.501	0.012	0.014
603_Mean_OPUS–10134	-898.332	-3553.641	-31.627	0.011	0.013
603_Mean_OPUS–10135	-140.109	-2330.629	-25.071	0.011	0.013
603_Mean_OPUS–10136	7124.533	10.181	-72.282	0.011	0.014
603_Mean_OPUS–10137	-895.147	-3547.046	-31.603	0.012	0.015
603_Mean_OPUS–10138	-884.571	-3542.03	-31.9	0.012	0.015
603_Mean_OPUS–10139	-869.979	-3538.791	-32.055	0.013	0.014
603_Mean_OPUS–10140	-850.755	-3543.331	-32.205	0.012	0.014
603_Mean_OPUS–10141	-843.725	-3550.729	-32.261	0.013	0.014
603_Mean_OPUS–10142	-833.915	-3543.482	-32.313	0.013	0.015
603_Mean_OPUS–10143	-830.411	-3547.369	-32.312	0.012	0.014
603_Mean_OPUS–10144	-823.938	-3547.626	-32.474	0.013	0.015

Name	dN (USft)	dE (USft)	dHt (USft)	Horz RMS	Vert RMS
603_Mean_OPUS–10145	-823.171	-3540.863	-32.429	0.013	0.015
603_Mean_OPUS–10146	-817.944	-3539.042	-32.3	0.012	0.014
603_Mean_OPUS–10147	-817.967	-3544.704	-32.334	0.012	0.014
603_Mean_OPUS–10148	-811.564	-3550.614	-32.434	0.012	0.014
603_Mean_OPUS–10149	-803.119	-3544.182	-32.421	0.012	0.014
603_Mean_OPUS–10150	-813.37	-3534.353	-32.349	0.012	0.014
603_Mean_OPUS–10151	-805.199	-3527.878	-32.253	0.012	0.014
603_Mean_OPUS–10152	-798.038	-3528.972	-32.292	0.013	0.015
603_Mean_OPUS–10153	-791.988	-3525.383	-32.441	0.012	0.014
603_Mean_OPUS–10154	-790.959	-3512.408	-32.426	0.012	0.014
603_Mean_OPUS–10155	-780.083	-3499.337	-32.307	0.012	0.014
603_Mean_OPUS–10156	-769.039	-3509.571	-32.344	0.012	0.014
603_Mean_OPUS–10157	-756.445	-3504.242	-32.373	0.012	0.014
603_Mean_OPUS–10158	-739.774	-3504.791	-32.366	0.012	0.014
603_Mean_OPUS–10159	-727.02	-3506.913	-32.392	0.012	0.014
603_Mean_OPUS–10160	-713.731	-3501.842	-32.304	0.012	0.014
603_Mean_OPUS–10161	-701.998	-3491.857	-32.34	0.012	0.014
603_Mean_OPUS–10162	-694.931	-3490.126	-32.357	0.013	0.015
603_Mean_OPUS–10163	-684.434	-3484.821	-32.43	0.012	0.014
603_Mean_OPUS–10164	-676.703	-3484.499	-32.548	0.013	0.015
603_Mean_OPUS–10165	-675.62	-3480.973	-32.583	0.012	0.014
603_Mean_OPUS–10166	-671.155	-3479.436	-32.546	0.012	0.014
603_Mean_OPUS–10167	-666.755	-3484.143	-32.554	0.013	0.015
603_Mean_OPUS–10168	-659.949	-3483.183	-32.947	0.012	0.014
603_Mean_OPUS–10169	-650.794	-3480.257	-33.12	0.013	0.015
603_Mean_OPUS–10170	-648.398	-3475.79	-33.166	0.012	0.014

Name	dN (USft)	dE (USft)	dHt (USft)	Horz RMS	Vert RMS
603_Mean_OPUS−10171	-639.066	-3467.926	-33.143	0.013	0.015
603_Mean_OPUS−10172	-631.183	-3460.284	-33.164	0.012	0.015
603_Mean_OPUS−10173	-611.137	-3458.855	-33.199	0.012	0.015
603_Mean_OPUS−10174	-594.964	-3459.959	-33.099	0.012	0.014
603_Mean_OPUS−10175	-592.873	-3461.207	-33.164	0.012	0.014
603_Mean_OPUS−10176	-537.159	-3467.605	-34.297	0.012	0.014
603_Mean_OPUS−10177	-528.224	-3464.761	-34.559	0.012	0.014
603_Mean_OPUS−10178	-518.587	-3455.287	-34.779	0.012	0.014
603_Mean_OPUS−10179	-509.164	-3448.286	-34.883	0.011	0.014
603_Mean_OPUS−10180	-501.69	-3449.095	-34.898	0.011	0.014
603_Mean_OPUS−10181	-497.667	-3443.196	-34.908	0.012	0.014
603_Mean_OPUS−10182	-487.194	-3439.815	-35.186	0.011	0.014
603_Mean_OPUS−10183	-473.78	-3433.916	-35.251	0.011	0.014
603_Mean_OPUS−10184	-457.437	-3428.459	-35.351	0.012	0.014
603_Mean_OPUS−10185	-441.336	-3424.377	-35.428	0.012	0.014
603_Mean_OPUS−10186	-435.608	-3422.849	-35.642	0.011	0.014
603_Mean_OPUS−10187	-424.571	-3423.432	-35.747	0.011	0.013
603_Mean_OPUS−10188	-415.597	-3423.754	-35.899	0.011	0.013
603_Mean_OPUS−10189	-405.802	-3424.021	-35.906	0.011	0.014
603_Mean_OPUS−10190	-398.441	-3427.736	-36.032	0.011	0.013
603_Mean_OPUS−10191	-384.313	-3422.183	-36.055	0.011	0.013
603_Mean_OPUS−10192	-381.286	-3427.267	-36.085	0.011	0.013
603_Mean_OPUS−10193	-367.372	-3424.444	-36.245	0.011	0.013
603_Mean_OPUS−10194	-367.896	-3418.33	-36.313	0.011	0.014
603_Mean_OPUS−10195	-366.079	-3410.565	-36.266	0.011	0.013
603_Mean_OPUS−10196	-355.95	-3405.306	-36.309	0.011	0.014

Name	dN (USft)	dE (USft)	dHt (USft)	Horz RMS	Vert RMS
603_Mean_OPUS–10197	-348.869	-3402.148	-36.372	0.011	0.013
603_Mean_OPUS–10198	-342.706	-3396.752	-36.438	0.014	0.025
603_Mean_OPUS–10199	-329.579	-3397.161	-36.474	0.011	0.013
603_Mean_OPUS–10200	-318.324	-3392.233	-36.579	0.011	0.013
603_Mean_OPUS–10201	-307.986	-3387.34	-36.634	0.011	0.013
603_Mean_OPUS–10202	-295.016	-3387.562	-36.695	0.011	0.014
603_Mean_OPUS–10203	-284.67	-3381.708	-36.69	0.011	0.014
603_Mean_OPUS–10204	-274.094	-3374.547	-36.767	0.011	0.013
603_Mean_OPUS–10205	-267.491	-3373.302	-36.843	0.011	0.013
603_Mean_OPUS–10206	-257.647	-3376.006	-36.839	0.011	0.014
603_Mean_OPUS–10207	-253.769	-3375.549	-36.792	0.011	0.013
603_Mean_OPUS–10208	-244.437	-3372.192	-36.822	0.011	0.013
603_Mean_OPUS–10209	-230.963	-3370.713	-37.061	0.011	0.013
603_Mean_OPUS–10210	-223.522	-3364.109	-37.062	0.011	0.013
603_Mean_OPUS–10211	-212.977	-3375.281	-37.353	0.011	0.013
603_Mean_OPUS–10212	-204.049	-3377.921	-37.328	0.011	0.013
603_Mean_OPUS–10213	-190.1	-3381.803	-37.497	0.011	0.014
603_Mean_OPUS–10214	-181.998	-3373.646	-37.789	0.011	0.013
603_Mean_OPUS–10215	-167.783	-3384.127	-37.912	0.011	0.013
603_Mean_OPUS–10216	-152.864	-3389.049	-38.136	0.011	0.013
603_Mean_OPUS–10217	-151.306	-3393.588	-38.091	0.011	0.013
603_Mean_OPUS–10218	-146.999	-3396.224	-38.478	0.011	0.014
603_Mean_OPUS–10219	-145.677	-3391.642	-38.438	0.011	0.014
603_Mean_OPUS–10220	-135.254	-3391.481	-38.491	0.011	0.014
603_Mean_OPUS–10221	-131.042	-3395.189	-38.445	0.011	0.013
603_Mean_OPUS–10222	-126.576	-3397.694	-38.52	0.01	0.013

Name	dN (USft)	dE (USft)	dHt (USft)	Horz RMS	Vert RMS
603_Mean_OPUS–10223	-124.234	-3397.716	-38.708	0.01	0.013
603_Mean_OPUS–10224	-121.784	-3393.965	-38.578	0.011	0.013
603_Mean_OPUS–10225	-124.191	-3382.631	-38.513	0.01	0.012
603_Mean_OPUS–10226	-124.31	-3367.063	-38.529	0.011	0.013
603_Mean_OPUS–10227	-122.226	-3359.399	-38.455	0.011	0.013
603_Mean_OPUS–10228	-114.742	-3337.903	-38.451	0.011	0.013
603_Mean_OPUS–10229	-117.079	-3329.723	-38.419	0.01	0.012
603_Mean_OPUS–10230	-116.177	-3322.625	-38.441	0.011	0.013
603_Mean_OPUS–10231	-104.402	-3309.496	-38.422	0.011	0.013
603_Mean_OPUS–10232	-95.242	-3296.255	-38.373	0.01	0.012
603_Mean_OPUS–10233	-92.866	-3285.062	-38.334	0.011	0.012
603_Mean_OPUS–10234	-140.1	-2330.618	-24.672	0.012	0.017
603_Mean_OPUS–10235	-140.12	-2330.598	-24.664	0.012	0.015
603_Mean_OPUS–10236	-140.088	-2330.637	-25.238	0.015	0.022
603_Mean_OPUS–10237	521.219	-816.563	1.865	0.012	0.016
603_Mean_OPUS–10238	521.931	-816.741	1.806	0.012	0.016
603_Mean_OPUS–10239	517.087	-826.604	1.562	0.011	0.015
603_Mean_OPUS–10240	512.171	-833.583	1.849	0.011	0.015
603_Mean_OPUS–10241	510.321	-840.13	1.954	0.012	0.015
603_Mean_OPUS–10242	507.269	-838.435	1.929	0.011	0.014
603_Mean_OPUS–10243	504.087	-847.271	1.783	0.011	0.014
603_Mean_OPUS–10244	506.836	-856.497	1.852	0.011	0.014
603_Mean_OPUS–10245	506.171	-870.81	1.816	0.012	0.014
603_Mean_OPUS–10246	505.993	-876.321	1.716	0.012	0.014
603_Mean_OPUS–10247	504.75	-877.137	1.697	0.011	0.014
603_Mean_OPUS–10248	505.131	-881.545	1.777	0.011	0.014

Name	dN (USft)	dE (USft)	dHt (USft)	Horz RMS	Vert RMS
603_Mean_OPUS–10249	506.706	-887.489	1.623	0.011	0.014
603_Mean_OPUS–10250	512.673	-888.169	1.626	0.011	0.014
603_Mean_OPUS–10251	524.098	-887.453	1.79	0.011	0.014
603_Mean_OPUS–10252	526.568	-886.465	1.797	0.011	0.014
603_Mean_OPUS–10253	526.421	-886.971	1.714	0.011	0.014
603_Mean_OPUS–10254	528.928	-880.983	2.176	0.011	0.014
603_Mean_OPUS–10255	533.106	-871.489	2.643	0.011	0.014
603_Mean_OPUS–10256	535.974	-859.07	2.677	0.012	0.015
603_Mean_OPUS–10257	537.746	-849.096	2.676	0.011	0.014
603_Mean_OPUS–10258	543.492	-841.275	2.862	0.011	0.014
603_Mean_OPUS–10259	546	-833.829	2.555	0.011	0.014
603_Mean_OPUS–10260	545.384	-830.818	2.483	0.011	0.014
603_Mean_OPUS–10261	545.294	-830.867	2.456	0.011	0.014
603_Mean_OPUS–10262	548.233	-822.827	2.401	0.011	0.014
603_Mean_OPUS–10263	545.853	-818.002	2.371	0.011	0.014
603_Mean_OPUS–10264	543.757	-810.908	2.241	0.012	0.015
603_Mean_OPUS–10265	543.444	-811.495	2.09	0.011	0.014
603_Mean_OPUS–10266	538.245	-804.121	2.161	0.011	0.014
603_Mean_OPUS–10267	531.397	-807.652	1.934	0.012	0.015
603_Mean_OPUS–10268	523.309	-811.461	2.072	0.012	0.015
603_Mean_OPUS–10269	520.991	-806.849	1.946	0.012	0.015
603_Mean_OPUS–10270	515.3	-800.721	1.948	0.012	0.015
603_Mean_OPUS–10271	507.193	-809.232	1.893	0.012	0.015
603_Mean_OPUS–10272	512.8	-816.388	2.077	0.011	0.014
603_Mean_OPUS–10273	508.009	-823.292	2.126	0.011	0.014
603_Mean_OPUS–10274	498.221	-819.528	1.877	0.011	0.014

Name	dN (USft)	dE (USft)	dHt (USft)	Horz RMS	Vert RMS
603_Mean_OPUS–10275	494.344	-828.219	1.772	0.011	0.014
603_Mean_OPUS–10276	502.552	-834.286	1.997	0.011	0.014
603_Mean_OPUS–10277	498.172	-843.11	1.95	0.011	0.014
603_Mean_OPUS–10278	488.418	-839.401	1.593	0.011	0.014
603_Mean_OPUS–10279	484.727	-848.838	1.546	0.011	0.014
603_Mean_OPUS–10280	495.598	-851.607	1.798	0.011	0.014
603_Mean_OPUS–10281	502.888	-855.305	1.918	0.011	0.014
603_Mean_OPUS–10282	502.222	-863.393	1.713	0.011	0.014
603_Mean_OPUS–10283	492.588	-863.039	1.842	0.011	0.014
603_Mean_OPUS–10284	484.115	-858.996	1.691	0.011	0.014
603_Mean_OPUS–10285	478.575	-867.671	1.776	0.011	0.014
603_Mean_OPUS–10286	491.716	-872.509	1.978	0.011	0.014
603_Mean_OPUS–10287	500.768	-874.721	1.906	0.011	0.014
603_Mean_OPUS–10288	501.937	-881.366	1.659	0.011	0.014
603_Mean_OPUS–10289	491.78	-881.689	1.718	0.011	0.014
603_Mean_OPUS–10290	482.685	-883.491	1.67	0.011	0.014
603_Mean_OPUS–10291	484.574	-895.135	1.41	0.011	0.014
603_Mean_OPUS–10292	493.743	-898.086	1.526	0.01	0.013
603_Mean_OPUS–10293	498.473	-889.093	1.815	0.01	0.013
603_Mean_OPUS–10294	510.375	-891.685	1.559	0.01	0.013
603_Mean_OPUS–10295	505.375	-900.332	1.615	0.01	0.013
603_Mean_OPUS–10296	509.893	-905.802	1.096	0.01	0.013
603_Mean_OPUS–10297	518.16	-911.164	0.963	0.01	0.013
603_Mean_OPUS–10298	498.441	-910.063	1.165	0.01	0.012
603_Mean_OPUS–10299	528.24	-916.308	0.935	0.01	0.012
603_Mean_OPUS–10300	530.636	-905.332	1.444	0.01	0.012

Name	dN (USft)	dE (USft)	dHt (USft)	Horz RMS	Vert RMS
603_Mean_OPUS–10301	521.674	-898.737	1.366	0.01	0.013
603_Mean_OPUS–10302	513.858	-896.421	1.464	0.01	0.013
603_Mean_OPUS–10303	527.39	-891.044	1.726	0.01	0.013
603_Mean_OPUS–10304	535.182	-899.195	1.827	0.01	0.013
603_Mean_OPUS–10305	541.505	-889.349	2.249	0.01	0.013
603_Mean_OPUS–10306	531.609	-884.191	2.118	0.011	0.014
603_Mean_OPUS–10307	534.78	-873.688	2.598	0.01	0.013
603_Mean_OPUS–10308	544.936	-877.748	2.507	0.01	0.013
603_Mean_OPUS–10309	549.692	-869.355	2.962	0.011	0.014
603_Mean_OPUS–10310	540.72	-862.059	2.761	0.01	0.013
603_Mean_OPUS–10311	541.004	-851.365	2.72	0.01	0.013
603_Mean_OPUS–10312	550.098	-855.178	2.858	0.011	0.014
603_Mean_OPUS–10313	552.808	-863.1	2.951	0.01	0.013
603_Mean_OPUS–10314	554.989	-846.613	2.969	0.011	0.014
603_Mean_OPUS–10315	548.497	-845.027	2.886	0.011	0.014
603_Mean_OPUS–10316	545.143	-842.38	3.034	0.011	0.014
603_Mean_OPUS–10317	549.518	-833.552	2.761	0.01	0.013
603_Mean_OPUS–10318	559.975	-834.278	2.93	0.01	0.013
603_Mean_OPUS–10319	552.489	-823.458	2.669	0.01	0.013
603_Mean_OPUS–10320	560.41	-819.29	2.638	0.011	0.014
603_Mean_OPUS–10321	554.564	-807.434	2.444	0.01	0.013
603_Mean_OPUS–10322	547.067	-812.247	2.341	0.01	0.013
603_Mean_OPUS–10323	544.131	-804.8	2.367	0.01	0.013
603_Mean_OPUS–10324	545.639	-794.906	2.426	0.01	0.013
603_Mean_OPUS–10325	522.848	-794.211	2.065	0.01	0.013
603_Mean_OPUS–10326	529.276	-804.575	1.92	0.01	0.013

Name	dN (USft)	dE (USft)	dHt (USft)	Horz RMS	Vert RMS
603_Mean_OPUS–10327	538.856	-799.928	2.199	0.01	0.013
603_Mean_OPUS–10328	534.682	-785.762	2.198	0.01	0.013
603_Mean_OPUS–10329	531.499	-817.366	1.008	0.01	0.013
603_Mean_OPUS–10330	527.474	-818.036	1.023	0.01	0.013
603_Mean_OPUS–10331	523.812	-820.971	1.128	0.011	0.014
603_Mean_OPUS–10332	517.75	-829.295	1.288	0.011	0.014
603_Mean_OPUS–10333	514.543	-836.983	1.489	0.01	0.013
603_Mean_OPUS–10334	511.494	-841.715	1.473	0.01	0.013
603_Mean_OPUS–10335	509.735	-847.256	1.495	0.01	0.013
603_Mean_OPUS–10336	511.736	-856.017	1.856	0.011	0.014
603_Mean_OPUS–10337	510.049	-864.286	1.736	0.011	0.014
603_Mean_OPUS–10338	508.446	-873.634	1.413	0.011	0.014
603_Mean_OPUS–10339	511.505	-880.209	1.32	0.019	0.023
603_Mean_OPUS–10340	517.956	-883.364	1.211	0.01	0.013
603_Mean_OPUS–10341	520.897	-881.103	1.009	0.01	0.013
603_Mean_OPUS–10342	519.788	-877.841	1.143	0.011	0.014
603_Mean_OPUS–10343	522.016	-870.971	1.426	0.011	0.013
603_Mean_OPUS–10344	525.251	-865.166	1.885	0.011	0.013
603_Mean_OPUS–10345	527.844	-855.501	2.041	0.011	0.013
603_Mean_OPUS–10346	529.731	-846.355	1.984	0.011	0.013
603_Mean_OPUS–10347	529.83	-840.047	1.728	0.011	0.013
603_Mean_OPUS–10348	535.167	-834.902	1.63	0.011	0.013
603_Mean_OPUS–10349	539.945	-830.031	1.469	0.011	0.013
603_Mean_OPUS–10350	538.314	-823.802	1.294	0.011	0.014
603_Mean_OPUS–10351	533.336	-819.936	1.108	0.011	0.013
603_Mean_OPUS–10352	535.973	-814.343	1.647	0.011	0.014

Name	dN (USft)	dE (USft)	dHt (USft)	Horz RMS	Vert RMS
603_Mean_OPUS–10353	542.988	-819.232	1.921	0.011	0.014
603_Mean_OPUS–10354	532.547	-831.436	1.568	0.011	0.013
603_Mean_OPUS–10355	528.276	-839.113	1.79	0.01	0.012
603_Mean_OPUS–10356	524.439	-848.312	2.025	0.01	0.012
603_Mean_OPUS–10357	522.698	-857.765	2.061	0.01	0.012
603_Mean_OPUS–10358	521.331	-866.711	1.793	0.01	0.012
603_Mean_OPUS–10359	518.425	-871.596	1.52	0.01	0.012
603_Mean_OPUS–10360	514.195	-867.835	1.568	0.01	0.012
603_Mean_OPUS–10361	514.276	-859.759	1.827	0.011	0.013
603_Mean_OPUS–10362	517.223	-850.132	2.012	0.01	0.012
603_Mean_OPUS–10363	519.648	-844.383	1.984	0.011	0.013
603_Mean_OPUS–10364	522.397	-838.298	1.656	0.01	0.012
603_Mean_OPUS–10365	526.923	-831.94	1.53	0.011	0.013
603_Mean_OPUS–10366	528.915	-814.595	1.529	0.01	0.012
603_Mean_OPUS–10367	532.915	-824.048	1.407	0.01	0.012
603_Mean_OPUS–10368	541.984	-828.155	1.643	0.01	0.012
603_Mean_OPUS–10369	537.965	-834.703	1.821	0.01	0.012
603_Mean_OPUS–10370	539.955	-839.988	2.487	0.01	0.012
603_Mean_OPUS–10371	531.334	-834.481	1.698	0.01	0.012
603_Mean_OPUS–10372	520.283	-830.096	1.323	0.01	0.012
603_Mean_OPUS–10373	513.807	-841.86	1.508	0.01	0.012
603_Mean_OPUS–10374	517.935	-844.393	1.823	0.01	0.012
603_Mean_OPUS–10375	522.27	-846.634	2.009	0.01	0.012
603_Mean_OPUS–10376	525.445	-837.967	1.689	0.01	0.012
603_Mean_OPUS–10377	528.788	-833.113	1.56	0.01	0.012
603_Mean_OPUS–10378	531.235	-850.118	2.09	0.01	0.012

Name	dN (USft)	dE (USft)	dHt (USft)	Horz RMS	Vert RMS
603_Mean_OPUS–10379	528.827	-861.306	2.13	0.011	0.013
603_Mean_OPUS–10380	518.229	-857.729	1.936	0.011	0.013
603_Mean_OPUS–10381	518.341	-865.707	1.795	0.01	0.012
603_Mean_OPUS–10382	524.771	-879.183	1.703	0.01	0.012
603_Mean_OPUS–10383	527.797	-870.481	2.007	0.01	0.012
603_Mean_OPUS–10384	511.591	-884.452	1.551	0.01	0.012
603_Mean_OPUS–10385	516.415	-877.887	1.164	0.01	0.012
603_Mean_OPUS–10386	512.065	-875.042	1.257	0.011	0.013
603_Mean_OPUS–10387	515.519	-873.493	1.246	0.012	0.014
603_Mean_OPUS–10388	512.415	-871.878	1.343	0.01	0.012
603_Mean_OPUS–10389	584.204	-840.057	2.708	0.01	0.012
603_Mean_OPUS–10390	584.673	-840.252	2.835	0.011	0.013
603_Mean_OPUS–10391	590.273	-841.54	2.958	0.01	0.012
603_Mean_OPUS–10392	597.557	-840.711	2.693	0.011	0.013
603_Mean_OPUS–10393	601.673	-836.008	2.45	0.011	0.013
603_Mean_OPUS–10394	602.769	-831.329	2.442	0.011	0.013
603_Mean_OPUS–10395	602.713	-831.779	2.508	0.01	0.012
603_Mean_OPUS–10396	605.243	-826.567	2.656	0.01	0.012
603_Mean_OPUS–10397	605.08	-819.975	2.385	0.01	0.012
603_Mean_OPUS–10398	604.313	-820.537	2.212	0.01	0.012
603_Mean_OPUS–10399	599.44	-815.615	2.566	0.01	0.013
603_Mean_OPUS–10400	593.281	-811.382	2.692	0.01	0.013
603_Mean_OPUS–10401	585.499	-810.674	2.681	0.01	0.012
603_Mean_OPUS–10402	578.409	-810.012	2.546	0.01	0.012
603_Mean_OPUS–10403	571.87	-810.705	2.478	0.01	0.012
603_Mean_OPUS–10404	568.812	-812.828	2.352	0.01	0.013

Name	dN (USft)	dE (USft)	dHt (USft)	Horz RMS	Vert RMS
603_Mean_OPUS–10405	568.537	-813.218	2.225	0.01	0.012
603_Mean_OPUS–10406	568.017	-819.055	2.526	0.01	0.012
603_Mean_OPUS–10407	570.926	-824.06	2.784	0.01	0.012
603_Mean_OPUS–10408	574.477	-829.317	2.805	0.01	0.013
603_Mean_OPUS–10409	578.199	-834.405	2.781	0.01	0.013
603_Mean_OPUS–10410	581.898	-838.605	2.737	0.01	0.013
603_Mean_OPUS–10411	577.595	-840.93	2.809	0.01	0.012
603_Mean_OPUS–10412	569.766	-843.724	3	0.01	0.012
603_Mean_OPUS–10413	560.62	-844.471	3.025	0.01	0.012
603_Mean_OPUS–10414	568.432	-834.809	3.069	0.01	0.012
603_Mean_OPUS–10415	573.317	-831.6	2.734	0.01	0.012
603_Mean_OPUS–10416	566.67	-824.267	2.863	0.011	0.012
603_Mean_OPUS–10417	558.451	-825.634	2.79	0.01	0.012
603_Mean_OPUS–10418	552.093	-813.177	2.423	0.01	0.012
603_Mean_OPUS–10419	562.824	-805.866	2.521	0.01	0.012
603_Mean_OPUS–10420	555.672	-794.015	2.416	0.01	0.012
603_Mean_OPUS–10421	565.241	-790.802	2.599	0.01	0.012
603_Mean_OPUS–10422	568.131	-798.138	2.597	0.01	0.012
603_Mean_OPUS–10423	571.278	-806.328	2.556	0.01	0.012
603_Mean_OPUS–10424	584.447	-804.193	2.776	0.01	0.012
603_Mean_OPUS–10425	580.616	-796.452	2.496	0.01	0.012
603_Mean_OPUS–10426	571.559	-799.77	2.539	0.01	0.012
603_Mean_OPUS–10427	581.551	-787.832	2.543	0.01	0.012
603_Mean_OPUS–10428	594.543	-787.75	2.574	0.01	0.012
603_Mean_OPUS–10429	590.353	-797.529	2.629	0.01	0.012
603_Mean_OPUS–10430	587.901	-804.632	2.714	0.01	0.012

Name	dN (USft)	dE (USft)	dHt (USft)	Horz RMS	Vert RMS
603_Mean_OPUS–10431	600.182	-809.167	2.879	0.01	0.012
603_Mean_OPUS–10432	604.527	-800.993	2.653	0.01	0.012
603_Mean_OPUS–10433	605.386	-790.138	2.543	0.01	0.012
603_Mean_OPUS–10434	617.095	-792.934	2.129	0.01	0.012
603_Mean_OPUS–10435	610.444	-804.574	2.568	0.01	0.012
603_Mean_OPUS–10436	605.495	-812.23	2.581	0.01	0.012
603_Mean_OPUS–10437	609.902	-821.029	2.357	0.01	0.012
603_Mean_OPUS–10438	616.854	-812.836	2.311	0.01	0.012
603_Mean_OPUS–10439	624.893	-803.486	1.914	0.01	0.012
603_Mean_OPUS–10440	632.756	-809.369	1.524	0.011	0.013
603_Mean_OPUS–10441	636.677	-822.38	1.332	0.01	0.012
603_Mean_OPUS–10442	623.487	-818.797	1.815	0.01	0.012
603_Mean_OPUS–10443	610.917	-826.777	2.368	0.01	0.012
603_Mean_OPUS–10444	607.317	-835.839	2.445	0.01	0.012
603_Mean_OPUS–10445	616.164	-839.826	2.306	0.01	0.012
603_Mean_OPUS–10446	626.512	-846.674	2.191	0.011	0.013
603_Mean_OPUS–10447	636.362	-836.015	1.388	0.011	0.013
603_Mean_OPUS–10448	622.772	-828.064	1.869	0.01	0.012
603_Mean_OPUS–10449	600.686	-841.157	2.737	0.01	0.012
603_Mean_OPUS–10450	605.197	-848.322	2.803	0.01	0.012
603_Mean_OPUS–10451	611.898	-858.546	2.468	0.011	0.013
603_Mean_OPUS–10452	621.997	-852.666	2.23	0.01	0.012
603_Mean_OPUS–10453	606.223	-866.63	2.446	0.011	0.013
603_Mean_OPUS–10454	598.174	-858.505	2.743	0.011	0.013
603_Mean_OPUS–10455	593.439	-848.352	2.911	0.011	0.013
603_Mean_OPUS–10456	581.094	-846.613	2.881	0.011	0.013

Name	dN (USft)	dE (USft)	dHt (USft)	Horz RMS	Vert RMS
603_Mean_OPUS–10457	586.085	-856.038	2.797	0.011	0.013
603_Mean_OPUS–10458	591.68	-866.639	2.63	0.01	0.012
603_Mean_OPUS–10459	578.243	-868.662	2.615	0.01	0.012
603_Mean_OPUS–10460	577.56	-855.917	2.861	0.01	0.012
603_Mean_OPUS–10461	565.355	-848.15	2.885	0.01	0.012
603_Mean_OPUS–10462	559.759	-855.228	2.776	0.011	0.012
603_Mean_OPUS–10463	569.71	-864.31	2.747	0.01	0.012
603_Mean_OPUS–10464	559.262	-867.845	2.715	0.01	0.012
603_Mean_OPUS–10465	599.025	-822.495	1.41	0.011	0.014
603_Mean_OPUS–10466	599.271	-826.244	1.829	0.011	0.014
603_Mean_OPUS–10467	597.392	-831.398	1.996	0.011	0.014
603_Mean_OPUS–10468	589.893	-834.456	2.018	0.011	0.014
603_Mean_OPUS–10469	585.471	-832.281	2.319	0.011	0.014
603_Mean_OPUS–10470	580.119	-824.923	1.958	0.011	0.014
603_Mean_OPUS–10471	575.242	-818.388	1.705	0.011	0.014
603_Mean_OPUS–10472	574.572	-816.543	1.752	0.011	0.014
603_Mean_OPUS–10473	576.98	-816.982	1.798	0.011	0.014
603_Mean_OPUS–10474	582.2	-815.294	1.995	0.011	0.014
603_Mean_OPUS–10475	588.696	-815.179	1.862	0.011	0.014
603_Mean_OPUS–10476	595.05	-817.954	1.834	0.011	0.014
603_Mean_OPUS–10477	597.75	-823.928	1.34	0.011	0.014
603_Mean_OPUS–10478	593.754	-822.316	1.869	0.012	0.015
603_Mean_OPUS–10479	589.649	-821.636	2.206	0.012	0.015
603_Mean_OPUS–10480	585.224	-818.097	2.029	0.012	0.015
603_Mean_OPUS–10481	581.694	-820.029	1.78	0.012	0.015
603_Mean_OPUS–10482	583.771	-823.425	2.097	0.012	0.015

Name	dN (USft)	dE (USft)	dHt (USft)	Horz RMS	Vert RMS
603_Mean_OPUS–10483	588.583	-827.48	2.282	0.012	0.015
603_Mean_OPUS–10484	594.782	-827.425	1.803	0.012	0.015
603_Mean_OPUS–10485	598.511	-834.03	2.301	0.012	0.015
603_Mean_OPUS–10486	591.973	-836.167	2.161	0.012	0.015
603_Mean_OPUS–10487	586.196	-836.578	2.575	0.012	0.015
603_Mean_OPUS–10488	581.217	-830.501	2.337	0.012	0.015
603_Mean_OPUS–10489	577.198	-824.448	2.238	0.012	0.015
603_Mean_OPUS–10490	571.908	-818.813	2.019	0.012	0.015
603_Mean_OPUS–10491	574.779	-813.423	2.153	0.012	0.015
603_Mean_OPUS–10492	580.84	-813.368	2.27	0.013	0.015
603_Mean_OPUS–10493	589.562	-813.041	2.284	0.013	0.015
603_Mean_OPUS–10494	596.143	-815.683	2.226	0.013	0.015
603_Mean_OPUS–10495	601.804	-821.322	2.081	0.013	0.016
603_Mean_OPUS–10496	601.847	-825.757	2.172	0.013	0.016
603_Mean_OPUS–10497	595.803	-760.743	1.555	0.014	0.017
603_Mean_OPUS–10498	594.687	-776.932	2.414	0.013	0.015
603_Mean_OPUS–10499	595.828	-793.247	2.59	0.013	0.015
603_Mean_OPUS–10500	595.514	-807.237	2.903	0.013	0.016
603_Mean_OPUS–10501	595.544	-812.854	2.631	0.013	0.015
603_Mean_OPUS–10502	594.828	-817.787	1.749	0.013	0.015
603_Mean_OPUS–10503	594.964	-821.611	1.478	0.013	0.015
603_Mean_OPUS–10504	594.556	-825.093	1.805	0.013	0.015
603_Mean_OPUS–10505	594.431	-829.512	2.103	0.013	0.015
603_Mean_OPUS–10506	594.859	-834.854	2.197	0.013	0.016
603_Mean_OPUS–10507	594.979	-840.43	2.736	0.012	0.015
603_Mean_OPUS–10508	594.877	-844.487	2.929	0.012	0.015

Name	dN (USft)	dE (USft)	dHt (USft)	Horz RMS	Vert RMS
603_Mean_OPUS–10509	594.107	-854.452	2.899	0.012	0.015
603_Mean_OPUS–10510	596.767	-869.542	2.693	0.013	0.016
603_Mean_OPUS–10511	596.406	-885.686	2.486	0.013	0.016
603_Mean_OPUS–10512	597.394	-901.833	2.017	0.012	0.015
603_Mean_OPUS–10513	597.78	-914.971	1.974	0.012	0.015
603_Mean_OPUS–10514	597.573	-933.199	0.968	0.013	0.016
603_Mean_OPUS–10515	599.052	-949.571	0.666	0.012	0.015
603_Mean_OPUS–10516	596.831	-971.487	-0.214	0.013	0.016
603_Mean_OPUS–10517	596.271	-991.187	-1.27	0.014	0.017
603_Mean_OPUS–10518	596.833	-1007.064	-1.574	0.013	0.016
603_Mean_OPUS–10519	702.087	-1018.341	-4.616	0.012	0.013
603_Mean_OPUS–10520	-1668.844	-2836.204	-3.592	0.012	0.014
2600_Mean_OPUS–5392	1528.773	505.565	-21.328	0.012	0.014
2600_Mean_OPUS–5393	1528.758	505.592	-21.315	0.011	0.011
2600_Mean_OPUS–5394	1528.791	505.563	-21.319	0.011	0.014
2600_Mean_OPUS–5395	62.824	-647.804	-10.599	0.01	0.012
2600_Mean_OPUS–5396	110.486	-678.596	-12.879	0.011	0.013
2600_Mean_OPUS–5397	146.225	-647.895	-12.338	0.011	0.012
2600_Mean_OPUS–5398	110.477	-602.716	-12.504	0.011	0.014
2600_Mean_OPUS–5399	50.405	-843.58	-11.28	0.011	0.014
2600_Mean_OPUS–5400	63.603	-856.866	-11.496	0.012	0.015
2600_Mean_OPUS–5401	50.395	-865.309	-10.804	0.011	0.014
2600_Mean_OPUS–5402	37.13	-856.848	-10.84	0.011	0.014
2600_Mean_OPUS–5403	261.377	-837.612	-14.292	0.011	0.014
2600_Mean_OPUS–5404	289.262	-808.102	-14.907	0.011	0.013
2600_Mean_OPUS–5405	310.398	-837.573	-14.768	0.01	0.012

Name	dN (USft)	dE (USft)	dHt (USft)	Horz RMS	Vert RMS
2600_Mean_OPUS–5406	289.348	-861.73	-14.861	0.011	0.014
2600_Mean_OPUS–5407	321.47	-620.981	-15.178	0.011	0.014
2600_Mean_OPUS–5408	341.21	-601.309	-15.462	0.011	0.015
2600_Mean_OPUS–5409	371.587	-621.08	-15.06	0.013	0.016
2600_Mean_OPUS–5410	341.205	-641.183	-14.933	0.013	0.016
2600_Mean_OPUS–5411	294.207	-541.311	-14.093	0.012	0.015
2600_Mean_OPUS–5412	259.08	-519.546	-13.619	0.012	0.015
2600_Mean_OPUS–5413	231.758	-541.363	-13.742	0.013	0.016
2600_Mean_OPUS–5414	259.092	-564.264	-15.649	0.013	0.016
2600_Mean_OPUS–5415	867.558	-716.287	-28.191	0.013	0.017
2600_Mean_OPUS–5416	879.163	-717.187	-29.106	0.014	0.019
2600_Mean_OPUS–5417	884.851	-728.942	-28.685	0.014	0.02
2600_Mean_OPUS–5418	883.02	-669.322	-28.814	0.014	0.019
2600_Mean_OPUS–5419	891.986	-658.719	-28.513	0.015	0.021
2600_Mean_OPUS–5420	1528.759	505.594	-21.331	0.01	0.012
2600_Mean_OPUS–5421	5019.01	-2153.626	-43.821	0.01	0.012

6. Level Reduction Reports

No differential levelling was performed for this project. The GPS elevations returned by the mean OPUS solution on each primary project control point proved to be very accurate through the project control checkshots and exceeded the required vertical tolerances for the project.

7. Traverse Adjustment Reports

While conventional traversing was not performed on this project, the following spreadsheets have been included that demonstrate how mean OPUS values were calculated for each project control point.

All latutude and longitude values in the tables below are NAD83(2011)(EPOCH: 2010.0000). All ellipsoid heights are given in Meters.

For report brevity, the complete OPUS solutions have not been included, but can be found in the 'OPUS Solution Reports' section of the deliverable directory.

OPUS SOLUTIONS – POINT 1									
LAT	63	19	32.49462	W LON	168	58	15.23734	EL HGT	13.61
LAT	63	19	32.49415	W LON	168	58	15.23622	EL HGT	13.63
LAT	63	19	32.49462	W LON	168	58	15.23705	EL HGT	13.613
MEAN LAT	**63**	**19**	**32.49446**	**MEAN LONG**	**168**	**58**	**15.23687**	**MEAN EL HT**	**13.61767**

OPUS SOLUTIONS – POINT 2									
LAT	63	18	57.71524	W LON	168	57	18.25405	EL HGT	20.899
LAT	63	18	57.71524	W LON	168	57	18.25402	EL HGT	20.624
LAT	63	18	57.71516	W LON	168	57	18.2543	EL HGT	20.776
LAT	63	18	57.71534	W LON	168	57	18.25387	EL HGT	20.449
MEAN LAT	**63**	**19**	**57.715245**	**MEAN LONG**	**168**	**57**	**18.25406**	**MEAN EL HT**	**20.687**

OPUS SOLUTIONS – POINT 59									
LAT	63	20	8.84555	W LON	168	56	24.38538	EL HGT	6.55
LAT	63	20	8.84548	W LON	168	56	24.3852	EL HGT	6.546
LAT	63	20	8.84548	W LON	168	56	24.3852	EL HGT	6.546
LAT	63	20	8.84562	W LON	168	56	24.38542	EL HGT	6.543
LAT	63	20	8.84562	W LON	168	56	24.38542	EL HGT	6.543
MEAN LAT	**63**	**20**	**8.84555**	**MEAN LONG**	**168**	**56**	**24.385324**	**MEAN EL HT**	**6.5456**

OPUS SOLUTIONS – POINT 2600									
LAT	63	18	42.74795	W LON	168	57	29.8651	EL HGT	27.1
LAT	63	18	42.74759	W LON	168	57	29.8643	EL HGT	27.244
LAT	63	18	42.74791	W LON	168	57	29.86445	EL HGT	27.252
LAT	63	18	42.74795	W LON	168	57	29.8651	EL HGT	27.272
MEAN LAT	**63**	**18**	**42.74785**	**MEAN LONG**	**168**	**57**	**29.8647375**	**MEAN EL HT**	**27.217**

OPUS SOLUTIONS – POINT 603									
LAT	63	18	58.71784	W LON	168	56	27.18618	EL HGT	29.002
LAT	63	18	58.71744	W LON	168	56	27.18586	EL HGT	29.006
LAT	63	18	58.7182	W LON	168	56	27.18629	EL HGT	29.004
LAT	63	18	58.71827	W LON	168	56	27.1865	EL HGT	29.01
LAT	63	18	58.71773	W LON	168	56	27.18661	EL HGT	29.006
MEAN LAT	**63**	**18**	**58.717896**	**MEAN LONG**	**168**	**56**	**27.186288**	**MEAN EL HT**	**29.0056**

8. Survey Quality

The survey quality achieved exceeds all quality requirements outlined in Table 4-3 of the USACE Alaska District – Environmental Program Manual For Electronic Deliverables, April 2017. The RMS Values in the OPUS Solutions, RTK Survey Checkshots, and RTK RMS Values were all used to evaluate the survey quality. These values can all be found/confirmed in this report document and associated deliverable package.

ATTACHMENT H-1
Control Statement

N.E. Cape Remedial Action
Control Statement

This memo describes the relationship between the 2018 Lounsbury survey coordinate system and the 2013 Eco-Land survey coordinate system. During the field survey, discrepancies were found between provided control, NGS control and stakeout coordinates. The following is a summary of the steps taken to reconcile old data with new data.

Coordinate System Summary

COORDINATE SYSTEM
THIS PROJECT IS LOCATED ENTIRELY WITHIN ALASKA STATE PLANE ZONE 9 (AKSPZ9) U.S. SURVEY FOOT GRID COORDINATE SYSTEM.

BASIS OF COORDINATES
THE BASIS OF COORDINATES IS CONTROL POINT #1, A FOUND 5/8” REBAR LOCATED AT THE SOUTHEAST CORNER OF THE GRAVEL APRON SERVICING THE NORTHEAST CAPE RUNWAY. SAID POINT WAS SET BY ECO-LAND SURVEYS IN 2013 AND HAS AKSPZ9 COORDINATES OF 3409053.3560' NORTH, 1809572.5610' EAST.

BASIS OF BEARINGS
THIS PROJECT PRESERVES ALASKA STATE PLANE ZONE 9 GRID BEARINGS.

CONVERSION PARAMETERS
TO CONVERT AKSPZ9 U.S. SURVEY FOOT GRID COORDINATES TO “ECO-LAND” LOCAL COORDINATES:

1. ADD +0.245 EAST AND SUBTRACT -0.704 NORTH FROM THE GRID COORDINATES.
2. ROTATE THE RESULTING COORDINATES ABOUT CONTROL POINT #1 (3409053.3560 N, 1809572.5610 E) N 00°55’05.6805” E
3. SCALE THE RESULTING COORDINATES ABOUT CONTROL POINT #1 (3409053.3560 N, 1809572.5610 E) USING 1.000051579.

TO CONVERT “ECO-LAND” LOCAL COORDINATES TO AKSPZ9 U.S. SURVEY FOOT GRID COORDINATES:

1. SCALE THE “ECO-LAND” LOCAL COORDINATES ABOUT CONTROL POINT #1 (3409052.6520 N, 1809572.8060 E) USING 0.999948424.
2. ROTATE THE RESULTING COORDINATES ABOUT CONTROL POINT #1 (3409052.6520 N, 1809572.8060 E) N 00°55’05.6805” W
3. SUBTRACT -0.245 EAST AND ADD +0.704 NORTH TO THE RESULTING COORDINATES.

VERTICAL CONTROL STATEMENT
THE VERTICAL DATUM FOR THIS SURVEY IS NAVD88(GEOID 12B) IN U.S. SURVEY FEET, AS ESTABLISHED BY GPS ELEVATION TRANSFER. THE AVERAGE OF MULTIPLE NGS OPUS SOLUTIONS, OBSERVED OVER DIFFERENT DAYS, WAS HELD FIXED FOR EACH PROJECT CONTROL POINT.

ATTACHMENT H-2
Descriptor Key

Northeast Cape Remedial Action –
Site 28 Sediment Mapping Survey Services
Topographic Survey Descriptor Key

Field Code	Full Description
BM	Benchmark
Calc	Calculated or Staked Point
CBC	Brass Cap Monument
CHK	Checkshot
CP	Control Point
CRBC	Rebar with Cap
EPP	Power Pole
GB	Grade Break
GS	Ground Shot
GTOE	Toe of Slope
GTOP	Top of Slope
HEW	Edge of Water
ML	Misc. Linear Feature
MP	Misc Point
RCL	Centerline of Road
RSH	Shoulder of Road
VEG	Edge of Vegetation

ATTACHMENT H-3
Survey Data Table

2018 Northeast Cape Periodic Review
Survey Table

Field Survey Point ID	Feature Location ID	Latitude (WGS84)	Longitude (WGS84)	Latitude (NAD 83 (2011))	Longitude (NAD 83 (2011))	Northing (UTM Zone 2N)	Easting (UTM Zone 2N)	Northing - Alaska State Plane Zone 9, U.S. Survey Feet	Easting - Alaska State Plane Zone 9, U.S. Survey Feet	Elevation (NAVD88, GEOID12B, U.S. Survey Feet)	Elevation (NAVD88, GEOID12B, Meters)	Text Descriptor	Measurement Date/Time
1	CP 1 RTK BASE	63°19'32.47895"N	168°58'15.32269"W	63°19'32.49446"N	168°58'15.23687"W	7023485.9420	601619.7430	3409053.356	1809572.561	28.409	8.659	CP 1 RTK BASE	8/1/2018 10:19
2	2	63°18'57.69975"N	168°57'18.33986"W	63°18'57.71525"N	168°57'18.25406"W	7022435.1010	602446.5850	3405563.115	1812231.739	51.535	15.708	CRBC	8/1/2018 16:35
59	8039 A	63°20'08.83006"N	168°56'24.47121"W	63°20'08.84555"N	168°56'24.38532"W	7024659.7760	603125.3060	3412827.77	1814572.558	5.248	1.599	CBC	8/1/2018 10:19
603	BM B	63°18'58.70241"N	168°56'27.27211"W	63°18'58.71790"N	168°56'27.18629"W	7022488.8670	603156.0700	3405703.216	1814562.383	78.814	24.023	BM B NGSCBC	8/1/2018 8:42
1002	GPS-2	63°19'05.77800"N	168°56'49.31203"W	63°19'05.79349"N	168°56'49.22621"W	7022697.9410	602842.4310	3406405.262	1813544.002	71.976	21.938	CRBC	8/4/2018 9:33
2600	2600	63°18'42.73235"N	168°57'29.95052"W	63°18'42.74785"N	168°57'29.86474"W	7021966.8780	602299.8010	3404034.336	1811726.161	72.924	22.227	CRB	8/1/2018 15:07
2558	2558	63°18'45.36876"N	168°57'41.70504"W	63°18'45.38426"N	168°57'41.61925"W	7022043.2400	602133.6480	3404293.3920	1811184.9030	58.683	17.886	2018NEC28-SS01	8/3/2018 12:40
2559	2559	63°18'58.00178"N	168°57'41.76207"W	63°18'58.01728"N	168°57'41.67627"W	7022434.0660	602120.4250	3405576.4120	1811161.5190	37.804	11.523	2018NEC28-SS02	8/3/2018 12:41
2560	2560	63°18'57.83948"N	168°57'41.79408"W	63°18'57.85498"N	168°57'41.70828"W	7022429.0300	602120.1390	3405559.9040	1811160.3240	37.818	11.527	2018NEC28-SS03	8/3/2018 12:43
2561	2561	63°18'57.40699"N	168°57'41.55871"W	63°18'57.42249"N	168°57'41.47291"W	7022415.7540	602123.8400	3405516.1530	1811171.7850	38.752	11.812	2018NEC28-SS04	8/3/2018 12:44
2562	2562	63°18'56.93005"N	168°57'41.59496"W	63°18'56.94555"N	168°57'41.50916"W	7022400.9820	602123.8040	3405467.6860	1811170.9140	39.443	12.022	2018NEC28-SS05	8/3/2018 12:45
2563	2563	63°18'56.56474"N	168°57'41.48112"W	63°18'56.58024"N	168°57'41.39533"W	7022389.7300	602125.7480	3405430.6680	1811176.7140	39.597	12.069	2018NEC28-SS06	8/3/2018 12:47
2564	2564	63°18'56.33084"N	168°57'41.89117"W	63°18'56.34634"N	168°57'41.80538"W	7022382.3120	602120.2730	3405406.6090	1811158.3710	39.707	12.103	2018NEC28-SS07	8/3/2018 12:48
2565	2565	63°18'56.32647"N	168°57'41.66119"W	63°18'56.34197"N	168°57'41.57539"W	7022382.2790	602123.4770	3405406.3350	1811168.8820	39.666	12.090	2018NEC28-SS08	8/3/2018 12:50
2566	2566	63°18'56.13910"N	168°57'41.77685"W	63°18'56.15460"N	168°57'41.69105"W	7022376.4300	602122.0520	3405387.2190	1811163.9080	39.740	12.113	2018NEC28-SS09	8/3/2018 12:51
2567	2567	63°18'55.83461"N	168°57'41.91883"W	63°18'55.85011"N	168°57'41.83303"W	7022366.9470	602120.3760	3405356.1890	1811157.9240	39.968	12.182	2018NEC28-SS10	8/3/2018 12:52
2568	2568	63°18'55.57061"N	168°57'42.56023"W	63°18'55.58611"N	168°57'42.47444"W	7022358.4950	602111.7120	3405328.9020	1811129.0640	40.210	12.256	2018NEC28-SS11	8/3/2018 12:54
2569	2569	63°18'55.40361"N	168°57'42.54043"W	63°18'55.41911"N	168°57'42.45463"W	7022353.3370	602112.1520	3405311.9550	1811130.2430	40.293	12.281	2018NEC28-SS12	8/3/2018 12:55
2570	2570	63°18'53.60124"N	168°57'43.48041"W	63°18'53.61674"N	168°57'43.39462"W	7022297.1580	602100.8470	3405128.2040	1811090.2750	43.051	13.122	2018NEC28-SS13	8/3/2018 12:57
2571	2571	63°18'53.37489"N	168°57'43.24702"W	63°18'53.39039"N	168°57'43.16122"W	7022290.2580	602104.3170	3405105.3870	1811101.3070	43.217	13.172	2018NEC28-SS14	8/3/2018 12:58
2572	2572	63°18'50.11207"N	168°57'45.97513"W	63°18'50.12757"N	168°57'45.88934"W	7022188.1040	602069.5690	3404771.9850	1810982.0660	46.239	14.094	2018NEC28-SS15	8/3/2018 12:59
2573	2573	63°18'49.74352"N	168°57'46.45252"W	63°18'49.75902"N	168°57'46.36672"W	7022176.4900	602063.2890	3404734.2010	1810960.8670	46.827	14.273	2018NEC28-SS16	8/3/2018 13:01
2574	2574	63°18'49.14343"N	168°57'46.38444"W	63°18'49.15893"N	168°57'46.29865"W	7022157.9540	602064.8260	3404673.3040	1810964.9620	50.273	15.323	2018NEC28-SS17	8/3/2018 13:02
2575	2575	63°18'48.74094"N	168°57'46.69880"W	63°18'48.75644"N	168°57'46.61301"W	7022145.3620	602060.8480	3404632.1930	1810951.2650	52.085	15.875	2018NEC28-SS18	8/3/2018 13:04
2576	2576	63°18'48.26228"N	168°57'47.09359"W	63°18'48.27777"N	168°57'47.00780"W	7022130.3780	602055.8260	3404583.2860	1810934.0190	53.955	16.445	2018NEC28-SS19	8/3/2018 13:05
2577	2577	63°18'45.79453"N	168°57'48.66116"W	63°18'45.81003"N	168°57'48.57537"W	7022053.3360	602036.4400	3404331.4940	1810866.4710	0.000	0.000	2018NEC28-SS20	8/3/2018 13:06
2578	2578	63°18'43.37121"N	168°57'48.78994"W	63°18'43.38671"N	168°57'48.70415"W	7021978.3050	602037.0300	3404085.2760	1810864.5670	0.000	0.000	2018NEC28-SS21	8/3/2018 13:08
2579	2579	63°18'43.30102"N	168°57'48.68876"W	63°18'43.31652"N	168°57'48.60297"W	7021976.1780	602038.5070	3404078.2220	1810869.3040	61.506	18.747	2018NEC28-SS22	8/3/2018 13:09
2580	2580	63°18'43.27332"N	168°57'48.50612"W	63°18'43.28882"N	168°57'48.42033"W	7021975.4020	602041.0760	3404075.5440	1810877.6920	61.548	18.760	2018NEC28-SS23	8/3/2018 13:11
2581	2581	63°18'56.73315"N	168°57'41.52678"W	63°18'56.74865"N	168°57'41.44098"W	7022394.9210	602124.9470	3405447.7390	1811174.3520	39.590	12.067	2018NEC28-SS24	8/3/2018 13:12
2582	2582	63°18'53.31642"N	168°57'43.39645"W	63°18'53.33192"N	168°57'43.31066"W	7022288.3830	602102.2960	3405099.3380	1811094.5780	43.224	13.175	2018NEC28-SS25	8/3/2018 13:13
2583	2583	63°18'53.00234"N	168°57'43.60531"W	63°18'53.01784"N	168°57'43.51952"W	7022278.5740	602099.6980	3405067.2850	1811085.5550	43.196	13.166	2018NEC28-SS26	8/3/2018 13:15
2584	2584	63°18'53.15319"N	168°57'43.79994"W	63°18'53.16869"N	168°57'43.71414"W	7022283.1550	602096.8420	3405082.4620	1811076.4180	43.213	13.171	2018NEC28-SS27	8/3/2018 13:16
2585	2585	63°18'52.19933"N	168°57'44.53007"W	63°18'52.21483"N	168°57'44.44428"W	7022253.3200	602087.6220	3404985.0440	1811044.6380	43.953	13.397	2018NEC28-SS28	8/3/2018 13:18
2586	2586	63°18'51.93826"N	168°57'44.40747"W	63°18'51.95376"N	168°57'44.32167"W	7022245.2970	602089.5850	3404958.6190	1811050.6670	43.957	13.398	2018NEC28-SS29	8/3/2018 13:19
2587	2587	63°18'51.47323"N	168°57'45.38310"W	63°18'51.48873"N	168°57'45.29731"W	7022230.4780	602076.4670	3404910.6680	1811006.8700	43.983	13.406	2018NEC28-SS30	8/3/2018 13:20
2588	2588	63°18'51.19354"N	168°57'45.40300"W	63°18'51.20904"N	168°57'45.31720"W	7022221.8160	602076.4660	3404882.2470	1811006.4210	43.895	13.379	2018NEC28-SS31	8/3/2018 13:22
2589	2589	63°18'50.84200"N	168°57'45.15946"W	63°18'50.85750"N	168°57'45.07367"W	7022211.0480	602080.2000	3404846.7230	1811018.1220	44.141	13.454	2018NEC28-SS32	8/3/2018 13:23
2590	2590	63°18'50.53227"N	168°57'45.14459"W	63°18'50.54777"N	168°57'45.05880"W	7022201.4720	602080.7110	3404815.2760	1811019.3100	0.000	0.000	2018NEC28-SS33	8/3/2018 13:25
2591	2591	63°18'49.46651"N	168°57'46.71894"W	63°18'49.48201"N	168°57'46.63315"W	7022167.8020	602059.8540	3404705.8700	1810949.1530	48.108	14.663	2018NEC28-SS34	8/3/2018 13:26
2592	2592	63°18'49.28645"N	168°57'46.11318"W	63°18'49.30195"N	168°57'46.02739"W	7022162.4990	602068.4600	3404688.0300	1810977.1170	0.000	0.000	2018NEC28-SS35	8/3/2018 13:27
2593	2593	63°18'48.93748"N	168°57'46.37466"W	63°18'48.95298"N	168°57'46.28887"W	7022151.5870	602065.1650	3404652.3940	1810965.7470	51.379	15.660	2018NEC28-SS36	8/3/2018 13:29
2594	2594	63°18'48.44538"N	168°57'46.92171"W	63°18'48.46088"N	168°57'46.83592"W	7022136.1200	602058.0370	3404602.0100	1810941.5690	53.039	16.166	2018NEC28-SS37	8/3/2018 13:30
2595	2595	63°18'48.25673"N	168°57'46.84484"W	63°18'48.27223"N	168°57'46.75905"W	7022130.3170	602059.2920	3404582.9070	1810945.3900	54.759	16.691	2018NEC28-SS38	8/3/2018 13:32

2018 Northeast Cape Periodic Review
Survey Table

Field Survey Point ID	Feature Location ID	Latitude (WGS84)	Longitude (WGS84)	Latitude (NAD 83 (2011))	Longitude (NAD 83 (2011))	Northing (UTM Zone 2N)	Easting (UTM Zone 2N)	Northing - Alaska State Plane Zone 9, U.S. Survey Feet	Easting - Alaska State Plane Zone 9, U.S. Survey Feet	Elevation (NAVD88, GEOID12B, U.S. Survey Feet)	Elevation (NAVD88, GEOID12B, Meters)	Text Descriptor	Measurement Date/Time
2596	2596	63°18'48.10275"N	168°57'46.99710"W	63°18'48.11825"N	168°57'46.91131"W	7022125.4860	602057.3250	3404567.1550	1810938.6880	55.144	16.808	2018NEC28-SS39	8/3/2018 13:33
2597	2597	63°18'46.31033"N	168°57'43.50799"W	63°18'46.32583"N	168°57'43.42220"W	7022071.5730	602107.6350	3404387.6880	1811101.0020	57.705	17.588	2018NEC28-SS40	8/3/2018 13:34
2598	2598	63°18'46.18960"N	168°57'43.41918"W	63°18'46.20510"N	168°57'43.33339"W	7022067.8770	602108.9900	3404375.4920	1811105.2570	57.736	17.598	2018NEC28-SS41	8/3/2018 13:36
2599	2599	63°18'45.73777"N	168°57'47.98254"W	63°18'45.75327"N	168°57'47.89675"W	7022051.8800	602045.9390	3404326.2300	1810897.5610	58.066	17.698	2018NEC28-SS42	8/3/2018 13:37
2601	2601	63°18'43.91482"N	168°57'43.95988"W	63°18'43.93032"N	168°57'43.87410"W	7021997.2590	602103.7040	3404144.0560	1811084.2990	60.815	18.536	2018NEC28-SS44	8/3/2018 13:39
2602	2602	63°18'43.89071"N	168°57'44.19305"W	63°18'43.90621"N	168°57'44.10727"W	7021996.4100	602100.4830	3404141.4350	1811073.6880	0.000	0.000	2018NEC28-SS45	8/3/2018 13:40
2603	2603	63°18'43.81229"N	168°57'44.07087"W	63°18'43.82778"N	168°57'43.98508"W	7021994.0380	602102.2600	3404133.5600	1811079.3980	60.820	18.538	2018NEC28-SS46	8/3/2018 13:41
2604	2604	63°18'43.95943"N	168°57'49.29893"W	63°18'43.97493"N	168°57'49.21314"W	7021996.2780	602029.3700	3404144.6420	1810840.3520	0.000	0.000	2018NEC28-SS47	8/3/2018 13:43
2605	2605	63°18'44.46432"N	168°57'51.46056"W	63°18'44.47982"N	168°57'51.37477"W	7022010.9440	601998.7960	3404194.3260	1810740.7860	61.016	18.598	2018NEC28-SS48	8/3/2018 13:44
2606	2606	63°18'43.26886"N	168°57'48.97296"W	63°18'43.28436"N	168°57'48.88718"W	7021975.0570	602034.5840	3404074.7460	1810856.3750	0.000	0.000	2018NEC28-SS49	8/3/2018 13:46
2607	2607	63°18'43.28481"N	168°57'48.50842"W	63°18'43.30031"N	168°57'48.42263"W	7021975.7560	602041.0320	3404076.7090	1810877.5680	61.552	18.761	2018NEC28-SS50	8/3/2018 13:47
2608	2608	63°18'52.97857"N	168°57'43.83129"W	63°18'52.99407"N	168°57'43.74550"W	7022277.7380	602096.5780	3405064.7030	1811075.2730	43.213	13.171	2018NEC28-SS51	8/3/2018 13:48
2610	2610	63°18'45.64487"N	168°57'48.27629"W	63°18'45.66037"N	168°57'48.19050"W	7022048.8760	602041.9430	3404316.5780	1810884.2960	58.085	17.704	2018NEC28-SS43	8/3/2018 13:50
5001	STOKE	63°19'30.81381"N	168°55'28.69088"W	63°19'30.82929"N	168°55'28.60503"W	7023508.6300	603938.9000	3409009.096	1817183.125	24.847	7.573	CHK 0 HV	8/1/2018 9:38
5002	5002	63°20'08.82997"N	168°56'24.47091"W	63°20'08.84546"N	168°56'24.38504"W	7024659.7730	603125.3100	3412827.761	1814572.572	5.236	1.596	CHK 59 HV	8/1/2018 11:30
5003	5003	63°20'06.89410"N	168°56'26.90524"W	63°20'06.90959"N	168°56'26.81935"W	7024598.7930	603093.3900	3412629.31	1814464.718	4.512	1.375	CHK 59 HV BM 8039B	8/1/2018 11:43
5004	5004	63°20'04.42856"N	168°56'31.18733"W	63°20'04.44406"N	168°56'31.10147"W	7024520.6000	603036.3040	3412375.673	1814273.413	4.018	1.225	CHK 0 HV BM 8039C	8/1/2018 11:48
5005	5005	63°18'39.01668"N	168°58'07.96138"W	63°18'39.03218"N	168°58'07.87561"W	7021835.1160	601774.5380	3403628.893	1809995.972	75.385	22.977	CHK 0 HV NEAR 34009	8/1/2018 12:54
5006	5006	63°18'42.73262"N	168°57'29.95021"W	63°18'42.74812"N	168°57'29.86442"W	7021966.8860	602299.8050	3404034.363	1811726.175	72.966	22.24	CHK 2600 HV	8/1/2018 15:02
5007	5007	63°18'38.87278"N	168°57'39.96044"W	63°18'38.88828"N	168°57'39.87465"W	7021843.0340	602164.3150	3403634.924	1811275.28	93.913	28.625	CHK 0 HV	8/1/2018 15:16
5008	5008	63°18'14.54356"N	168°57'25.41886"W	63°18'14.55905"N	168°57'25.33309"W	7021096.7590	602390.6520	3401174.734	1811979.723	240.069	73.173	CHK 0 HV	8/1/2018 15:33
5009	5009	63°19'32.47889"N	168°58'15.32280"W	63°19'32.49439"N	168°58'15.23698"W	7023485.9400	601619.7410	3409053.349	1809572.556	28.488	8.683	CHK 0 HV	8/2/2018 11:04
5010	5010	63°18'45.68881"N	168°57'48.68632"W	63°18'45.70431"N	168°57'48.60053"W	7022050.0540	602036.1940	3404320.738	1810865.495	58.08	17.703	HEW1	8/2/2018 11:24
5011	5011	63°18'45.56551"N	168°57'48.25826"W	63°18'45.58101"N	168°57'48.17248"W	7022046.4290	602042.2710	3404308.531	1810885.25	58.092	17.707	HEW1	8/2/2018 11:24
5012	5012	63°18'45.41625"N	168°57'48.04362"W	63°18'45.43175"N	168°57'47.95784"W	7022041.9060	602045.4050	3404293.53	1810895.299	58.11	17.712	HEW1	8/2/2018 11:25
5013	5013	63°18'45.43875"N	168°57'47.83209"W	63°18'45.45424"N	168°57'47.74630"W	7022042.6950	602048.3260	3404295.971	1810904.924	58.065	17.698	HEW1	8/2/2018 11:25
5014	5014	63°18'45.55935"N	168°57'47.74347"W	63°18'45.57485"N	168°57'47.65767"W	7022046.4660	602049.4410	3404308.286	1810908.774	58.028	17.687	HEW1	8/2/2018 11:25
5015	5015	63°18'45.71720"N	168°57'47.64733"W	63°18'45.73269"N	168°57'47.56154"W	7022051.3920	602050.6230	3404324.388	1810912.906	58.068	17.699	HEW1	8/2/2018 11:26
5016	5016	63°18'45.85936"N	168°57'47.73746"W	63°18'45.87486"N	168°57'47.65166"W	7022055.7500	602049.2290	3404338.76	1810908.556	58.088	17.705	HEW1	8/2/2018 11:26
5017	5017	63°18'45.85837"N	168°57'48.08032"W	63°18'45.87386"N	168°57'47.99453"W	7022055.5680	602044.4600	3404338.406	1810892.897	58.048	17.693	HEW1	8/2/2018 11:26
5018	5018	63°18'45.96275"N	168°57'48.28021"W	63°18'45.97824"N	168°57'48.19442"W	7022058.7090	602041.5760	3404348.86	1810883.595	58.11	17.712	HEW1	8/2/2018 11:26
5019	5019	63°18'45.92992"N	168°57'48.43460"W	63°18'45.94542"N	168°57'48.34881"W	7022057.6250	602039.4600	3404345.412	1810876.597	58.058	17.696	HEW1	8/2/2018 11:27
5020	5020	63°18'45.73583"N	168°57'48.64943"W	63°18'45.75133"N	168°57'48.56364"W	7022051.5250	602036.6610	3404325.541	1810867.103	58.102	17.71	HEW1 C	8/2/2018 11:27
5021	5021	63°18'45.79295"N	168°57'46.30289"W	63°18'45.80845"N	168°57'46.21711"W	7022054.3300	602069.2550	3404333.075	1810974.191	58.993	17.981	HEW2	8/2/2018 11:44
5022	5022	63°18'45.77005"N	168°57'46.10243"W	63°18'45.78555"N	168°57'46.01664"W	7022053.7100	602072.0670	3404330.897	1810983.385	58.951	17.968	HEW2	8/2/2018 11:45
5023	5023	63°18'45.84938"N	168°57'45.83588"W	63°18'45.86488"N	168°57'45.75008"W	7022056.2820	602075.6980	3404339.151	1810995.43	58.99	17.98	HEW2	8/2/2018 11:45
5024	5024	63°18'46.03247"N	168°57'45.91969"W	63°18'46.04797"N	168°57'45.83390"W	7022061.9100	602074.3520	3404357.685	1810991.301	58.974	17.975	HEW2	8/2/2018 11:46
5025	5025	63°18'46.10354"N	168°57'45.55309"W	63°18'46.11904"N	168°57'45.46730"W	7022064.2710	602079.3830	3404365.174	1811007.929	59.018	17.989	HEW2	8/2/2018 11:46
5026	5026	63°18'46.25229"N	168°57'45.35572"W	63°18'46.26778"N	168°57'45.26994"W	7022068.9600	602081.9830	3404380.427	1811016.7	58.975	17.976	HEW2	8/2/2018 11:46
5027	5027	63°18'46.33088"N	168°57'45.53677"W	63°18'46.34638"N	168°57'45.45097"W	7022071.3120	602079.3860	3404388.276	1811008.301	58.952	17.968	HEW2	8/2/2018 11:47
5028	5028	63°18'46.24113"N	168°57'45.94936"W	63°18'46.25662"N	168°57'45.86357"W	7022068.3520	602073.7340	3404378.855	1810989.603	59.021	17.99	HEW2	8/2/2018 11:47
5029	5029	63°18'46.09493"N	168°57'46.07431"W	63°18'46.11042"N	168°57'45.98851"W	7022063.7740	602072.1390	3404363.914	1810984.136	59.088	18.01	HEW2	8/2/2018 11:47
5030	5030	63°18'45.92776"N	168°57'46.22906"W	63°18'45.94326"N	168°57'46.14328"W	7022058.5330	602070.1500	3404346.821	1810977.342	58.919	17.959	HEW2 C	8/2/2018 11:48
5031	5031	63°18'45.45531"N	168°57'42.30845"W	63°18'45.47082"N	168°57'42.22265"W	7022045.6510	602125.1670	3404301.736	1811157.199	58.643	17.874	HEW3	8/2/2018 12:02

2018 Northeast Cape Periodic Review
Survey Table

Field Survey Point ID	Feature Location ID	Latitude (WGS84)	Longitude (WGS84)	Latitude (NAD 83 (2011))	Longitude (NAD 83 (2011))	Northing (UTM Zone 2N)	Easting (UTM Zone 2N)	Northing - Alaska State Plane Zone 9, U.S. Survey Feet	Easting - Alaska State Plane Zone 9, U.S. Survey Feet	Elevation (NAVD88, GEOID12B, U.S. Survey Feet)	Elevation (NAVD88, GEOID12B, Meters)	Text Descriptor	Measurement Date/Time
5032	5032	63°18'45.60212"N	168°57'42.15254"W	63°18'45.61762"N	168°57'42.06675"W	7022050.2620	602127.1920	3404316.762	1811164.079	58.67	17.883	HEW3	8/2/2018 12:02
5033	5033	63°18'45.63307"N	168°57'41.87918"W	63°18'45.64857"N	168°57'41.79339"W	7022051.3400	602130.9650	3404320.107	1811176.514	58.643	17.874	HEW3	8/2/2018 12:03
5034	5034	63°18'45.45789"N	168°57'41.65312"W	63°18'45.47338"N	168°57'41.56733"W	7022046.0200	602134.2830	3404302.482	1811187.128	58.648	17.876	HEW3	8/2/2018 12:03
5035	5035	63°18'45.31438"N	168°57'41.47029"W	63°18'45.32987"N	168°57'41.38449"W	7022041.6610	602136.9680	3404288.042	1811195.715	58.754	17.908	HEW3	8/2/2018 12:03
5036	5036	63°18'45.17996"N	168°57'41.60235"W	63°18'45.19546"N	168°57'41.51655"W	7022037.4440	602135.2630	3404274.292	1811189.904	58.752	17.907	HEW3	8/2/2018 12:04
5037	5037	63°18'45.29517"N	168°57'41.98770"W	63°18'45.31066"N	168°57'41.90190"W	7022040.8380	602129.7880	3404285.708	1811172.113	58.666	17.881	HEW3 C	8/2/2018 12:04
5038	5038	63°18'46.07608"N	168°57'43.54810"W	63°18'46.09157"N	168°57'43.46232"W	7022064.3080	602107.3070	3404363.867	1811099.555	57.722	17.594	HEW4	8/2/2018 12:05
5039	5039	63°18'46.10161"N	168°57'43.16931"W	63°18'46.11711"N	168°57'43.08352"W	7022065.2660	602112.5530	3404366.74	1811116.815	57.753	17.603	HEW4	8/2/2018 12:06
5040	5040	63°18'46.24535"N	168°57'43.10106"W	63°18'46.26085"N	168°57'43.01527"W	7022069.7430	602113.3610	3404381.389	1811119.696	57.758	17.605	HEW4	8/2/2018 12:06
5041	5041	63°18'46.36663"N	168°57'43.36495"W	63°18'46.38213"N	168°57'43.27916"W	7022073.3790	602109.5700	3404393.512	1811107.443	57.773	17.609	HEW4	8/2/2018 12:06
5042	5042	63°18'46.34542"N	168°57'43.58377"W	63°18'46.36092"N	168°57'43.49797"W	7022072.6260	602106.5460	3404391.196	1811097.483	57.628	17.565	HEW4	8/2/2018 12:07
5043	5043	63°18'46.21907"N	168°57'43.55692"W	63°18'46.23457"N	168°57'43.47114"W	7022068.7280	602107.0440	3404378.383	1811098.917	57.727	17.595	HEW4 C	8/2/2018 12:07
5044	5044	63°18'48.10128"N	168°57'46.99773"W	63°18'48.11678"N	168°57'46.91194"W	7022125.4400	602057.3180	3404567.005	1810938.662	55.192	16.823	MP SPRING	8/2/2018 12:12
5045	5045	63°18'48.07914"N	168°57'46.96249"W	63°18'48.09464"N	168°57'46.87669"W	7022124.7710	602057.8300	3404564.783	1810940.308	55.211	16.828	HEW5HEW6	8/2/2018 12:14
5046	5046	63°18'48.09337"N	168°57'47.06109"W	63°18'48.10886"N	168°57'46.97530"W	7022125.1670	602056.4440	3404566.155	1810935.781	55.19	16.822	HEW6	8/2/2018 12:14
5047	5047	63°18'48.18623"N	168°57'46.97783"W	63°18'48.20173"N	168°57'46.89205"W	7022128.0770	602057.5110	3404575.648	1810939.431	54.957	16.751	HEW6	8/2/2018 12:14
5048	5048	63°18'48.16642"N	168°57'46.97728"W	63°18'48.18192"N	168°57'46.89149"W	7022127.4640	602057.5380	3404573.636	1810939.489	54.935	16.744	HEW5	8/2/2018 12:14
5049	5049	63°18'48.18045"N	168°57'46.89347"W	63°18'48.19595"N	168°57'46.80768"W	7022127.9350	602058.6900	3404575.123	1810943.294	54.879	16.727	HEW5	8/2/2018 12:15
5050	5050	63°18'48.19413"N	168°57'46.90977"W	63°18'48.20963"N	168°57'46.82397"W	7022128.3520	602058.4500	3404576.501	1810942.527	54.809	16.706	HEW6	8/2/2018 12:15
5051	5051	63°18'48.23592"N	168°57'46.86476"W	63°18'48.25142"N	168°57'46.77897"W	7022129.6640	602059.0350	3404580.778	1810944.514	54.78	16.697	HEW6	8/2/2018 12:15
5052	5052	63°18'48.22654"N	168°57'46.77560"W	63°18'48.24204"N	168°57'46.68981"W	7022129.4140	602060.2850	3404579.891	1810948.602	54.71	16.676	HEW5	8/2/2018 12:15
5053	5053	63°18'48.27904"N	168°57'46.79622"W	63°18'48.29454"N	168°57'46.71043"W	7022131.0290	602059.9470	3404585.208	1810947.574	54.75	16.688	HEW5	8/2/2018 12:15
5054	5054	63°18'48.24859"N	168°57'46.88272"W	63°18'48.26409"N	168°57'46.79694"W	7022130.0480	602058.7730	3404582.052	1810943.673	54.752	16.689	HEW6	8/2/2018 12:16
5055	5055	63°18'48.27912"N	168°57'46.94838"W	63°18'48.29462"N	168°57'46.86258"W	7022130.9640	602057.8300	3404585.104	1810940.624	54.365	16.571	HEW6	8/2/2018 12:16
5056	5056	63°18'48.30248"N	168°57'47.00317"W	63°18'48.31798"N	168°57'46.91738"W	7022131.6620	602057.0440	3404587.436	1810938.083	53.847	16.413	HEW6	8/2/2018 12:16
5057	5057	63°18'48.29300"N	168°57'47.04975"W	63°18'48.30850"N	168°57'46.96396"W	7022131.3480	602056.4050	3404586.439	1810935.971	53.824	16.406	HEW6	8/2/2018 12:16
5058	5058	63°18'48.24967"N	168°57'47.09941"W	63°18'48.26516"N	168°57'47.01362"W	7022129.9860	602055.7570	3404582.001	1810933.774	53.989	16.456	HEW6	8/2/2018 12:17
5059	5059	63°18'48.25312"N	168°57'47.21343"W	63°18'48.26862"N	168°57'47.12765"W	7022130.0420	602054.1670	3404582.268	1810928.56	54.007	16.461	HEW6	8/2/2018 12:17
5060	5060	63°18'48.28109"N	168°57'47.20477"W	63°18'48.29659"N	168°57'47.11897"W	7022130.9120	602054.2600	3404585.115	1810928.91	53.923	16.436	HEW6	8/2/2018 12:17
5061	5061	63°18'48.28083"N	168°57'47.13437"W	63°18'48.29633"N	168°57'47.04858"W	7022130.9350	602055.2400	3404585.14	1810932.126	53.983	16.454	HEW6	8/2/2018 12:17
5062	5062	63°18'48.29929"N	168°57'47.07039"W	63°18'48.31479"N	168°57'46.98460"W	7022131.5340	602056.1120	3404587.063	1810935.018	53.779	16.392	HEW6	8/2/2018 12:17
5063	5063	63°18'48.31592"N	168°57'47.05046"W	63°18'48.33142"N	168°57'46.96467"W	7022132.0570	602056.3730	3404588.766	1810935.901	53.766	16.388	HEW6	8/2/2018 12:17
5064	5064	63°18'48.34902"N	168°57'47.04977"W	63°18'48.36452"N	168°57'46.96399"W	7022133.0820	602056.3500	3404592.129	1810935.878	53.706	16.37	HEW6	8/2/2018 12:18
5065	5065	63°18'48.39420"N	168°57'47.03987"W	63°18'48.40969"N	168°57'46.95409"W	7022134.4840	602056.4430	3404596.724	1810936.256	53.396	16.275	HEW6	8/2/2018 12:18
5066	5066	63°18'48.43022"N	168°57'47.00195"W	63°18'48.44572"N	168°57'46.91616"W	7022135.6150	602056.9360	3404600.411	1810937.929	53.035	16.165	HEW6	8/2/2018 12:18
5067	5067	63°18'48.49522"N	168°57'46.85158"W	63°18'48.51072"N	168°57'46.76579"W	7022137.6930	602058.9640	3404607.124	1810944.69	52.932	16.134	HEW6	8/2/2018 12:18
5068	5068	63°18'48.31384"N	168°57'46.84283"W	63°18'48.32934"N	168°57'46.75705"W	7022132.0850	602059.2640	3404588.708	1810945.388	54.635	16.653	HEW5	8/2/2018 12:19
5069	5069	63°18'48.39246"N	168°57'46.87089"W	63°18'48.40796"N	168°57'46.78509"W	7022134.5050	602058.7960	3404596.673	1810943.977	53.025	16.162	HEW5	8/2/2018 12:19
5070	5070	63°18'48.46819"N	168°57'46.79986"W	63°18'48.48369"N	168°57'46.71408"W	7022136.8790	602059.7100	3404604.417	1810947.097	53.046	16.168	HEW5	8/2/2018 12:19
5071	5071	63°18'48.30494"N	168°57'46.85714"W	63°18'48.32045"N	168°57'46.77136"W	7022131.8030	602059.0740	3404587.794	1810944.749	54.691	16.67	HEW7	8/2/2018 12:20
5072	5072	63°18'48.29707"N	168°57'46.92332"W	63°18'48.31257"N	168°57'46.83753"W	7022131.5300	602058.1600	3404586.946	1810941.739	54.198	16.52	HEW7	8/2/2018 12:20
5073	5073	63°18'48.31597"N	168°57'46.99016"W	63°18'48.33147"N	168°57'46.90438"W	7022132.0860	602057.2120	3404588.816	1810938.655	53.732	16.378	HEW7	8/2/2018 12:20
5074	5074	63°18'48.34664"N	168°57'47.01966"W	63°18'48.36214"N	168°57'46.93387"W	7022133.0210	602056.7710	3404591.909	1810937.257	53.735	16.378	HEW7	8/2/2018 12:21
5075	5075	63°18'48.39037"N	168°57'47.02107"W	63°18'48.40586"N	168°57'46.93527"W	7022134.3740	602056.7090	3404596.349	1810937.121	53.315	16.25	HEW7	8/2/2018 12:21

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Survey Table

Field Survey Point ID	Feature Location ID	Latitude (WGS84)	Longitude (WGS84)	Latitude (NAD 83 (2011))	Longitude (NAD 83 (2011))	Northing (UTM Zone 2N)	Easting (UTM Zone 2N)	Northing - Alaska State Plane Zone 9, U.S. Survey Feet	Easting - Alaska State Plane Zone 9, U.S. Survey Feet	Elevation (NAVD88, GEOID12B, U.S. Survey Feet)	Elevation (NAVD88, GEOID12B, Meters)	Text Descriptor	Measurement Date/Time
5076	5076	63°18'48.38997"N	168°57'46.91238"W	63°18'48.40547"N	168°57'46.82660"W	7022134.4090	602058.2210	3404596.389	1810942.086	53.066	16.175	HEW7 C	8/2/2018 12:21
5077	5077	63°18'48.58547"N	168°57'46.70750"W	63°18'48.60097"N	168°57'46.62170"W	7022140.5490	602060.8800	3404616.396	1810951.123	52.457	15.989	HEW6	8/2/2018 12:23
5078	5078	63°18'48.67880"N	168°57'46.72785"W	63°18'48.69430"N	168°57'46.64207"W	7022143.4270	602060.5050	3404625.86	1810950.04	52.33	15.95	HEW6	8/2/2018 12:23
5079	5079	63°18'48.75754"N	168°57'46.70950"W	63°18'48.77304"N	168°57'46.62371"W	7022145.8720	602060.6830	3404633.871	1810950.749	52.057	15.867	HEW6	8/2/2018 12:23
5080	5080	63°18'48.83553"N	168°57'46.69579"W	63°18'48.85103"N	168°57'46.61000"W	7022148.2900	602060.7970	3404641.802	1810951.247	51.702	15.759	HEW6	8/2/2018 12:24
5081	5081	63°18'48.85654"N	168°57'46.65037"W	63°18'48.87203"N	168°57'46.56459"W	7022148.9600	602061.4080	3404643.969	1810953.287	51.689	15.755	HEW6	8/2/2018 12:24
5082	5082	63°18'48.86711"N	168°57'46.54895"W	63°18'48.88261"N	168°57'46.46315"W	7022149.3330	602062.8090	3404645.118	1810957.902	51.637	15.739	HEW6	8/2/2018 12:24
5083	5083	63°18'48.89009"N	168°57'46.46175"W	63°18'48.90559"N	168°57'46.37596"W	7022150.0820	602064.0000	3404647.516	1810961.847	51.617	15.733	HEW6	8/2/2018 12:24
5084	5084	63°18'49.05431"N	168°57'46.35691"W	63°18'49.06981"N	168°57'46.27112"W	7022155.2090	602065.2970	3404664.273	1810966.366	50.978	15.538	HEW6	8/2/2018 12:25
5085	5085	63°18'49.14264"N	168°57'46.40987"W	63°18'49.15815"N	168°57'46.32409"W	7022157.9190	602064.4730	3404673.205	1810963.802	50.276	15.324	HEW6	8/2/2018 12:25
5086	5086	63°18'49.26426"N	168°57'46.24722"W	63°18'49.27976"N	168°57'46.16143"W	7022161.7530	602066.6170	3404685.677	1810971.031	49.902	15.21	HEW6	8/2/2018 12:25
5087	5087	63°18'49.29916"N	168°57'46.18035"W	63°18'49.31466"N	168°57'46.09457"W	7022162.8630	602067.5130	3404689.271	1810974.028	49.688	15.145	HEW6	8/2/2018 12:25
5088	5088	63°18'49.31998"N	168°57'46.13488"W	63°18'49.33548"N	168°57'46.04908"W	7022163.5270	602068.1250	3404691.419	1810976.071	49.444	15.071	HEW6	8/2/2018 12:26
5089	5089	63°18'49.34615"N	168°57'46.09129"W	63°18'49.36164"N	168°57'46.00550"W	7022164.3560	602068.7060	3404694.109	1810978.019	49.208	14.999	HEW6	8/2/2018 12:26
5090	5090	63°18'49.39186"N	168°57'46.17122"W	63°18'49.40736"N	168°57'46.08544"W	7022165.7350	602067.5490	3404698.693	1810974.293	49.022	14.942	HEW6	8/2/2018 12:26
5091	5091	63°18'49.48394"N	168°57'46.18500"W	63°18'49.49944"N	168°57'46.09922"W	7022168.5770	602067.2660	3404708.035	1810973.512	48.428	14.761	HEW6	8/2/2018 12:27
5092	5092	63°18'49.47307"N	168°57'46.67658"W	63°18'49.48856"N	168°57'46.59080"W	7022168.0230	602060.4370	3404706.567	1810951.077	48.173	14.683	HEW8	8/2/2018 12:29
5093	5093	63°18'49.45762"N	168°57'46.70402"W	63°18'49.47312"N	168°57'46.61823"W	7022167.5340	602060.0710	3404704.978	1810949.849	48.13	14.67	HEW8	8/2/2018 12:29
5094	5094	63°18'49.46325"N	168°57'46.73666"W	63°18'49.47875"N	168°57'46.65088"W	7022167.6930	602059.6110	3404705.526	1810948.349	48.102	14.662	HEW8	8/2/2018 12:29
5095	5095	63°18'49.48206"N	168°57'46.72364"W	63°18'49.49756"N	168°57'46.63784"W	7022168.2810	602059.7740	3404707.446	1810948.913	48.081	14.655	HEW8 C	8/2/2018 12:29
5096	5096	63°18'49.53884"N	168°57'46.22012"W	63°18'49.55435"N	168°57'46.13432"W	7022170.2610	602066.7240	3404713.585	1810971.818	47.576	14.501	HEW6	8/2/2018 12:29
5097	5097	63°18'49.58636"N	168°57'46.28895"W	63°18'49.60186"N	168°57'46.20316"W	7022171.7000	602065.7190	3404718.36	1810968.596	47.178	14.38	HEW6	8/2/2018 12:30
5098	5098	63°18'49.60051"N	168°57'46.39658"W	63°18'49.61601"N	168°57'46.31079"W	7022172.0900	602064.2080	3404719.718	1810963.657	47.036	14.336	HEW6	8/2/2018 12:30
5099	5099	63°18'49.66381"N	168°57'46.57081"W	63°18'49.67931"N	168°57'46.48501"W	7022173.9720	602061.7220	3404726.018	1810955.595	46.967	14.316	HEW6	8/2/2018 12:30
5100	5100	63°18'49.73959"N	168°57'46.50021"W	63°18'49.75509"N	168°57'46.41441"W	7022176.3480	602062.6290	3404733.767	1810958.695	46.894	14.293	HEW6	8/2/2018 12:30
5101	5101	63°18'49.81362"N	168°57'46.46466"W	63°18'49.82912"N	168°57'46.37887"W	7022178.6540	602063.0510	3404741.312	1810960.197	46.901	14.296	HEW6	8/2/2018 12:30
5102	5102	63°18'49.88662"N	168°57'46.39824"W	63°18'49.90212"N	168°57'46.31244"W	7022180.9410	602063.9040	3404748.775	1810963.111	46.672	14.226	HEW6	8/2/2018 12:31
5103	5103	63°18'49.95976"N	168°57'46.38287"W	63°18'49.97526"N	168°57'46.29707"W	7022183.2110	602064.0460	3404756.215	1810963.693	46.439	14.155	HEW6	8/2/2018 12:31
5104	5104	63°18'50.04191"N	168°57'46.22968"W	63°18'50.05741"N	168°57'46.14388"W	7022185.8200	602066.0960	3404764.671	1810970.555	46.319	14.118	HEW6	8/2/2018 12:31
5105	5105	63°18'50.04292"N	168°57'46.16146"W	63°18'50.05842"N	168°57'46.07567"W	7022185.8820	602067.0440	3404764.824	1810973.669	46.28	14.106	HEW6	8/2/2018 12:32
5106	5106	63°18'50.05617"N	168°57'46.11280"W	63°18'50.07167"N	168°57'46.02701"W	7022186.3140	602067.7080	3404766.206	1810975.87	46.286	14.108	HEW6	8/2/2018 12:32
5107	5107	63°18'50.13406"N	168°57'45.97684"W	63°18'50.14955"N	168°57'45.89105"W	7022188.7830	602069.5230	3404774.217	1810981.952	46.258	14.099	HEW6	8/2/2018 12:32
5108	5108	63°18'50.14504"N	168°57'45.84499"W	63°18'50.16054"N	168°57'45.75920"W	7022189.1820	602071.3470	3404775.43	1810987.956	46.256	14.099	HEW6	8/2/2018 12:32
5109	5109	63°18'50.13334"N	168°57'45.76403"W	63°18'50.14883"N	168°57'45.67824"W	7022188.8550	602072.4850	3404774.301	1810991.673	46.126	14.059	HEW6	8/2/2018 12:32
5110	5110	63°18'50.19183"N	168°57'45.67372"W	63°18'50.20733"N	168°57'45.58793"W	7022190.7050	602073.6840	3404780.309	1810995.702	45.787	13.956	HEW6	8/2/2018 12:33
5111	5111	63°18'50.25804"N	168°57'45.64309"W	63°18'50.27354"N	168°57'45.55730"W	7022192.7670	602074.0450	3404787.056	1810996.992	45.599	13.898	HEW6	8/2/2018 12:33
5112	5112	63°18'50.32722"N	168°57'45.54186"W	63°18'50.34272"N	168°57'45.45607"W	7022194.9520	602075.3860	3404794.157	1811001.502	44.979	13.71	HEW6	8/2/2018 12:33
5113	5113	63°18'50.45120"N	168°57'45.41087"W	63°18'50.46670"N	168°57'45.32509"W	7022198.8460	602077.0860	3404806.846	1811007.281	44.789	13.652	HEW6	8/2/2018 12:34
5114	5114	63°18'42.73227"N	168°57'29.94991"W	63°18'42.74776"N	168°57'29.86412"W	7021966.8750	602299.8100	3404034.328	1811726.189	73.037	22.262	CHK 2600 HV	8/2/2018 12:40
5115	5115	63°20'08.82969"N	168°56'24.47122"W	63°20'08.84519"N	168°56'24.38535"W	7024659.7650	603125.3050	3412827.733	1814572.558	5.285	1.611	CHK 59 HV	8/2/2018 14:35
5116	5116	63°18'50.48051"N	168°57'45.27559"W	63°18'50.49601"N	168°57'45.18978"W	7022199.8120	602078.9400	3404809.922	1811013.412	44.737	13.636	HEW6	8/2/2018 15:14
5117	5117	63°18'50.57946"N	168°57'45.18671"W	63°18'50.59496"N	168°57'45.10092"W	7022202.9130	602080.0790	3404820.038	1811017.309	44.48	13.557	HEW6	8/2/2018 15:16
5118	5118	63°18'50.72525"N	168°57'45.11357"W	63°18'50.74074"N	168°57'45.02778"W	7022207.4560	602080.9530	3404834.899	1811020.41	44.254	13.489	HEW6	8/2/2018 15:17
5119	5119	63°18'50.88535"N	168°57'45.29156"W	63°18'50.90085"N	168°57'45.20577"W	7022212.3310	602078.3190	3404851.028	1811012.017	44.028	13.42	HEW6	8/2/2018 15:17

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Survey Table

Field Survey Point ID	Feature Location ID	Latitude (WGS84)	Longitude (WGS84)	Latitude (NAD 83 (2011))	Longitude (NAD 83 (2011))	Northing (UTM Zone 2N)	Easting (UTM Zone 2N)	Northing - Alaska State Plane Zone 9, U.S. Survey Feet	Easting - Alaska State Plane Zone 9, U.S. Survey Feet	Elevation (NAVD88, GEOID12B, U.S. Survey Feet)	Elevation (NAVD88, GEOID12B, Meters)	Text Descriptor	Measurement Date/Time
5120	5120	63°18'50.95993"N	168°57'45.50357"W	63°18'50.97543"N	168°57'45.41777"W	7022214.5440	602075.2960	3404858.446	1811002.211	43.918	13.386	HEW6	8/2/2018 15:18
5121	5121	63°18'51.13799"N	168°57'45.46906"W	63°18'51.15349"N	168°57'45.38327"W	7022220.0680	602075.6010	3404876.556	1811003.495	43.899	13.381	HEW6	8/2/2018 15:18
5122	5122	63°18'51.28536"N	168°57'45.51146"W	63°18'51.30086"N	168°57'45.42566"W	7022224.6090	602074.8660	3404891.492	1811001.316	43.919	13.387	HEW6	8/2/2018 15:19
5123	5123	63°18'51.41236"N	168°57'45.64741"W	63°18'51.42785"N	168°57'45.56162"W	7022228.4780	602072.8500	3404904.29	1810994.898	44.027	13.419	HEW6	8/2/2018 15:19
5124	5124	63°18'51.47995"N	168°57'45.67381"W	63°18'51.49545"N	168°57'45.58801"W	7022230.5580	602072.4160	3404911.135	1810993.581	43.913	13.385	HEW6	8/2/2018 15:19
5125	5125	63°18'51.55306"N	168°57'45.56738"W	63°18'51.56855"N	168°57'45.48158"W	7022232.8670	602073.8250	3404918.639	1810998.322	44.04	13.423	HEW6	8/2/2018 15:21
5126	5126	63°18'51.57111"N	168°57'45.37290"W	63°18'51.58661"N	168°57'45.28711"W	7022233.5110	602076.5130	3404920.616	1811007.175	44.046	13.425	HEW6	8/2/2018 15:21
5127	5127	63°18'51.47026"N	168°57'45.29900"W	63°18'51.48575"N	168°57'45.21320"W	7022230.4240	602077.6410	3404910.428	1811010.716	44.002	13.412	HEW6	8/2/2018 15:22
5128	5128	63°18'51.47959"N	168°57'45.21251"W	63°18'51.49509"N	168°57'45.12673"W	7022230.7510	602078.8350	3404911.44	1811014.651	43.992	13.409	HEW6	8/2/2018 15:22
5129	5129	63°18'51.52096"N	168°57'45.20319"W	63°18'51.53645"N	168°57'45.11741"W	7022232.0340	602078.9240	3404915.648	1811015.009	44.006	13.413	HEW6	8/2/2018 15:22
5130	5130	63°18'51.53223"N	168°57'45.07529"W	63°18'51.54774"N	168°57'44.98949"W	7022232.4400	602080.6920	3404916.888	1811020.832	43.987	13.407	HEW6	8/2/2018 15:22
5131	5131	63°18'51.51715"N	168°57'44.95404"W	63°18'51.53266"N	168°57'44.86824"W	7022232.0270	602082.3940	3404915.446	1811026.395	44.011	13.415	HEW6	8/2/2018 15:22
5132	5132	63°18'51.53880"N	168°57'44.91472"W	63°18'51.55430"N	168°57'44.82894"W	7022232.7140	602082.9200	3404917.673	1811028.155	44.041	13.424	HEW6	8/2/2018 15:23
5133	5133	63°18'51.59879"N	168°57'44.86543"W	63°18'51.61429"N	168°57'44.77964"W	7022234.5920	602083.5460	3404923.803	1811030.308	43.967	13.401	HEW6	8/2/2018 15:23
5134	5134	63°18'51.66866"N	168°57'44.79178"W	63°18'51.68416"N	168°57'44.70597"W	7022236.7860	602084.5030	3404930.953	1811033.557	44.008	13.414	HEW6	8/2/2018 15:23
5135	5135	63°18'51.75900"N	168°57'44.76604"W	63°18'51.77450"N	168°57'44.68025"W	7022239.5930	602084.7720	3404940.148	1811034.584	43.972	13.403	HEW6	8/2/2018 15:23
5136	5136	63°18'51.85983"N	168°57'44.93291"W	63°18'51.87533"N	168°57'44.84712"W	7022242.6380	602082.3510	3404950.265	1811026.797	43.945	13.394	HEW6	8/2/2018 15:24
5137	5137	63°18'52.03835"N	168°57'44.81913"W	63°18'52.05386"N	168°57'44.73335"W	7022248.2120	602083.7580	3404968.481	1811031.7	43.906	13.382	HEW6	8/2/2018 15:24
5138	5138	63°18'52.22644"N	168°57'44.64568"W	63°18'52.24194"N	168°57'44.55989"W	7022254.1080	602085.9870	3404987.712	1811039.313	43.955	13.398	HEW6	8/2/2018 15:25
5139	5139	63°18'52.38332"N	168°57'44.34484"W	63°18'52.39882"N	168°57'44.25904"W	7022259.0950	602090.0180	3405003.868	1811052.796	43.977	13.404	HEW6	8/2/2018 15:25
5140	5140	63°18'52.40434"N	168°57'44.06471"W	63°18'52.41984"N	168°57'43.97892"W	7022259.8690	602093.8950	3405006.21	1811065.556	44.025	13.419	HEW6	8/2/2018 15:25
5141	5141	63°18'52.44199"N	168°57'43.96395"W	63°18'52.45749"N	168°57'43.87815"W	7022261.0780	602095.2600	3405010.108	1811070.096	43.967	13.401	HEW6	8/2/2018 15:26
5142	5142	63°18'52.53845"N	168°57'43.83949"W	63°18'52.55395"N	168°57'43.75370"W	7022264.1180	602096.8970	3405019.997	1811075.622	43.912	13.384	HEW6	8/2/2018 15:27
5143	5143	63°18'52.60742"N	168°57'43.83720"W	63°18'52.62291"N	168°57'43.75141"W	7022266.2520	602096.8610	3405027.003	1811075.613	43.76	13.338	HEW6	8/2/2018 15:27
5144	5144	63°18'52.65892"N	168°57'43.92273"W	63°18'52.67442"N	168°57'43.83695"W	7022267.8080	602095.6200	3405032.171	1811071.622	43.778	13.344	HEW6	8/2/2018 15:28
5145	5145	63°18'52.69878"N	168°57'43.88668"W	63°18'52.71428"N	168°57'43.80090"W	7022269.0570	602096.0820	3405036.246	1811073.203	43.772	13.342	HEW6	8/2/2018 15:28
5146	5146	63°18'52.77723"N	168°57'43.80342"W	63°18'52.79273"N	168°57'43.71762"W	7022271.5210	602097.1640	3405044.275	1811076.877	43.376	13.221	HEW6	8/2/2018 15:28
5147	5147	63°18'52.86681"N	168°57'43.76315"W	63°18'52.88231"N	168°57'43.67736"W	7022274.3110	602097.6360	3405053.403	1811078.569	43.235	13.178	HEW6	8/2/2018 15:29
5148	5148	63°18'52.98371"N	168°57'43.94568"W	63°18'52.99921"N	168°57'43.85989"W	7022277.8470	602094.9810	3405065.141	1811070.04	43.223	13.174	HEW6	8/2/2018 15:29
5149	5149	63°18'53.13862"N	168°57'44.04533"W	63°18'53.15412"N	168°57'43.95953"W	7022282.5960	602093.4420	3405080.801	1811065.234	43.23	13.176	HEW6	8/2/2018 15:30
5150	5150	63°18'53.25639"N	168°57'43.90237"W	63°18'53.27189"N	168°57'43.81658"W	7022286.3020	602095.3160	3405092.867	1811071.57	43.223	13.174	HEW6	8/2/2018 15:30
5151	5151	63°18'53.33076"N	168°57'43.54854"W	63°18'53.34626"N	168°57'43.46276"W	7022288.7600	602100.1650	3405100.682	1811087.608	43.275	13.19	HEW6	8/2/2018 15:31
5152	5152	63°18'53.42318"N	168°57'43.47596"W	63°18'53.43868"N	168°57'43.39016"W	7022291.6510	602101.0840	3405110.123	1811090.771	43.213	13.171	HEW6	8/2/2018 15:31
5153	5153	63°18'53.43918"N	168°57'43.37564"W	63°18'53.45469"N	168°57'43.28984"W	7022292.1910	602102.4640	3405111.822	1811095.327	43.172	13.159	HEW6	8/2/2018 15:32
5154	5154	63°18'53.64979"N	168°57'43.45697"W	63°18'53.66529"N	168°57'43.37118"W	7022298.6710	602101.1260	3405133.152	1811091.266	43.05	13.122	HEW9	8/2/2018 15:34
5155	5155	63°18'53.59086"N	168°57'43.57907"W	63°18'53.60637"N	168°57'43.49327"W	7022296.7940	602099.4850	3405127.077	1811085.786	43.045	13.12	HEW9	8/2/2018 15:34
5156	5156	63°18'53.54348"N	168°57'43.52028"W	63°18'53.55898"N	168°57'43.43449"W	7022295.3540	602100.3490	3405122.308	1811088.549	43.084	13.132	HEW9	8/2/2018 15:35
5157	5157	63°18'53.56168"N	168°57'43.38576"W	63°18'53.57718"N	168°57'43.29998"W	7022295.9760	602102.2030	3405124.256	1811094.663	43.058	13.124	HEW9	8/2/2018 15:35
5158	5158	63°18'53.62253"N	168°57'43.35277"W	63°18'53.63803"N	168°57'43.26697"W	7022297.8740	602102.6020	3405130.461	1811096.07	43.026	13.114	HEW9 C	8/2/2018 15:35
5159	5159	63°18'53.92732"N	168°57'43.43724"W	63°18'53.94282"N	168°57'43.35144"W	7022307.2660	602101.1270	3405161.354	1811091.711	42.437	12.935	HEW11HEW10	8/2/2018 15:37
5160	5160	63°18'53.94197"N	168°57'43.49420"W	63°18'53.95747"N	168°57'43.40840"W	7022307.6940	602100.3200	3405162.8	1811089.085	42.515	12.959	HEW11	8/2/2018 15:38
5161	5161	63°18'54.07248"N	168°57'43.35391"W	63°18'54.08797"N	168°57'43.26811"W	7022311.7940	602102.1440	3405176.158	1811095.278	41.803	12.742	HEW11	8/2/2018 15:38
5162	5162	63°18'54.18092"N	168°57'43.17345"W	63°18'54.19643"N	168°57'43.08765"W	7022315.2290	602104.5480	3405187.306	1811103.342	41.647	12.694	HEW11	8/2/2018 15:38
5163	5163	63°18'54.26256"N	168°57'43.00461"W	63°18'54.27806"N	168°57'42.91882"W	7022317.8290	602106.8160	3405195.722	1811110.919	41.5	12.649	HEW11	8/2/2018 15:39

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Survey Table

Field Survey Point ID	Feature Location ID	Latitude (WGS84)	Longitude (WGS84)	Latitude (NAD 83 (2011))	Longitude (NAD 83 (2011))	Northing (UTM Zone 2N)	Easting (UTM Zone 2N)	Northing - Alaska State Plane Zone 9, U.S. Survey Feet	Easting - Alaska State Plane Zone 9, U.S. Survey Feet	Elevation (NAVD88, GEOID12B, U.S. Survey Feet)	Elevation (NAVD88, GEOID12B, Meters)	Text Descriptor	Measurement Date/Time
5164	5164	63°18'54.32754"N	168°57'43.09285"W	63°18'54.34303"N	168°57'43.00705"W	7022319.8000	602105.5250	3405202.256	1811106.782	41.474	12.641	HEW11	8/2/2018 15:39
5165	5165	63°18'54.37039"N	168°57'43.03920"W	63°18'54.38588"N	168°57'42.95340"W	7022321.1500	602106.2290	3405206.648	1811109.162	41.433	12.629	HEW11	8/2/2018 15:39
5166	5166	63°18'54.38658"N	168°57'42.92152"W	63°18'54.40208"N	168°57'42.83572"W	7022321.7030	602107.8510	3405208.38	1811114.51	41.383	12.614	HEW11	8/2/2018 15:39
5167	5167	63°18'54.47182"N	168°57'42.80453"W	63°18'54.48732"N	168°57'42.71874"W	7022324.3920	602109.3940	3405217.123	1811119.713	41.271	12.579	HEW11	8/2/2018 15:39
5168	5168	63°18'54.61165"N	168°57'42.71113"W	63°18'54.62715"N	168°57'42.62533"W	7022328.7590	602110.5560	3405231.394	1811123.749	41.129	12.536	HEW11	8/2/2018 15:40
5169	5169	63°18'54.77511"N	168°57'42.64098"W	63°18'54.79061"N	168°57'42.55518"W	7022333.8480	602111.3720	3405248.048	1811126.684	41.011	12.5	HEW11	8/2/2018 15:40
5170	5170	63°18'54.91968"N	168°57'42.51549"W	63°18'54.93519"N	168°57'42.42968"W	7022338.3760	602112.9750	3405262.824	1811132.178	40.913	12.47	HEW11	8/2/2018 15:40
5171	5171	63°18'55.09419"N	168°57'42.42406"W	63°18'55.10969"N	168°57'42.33827"W	7022343.8160	602114.0760	3405280.615	1811136.067	40.601	12.375	HEW11	8/2/2018 15:41
5172	5172	63°18'55.16777"N	168°57'42.46474"W	63°18'55.18327"N	168°57'42.37894"W	7022346.0740	602113.4370	3405288.058	1811134.088	40.461	12.333	HEW11	8/2/2018 15:42
5173	5173	63°18'55.23556"N	168°57'42.62180"W	63°18'55.25106"N	168°57'42.53601"W	7022348.1020	602111.1850	3405294.827	1811126.803	40.39	12.311	HEW11	8/2/2018 15:42
5174	5174	63°18'55.34598"N	168°57'42.72073"W	63°18'55.36148"N	168°57'42.63493"W	7022351.4750	602109.7000	3405305.969	1811122.103	40.319	12.289	HEW11	8/2/2018 15:43
5175	5175	63°18'55.48532"N	168°57'42.67584"W	63°18'55.50082"N	168°57'42.59004"W	7022355.8060	602110.1880	3405320.154	1811123.924	40.294	12.282	HEW11	8/2/2018 15:43
5176	5176	63°18'55.62705"N	168°57'42.65463"W	63°18'55.64255"N	168°57'42.56883"W	7022360.2000	602110.3440	3405334.564	1811124.66	40.18	12.247	HEW11	8/2/2018 15:44
5177	5177	63°18'55.72074"N	168°57'42.60650"W	63°18'55.73624"N	168°57'42.52071"W	7022363.1200	602110.9210	3405344.115	1811126.704	40.18	12.247	HEW11	8/2/2018 15:44
5178	5178	63°18'55.78184"N	168°57'42.37300"W	63°18'55.79734"N	168°57'42.28721"W	7022365.1130	602114.1090	3405350.494	1811137.268	40.117	12.228	HEW11	8/2/2018 15:44
5179	5179	63°18'55.77042"N	168°57'42.16521"W	63°18'55.78591"N	168°57'42.07940"W	7022364.8520	602117.0120	3405349.487	1811146.777	40.066	12.212	HEW11	8/2/2018 15:45
5180	5180	63°18'55.78778"N	168°57'42.07781"W	63°18'55.80328"N	168°57'41.99202"W	7022365.4280	602118.2100	3405351.315	1811150.74	40.078	12.216	HEW11	8/2/2018 15:45
5181	5181	63°18'55.88144"N	168°57'41.99089"W	63°18'55.89694"N	168°57'41.90509"W	7022368.3640	602119.3280	3405360.892	1811154.556	39.966	12.182	HEW11	8/2/2018 15:45
5182	5182	63°18'55.97655"N	168°57'41.96125"W	63°18'55.99205"N	168°57'41.87546"W	7022371.3200	602119.6460	3405370.574	1811155.753	39.909	12.164	HEW11	8/2/2018 15:46
5183	5183	63°18'56.08718"N	168°57'41.97487"W	63°18'56.10268"N	168°57'41.88908"W	7022374.7370	602119.3480	3405381.8	1811154.949	39.803	12.132	HEW11	8/2/2018 15:46
5184	5184	63°18'56.17711"N	168°57'41.98501"W	63°18'56.19261"N	168°57'41.89921"W	7022377.5140	602119.1190	3405390.926	1811154.338	39.721	12.107	HEW11	8/2/2018 15:46
5185	5185	63°18'56.29982"N	168°57'41.95828"W	63°18'56.31532"N	168°57'41.87249"W	7022381.3230	602119.3700	3405403.409	1811155.357	39.726	12.109	HEW11	8/2/2018 15:46
5186	5186	63°18'56.37165"N	168°57'41.99778"W	63°18'56.38715"N	168°57'41.91199"W	7022383.5280	602118.7490	3405410.675	1811153.435	39.719	12.106	HEW11	8/2/2018 15:46
5187	5187	63°18'56.45547"N	168°57'41.94530"W	63°18'56.47097"N	168°57'41.85950"W	7022386.1440	602119.3970	3405419.227	1811155.694	39.677	12.094	HEW11	8/2/2018 15:47
5188	5188	63°18'56.51765"N	168°57'41.72864"W	63°18'56.53315"N	168°57'41.64284"W	7022388.1640	602122.3500	3405425.702	1811165.487	39.655	12.087	HEW11	8/2/2018 15:48
5189	5189	63°18'56.55912"N	168°57'41.58220"W	63°18'56.57462"N	168°57'41.49639"W	7022389.5120	602124.3470	3405430.022	1811172.107	39.615	12.075	HEW11	8/2/2018 15:48
5190	5190	63°18'56.61472"N	168°57'41.57772"W	63°18'56.63022"N	168°57'41.49192"W	7022391.2340	602124.3550	3405435.673	1811172.22	39.595	12.069	HEW11	8/2/2018 15:48
5191	5191	63°18'56.70746"N	168°57'41.68719"W	63°18'56.72297"N	168°57'41.60139"W	7022394.0550	602122.7400	3405445.011	1811167.068	39.622	12.077	HEW11	8/2/2018 15:49
5192	5192	63°18'56.86524"N	168°57'41.62208"W	63°18'56.88074"N	168°57'41.53627"W	7022398.9650	602123.4910	3405461.084	1811169.782	39.586	12.066	HEW11	8/2/2018 15:51
5193	5193	63°18'56.98321"N	168°57'41.63776"W	63°18'56.99872"N	168°57'41.55197"W	7022402.6080	602123.1570	3405473.054	1811168.872	39.337	11.99	HEW11	8/2/2018 15:52
5194	5194	63°18'57.08411"N	168°57'41.39785"W	63°18'57.09961"N	168°57'41.31206"W	7022405.8360	602126.3950	3405483.479	1811179.663	39.076	11.911	HEW11	8/2/2018 15:52
5195	5195	63°18'57.19855"N	168°57'41.48308"W	63°18'57.21405"N	168°57'41.39728"W	7022409.3390	602125.0970	3405495.039	1811175.582	39.095	11.916	HEW11	8/2/2018 15:53
5196	5196	63°18'57.28800"N	168°57'41.64353"W	63°18'57.30350"N	168°57'41.55773"W	7022412.0350	602122.7770	3405504.005	1811168.107	38.956	11.874	HEW11	8/2/2018 15:53
5200	5200	63°18'57.72786"N	168°57'41.57424"W	63°18'57.74336"N	168°57'41.48844"W	7022425.6750	602123.3080	3405548.73	1811170.548	38.317	11.679	HEW11	8/2/2018 15:55
5201	5201	63°18'57.79693"N	168°57'41.70258"W	63°18'57.81242"N	168°57'41.61678"W	7022427.7540	602121.4540	3405555.65	1811164.573	37.897	11.551	HEW11	8/2/2018 15:55
5202	5202	63°18'57.79854"N	168°57'41.75890"W	63°18'57.81404"N	168°57'41.67311"W	7022427.7800	602120.6690	3405555.772	1811161.998	37.825	11.529	HEW11	8/2/2018 15:55
5203	5203	63°18'57.82101"N	168°57'41.87596"W	63°18'57.83651"N	168°57'41.79016"W	7022428.4230	602119.0180	3405557.968	1811156.615	37.927	11.56	HEW11	8/2/2018 15:55
5204	5204	63°18'57.87921"N	168°57'41.81647"W	63°18'57.89471"N	168°57'41.73067"W	7022430.2500	602119.7890	3405563.923	1811159.236	37.798	11.521	HEW11	8/2/2018 15:56
5205	5205	63°18'57.90927"N	168°57'41.70278"W	63°18'57.92477"N	168°57'41.61698"W	7022431.2300	602121.3410	3405567.06	1811164.379	37.897	11.551	HEW11	8/2/2018 15:56
5206	5206	63°18'57.95097"N	168°57'41.65740"W	63°18'57.96647"N	168°57'41.57160"W	7022432.5410	602121.9310	3405571.329	1811166.383	37.885	11.547	HEW11	8/2/2018 15:56
5207	5207	63°18'57.98571"N	168°57'41.74763"W	63°18'58.00120"N	168°57'41.66184"W	7022433.5750	602120.6420	3405574.79	1811162.205	37.853	11.538	HEW11	8/2/2018 15:57
5208	5208	63°18'58.02242"N	168°57'41.85318"W	63°18'58.03792"N	168°57'41.76738"W	7022434.6650	602119.1370	3405578.441	1811157.324	37.821	11.528	HEW11	8/2/2018 15:58
5209	5209	63°18'57.98078"N	168°57'42.12264"W	63°18'57.99627"N	168°57'42.03685"W	7022433.2570	602115.4290	3405574.012	1811145.086	37.865	11.541	HEW11	8/2/2018 15:58
5210	5210	63°18'57.97677"N	168°57'42.53363"W	63°18'57.99227"N	168°57'42.44783"W	7022432.9510	602109.7150	3405573.301	1811126.322	37.866	11.542	HEW11	8/2/2018 15:58

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Field Survey Point ID	Feature Location ID	Latitude (WGS84)	Longitude (WGS84)	Latitude (NAD 83 (2011))	Longitude (NAD 83 (2011))	Northing (UTM Zone 2N)	Easting (UTM Zone 2N)	Northing - Alaska State Plane Zone 9, U.S. Survey Feet	Easting - Alaska State Plane Zone 9, U.S. Survey Feet	Elevation (NAVD88, GEOID12B, U.S. Survey Feet)	Elevation (NAVD88, GEOID12B, Meters)	Text Descriptor	Measurement Date/Time
5211	5211	63°18'58.01702"N	168°57'42.94321"W	63°18'58.03252"N	168°57'42.85741"W	7022434.0150	602103.9770	3405577.086	1811107.55	37.79	11.519	HEW11	8/2/2018 15:59
5212	5212	63°18'57.98803"N	168°57'43.43325"W	63°18'58.00353"N	168°57'43.34746"W	7022432.9010	602097.1880	3405573.78	1811085.217	37.754	11.508	HEW11	8/2/2018 15:59
5213	5213	63°18'58.03433"N	168°57'43.44991"W	63°18'58.04983"N	168°57'43.36410"W	7022434.3270	602096.9110	3405578.47	1811084.38	37.693	11.489	HEW12	8/2/2018 16:00
5214	5214	63°18'58.04535"N	168°57'42.95922"W	63°18'58.06086"N	168°57'42.87343"W	7022434.8850	602103.7270	3405579.952	1811106.772	37.737	11.502	HEW12	8/2/2018 16:00
5215	5215	63°18'58.05945"N	168°57'42.57107"W	63°18'58.07495"N	168°57'42.48527"W	7022435.4930	602109.1130	3405581.671	1811124.476	37.789	11.518	HEW12	8/2/2018 16:01
5216	5216	63°18'58.09968"N	168°57'42.15934"W	63°18'58.11517"N	168°57'42.07354"W	7022436.9190	602114.8020	3405586.061	1811143.214	37.864	11.541	HEW12	8/2/2018 16:01
5217	5217	63°18'58.13640"N	168°57'41.77156"W	63°18'58.15189"N	168°57'41.68576"W	7022438.2270	602120.1610	3405590.077	1811160.864	37.78	11.515	HEW12	8/2/2018 16:01
5218	5218	63°18'58.10018"N	168°57'41.56028"W	63°18'58.11568"N	168°57'41.47448"W	7022437.2000	602123.1360	3405586.555	1811170.573	37.876	11.545	HEW12	8/2/2018 16:02
5219	5219	63°18'58.09115"N	168°57'41.33905"W	63°18'58.10665"N	168°57'41.25325"W	7022437.0190	602126.2220	3405585.802	1811180.692	37.875	11.544	HEW12	8/2/2018 16:02
5220	5220	63°18'58.11684"N	168°57'41.04391"W	63°18'58.13234"N	168°57'40.95812"W	7022437.9440	602130.3030	3405588.629	1811194.129	37.856	11.539	HEW12	8/2/2018 16:02
5221	5221	63°18'58.12933"N	168°57'40.87488"W	63°18'58.14484"N	168°57'40.78908"W	7022438.4050	602132.6430	3405590.023	1811201.828	37.831	11.531	HEW12	8/2/2018 16:03
5222	5222	63°18'58.17075"N	168°57'40.42311"W	63°18'58.18625"N	168°57'40.33732"W	7022439.8870	602138.8870	3405594.564	1811222.393	37.849	11.536	HEW12	8/2/2018 16:03
5223	5223	63°18'58.17464"N	168°57'40.25593"W	63°18'58.19014"N	168°57'40.17012"W	7022440.0810	602141.2090	3405595.083	1811230.022	37.839	11.533	HEW12	8/2/2018 16:04
5224	5224	63°18'58.31299"N	168°57'40.03684"W	63°18'58.32849"N	168°57'39.95104"W	7022444.4580	602144.1210	3405609.296	1811239.8	37.844	11.535	HEW12	8/2/2018 16:04
5225	5225	63°18'58.39490"N	168°57'39.74610"W	63°18'58.41040"N	168°57'39.66030"W	7022447.1210	602148.0850	3405617.83	1811252.944	37.856	11.539	HEW12	8/2/2018 16:04
5226	5226	63°18'58.39805"N	168°57'39.49646"W	63°18'58.41355"N	168°57'39.41066"W	7022447.3290	602151.5550	3405618.335	1811264.34	37.853	11.538	HEW12	8/2/2018 16:05
5227	5227	63°18'58.36113"N	168°57'39.18459"W	63°18'58.37663"N	168°57'39.09879"W	7022446.3250	602155.9310	3405614.816	1811278.644	37.974	11.575	HEW12	8/2/2018 16:05
5228	5228	63°19'32.47889"N	168°58'15.32271"W	63°19'32.49439"N	168°58'15.23690"W	7023485.9390	601619.7420	3409053.349	1809572.56	28.483	8.682	CHK 1 HV	8/2/2018 16:30
5229	5229	63°18'57.69940"N	168°57'18.33934"W	63°18'57.71489"N	168°57'18.25353"W	7022435.0910	602446.5930	3405563.08	1812231.763	51.439	15.679	CHK 2 HV	8/2/2018 17:34
5230	5230	63°18'57.69957"N	168°57'18.33980"W	63°18'57.71507"N	168°57'18.25400"W	7022435.0960	602446.5860	3405563.097	1812231.742	51.426	15.675	CHK 2 HV	8/2/2018 18:07
5231	5231	63°18'57.69985"N	168°57'18.33948"W	63°18'57.71534"N	168°57'18.25367"W	7022435.1040	602446.5910	3405563.125	1812231.756	51.432	15.677	CHK 2 HV	8/3/2018 9:00
5232	5232	63°19'03.82813"N	168°56'45.44221"W	63°19'03.84363"N	168°56'45.35639"W	7022639.3400	602898.1990	3406210.13	1813723.983	78.722	23.995	GS	8/3/2018 9:08
5233	5233	63°19'04.78507"N	168°56'45.01774"W	63°19'04.80056"N	168°56'44.93193"W	7022669.1350	602903.1550	3406307.639	1813741.77	78.97	24.07	GS	8/3/2018 9:09
5234	5234	63°19'04.88922"N	168°56'44.97200"W	63°19'04.90471"N	168°56'44.88619"W	7022672.3780	602903.6880	3406318.251	1813743.685	79.036	24.09	GS	8/3/2018 9:15
5235	5235	63°19'04.99167"N	168°56'44.92464"W	63°19'05.00716"N	168°56'44.83881"W	7022675.5690	602904.2450	3406328.692	1813745.677	78.562	23.946	GS	8/3/2018 9:20
5236	5236	63°19'05.08047"N	168°56'44.88655"W	63°19'05.09596"N	168°56'44.80073"W	7022678.3330	602904.6870	3406337.739	1813747.268	78.48	23.921	GS	8/3/2018 9:21
5237	5237	63°19'05.17441"N	168°56'44.84272"W	63°19'05.18990"N	168°56'44.75690"W	7022681.2590	602905.2040	3406347.313	1813749.113	77.794	23.712	GS	8/3/2018 9:21
5238	5238	63°19'05.27789"N	168°56'44.80309"W	63°19'05.29338"N	168°56'44.71726"W	7022684.4780	602905.6530	3406357.853	1813750.75	77.005	23.471	GS	8/3/2018 9:22
5239	5239	63°19'05.37720"N	168°56'44.75651"W	63°19'05.39269"N	168°56'44.67069"W	7022687.5720	602906.2020	3406367.974	1813752.711	76.797	23.408	GS	8/3/2018 9:22
5240	5240	63°19'05.58438"N	168°56'44.66393"W	63°19'05.59987"N	168°56'44.57811"W	7022694.0230	602907.2840	3406389.086	1813756.593	75.711	23.077	GS	8/3/2018 9:22
5241	5241	63°19'05.80371"N	168°56'44.56513"W	63°19'05.81920"N	168°56'44.47930"W	7022700.8520	602908.4410	3406411.436	1813760.739	74.168	22.606	GS	8/3/2018 9:23
5242	5242	63°19'06.01640"N	168°56'44.47140"W	63°19'06.03189"N	168°56'44.38558"W	7022707.4750	602909.5340	3406433.108	1813764.664	71.979	21.939	GS	8/3/2018 9:23
5243	5243	63°19'06.22916"N	168°56'44.37712"W	63°19'06.24465"N	168°56'44.29130"W	7022714.0990	602910.6350	3406454.787	1813768.614	69.356	21.14	GS	8/3/2018 9:24
5244	5244	63°19'06.41767"N	168°56'44.29179"W	63°19'06.43315"N	168°56'44.20597"W	7022719.9690	602911.6350	3406473.997	1813772.196	66.245	20.191	GS	8/3/2018 9:24
5245	5245	63°19'06.61687"N	168°56'44.20607"W	63°19'06.63236"N	168°56'44.12025"W	7022726.1710	602912.6300	3406494.293	1813775.778	62.78	19.135	GS	8/3/2018 9:25
5246	5246	63°19'06.83244"N	168°56'44.10900"W	63°19'06.84793"N	168°56'44.02318"W	7022732.8830	602913.7670	3406516.26	1813779.851	60.402	18.41	GS	8/3/2018 9:25
5247	5247	63°19'06.99848"N	168°56'44.03675"W	63°19'07.01397"N	168°56'43.95093"W	7022738.0530	602914.6070	3406533.178	1813782.873	57.96	17.666	END FILL BEGIN ORIGINAL GR	8/3/2018 9:26
5248	5248	63°19'07.22241"N	168°56'43.93307"W	63°19'07.23790"N	168°56'43.84724"W	7022745.0270	602915.8280	3406555.999	1813787.234	55.852	17.024	GS	8/3/2018 9:27
5249	5249	63°19'07.45635"N	168°56'43.83322"W	63°19'07.47184"N	168°56'43.74739"W	7022752.3090	602916.9850	3406579.834	1813791.403	54.566	16.632	GS	8/3/2018 9:27
5250	5250	63°19'07.68463"N	168°56'43.72983"W	63°19'07.70012"N	168°56'43.64401"W	7022759.4180	602918.1960	3406603.097	1813795.743	53.877	16.422	GS	8/3/2018 9:28
5251	5251	63°19'07.93186"N	168°56'43.62076"W	63°19'07.94735"N	168°56'43.53493"W	7022767.1160	602919.4690	3406628.288	1813800.311	52.698	16.062	GS	8/3/2018 9:28
5252	5252	63°19'04.75458"N	168°56'45.03246"W	63°19'04.77007"N	168°56'44.94665"W	7022668.1850	602902.9800	3406304.531	1813741.149	78.639	23.969	GS	8/3/2018 9:35
5253	5253	63°19'04.73012"N	168°56'45.04272"W	63°19'04.74561"N	168°56'44.95691"W	7022667.4240	602902.8620	3406302.039	1813740.721	78.167	23.825	GS	8/3/2018 9:35
5254	5254	63°19'04.70205"N	168°56'45.05417"W	63°19'04.71754"N	168°56'44.96834"W	7022666.5510	602902.7310	3406299.18	1813740.245	78.281	23.86	GS	8/3/2018 9:35

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Survey Table

Field Survey Point ID	Feature Location ID	Latitude (WGS84)	Longitude (WGS84)	Latitude (NAD 83 (2011))	Longitude (NAD 83 (2011))	Northing (UTM Zone 2N)	Easting (UTM Zone 2N)	Northing - Alaska State Plane Zone 9, U.S. Survey Feet	Easting - Alaska State Plane Zone 9, U.S. Survey Feet	Elevation (NAVD88, GEOID12B, U.S. Survey Feet)	Elevation (NAVD88, GEOID12B, Meters)	Text Descriptor	Measurement Date/Time
5255	5255	63°19'04.67992"N	168°56'45.06551"W	63°19'04.69541"N	168°56'44.97970"W	7022665.8610	602902.5950	3406296.924	1813739.764	78.488	23.923	GS	8/3/2018 9:35
5256	5256	63°19'04.64629"N	168°56'45.07993"W	63°19'04.66178"N	168°56'44.99411"W	7022664.8140	602902.4270	3406293.497	1813739.162	78.848	24.033	GS	8/3/2018 9:36
5257	5257	63°19'04.61299"N	168°56'45.09242"W	63°19'04.62848"N	168°56'45.00659"W	7022663.7780	602902.2870	3406290.106	1813738.647	78.972	24.071	GS	8/3/2018 9:36
5258	5258	63°19'04.58931"N	168°56'45.10529"W	63°19'04.60480"N	168°56'45.01947"W	7022663.0400	602902.1310	3406287.691	1813738.099	78.99	24.076	GS	8/3/2018 9:36
5259	5259	63°19'04.55773"N	168°56'45.11894"W	63°19'04.57322"N	168°56'45.03312"W	7022662.0560	602901.9730	3406284.473	1813737.528	78.763	24.007	GS	8/3/2018 9:37
5260	5260	63°19'04.52387"N	168°56'45.13284"W	63°19'04.53936"N	168°56'45.04701"W	7022661.0030	602901.8130	3406281.024	1813736.95	78.922	24.056	GS	8/3/2018 9:37
5261	5261	63°19'04.48845"N	168°56'45.14900"W	63°19'04.50394"N	168°56'45.06317"W	7022659.9000	602901.6230	3406277.414	1813736.271	79.297	24.17	GS	8/3/2018 9:37
5262	5262	63°19'04.44193"N	168°56'45.17058"W	63°19'04.45742"N	168°56'45.08477"W	7022658.4510	602901.3690	3406272.674	1813735.363	79.621	24.268	GS	8/3/2018 9:37
5263	5263	63°19'04.40330"N	168°56'45.18785"W	63°19'04.41879"N	168°56'45.10203"W	7022657.2480	602901.1670	3406268.737	1813734.639	79.616	24.267	GS	8/3/2018 9:38
5264	5264	63°19'04.36126"N	168°56'45.20577"W	63°19'04.37675"N	168°56'45.11994"W	7022655.9390	602900.9600	3406264.454	1813733.891	79.581	24.256	GS	8/3/2018 9:38
5265	5265	63°19'04.31233"N	168°56'45.22580"W	63°19'04.32781"N	168°56'45.13998"W	7022654.4160	602900.7290	3406259.469	1813733.058	79.483	24.227	GS	8/3/2018 9:38
5266	5266	63°19'04.27604"N	168°56'45.24576"W	63°19'04.29153"N	168°56'45.15994"W	7022653.2850	602900.4880	3406255.769	1813732.207	79.496	24.23	GS	8/3/2018 9:39
5267	5267	63°19'04.24445"N	168°56'45.25718"W	63°19'04.25994"N	168°56'45.17136"W	7022652.3030	602900.3600	3406252.552	1813731.738	79.279	24.164	GS	8/3/2018 9:39
5268	5268	63°19'04.21151"N	168°56'45.27314"W	63°19'04.22700"N	168°56'45.18732"W	7022651.2760	602900.1710	3406249.194	1813731.064	79.204	24.141	GS	8/3/2018 9:40
5269	5269	63°19'04.17888"N	168°56'45.28555"W	63°19'04.19437"N	168°56'45.19972"W	7022650.2610	602900.0300	3406245.871	1813730.552	78.862	24.037	GS	8/3/2018 9:40
5270	5270	63°19'04.15175"N	168°56'45.29642"W	63°19'04.16724"N	168°56'45.21060"W	7022649.4170	602899.9060	3406243.107	1813730.101	78.324	23.873	GS	8/3/2018 9:42
5271	5271	63°19'04.12071"N	168°56'45.31198"W	63°19'04.13620"N	168°56'45.22617"W	7022648.4500	602899.7200	3406239.943	1813729.442	78.302	23.866	GS	8/3/2018 9:43
5272	5272	63°19'04.09230"N	168°56'45.32465"W	63°19'04.10779"N	168°56'45.23882"W	7022647.5650	602899.5720	3406237.048	1813728.911	78.335	23.877	GS	8/3/2018 9:43
5273	5273	63°19'04.06124"N	168°56'45.33831"W	63°19'04.07673"N	168°56'45.25249"W	7022646.5980	602899.4130	3406233.883	1813728.339	78.332	23.876	GS	8/3/2018 9:44
5274	5274	63°19'04.03391"N	168°56'45.35205"W	63°19'04.04940"N	168°56'45.26624"W	7022645.7460	602899.2490	3406231.097	1813727.757	78.291	23.863	GS	8/3/2018 9:44
5275	5275	63°19'04.00394"N	168°56'45.36296"W	63°19'04.01943"N	168°56'45.27714"W	7022644.8140	602899.1270	3406228.045	1813727.309	78.302	23.866	GS	8/3/2018 9:44
5276	5276	63°19'03.96696"N	168°56'45.37959"W	63°19'03.98245"N	168°56'45.29378"W	7022643.6630	602898.9320	3406224.277	1813726.611	78.23	23.844	GS	8/3/2018 9:44
5277	5277	63°19'03.93900"N	168°56'45.39367"W	63°19'03.95448"N	168°56'45.30784"W	7022642.7910	602898.7640	3406221.426	1813726.015	78.149	23.82	GS	8/3/2018 9:45
5278	5278	63°19'03.93819"N	168°56'45.39580"W	63°19'03.95369"N	168°56'45.30997"W	7022642.7660	602898.7350	3406221.343	1813725.919	78.135	23.816	GS	8/3/2018 9:45
5279	5279	63°19'03.90097"N	168°56'45.40868"W	63°19'03.91647"N	168°56'45.32286"W	7022641.6080	602898.5930	3406217.553	1813725.393	78.193	23.833	GS	8/3/2018 9:45
5280	5280	63°19'03.86535"N	168°56'45.42728"W	63°19'03.88084"N	168°56'45.34145"W	7022640.4980	602898.3700	3406213.921	1813724.603	78.568	23.948	GS	8/3/2018 9:46
5281	5281	63°19'03.79692"N	168°56'45.45785"W	63°19'03.81241"N	168°56'45.37202"W	7022638.3670	602898.0120	3406206.948	1813723.321	78.656	23.974	GS	8/3/2018 9:46
5282	5282	63°19'03.72278"N	168°56'45.48896"W	63°19'03.73827"N	168°56'45.40315"W	7022636.0590	602897.6530	3406199.395	1813722.024	78.501	23.927	GS	8/3/2018 9:46
5283	5283	63°19'03.67536"N	168°56'45.51318"W	63°19'03.69085"N	168°56'45.42737"W	7022634.5810	602897.3630	3406194.56	1813720.997	78.298	23.865	GS	8/3/2018 9:47
5284	5284	63°19'03.62564"N	168°56'45.53302"W	63°19'03.64113"N	168°56'45.44720"W	7022633.0340	602897.1360	3406189.496	1813720.174	78.218	23.841	GS	8/3/2018 9:48
5285	5285	63°19'03.57663"N	168°56'45.55476"W	63°19'03.59212"N	168°56'45.46893"W	7022631.5080	602896.8820	3406184.502	1813719.263	77.99	23.771	GS	8/3/2018 9:49
5286	5286	63°19'03.52836"N	168°56'45.57509"W	63°19'03.54385"N	168°56'45.48929"W	7022630.0060	602896.6470	3406179.584	1813718.415	77.992	23.772	GS	8/3/2018 9:49
5287	5287	63°19'03.43164"N	168°56'45.61272"W	63°19'03.44713"N	168°56'45.52691"W	7022626.9970	602896.2200	3406169.733	1813716.858	77.871	23.735	GS	8/3/2018 9:49
5288	5288	63°19'03.33842"N	168°56'45.66113"W	63°19'03.35391"N	168°56'45.57532"W	7022624.0910	602895.6390	3406160.228	1813714.803	77.738	23.695	GS	8/3/2018 9:50
5289	5289	63°19'03.24193"N	168°56'45.70499"W	63°19'03.25743"N	168°56'45.61918"W	7022621.0860	602895.1240	3406150.396	1813712.961	77.412	23.595	GS	8/3/2018 9:50
5290	5290	63°19'03.14242"N	168°56'45.74461"W	63°19'03.15791"N	168°56'45.65880"W	7022617.9900	602894.6720	3406140.259	1813711.318	77.023	23.477	GS	8/3/2018 9:50
5291	5291	63°19'03.04590"N	168°56'45.78987"W	63°19'03.06139"N	168°56'45.70405"W	7022614.9830	602894.1380	3406130.422	1813709.412	76.772	23.4	GS	8/3/2018 9:51
5292	5292	63°19'02.95172"N	168°56'45.83078"W	63°19'02.96721"N	168°56'45.74497"W	7022612.0510	602893.6620	3406120.826	1813707.701	76.172	23.217	GS	8/3/2018 9:52
5293	5293	63°19'02.84829"N	168°56'45.87347"W	63°19'02.86378"N	168°56'45.78766"W	7022608.8320	602893.1700	3406110.289	1813705.924	75.871	23.126	GS	8/3/2018 9:52
5294	5294	63°19'02.75183"N	168°56'45.92269"W	63°19'02.76733"N	168°56'45.83687"W	7022605.8260	602892.5810	3406100.456	1813703.837	75.28	22.946	GS	8/3/2018 9:52
5295	5295	63°19'02.66142"N	168°56'45.96055"W	63°19'02.67691"N	168°56'45.87474"W	7022603.0120	602892.1440	3406091.245	1813702.259	74.679	22.762	GS	8/3/2018 9:53
5296	5296	63°19'02.55772"N	168°56'46.01041"W	63°19'02.57320"N	168°56'45.92459"W	7022599.7810	602891.5540	3406080.675	1813700.155	74.133	22.596	GS	8/3/2018 9:53
5297	5297	63°19'02.45326"N	168°56'46.05189"W	63°19'02.46875"N	168°56'45.96607"W	7022596.5310	602891.0800	3406070.035	1813698.435	73.711	22.467	GS	8/3/2018 9:53
5298	5298	63°19'02.36810"N	168°56'46.09103"W	63°19'02.38359"N	168°56'46.00521"W	7022593.8790	602890.6200	3406061.356	1813696.79	73.613	22.437	GS	8/3/2018 9:54

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Survey Table

Field Survey Point ID	Feature Location ID	Latitude (WGS84)	Longitude (WGS84)	Latitude (NAD 83 (2011))	Longitude (NAD 83 (2011))	Northing (UTM Zone 2N)	Easting (UTM Zone 2N)	Northing - Alaska State Plane Zone 9, U.S. Survey Feet	Easting - Alaska State Plane Zone 9, U.S. Survey Feet	Elevation (NAVD88, GEOID12B, U.S. Survey Feet)	Elevation (NAVD88, GEOID12B, Meters)	Text Descriptor	Measurement Date/Time
5299	5299	63°19'02.26742"N	168°56'46.13594"W	63°19'02.28291"N	168°56'46.05011"W	7022590.7440	602890.0950	3406051.097	1813694.907	73.387	22.368	GS	8/3/2018 9:54
5300	5300	63°19'02.17605"N	168°56'46.17427"W	63°19'02.19153"N	168°56'46.08846"W	7022587.9000	602889.6520	3406041.788	1813693.309	73.11	22.284	GS	8/3/2018 9:55
5301	5301	63°19'02.07778"N	168°56'46.21754"W	63°19'02.09327"N	168°56'46.13172"W	7022584.8400	602889.1480	3406031.775	1813691.497	72.679	22.153	GS	8/3/2018 9:56
5302	5302	63°19'01.98369"N	168°56'46.25848"W	63°19'01.99918"N	168°56'46.17267"W	7022581.9110	602888.6710	3406022.188	1813689.784	72.412	22.071	GS	8/3/2018 9:56
5303	5303	63°19'01.88122"N	168°56'46.30396"W	63°19'01.89671"N	168°56'46.21815"W	7022578.7210	602888.1400	3406011.747	1813687.878	71.881	21.909	GS	8/3/2018 9:57
5304	5304	63°19'01.78905"N	168°56'46.34613"W	63°19'01.80454"N	168°56'46.26033"W	7022575.8500	602887.6450	3406002.354	1813686.106	71.137	21.683	GS	8/3/2018 9:57
5305	5305	63°19'01.70092"N	168°56'46.38739"W	63°19'01.71641"N	168°56'46.30156"W	7022573.1050	602887.1590	3405993.372	1813684.369	70.55	21.504	GTOP	8/3/2018 9:57
5306	5306	63°19'01.66719"N	168°56'46.39642"W	63°19'01.68269"N	168°56'46.31060"W	7022572.0580	602887.0660	3405989.94	1813684.013	69.728	21.253	GTOE	8/3/2018 9:58
5307	5307	63°19'01.62388"N	168°56'46.41692"W	63°19'01.63938"N	168°56'46.33111"W	7022570.7090	602886.8240	3405985.526	1813683.149	70.113	21.371	RSH	8/3/2018 9:59
5308	5308	63°19'01.49952"N	168°56'46.47774"W	63°19'01.51501"N	168°56'46.39192"W	7022566.8340	602886.1010	3405972.849	1813680.579	69.972	21.327	RCL	8/3/2018 9:59
5309	5309	63°19'01.36114"N	168°56'46.53419"W	63°19'01.37663"N	168°56'46.44837"W	7022562.5270	602885.4530	3405958.753	1813678.232	69.101	21.062	RSH2	8/3/2018 10:00
5310	5310	63°19'01.31403"N	168°56'46.55380"W	63°19'01.32952"N	168°56'46.46798"W	7022561.0610	602885.2270	3405953.953	1813677.415	67.865	20.685	GTOE2	8/3/2018 10:00
5311	5311	63°19'01.18438"N	168°56'46.61466"W	63°19'01.19987"N	168°56'46.52883"W	7022557.0230	602884.5090	3405940.74	1813674.852	66.906	20.393	GS	8/3/2018 10:01
5312	5312	63°19'01.12972"N	168°56'46.63897"W	63°19'01.14521"N	168°56'46.55315"W	7022555.3210	602884.2250	3405935.17	1813673.833	66.295	20.207	GS	8/3/2018 10:01
5313	5313	63°19'00.97229"N	168°56'46.70813"W	63°19'00.98778"N	168°56'46.62231"W	7022550.4190	602883.4190	3405919.129	1813670.937	63.478	19.348	GS	8/3/2018 10:01
5314	5314	63°19'04.17405"N	168°56'44.04009"W	63°19'04.18953"N	168°56'43.95427"W	7022650.6670	602917.3620	3406246.315	1813787.438	78.94	24.061	GS	8/3/2018 10:07
5315	5315	63°19'03.81491"N	168°56'47.05862"W	63°19'03.83040"N	168°56'46.97280"W	7022638.2100	602875.7250	3406207.574	1813650.186	77.615	23.657	GS	8/3/2018 10:08
5316	5316	63°19'03.20997"N	168°56'52.15343"W	63°19'03.22546"N	168°56'52.06760"W	7022617.2240	602805.4470	3406142.313	1813418.522	59.598	18.166	GS	8/3/2018 10:10
5317	5317	63°19'03.27576"N	168°56'51.58016"W	63°19'03.29125"N	168°56'51.49435"W	7022619.5150	602813.3570	3406149.424	1813444.593	60.9	18.562	GS	8/3/2018 10:11
5318	5318	63°19'03.32782"N	168°56'51.14385"W	63°19'03.34332"N	168°56'51.05804"W	7022621.3200	602819.3750	3406155.039	1813464.432	62.718	19.116	GS	8/3/2018 10:11
5319	5319	63°19'03.37309"N	168°56'50.77647"W	63°19'03.38858"N	168°56'50.69065"W	7022622.8840	602824.4410	3406159.912	1813481.134	64.624	19.697	VEG2 BEGIB FILL END OG	8/3/2018 10:12
5320	5320	63°19'03.40617"N	168°56'50.49168"W	63°19'03.42166"N	168°56'50.40587"W	7022624.0340	602828.3700	3406163.485	1813494.085	67.899	20.696	GS	8/3/2018 10:12
5321	5321	63°19'03.44988"N	168°56'50.12559"W	63°19'03.46537"N	168°56'50.03978"W	7022625.5500	602833.4200	3406168.199	1813510.731	70.914	21.615	GS	8/3/2018 10:13
5322	5322	63°19'03.49763"N	168°56'49.72486"W	63°19'03.51312"N	168°56'49.63904"W	7022627.2060	602838.9470	3406173.349	1813528.952	72.594	22.127	GS	8/3/2018 10:13
5323	5323	63°19'03.55815"N	168°56'49.21454"W	63°19'03.57364"N	168°56'49.12871"W	7022629.3050	602845.9870	3406179.879	1813552.157	73.917	22.53	GS	8/3/2018 10:13
5324	5324	63°19'03.61586"N	168°56'48.72969"W	63°19'03.63135"N	168°56'48.64387"W	7022631.3070	602852.6750	3406186.104	1813574.203	74.704	22.77	GS	8/3/2018 10:14
5325	5325	63°19'03.67831"N	168°56'48.19361"W	63°19'03.69380"N	168°56'48.10779"W	7022633.4780	602860.0710	3406192.848	1813598.581	76.087	23.192	GS	8/3/2018 10:14
5326	5326	63°19'03.73551"N	168°56'47.71449"W	63°19'03.75100"N	168°56'47.62867"W	7022635.4610	602866.6790	3406199.017	1813620.366	76.816	23.414	GS	8/3/2018 10:14
5327	5327	63°19'03.78882"N	168°56'47.27404"W	63°19'03.80431"N	168°56'47.18822"W	7022637.3070	602872.7540	3406204.762	1813640.392	77.425	23.599	GS	8/3/2018 10:15
5328	5328	63°19'03.83898"N	168°56'46.86113"W	63°19'03.85447"N	168°56'46.77532"W	7022639.0430	602878.4480	3406210.167	1813659.165	77.87	23.735	GS	8/3/2018 10:15
5329	5329	63°19'03.86898"N	168°56'46.60058"W	63°19'03.88447"N	168°56'46.51476"W	7022640.0870	602882.0430	3406213.409	1813671.014	78.166	23.825	GS	8/3/2018 10:16
5330	5330	63°19'03.87857"N	168°56'46.51187"W	63°19'03.89406"N	168°56'46.42605"W	7022640.4230	602883.2680	3406214.45	1813675.049	78.245	23.849	GS	8/3/2018 10:16
5331	5331	63°19'03.88766"N	168°56'46.43810"W	63°19'03.90315"N	168°56'46.35228"W	7022640.7370	602884.2850	3406215.428	1813678.403	78.142	23.818	GS	8/3/2018 10:16
5332	5332	63°19'03.89849"N	168°56'46.35855"W	63°19'03.91399"N	168°56'46.27272"W	7022641.1080	602885.3810	3406216.588	1813682.018	77.977	23.768	GS	8/3/2018 10:16
5333	5333	63°19'03.90695"N	168°56'46.28469"W	63°19'03.92244"N	168°56'46.19886"W	7022641.4020	602886.4000	3406217.502	1813685.377	77.844	23.727	GS	8/3/2018 10:17
5334	5334	63°19'03.92044"N	168°56'46.18174"W	63°19'03.93593"N	168°56'46.09593"W	7022641.8660	602887.8190	3406218.95	1813690.056	77.996	23.773	GS	8/3/2018 10:17
5335	5335	63°19'03.93054"N	168°56'46.09100"W	63°19'03.94604"N	168°56'46.00517"W	7022642.2190	602889.0720	3406220.044	1813694.183	78.275	23.858	GS	8/3/2018 10:17
5336	5336	63°19'03.94065"N	168°56'46.00711"W	63°19'03.95615"N	168°56'45.92129"W	7022642.5690	602890.2280	3406221.134	1813697.997	78.469	23.917	GS	8/3/2018 10:17
5337	5337	63°19'03.95165"N	168°56'45.90327"W	63°19'03.96714"N	168°56'45.81745"W	7022642.9560	602891.6620	3406222.329	1813702.721	78.549	23.942	GS	8/3/2018 10:18
5338	5338	63°19'03.96294"N	168°56'45.81575"W	63°19'03.97844"N	168°56'45.72994"W	7022643.3440	602892.8680	3406223.541	1813706.699	78.64	23.97	GS	8/3/2018 10:18
5339	5339	63°19'03.97359"N	168°56'45.70645"W	63°19'03.98908"N	168°56'45.62063"W	7022643.7220	602894.3780	3406224.705	1813711.673	78.766	24.008	GS	8/3/2018 10:18
5340	5340	63°19'03.98645"N	168°56'45.61756"W	63°19'04.00194"N	168°56'45.53175"W	7022644.1600	602895.6020	3406226.078	1813715.711	78.629	23.966	GS	8/3/2018 10:19
5341	5341	63°19'03.99644"N	168°56'45.52479"W	63°19'04.01193"N	168°56'45.43896"W	7022644.5100	602896.8830	3406227.162	1813719.931	78.563	23.946	GS	8/3/2018 10:19
5342	5342	63°19'04.00640"N	168°56'45.44465"W	63°19'04.02189"N	168°56'45.35884"W	7022644.8540	602897.9880	3406228.234	1813723.574	78.366	23.886	GS	8/3/2018 10:19

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Field Survey Point ID	Feature Location ID	Latitude (WGS84)	Longitude (WGS84)	Latitude (NAD 83 (2011))	Longitude (NAD 83 (2011))	Northing (UTM Zone 2N)	Easting (UTM Zone 2N)	Northing - Alaska State Plane Zone 9, U.S. Survey Feet	Easting - Alaska State Plane Zone 9, U.S. Survey Feet	Elevation (NAVD88, GEOID12B, U.S. Survey Feet)	Elevation (NAVD88, GEOID12B, Meters)	Text Descriptor	Measurement Date/Time
5343	5343	63°19'04.01703"N	168°56'45.35668"W	63°19'04.03252"N	168°56'45.27086"W	7022645.2220	602899.2010	3406229.379	1813727.574	78.257	23.853	GS	8/3/2018 10:19
5344	5344	63°19'04.02807"N	168°56'45.27234"W	63°19'04.04356"N	168°56'45.18653"W	7022645.6010	602900.3640	3406230.564	1813731.407	78.16	23.823	GS	8/3/2018 10:20
5345	5345	63°19'04.03820"N	168°56'45.18692"W	63°19'04.05369"N	168°56'45.10110"W	7022645.9530	602901.5420	3406231.657	1813735.291	77.847	23.728	GS	8/3/2018 10:20
5346	5346	63°19'04.04659"N	168°56'45.10982"W	63°19'04.06208"N	168°56'45.02400"W	7022646.2470	602902.6060	3406232.567	1813738.798	77.667	23.673	GS	8/3/2018 10:20
5347	5347	63°19'04.05554"N	168°56'45.04043"W	63°19'04.07103"N	168°56'44.95461"W	7022646.5550	602903.5630	3406233.528	1813741.952	77.49	23.619	GS	8/3/2018 10:20
5348	5348	63°19'04.05987"N	168°56'44.99550"W	63°19'04.07535"N	168°56'44.90967"W	7022646.7080	602904.1840	3406234.001	1813743.997	77.566	23.642	GS	8/3/2018 10:21
5349	5349	63°19'04.06989"N	168°56'44.91961"W	63°19'04.08538"N	168°56'44.83379"W	7022647.0520	602905.2290	3406235.076	1813747.446	77.979	23.768	GS	8/3/2018 10:21
5350	5350	63°19'04.07952"N	168°56'44.84483"W	63°19'04.09501"N	168°56'44.75900"W	7022647.3840	602906.2600	3406236.11	1813750.845	78.363	23.885	GS	8/3/2018 10:21
5351	5351	63°19'04.09733"N	168°56'44.68612"W	63°19'04.11281"N	168°56'44.60030"W	7022648.0050	602908.4500	3406238.038	1813758.063	78.624	23.965	GS	8/3/2018 10:21
5352	5352	63°19'04.12938"N	168°56'44.41542"W	63°19'04.14487"N	168°56'44.32961"W	7022649.1180	602912.1840	3406241.497	1813770.372	78.977	24.072	GS	8/3/2018 10:22
5353	5353	63°19'04.16588"N	168°56'44.10109"W	63°19'04.18137"N	168°56'44.01528"W	7022650.3870	602916.5210	3406245.44	1813784.666	78.895	24.047	GS	8/3/2018 10:22
5354	5354	63°19'04.20279"N	168°56'43.80050"W	63°19'04.21828"N	168°56'43.71468"W	7022651.6630	602920.6660	3406249.414	1813798.332	78.782	24.013	GS	8/3/2018 10:22
5355	5355	63°19'04.25909"N	168°56'43.34412"W	63°19'04.27457"N	168°56'43.25830"W	7022653.6080	602926.9590	3406255.475	1813819.08	78.336	23.877	GS	8/3/2018 10:24
5356	5356	63°19'04.31225"N	168°56'42.87042"W	63°19'04.32774"N	168°56'42.78460"W	7022655.4640	602933.4970	3406261.23	1813840.624	77.611	23.656	GS	8/3/2018 10:24
5357	5357	63°19'04.36994"N	168°56'42.39194"W	63°19'04.38543"N	168°56'42.30612"W	7022657.4630	602940.0960	3406267.449	1813862.379	76.672	23.37	GS	8/3/2018 10:24
5358	5358	63°19'04.43051"N	168°56'41.89855"W	63°19'04.44599"N	168°56'41.81273"W	7022659.5560	602946.8990	3406273.971	1813884.81	75.171	22.912	GS	8/3/2018 10:25
5359	5359	63°19'04.48574"N	168°56'41.40974"W	63°19'04.50123"N	168°56'41.32391"W	7022661.4830	602953.6450	3406279.948	1813907.041	74.335	22.657	GS	8/3/2018 10:26
5360	5360	63°19'04.54280"N	168°56'40.93741"W	63°19'04.55829"N	168°56'40.85159"W	7022663.4590	602960.1590	3406286.098	1813928.516	73.13	22.29	GS	8/3/2018 10:26
5361	5361	63°19'04.60773"N	168°56'40.38898"W	63°19'04.62322"N	168°56'40.30316"W	7022665.7130	602967.7240	3406293.105	1813953.453	71.821	21.891	GS	8/3/2018 10:26
5362	5362	63°19'04.66795"N	168°56'39.88098"W	63°19'04.68344"N	168°56'39.79516"W	7022667.8030	602974.7310	3406299.603	1813976.552	70.234	21.407	GS	8/3/2018 10:27
5363	5363	63°19'04.72461"N	168°56'39.40069"W	63°19'04.74010"N	168°56'39.31487"W	7022669.7700	602981.3570	3406305.719	1813998.391	68.552	20.895	GS	8/3/2018 10:27
5364	5364	63°19'04.78124"N	168°56'38.93554"W	63°19'04.79673"N	168°56'38.84972"W	7022671.7300	602987.7720	3406311.82	1814019.539	66.54	20.281	GS	8/3/2018 10:27
5365	5365	63°19'04.83567"N	168°56'38.47375"W	63°19'04.85117"N	168°56'38.38793"W	7022673.6200	602994.1420	3406317.696	1814040.537	64.807	19.753	GS	8/3/2018 10:28
5366	5366	63°19'04.89361"N	168°56'38.00108"W	63°19'04.90910"N	168°56'37.91526"W	7022675.6230	603000.6600	3406323.936	1814062.026	63.622	19.392	GS	8/3/2018 10:28
5367	5367	63°19'04.95067"N	168°56'37.51000"W	63°19'04.96616"N	168°56'37.42418"W	7022677.6080	603007.4350	3406330.101	1814084.357	62.483	19.045	GS	8/3/2018 10:28
5368	5368	63°19'05.00450"N	168°56'37.05478"W	63°19'05.01999"N	168°56'36.96896"W	7022679.4760	603013.7140	3406335.91	1814105.056	61.119	18.629	RSH3	8/3/2018 10:29
5369	5369	63°19'05.06949"N	168°56'36.49571"W	63°19'05.08499"N	168°56'36.40989"W	7022681.7370	603021.4270	3406342.932	1814130.479	60.83	18.541	RCL1	8/3/2018 10:30
5370	5370	63°19'05.13820"N	168°56'35.94488"W	63°19'05.15369"N	168°56'35.85905"W	7022684.1080	603029.0220	3406350.325	1814155.519	59.332	18.085	RSH1	8/3/2018 10:30
5371	5371	63°19'05.20321"N	168°56'35.37177"W	63°19'05.21870"N	168°56'35.28594"W	7022686.3750	603036.9300	3406357.359	1814181.583	54.188	16.516	GTOE1	8/3/2018 10:30
5372	5372	63°19'05.27671"N	168°56'34.76745"W	63°19'05.29221"N	168°56'34.68163"W	7022688.9190	603045.2640	3406365.279	1814209.058	52.257	15.928	GS	8/3/2018 10:31
5373	5373	63°19'05.34981"N	168°56'34.16848"W	63°19'05.36531"N	168°56'34.08266"W	7022691.4480	603053.5240	3406373.154	1814236.289	51.706	15.76	GS	8/3/2018 10:31
5374	5374	63°18'43.29940"N	168°57'48.91529"W	63°18'43.31490"N	168°57'48.82951"W	7021976.0270	602035.3570	3404077.89	1810858.959	61.58	18.77	HEW13	8/3/2018 11:13
5375	5375	63°18'43.31956"N	168°57'48.87906"W	63°18'43.33505"N	168°57'48.79326"W	7021976.6670	602035.8410	3404079.964	1810860.581	61.521	18.752	HEW13	8/3/2018 11:14
5376	5376	63°18'43.33884"N	168°57'48.78681"W	63°18'43.35434"N	168°57'48.70102"W	7021977.3050	602037.1060	3404081.991	1810864.763	61.499	18.745	HEW13	8/3/2018 11:14
5377	5377	63°18'43.36613"N	168°57'48.72659"W	63°18'43.38163"N	168°57'48.64081"W	7021978.1750	602037.9170	3404084.807	1810867.469	61.482	18.74	HEW13	8/3/2018 11:14
5378	5378	63°18'43.42278"N	168°57'48.71707"W	63°18'43.43828"N	168°57'48.63128"W	7021979.9320	602037.9940	3404090.568	1810867.811	61.45	18.73	HEW13	8/3/2018 11:15
5379	5379	63°18'43.47330"N	168°57'48.64749"W	63°18'43.48880"N	168°57'48.56171"W	7021981.5260	602038.9120	3404095.75	1810870.906	61.529	18.754	HEW13	8/3/2018 11:15
5380	5380	63°18'43.46435"N	168°57'48.53167"W	63°18'43.47984"N	168°57'48.44590"W	7021981.3000	602040.5320	3404094.926	1810876.211	61.475	18.738	HEW13	8/3/2018 11:15
5381	5381	63°18'43.40052"N	168°57'48.51921"W	63°18'43.41602"N	168°57'48.43343"W	7021979.3310	602040.7690	3404088.453	1810876.885	61.475	18.738	HEW13	8/3/2018 11:16
5382	5382	63°18'43.32725"N	168°57'48.47603"W	63°18'43.34275"N	168°57'48.39025"W	7021977.0830	602041.4410	3404081.043	1810878.978	61.558	18.763	HEW13	8/3/2018 11:16
5383	5383	63°18'43.28943"N	168°57'48.49534"W	63°18'43.30493"N	168°57'48.40956"W	7021975.9050	602041.2100	3404077.188	1810878.158	61.555	18.762	HEW13	8/3/2018 11:16
5384	5384	63°18'43.26233"N	168°57'48.49771"W	63°18'43.27784"N	168°57'48.41194"W	7021975.0650	602041.2030	3404074.434	1810878.094	61.545	18.759	HEW13	8/3/2018 11:16
5385	5385	63°18'43.24738"N	168°57'48.67032"W	63°18'43.26288"N	168°57'48.58454"W	7021974.5260	602038.8160	3404072.788	1810870.234	61.523	18.752	HEW13	8/3/2018 11:16
5386	5386	63°18'43.25888"N	168°57'48.85685"W	63°18'43.27437"N	168°57'48.77106"W	7021974.7990	602036.2100	3404073.818	1810861.695	61.531	18.755	HEW13 C	8/3/2018 11:17

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Survey Table

Field Survey Point ID	Feature Location ID	Latitude (WGS84)	Longitude (WGS84)	Latitude (NAD 83 (2011))	Longitude (NAD 83 (2011))	Northing (UTM Zone 2N)	Easting (UTM Zone 2N)	Northing - Alaska State Plane Zone 9, U.S. Survey Feet	Easting - Alaska State Plane Zone 9, U.S. Survey Feet	Elevation (NAVD88, GEOID12B, U.S. Survey Feet)	Elevation (NAVD88, GEOID12B, Meters)	Text Descriptor	Measurement Date/Time
5387	5387	63°18'42.73292"N	168°57'29.95007"W	63°18'42.74842"N	168°57'29.86427"W	7021966.8960	602299.8070	3404034.394	1811726.181	73.027	22.259	CHK 2600 HV	8/3/2018 12:40
5388	5388	63°18'44.29882"N	168°57'23.07316"W	63°18'44.31431"N	168°57'22.98738"W	7022018.3920	602393.9510	3404198.541	1812037.715	63.513	19.359	MP SW03	8/3/2018 15:27
5389	5389	63°18'42.00958"N	168°57'21.03215"W	63°18'42.02507"N	168°57'20.94635"W	7021948.4710	602424.6100	3403967.554	1812134.729	71.424	21.77	MP SW01	8/3/2018 15:30
5390	5390	63°18'43.19450"N	168°57'16.58994"W	63°18'43.20999"N	168°57'16.50414"W	7021987.1030	602485.2510	3404091.206	1812335.679	64.182	19.563	MP SW02	8/3/2018 15:33
5391	5391	63°19'05.77866"N	168°56'49.31111"W	63°19'05.79415"N	168°56'49.22530"W	7022697.9620	602842.4430	3406405.33	1813544.043	72.095	21.975	CHK HV GPS 2	8/3/2018 15:42
5392	5392	63°18'57.69969"N	168°57'18.34014"W	63°18'57.71519"N	168°57'18.25434"W	7022435.0990	602446.5810	3405563.109	1812231.726	52.016	15.855	CHK 0 HV	8/3/2018 17:19
5393	5393	63°18'57.69955"N	168°57'18.33958"W	63°18'57.71504"N	168°57'18.25377"W	7022435.0950	602446.5900	3405563.095	1812231.752	52.029	15.859	CHK 2 HV	8/3/2018 18:27
5394	5394	63°18'57.69988"N	168°57'18.34020"W	63°18'57.71537"N	168°57'18.25439"W	7022435.1050	602446.5810	3405563.128	1812231.723	51.293	15.634	CHK 0 HV	8/4/2018 7:54
5395	5395	63°18'43.45415"N	168°57'44.10655"W	63°18'43.46965"N	168°57'44.02076"W	7021982.9420	602102.1160	3404097.16	1811078.357	61.981	18.892	MP	8/4/2018 8:02
5396	5396	63°18'43.92821"N	168°57'44.76361"W	63°18'43.94371"N	168°57'44.67782"W	7021997.3180	602092.5070	3404144.822	1811047.565	59.703	18.197	MP	8/4/2018 8:04
5397	5397	63°18'44.27513"N	168°57'44.07902"W	63°18'44.29062"N	168°57'43.99322"W	7022008.3540	602101.6920	3404180.562	1811078.265	60.244	18.362	MP	8/4/2018 8:07
5398	5398	63°18'43.91604"N	168°57'43.10283"W	63°18'43.93154"N	168°57'43.01705"W	7021997.6760	602115.6280	3404144.813	1811123.445	60.077	18.311	MP	8/4/2018 8:08
5399	5399	63°18'43.36308"N	168°57'48.39586"W	63°18'43.37858"N	168°57'48.31007"W	7021978.2270	602042.5220	3404084.741	1810882.581	61.301	18.684	MP	8/4/2018 8:14
5400	5400	63°18'43.49510"N	168°57'48.68198"W	63°18'43.51061"N	168°57'48.59619"W	7021982.1850	602038.4110	3404097.939	1810869.295	61.084	18.619	MP	8/4/2018 8:15
5401	5401	63°18'43.36644"N	168°57'48.87144"W	63°18'43.38194"N	168°57'48.78565"W	7021978.1210	602035.9010	3404084.731	1810860.852	61.777	18.83	MP	8/4/2018 8:15
5402	5402	63°18'43.23452"N	168°57'48.69097"W	63°18'43.25001"N	168°57'48.60518"W	7021974.1190	602038.5420	3404071.466	1810869.312	61.74	18.818	MP	8/4/2018 8:16
5403	5403	63°18'45.43881"N	168°57'48.19059"W	63°18'45.45431"N	168°57'48.10481"W	7022042.5390	602043.3380	3404295.713	1810888.549	58.293	17.768	MP	8/4/2018 8:19
5404	5404	63°18'45.70860"N	168°57'47.53485"W	63°18'45.72410"N	168°57'47.44905"W	7022051.1760	602052.1970	3404323.598	1810918.058	57.679	17.581	MP	8/4/2018 8:20
5405	5405	63°18'45.92134"N	168°57'48.17241"W	63°18'45.93684"N	168°57'48.08661"W	7022057.4760	602043.1160	3404344.734	1810888.587	57.819	17.623	MP	8/4/2018 8:22
5406	5406	63°18'45.71798"N	168°57'48.70857"W	63°18'45.73348"N	168°57'48.62279"W	7022050.9470	602035.8560	3404323.684	1810864.431	57.725	17.595	MP	8/4/2018 8:23
5407	5407	63°18'45.99584"N	168°57'43.42784"W	63°18'46.01134"N	168°57'43.34205"W	7022061.8790	602109.0600	3404355.806	1811105.18	57.409	17.498	MP	8/4/2018 8:27
5408	5408	63°18'46.18701"N	168°57'42.99028"W	63°18'46.20251"N	168°57'42.90449"W	7022067.9870	602114.9600	3404375.546	1811124.852	57.125	17.412	MP	8/4/2018 8:28
5409	5409	63°18'46.48918"N	168°57'43.41225"W	63°18'46.50468"N	168°57'43.32646"W	7022077.1490	602108.7910	3404405.924	1811105.081	57.528	17.534	MP	8/4/2018 8:31
5410	5410	63°18'46.19333"N	168°57'43.86304"W	63°18'46.20882"N	168°57'43.77724"W	7022067.7960	602102.8100	3404375.542	1811084.977	57.654	17.573	MP	8/4/2018 8:32
5411	5411	63°18'45.71478"N	168°57'41.69374"W	63°18'45.73028"N	168°57'41.60795"W	7022053.9500	602133.4650	3404328.543	1811184.85	58.493	17.829	MP	8/4/2018 8:37
5412	5412	63°18'45.36554"N	168°57'41.22981"W	63°18'45.38104"N	168°57'41.14402"W	7022043.3510	602140.2640	3404293.416	1811206.615	58.966	17.973	MP	8/4/2018 8:39
5413	5413	63°18'45.10008"N	168°57'41.71701"W	63°18'45.11558"N	168°57'41.63123"W	7022034.9220	602133.7460	3404266.094	1811184.798	58.842	17.935	MP	8/4/2018 8:40
5414	5414	63°18'45.37279"N	168°57'42.20856"W	63°18'45.38828"N	168°57'42.12278"W	7022043.1420	602126.6380	3404293.428	1811161.897	56.936	17.354	MP	8/4/2018 8:42
5415	5415	63°18'51.38639"N	168°57'45.32046"W	63°18'51.40189"N	168°57'45.23466"W	7022227.8190	602077.4250	3404901.894	1811009.874	44.41	13.536	EPP BASE ONLY	8/4/2018 8:53
5416	5416	63°18'51.50076"N	168°57'45.33605"W	63°18'51.51626"N	168°57'45.25026"W	7022231.3510	602077.0950	3404913.499	1811008.974	43.494	13.257	ML1 SUBMERGED PP	8/4/2018 8:57
5417	5417	63°18'51.55863"N	168°57'45.59133"W	63°18'51.57413"N	168°57'45.50554"W	7022233.0280	602073.4860	3404919.188	1810997.219	43.915	13.385	ML1 SUBMERGED PP	8/4/2018 8:58
5418	5418	63°18'51.53111"N	168°57'44.28701"W	63°18'51.54661"N	168°57'44.20120"W	7022232.7540	602091.6610	3404917.356	1811056.838	43.787	13.346	L2 PARTIALLY SUBMERGED P	8/4/2018 9:00
5419	5419	63°18'51.61767"N	168°57'44.05173"W	63°18'51.63317"N	168°57'43.96594"W	7022235.5360	602094.8490	3404926.322	1811067.442	44.088	13.438	ML2 PARTIALY SUBMERGED P	8/4/2018 9:00
5420	5420	63°18'57.69955"N	168°57'18.33951"W	63°18'57.71505"N	168°57'18.25371"W	7022435.0950	602446.5900	3405563.095	1812231.755	51.28	15.63	CHK 2 HV	8/4/2018 9:15
5421	5421	63°19'32.47886"N	168°58'15.32326"W	63°19'32.49437"N	168°58'15.23744"W	7023485.9390	601619.7350	3409053.346	1809572.535	28.383	8.651	CHK 1 HV	8/4/2018 9:20
8733	8733	63°18'02.49176"N	168°57'19.09969"W	63°18'02.50725"N	168°57'19.01393"W	7020726.6950	602490.4970	3399955.406	1812288.389	359.968	109.718	MAG NAIL	
8734	8734	63°18'16.63308"N	168°57'28.66663"W	63°18'16.64857"N	168°57'28.58086"W	7021159.9660	602343.3890	3401384.541	1811827.883	219.728	66.973	MAG NAIL	
10001	10001	63°19'32.47891"N	168°58'15.32291"W	63°19'32.49442"N	168°58'15.23709"W	7023485.9400	601619.7390	3409053.351	1809572.551	28.449	8.671	CHK 1 HV	8/2/2018 8:52
10002	10002	63°18'42.73254"N	168°57'29.95021"W	63°18'42.74803"N	168°57'29.86443"W	7021966.8840	602299.8050	3404034.355	1811726.175	73.042	22.263	CHK 2600 HV	8/2/2018 9:09
10003	10003	63°18'57.69942"N	168°57'18.33963"W	63°18'57.71491"N	168°57'18.25381"W	7022435.0910	602446.5890	3405563.082	1812231.75	51.433	15.677	CHK 0 HV	8/2/2018 9:27
10004	10004	63°20'08.82995"N	168°56'24.47102"W	63°20'08.84544"N	168°56'24.38513"W	7024659.7730	603125.3080	3412827.759	1814572.567	5.296	1.614	CHK 59 HV	8/2/2018 9:51
10005	10005	63°18'42.87993"N	168°57'39.58913"W	63°18'42.89543"N	168°57'39.50335"W	7021967.1750	602165.5390	3404042.181	1811285.647	63.523	19.362	HEW100	8/2/2018 10:40
10006	10006	63°18'42.91734"N	168°57'39.43692"W	63°18'42.93284"N	168°57'39.35114"W	7021968.4000	602167.6200	3404046.094	1811292.538	63.507	19.357	HEW100	8/2/2018 10:40
10007	10007	63°18'43.02619"N	168°57'39.29680"W	63°18'43.04168"N	168°57'39.21102"W	7021971.8290	602169.4620	3404057.252	1811298.759	63.512	19.359	HEW100	8/2/2018 10:40

2018 Northeast Cape Periodic Review
Survey Table

Field Survey Point ID	Feature Location ID	Latitude (WGS84)	Longitude (WGS84)	Latitude (NAD 83 (2011))	Longitude (NAD 83 (2011))	Northing (UTM Zone 2N)	Easting (UTM Zone 2N)	Northing - Alaska State Plane Zone 9, U.S. Survey Feet	Easting - Alaska State Plane Zone 9, U.S. Survey Feet	Elevation (NAVD88, GEOID12B, U.S. Survey Feet)	Elevation (NAVD88, GEOID12B, Meters)	Text Descriptor	Measurement Date/Time
10008	10008	63°18'43.13760"N	168°57'39.07780"W	63°18'43.15310"N	168°57'38.99201"W	7021975.3730	602172.4000	3404068.73	1811308.579	63.505	19.356	HEW100	8/2/2018 10:41
10009	10009	63°18'43.23931"N	168°57'38.94311"W	63°18'43.25481"N	168°57'38.85733"W	7021978.5800	602174.1740	3404079.16	1811314.564	63.551	19.37	HEW100	8/2/2018 10:41
10010	10010	63°18'43.25831"N	168°57'39.04228"W	63°18'43.27381"N	168°57'38.95650"W	7021979.1240	602172.7750	3404081.016	1811310.003	63.475	19.347	HEW100	8/2/2018 10:42
10011	10011	63°18'43.24509"N	168°57'39.29697"W	63°18'43.26059"N	168°57'39.21118"W	7021978.6020	602169.2440	3404079.485	1811298.391	63.545	19.368	HEW100	8/2/2018 10:42
10012	10012	63°18'43.25478"N	168°57'39.41235"W	63°18'43.27027"N	168°57'39.32657"W	7021978.8500	602167.6290	3404080.383	1811293.105	63.514	19.359	HEW100	8/2/2018 10:42
10013	10013	63°18'43.30748"N	168°57'39.62035"W	63°18'43.32297"N	168°57'39.53457"W	7021980.3890	602164.6830	3404085.582	1811283.517	63.525	19.363	HEW100	8/2/2018 10:42
10014	10014	63°18'43.31106"N	168°57'39.77627"W	63°18'43.32656"N	168°57'39.69050"W	7021980.4310	602162.5100	3404085.83	1811276.389	63.516	19.36	HEW100	8/2/2018 10:43
10015	10015	63°18'43.29209"N	168°57'39.92316"W	63°18'43.30759"N	168°57'39.83738"W	7021979.7790	602160.4850	3404083.795	1811269.711	63.488	19.351	HEW100	8/2/2018 10:44
10016	10016	63°18'43.33129"N	168°57'39.98096"W	63°18'43.34678"N	168°57'39.89517"W	7021980.9660	602159.6420	3404087.733	1811267.006	63.488	19.351	HEW100	8/2/2018 10:44
10017	10017	63°18'43.32961"N	168°57'40.02146"W	63°18'43.34511"N	168°57'39.93567"W	7021980.8960	602159.0800	3404087.533	1811265.159	63.524	19.362	HEW100	8/2/2018 10:44
10018	10018	63°18'43.26427"N	168°57'40.07881"W	63°18'43.27976"N	168°57'39.99303"W	7021978.8490	602158.3470	3404080.854	1811262.647	63.516	19.36	HEW100	8/2/2018 10:45
10019	10019	63°18'43.21258"N	168°57'40.29311"W	63°18'43.22808"N	168°57'40.20732"W	7021977.1550	602155.4160	3404075.446	1811252.943	63.499	19.354	HEW100	8/2/2018 10:46
10020	10020	63°18'43.13710"N	168°57'40.38189"W	63°18'43.15260"N	168°57'40.29610"W	7021974.7800	602154.2550	3404067.714	1811249.012	63.459	19.342	HEW100	8/2/2018 10:47
10021	10021	63°18'43.05717"N	168°57'40.34357"W	63°18'43.07266"N	168°57'40.25778"W	7021972.3240	602154.8670	3404059.624	1811250.894	63.445	19.338	HEW100	8/2/2018 10:47
10022	10022	63°18'43.03313"N	168°57'40.27164"W	63°18'43.04863"N	168°57'40.18586"W	7021971.6130	602155.8910	3404057.236	1811254.219	63.508	19.357	HEW100	8/2/2018 10:47
10023	10023	63°18'42.99513"N	168°57'40.27220"W	63°18'43.01063"N	168°57'40.18642"W	7021970.4370	602155.9200	3404053.376	1811254.256	63.501	19.355	HEW100	8/2/2018 10:47
10024	10024	63°18'42.96293"N	168°57'40.00470"W	63°18'42.97843"N	168°57'39.91891"W	7021969.5590	602159.6740	3404050.304	1811266.528	63.522	19.361	HEW100	8/2/2018 10:48
10025	10025	63°18'42.90285"N	168°57'39.68809"W	63°18'42.91834"N	168°57'39.60231"W	7021967.8400	602164.1390	3404044.436	1811281.089	63.485	19.35	HEW100	8/2/2018 10:48
10026	10026	63°18'42.88223"N	168°57'39.63911"W	63°18'42.89773"N	168°57'39.55333"W	7021967.2240	602164.8410	3404042.378	1811283.36	63.529	19.364	HEW100 C	8/2/2018 10:48
10027	10027	63°18'43.55155"N	168°57'43.07608"W	63°18'43.56705"N	168°57'42.99030"W	7021986.4110	602116.3580	3404107.814	1811125.266	60.809	18.535	HEW101	8/2/2018 10:52
10028	10028	63°18'43.61507"N	168°57'42.95247"W	63°18'43.63057"N	168°57'42.86669"W	7021988.4310	602118.0160	3404114.357	1811130.808	60.738	18.513	HEW101	8/2/2018 10:52
10029	10029	63°18'43.66092"N	168°57'42.78559"W	63°18'43.67642"N	168°57'42.69981"W	7021989.9230	602120.2930	3404119.137	1811138.355	60.816	18.537	HEW101	8/2/2018 10:53
10030	10030	63°18'43.70895"N	168°57'42.63972"W	63°18'43.72444"N	168°57'42.55394"W	7021991.4740	602122.2750	3404124.123	1811144.939	60.759	18.519	HEW101	8/2/2018 10:53
10031	10031	63°18'43.76279"N	168°57'42.45971"W	63°18'43.77828"N	168°57'42.37392"W	7021993.2190	602124.7270	3404129.724	1811153.073	60.751	18.517	HEW101	8/2/2018 10:53
10032	10032	63°18'43.79184"N	168°57'42.40402"W	63°18'43.80734"N	168°57'42.31823"W	7021994.1430	602125.4730	3404132.716	1811155.569	60.791	18.529	HEW101	8/2/2018 10:53
10033	10033	63°18'43.81714"N	168°57'42.44812"W	63°18'43.83263"N	168°57'42.36233"W	7021994.9060	602124.8350	3404135.253	1811153.513	60.745	18.515	HEW101	8/2/2018 10:54
10034	10034	63°18'43.73457"N	168°57'42.76311"W	63°18'43.75006"N	168°57'42.67731"W	7021992.2120	602120.5330	3404126.634	1811139.261	60.769	18.522	HEW101	8/2/2018 10:55
10035	10035	63°18'43.72496"N	168°57'43.07113"W	63°18'43.74045"N	168°57'42.98536"W	7021991.7780	602116.2570	3404125.43	1811125.207	60.743	18.514	HEW101	8/2/2018 10:55
10036	10036	63°18'43.76463"N	168°57'43.39893"W	63°18'43.78013"N	168°57'43.31314"W	7021992.8610	602111.6570	3404129.217	1811110.169	60.785	18.527	HEW101	8/2/2018 11:05
10037	10037	63°18'43.77857"N	168°57'43.50813"W	63°18'43.79407"N	168°57'43.42234"W	7021993.2440	602110.1240	3404130.552	1811105.158	60.812	18.535	HEW101	8/2/2018 11:06
10038	10038	63°18'43.91864"N	168°57'43.51217"W	63°18'43.93414"N	168°57'43.42638"W	7021997.5750	602109.9300	3404144.775	1811104.743	60.828	18.541	HEW101	8/2/2018 11:06
10039	10039	63°18'44.00020"N	168°57'43.55974"W	63°18'44.01570"N	168°57'43.47395"W	7022000.0780	602109.1870	3404153.023	1811102.436	60.791	18.529	HEW101	8/2/2018 11:07
10040	10040	63°18'44.10554"N	168°57'43.76209"W	63°18'44.12103"N	168°57'43.67630"W	7022003.2470	602106.2680	3404163.572	1811093.02	60.786	18.528	HEW101	8/2/2018 11:08
10041	10041	63°18'44.17311"N	168°57'43.95615"W	63°18'44.18861"N	168°57'43.87037"W	7022005.2520	602103.5010	3404170.292	1811084.045	60.758	18.519	HEW101	8/2/2018 11:09
10042	10042	63°18'44.10684"N	168°57'44.23618"W	63°18'44.12234"N	168°57'44.15039"W	7022003.0780	602099.6700	3404163.354	1811071.363	60.783	18.527	HEW101	8/2/2018 11:09
10043	10043	63°18'44.03654"N	168°57'44.41722"W	63°18'44.05203"N	168°57'44.33142"W	7022000.8230	602097.2200	3404156.08	1811063.209	60.791	18.529	HEW101	8/2/2018 11:10
10044	10044	63°18'43.94930"N	168°57'44.63480"W	63°18'43.96479"N	168°57'44.54901"W	7021998.0270	602094.2790	3404147.059	1811053.414	60.822	18.539	HEW101	8/2/2018 11:11
10045	10045	63°18'43.82275"N	168°57'44.56323"W	63°18'43.83825"N	168°57'44.47745"W	7021994.1440	602095.3990	3404134.259	1811056.891	60.787	18.528	HEW101	8/2/2018 11:11
10046	10046	63°18'43.73027"N	168°57'44.34211"W	63°18'43.74577"N	168°57'44.25633"W	7021991.3800	602098.5670	3404125.03	1811067.143	60.818	18.537	HEW101	8/2/2018 11:12
10047	10047	63°18'43.57656"N	168°57'44.33825"W	63°18'43.59206"N	168°57'44.25246"W	7021986.6260	602098.7720	3404109.421	1811067.572	60.824	18.539	HEW101	8/2/2018 11:12
10048	10048	63°18'43.56975"N	168°57'44.27985"W	63°18'43.58525"N	168°57'44.19407"W	7021986.4420	602099.5910	3404108.773	1811070.251	60.875	18.555	HEW101	8/2/2018 11:13
10049	10049	63°18'43.65926"N	168°57'44.19322"W	63°18'43.67476"N	168°57'44.10742"W	7021989.2490	602100.7080	3404117.928	1811074.061	60.767	18.522	HEW101	8/2/2018 11:14
10050	10050	63°18'43.63976"N	168°57'43.91930"W	63°18'43.65526"N	168°57'43.83351"W	7021988.7670	602104.5390	3404116.15	1811086.605	60.718	18.507	HEW101	8/2/2018 11:15
10051	10051	63°18'43.54313"N	168°57'43.88376"W	63°18'43.55863"N	168°57'43.79797"W	7021985.7930	602105.1280	3404106.362	1811088.387	60.77	18.523	HEW101	8/2/2018 11:15

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Field Survey Point ID	Feature Location ID	Latitude (WGS84)	Longitude (WGS84)	Latitude (NAD 83 (2011))	Longitude (NAD 83 (2011))	Northing (UTM Zone 2N)	Easting (UTM Zone 2N)	Northing - Alaska State Plane Zone 9, U.S. Survey Feet	Easting - Alaska State Plane Zone 9, U.S. Survey Feet	Elevation (NAVD88, GEOID12B, U.S. Survey Feet)	Elevation (NAVD88, GEOID12B, Meters)	Text Descriptor	Measurement Date/Time
10052	10052	63°18'43.52839"N	168°57'43.78273"W	63°18'43.54388"N	168°57'43.69695"W	7021985.3810	602106.5490	3404104.939	1811093.026	60.802	18.532	HEW101	8/2/2018 11:15
10053	10053	63°18'43.47070"N	168°57'43.81758"W	63°18'43.48620"N	168°57'43.73179"W	7021983.5810	602106.1210	3404099.054	1811091.529	60.972	18.584	HEW101	8/2/2018 11:16
10054	10054	63°18'43.45063"N	168°57'43.49773"W	63°18'43.46613"N	168°57'43.41195"W	7021983.1020	602110.5910	3404097.253	1811106.172	60.929	18.571	HEW101	8/2/2018 11:16
10055	10055	63°18'43.44664"N	168°57'43.22873"W	63°18'43.46214"N	168°57'43.14295"W	7021983.0980	602114.3380	3404097.046	1811118.466	61.101	18.624	HEW101	8/2/2018 11:16
10056	10056	63°18'43.44303"N	168°57'43.22240"W	63°18'43.45852"N	168°57'43.13662"W	7021982.9880	602114.4290	3404096.684	1811118.761	61.2	18.654	MP infall	8/2/2018 11:20
10057	10057	63°18'43.49582"N	168°57'43.20121"W	63°18'43.51131"N	168°57'43.11542"W	7021984.6310	602114.6720	3404102.061	1811119.642	60.824	18.539	HEW101	8/2/2018 11:27
10058	10058	63°18'43.54522"N	168°57'43.10116"W	63°18'43.56072"N	168°57'43.01536"W	7021986.2040	602116.0160	3404107.153	1811124.131	60.793	18.53	HEW101 C	8/2/2018 11:27
10059	10059	63°18'44.47207"N	168°57'51.37127"W	63°18'44.48757"N	168°57'51.28549"W	7022011.2230	602000.0310	3404195.179	1810744.852	61	18.593	HEW102	8/2/2018 11:39
10060	10060	63°18'44.50018"N	168°57'51.43013"W	63°18'44.51567"N	168°57'51.34434"W	7022012.0660	601999.1840	3404197.99	1810742.117	61.019	18.599	HEW102	8/2/2018 11:39
10061	10061	63°18'44.47154"N	168°57'51.57489"W	63°18'44.48704"N	168°57'51.48911"W	7022011.1170	601997.1980	3404194.975	1810735.552	61.034	18.603	HEW102	8/2/2018 11:39
10062	10062	63°18'44.39257"N	168°57'51.59504"W	63°18'44.40807"N	168°57'51.50926"W	7022008.6640	601996.9950	3404186.939	1810734.761	61.033	18.603	HEW102	8/2/2018 11:39
10063	10063	63°18'44.37425"N	168°57'51.40854"W	63°18'44.38974"N	168°57'51.32274"W	7022008.1800	601999.6080	3404185.216	1810743.31	60.949	18.577	HEW102	8/2/2018 11:40
10064	10064	63°18'44.42090"N	168°57'51.35023"W	63°18'44.43640"N	168°57'51.26443"W	7022009.6490	602000.3740	3404189.997	1810745.897	61.004	18.594	HEW102 C	8/2/2018 11:40
10065	10065	63°18'46.95501"N	168°57'47.10710"W	63°18'46.97051"N	168°57'47.02132"W	7022089.9270	602056.9230	3404450.505	1810935.549	57.14	17.416	HEW103	8/2/2018 11:45
10066	10066	63°18'47.01138"N	168°57'46.86125"W	63°18'47.02688"N	168°57'46.77546"W	7022091.7800	602060.2880	3404456.411	1810946.686	57.136	17.415	HEW103	8/2/2018 11:46
10067	10067	63°18'47.08367"N	168°57'46.69309"W	63°18'47.09917"N	168°57'46.60731"W	7022094.0910	602062.5570	3404463.878	1810954.248	57.096	17.403	HEW103	8/2/2018 11:46
10068	10068	63°18'47.11638"N	168°57'46.52283"W	63°18'47.13188"N	168°57'46.43704"W	7022095.1780	602064.8940	3404467.326	1810961.971	57.006	17.375	HEW103	8/2/2018 11:47
10069	10069	63°18'47.19668"N	168°57'46.37175"W	63°18'47.21218"N	168°57'46.28597"W	7022097.7300	602066.9170	3404475.593	1810968.74	56.971	17.365	HEW103	8/2/2018 11:47
10070	10070	63°18'47.25989"N	168°57'46.35570"W	63°18'47.27539"N	168°57'46.26990"W	7022099.6920	602067.0780	3404482.025	1810969.369	57.027	17.382	HEW103	8/2/2018 11:48
10071	10071	63°18'47.26879"N	168°57'46.43135"W	63°18'47.28429"N	168°57'46.34555"W	7022099.9340	602066.0170	3404482.873	1810965.899	56.923	17.35	HEW103	8/2/2018 11:49
10072	10072	63°18'47.19744"N	168°57'46.54827"W	63°18'47.21295"N	168°57'46.46248"W	7022097.6750	602064.4600	3404475.54	1810960.676	56.994	17.372	HEW103	8/2/2018 11:49
10073	10073	63°18'47.13497"N	168°57'46.79710"W	63°18'47.15046"N	168°57'46.71132"W	7022095.6320	602061.0590	3404469.011	1810949.413	57.09	17.401	HEW103	8/2/2018 11:50
10074	10074	63°18'47.07389"N	168°57'47.01350"W	63°18'47.08939"N	168°57'46.92772"W	7022093.6470	602058.1080	3404462.648	1810939.629	57.049	17.388	HEW103	8/2/2018 11:50
10075	10075	63°18'47.00135"N	168°57'47.17367"W	63°18'47.01685"N	168°57'47.08789"W	7022091.3320	602055.9510	3404455.162	1810932.432	57.142	17.417	HEW103 C	8/2/2018 11:50
10076	10076	63°18'48.49190"N	168°57'44.91742"W	63°18'48.50740"N	168°57'44.83164"W	7022138.4450	602085.8780	3404608.216	1811033.039	54.226	16.528	HEW104	8/2/2018 12:06
10077	10077	63°18'48.48322"N	168°57'44.92980"W	63°18'48.49872"N	168°57'44.84400"W	7022138.1710	602085.7150	3404607.325	1811032.488	54.283	16.546	HEW105	8/2/2018 12:06
10078	10078	63°18'48.55545"N	168°57'45.11645"W	63°18'48.57095"N	168°57'45.03066"W	7022140.3240	602083.0470	3404614.523	1811023.844	51.962	15.838	HEW104	8/2/2018 12:07
10079	10079	63°18'48.54977"N	168°57'45.15024"W	63°18'48.56527"N	168°57'45.06446"W	7022140.1330	602082.5820	3404613.921	1811022.31	52.031	15.859	HEW105	8/2/2018 12:07
10080	10080	63°18'48.63414"N	168°57'45.12741"W	63°18'48.64964"N	168°57'45.04162"W	7022142.7530	602082.8170	3404622.507	1811023.214	51.875	15.811	HEW105	8/2/2018 12:07
10081	10081	63°18'48.63903"N	168°57'45.08632"W	63°18'48.65453"N	168°57'45.00053"W	7022142.9230	602083.3840	3404623.034	1811025.083	51.924	15.826	HEW104	8/2/2018 12:07
10082	10082	63°18'48.71231"N	168°57'45.24188"W	63°18'48.72781"N	168°57'45.15610"W	7022145.1210	602081.1470	3404630.361	1811017.857	51.847	15.803	HEW105	8/2/2018 12:08
10083	10083	63°18'48.72552"N	168°57'45.19688"W	63°18'48.74102"N	168°57'45.11108"W	7022145.5500	602081.7610	3404631.736	1811019.891	51.826	15.797	HEW104	8/2/2018 12:08
10084	10084	63°18'48.76504"N	168°57'45.19988"W	63°18'48.78054"N	168°57'45.11409"W	7022146.7710	602081.6800	3404635.748	1811019.689	51.745	15.772	HEW104	8/2/2018 12:08
10085	10085	63°18'48.79952"N	168°57'45.20536"W	63°18'48.81502"N	168°57'45.11956"W	7022147.8350	602081.5700	3404639.246	1811019.382	51.762	15.777	HEW105	8/2/2018 12:09
10086	10086	63°18'48.77197"N	168°57'45.05640"W	63°18'48.78747"N	168°57'44.97061"W	7022147.0490	602083.6690	3404636.558	1811026.231	51.637	15.739	HEW105	8/2/2018 12:09
10087	10087	63°18'48.74067"N	168°57'44.97764"W	63°18'48.75616"N	168°57'44.89185"W	7022146.1150	602084.7960	3404633.437	1811029.88	51.702	15.759	HEW104	8/2/2018 12:09
10088	10088	63°18'48.84393"N	168°57'45.05142"W	63°18'48.85942"N	168°57'44.96564"W	7022149.2770	602083.6680	3404643.87	1811026.34	51.4	15.667	HEW104	8/2/2018 12:10
10089	10089	63°18'48.87075"N	168°57'45.11452"W	63°18'48.88625"N	168°57'45.02873"W	7022150.0790	602082.7640	3404646.547	1811023.414	51.279	15.63	HEW105	8/2/2018 12:10
10090	10090	63°18'48.92160"N	168°57'44.83254"W	63°18'48.93710"N	168°57'44.74674"W	7022151.7770	602086.6370	3404651.92	1811036.21	50.647	15.437	HEW105	8/2/2018 12:10
10091	10091	63°18'48.90569"N	168°57'44.80016"W	63°18'48.92118"N	168°57'44.71436"W	7022151.2990	602087.1030	3404650.328	1811037.715	50.601	15.423	HEW104	8/2/2018 12:11
10092	10092	63°18'49.07374"N	168°57'44.86643"W	63°18'49.08923"N	168°57'44.78065"W	7022156.4690	602086.0160	3404667.347	1811034.412	49.815	15.184	HEW105	8/2/2018 12:11
10093	10093	63°18'49.07625"N	168°57'44.80401"W	63°18'49.09174"N	168°57'44.71822"W	7022156.5740	602086.8820	3404667.648	1811037.259	49.973	15.232	HEW104	8/2/2018 12:12
10094	10094	63°18'49.12904"N	168°57'44.71727"W	63°18'49.14454"N	168°57'44.63149"W	7022158.2460	602088.0370	3404673.074	1811041.134	49.944	15.223	HEW104	8/2/2018 12:12
10095	10095	63°18'49.16625"N	168°57'44.70833"W	63°18'49.18175"N	168°57'44.62255"W	7022159.4010	602088.1250	3404676.86	1811041.481	49.886	15.205	HEW104	8/2/2018 12:12

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Field Survey Point ID	Feature Location ID	Latitude (WGS84)	Longitude (WGS84)	Latitude (NAD 83 (2011))	Longitude (NAD 83 (2011))	Northing (UTM Zone 2N)	Easting (UTM Zone 2N)	Northing - Alaska State Plane Zone 9, U.S. Survey Feet	Easting - Alaska State Plane Zone 9, U.S. Survey Feet	Elevation (NAVD88, GEOID12B, U.S. Survey Feet)	Elevation (NAVD88, GEOID12B, Meters)	Text Descriptor	Measurement Date/Time
10096	10096	63°18'49.25489"N	168°57'44.86333"W	63°18'49.27039"N	168°57'44.77753"W	7022162.0750	602085.8810	3404685.748	1811034.256	49.807	15.181	HEW104	8/2/2018 12:13
10097	10097	63°18'49.14188"N	168°57'44.79144"W	63°18'49.15738"N	168°57'44.70566"W	7022158.6110	602086.9920	3404674.323	1811037.725	49.855	15.196	HEW105	8/2/2018 12:13
10098	10098	63°18'49.21026"N	168°57'44.89788"W	63°18'49.22576"N	168°57'44.81210"W	7022160.6790	602085.4440	3404681.19	1811032.751	49.834	15.19	HEW105	8/2/2018 12:13
10099	10099	63°18'49.36826"N	168°57'44.86654"W	63°18'49.38376"N	168°57'44.78076"W	7022165.5820	602085.7250	3404697.26	1811033.923	49.655	15.135	HEW105	8/2/2018 12:14
10100	10100	63°18'49.34336"N	168°57'44.76469"W	63°18'49.35886"N	168°57'44.67889"W	7022164.8560	602087.1670	3404694.806	1811038.616	49.72	15.155	HEW104	8/2/2018 12:14
10101	10101	63°18'49.52480"N	168°57'44.89256"W	63°18'49.54031"N	168°57'44.80677"W	7022170.4130	602085.2090	3404713.14	1811032.477	48.664	14.833	HEW104	8/2/2018 12:15
10102	10102	63°18'49.52235"N	168°57'44.98656"W	63°18'49.53784"N	168°57'44.90076"W	7022170.2950	602083.9030	3404712.821	1811028.188	48.611	14.817	HEW105	8/2/2018 12:15
10103	10103	63°18'49.66215"N	168°57'45.12745"W	63°18'49.67765"N	168°57'45.04165"W	7022174.5590	602081.8060	3404726.916	1811021.523	48.161	14.68	HEW105	8/2/2018 12:16
10104	10104	63°18'49.66643"N	168°57'45.05710"W	63°18'49.68192"N	168°57'44.97131"W	7022174.7220	602082.7800	3404727.402	1811024.729	48.149	14.676	HEW104	8/2/2018 12:16
10105	10105	63°18'48.57734"N	168°57'46.67847"W	63°18'48.59284"N	168°57'46.59268"W	7022140.3100	602061.2920	3404615.592	1810952.462	52.402	15.972	HEW5	8/2/2018 12:23
10106	10106	63°18'48.67661"N	168°57'46.67561"W	63°18'48.69211"N	168°57'46.58983"W	7022143.3830	602061.2340	3404625.676	1810952.43	52.239	15.923	HEW5	8/2/2018 12:23
10107	10107	63°18'48.74868"N	168°57'46.65537"W	63°18'48.76417"N	168°57'46.56958"W	7022145.6210	602061.4450	3404633.011	1810953.236	51.971	15.841	HEW5	8/2/2018 12:23
10108	10108	63°18'48.84062"N	168°57'46.52775"W	63°18'48.85612"N	168°57'46.44195"W	7022148.5220	602063.1300	3404642.443	1810958.914	51.643	15.741	HEW5	8/2/2018 12:24
10109	10109	63°18'48.87408"N	168°57'46.39866"W	63°18'48.88958"N	168°57'46.31287"W	7022149.6150	602064.8930	3404645.937	1810964.755	51.599	15.727	HEW5	8/2/2018 12:24
10110	10110	63°18'49.05508"N	168°57'46.31051"W	63°18'49.07058"N	168°57'46.22472"W	7022155.2530	602065.9420	3404664.385	1810968.484	50.968	15.535	HEW5	8/2/2018 12:24
10111	10111	63°18'49.14065"N	168°57'46.36274"W	63°18'49.15615"N	168°57'46.27694"W	7022157.8780	602065.1310	3404673.037	1810965.958	50.281	15.326	HEW5	8/2/2018 12:25
10112	10112	63°18'49.25401"N	168°57'46.22439"W	63°18'49.26951"N	168°57'46.13859"W	7022161.4460	602066.9440	3404684.653	1810972.091	49.88	15.204	HEW5	8/2/2018 12:25
10113	10113	63°18'49.28725"N	168°57'46.15620"W	63°18'49.30275"N	168°57'46.07041"W	7022162.5050	602067.8600	3404688.079	1810975.151	49.651	15.134	HEW5	8/2/2018 12:25
10114	10114	63°18'49.28976"N	168°57'46.08051"W	63°18'49.30526"N	168°57'45.99472"W	7022162.6160	602068.9110	3404688.39	1810978.604	49.346	15.041	HEW5	8/2/2018 12:26
10115	10115	63°18'49.34209"N	168°57'46.03895"W	63°18'49.35759"N	168°57'45.95316"W	7022164.2530	602069.4380	3404693.736	1810980.416	49.096	14.965	HEW5	8/2/2018 12:26
10116	10116	63°18'49.40062"N	168°57'46.01090"W	63°18'49.41612"N	168°57'45.92511"W	7022166.0770	602069.7710	3404699.701	1810981.601	49.025	14.943	HEW5	8/2/2018 12:26
10117	10117	63°18'49.50317"N	168°57'46.06166"W	63°18'49.51867"N	168°57'45.97587"W	7022169.2270	602068.9630	3404710.079	1810979.114	48.335	14.733	HEW5	8/2/2018 12:27
10118	10118	63°18'49.55150"N	168°57'46.12105"W	63°18'49.56701"N	168°57'46.03526"W	7022170.6960	602068.0900	3404714.944	1810976.322	47.617	14.514	HEW5	8/2/2018 12:27
10119	10119	63°18'49.59989"N	168°57'46.22331"W	63°18'49.61540"N	168°57'46.13752"W	7022172.1480	602066.6190	3404719.783	1810971.572	47.156	14.373	HEW5	8/2/2018 12:27
10120	10120	63°18'49.62413"N	168°57'46.35472"W	63°18'49.63963"N	168°57'46.26892"W	7022172.8400	602064.7670	3404722.148	1810965.53	46.885	14.291	HEW5	8/2/2018 12:30
10121	10121	63°18'49.69301"N	168°57'46.42931"W	63°18'49.70851"N	168°57'46.34351"W	7022174.9380	602063.6620	3404729.088	1810962.01	46.863	14.284	HEW5	8/2/2018 12:30
10122	10122	63°18'49.73076"N	168°57'46.45065"W	63°18'49.74626"N	168°57'46.36487"W	7022176.0960	602063.3270	3404732.906	1810960.973	46.82	14.271	HEW5	8/2/2018 12:30
10123	10123	63°18'49.80540"N	168°57'46.41933"W	63°18'49.82090"N	168°57'46.33355"W	7022178.4190	602063.6900	3404740.51	1810962.281	46.8	14.265	HEW5	8/2/2018 12:31
10124	10124	63°18'49.87566"N	168°57'46.33648"W	63°18'49.89116"N	168°57'46.25069"W	7022180.6300	602064.7740	3404747.707	1810965.95	46.727	14.243	HEW5	8/2/2018 12:31
10125	10125	63°18'49.95244"N	168°57'46.33264"W	63°18'49.96793"N	168°57'46.24686"W	7022183.0070	602064.7510	3404755.508	1810965.999	46.422	14.149	HEW5	8/2/2018 12:31
10126	10126	63°18'50.01683"N	168°57'46.12634"W	63°18'50.03232"N	168°57'46.04055"W	7022185.0900	602067.5590	3404762.2	1810975.316	46.283	14.107	HEW5	8/2/2018 12:31
10127	10127	63°18'50.03792"N	168°57'46.06855"W	63°18'50.05341"N	168°57'45.98276"W	7022185.7680	602068.3420	3404764.385	1810977.921	46.248	14.096	HEW5	8/2/2018 12:32
10128	10128	63°18'50.11423"N	168°57'45.95082"W	63°18'50.12973"N	168°57'45.86501"W	7022188.1810	602069.9050	3404772.223	1810983.173	46.224	14.089	HEW5	8/2/2018 12:32
10129	10129	63°18'50.12729"N	168°57'45.85782"W	63°18'50.14280"N	168°57'45.77203"W	7022188.6270	602071.1860	3404773.618	1810987.399	46.22	14.088	HEW5	8/2/2018 12:32
10130	10130	63°18'50.11936"N	168°57'45.75183"W	63°18'50.13486"N	168°57'45.66604"W	7022188.4280	602072.6690	3404772.891	1810992.253	46.16	14.069	HEW5	8/2/2018 12:32
10131	10131	63°18'50.18486"N	168°57'45.64441"W	63°18'50.20036"N	168°57'45.55862"W	7022190.5020	602074.0990	3404779.622	1810997.052	45.809	13.963	HEW5	8/2/2018 12:33
10132	10132	63°18'50.25013"N	168°57'45.60598"W	63°18'50.26563"N	168°57'45.52019"W	7022192.5380	602074.5690	3404786.28	1810998.7	45.473	13.86	HEW5	8/2/2018 12:33
10133	10133	63°18'50.31977"N	168°57'45.51874"W	63°18'50.33526"N	168°57'45.43296"W	7022194.7310	602075.7140	3404793.417	1811002.57	44.957	13.703	HEW5	8/2/2018 12:33
10134	10134	63°18'50.43166"N	168°57'45.37959"W	63°18'50.44716"N	168°57'45.29380"W	7022198.2550	602077.5410	3404804.884	1811008.742	44.831	13.665	HEW5	8/2/2018 12:34
10135	10135	63°18'57.69967"N	168°57'18.33953"W	63°18'57.71517"N	168°57'18.25372"W	7022435.0990	602446.5900	3405563.107	1812231.754	51.4	15.667	CHK 2 HV	8/2/2018 12:50
10136	10136	63°20'08.82985"N	168°56'24.47107"W	63°20'08.84535"N	168°56'24.38519"W	7024659.7700	603125.3080	3412827.749	1814572.565	5.323	1.623	CHK 0 HV	8/2/2018 14:33
10137	10137	63°18'50.46195"N	168°57'45.23411"W	63°18'50.47745"N	168°57'45.14831"W	7022199.2560	602079.5350	3404808.068	1811015.337	44.715	13.629	HEW5	8/2/2018 15:16
10138	10138	63°18'50.56526"N	168°57'45.12057"W	63°18'50.58076"N	168°57'45.03477"W	7022202.5030	602081.0130	3404818.645	1811020.353	44.418	13.539	HEW5	8/2/2018 15:16
10139	10139	63°18'50.70838"N	168°57'45.04451"W	63°18'50.72388"N	168°57'44.95871"W	7022206.9650	602081.9310	3404833.237	1811023.592	44.264	13.492	HEW5	8/2/2018 15:17

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Field Survey Point ID	Feature Location ID	Latitude (WGS84)	Longitude (WGS84)	Latitude (NAD 83 (2011))	Longitude (NAD 83 (2011))	Northing (UTM Zone 2N)	Easting (UTM Zone 2N)	Northing - Alaska State Plane Zone 9, U.S. Survey Feet	Easting - Alaska State Plane Zone 9, U.S. Survey Feet	Elevation (NAVD88, GEOID12B, U.S. Survey Feet)	Elevation (NAVD88, GEOID12B, Meters)	Text Descriptor	Measurement Date/Time
10140	10140	63°18'50.89834"N	168°57'45.13705"W	63°18'50.91383"N	168°57'45.05127"W	7022212.8000	602080.4560	3404852.461	1811019.053	44.114	13.446	HEW5	8/2/2018 15:18
10141	10141	63°18'50.96871"N	168°57'45.29649"W	63°18'50.98421"N	168°57'45.21071"W	7022214.9070	602078.1690	3404859.491	1811011.655	44.058	13.429	HEW5	8/2/2018 15:19
10142	10142	63°18'51.06412"N	168°57'45.13441"W	63°18'51.07962"N	168°57'45.04861"W	7022217.9310	602080.3300	3404869.301	1811018.901	44.006	13.413	HEW5	8/2/2018 15:19
10143	10143	63°18'51.09923"N	168°57'45.21825"W	63°18'51.11473"N	168°57'45.13246"W	7022218.9800	602079.1290	3404872.805	1811015.014	44.007	13.413	HEW5	8/2/2018 15:19
10144	10144	63°18'51.16299"N	168°57'45.22156"W	63°18'51.17849"N	168°57'45.13578"W	7022220.9510	602079.0200	3404879.278	1811014.758	43.846	13.364	HEW5	8/2/2018 15:19
10145	10145	63°18'51.16946"N	168°57'45.07328"W	63°18'51.18496"N	168°57'44.98749"W	7022221.2170	602081.0770	3404880.045	1811021.52	43.891	13.378	HEW5	8/2/2018 15:20
10146	10146	63°18'51.22063"N	168°57'45.03157"W	63°18'51.23612"N	168°57'44.94577"W	7022222.8190	602081.6070	3404885.272	1811023.341	44.02	13.417	HEW5	8/2/2018 15:20
10147	10147	63°18'51.22130"N	168°57'45.15551"W	63°18'51.23680"N	168°57'45.06971"W	7022222.7850	602079.8820	3404885.249	1811017.679	43.986	13.407	HEW5	8/2/2018 15:20
10148	10148	63°18'51.28527"N	168°57'45.28261"W	63°18'51.30076"N	168°57'45.19680"W	7022224.7070	602078.0510	3404891.652	1811011.769	43.886	13.377	HEW5	8/2/2018 15:21
10149	10149	63°18'51.36737"N	168°57'45.13883"W	63°18'51.38287"N	168°57'45.05304"W	7022227.3110	602079.9700	3404900.097	1811018.201	43.9	13.381	HEW5	8/2/2018 15:21
10150	10150	63°18'51.26490"N	168°57'44.92732"W	63°18'51.28040"N	168°57'44.84152"W	7022224.2350	602083.0140	3404889.846	1811028.03	43.971	13.403	HEW5	8/2/2018 15:22
10151	10151	63°18'51.34430"N	168°57'44.78269"W	63°18'51.35980"N	168°57'44.69690"W	7022226.7550	602084.9480	3404898.017	1811034.505	44.068	13.432	HEW5	8/2/2018 15:22
10152	10152	63°18'51.41496"N	168°57'44.80410"W	63°18'51.43047"N	168°57'44.71830"W	7022228.9320	602084.5810	3404905.178	1811033.411	44.028	13.42	HEW5	8/2/2018 15:23
10153	10153	63°18'51.47395"N	168°57'44.72340"W	63°18'51.48944"N	168°57'44.63761"W	7022230.7920	602085.6450	3404911.228	1811037	43.879	13.374	HEW5	8/2/2018 15:23
10154	10154	63°18'51.48201"N	168°57'44.43904"W	63°18'51.49750"N	168°57'44.35324"W	7022231.1670	602089.5940	3404912.257	1811049.975	43.894	13.379	HEW5	8/2/2018 15:24
10155	10155	63°18'51.58698"N	168°57'44.14908"W	63°18'51.60248"N	168°57'44.06328"W	7022234.5430	602093.5250	3404923.133	1811063.046	44.013	13.415	HEW5	8/2/2018 15:24
10156	10156	63°18'51.69732"N	168°57'44.36915"W	63°18'51.71282"N	168°57'44.28336"W	7022237.8600	602090.3550	3404934.177	1811052.813	43.977	13.404	HEW5	8/2/2018 15:25
10157	10157	63°18'51.82044"N	168°57'44.24807"W	63°18'51.83594"N	168°57'44.16227"W	7022241.7230	602091.9180	3404946.771	1811058.141	43.949	13.396	HEW5	8/2/2018 15:25
10158	10158	63°18'51.98462"N	168°57'44.25416"W	63°18'52.00012"N	168°57'44.16837"W	7022246.8000	602091.6720	3404963.441	1811057.593	43.956	13.398	HEW5	8/2/2018 15:25
10159	10159	63°18'52.11051"N	168°57'44.29611"W	63°18'52.12601"N	168°57'44.21030"W	7022250.6760	602090.9650	3404976.196	1811055.47	43.93	13.39	HEW5	8/2/2018 15:26
10160	10160	63°18'52.24051"N	168°57'44.18040"W	63°18'52.25601"N	168°57'44.09460"W	7022254.7490	602092.4470	3404989.485	1811060.541	44.018	13.417	HEW5	8/2/2018 15:26
10161	10161	63°18'52.35441"N	168°57'43.95769"W	63°18'52.36991"N	168°57'43.87189"W	7022258.3720	602095.4330	3405001.218	1811070.526	43.983	13.406	HEW5	8/2/2018 15:26
10162	10162	63°18'52.42370"N	168°57'43.91729"W	63°18'52.43920"N	168°57'43.83150"W	7022260.5330	602095.9270	3405008.285	1811072.257	43.966	13.401	HEW5	8/2/2018 15:27
10163	10163	63°18'52.52618"N	168°57'43.79746"W	63°18'52.54168"N	168°57'43.71166"W	7022263.7570	602097.4940	3405018.782	1811077.562	43.893	13.378	HEW5	8/2/2018 15:27
10164	10164	63°18'52.60223"N	168°57'43.78765"W	63°18'52.61772"N	168°57'43.70186"W	7022266.1140	602097.5550	3405026.513	1811077.885	43.776	13.343	HEW5	8/2/2018 15:27
10165	10165	63°18'52.61232"N	168°57'43.71008"W	63°18'52.62782"N	168°57'43.62430"W	7022266.4610	602098.6240	3405027.595	1811081.411	43.74	13.332	HEW5	8/2/2018 15:28
10166	10166	63°18'52.65603"N	168°57'43.67488"W	63°18'52.67153"N	168°57'43.58908"W	7022267.8280	602099.0710	3405032.061	1811082.947	43.778	13.343	HEW5	8/2/2018 15:28
10167	10167	63°18'52.70010"N	168°57'43.77635"W	63°18'52.71559"N	168°57'43.69056"W	7022269.1470	602097.6160	3405036.461	1811078.24	43.77	13.341	HEW5	8/2/2018 15:28
10168	10168	63°18'52.76694"N	168°57'43.75293"W	63°18'52.78243"N	168°57'43.66712"W	7022271.2250	602097.8760	3405043.267	1811079.2	43.377	13.221	HEW5	8/2/2018 15:28
10169	10169	63°18'52.85658"N	168°57'43.68564"W	63°18'52.87208"N	168°57'43.59984"W	7022274.0280	602098.7240	3405052.421	1811082.126	43.204	13.169	HEW5	8/2/2018 15:29
10170	10170	63°18'52.87946"N	168°57'43.58701"W	63°18'52.89495"N	168°57'43.50122"W	7022274.7800	602100.0740	3405054.818	1811086.593	43.158	13.155	HEW5	8/2/2018 15:29
10171	10171	63°18'52.97007"N	168°57'43.41155"W	63°18'52.98557"N	168°57'43.32576"W	7022277.6610	602102.4260	3405064.15	1811094.458	43.181	13.162	HEW5	8/2/2018 15:30
10172	10172	63°18'53.04644"N	168°57'43.24148"W	63°18'53.06194"N	168°57'43.15570"W	7022280.0990	602104.7170	3405072.033	1811102.1	43.16	13.155	HEW5	8/2/2018 15:30
10173	10173	63°18'53.24354"N	168°57'43.20310"W	63°18'53.25904"N	168°57'43.11731"W	7022286.2140	602105.0570	3405092.079	1811103.529	43.126	13.145	HEW5	8/2/2018 15:31
10174	10174	63°18'53.40291"N	168°57'43.22155"W	63°18'53.41840"N	168°57'43.13575"W	7022291.1360	602104.6440	3405108.252	1811102.424	43.226	13.175	HEW5	8/2/2018 15:31
10175	10175	63°18'53.42369"N	168°57'43.24813"W	63°18'53.43919"N	168°57'43.16233"W	7022291.7680	602104.2540	3405110.343	1811101.176	43.161	13.156	HEW5 jpn5153	8/2/2018 15:32
10176	10176	63°18'53.97313"N	168°57'43.36841"W	63°18'53.98863"N	168°57'43.28262"W	7022308.7140	602102.0400	3405166.057	1811094.779	42.03	12.811	HEW10	8/2/2018 15:37
10177	10177	63°18'54.06062"N	168°57'43.30302"W	63°18'54.07612"N	168°57'43.21721"W	7022311.4500	602102.8640	3405174.992	1811097.622	41.768	12.731	HEW10	8/2/2018 15:38
10178	10178	63°18'54.15397"N	168°57'43.09222"W	63°18'54.16947"N	168°57'43.00643"W	7022314.4310	602105.7040	3405184.628	1811107.096	41.548	12.664	HEW10	8/2/2018 15:38
10179	10179	63°18'54.24561"N	168°57'42.93564"W	63°18'54.26111"N	168°57'42.84984"W	7022317.3350	602107.7930	3405194.052	1811114.097	41.444	12.632	HEW10	8/2/2018 15:39
10180	10180	63°18'54.31931"N	168°57'42.95070"W	63°18'54.33481"N	168°57'42.86490"W	7022319.6090	602107.5110	3405201.526	1811113.288	41.429	12.628	HEW10	8/2/2018 15:39
10181	10181	63°18'54.35797"N	168°57'42.82015"W	63°18'54.37347"N	168°57'42.73434"W	7022320.8630	602109.2890	3405205.549	1811119.187	41.419	12.625	HEW10	8/2/2018 15:39
10182	10182	63°18'54.46052"N	168°57'42.74243"W	63°18'54.47602"N	168°57'42.65664"W	7022324.0700	602110.2690	3405216.022	1811122.568	41.142	12.54	HEW10	8/2/2018 15:39
10183	10183	63°18'54.59162"N	168°57'42.60855"W	63°18'54.60712"N	168°57'42.52275"W	7022328.1850	602112.0030	3405229.436	1811128.467	41.077	12.52	HEW10	8/2/2018 15:40

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Field Survey Point ID	Feature Location ID	Latitude (WGS84)	Longitude (WGS84)	Latitude (NAD 83 (2011))	Longitude (NAD 83 (2011))	Northing (UTM Zone 2N)	Easting (UTM Zone 2N)	Northing - Alaska State Plane Zone 9, U.S. Survey Feet	Easting - Alaska State Plane Zone 9, U.S. Survey Feet	Elevation (NAVD88, GEOID12B, U.S. Survey Feet)	Elevation (NAVD88, GEOID12B, Meters)	Text Descriptor	Measurement Date/Time
10184	10184	63°18'54.75162"N	168°57'42.48331"W	63°18'54.76713"N	168°57'42.39751"W	7022333.1910	602113.5880	3405245.779	1811133.924	40.977	12.49	HEW10	8/2/2018 15:40
10185	10185	63°18'54.90946"N	168°57'42.38825"W	63°18'54.92496"N	168°57'42.30245"W	7022338.1160	602114.7560	3405261.88	1811138.006	40.901	12.467	HEW10	8/2/2018 15:41
10186	10186	63°18'54.96559"N	168°57'42.35278"W	63°18'54.98109"N	168°57'42.26698"W	7022339.8690	602115.1940	3405267.607	1811139.534	40.686	12.401	HEW10	8/2/2018 15:41
10187	10187	63°18'55.07434"N	168°57'42.36163"W	63°18'55.08983"N	168°57'42.27583"W	7022343.2290	602114.9640	3405278.645	1811138.951	40.582	12.369	HEW10	8/2/2018 15:42
10188	10188	63°18'55.16272"N	168°57'42.36547"W	63°18'55.17822"N	168°57'42.27968"W	7022345.9620	602114.8230	3405287.619	1811138.63	40.431	12.323	HEW10	8/2/2018 15:42
10189	10189	63°18'55.25918"N	168°57'42.36787"W	63°18'55.27468"N	168°57'42.28206"W	7022348.9450	602114.6950	3405297.414	1811138.362	40.423	12.321	HEW10	8/2/2018 15:42
10190	10190	63°18'55.33222"N	168°57'42.44658"W	63°18'55.34772"N	168°57'42.36077"W	7022351.1700	602113.5280	3405304.774	1811134.647	40.297	12.283	HEW10	8/2/2018 15:43
10191	10191	63°18'55.47040"N	168°57'42.31999"W	63°18'55.48591"N	168°57'42.23421"W	7022355.5020	602115.1530	3405318.902	1811140.201	40.275	12.276	HEW10	8/2/2018 15:43
10192	10192	63°18'55.50102"N	168°57'42.43023"W	63°18'55.51652"N	168°57'42.34442"W	7022356.4000	602113.5900	3405321.93	1811135.116	40.245	12.267	HEW10	8/2/2018 15:43
10193	10193	63°18'55.63753"N	168°57'42.36348"W	63°18'55.65303"N	168°57'42.27769"W	7022360.6530	602114.3840	3405335.844	1811137.94	40.085	12.218	HEW10	8/2/2018 15:44
10194	10194	63°18'55.63140"N	168°57'42.22986"W	63°18'55.64689"N	168°57'42.14406"W	7022360.5220	602116.2490	3405335.32	1811144.053	40.018	12.197	HEW10	8/2/2018 15:44
10195	10195	63°18'55.64805"N	168°57'42.05924"W	63°18'55.66354"N	168°57'41.97344"W	7022361.1130	602118.6070	3405337.137	1811151.818	40.064	12.212	HEW10	8/2/2018 15:45
10196	10196	63°18'55.74691"N	168°57'41.94051"W	63°18'55.76241"N	168°57'41.85472"W	7022364.2240	602120.1610	3405347.266	1811157.078	40.022	12.199	HEW10	8/2/2018 15:45
10197	10197	63°18'55.81611"N	168°57'41.86890"W	63°18'55.83161"N	168°57'41.78310"W	7022366.3970	602121.0890	3405354.347	1811160.235	39.959	12.179	HEW10	8/2/2018 15:45
10198	10198	63°18'55.87591"N	168°57'41.74858"W	63°18'55.89142"N	168°57'41.66279"W	7022368.3000	602122.7040	3405360.51	1811165.632	39.892	12.159	HEW10	8/2/2018 15:46
10199	10199	63°18'56.00519"N	168°57'41.75288"W	63°18'56.02069"N	168°57'41.66709"W	7022372.2980	602122.5170	3405373.637	1811165.223	39.858	12.149	HEW10	8/2/2018 15:46
10200	10200	63°18'56.11520"N	168°57'41.64104"W	63°18'56.13070"N	168°57'41.55523"W	7022375.7510	602123.9650	3405384.892	1811170.15	39.752	12.117	HEW10	8/2/2018 15:46
10201	10201	63°18'56.21618"N	168°57'41.53027"W	63°18'56.23168"N	168°57'41.44447"W	7022378.9240	602125.4070	3405395.23	1811175.043	39.697	12.1	HEW10	8/2/2018 15:47
10202	10202	63°18'56.34387"N	168°57'41.53053"W	63°18'56.35937"N	168°57'41.44473"W	7022382.8750	602125.2780	3405408.199	1811174.821	39.637	12.081	HEW10	8/2/2018 15:47
10203	10203	63°18'56.44479"N	168°57'41.39870"W	63°18'56.46029"N	168°57'41.31291"W	7022386.0550	602127.0120	3405418.546	1811180.676	39.642	12.083	HEW10	8/2/2018 15:48
10204	10204	63°18'56.54775"N	168°57'41.23819"W	63°18'56.56325"N	168°57'41.15241"W	7022389.3120	602129.1440	3405429.122	1811187.837	39.565	12.06	HEW10	8/2/2018 15:48
10205	10205	63°18'56.61255"N	168°57'41.20862"W	63°18'56.62805"N	168°57'41.12282"W	7022391.3300	602129.4920	3405435.725	1811189.081	39.49	12.036	HEW10	8/2/2018 15:49
10206	10206	63°18'56.70988"N	168°57'41.26432"W	63°18'56.72537"N	168°57'41.17852"W	7022394.3160	602128.6210	3405445.569	1811186.377	39.494	12.038	HEW10	8/2/2018 15:49
10207	10207	63°18'56.74798"N	168°57'41.25294"W	63°18'56.76348"N	168°57'41.16714"W	7022395.5000	602128.7420	3405449.447	1811186.834	39.541	12.052	HEW10	8/2/2018 15:50
10208	10208	63°18'56.83930"N	168°57'41.17615"W	63°18'56.85480"N	168°57'41.09036"W	7022398.3600	602129.7200	3405458.779	1811190.191	39.511	12.043	HEW10	8/2/2018 15:50
10209	10209	63°18'56.97168"N	168°57'41.13900"W	63°18'56.98719"N	168°57'41.05321"W	7022402.4720	602130.1070	3405472.252	1811191.67	39.273	11.97	HEW10	8/2/2018 15:51
10210	10210	63°18'57.04388"N	168°57'40.99180"W	63°18'57.05938"N	168°57'40.90601"W	7022404.7710	602132.0840	3405479.693	1811198.274	39.272	11.97	HEW10	8/2/2018 15:52
10211	10211	63°18'57.14947"N	168°57'41.23261"W	63°18'57.16496"N	168°57'41.14681"W	7022407.9310	602128.6300	3405490.239	1811187.102	38.981	11.881	HEW10	8/2/2018 15:53
10212	10212	63°18'57.23777"N	168°57'41.28724"W	63°18'57.25327"N	168°57'41.20144"W	7022410.6390	602127.7830	3405499.167	1811184.462	39.006	11.889	HEW10	8/2/2018 15:53
10213	10213	63°18'57.37569"N	168°57'41.36727"W	63°18'57.39119"N	168°57'41.28147"W	7022414.8700	602126.5340	3405513.116	1811180.58	38.837	11.838	HEW10	8/2/2018 15:54
10214	10214	63°18'57.45414"N	168°57'41.18582"W	63°18'57.46964"N	168°57'41.10003"W	7022417.3780	602128.9810	3405521.218	1811188.738	38.545	11.749	HEW10	8/2/2018 15:54
10215	10215	63°18'57.59574"N	168°57'41.41023"W	63°18'57.61124"N	168°57'41.32443"W	7022421.6600	602125.7200	3405535.433	1811178.256	38.423	11.711	HEW10	8/2/2018 15:54
10216	10216	63°18'57.74338"N	168°57'41.51266"W	63°18'57.75887"N	168°57'41.42687"W	7022426.1820	602124.1490	3405550.352	1811173.335	38.199	11.643	HEW10	8/2/2018 15:55
10217	10217	63°18'57.75943"N	168°57'41.61149"W	63°18'57.77493"N	168°57'41.52568"W	7022426.6350	602122.7590	3405551.909	1811168.795	38.244	11.657	HEW10	8/2/2018 15:55
10218	10218	63°18'57.80225"N	168°57'41.66764"W	63°18'57.81775"N	168°57'41.58185"W	7022427.9350	602121.9350	3405556.217	1811166.16	37.857	11.539	HEW10	8/2/2018 15:55
10219	10219	63°18'57.81454"N	168°57'41.56687"W	63°18'57.83004"N	168°57'41.48108"W	7022428.3600	602123.3250	3405557.539	1811170.742	37.898	11.551	HEW10	8/2/2018 15:56
10220	10220	63°18'57.91710"N	168°57'41.55967"W	63°18'57.93260"N	168°57'41.47387"W	7022431.5360	602123.3240	3405567.961	1811170.902	37.845	11.535	HEW10	8/2/2018 15:56
10221	10221	63°18'57.95916"N	168°57'41.63933"W	63°18'57.97466"N	168°57'41.55354"W	7022432.8020	602122.1750	3405572.174	1811167.195	37.891	11.549	HEW10	8/2/2018 15:56
10222	10222	63°18'58.00352"N	168°57'41.69260"W	63°18'58.01902"N	168°57'41.60679"W	7022434.1510	602121.3900	3405576.64	1811164.689	37.816	11.526	HEW10	8/2/2018 15:57
10223	10223	63°18'58.02658"N	168°57'41.69225"W	63°18'58.04207"N	168°57'41.60644"W	7022434.8640	602121.3720	3405578.982	1811164.667	37.628	11.469	HEW10	8/2/2018 15:59
10224	10224	63°18'58.05008"N	168°57'41.60925"W	63°18'58.06559"N	168°57'41.52346"W	7022435.6280	602122.5040	3405581.431	1811168.419	37.758	11.509	HEW10	8/2/2018 16:01
10225	10225	63°18'58.02459"N	168°57'41.36203"W	63°18'58.04010"N	168°57'41.27623"W	7022434.9490	602125.9680	3405579.025	1811179.752	37.822	11.528	HEW10	8/2/2018 16:02
10226	10226	63°18'58.02094"N	168°57'41.02129"W	63°18'58.03644"N	168°57'40.93548"W	7022434.9870	602130.7130	3405578.906	1811195.32	37.807	11.524	HEW10	8/2/2018 16:02
10227	10227	63°18'58.04022"N	168°57'40.85278"W	63°18'58.05573"N	168°57'40.76699"W	7022435.6580	602133.0380	3405580.989	1811202.984	37.88	11.546	HEW10	8/2/2018 16:03

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Survey Table

Field Survey Point ID	Feature Location ID	Latitude (WGS84)	Longitude (WGS84)	Latitude (NAD 83 (2011))	Longitude (NAD 83 (2011))	Northing (UTM Zone 2N)	Easting (UTM Zone 2N)	Northing - Alaska State Plane Zone 9, U.S. Survey Feet	Easting - Alaska State Plane Zone 9, U.S. Survey Feet	Elevation (NAVD88, GEOID12B, U.S. Survey Feet)	Elevation (NAVD88, GEOID12B, Meters)	Text Descriptor	Measurement Date/Time
10228	10228	63°18'58.11047"N	168°57'40.37958"W	63°18'58.12597"N	168°57'40.29378"W	7022438.0410	602139.5520	3405588.474	1811224.48	37.885	11.547	HEW10	8/2/2018 16:03
10229	10229	63°18'58.08616"N	168°57'40.20135"W	63°18'58.10166"N	168°57'40.11555"W	7022437.3680	602142.0560	3405586.137	1811232.66	37.917	11.557	HEW10	8/2/2018 16:03
10230	10230	63°18'58.09391"N	168°57'40.04564"W	63°18'58.10941"N	168°57'39.95984"W	7022437.6760	602144.2140	3405587.039	1811239.759	37.895	11.55	HEW10	8/2/2018 16:04
10231	10231	63°18'58.20772"N	168°57'39.75409"W	63°18'58.22322"N	168°57'39.66828"W	7022441.3260	602148.1590	3405598.814	1811252.887	37.914	11.556	HEW10	8/2/2018 16:04
10232	10232	63°18'58.29578"N	168°57'39.46099"W	63°18'58.31127"N	168°57'39.37520"W	7022444.1800	602152.1490	3405607.974	1811266.128	37.963	11.571	HEW10	8/2/2018 16:05
10233	10233	63°18'58.31738"N	168°57'39.21514"W	63°18'58.33288"N	168°57'39.12933"W	7022444.9580	602155.5490	3405610.35	1811277.321	38.002	11.583	HEW10	8/2/2018 16:05
10234	10234	63°18'57.69976"N	168°57'18.33929"W	63°18'57.71525"N	168°57'18.25347"W	7022435.1020	602446.5930	3405563.116	1812231.765	51.418	15.672	CHK 2 HV	8/2/2018 17:11
10235	10235	63°18'57.69956"N	168°57'18.33886"W	63°18'57.71505"N	168°57'18.25305"W	7022435.0960	602446.5990	3405563.096	1812231.785	51.426	15.675	CHK 2 HV	8/2/2018 18:09
10236	10236	63°18'57.69988"N	168°57'18.33970"W	63°18'57.71538"N	168°57'18.25389"W	7022435.1050	602446.5870	3405563.128	1812231.746	51.433	15.677	CHK 0 HV	8/3/2018 8:57
10237	10237	63°19'03.96540"N	168°56'44.95903"W	63°19'03.98089"N	168°56'44.87322"W	7022643.8020	602904.7840	3406224.434	1813745.82	78.543	23.94	MP flag	8/3/2018 9:09
10238	10238	63°19'03.97244"N	168°56'44.96267"W	63°19'03.98793"N	168°56'44.87685"W	7022644.0180	602904.7270	3406225.146	1813745.642	78.484	23.922	GB1	8/3/2018 9:10
10239	10239	63°19'03.92636"N	168°56'45.18033"W	63°19'03.94185"N	168°56'45.09450"W	7022642.4950	602901.7450	3406220.303	1813735.779	78.239	23.847	GB1	8/3/2018 9:10
10240	10240	63°19'03.87910"N	168°56'45.33485"W	63°19'03.89459"N	168°56'45.24904"W	7022640.9640	602899.6420	3406215.387	1813728.801	78.527	23.935	GB1	8/3/2018 9:11
10241	10241	63°19'03.86195"N	168°56'45.47886"W	63°19'03.87744"N	168°56'45.39304"W	7022640.3690	602897.6550	3406213.537	1813722.253	78.632	23.967	GB1	8/3/2018 9:11
10242	10242	63°19'03.83162"N	168°56'45.44285"W	63°19'03.84712"N	168°56'45.35703"W	7022639.4480	602898.1860	3406210.484	1813723.948	78.607	23.959	MP flag	8/3/2018 9:12
10243	10243	63°19'03.80174"N	168°56'45.63743"W	63°19'03.81723"N	168°56'45.55161"W	7022638.4360	602895.5090	3406207.303	1813715.112	78.461	23.915	GB1	8/3/2018 9:12
10244	10244	63°19'03.83028"N	168°56'45.83840"W	63°19'03.84578"N	168°56'45.75258"W	7022639.2300	602892.6850	3406210.051	1813705.886	78.53	23.936	GB1	8/3/2018 9:12
10245	10245	63°19'03.82605"N	168°56'46.15197"W	63°19'03.84155"N	168°56'46.06615"W	7022638.9590	602888.3270	3406209.386	1813691.573	78.494	23.925	GB1	8/3/2018 9:13
10246	10246	63°19'03.82520"N	168°56'46.27267"W	63°19'03.84070"N	168°56'46.18685"W	7022638.8790	602886.6480	3406209.209	1813686.062	78.394	23.895	GB1	8/3/2018 9:14
10247	10247	63°19'03.81310"N	168°56'46.29096"W	63°19'03.82859"N	168°56'46.20515"W	7022638.4960	602886.4060	3406207.966	1813685.247	78.375	23.889	MP flag	8/3/2018 9:14
10248	10248	63°19'03.81756"N	168°56'46.38734"W	63°19'03.83305"N	168°56'46.30153"W	7022638.5910	602885.0610	3406208.347	1813680.838	78.455	23.913	GB1	8/3/2018 9:14
10249	10249	63°19'03.83403"N	168°56'46.51687"W	63°19'03.84952"N	168°56'46.43106"W	7022639.0430	602883.2420	3406209.922	1813674.895	78.301	23.866	GB1	8/3/2018 9:15
10250	10250	63°19'03.89286"N	168°56'46.52961"W	63°19'03.90836"N	168°56'46.44380"W	7022640.8580	602883.0070	3406215.888	1813674.215	78.304	23.867	GB1	8/3/2018 9:15
10251	10251	63°19'04.00522"N	168°56'46.50985"W	63°19'04.02071"N	168°56'46.42403"W	7022644.3420	602883.1710	3406227.314	1813674.93	78.469	23.917	GB1	8/3/2018 9:15
10252	10252	63°19'04.02937"N	168°56'46.48731"W	63°19'04.04486"N	168°56'46.40150"W	7022645.1000	602883.4600	3406229.784	1813675.919	78.475	23.919	GB1	8/3/2018 9:15
10253	10253	63°19'04.02801"N	168°56'46.49844"W	63°19'04.04349"N	168°56'46.41263"W	7022645.0530	602883.3060	3406229.637	1813675.413	78.392	23.894	MP flag	8/3/2018 9:16
10254	10254	63°19'04.05172"N	168°56'46.36648"W	63°19'04.06721"N	168°56'46.28066"W	7022645.8450	602885.1190	3406232.144	1813681.4	78.855	24.035	GB1	8/3/2018 9:16
10255	10255	63°19'04.09130"N	168°56'46.15714"W	63°19'04.10679"N	168°56'46.07131"W	7022647.1630	602887.9920	3406236.322	1813690.894	79.322	24.177	GB1	8/3/2018 9:17
10256	10256	63°19'04.11753"N	168°56'45.88422"W	63°19'04.13301"N	168°56'45.79841"W	7022648.0960	602891.7630	3406239.19	1813703.314	79.356	24.188	GB1	8/3/2018 9:17
10257	10257	63°19'04.13334"N	168°56'45.66526"W	63°19'04.14884"N	168°56'45.57944"W	7022648.6830	602894.7930	3406240.961	1813713.287	79.355	24.187	GB1	8/3/2018 9:17
10258	10258	63°19'04.18864"N	168°56'45.49199"W	63°19'04.20413"N	168°56'45.40617"W	7022650.4710	602897.1490	3406246.707	1813721.108	79.54	24.244	GB1	8/3/2018 9:17
10259	10259	63°19'04.21213"N	168°56'45.32808"W	63°19'04.22762"N	168°56'45.24226"W	7022651.2710	602899.4060	3406249.216	1813728.554	79.234	24.151	GB1	8/3/2018 9:18
10260	10260	63°19'04.20558"N	168°56'45.26239"W	63°19'04.22107"N	168°56'45.17657"W	7022651.0980	602900.3260	3406248.6	1813731.565	79.162	24.129	GB1	8/3/2018 9:18
10261	10261	63°19'04.20470"N	168°56'45.26350"W	63°19'04.22020"N	168°56'45.17767"W	7022651.0700	602900.3120	3406248.51	1813731.516	79.135	24.12	MP flag	8/3/2018 9:18
10262	10262	63°19'04.23233"N	168°56'45.08643"W	63°19'04.24782"N	168°56'45.00061"W	7022652.0040	602902.7470	3406251.449	1813739.556	79.079	24.103	GB1	8/3/2018 9:18
10263	10263	63°19'04.20811"N	168°56'44.98164"W	63°19'04.22361"N	168°56'44.89583"W	7022651.3010	602904.2290	3406249.068	1813744.382	79.05	24.094	GB1	8/3/2018 9:18
10264	10264	63°19'04.18633"N	168°56'44.82712"W	63°19'04.20183"N	168°56'44.74130"W	7022650.6960	602906.4000	3406246.972	1813751.475	78.919	24.055	GB1	8/3/2018 9:19
10265	10265	63°19'04.18336"N	168°56'44.84007"W	63°19'04.19885"N	168°56'44.75426"W	7022650.5980	602906.2230	3406246.66	1813750.889	78.768	24.008	MP flag	8/3/2018 9:19
10266	10266	63°19'04.13099"N	168°56'44.68051"W	63°19'04.14648"N	168°56'44.59470"W	7022649.0490	602908.4950	3406241.461	1813758.263	78.839	24.03	GB1	8/3/2018 9:19
10267	10267	63°19'04.06415"N	168°56'44.76027"W	63°19'04.07964"N	168°56'44.67447"W	7022646.9460	602907.4510	3406234.613	1813754.732	78.612	23.961	GB1	8/3/2018 9:20
10268	10268	63°19'03.98515"N	168°56'44.84659"W	63°19'04.00064"N	168°56'44.76077"W	7022644.4630	602906.3290	3406226.524	1813750.922	78.75	24.003	GB1 C	8/3/2018 9:20
10269	10269	63°19'03.96159"N	168°56'44.74646"W	63°19'03.97708"N	168°56'44.66064"W	7022643.7790	602907.7450	3406224.207	1813755.534	78.624	23.965	GS	8/3/2018 9:20
10270	10270	63°19'03.90457"N	168°56'44.61436"W	63°19'03.92007"N	168°56'44.52855"W	7022642.0740	602909.6400	3406218.515	1813761.662	78.626	23.965	GS	8/3/2018 9:20
10271	10271	63°19'03.82616"N	168°56'44.80360"W	63°19'03.84165"N	168°56'44.71777"W	7022639.5630	602907.0850	3406210.409	1813753.151	78.57	23.948	GS	8/3/2018 9:20

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Survey Table

Field Survey Point ID	Feature Location ID	Latitude (WGS84)	Longitude (WGS84)	Latitude (NAD 83 (2011))	Longitude (NAD 83 (2011))	Northing (UTM Zone 2N)	Easting (UTM Zone 2N)	Northing - Alaska State Plane Zone 9, U.S. Survey Feet	Easting - Alaska State Plane Zone 9, U.S. Survey Feet	Elevation (NAVD88, GEOID12B, U.S. Survey Feet)	Elevation (NAVD88, GEOID12B, Meters)	Text Descriptor	Measurement Date/Time
10272	10272	63°19'03.88251"N	168°56'44.95823"W	63°19'03.89800"N	168°56'44.87241"W	7022641.2380	602904.8780	3406216.016	1813745.995	78.754	24.004	GS	8/3/2018 9:21
10273	10273	63°19'03.83647"N	168°56'45.11109"W	63°19'03.85196"N	168°56'45.02527"W	7022639.7450	602902.7970	3406211.225	1813739.091	78.804	24.02	GS	8/3/2018 9:21
10274	10274	63°19'03.73951"N	168°56'45.03221"W	63°19'03.75500"N	168°56'44.94639"W	7022636.7800	602903.9900	3406201.437	1813742.855	78.554	23.943	GS	8/3/2018 9:21
10275	10275	63°19'03.70275"N	168°56'45.22384"W	63°19'03.71825"N	168°56'45.13803"W	7022635.5580	602901.3610	3406197.56	1813734.165	78.449	23.911	GS	8/3/2018 9:21
10276	10276	63°19'03.78452"N	168°56'45.35372"W	63°19'03.80002"N	168°56'45.26790"W	7022638.0300	602899.4730	3406205.767	1813728.097	78.674	23.98	GS	8/3/2018 9:21
10277	10277	63°19'03.74284"N	168°56'45.54847"W	63°19'03.75833"N	168°56'45.46264"W	7022636.6530	602896.8050	3406201.387	1813719.273	78.628	23.966	GS	8/3/2018 9:22
10278	10278	63°19'03.64623"N	168°56'45.47078"W	63°19'03.66172"N	168°56'45.38496"W	7022633.6990	602897.9820	3406191.634	1813722.982	78.271	23.857	GS	8/3/2018 9:22
10279	10279	63°19'03.61143"N	168°56'45.67870"W	63°19'03.62692"N	168°56'45.59288"W	7022632.5300	602895.1240	3406187.943	1813713.545	78.223	23.843	GS	8/3/2018 9:22
10280	10280	63°19'03.71888"N	168°56'45.73540"W	63°19'03.73437"N	168°56'45.64958"W	7022635.8290	602894.2280	3406198.814	1813710.776	78.476	23.919	GS	8/3/2018 9:22
10281	10281	63°19'03.79124"N	168°56'45.81373"W	63°19'03.80673"N	168°56'45.72791"W	7022638.0320	602893.0670	3406206.104	1813707.078	78.596	23.956	GS	8/3/2018 9:22
10282	10282	63°19'03.78599"N	168°56'45.99100"W	63°19'03.80148"N	168°56'45.90519"W	7022637.7910	602890.6060	3406205.438	1813698.991	78.391	23.894	GS	8/3/2018 9:23
10283	10283	63°19'03.69110"N	168°56'45.98672"W	63°19'03.70659"N	168°56'45.90091"W	7022634.8570	602890.7590	3406195.804	1813699.345	78.52	23.933	GS	8/3/2018 9:23
10284	10284	63°19'03.60705"N	168°56'45.90128"W	63°19'03.62254"N	168°56'45.81546"W	7022632.2950	602892.0320	3406187.331	1813703.387	78.368	23.887	GS	8/3/2018 9:23
10285	10285	63°19'03.55392"N	168°56'46.09318"W	63°19'03.56941"N	168°56'46.00736"W	7022630.5660	602889.4140	3406181.791	1813694.712	78.453	23.913	GS	8/3/2018 9:23
10286	10286	63°19'03.68405"N	168°56'46.19436"W	63°19'03.69954"N	168°56'46.10854"W	7022634.5470	602887.8780	3406194.932	1813689.874	78.655	23.974	GS	8/3/2018 9:23
10287	10287	63°19'03.77351"N	168°56'46.23953"W	63°19'03.78901"N	168°56'46.15371"W	7022637.2940	602887.1610	3406203.984	1813687.662	78.584	23.952	GS	8/3/2018 9:23
10288	10288	63°19'03.78609"N	168°56'46.38455"W	63°19'03.80158"N	168°56'46.29874"W	7022637.6190	602885.1310	3406205.153	1813681.018	78.336	23.877	GS	8/3/2018 9:24
10289	10289	63°19'03.68617"N	168°56'46.39530"W	63°19'03.70166"N	168°56'46.30947"W	7022634.5230	602885.0800	3406194.996	1813680.694	78.396	23.895	GS	8/3/2018 9:24
10290	10290	63°19'03.59693"N	168°56'46.43802"W	63°19'03.61242"N	168°56'46.35220"W	7022631.7430	602884.5750	3406185.901	1813678.892	78.347	23.88	GS	8/3/2018 9:24
10291	10291	63°19'03.61741"N	168°56'46.69224"W	63°19'03.63290"N	168°56'46.60642"W	7022632.2630	602881.0180	3406187.79	1813667.248	78.087	23.801	GS	8/3/2018 9:24
10292	10292	63°19'03.70814"N	168°56'46.75354"W	63°19'03.72363"N	168°56'46.66773"W	7022635.0430	602880.0750	3406196.959	1813664.297	78.204	23.837	GS	8/3/2018 9:24
10293	10293	63°19'03.75324"N	168°56'46.55495"W	63°19'03.76873"N	168°56'46.46914"W	7022636.5270	602882.7930	3406201.688	1813673.291	78.493	23.925	GS	8/3/2018 9:24
10294	10294	63°19'03.87082"N	168°56'46.60741"W	63°19'03.88631"N	168°56'46.52160"W	7022640.1410	602881.9460	3406213.591	1813670.699	78.237	23.847	GS	8/3/2018 9:25
10295	10295	63°19'03.82299"N	168°56'46.79850"W	63°19'03.83849"N	168°56'46.71269"W	7022638.5760	602879.3350	3406208.59	1813662.052	78.293	23.864	GS	8/3/2018 9:25
10296	10296	63°19'03.86835"N	168°56'46.91662"W	63°19'03.88385"N	168°56'46.83081"W	7022639.9270	602877.6470	3406213.108	1813656.582	77.774	23.706	GS	8/3/2018 9:25
10297	10297	63°19'03.95060"N	168°56'47.03105"W	63°19'03.96609"N	168°56'46.94523"W	7022642.4200	602875.9740	3406221.376	1813651.219	77.641	23.665	GS	8/3/2018 9:25
10298	10298	63°19'03.75631"N	168°56'47.01404"W	63°19'03.77181"N	168°56'46.92822"W	7022636.4170	602876.4030	3406201.656	1813652.32	77.843	23.727	GS	8/3/2018 9:26
10299	10299	63°19'04.05066"N	168°56'47.14001"W	63°19'04.06615"N	168°56'47.05419"W	7022645.4670	602874.3590	3406231.456	1813646.076	77.613	23.657	GS	8/3/2018 9:26
10300	10300	63°19'04.07247"N	168°56'46.89889"W	63°19'04.08796"N	168°56'46.81307"W	7022646.2500	602877.6920	3406233.852	1813657.051	78.122	23.812	GS	8/3/2018 9:26
10301	10301	63°19'03.98317"N	168°56'46.75774"W	63°19'03.99867"N	168°56'46.67193"W	7022643.5500	602879.7440	3406224.889	1813663.646	78.044	23.788	GS	8/3/2018 9:26
10302	10302	63°19'03.90587"N	168°56'46.70985"W	63°19'03.92136"N	168°56'46.62404"W	7022641.1800	602880.4870	3406217.074	1813665.962	78.142	23.818	GS	8/3/2018 9:27
10303	10303	63°19'04.03820"N	168°56'46.58728"W	63°19'04.05369"N	168°56'46.50145"W	7022645.3280	602882.0610	3406230.606	1813671.339	78.404	23.898	GS	8/3/2018 9:27
10304	10304	63°19'04.11622"N	168°56'46.76291"W	63°19'04.13171"N	168°56'46.67708"W	7022647.6640	602879.5400	3406238.398	1813663.188	78.506	23.929	GS	8/3/2018 9:28
10305	10305	63°19'04.17686"N	168°56'46.54507"W	63°19'04.19235"N	168°56'46.45926"W	7022649.6370	602882.5100	3406244.72	1813673.035	78.928	24.057	GS	8/3/2018 9:28
10306	10306	63°19'04.07862"N	168°56'46.43572"W	63°19'04.09411"N	168°56'46.34991"W	7022646.6470	602884.1290	3406234.825	1813678.193	78.797	24.017	GS	8/3/2018 9:28
10307	10307	63°19'04.10814"N	168°56'46.20468"W	63°19'04.12363"N	168°56'46.11886"W	7022647.6630	602887.3140	3406237.996	1813688.695	79.277	24.164	GS	8/3/2018 9:28
10308	10308	63°19'04.20876"N	168°56'46.28990"W	63°19'04.22425"N	168°56'46.20408"W	7022650.7380	602886.0290	3406248.152	1813684.635	79.186	24.136	GS	8/3/2018 9:28
10309	10309	63°19'04.25421"N	168°56'46.10446"W	63°19'04.26971"N	168°56'46.01863"W	7022652.2270	602888.5630	3406252.907	1813693.028	79.641	24.275	GS	8/3/2018 9:29
10310	10310	63°19'04.16473"N	168°56'45.94797"W	63°19'04.18021"N	168°56'45.86214"W	7022649.5280	602890.8290	3406243.936	1813700.324	79.439	24.213	GS	8/3/2018 9:29
10311	10311	63°19'04.16579"N	168°56'45.71376"W	63°19'04.18128"N	168°56'45.62794"W	7022649.6650	602894.0860	3406244.22	1813711.018	79.398	24.201	GS	8/3/2018 9:29
10312	10312	63°19'04.25592"N	168°56'45.79396"W	63°19'04.27141"N	168°56'45.70813"W	7022652.4180	602892.8810	3406253.314	1813707.205	79.536	24.243	GS	8/3/2018 9:29
10313	10313	63°19'04.28388"N	168°56'45.96641"W	63°19'04.29937"N	168°56'45.88058"W	7022653.2060	602890.4540	3406256.024	1813699.283	79.63	24.271	GS	8/3/2018 9:30
10314	10314	63°19'04.30268"N	168°56'45.60470"W	63°19'04.31817"N	168°56'45.51889"W	7022653.9490	602895.4680	3406258.205	1813715.77	79.648	24.277	GS	8/3/2018 9:30
10315	10315	63°19'04.23852"N	168°56'45.57232"W	63°19'04.25402"N	168°56'45.48649"W	7022651.9790	602895.9820	3406251.713	1813717.356	79.565	24.251	GS	8/3/2018 9:30

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Field Survey Point ID	Feature Location ID	Latitude (WGS84)	Longitude (WGS84)	Latitude (NAD 83 (2011))	Longitude (NAD 83 (2011))	Northing (UTM Zone 2N)	Easting (UTM Zone 2N)	Northing - Alaska State Plane Zone 9, U.S. Survey Feet	Easting - Alaska State Plane Zone 9, U.S. Survey Feet	Elevation (NAVD88, GEOID12B, U.S. Survey Feet)	Elevation (NAVD88, GEOID12B, Meters)	Text Descriptor	Measurement Date/Time
10316	10316	63°19'04.20507"N	168°56'45.51558"W	63°19'04.22056"N	168°56'45.42977"W	7022650.9690	602896.8040	3406248.358	1813720.003	79.712	24.296	GS	8/3/2018 9:30
10317	10317	63°19'04.24671"N	168°56'45.32073"W	63°19'04.26220"N	168°56'45.23492"W	7022652.3440	602899.4740	3406252.733	1813728.832	79.439	24.213	GS	8/3/2018 9:30
10318	10318	63°19'04.34976"N	168°56'45.33288"W	63°19'04.36526"N	168°56'45.24706"W	7022655.5270	602899.2020	3406263.191	1813728.105	79.609	24.265	GS	8/3/2018 9:32
10319	10319	63°19'04.27433"N	168°56'45.09872"W	63°19'04.28981"N	168°56'45.01289"W	7022653.2970	602902.5350	3406255.705	1813738.925	79.348	24.185	GS	8/3/2018 9:32
10320	10320	63°19'04.35162"N	168°56'45.00462"W	63°19'04.36711"N	168°56'44.91880"W	7022655.7310	602903.7670	3406263.626	1813743.093	79.317	24.176	GS	8/3/2018 9:33
10321	10321	63°19'04.29215"N	168°56'44.74719"W	63°19'04.30764"N	168°56'44.66136"W	7022654.0060	602907.4080	3406257.779	1813754.949	79.122	24.116	GS	8/3/2018 9:33
10322	10322	63°19'04.21913"N	168°56'44.85525"W	63°19'04.23463"N	168°56'44.76942"W	7022651.6980	602905.9770	3406250.282	1813750.136	79.019	24.085	GS	8/3/2018 9:33
10323	10323	63°19'04.18904"N	168°56'44.69328"W	63°19'04.20452"N	168°56'44.60746"W	7022650.8390	602908.2600	3406247.347	1813757.583	79.045	24.093	GS	8/3/2018 9:34
10324	10324	63°19'04.20228"N	168°56'44.47615"W	63°19'04.21777"N	168°56'44.39032"W	7022651.3460	602911.2670	3406248.855	1813767.477	79.104	24.111	GS	8/3/2018 9:34
10325	10325	63°19'03.97782"N	168°56'44.46911"W	63°19'03.99331"N	168°56'44.38330"W	7022644.4050	602911.5880	3406226.063	1813768.173	78.743	24.001	GS	8/3/2018 9:34
10326	10326	63°19'04.04278"N	168°56'44.69368"W	63°19'04.05826"N	168°56'44.60787"W	7022646.3140	602908.3990	3406232.492	1813757.809	78.598	23.957	GS	8/3/2018 9:35
10327	10327	63°19'04.13631"N	168°56'44.58853"W	63°19'04.15181"N	168°56'44.50270"W	7022649.2550	602909.7690	3406242.071	1813762.455	78.877	24.042	GS	8/3/2018 9:35
10328	10328	63°19'04.09294"N	168°56'44.27992"W	63°19'04.10843"N	168°56'44.19410"W	7022648.0510	602914.1060	3406237.898	1813776.621	78.876	24.041	GS	8/3/2018 9:35
10329	10329	63°19'04.06673"N	168°56'44.97291"W	63°19'04.08222"N	168°56'44.88708"W	7022646.9310	602904.4910	3406234.715	1813745.017	77.686	23.679	GB2	8/3/2018 9:35
10330	10330	63°19'04.02722"N	168°56'44.98900"W	63°19'04.04271"N	168°56'44.90319"W	7022645.7010	602904.3060	3406230.69	1813744.348	77.701	23.683	GB2	8/3/2018 9:36
10331	10331	63°19'03.99165"N	168°56'45.05459"W	63°19'04.00713"N	168°56'44.96878"W	7022644.5710	602903.4290	3406227.028	1813741.412	77.806	23.715	GB2	8/3/2018 9:36
10332	10332	63°19'03.93332"N	168°56'45.23900"W	63°19'03.94882"N	168°56'45.15317"W	7022642.6850	602900.9220	3406220.966	1813733.088	77.966	23.764	GB2	8/3/2018 9:36
10333	10333	63°19'03.90299"N	168°56'45.40845"W	63°19'03.91848"N	168°56'45.32263"W	7022641.6710	602898.5940	3406217.758	1813725.4	78.167	23.825	GB2	8/3/2018 9:36
10334	10334	63°19'03.87375"N	168°56'45.51313"W	63°19'03.88924"N	168°56'45.42732"W	7022640.7190	602897.1670	3406214.71	1813720.668	78.151	23.82	GB2	8/3/2018 9:36
10335	10335	63°19'03.85733"N	168°56'45.63506"W	63°19'03.87282"N	168°56'45.54924"W	7022640.1570	602895.4870	3406212.951	1813715.127	78.173	23.827	GB2	8/3/2018 9:37
10336	10336	63°19'03.87845"N	168°56'45.82613"W	63°19'03.89394"N	168°56'45.74032"W	7022640.7250	602892.8080	3406214.952	1813706.366	78.533	23.937	GB2	8/3/2018 9:38
10337	10337	63°19'03.86318"N	168°56'46.00773"W	63°19'03.87867"N	168°56'45.92193"W	7022640.1720	602890.2960	3406213.265	1813698.098	78.414	23.901	GB2	8/3/2018 9:38
10338	10338	63°19'03.84891"N	168°56'46.21295"W	63°19'03.86440"N	168°56'46.12714"W	7022639.6390	602887.4560	3406211.662	1813688.75	78.091	23.802	GB2	8/3/2018 9:38
10339	10339	63°19'03.88009"N	168°56'46.35580"W	63°19'03.89558"N	168°56'46.26998"W	7022640.5400	602885.4380	3406214.721	1813682.174	77.998	23.774	GB2	8/3/2018 9:38
10340	10340	63°19'03.94410"N	168°56'46.42255"W	63°19'03.95959"N	168°56'46.33673"W	7022642.4900	602884.4460	3406221.172	1813679.019	77.889	23.741	GB2	8/3/2018 9:38
10341	10341	63°19'03.97268"N	168°56'46.37197"W	63°19'03.98817"N	168°56'46.28616"W	7022643.3970	602885.1210	3406224.113	1813681.281	77.688	23.679	GB2	8/3/2018 9:39
10342	10342	63°19'03.96124"N	168°56'46.30098"W	63°19'03.97673"N	168°56'46.21516"W	7022643.0750	602886.1200	3406223.004	1813684.542	77.821	23.72	GB2	8/3/2018 9:39
10343	10343	63°19'03.98206"N	168°56'46.14979"W	63°19'03.99755"N	168°56'46.06397"W	7022643.7860	602888.2030	3406225.232	1813691.412	78.104	23.806	GB2	8/3/2018 9:39
10344	10344	63°19'04.01295"N	168°56'46.02155"W	63°19'04.02845"N	168°56'45.93572"W	7022644.8000	602889.9560	3406228.466	1813697.217	78.564	23.946	GB2	8/3/2018 9:39
10345	10345	63°19'04.03692"N	168°56'45.80904"W	63°19'04.05241"N	168°56'45.72321"W	7022645.6360	602892.8890	3406231.06	1813706.882	78.719	23.994	GB2	8/3/2018 9:39
10346	10346	63°19'04.05402"N	168°56'45.60815"W	63°19'04.06951"N	168°56'45.52232"W	7022646.2540	602895.6660	3406232.947	1813716.028	78.662	23.976	GB2	8/3/2018 9:39
10347	10347	63°19'04.05397"N	168°56'45.47002"W	63°19'04.06946"N	168°56'45.38420"W	7022646.3140	602897.5880	3406233.046	1813722.336	78.406	23.898	GB2	8/3/2018 9:40
10348	10348	63°19'04.10567"N	168°56'45.35547"W	63°19'04.12117"N	168°56'45.26966"W	7022647.9650	602899.1300	3406238.383	1813727.481	78.308	23.868	GB2	8/3/2018 9:40
10349	10349	63°19'04.15191"N	168°56'45.24710"W	63°19'04.16740"N	168°56'45.16129"W	7022649.4440	602900.5920	3406243.161	1813732.353	78.148	23.819	GB2	8/3/2018 9:41
10350	10350	63°19'04.13485"N	168°56'45.11133"W	63°19'04.15034"N	168°56'45.02552"W	7022648.9770	602902.4980	3406241.53	1813738.582	77.973	23.766	GB2	8/3/2018 9:42
10351	10351	63°19'04.08523"N	168°56'45.02851"W	63°19'04.10072"N	168°56'44.94269"W	7022647.4780	602903.6990	3406236.552	1813742.447	77.786	23.709	GB2 C	8/3/2018 9:42
10352	10352	63°19'04.11028"N	168°56'44.90512"W	63°19'04.12577"N	168°56'44.81929"W	7022648.3080	602905.3910	3406239.189	1813748.04	78.325	23.874	GS	8/3/2018 9:43
10353	10353	63°19'04.18012"N	168°56'45.00962"W	63°19'04.19561"N	168°56'44.92380"W	7022650.4220	602903.8680	3406246.204	1813743.151	78.599	23.957	GS	8/3/2018 9:43
10354	10354	63°19'04.07932"N	168°56'45.28054"W	63°19'04.09481"N	168°56'45.19472"W	7022647.1830	602900.1990	3406235.763	1813730.947	78.246	23.849	GB3	8/3/2018 9:44
10355	10355	63°19'04.03852"N	168°56'45.45013"W	63°19'04.05401"N	168°56'45.36431"W	7022645.8450	602897.8800	3406231.492	1813723.27	78.468	23.917	GB3	8/3/2018 9:45
10356	10356	63°19'04.00224"N	168°56'45.65289"W	63°19'04.01774"N	168°56'45.56706"W	7022644.6330	602895.0950	3406227.655	1813714.071	78.703	23.989	GB3	8/3/2018 9:45
10357	10357	63°19'03.98663"N	168°56'45.86045"W	63°19'04.00213"N	168°56'45.77464"W	7022644.0570	602892.2230	3406225.914	1813704.618	78.739	24	GB3	8/3/2018 9:45
10358	10358	63°19'03.97463"N	168°56'46.05678"W	63°19'03.99011"N	168°56'45.97095"W	7022643.5980	602889.5040	3406224.547	1813695.672	78.471	23.918	GB3	8/3/2018 9:45
10359	10359	63°19'03.94680"N	168°56'46.16477"W	63°19'03.96230"N	168°56'46.07894"W	7022642.6890	602888.0290	3406221.64	1813690.787	78.198	23.835	GB3	8/3/2018 9:46

2018 Northeast Cape Periodic Review
Survey Table

Field Survey Point ID	Feature Location ID	Latitude (WGS84)	Longitude (WGS84)	Latitude (NAD 83 (2011))	Longitude (NAD 83 (2011))	Northing (UTM Zone 2N)	Easting (UTM Zone 2N)	Northing - Alaska State Plane Zone 9, U.S. Survey Feet	Easting - Alaska State Plane Zone 9, U.S. Survey Feet	Elevation (NAVD88, GEOID12B, U.S. Survey Feet)	Elevation (NAVD88, GEOID12B, Meters)	Text Descriptor	Measurement Date/Time
10360	10360	63°19'03.90457"N	168°56'46.08396"W	63°19'03.92006"N	168°56'45.99814"W	7022641.4180	602889.1950	3406217.411	1813694.548	78.246	23.849	GB3	8/3/2018 9:46
10361	10361	63°19'03.90406"N	168°56'45.90713"W	63°19'03.91955"N	168°56'45.82132"W	7022641.4810	602891.6560	3406217.492	1813702.624	78.505	23.928	GB3	8/3/2018 9:46
10362	10362	63°19'03.93150"N	168°56'45.69533"W	63°19'03.94699"N	168°56'45.60950"W	7022642.4250	602894.5750	3406220.438	1813712.251	78.69	23.985	GB3	8/3/2018 9:46
10363	10363	63°19'03.95445"N	168°56'45.56860"W	63°19'03.96994"N	168°56'45.48278"W	7022643.1910	602896.3150	3406222.864	1813718	78.662	23.976	GB3	8/3/2018 9:47
10364	10364	63°19'03.98052"N	168°56'45.43441"W	63°19'03.99601"N	168°56'45.34859"W	7022644.0580	602898.1560	3406225.613	1813724.085	78.334	23.876	GB3	8/3/2018 9:47
10365	10365	63°19'04.02404"N	168°56'45.29360"W	63°19'04.03954"N	168°56'45.20777"W	7022645.4670	602900.0720	3406230.139	1813730.443	78.208	23.838	GB3 C	8/3/2018 9:47
10366	10366	63°19'04.04084"N	168°56'44.91318"W	63°19'04.05634"N	168°56'44.82736"W	7022646.1570	602905.3480	3406232.131	1813747.788	78.207	23.838	GS	8/3/2018 9:47
10367	10367	63°19'04.08175"N	168°56'45.11868"W	63°19'04.09724"N	168°56'45.03286"W	7022647.3300	602902.4480	3406236.131	1813738.335	78.085	23.8	GS	8/3/2018 9:48
10368	10368	63°19'04.17168"N	168°56'45.20532"W	63°19'04.18717"N	168°56'45.11950"W	7022650.0740	602901.1540	3406245.2	1813734.228	78.321	23.872	GS	8/3/2018 9:48
10369	10369	63°19'04.13318"N	168°56'45.35011"W	63°19'04.14867"N	168°56'45.26428"W	7022648.8190	602899.1780	3406241.181	1813727.68	78.499	23.927	GS	8/3/2018 9:48
10370	10370	63°19'04.15362"N	168°56'45.46506"W	63°19'04.16912"N	168°56'45.37925"W	7022649.4000	602897.5580	3406243.171	1813722.396	79.165	24.13	GS	8/3/2018 9:49
10371	10371	63°19'04.06787"N	168°56'45.34763"W	63°19'04.08337"N	168°56'45.26181"W	7022646.7990	602899.2770	3406234.55	1813727.902	78.376	23.889	GS	8/3/2018 9:49
10372	10372	63°19'03.95839"N	168°56'45.25562"W	63°19'03.97388"N	168°56'45.16980"W	7022643.4530	602900.6650	3406223.499	1813732.287	78.001	23.775	GS	8/3/2018 9:49
10373	10373	63°19'03.89654"N	168°56'45.51545"W	63°19'03.91203"N	168°56'45.42964"W	7022641.4230	602897.1120	3406217.023	1813720.524	78.186	23.831	GS	8/3/2018 9:49
10374	10374	63°19'03.93759"N	168°56'45.56944"W	63°19'03.95308"N	168°56'45.48361"W	7022642.6690	602896.3200	3406221.151	1813717.99	78.501	23.927	GS	8/3/2018 9:50
10375	10375	63°19'03.98062"N	168°56'45.61694"W	63°19'03.99611"N	168°56'45.53112"W	7022643.9800	602895.6170	3406225.486	1813715.749	78.687	23.984	GS	8/3/2018 9:50
10376	10376	63°19'04.01047"N	168°56'45.42607"W	63°19'04.02596"N	168°56'45.34024"W	7022644.9880	602898.2430	3406228.661	1813724.416	78.367	23.886	GS	8/3/2018 9:50
10377	10377	63°19'04.04259"N	168°56'45.31860"W	63°19'04.05808"N	168°56'45.23277"W	7022646.0300	602899.7060	3406232.004	1813729.27	78.238	23.847	GS	8/3/2018 9:50
10378	10378	63°19'04.06943"N	168°56'45.68998"W	63°19'04.08492"N	168°56'45.60416"W	7022646.6950	602894.5130	3406234.451	1813712.265	78.768	24.009	GS	8/3/2018 9:51
10379	10379	63°19'04.04753"N	168°56'45.93574"W	63°19'04.06302"N	168°56'45.84993"W	7022645.9080	602891.1150	3406232.042	1813701.078	78.808	24.021	GS	8/3/2018 9:51
10380	10380	63°19'03.94264"N	168°56'45.86127"W	63°19'03.95813"N	168°56'45.77545"W	7022642.6950	602892.2550	3406221.445	1813704.654	78.614	23.962	GS	8/3/2018 9:51
10381	10381	63°19'03.94503"N	168°56'46.03588"W	63°19'03.96052"N	168°56'45.95006"W	7022642.6920	602889.8240	3406221.557	1813696.676	78.473	23.919	GS	8/3/2018 9:52
10382	10382	63°19'04.01050"N	168°56'46.32857"W	63°19'04.02599"N	168°56'46.24275"W	7022644.5870	602885.6870	3406227.986	1813683.2	78.381	23.891	GS	8/3/2018 9:52
10383	10383	63°19'04.03888"N	168°56'46.13699"W	63°19'04.05438"N	168°56'46.05116"W	7022645.5500	602888.3240	3406231.013	1813691.902	78.686	23.983	GS	8/3/2018 9:52
10384	10384	63°19'03.88162"N	168°56'46.44866"W	63°19'03.89711"N	168°56'46.36284"W	7022640.5460	602884.1440	3406214.807	1813677.931	78.229	23.844	GS	8/3/2018 9:53
10385	10385	63°19'03.92804"N	168°56'46.30321"W	63°19'03.94353"N	168°56'46.21739"W	7022642.0470	602886.1220	3406219.631	1813684.496	77.842	23.726	GS	8/3/2018 9:53
10386	10386	63°19'03.88477"N	168°56'46.24247"W	63°19'03.90025"N	168°56'46.15666"W	7022640.7350	602887.0090	3406215.281	1813687.342	77.935	23.755	GS	8/3/2018 9:53
10387	10387	63°19'03.91851"N	168°56'46.20734"W	63°19'03.93400"N	168°56'46.12151"W	7022641.7950	602887.4650	3406218.735	1813688.89	77.924	23.751	GS	8/3/2018 9:53
10388	10388	63°19'03.88770"N	168°56'46.17308"W	63°19'03.90319"N	168°56'46.08727"W	7022640.8570	602887.9720	3406215.631	1813690.506	78.021	23.781	GS	8/3/2018 9:53
10389	10389	63°19'04.58919"N	168°56'45.45067"W	63°19'04.60468"N	168°56'45.36485"W	7022662.8820	602897.3260	3406287.42	1813722.326	79.388	24.197	GB4	8/3/2018 9:54
10390	10390	63°19'04.59384"N	168°56'45.45475"W	63°19'04.60933"N	168°56'45.36894"W	7022663.0240	602897.2650	3406287.889	1813722.132	79.515	24.236	MP flag	8/3/2018 9:55
10391	10391	63°19'04.64916"N	168°56'45.48095"W	63°19'04.66466"N	168°56'45.39514"W	7022664.7240	602896.8460	3406293.488	1813720.843	79.637	24.273	GB4	8/3/2018 9:55
10392	10392	63°19'04.72074"N	168°56'45.46018"W	63°19'04.73623"N	168°56'45.37436"W	7022666.9480	602897.0640	3406300.773	1813721.672	79.373	24.193	GB4	8/3/2018 9:55
10393	10393	63°19'04.76049"N	168°56'45.35573"W	63°19'04.77598"N	168°56'45.26991"W	7022668.2240	602898.4770	3406304.889	1813726.376	79.13	24.119	GB4	8/3/2018 9:55
10394	10394	63°19'04.77052"N	168°56'45.25292"W	63°19'04.78601"N	168°56'45.16710"W	7022668.5800	602899.8980	3406305.985	1813731.054	79.121	24.116	GB4	8/3/2018 9:56
10395	10395	63°19'04.77004"N	168°56'45.26280"W	63°19'04.78553"N	168°56'45.17698"W	7022668.5610	602899.7610	3406305.928	1813730.604	79.188	24.137	MP f'ag	8/3/2018 9:56
10396	10396	63°19'04.79411"N	168°56'45.14779"W	63°19'04.80960"N	168°56'45.06196"W	7022669.3570	602901.3370	3406308.459	1813735.816	79.336	24.182	GB4	8/3/2018 9:56
10397	10397	63°19'04.79143"N	168°56'45.00354"W	63°19'04.80693"N	168°56'44.91771"W	7022669.3390	602903.3460	3406308.296	1813742.408	79.064	24.099	GB4	8/3/2018 9:56
10398	10398	63°19'04.78398"N	168°56'45.01610"W	63°19'04.79947"N	168°56'44.93028"W	7022669.1020	602903.1790	3406307.529	1813741.847	78.891	24.046	MP flag	8/3/2018 9:57
10399	10399	63°19'04.73521"N	168°56'44.91012"W	63°19'04.75070"N	168°56'44.82430"W	7022667.6410	602904.7020	3406302.656	1813746.768	79.245	24.154	GB4	8/3/2018 9:57
10400	10400	63°19'04.67390"N	168°56'44.81968"W	63°19'04.68940"N	168°56'44.73385"W	7022665.7840	602906.0210	3406296.497	1813751.001	79.371	24.192	GB4	8/3/2018 9:57
10401	10401	63°19'04.59719"N	168°56'44.80698"W	63°19'04.61267"N	168°56'44.72116"W	7022663.4160	602906.2730	3406288.715	1813751.709	79.36	24.189	GB4	8/3/2018 9:57
10402	10402	63°19'04.52729"N	168°56'44.79502"W	63°19'04.54278"N	168°56'44.70921"W	7022661.2590	602906.5090	3406281.625	1813752.372	79.225	24.148	GB4	8/3/2018 9:57
10403	10403	63°19'04.46304"N	168°56'44.81254"W	63°19'04.47852"N	168°56'44.72673"W	7022659.2630	602906.3290	3406275.086	1813751.679	79.157	24.127	GB4	8/3/2018 9:58

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Survey Table

Field Survey Point ID	Feature Location ID	Latitude (WGS84)	Longitude (WGS84)	Latitude (NAD 83 (2011))	Longitude (NAD 83 (2011))	Northing (UTM Zone 2N)	Easting (UTM Zone 2N)	Northing - Alaska State Plane Zone 9, U.S. Survey Feet	Easting - Alaska State Plane Zone 9, U.S. Survey Feet	Elevation (NAVD88, GEOID12B, U.S. Survey Feet)	Elevation (NAVD88, GEOID12B, Meters)	Text Descriptor	Measurement Date/Time
10404	10404	63°19'04.43327"N	168°56'44.86014"W	63°19'04.44876"N	168°56'44.77432"W	7022658.3210	602905.6960	3406272.027	1813749.555	79.031	24.089	GB4	8/3/2018 9:58
10405	10405	63°19'04.43063"N	168°56'44.86875"W	63°19'04.44612"N	168°56'44.78294"W	7022658.2360	602905.5790	3406271.752	1813749.166	78.903	24.05	MP flag	8/3/2018 9:58
10406	10406	63°19'04.42646"N	168°56'44.99672"W	63°19'04.44195"N	168°56'44.91091"W	7022658.0500	602903.8030	3406271.233	1813743.329	79.205	24.142	GB4	8/3/2018 9:59
10407	10407	63°19'04.45591"N	168°56'45.10526"W	63°19'04.47140"N	168°56'45.01944"W	7022658.9120	602902.2640	3406274.142	1813738.323	79.463	24.22	GB4	8/3/2018 9:59
10408	10408	63°19'04.49171"N	168°56'45.21906"W	63°19'04.50720"N	168°56'45.13324"W	7022659.9690	602900.6450	3406277.693	1813733.066	79.484	24.227	GB4	8/3/2018 9:59
10409	10409	63°19'04.52917"N	168°56'45.32908"W	63°19'04.54466"N	168°56'45.24327"W	7022661.0790	602899.0770	3406281.415	1813727.979	79.46	24.219	GB4	8/3/2018 9:59
10410	10410	63°19'04.56626"N	168°56'45.41972"W	63°19'04.58175"N	168°56'45.33389"W	7022662.1860	602897.7800	3406285.114	1813723.778	79.416	24.206	GB4 C	8/3/2018 10:00
10411	10411	63°19'04.52428"N	168°56'45.47216"W	63°19'04.53977"N	168°56'45.38634"W	7022660.8640	602897.0920	3406280.811	1813721.453	79.488	24.228	GS	8/3/2018 10:00
10412	10412	63°19'04.44767"N	168°56'45.53614"W	63°19'04.46316"N	168°56'45.45031"W	7022658.4650	602896.2780	3406272.982	1813718.659	79.679	24.286	GS	8/3/2018 10:00
10413	10413	63°19'04.35775"N	168°56'45.55577"W	63°19'04.37325"N	168°56'45.46995"W	7022655.6750	602896.0940	3406263.835	1813717.913	79.703	24.294	GS	8/3/2018 10:00
10414	10414	63°19'04.43310"N	168°56'45.34146"W	63°19'04.44859"N	168°56'45.25564"W	7022658.1010	602899.0010	3406271.648	1813727.574	79.748	24.307	GS	8/3/2018 10:01
10415	10415	63°19'04.48066"N	168°56'45.26946"W	63°19'04.49615"N	168°56'45.18363"W	7022659.6050	602899.9550	3406276.533	1813730.783	79.413	24.205	GS	8/3/2018 10:01
10416	10416	63°19'04.41405"N	168°56'45.11132"W	63°19'04.42954"N	168°56'45.02549"W	7022657.6150	602902.2210	3406269.886	1813738.116	79.542	24.244	GS	8/3/2018 10:01
10417	10417	63°19'04.33336"N	168°56'45.14418"W	63°19'04.34886"N	168°56'45.05837"W	7022655.1040	602901.8440	3406261.667	1813736.75	79.468	24.222	GS	8/3/2018 10:01
10418	10418	63°19'04.26876"N	168°56'44.87380"W	63°19'04.28425"N	168°56'44.78797"W	7022653.2260	602905.6700	3406255.309	1813749.206	79.102	24.11	GS	8/3/2018 10:02
10419	10419	63°19'04.37321"N	168°56'44.70989"W	63°19'04.38870"N	168°56'44.62406"W	7022656.5300	602907.8460	3406266.04	1813756.517	79.2	24.14	GS	8/3/2018 10:02
10420	10420	63°19'04.30089"N	168°56'44.45301"W	63°19'04.31638"N	168°56'44.36719"W	7022654.4070	602911.4910	3406258.888	1813768.369	79.095	24.108	GS	8/3/2018 10:02
10421	10421	63°19'04.39456"N	168°56'44.37925"W	63°19'04.41005"N	168°56'44.29343"W	7022657.3380	602912.4250	3406268.457	1813771.581	79.278	24.164	GS	8/3/2018 10:02
10422	10422	63°19'04.42420"N	168°56'44.53880"W	63°19'04.43969"N	168°56'44.45298"W	7022658.1840	602910.1760	3406271.347	1813764.245	79.276	24.163	GS	8/3/2018 10:03
10423	10423	63°19'04.45650"N	168°56'44.71696"W	63°19'04.47199"N	168°56'44.63113"W	7022659.1040	602907.6650	3406274.494	1813756.055	79.235	24.151	GS	8/3/2018 10:03
10424	10424	63°19'04.58577"N	168°56'44.66548"W	63°19'04.60127"N	168°56'44.57966"W	7022663.1260	602908.2530	3406287.662	1813758.19	79.455	24.218	GS	8/3/2018 10:03
10425	10425	63°19'04.54682"N	168°56'44.49740"W	63°19'04.56231"N	168°56'44.41157"W	7022661.9960	602910.6300	3406283.832	1813765.931	79.174	24.132	GS	8/3/2018 10:03
10426	10426	63°19'04.45821"N	168°56'44.57329"W	63°19'04.47370"N	168°56'44.48748"W	7022659.2210	602909.6620	3406274.775	1813762.613	79.218	24.146	GS	8/3/2018 10:04
10427	10427	63°19'04.55463"N	168°56'44.30836"W	63°19'04.57012"N	168°56'44.22255"W	7022662.3220	602913.2520	3406284.767	1813774.551	79.222	24.147	GS	8/3/2018 10:04
10428	10428	63°19'04.68249"N	168°56'44.30189"W	63°19'04.69798"N	168°56'44.21607"W	7022666.2810	602913.2150	3406297.758	1813774.633	79.253	24.156	GS	8/3/2018 10:04
10429	10429	63°19'04.64284"N	168°56'44.51747"W	63°19'04.65833"N	168°56'44.43164"W	7022664.9580	602910.2560	3406293.569	1813764.854	79.308	24.173	GS	8/3/2018 10:04
10430	10430	63°19'04.61985"N	168°56'44.67385"W	63°19'04.63535"N	168°56'44.58803"W	7022664.1770	602908.1030	3406291.117	1813757.751	79.393	24.199	GS	8/3/2018 10:05
10431	10431	63°19'04.74147"N	168°56'44.76868"W	63°19'04.75696"N	168°56'44.68287"W	7022667.8980	602906.6630	3406303.398	1813753.217	79.558	24.249	GS	8/3/2018 10:05
10432	10432	63°19'04.78292"N	168°56'44.58818"W	63°19'04.79841"N	168°56'44.50236"W	7022669.2600	602909.1330	3406307.743	1813761.391	79.332	24.18	GS	8/3/2018 10:05
10433	10433	63°19'04.78962"N	168°56'44.35026"W	63°19'04.80511"N	168°56'44.26445"W	7022669.5740	602912.4360	3406308.602	1813772.245	79.222	24.147	GS	8/3/2018 10:05
10434	10434	63°19'04.90533"N	168°56'44.40723"W	63°19'04.92082"N	168°56'44.32142"W	7022673.1280	602911.5290	3406320.311	1813769.45	78.809	24.021	GS	8/3/2018 10:05
10435	10435	63°19'04.84174"N	168°56'44.66446"W	63°19'04.85723"N	168°56'44.57864"W	7022671.0460	602908.0130	3406313.66	1813757.809	79.247	24.155	GS	8/3/2018 10:06
10436	10436	63°19'04.79426"N	168°56'44.83384"W	63°19'04.80975"N	168°56'44.74803"W	7022669.5020	602905.7040	3406308.71	1813750.153	79.261	24.159	GS	8/3/2018 10:06
10437	10437	63°19'04.83907"N	168°56'45.02488"W	63°19'04.85456"N	168°56'44.93905"W	7022670.8030	602903.0020	3406313.118	1813741.354	79.037	24.091	GS	8/3/2018 10:06
10438	10438	63°19'04.90617"N	168°56'44.84302"W	63°19'04.92166"N	168°56'44.75719"W	7022672.9600	602905.4660	3406320.07	1813749.547	78.991	24.077	GS	8/3/2018 10:06
10439	10439	63°19'04.98379"N	168°56'44.63544"W	63°19'04.99928"N	168°56'44.54963"W	7022675.4540	602908.2760	3406328.109	1813758.897	78.594	23.955	GS	8/3/2018 10:06
10440	10440	63°19'05.06213"N	168°56'44.76140"W	63°19'05.07763"N	168°56'44.67558"W	7022677.8220	602906.4460	3406335.971	1813753.014	78.205	23.837	GS	8/3/2018 10:07
10441	10441	63°19'05.10284"N	168°56'45.04482"W	63°19'05.11834"N	168°56'44.95900"W	7022678.9550	602902.4630	3406339.893	1813740.003	78.012	23.778	GS	8/3/2018 10:07
10442	10442	63°19'04.97243"N	168°56'44.97113"W	63°19'04.98792"N	168°56'44.88531"W	7022674.9530	602903.6180	3406326.703	1813743.586	78.495	23.925	GS	8/3/2018 10:07
10443	10443	63°19'04.84999"N	168°56'45.15034"W	63°19'04.86548"N	168°56'45.06452"W	7022671.0850	602901.2460	3406314.133	1813735.606	79.048	24.094	GS	8/3/2018 10:07
10444	10444	63°19'04.81602"N	168°56'45.35002"W	63°19'04.83151"N	168°56'45.26419"W	7022669.9450	602898.5020	3406310.533	1813726.544	79.125	24.117	GS	8/3/2018 10:07
10445	10445	63°19'04.90374"N	168°56'45.43409"W	63°19'04.91924"N	168°56'45.34828"W	7022672.6210	602897.2450	3406319.379	1813722.558	78.986	24.075	GS	8/3/2018 10:08
10446	10446	63°19'05.00672"N	168°56'45.58030"W	63°19'05.02221"N	168°56'45.49448"W	7022675.7420	602895.1090	3406329.728	1813715.709	78.871	24.04	GS	8/3/2018 10:08
10447	10447	63°19'05.10195"N	168°56'45.34342"W	63°19'05.11744"N	168°56'45.25760"W	7022678.7940	602898.3100	3406339.578	1813726.368	78.068	23.795	GS	8/3/2018 10:08

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Survey Table

Field Survey Point ID	Feature Location ID	Latitude (WGS84)	Longitude (WGS84)	Latitude (NAD 83 (2011))	Longitude (NAD 83 (2011))	Northing (UTM Zone 2N)	Easting (UTM Zone 2N)	Northing - Alaska State Plane Zone 9, U.S. Survey Feet	Easting - Alaska State Plane Zone 9, U.S. Survey Feet	Elevation (NAVD88, GEOID12B, U.S. Survey Feet)	Elevation (NAVD88, GEOID12B, Meters)	Text Descriptor	Measurement Date/Time
10448	10448	63°19'04.96689"N	168°56'45.17425"W	63°19'04.98238"N	168°56'45.08843"W	7022674.6910	602900.7970	3406325.988	1813734.319	78.549	23.942	GS	8/3/2018 10:08
10449	10449	63°19'04.75161"N	168°56'45.46882"W	63°19'04.76710"N	168°56'45.38300"W	7022667.8990	602896.9130	3406303.902	1813721.226	79.417	24.206	GS	8/3/2018 10:09
10450	10450	63°19'04.79717"N	168°56'45.62405"W	63°19'04.81266"N	168°56'45.53822"W	7022669.2390	602894.7080	3406308.413	1813714.061	79.483	24.227	GS	8/3/2018 10:09
10451	10451	63°19'04.86479"N	168°56'45.84545"W	63°19'04.88028"N	168°56'45.75963"W	7022671.2330	602891.5610	3406315.114	1813703.837	79.148	24.124	GS	8/3/2018 10:09
10452	10452	63°19'04.96323"N	168°56'45.71310"W	63°19'04.97873"N	168°56'45.62728"W	7022674.3380	602893.3050	3406325.212	1813709.717	78.91	24.052	GS	8/3/2018 10:10
10453	10453	63°19'04.81024"N	168°56'46.02446"W	63°19'04.82572"N	168°56'45.93864"W	7022669.4650	602889.1250	3406309.439	1813695.753	79.126	24.118	GS	8/3/2018 10:10
10454	10454	63°19'04.72969"N	168°56'45.84949"W	63°19'04.74518"N	168°56'45.76367"W	7022667.0510	602891.6390	3406301.39	1813703.878	79.423	24.208	GS	8/3/2018 10:10
10455	10455	63°19'04.68144"N	168°56'45.62894"W	63°19'04.69693"N	168°56'45.54311"W	7022665.6570	602894.7550	3406296.655	1813714.031	79.591	24.259	GS	8/3/2018 10:10
10456	10456	63°19'04.55963"N	168°56'45.59531"W	63°19'04.57513"N	168°56'45.50949"W	7022661.9030	602895.3440	3406284.309	1813715.77	79.56	24.25	GS	8/3/2018 10:11
10457	10457	63°19'04.61030"N	168°56'45.79982"W	63°19'04.62578"N	168°56'45.71401"W	7022663.3790	602892.4480	3406289.301	1813706.346	79.476	24.224	GS	8/3/2018 10:11
10458	10458	63°19'04.66708"N	168°56'46.02989"W	63°19'04.68258"N	168°56'45.94406"W	7022665.0340	602889.1910	3406294.896	1813695.744	79.31	24.174	GS	8/3/2018 10:11
10459	10459	63°19'04.53515"N	168°56'46.07901"W	63°19'04.55063"N	168°56'45.99319"W	7022660.9300	602888.6390	3406281.459	1813693.721	79.295	24.169	GS	8/3/2018 10:11
10460	10460	63°19'04.52636"N	168°56'45.80026"W	63°19'04.54185"N	168°56'45.71443"W	7022660.7820	602892.5250	3406280.776	1813706.466	79.541	24.244	GS	8/3/2018 10:12
10461	10461	63°19'04.40496"N	168°56'45.63462"W	63°19'04.42045"N	168°56'45.54879"W	7022657.1000	602894.9500	3406268.57	1813714.233	79.564	24.251	GS	8/3/2018 10:12
10462	10462	63°19'04.35103"N	168°56'45.79156"W	63°19'04.36652"N	168°56'45.70574"W	7022655.3620	602892.8200	3406262.975	1813707.156	79.455	24.218	GS	8/3/2018 10:13
10463	10463	63°19'04.45045"N	168°56'45.98681"W	63°19'04.46594"N	168°56'45.90099"W	7022658.3500	602890.0050	3406272.926	1813698.073	79.427	24.209	GS	8/3/2018 10:13
10464	10464	63°19'04.34818"N	168°56'46.06796"W	63°19'04.36367"N	168°56'45.98214"W	7022655.1500	602888.9780	3406262.478	1813694.538	79.394	24.199	GS	8/3/2018 10:13
10465	10465	63°19'04.73224"N	168°56'45.06089"W	63°19'04.74773"N	168°56'44.97507"W	7022667.4820	602902.6070	3406302.241	1813739.888	78.089	23.802	GB5	8/3/2018 10:14
10466	10466	63°19'04.73527"N	168°56'45.14287"W	63°19'04.75076"N	168°56'45.05704"W	7022667.5390	602901.4640	3406302.487	1813736.139	78.508	23.929	GB5	8/3/2018 10:14
10467	10467	63°19'04.71761"N	168°56'45.25635"W	63°19'04.73310"N	168°56'45.17054"W	7022666.9420	602899.9020	3406300.608	1813730.986	78.676	23.98	GB5	8/3/2018 10:15
10468	10468	63°19'04.64429"N	168°56'45.32601"W	63°19'04.65978"N	168°56'45.24019"W	7022664.6420	602899.0060	3406293.109	1813727.927	78.697	23.987	GB5	8/3/2018 10:16
10469	10469	63°19'04.60041"N	168°56'45.27999"W	63°19'04.61590"N	168°56'45.19417"W	7022663.3050	602899.6900	3406288.687	1813730.102	78.999	24.079	GB5	8/3/2018 10:17
10470	10470	63°19'04.54654"N	168°56'45.12084"W	63°19'04.56203"N	168°56'45.03503"W	7022661.7090	602901.9570	3406283.335	1813737.46	78.637	23.969	GB5	8/3/2018 10:17
10471	10471	63°19'04.49747"N	168°56'44.97954"W	63°19'04.51296"N	168°56'44.89371"W	7022660.2540	602903.9720	3406278.458	1813743.995	78.384	23.892	GB5	8/3/2018 10:17
10472	10472	63°19'04.49058"N	168°56'44.93939"W	63°19'04.50607"N	168°56'44.85357"W	7022660.0590	602904.5370	3406277.788	1813745.84	78.431	23.906	GB5	8/3/2018 10:17
10473	10473	63°19'04.51434"N	168°56'44.94813"W	63°19'04.52984"N	168°56'44.86232"W	7022660.7910	602904.3920	3406280.195	1813745.401	78.477	23.92	GB5	8/3/2018 10:17
10474	10474	63°19'04.56546"N	168°56'44.90930"W	63°19'04.58095"N	168°56'44.82348"W	7022662.3890	602904.8810	3406285.416	1813747.089	78.675	23.98	GB5	8/3/2018 10:17
10475	10475	63°19'04.62938"N	168°56'44.90445"W	63°19'04.64487"N	168°56'44.81863"W	7022664.3690	602904.8850	3406291.911	1813747.204	78.542	23.94	GB5	8/3/2018 10:17
10476	10476	63°19'04.69238"N	168°56'44.96291"W	63°19'04.70786"N	168°56'44.87709"W	7022666.2920	602904.0100	3406298.266	1813744.429	78.514	23.931	GB5 C	8/3/2018 10:18
10477	10477	63°19'04.71992"N	168°56'45.09271"W	63°19'04.73541"N	168°56'45.00689"W	7022667.0860	602902.1770	3406300.966	1813738.455	78.02	23.78	GS	8/3/2018 10:18
10478	10478	63°19'04.68033"N	168°56'45.05884"W	63°19'04.69581"N	168°56'44.97303"W	7022665.8760	602902.6870	3406296.97	1813740.068	78.548	23.942	GS	8/3/2018 10:18
10479	10479	63°19'04.63981"N	168°56'45.04546"W	63°19'04.65530"N	168°56'44.95964"W	7022664.6290	602902.9130	3406292.865	1813740.747	78.885	24.044	GS	8/3/2018 10:18
10480	10480	63°19'04.59567"N	168°56'44.96958"W	63°19'04.61117"N	168°56'44.88376"W	7022663.2970	602904.0130	3406288.439	1813744.286	78.709	23.99	GS	8/3/2018 10:19
10481	10481	63°19'04.56125"N	168°56'45.01314"W	63°19'04.57674"N	168°56'44.92731"W	7022662.2130	602903.4410	3406284.91	1813742.354	78.459	23.914	GS	8/3/2018 10:19
10482	10482	63°19'04.58224"N	168°56'45.08673"W	63°19'04.59773"N	168°56'45.00091"W	7022662.8290	602902.3960	3406286.987	1813738.958	78.776	24.011	GS	8/3/2018 10:19
10483	10483	63°19'04.63026"N	168°56'45.17375"W	63°19'04.64575"N	168°56'45.08794"W	7022664.2760	602901.1380	3406291.799	1813734.904	78.962	24.068	GS	8/3/2018 10:19
10484	10484	63°19'04.69127"N	168°56'45.17034"W	63°19'04.70676"N	168°56'45.08452"W	7022666.1650	602901.1250	3406297.998	1813734.958	78.482	23.921	GS	8/3/2018 10:20
10485	10485	63°19'04.72905"N	168°56'45.31356"W	63°19'04.74453"N	168°56'45.22775"W	7022667.2700	602899.0950	3406301.727	1813728.354	78.981	24.073	GS	8/3/2018 10:20
10486	10486	63°19'04.66504"N	168°56'45.36272"W	63°19'04.68053"N	168°56'45.27690"W	7022665.2680	602898.4750	3406295.189	1813726.216	78.84	24.03	GS	8/3/2018 10:20
10487	10487	63°19'04.60824"N	168°56'45.37380"W	63°19'04.62373"N	168°56'45.28797"W	7022663.5060	602898.3770	3406289.412	1813725.805	79.255	24.157	GS	8/3/2018 10:20
10488	10488	63°19'04.55825"N	168°56'45.24256"W	63°19'04.57373"N	168°56'45.15674"W	7022662.0170	602900.2520	3406284.433	1813731.882	79.016	24.084	GS	8/3/2018 10:20
10489	10489	63°19'04.51771"N	168°56'45.11147"W	63°19'04.53320"N	168°56'45.02566"W	7022660.8220	602902.1160	3406280.414	1813737.936	78.917	24.054	GS	8/3/2018 10:21
10490	10490	63°19'04.46472"N	168°56'44.99004"W	63°19'04.48021"N	168°56'44.90422"W	7022659.2360	602903.8580	3406275.124	1813743.57	78.698	23.987	GS	8/3/2018 10:21
10491	10491	63°19'04.49211"N	168°56'44.87101"W	63°19'04.50760"N	168°56'44.78519"W	7022660.1370	602905.4870	3406277.995	1813748.96	78.832	24.028	GS	8/3/2018 10:21

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Survey Table

Field Survey Point ID	Feature Location ID	Latitude (WGS84)	Longitude (WGS84)	Latitude (NAD 83 (2011))	Longitude (NAD 83 (2011))	Northing (UTM Zone 2N)	Easting (UTM Zone 2N)	Northing - Alaska State Plane Zone 9, U.S. Survey Feet	Easting - Alaska State Plane Zone 9, U.S. Survey Feet	Elevation (NAVD88, GEOID12B, U.S. Survey Feet)	Elevation (NAVD88, GEOID12B, Meters)	Text Descriptor	Measurement Date/Time
10492	10492	63°19'04.55176"N	168°56'44.86763"W	63°19'04.56725"N	168°56'44.78181"W	7022661.9840	602905.4750	3406284.056	1813749.015	78.95	24.064	GS	8/3/2018 10:21
10493	10493	63°19'04.63756"N	168°56'44.85733"W	63°19'04.65305"N	168°56'44.77151"W	7022664.6430	602905.5330	3406292.778	1813749.342	78.964	24.068	GS	8/3/2018 10:21
10494	10494	63°19'04.70277"N	168°56'44.91280"W	63°19'04.71826"N	168°56'44.82697"W	7022666.6360	602904.6970	3406299.359	1813746.7	78.906	24.051	GS	8/3/2018 10:22
10495	10495	63°19'04.75941"N	168°56'45.03418"W	63°19'04.77490"N	168°56'44.94837"W	7022668.3340	602902.9520	3406305.02	1813741.062	78.761	24.006	GS	8/3/2018 10:22
10496	10496	63°19'04.76055"N	168°56'45.13126"W	63°19'04.77604"N	168°56'45.04545"W	7022668.3260	602901.6000	3406305.063	1813736.627	78.852	24.034	GS	8/3/2018 10:22
10497	10497	63°19'04.69053"N	168°56'43.71022"W	63°19'04.70602"N	168°56'43.62440"W	7022666.7930	602921.4380	3406299.019	1813801.64	78.234	23.846	GS	8/3/2018 10:24
10498	10498	63°19'04.68217"N	168°56'44.06502"W	63°19'04.69765"N	168°56'43.97920"W	7022666.3760	602916.5110	3406297.903	1813785.451	79.093	24.108	GS	8/3/2018 10:24
10499	10499	63°19'04.69604"N	168°56'44.42176"W	63°19'04.71153"N	168°56'44.33593"W	7022666.6470	602911.5340	3406299.044	1813769.136	79.269	24.161	GS	8/3/2018 10:24
10500	10500	63°19'04.69521"N	168°56'44.72813"W	63°19'04.71070"N	168°56'44.64232"W	7022666.4840	602907.2730	3406298.73	1813755.146	79.582	24.257	GS	8/3/2018 10:25
10501	10501	63°19'04.69642"N	168°56'44.85108"W	63°19'04.71191"N	168°56'44.76526"W	7022666.4670	602905.5610	3406298.76	1813749.529	79.311	24.174	GS	8/3/2018 10:25
10502	10502	63°19'04.69017"N	168°56'44.95933"W	63°19'04.70566"N	168°56'44.87352"W	7022666.2250	602904.0620	3406298.044	1813744.596	78.428	23.905	GS	8/3/2018 10:26
10503	10503	63°19'04.69211"N	168°56'45.04300"W	63°19'04.70761"N	168°56'44.95718"W	7022666.2480	602902.8960	3406298.179	1813740.772	78.158	23.822	GS	8/3/2018 10:26
10504	10504	63°19'04.68867"N	168°56'45.11934"W	63°19'04.70416"N	168°56'45.03353"W	7022666.1070	602901.8370	3406297.772	1813737.291	78.485	23.922	GS	8/3/2018 10:26
10505	10505	63°19'04.68816"N	168°56'45.21615"W	63°19'04.70365"N	168°56'45.13033"W	7022666.0480	602900.4910	3406297.647	1813732.871	78.782	24.013	GS	8/3/2018 10:27
10506	10506	63°19'04.69322"N	168°56'45.33292"W	63°19'04.70872"N	168°56'45.24711"W	7022666.1530	602898.8610	3406298.074	1813727.53	78.876	24.041	GS	8/3/2018 10:27
10507	10507	63°19'04.69532"N	168°56'45.45496"W	63°19'04.71081"N	168°56'45.36914"W	7022666.1630	602897.1610	3406298.195	1813721.953	79.416	24.206	GS	8/3/2018 10:27
10508	10508	63°19'04.69497"N	168°56'45.54379"W	63°19'04.71046"N	168°56'45.45797"W	7022666.1130	602895.9260	3406298.093	1813717.897	79.608	24.265	GS	8/3/2018 10:28
10509	10509	63°19'04.68899"N	168°56'45.76221"W	63°19'04.70449"N	168°56'45.67640"W	7022665.8310	602892.8930	3406297.322	1813707.932	79.578	24.256	GS	8/3/2018 10:28
10510	10510	63°19'04.71763"N	168°56'46.09161"W	63°19'04.73312"N	168°56'46.00580"W	7022666.5700	602888.2830	3406299.983	1813692.841	79.373	24.193	GS	8/3/2018 10:28
10511	10511	63°19'04.71669"N	168°56'46.44513"W	63°19'04.73217"N	168°56'46.35932"W	7022666.3830	602883.3650	3406299.622	1813676.698	79.166	24.13	GS	8/3/2018 10:29
10512	10512	63°19'04.72902"N	168°56'46.79828"W	63°19'04.74451"N	168°56'46.71245"W	7022666.6070	602878.4410	3406300.61	1813660.55	78.697	23.987	GS	8/3/2018 10:29
10513	10513	63°19'04.73495"N	168°56'47.08574"W	63°19'04.75044"N	168°56'46.99993"W	7022666.6630	602874.4350	3406300.996	1813647.412	78.654	23.974	GS	8/3/2018 10:29
10514	10514	63°19'04.73586"N	168°56'47.48483"W	63°19'04.75134"N	168°56'47.39902"W	7022666.5130	602868.8830	3406300.789	1813629.185	77.648	23.667	GS	8/3/2018 10:29
10515	10515	63°19'04.75306"N	168°56'47.84270"W	63°19'04.76855"N	168°56'47.75689"W	7022666.8860	602863.8870	3406302.268	1813612.813	77.347	23.575	GS	8/3/2018 10:30
10516	10516	63°19'04.73474"N	168°56'48.32327"W	63°19'04.75023"N	168°56'48.23745"W	7022666.1050	602857.2200	3406300.046	1813590.897	76.467	23.307	GS	8/3/2018 10:30
10517	10517	63°19'04.73242"N	168°56'48.75475"W	63°19'04.74791"N	168°56'48.66893"W	7022665.8410	602851.2190	3406299.487	1813571.196	75.41	22.985	GS	8/3/2018 10:30
10518	10518	63°19'04.74052"N	168°56'49.10209"W	63°19'04.75601"N	168°56'49.01628"W	7022665.9370	602846.3790	3406300.049	1813555.32	75.106	22.892	GS	8/3/2018 10:30
10519	10519	63°19'05.77838"N	168°56'49.31114"W	63°19'05.79388"N	168°56'49.22532"W	7022697.9540	602842.4430	3406405.302	1813544.042	72.067	21.966	CHK 0 HV	8/3/2018 10:32
10520	10520	63°18'42.73270"N	168°57'29.95010"W	63°18'42.74820"N	168°57'29.86431"W	7021966.8890	602299.8070	3404034.372	1811726.18	73.044	22.264	CHK 0 HV	8/3/2018 12:41

ATTACHMENT H-4
Logbook

No. 370-6F - Cross Section - 6 3/4 x 8 3/4

6 32281 37061 1
ISBN 978-1-932149-49-4

2018 - MISC - 3

Rite in the Rain®

ALL-WEATHER

CROSS SECTION FIELD BOOK

№ 370-6F

2018 - MISC - 3

INDEX

PG#	DATE	W/O	DESC
1-3	6/19/18	18-030	CORDOVA ASBUILT
4-13	7/26/18 -7/27/18	18-027	JBER MON. WELLS
14-24	7/31/18 -8/4/18	18-002	ECC N.E. CAPE

WO # 18-002 — ECC N.E. CAPE PROJ. OVERVIEW

PROJECT DESCRIPTION

- PURPOSE OF SURVEY IS TO PROVIDE SURVEY SUPPORT TO ECC / JACOBS @ N.E. CAPE.
- SURVEY GOALS :
  - TIE INTO EXISTING SURVEY CONTROL & SUPPLEMENT AS NECESSARY
  - 2x CROSS SECTIONS & MICRO-TOPO @ SITE #7
  - STAKE 90 SAMPLE SPOTS @ SITE #8
  - STAKE ~ 51 SAMPLE SPOTS @ SITE #28
  - SURVEY EDGE-OF-WATER @ SITE #28

J. VARNEY
E. CERNEY — FB 18-MISC-3 — JULY 31ST, 2018

SURVEYOR'S CERTIFICATE

I, JOSHUA W. VARNEY, DO HEREBY CERTIFY THAT I WAS IN RESPONSIBLE CHARGE OF ALL FIELD ACTIVITIES FROM 7/31/18 - 8/4/18.

STATE OF ALASKA
49TH
JOSHUA W. VARNEY
No. LS106379
8/24/18
REGISTERED PROFESSIONAL LAND SURVEYOR

EQUIPMENT LIST

TOPCON GR-5 RECEIVERS :

1117 - 21270	715 - 10021
1117 - 21371	715 - 10053
1117 - 21369	1117 - 20041

TOPCON FC-5000 DATA COLLECTORS : P/N = 1010086-01
S/N = 229084
180294

WO# 18-002 NE CAPE - ECC
PRIMARY CONTROL

PRIMARY CONTROL NOTES:

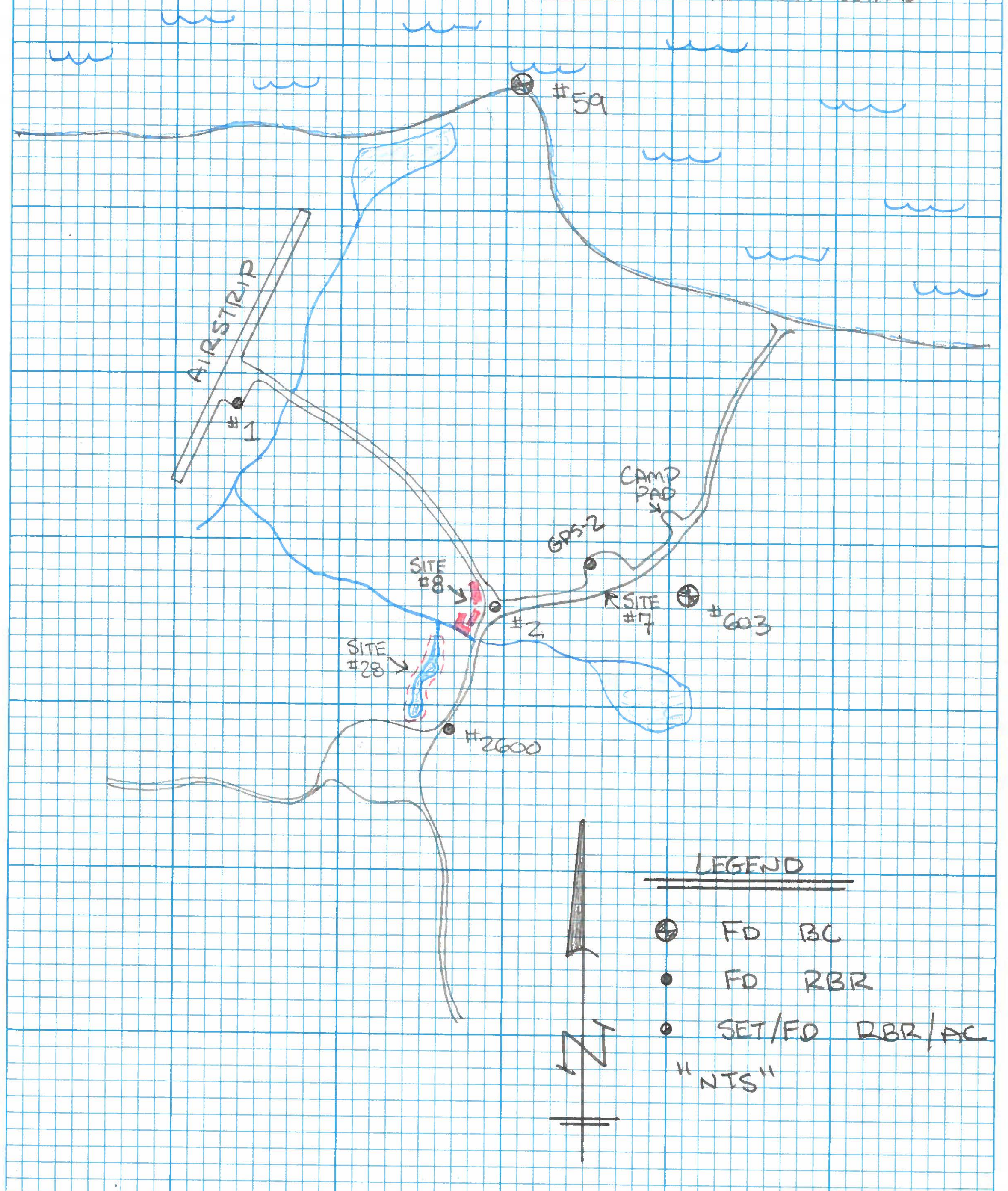
- RECORD COORDINATES RECEIVED FROM JACOBS ON 04-18-18 WERE DERIVED FROM "ECO-LAND" SURVEYS, R. SCOTT McCLINTOCK 8904-S
- COORDINATES LISTED AS "AK STATE PLANE ZONE 9", BUT INITIAL FIELD CHECKS FOUND THIS TO BE WRONG.
- ROTATION OF +0.87° IS LISTED IN THE "BASIS-OF SURVEY DATUM REPORT" BUT THERE IS NO MENTION OF A SCALE FACTOR.
- USING STATIC DATA ON #1 & #2600, WE WERE ABLE TO LOCALIZE INTO OLD SYSTEM.
- ALL OTHER 8904-SET CONTROL WAS FOUND TO BE TOO SLOPPY TO USE.
- FURTHERMORE, OUR OPUS SOLUTION ON #1 DIFFERS FROM "ECO-LAND" POSITION BY 0.7'
- HOLDING OUR OPUS SOLUTION ON #1 MATCHES THE PUBLISHED POSITION OF #59 by 0.08'.

★ ALL FIELD PROCESSING HOLDS OUR SP29 POSITION OF #1 DERIVED BY OPUS (NOT ECO-LAND'S POSITION)

J. VARNEY ☑
E CERNEY

FB 18-MISC-3

~~JUL~~ AUGUST 1ST, 2018
± 50° O'CAST
10 MPH WIND



WO# 18-002 ECC N.E. CAPE
STATIC CONTROL

RTK/STATIC @ BASE (603) UNIT: 10053

START: 0848 HI: 1.109m
STOP: 3.638'
SLANT
FILE: 603_20180801_0848

RTK/STATIC @ BASE (1) UNIT: 21371

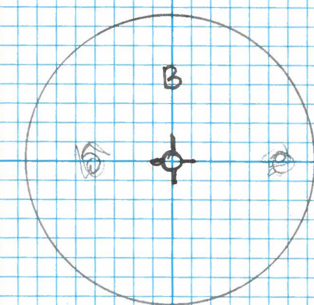
START: 1019 HI: 1.50m
STOP: 1828 4.92'
VERT
FILE: 1_20180801_1019

STATIC @ BASE (59) UNIT: 21270

START: 1133 HI: 1.500m
STOP: 1811 4.921'
VERT
FILE: 59_20180801_1133

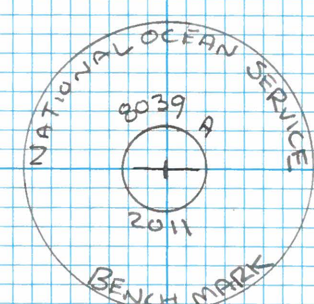
SAME CREW FB 18-MISC-3 AUG. 1ST, 2018
SAME Wx

☆ SKETCH P.15 ☆



- FD 3 1/4" BC ↑ 1± ON 1" O/D I.P.
- GOOD STABILITY / CONDITION
- PID = UW 3430 "BM B"
- Tx @ 461.10 / LOG @ 5 SEC / 10° MASK

- FD 3/4" RBR @ GRADE
- FENCE POST BEARS 1± EASTERLY
- EXCELLENT STABILITY
- PRIMARY CP FROM 2012 EGO-LAND SURVEY
- Tx @ 464.70 / LOG @ 5 SEC / 10° MASK



- FD 3 1/4" BC FLUSH W/ROCK
- EXC. STABILITY / CONDITION
- LOG @ 5 SEC / 10° MASK

WO # 18-002 ECC N.E. CAPE
STATIC CONTROL

STATIC BASE @ 2600 UNIT: 21369

START: 1507 HI: 1.546m
STOP: 1835 SLANT
5.075'
FILE: 2600-20180801-1507

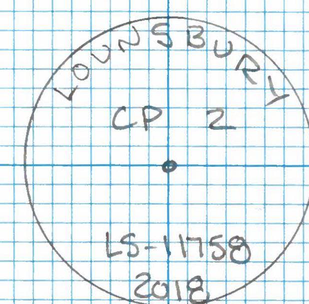
STATIC BASE @ 2 UNIT: 20041

START: 1634 HI: 1.650m
STOP: 1837 5.413'
VERT
FILE: 2-20180801-1634

SAME CREW FB 18-MISC-3 AUG. 1ST, 2018
SAME Wx

★ SEE VICINITY SKETCH P.15 ★

- FD 5/8" RBR @ GRADE
- GOOD STABILITY
- LOG @ 5 SEC / 10° MASK
- 2ND CP FROM "ECO-LAND" SURVEY



- SET 2" AC ON 5/8" x 30" RBR
- ~~FLUSH W/GROUND~~ $\downarrow 0^{5}$
- LOG @ 5 SEC / 10° MASK
- LOCATED @ ℄ OF INTERSECTION OF AIRSTRIP / CAMP / MOC ROADS

WO# 18-002 ECC N.E. CAPE RTK CHK'S

ROVER JOB "18-002_JV1"

PT#	CODE	DESC			HI
5001	CHK	@ "STOKE" RM 2			1.500m VT
5002	CHK	@ 59	ΔH: ~~0.66~~ <0.01	ΔV: ~~0.19~~ 0.01	"
5003	CHK	@ "8039-B" (#59 RM#1)			+5.42' VT
5004	CHK	@ "8039-C" (#59 RM#2)			"
5005	CHK	@ 34009	ΔH: 0.16	ΔV: 0.54	"
5006	CHK	@ 2600	ΔH: 0.03	ΔV: 0.03	"
5007	CHK	@ 34006	ΔH: 0.08	ΔV: 0.41	"
5008	CHK	@ 34008	ΔH: 0.09	ΔV: 0.83	"

SAME CREW FB 18-MISC-3 AUG. 1ST, 2018
SAME Wx

NOTE:

- CHECK SHOT COORDINATES DERIVED @ END OF DAY WITH POST-PROCESSED STATIC COORDINATS FOR # 1, 59, 2600.
- # 34006/8/9 ARE McCLINTOCK COORDS. THAT I "LOCALIZED" INTO SPZ9 BY:
  - TRANSLATING TO OPUS # 1
  - ROTATING TO #2600
  - SCALING TO #2600
- NEW JOBS START 8/2 W/ POST-PROCESSED COORDS.

WO# 18-002 ECC N.E. CAPE STATIC CONTROL

J. VARNEY
E. CERNEY

FB 18-MISC-3

AUGUST 2ND, 2018
± 50° RAIN
CALM

PT#	UNIT	FILE/START	STOP	HI	DESC
603	10053	603_2018_0802-0827	1401	3.64' SLANT	CBC · REF. P.16
1	21371	1-20180802-~~0915~~ 0855	1100	1.500m 4.92' VERT	CRB · REF. P.16
2600	21369	2600-20180802-0915	1239	5.07' SLANT	CRB · REF. P.17
2	20041	2-20180802-0931	1248	5.415' VERT	CRBC · REF. P.17
59	21270	59-20180802-0953	1428	1.500m 4.92' VERT	CBC · REF. P.16
2600	21369	2600-20180802-1245	1526	1.720m 5.643' SLANT	CRB · 2ND OBS.

WO # 18-002 — N.E. CAPE – ECC STATIC CONTROL — SAME CREW — FB 18-MISC-3 — AUG. 2ND, 2018 SAME Wx

PT#	UNIT	FILE/START	STOP	HI	DESC
2	20041	2.20180802-1253	1643	1.492m 4.894' VERT	CRBC · 2ND OBS.
603	10053	603.20180802-~~1404~~ 1405		1.067m 3.500' SLANT	CBC · 2ND OBS.
59	21270	59.20180802-1437	18:30	1.300m 4.265' VERT	CBC · 2ND OBS.
1	21371	1-20180802-1631	18:50	1.800m 5.905' VERT	CRB · 2ND OBS.
603	10053	603-20180802-1700	19:01	3.26' SLANT	CBC · 2ND OBS.

WO# 18-002 ——— ECC N.E. CAPE ———
RTK TOPO

ROVER JOB "18-002 JV2"

PT#	CODE		DESC			HI
5009	CHK	@	1	ΔH: 0.01	ΔV: 0.02	4.921' VT
5010 -5113	HEW	@	SITE 28			4.71' VT
5114	CHK	@	2600	ΔH: 0.02	ΔV: 0.02	4.71' VT
5115	CHK	@	59	ΔH: 0.04	ΔV: 0.02	"
5116 -5227	HEW	@	SITE 28			"
5228	CHK	@	~~X~~ 1	ΔH: 0.01	ΔV: 0.01	5.905' VT
5229	CHK	@	2	ΔH: 0.03	ΔV: 0.01	5.42' VT
-	LAYOUT FLAGS WITHIN SITE 8					

DU-B :

B2	2182	B24 -B44	2204 -2224
B6	2186		
B8	2188		
B12	2192		
B13	2193		
B16	2196		
B17	2197		
B18	2198		
B20	2200		
B23	2203		

SAME CREW — FB 18-MISC-3 — AUG. 2ND, 2018
SAME WX

ROVER JOB "18-002 EC2"

PT#	CODE		DESC			HI
10001	CHK	@	1	ΔH: 0.01'	ΔV: 0.02'	4.921' VT
10002	CHK	@	2600	ΔH: 0.02'	ΔV: 0.01'	5.07' SLANT
10003	CHK	@	2	ΔH: 0.02'	ΔV: 0.01'	5.415' VT
10004	CHK	@	59	ΔH: 0.01'	ΔV: 0.01'	4.921' VT
10005 - 10055	HEW	@	SITE 28			5.43' VT
10056	MP	WATER INFALL @ POND @ SITE 28				"
10057 - 10134	HEW	@	SITE 28			"
10135	CHK	@	2	ΔH: 0.01'	ΔV: 0.03'	"
10136	CHK	@	59	ΔH: 0.01'	ΔV: 0.01'	4.265' VT
10137 - 10233	HEW	@	SITE 28			5.43' VT
10234	CHK	@	2	ΔH: 0.02'	ΔV: 0.01'	5.43 VT
10235	CHK	@	2	ΔH: 0.04	ΔV: 0.01'	5.43 VT
-	LAYOUT FLAGS WITHIN SITE B					

2007 - A7		~~2020 - A20~~	2033 - A33
2008 - A8		2022 - A22	2036 - A36
2011 - A11	(A10 NOT SET)	2023 - A23	2038 - A38
2012 - A12		2027 - A27	
2014 - A14		2029 - A29	
2016 - A16		2030 - A30	
2020 - A20		2031 - A31	

WO # 18-002 ECC NE CAPE
RTK TOPO

RTK/STATIC @ BASE 603 UNIT: 10053

START: ~~0827~~ 0849 HI: ~~1.700m~~ 1.170m
3.84'
SLANT
STOP:
FILE: 603_20180803_~~0827~~ 0849

NOTES:
- Tx @ 461.10 / LOG @ 5 SEC / 10° MASK
- REF. P.16

RTK/STATIC @ BASE 2600 UNIT: 10021

START: 1714 HI: 1.719m
5.64'
SLANT
STOP: 1836
FILE: 2600_20180803_1714

J.VARNEY
E.CERNEY

FB 18-MISC-3

AUGUST 3RD, 2018
± 50° CALM
FOGGY

ROVER JOB "18-002_JV2"

PT#	CODE	DESC	HI
5231	CHK	@ 2 ΔH: 0.03 ΔV: 0.01	5.46'
5232 - 5313	–	☆ SITE #7 X-SECT #1 – FULL WIDTH –	↓
5314 - 5373	–	☆ SITE #7 X-SECT #2 – PERPENDICULAR FULL WIDTH	
5374 - 5386	HEW	☆ ADD'L HEW @ SITE # ~~8~~ 28	5.46'
5387	CHK	@ 2600 ΔH: 0.05 ΔV: 0.03	5.42' VT
		– STAKE # @ SITE 28 (INSTALL LATH @ ALL POINTS)	↓
5388	MP	SW Ø3	
5389	MP	SW Ø1	
5390	MP	SW Ø2	
5391	CHK	@ "GPS 2" FD 2" AC	
5392	CHK	@ 2 ΔH: 0.02 ΔV: 0.01	5.42'
		– FINISH ALL SITE #8 LAYOUT (C-1 → C-30) (A1 - A24, 27, 29-31, 33, 36, 38)	
5393	CHK	@ 2 ΔH: 0.03 ΔV: 0.01	5.42'

WO # 18-002

ECC NE CAPE
RTK TOPO

J. VARNEY
E. CERNEY

FB 18-MISC-3

AUGUST 3RD, 2018
± 50° CALM
FOGGY

ROVER JOB "18-002.ECZ"

PT. #	CODE	DESC.	HI
10236	CHK	@ 2 ΔH: 0.03' ΔV: 0.01'	5.43' VT
10237-10496	–	TOPO @ SITE #7	"
10497-10518	–	SITE #7 X-SECTION	"
10519	CHK	@ GPS-2	"
10520	CHK	@ 2600 ΔH: 0.03' ΔV: 0.01'	"

WO # 18-002 — ECC N.E. CAPE
RTK TOPO

RTK/STATIC BASE @ 2600   UNIT: 10053

START: 0749   HI: 1.720m
STOP: 1154   5.643'
FILE: 2600-20180804-0749   SLANT

NOTES: • Tx @ 461.10 / LOG @ 5 SEC / 10° MASK

STATIC BASE @ 1   UNIT: 20041

START: 0922   HI: 1.800m
STOP: 1201   5.905'
FILE: 1-20180804_0922   VERT

J.VARNEY
E.CERNEY

FB 18-MISC-3

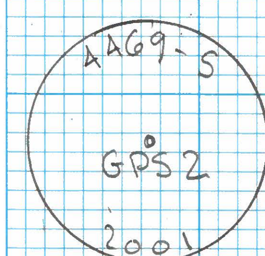
AUGUST 4TH, 2018
±50° O'CAST
CALM

ROVER JOB "18-002_JV2"

PT#	CODE	DESC			HI
5394	CHK @	2	ΔH: 0.04	ΔV: 0.01	5.43' VT
5395 -5414	–	LAYOUT LATH @ CARDINAL DIRECTIONS AROUND STANDING H_2O @ S'LY END SITE #28			↓
5415	EPP	BASE ONLY			
5416/7	ML (1)	SUBMERGED PP			
5418/19	ML (2)	PARTIALLY SUBMERGED PP			
5420	CHK @	2	ΔH: 0.03	ΔV: 0.02	5.43' VT
5421	CHK @	1	ΔH: 0.01	ΔV: 0.05	1.80m VT

STATIC BASE @ GPS-2   UNIT: ~~20~~ 10021

START: 0933   HI: 5.43'
STOP: 1143   VERT
FILE: GPS2_20180804_0933



• FD 2" AC ↑0.2
• OK STABILITY

APPENDIX I

WASTE DOCUMENTATION

2018 Northeast Cape Second Periodic Review
Waste Summary

Container	Container ID	Quantity	Contents	Waste Characterization Result	Generation Date	Manifest #	Classification	Date Shipped offsite	Weight (pounds)
55-gallon drum	WW-1	50 gallons	well development and purge water	Non-Hazardous	8/1/2018	2018-00405	Non-Hazardous	9/14/18	1913
55-gallon drum	WW-2	50 gallons	well development and purge water	Non-Hazardous	8/2/2018	2018-00405	Non-Hazardous	9/14/18	
55-gallon drum	WW-3	Started	well development and purge water	Non-Hazardous	8/3/2018	2018-00405	Non-Hazardous	9/14/18	
55-gallon drum	WW-4	2 gallons	Site 28 Decon water	Non-Hazardous	8/6/2018	2018-00405	Non-Hazardous	9/14/18	
55-gallon drum	WW-4	2 gallons	Site 28 Decon water	Non-Hazardous	8/7/2018	2018-00405	Non-Hazardous	9/14/18	
55-gallon drum	WW-4	3 gallons	Site 28 Decon water	Non-Hazardous	8/8/2018	2018-00405	Non-Hazardous	9/14/18	

1805949847

NON-HAZARDOUS WASTE MANIFEST	1. Generator ID Number AK0000228395	2. Page 1 of 3	3. Emergency Response Phone (907)751-4493	4. Waste Tracking Number 2018-00405

5. Generator's Name and Mailing Address US ARMY ENGINEER DISTRICT, ALASKA
PO BOX 6898, CEPOA-EN-EE-ER
JBER, AK 99506-6898
Generator's Phone: (907) 753-2578

Generator's Site Address (if different than mailing address)
USACE, AK, NEC FACILITY WIDE
NE CAPE, ST. LAWRENCE ISLAND
SAVOONGA, AK 99769

6. Transporter 1 Company Name: RIDGE CONTRACTING (907) 222-7518 — U.S. EPA ID Number:

7. Transporter 2 Company Name: ECC, INC. (907) 644-0428 — U.S. EPA ID Number: AKR000202408

8. Designated Facility Name and Site Address
CLEAN HARBORS GRASSY MOUNTAIN LLC
3 MILES EAST 7 MILES NORTH OF KNOLLS
GRANTSVILLE, UT 84029
Facility's Phone: (435) 884-8900 — U.S. EPA ID Number: UTD991301748

GENERATOR

HM	9. Waste Shipping Name and Description	10. Containers No.	Type	11. Total Quantity	12. Unit Wt./Vol.
	1 NON-REGULATED LIQUID	4	DM	1913	P
	2.				
	3.				
	4.				

13. Special Handling Instructions and Additional Information
1) CH1458548 IDW WATER

TO# W911KB18F0020
Contract# W911KB-17-D-0017

14. GENERATOR'S/OFFEROR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable ~~international and~~ national governmental regulations.

Generator's/Offeror's Printed/Typed Name: Stanley Seegars — Signature — Month 8 Day 10 Year 18

INT'L

15. International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit:
Transporter Signature (for exports only): Date leaving U.S.:

TRANSPORTER

16. Transporter Acknowledgment of Receipt of Materials
Transporter 1 Printed/Typed Name: Cory Smith — Signature — Month 9 Day 14 Year 18
Transporter 2 Printed/Typed Name: Don Malaney / Don Mangus — Signature — Month 10 Day 11 Year 18

DESIGNATED FACILITY

17. Discrepancy
1-979
17a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection
Manifest Reference Number:
17b. Alternate Facility (or Generator) — U.S. EPA ID Number
Facility's Phone:
17c. Signature of Alternate Facility (or Generator) — Month Day Year

H/32

18. Designated Facility Owner or Operator: Certification of receipt of materials covered by the manifest except as noted in Item 17a
2019000279
Printed/Typed Name: Cody Sefffeld — Signature — Month 1 Day 16 Year 19

169-BLC-O 5 11977 (Rev. 9/09)

DESIGNATED FACILITY TO GENERATOR

Certificate of Disposal / Treatment - Storage and Transfer

Run Date: 3/6/2019

Manifested To Site: Grassy Mountain, UT Facility
3 Miles East 7 Miles North of KnollsExit 41 off I-80
Grantsville, UT 84029

EPA ID/Prov ID: UTD991301748

Generator ID	Manifest No.	Generation Date	Received Date
US31722	NH2018-00405	8/10/2018	1/16/2019

The above described waste, received at the Clean Harbors facility listed above pursuant to the manifest(s) listed above, has/will be treated and/or disposed of by Clean Harbors, or another licensed facility approved by Clean Harbors, in accordance with applicable federal, state and provincial laws and regulations. Any waste received by Clean Harbors and subsequently shipped to another licensed facility has been or shall be identified as being generated by Clean Harbors in accordance with 40CFR 264.71(c).

For waste imported/exported to/from Canada the waste has/will be disposed or recycled according to the Canadian export and import of hazardous waste or hazardous recyclable material regulation as published in the Canadian Gazette Part II, vol 139, No 11, SOR/2005-149 May 17, 2005

Under civil and criminal penalties of law for the making of submission of false or fraudulent statements or representations (18 U.S.C. 1001 and 15 U.S.C. 2615), I certify that the information contained in or accompanying this document is true, accurate, and complete. As to the identified section(s) of this document for which I cannot personally verify truth and accuracy, I certify as the company official having supervisory responsibility for the persons who, acting under my direct instructions, made the verification that this information is true, accurate, and complete.

Signed: Paul A. Mello

Date: **3/6/2019**

Title: **Director Facility Applications**

APPENDIX J

ADEC LETTER OF NON-CONCURRENCE AT SITE 28

THE STATE of ALASKA
GOVERNOR MIKE DUNLEAVY

Department of Environmental Conservation

DIVISION OF SPILL PREVENTION AND RESPONSE
Contaminated Sites Program

555 Cordova Street
Anchorage, Alaska 99501
Main: 907-269-7528
Fax: 907-269-7687

ADEC File Number: 475.38.013

February 14, 2020

US Army Corps of Engineers USACE, AK District
Attention: Ms. Andrea Elconin
CEPOA-PM-ESP
P.O. Box 6898
JBER, AK 99506-0898

Re: **1) ADEC's Post-resolution Review of RTCs on the Draft 2019 NEC Second CERCLA FYR Report for Sites 21 and 28**
2) ADEC's Non-Concurrence with USACE's non-POL (Petroleum, Oil, Lubricants) CERCLA Contaminant Determination at Site 28

Dear Ms. Elconin:

This letter serves as Alaska Department of Environmental Conservation's Contaminated Sites Program (ADEC) formal notification to the Army Corps of Engineers' Formerly Used Defense Site Program (USACE) that ADEC does not concur with USACE's determinations with regard to CERCLA contamination issues associated with Site 28 at Northeast Cape that are discussed further in the following paragraphs.

Thank you for providing ADEC with responses to comments (RTCs) on the Draft 2019 Northeast Cape (NEC) Second CERCLA Five-year Review (FYR) Report for Sites 21 and 28; which is dated October 15, 2019 and was received by ADEC electronically from USACE on October 24, 2019. ADEC had previously completed its review of the document and electronically transmitted its review comments via email to USACE on December 13, 2019. Thank you for providing the first round of RTCs which were received electronically by ADEC from USACE on January 21, 2020. ADEC completed review of the RTCs and submitted RTC review determinations electronically in the template to USACE on February 5, 2020. ADEC and USACE participated in a comment resolution meeting on February 11 and USACE provided additional responses to ADEC based upon those discussions that were received electronically by ADEC on February 13, 2020. ADEC completed its second round of RTC review and is providing its final review determinations as notated in the template which is attached with this letter for USACE's records.

Also attached with this letter please find a copy of ADEC's email to USACE dated February 12, 2020; this email was intended to provide USACE with a preliminary summary of ADEC's position that it does not concur with USACE's following determinations that 1) non-POL CERCLA contamination is no longer present at Site 28, and 2) that the subject 'no remaining non-POL CERCLA contamination' determination warrants discontinuing FYRs and transitioning to Periodic Reviews as a result of only POL contamination remaining at Site 28.

The basis for ADEC's position of non-concurrence are based upon the following determinations: 1) soil and groundwater across all areas of Site 28 have not been entirely/adequately characterized to date in order to definitively determine whether or not non-POL CERCLA contamination remains at Site 28, and 2) the presentation of information in prior documents as well as the current FYR lacks the continuity and supporting information that would be necessary in order to definitively demonstrate that the media of concern with regard to non-POL CERCLA contaminants is limited to sediment at Site 28, and 3) that prior investigation results have definitively determined that non-POL CERCLA contaminants were not present in soil and/or groundwater at Site 28.

ADEC respectfully requests USACE include this letter, along with copies of the email and template which are attached with this letter in the final version of the FYR document. ADEC will provide USACE with a separate follow on letter once the final version of the subject five-year review report is received.

Please contact me at curtis.dunkin@alaska.gov or at (907)269-3053 if you have any questions regarding ADEC's comments, the enclosed attachments, and/or this letter.

Sincerely,

Curtis Dunkin
Environmental Program Specialist

Enclosures:
1) ADEC Comment Template Dated February 14, 2020
2) ADEC Email to USACE Dated February 12, 2020

cc:
1) Melinda Brunner – ADEC (via email)
2) Jennifer Currie – ALAW (via email)
3) Kenneth Andraschko – USACE (via email)
4) Robert Glascott – USACE (via email)
5) Haley Huff – Jacobs Engineering (via email)

APPENDIX K
RESPONSE TO COMMENTS

THE STATE of ALASKA
GOVERNOR MIKE DUNLEAVY

Department of Environmental Conservation

Spill Prevention and Response
Contaminated Sites

555 Cordova Street
Anchorage, Alaska 99501
Main: 907-269-7528
Fax: 907-269-7687

ADEC File Number: 475.38.013

August 18, 2020

US Army Corps of Engineers USACE, AK District
Attention: Mr. Robert Glascott
CEPOA-PM-ESP
P.O. Box 6898
JBER, AK 99506-0898

Re: **ADEC Review Determinations of Responses to Comments (RTCs) on the Draft 2019 Northeast Cape (NEC) Multisite Second CERCLA Periodic Review (PR) Report**

Dear Mr. Glascott:

Thank you for providing the Alaska Department of Environmental Conservation's Contaminated Sites Program (ADEC) with additional RTCs on the draft 2019 NEC Multisite Second CERCLA PR Report; and also a copy of the respective revised redline. ADEC submitted its initial comments on March 20, 2020 and received the initial RTCs from the Army Corps of Engineers (USACE) on June 1, 2020. ADEC received a second round of RTCs on July 21 and participated in a comment resolution meeting with USACE on July 27, 2020. ADEC received the additional post-resolution RTCs and the revised redline from USACE on August 14, 2020. ADEC has completed its review of the additional post-resolution RTCs and redline and determined all of the additional responses and revisions to be acceptable. ADEC's review determinations are notated as accepted in the template that is enclosed with this letter for USACE's review and records. This letter serves as ADEC's approval for USACE to finalize the document accordingly.

Please contact me at curtis.dunkin@alaska.gov or at (907)269-3053 if you have any questions regarding ADEC's comments and/or this letter.

Sincerely,

Curtis Dunkin

Curtis Dunkin
Environmental Program Specialist

Enclosures: 1) ADEC Comment Template (MSWord 39 pages) Dated August 18, 2020

Cc: 1) Melinda Brunner – ADEC (via email)
2) Jennifer Currie – ALAW (via email)

Alaska Department of Environmental Conservation (ADEC)
Contaminated Sites Program
Document Reviewed: Draft October 2019 Northeast Cape Multisite Second Periodic Review
Commenters: Curtis Dunkin-ADEC Project Manager
Date Submitted: March 20, 2020
ADEC Received Responses to Comments (RTCs) from USACE on June 1, 2020 and Submitted Review Determinations on June 30, 2020
July 27, 2020 USACE, ADEC, ECC and Jacobs participated in a review meeting of 2nd round ADEC comments. Participants were: Bobert Glascott, Aaron Shewman, Lisa Geist, (USACE), Curtis Dunkin (ADEC), Andy Larson, (ECC) and Haley Huff, Cynthia Trapp (Jacobs)
ADEC Received Post-resolution RTCs on August 14 and Submitted Review Determinations and Approvals on August 18, 2020

#	Page #	Section	ADEC Comment	Response
1.	ES-1	Executive Summary	Please apply any Site 7-specific revisions and/or changes to the 2019 Site 7 2nd Periodic Review (PR) document to this document wherever applicable and vice versa; similar to the request below associated with the Sites 21 and 28 PR.	Clarification. Attempts will be made to provide consistency between the Sites 21 and 28 FYR, the Site 7 Periodic Review, and this Multi-Site Periodic Review. Comments directed or deemed to be applicable to multiple documents will be applied wherever possible. However, due to varied document distribution dates this may not be possible in all cases. **ADEC-Accepted June 30, 2020**
2.	ES-2	Executive Summary	The last bullet on this page should be spilt out into additional bullets as needed in order to provide more emphasis on the different grouping and discussion of sites e.g. 21 and 28 vs. 13 and 16.	Accepted. The last bullet will be separated into multiple bullets to state: • Two sites (Sites 21 and 28) are required to undergo FYRs per CERCLA and SARA regulations as hazardous substances, pollutants, or contaminants remain at the sites above levels that allow for unlimited use and unrestricted exposure. The FYRs for these sites are included under a separate cover (USACE 2019).

#	Page #	Section	ADEC Comment	Response
				ADEC-Accepted June 30, 2020 - Although Site 28 is required to undergo a FYR, petroleum, oil, and lubricants (POL) contamination remains at the site. As such Site 28 is also included within this Periodic Review. **ADEC-Partially Accepted June 30, 2020; the clarification re: Site 28 should include mention that ADEC did not concur with USACE's determinations and path forward recommendations in the 2020 Five-year Review Report for Site 28.** Accepted. A sentence will be added to this bullet to state: ADEC did not concur with USACE's determinations and path forward recommendations in the 2020 Five-Year Review Report for Site 28. ADEC's letter of non-concurrence has been included within this document (Appendix I). **ADEC-Accepted August 18, 2020**
				• Two sites (Sites 13 and 16) were previously included as CERCLA contaminated sites; however, the only remaining contamination consists of petroleum, oil, and lubricants (POL), and therefore, these sites are included as Periodic Review sites. **ADEC-Accepted June 30, 2020**
			This and other discussions throughout the document that relate to Sites 21 and 28 should be amended in order to specify the USACE-FUDS determinations that were presented in the most recent 2nd FYR as well as ADEC's indication of non-concurrence;	Accepted. No changes related to Site 21 are necessary within this document as final determinations

#	Page #	Section	ADEC Comment	Response
				and/or review summaries are not included for this site. **ADEC-Accepted June 30, 2020** Site 28 will now be included as a site reviewed during this Periodic Review. The USACE-FUDS determinations, as well as, ADEC's indication of non-concurrence will be added to the Site 28 discussion. **ADEC-Accepted June 30, 2020**
			and further reference the locations in this where Site 28 is discussed further as well as ADEC's RTC approvals and non-concurrence letter, dated February 14, 2020, that should be included as attachments with this document.	Accepted. Site 28 will be added to this Periodic Review and referenced as being included in this document. The reference will also be updated to the Final FYR. Please see the first response within this comment on the page above. **ADEC-Accepted June 30, 2020** ADEC's RTC approvals and non-concurrence letter will also be included as attachments with this document. **ADEC-Accepted June 30, 2020**
3.	ES-3	Executive Summary	The statement in the second sentence of the last paragraph on this page should be amended to specify where in the document that the NFA is recommended for Site 32; noting that it would seem more appropriate to base NFA conclusions on a protectiveness determination e.g. confirmation samples determining cleanup levels were achieved.	Accepted. The following statement will be added to the Executive Summary: Confirmation soil samples collected from Site 32 following contaminated soil excavation activities in 2014 indicated all contaminated soil was removed. As a result, this Periodic Review recommends no further action (NFA) for Site 32. **ADEC-Accepted June 30, 2020** Because Site 32 is being recommended for NFA, the protectiveness statement will be added to the Periodic Review Summary Form and Section

#	Page #	Section	ADEC Comment	Response
				9.0. A table (Table 8-3) will be added to Section 8 to recommend Site 32 for NFA. **ADEC-Accepted June 30, 2020**
4.	S-2	PR Summary Form	<u>Site 3:</u> Further clarification should be added to the Recommendation section to clarify the 2024 Milestone Date;	Accepted. The following note will be added to tables in Section 8.0 and the PR Summary Form: Milestone Date reflects the date by which the recommendation/follow-up action should be completed. **ADEC-Accepted June 30, 2020**
			clarify how this relates to the recommendation to discontinue activities vs. what was recommended in the last review (2014-15).	Accepted. The previous recommendations and protectiveness determinations/statements from the 2014 Periodic Review, as well as, the implementation status of each issue/recommendation will be added to *Section 1.3.1.1. Site Status* as additional tables. **ADEC-Accepted June 30, 2020**
			<u>Sites 3…27</u>: This and other applicable sections of the document need to elaborate on and specify the planned future site management with re: to the remaining source plumes that were identified north of the MOC which extend in to Site 28, which USACE-FUDS informed ADEC during resolution of the Site 28 2nd FYR, that it intends to manage under the MOC LUCs and site management actions.	Accepted. The referenced table and other applicable sections of the document will be revised to indicate that the Environmental Covenant for the MOC will prohibit soil disturbance of any kind within the land use control area, which encompasses the source plumes that extend into Site 28. **ADEC-Accepted June 30, 2020**
			The use of the term ‘deed notice’ in the ‘Recommendation’ and throughout the document where applicable should be revised to ‘UECA’ and/or ‘covenant’, etc. in order to be consistent with the UECA law which has been promulgated by the State of Alaska.	Accepted. Reference to ‘deed notice’ will be revised to “Environmental Covenants in accordance with the UECA”, or similar, throughout the document.

#	Page #	Section	ADEC Comment	Response
				An issue will also be added to the Periodic Review describing the change from a deed notice to an Environmental Covenant in an ESD, as stated in the next comment response. **ADEC-Accepted June 30, 2020**
			Further, it should be clarified whether or not the new UECA requirements require an amendment or memorandum to specify the changes between the references/requirements for deed notice and LUCs vs. the UECA criteria, terms, etc.	Accepted. The following issue will be added to this PR: “Clarification for components of the LUC remedy is needed due to a newly promulgated ADEC regulation.” **ADEC-Accepted June 30, 2020** The following associated recommendation will also be added to this PR: “The anticipated change from LUC and deed notices to UECA and Environmental Covenants should be addressed in an ESD document.” **ADEC-Accepted June 30, 2020** The milestone date for this ESD will be 2024. **ADEC-Accepted June 30, 2020** The milestone date will be corrected to 2025 due to the final anticipated publication date of this document. **ADEC-Accepted August 18, 2020**
			This as well as other applicable sections and discussions throughout the document where applicable should be amended in order to specify the issues and recommendations as well as milestone dates that were identified in the prior PR with regard to LUCs and ‘deed notice’; and further specify why these were not completed in the prior five-year review period.	Accepted. The previous recommendations and protectiveness statements from the 2014 Periodic Review, as well as, the implementation status of each issue/recommendation will be added to *Section 1.3.1.1. Site Status* as additional tables,

#	Page #	Section	ADEC Comment	Response
				similar to those presented in the 2020 FYR for the 2014 issues/recommendations. **ADEC-Accepted June 30, 2020** An explanation to specify why the LUCs and deed notices were not completed will be included in these summary tables. **ADEC-Accepted June 30, 2020** Please note, the USACE is drafting Environmental Covenants, in accordance with UECA, and plans to distribute the ECs for ADEC review. **ADEC-Accepted June 30, 2020**
			Please revise the statement that references 'landfills at Site 9' to state e.g. '…top of landfills at Sites 7 and 9.'.	Accepted. The referenced text will be revised in the PR summary form to "on top of the landfill at Site 9." **ADEC-Accepted June 30, 2020** Specific information regarding Site 7 is included under a separate cover, as discussed in the Executive Summary, as well as Section 1.2.1 of this Periodic Review. **ADEC-Accepted June 30, 2020**
			Further, additional clarification language and/or a table note should be added here and throughout the document where applicable in order to specify that remedy, protectiveness evaluation, and controls for Site 7 are addressed under separate documents. The same clarifications need to be applied inversely to the Site 7 periodic review.	Accepted. References to Site 7 have been removed from the Summary Table. Site 7 is referred to throughout the text as addressed under a separate document with the applicable reference to the document. **ADEC-Accepted June 30, 2020**
			ADEC's position is that the current protectiveness is actually affected at sites where nature and extent delineation are incomplete, land controls have yet to be developed and formally	Clarification. At Site 8 where delineation is incomplete, current protectiveness is not affected due to the

#	Page #	Section	ADEC Comment	Response
			memorialized/implemented, remedy is not complete, etc.; and subsequently ADEC does not concur with several of the entries in the PR summary form as well as references and discussions in the document that the related issues do not affect current protectiveness and should be changed from 'no' to 'yes'.	impacts observed and the lack of an exposure pathway. **ADEC-Partially Accepted June 30, 2020; ADEC's partial concurrence based upon the RTC only applying to what is currently known and has been thoroughly characterized at the site, and it does not apply to data gaps which have been identified regarding the vertical and lateral extents of contamination sitewide.** Noted. As discussed in the comment resolution meeting held on July 27, 2020, the following sentence will be added to the recommendation for Site 8: The exposure risk and protectiveness will be further evaluated as part of the next periodic review. **ADEC-Accepted August 18, 2020**
				At Sites 3, 6, 8, 9, 10, 11, 13, 16, 19, 27, and 28 where LUCs are not recorded, current protectiveness is affected. Current protectiveness will be updated to state "Yes" for those sites. **ADEC-Accepted June 30, 2020**
5.	S3	PR Summary Form	Site 8: Please see and apply last paragraph in the comment immediately above. **ADEC-Partially Accepted June 30, 2020; related to the similar RTC/response above, ADEC's partial concurrence with the RTC based upon the RTC only applying to what is currently known and has been thoroughly characterized at the site, and it does not apply to data gaps which have been identified regarding the vertical and lateral extents of contamination sitewide.**	Clarification. The first issue specific to delineation of site contamination at Site 8 will not be updated to "Yes" for Affects Current Protectiveness. Page 51 of the Multi-Site Decision Document states the following regarding Site 8: "The high organic carbon content of the sediment promotes binding with the fuel components and minimizes the potential for contaminant migration. The abundant vegetation also helps

#	Page #	Section	ADEC Comment	Response
				naturally break down the diesel range organics. Given the limited surface area potentially affected by DRO and the lack of stressed vegetation, the potential for significant adverse effects to either human or ecological receptors is low." **ADEC-Partially Accepted June 30, 2020; please see and apply additional response on the left.** Noted. As discussed in the comment resolution meeting held on July 27, 2020, the following sentence will be added to the recommendation for Site 8: The exposure risk and protectiveness will be further evaluated as part of the next periodic review. **ADEC-Accepted August 18, 2020**
			Re: the discussion in the paragraph titled 'Issue', ADEC's recollection of the decision rationale to forego the planned Site 8 sediment sampling was somewhat different; noting that the decisions and rationale were multi-issued including but not limited to e.g. 1) sufficient volumes of sediment were not available across the decision units to provide enough sampling and analysis data to represent a monitoring event, 2) the ephemeral site conditions at the time of conducting the site survey in preparation for implementing the sampling reflected upland conditions without prevalent surface water and/or sediment, 3) it previous soil analytical results obtained during a prior investigation by USACE had confirmed the presence of a greater extent of fuel contamination in soil that extended underneath and potentially beyond the opposite side of the road, and 4) USACE apprised and coordinated the situation and site conditions with ADEC and	Accepted. The Issue paragraph will be revised to state: "Based on changes in site conditions over time (e.g., volume of sediment and ephemeral site conditions), sufficient material…" **ADEC-Accepted June 30, 2020** Section 3.6.1 will be revised to state: "In 2018, sediment samples were not collected. An attempt to modify the existing Decision Units (DUs) using the data collected in 2016 was made (Figure A-5). Sediment samples were not collected due to an insufficient volume of available sediment, which is defined in the DD as "continuously submerged", to provide enough sampling and analytical data to perform representative monitoring. Intermittently

#	Page #	Section	ADEC Comment	Response
			obtained approval to modify the field plan. This doesn't have to all be stated in the form, however it should be included and discussed in adequate in respective applicable narrative discussions throughout the document; and then this section be referenced in the form.	submerged sediments (e.g., ephemeral ponds, wet tundra) are considered soil. Soil is not currently considered a media of concern in the DD at Site 8 (USACE 2009a)." **ADEC-Partially Accepted June 30, 2020; please see and apply similar/same responses to RTCs above associated with Site 8.** Noted. As discussed in the comment resolution meeting held on July 27, 2020, the following sentence will be added to the recommendation for Site 8: The exposure risk and protectiveness will be further evaluated as part of the next periodic review. **ADEC-Accepted August 18, 2020ADEC-Accepted August 18, 2020**
				For consistency between issues/recommendations listed for other sites, a section reference will not be added to this table, as this is only a high-level summary of the findings of the PR. **ADEC-Accepted June 30, 2020**
			Please amend the 'Issue' and 'Recommendation' sections to also identify the potential data gaps associated with groundwater at Site 8 and the adjacent area(s).	Not Accepted. Groundwater is not a DD medium of concern at Site 8. **ADEC-Partially Accepted June 30, 2020; please see and apply similar/same responses to RTCs above associated with Site 8. Additional resolution potentially required to address the Site 8 issues.** Noted.

#	Page #	Section	ADEC Comment	Response
				As discussed in the comment resolution meeting held on July 27, 2020, the following sentence will be added to the recommendation for Site 8: The exposure risk and protectiveness will be further evaluated as part of the next periodic review. **ADEC-Accepted August 18, 2020**
			ADEC's position is that the current status of the uncharacterized contamination in multiple media at Site 8 affects current and future protectiveness and the table should be revised accordingly.	Clarification. The first issue specific to delineation of site contamination at Site 8 will not be updated to "Yes" for Affects Current Protectiveness. **ADEC-Accepted June 30, 2020** Page 51 of the Multi-Site Decision Document states the following regarding Site 8: "The high organic carbon content of the sediment promotes binding with the fuel components and minimizes the potential for contaminant migration. The abundant vegetation also helps naturally break down the diesel range organics. Given the limited surface area potentially affected by DRO and the lack of stressed vegetation, the potential for significant adverse effects to either human or ecological receptors is low." **ADEC-Accepted June 30, 2020** According to EPA OSWER 9200.2-111, *Clarifying the Use of Protectiveness Determinations for CERCLA Five-Year Reviews,* although the extent of POL-contaminated soil is not fully delineated at Site 8, there is no unacceptable risk to human and ecological

#	Page #	Section	ADEC Comment	Response
				receptors exposures because exposures are currently under control and no unacceptable risks are occurring. **ADEC-Accepted June 30, 2020**
6.	S-4	PR Summary Form	Site 10: Please amend the discussion in the Issue paragraph that identifies other COCs that were identified in soil and/or groundwater at this site (e.g. chlorinated VOCs, other POL-COCs in addition to ethylene glycol, etc.), and amend the recommendations to include the status of those COCs in respective media.	Clarification. The purpose of the Periodic Review Summary Form is to briefly state remaining site-specific issues and recommendations. For more detailed historical information and current recommendations at Site 10, please refer to subsequent sections of the Periodic Review. **ADEC-Partially Accepted June 30, 2020; ADEC does not disagree with the RTC or the presentation of information, however it needs to be specified clearly in one or both the form and narrative.** Accepted. The issue and recommendation will be revised as follows: Issue: Three groundwater sampling events have occurred in response to recommendations in the first FYR (USACE 2015b) to address a data gap regarding ethylene glycol in groundwater downgradient of Site 10. DRO, RRO, PAHs, PCBs, VOCs, metals and attenuation parameters have been monitored in groundwater in the downgradient wells (MW10-1 and 14MW06) from Site 10. COPCs identified during removal actions in soil such as tetrachloroethene (PCE), 1,1-dichloroethene, 1,2 dibromoethene, 1,1,2,2 tetrachlorethane, 1,2-dichloropropane, and

#	Page #	Section	ADEC Comment	Response
				trichloroethene (TCE) have been removed and have not been identified in groundwater **ADEC-Accepted August 18, 2020** Recommendation: Discontinue groundwater sample analysis for ethylene glycol and VOCs downgradient of Site 10 (monitoring wells MW10-1 and 14MW06) because the previously identified data gap is closed. **ADEC-Accepted August 18, 2020**
			Will this and other sites which are located within and/or adjacent to the AOC that represents the Main Operations Complex (MOC), be managed going forward in conjunction with the MOC; e.g. similar to what USACE proposed as part of the 2019 Second Five-year Review (FYR) for Sites 21 and 28, for the furthest upgradient areas of Site 28 closest to the MOC to be managed in association with the MOC, its LUC/ICs, NEPA, etc.?	Clarification. For the purposes of ongoing site evaluations and final site closure, there is not currently an effort to manage the individual sites under the MOC as a whole. However, due to the proximity of the sites and the nature of groundwater, the LUC, as documented in the anticipated Environmental Covenant, has been developed to encompass all MOC sites. This was also done in order to provide the most clarity to the spatial boundary to which the same LUCs apply, rather than issuing individual deed notices anticipated to be in the form of Environmental Covenants per site within the MOC. **ADEC-Accepted June 30, 2020; please ensure this is clearly and consistently presented in respective applicable sections of this report.** Accepted. Additional text will be added throughout the report where the selected remedy is mentioned to

#	Page #	Section	ADEC Comment	Response
				discuss the grouping of the MOC sites for the forthcoming Environmental Covenant. **ADEC-Accepted August 18, 2020**
			Site 15: Current protectiveness should be indicated as affected.	Not Accepted. "Current Protectiveness" will not be revised as requested. The nature and extent of soil contamination within Site 15 is known, has a remedy to prevent exposure through LUCs, and the potential effects of this contamination are monitored through the ongoing MOC groundwater monitoring program. **ADEC-Noted June 30, 2020; further resolution potentially necessary to ensure this is adequately addressed in forthcoming UECA and/or next five-year follow on actions** Noted. **ADEC-Noted August 18, 2020**
			Please revise/amend the last sentence in the Issue paragraph for the following reasons: 1) the sentence as currently presented may contain some typos or misplaced phrasing but it doesn't really make sense, and appears to present potentially conflicting information, 2) amend and rephrase the two sentences to better correlate the relationships between the stated depths of 12 feet bgs and 2 feet below the water table with what appears to be contamination that exceeded the respective cleanup level(s) was left in place at 15 feet below ground surface (bgs). Amend the sentence to reference feet e.g. '…15 feet bgs.' 3) clarify how the sidewall was advanced to 15 feet bgs although the preceding sentence essentially states that groundwater was encountered at 10 feet bgs and excavation was terminated 2 feet bgs at a12 feet bgs.	Accepted. The text describing the issue will be revised as follows: DRO-contaminated soil above the SSCL remains at the floor of the Site 15 G Plume excavation: contamination along the excavation floor at 12 feet (ft) bgs, which was two feet below groundwater in 2012, as well as contamination along the west excavation sidewall was not removed during the 2012 excavation effort. Although the 2013 excavation effort removed the contamination identified in the west sidewall during 2012 and reached 15 ft bgs, the contaminated soil associated with the 2012

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				excavation floor was not removed during the 2013 excavation effort. The contaminated soil associated with the 2012 excavation floor remains at 12 ft bgs. **ADEC-Accepted June 30, 2020** Please note that this issue will also be updated in Section 7.0. **ADEC-Accepted June 30, 2020**
			Recommendation should either include a reference to the detailed narrative section that specifies how the recommendation is to be accomplished and also specify risk drivers for the proposed removal action of the remaining contamination.	Clarification. The purpose of the Periodic Review Summary Form is to briefly state remaining site-specific issues and recommendations not to describe them in detail. For more detailed historical information and current recommendations at Site 15, please refer to subsequent sections of the Periodic Review. **ADEC-Noted June 30, 2020; noting that ADEC's request was to provide the brief reference in the form.** Accepted. An introductory paragraph will be inserted above the summary form to describe what is included in the summary form and will include references to report sections for further information on the data review that provided the basis for the final issues and recommendations listed in the summary form. **ADEC-Accepted August 18, 2020**
			Were the horizontal and lateral extents of the contamination completely characterized for all site COCs, including non-POL contaminants? **ADEC-Noted June 30, 2020; ADEC acknowledges that DRO is the COC associated with Site 15, however ADEC would**	Clarification, The Site 15 COC is DRO. Horizontal and lateral extents of the DRO contamination have been completely characterized at Site 15. **ADEC-**

#	Page #	Section	ADEC Comment	Response
			not necessarily concur with the statement that the entire extents of DRO contamination have been completely characterized. Please see and apply additional responses related to Site 15 (and similar responses for other sites); additional resolution discussion potentially necessary.	**Noted June 30, 2020; please see additional response on the left.** Noted. USACE maintains the original response. **ADEC-Accepted August 18, 2020**
7.	S-5	Protectiveness Statements	Please clarify how 'will be protective' is applicable to sites that have been determined to no longer have contamination that exceeds respective applicable criteria and/or where the exposure pathway has been determined to be complete.	Accepted. An additional protectiveness statement will be added for Site 32, where the site has been determined to no longer have contamination that exceeds respective applicable criteria: The remedy at Site 32 is protective of human health and the environment and is complete. Remedial activities are complete and have adequately addressed all exposure pathways that could result in unacceptable risk. **ADEC-Accepted June 30, 2020** At the remaining sites where the exposure pathway is potentially complete, the protectiveness determination is "will be" on the basis that once the remedy is complete, the exposure pathway will be eliminated. **ADEC-Accepted June 30, 2020**
			For the sites where 'will be protective' is determined to be applicable, then wouldn't an addendum due date also be necessary, e.g. similar to the milestone date in the summary form? The protectiveness statements for the 'will be protective' sites should specify/clarify what is required to achieve completion and/or protectiveness. **ADEC- June 30, 2020; clarification for addendum due date, e.g. identify an estimated date at which time a respective**	Accepted. The Protectiveness Statements will be updated to include the remaining requirements to achieve completion and/or protectiveness. **ADEC-Accepted June 30, 2020** Please note that this will also be updated in Section 9.0. **ADEC-Accepted June 30, 2020**

#	Page #	Section	ADEC Comment	Response
			remedy will be protective, within this or a future five-year periodic review period.	Please clarify what is requested specific to the "addendum due date." **ADEC- June 30, 2020; please see additional response on the left.** Accepted. For protectiveness statements with the status "will be protective", a sentence will be added to identify an estimated date at which the respective remedy will be protective. **ADEC-Accepted August 18, 2020**
			Site 8: ADEC disagrees with the protectiveness statement since it cannot be definitively determined at this time whether or not a direct exposure pathway is complete.	Clarification. The protectiveness statement will not be changed from "Short-Term Protective" to "Not Protective" due to the lack of the potential exposure to contaminated media at the site. **ADEC-Noted June 30, 2020** Please see the response to the fourth part of Comment 5 above. **ADEC-Noted June 30, 2020**
			The bullet should be amended to state e.g. '..sample locations in order to further evaluate exposure risk and whether further action is necessary to achieve protectiveness.'	Clarification. The bullet will be revised as requested to state: "Delineate the lateral and vertical extent of DRO contamination east of 2016 sample locations in order to create new DUs, provide a more accurate location of the pipeline break, and continue MNA in accordance with the remedy stated in the DD." **ADEC-Accepted June 30, 2020**
			Site 9: Related to the comments in the first paragraph of page S-5 comments above, the protectiveness statements should be amended/revised where applicable in order to specify whether or	Accepted. The Protectiveness Statements will be updated to include the remaining requirements to achieve

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			not controls, engineered and/or administrative, that are necessary in order for the remedy to achieve and maintain protectiveness; versus sites where removal actions may have eliminated the contamination as well as the exposure pathway. Site 9, as a former landfill, will require administrative and engineered controls (e.g. the cap, drainage diversion, etc.) in order to be protective.	completion and/or protectiveness and the Addendum Due Date will be added for each remaining requirement. **ADEC-Accepted June 30, 2020** Please note that this will also be updated in Section 9.0. **ADEC-Accepted June 30, 2020** In response to "sites where removal actions may have eliminated the contamination as well as the exposure pathway", an additional protectiveness statement (below) will be added for Site 32, where the site has been determined to no longer have contamination that exceeds respective applicable criteria: The remedy at Site 32 is protective of human health and the environment and is complete. Remedial activities are complete and have adequately addressed all exposure pathways that could result in unacceptable risks in these areas. **ADEC-Accepted June 30, 2020** Site 9 requires the full implementation of the LUCs through the filing of an Environmental Covenant to be protective. This will be updated in the Protectiveness Statement. **ADEC-Accepted June 30, 2020**
8.	S-6	Protectiveness Statements	Site 15: This and other applicable sites should include bulleted points that specify what is required to achieve protectiveness, as is presented for Site 8 and the preceding page.	Please see response to the comment above. **ADEC-Accepted June 30, 2020**
9.	1-7	1.2.1	The periodic review summary form does not include the specified detail re: post-2009 remedial actions as is stated in the last	Accepted.

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			paragraph of this section. This information should be added to the current section and presented in the same format and summary narrative as the preceding bullets.	The reference to the summary form was inaccurate and should have stated Section 3.0 instead. The text will be revised to state: Remedial actions following the 2009 DDs (USACE 2009a, 2009b) are summarized in Section 3.0. **ADEC-Accepted June 30, 2020** Post-2009 remedial actions will not be added to Section 1.2.1 "Initial Responses at NEC" as the section describes action completed prior to the DD preparation and signature. **ADEC-Accepted June 30, 2020**
10.	1-8	1.3	<u>Table 1-2</u>: On the subject of cleanup levels as identified/specified by the 2009 DDs as well as applicable laws and ARARs (e.g. 18AAC75, 18AAC70, etc.), ADEC submitted extensive comments on both draft 2019 documents for the Sites 21 and 28 Second FYR and the Site 7 Second PR reports; especially with re: to which COCs applied under which criteria at specific sites. Please see and apply all of ADEC's comments on the Sites 21 and 28 and Site 7 reports which would be applicable to this Multisite PR in general as well as any of the comments which may pertain to a specific site. Applicable issues include buy may not be limited to e.g. applicable action/cleanup levels for surface water, SSCLs for sediment, etc.	Clarification. Table 1-2 presents the applicable cleanup levels and COCs as determined in the 2009 DD. There are no SSCLs for sediment, as they were determined to be site-wide. **ADEC-Accepted June 30, 2020** The sentence preceding Table 1-2 will be revised to state: Site contaminants of concern (COCs) <u>and their respective media-specific sitewide cleanup levels</u> promulgated at the time of the DD are presented in Table 1-2. **ADEC-Accepted June 30, 2020** Additionally, two footnotes will be added to Table 1-2 that state: General sitewide cleanup levels presented in the DD (USACE 2009a). **ADEC-Accepted June 30, 2020** Applicable surface water criteria were determined from the SSCLs for a non-drinking

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				water source, as stated in the 2009 DD (USACE 2009a). **ADEC-Accepted June 30, 2020**
11.	1-9	1.3.1	The discussion in the last paragraph of this section should also specify and explain the USACE CERCLA-based decisions and rationale for separating Sites 21 and 28 and addressing those sites under a FYR instead of in this PR.	Accepted. Text will be revised to state: This review evaluates only the site remedies selected in the HTRW DD (USACE 2009a) <u>for non-CERCLA contaminants (i.e., POLs); site remedies selected in the HTRW DD (USACE 2009a) for CERCLA contaminants are evaluated in the FYR under separate cover (USACE 2019)</u>. **ADEC-Accepted June 30, 2020**
12.	1-10 – 1-13	1.3.1.1	<u>Table 1-3</u>: Please amend the table, as well as other references and/or narrative discussions throughout the document where applicable in order to adequately call out and emphasize those sites that will require UECA documentation in place of the Deed Notices, Notice of Environmental Contamination, ICs, etc.	Accepted. Sites where Environmental Covenants are planned will be noted in Table 1-3 with the following: "…an Environmental Covenant in accordance with the UECA is needed." **ADEC-Accepted June 30, 2020**
			<u>Site 8</u>: Please see and apply related comments above to this table and all other sections throughout the document for all information that is applicable to other respective sites.	Accepted. Related comments above will be applied to this table and all other sections throughout the document, as appropriate. **ADEC-Accepted June 30, 2020**
			<u>Sites 21 and 28:</u> The status descriptions for both these sites should be re-evaluated to ensure they are consistent with what was presented in the finalized 2020 Second FYR; or omit the detailed descriptions entirely and instead include an explanation of this being their first year that these two sites have been addressed under	Accepted. Detailed descriptions for Site 21 and Site 7 will be removed; rather an explanation for inclusion under separate cover will be provided. **ADEC-Accepted June 30, 2020**

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			a separate cover and will be going forward. Apply this similarly to Site 7.	Site 28 will now be included as a site reviewed during this Periodic Review. The site information will be consistent with what was presented in the finalized 2020 Second FYR. **ADEC-Accepted June 30, 2020**
			Site 29: Similar to ADEC's comment above related to uses of the phrase 'will be protective' there are what appear to be some inconsistencies with the presentation of information for some of the sites and the descriptions of their status; e.g. states that the remedy at Site 29 is complete 'however' there was debris in the stream that was removed in 2010. Please revise/amend as needed to clarify.	Accepted. The Site 29 status will be revised to state: Although the site was determined to be NFA; the 2009 DD (USACE 2009a) included a remedy. **ADEC-Accepted June 30, 2020** The remedy is complete. Incidental debris located in the stream channel that posed an inherent hazard was recommended for removal in the 2009 DD (USACE 2009a) and subsequently removed in 2010." **ADEC-Accepted June 30, 2020**
			It would be helpful to include a table note as well as additional discussion in section 1.3.1 and/or 1.3.1.1 that describes the status and composition of the group of sites that are referred to as the MOC; including how and why those sites are grouped, and how they have been managed under remedial actions in the past and how they will continue being managed in the future. This should also provide further clarification about the presentation of what appear to be two separate MOC site groups in the Protectiveness Summary Form; e.g. a larger group of individual sites listed on page S-2 vs. the smaller group of sites that is called the 'MOC monitoring network.	Accepted. A note will be added to Table 1-3 that states: Sites 10, 11, 13, 15, 16, 19, and 27 are collectively referred to as the MOC. **ADEC-Accepted June 30, 2020** An additional line within Table 1-3 will be added to discuss the MOC and details such as how the groundwater contamination will be managed as a whole under the forthcoming Environmental Covenant. **ADEC-Accepted June 30, 2020** Site 20 was recommended as NFA in the DD and will be removed from all references to the MOC,

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				which will bring consistency to the Protectiveness Summary and the group of sites that is referred to as the MOC monitoring well network. **ADEC-Accepted June 30, 2020**
13.	2-3	2.0	Table 2.1: This table should include USACE's draft transmittals and current draft and final reviews of the draft 2019 Site 7 PR and the final 2020 Sites 21 and 28 FYR reports.	Partially Accepted. The Draft and Final versions of the documents will be added to Table 2-1. **ADEC-Accepted June 30, 2020** For consistency between the Periodic Reviews, only Final versions of the documents will be added to Table 2-1. **ADEC-Accepted August 18, 2020**
14.	3-2	3.3	This section should reference the prior tables, forms and other major sections that include detail specifying the activities which are outstanding/required at each site in order to achieve protectiveness, remedy completed, and site closure.	Accepted. An additional reference to Tables 1-3 and 2-1, which include detail specifying the activities that have been performed and that are outstanding at each site, will be added to Section 3.3. **ADEC-Accepted June 30, 2020**
15.	3-3	3.4.1	Table 3-1: Please re-evaluate what is indicated as 'None' in the RAO column. What is stated in the Selected Remedy column is the RAO, and the current Implementation Status should also be revised accordingly.	Clarification. The selected remedy is the activity by which the Remedial Action Objective (RAO) will be achieved. There are Northeast Cape RAOs presented in Section 3.1.1 and MOC-specific RAOs presented in Section 3.1.2. The RAOs presented in the site-specific tables that include "Remedy, RAOs, and Status" are those which are stated in the DD. **ADEC-Accepted June 30, 2020; however please ensure the RTC is adequate specified and clarified in the information**

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				presented in the table and/or the associated respective narrative discussion. Accepted. The column heading "Selected Remedy" will be revised to "Selected Remedy to Achieve RAO". **ADEC-Accepted August 18, 2020** In addition, the tables will be revised so that only remedies specified in the DD (all of which have an applicable RAO) will be included in each table. This will remove all entries with "None" in the RAO column. **ADEC-Accepted August 18, 2020**
			ADEC also notes that there were additional evaluations and decisions made by USACE and ADEC that involved more than just the one criteria of RRO not exceeding the SSCL as indicated in footnote 1; e.g. there didn't appear to be an obvious source discernible from potential biogenic signatures and contributions, and that significant disturbance would cause unnecessary damage to the tundra ecosystem as was the same rationale applied to Site 28 remedy and field implementation decisions. This should be revisited and the references and narrative discussions amended/revised where applicable throughout the document. ADEC's recollection is that data evaluation and decisions involved what data indicated were limited exceedances (with likely a lot of biogenic influences based upon silica gel cleanup analysis results) in very wet tundra soils.	Accepted. The first table note will be revised to the following: [1] Results of sediment resampling, performed in accordance with ADEC Technical Memorandum 06-001 (ADEC 2006), did not exceed the RRO SSCL, so additional excavation was not performed. <u>There was not a source of POL-related contamination discernible from potential natural biogenic contributions and additional disturbance to the site would cause unnecessary damage to the tundra ecosystem.</u> **ADEC-Accepted June 30, 2020** Further discussion of the data evaluation and decisions with regard to the exceedance of RRO and the silica gel cleanup results are included in the final paragraph of this section. **ADEC-Accepted June 30, 2020**

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			Table Note 2: The statements and references made in this table note are not accurate or appropriate since a .350 determination has not been approved by ADEC for this site, or any other groundwater sources associated with the Northeast Cape FUDS. Further, with re: to Site 3 specifically, ADEC's understanding is that groundwater was not investigated at this site. This and other similar/related statements, discussions, references etc. throughout the document should be revised and amended as needed for accuracy and consistency. ADEC notes further that the 'does not apply' statement is also incorrect and should be revised or omitted since in situations where a .350 determination is approved, that the groundwater must still be managed with landowner-approved institutional controls.	Clarification. Results for shallow groundwater samples collected at Site 3 are discussed in Section 3.4. **ADEC-Accepted June 30, 2020** The following statement will be deleted from the second note within the applicable tables: "therefore, the sitewide groundwater RAO (i.e., prevent ingestion of groundwater containing contaminants at levels above state drinking water standards and pertinent risk-based standards for petroleum hydrocarbons) does not apply." **ADEC-Accepted June 30, 2020**
			References to LUCs, ICs, etc. throughout the document should be revised to be consistent with UECA.	Accepted. A third table note will be added, referencing the LUC selected remedy: "[3] LUCs will be recorded as an Environmental Covenant in accordance with the UECA." **ADEC-Accepted June 30, 2020**
			Please apply the related/same context of the comments above to other similar tables titled Remedy, RAOs, and Status that are presented for other sites throughout this section, e.g. table 3-5.	Accepted. The sitewide groundwater RAO statement referenced in the comment above will be removed from Tables 3-5 and 3-7. **ADEC-Accepted June 30, 2020** The table note regarding LUCs referenced in the comment above will be added to Tables 3-1, 3-5, 3-6, 3-7, 3-8, 3-9, 3-10, 3-11, 3-12, 3-13, and 3-14. **ADEC-Accepted June 30, 2020**
16.	3-6	3.4.2	What is the path forward or recommend timeline for the actions that are necessary for achieving remedy completion and	Accepted.

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			protectiveness RAOs? These should be discussed and/or the applicable sections referenced where this is discussed in more detail. Please apply this comment as related to other sites throughout this section and the document where applicable.	In each "O&M" section, the anticipated completion date will be added to all remedies in which, due to outstanding issues/recommendations presented in this Periodic Review, the implementation status is "Incomplete". **ADEC-Accepted June 30, 2020** The next milestone date for the Periodic Review will also be described for the applicable sites. **ADEC-Accepted June 30, 2020**
			Has groundwater been characterized and/or previously investigated at Site 3?	Yes, groundwater has been previously investigated and characterized at Site 3 as described in Section 3.4. **ADEC-Accepted June 30, 2020**
17.	3-11	3.6	Table 3-6: All tables in this section as well as references throughout the document as applicable should be amended/revised as needed in order clarify the relationship between the selected remedy and the RAO; noting that stating 'None' for the RAOs in this and other tables is misrepresentative and not clear.	Accepted. Remedies in which a site-wide RAO applies will be updated to include the associated RAO. For example, the selected remedy: LUC to record a deed notice to designate areas not suitable for drinking water, will now be associated with the site-wide RAO: Prevent ingestion of groundwater containing contaminants at levels above state drinking water standards and pertinent risk-based standards for petroleum hydrocarbons. **ADEC-Accepted June 30, 2020** Components of the remedy that do not directly apply to a site-wide RAO will remain "None" with the associated table note: [4] No applicable RAO presented in the DD (USACE 2009a). For example, the remedy "resampling tundra

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				sediment to evaluate biogenic interference from natural organic material" does not directly correlate to an RAO in the DD but is a component of the overall remedy for the site. **ADEC-Accepted June 30, 2020** These changes will be applied to all "Remedy, RAOs, and Status" tables in Section 3.0. **ADEC-Accepted June 30, 2020** Please note, following the comment resolution discussion that occurred on July 27, 2020, all RAOs where "None" was noted have been revised to the applicable RAO as stated in the Decision Document. **ADEC-Accepted August 18, 2020**
18.	3-17	3.7.1	More discussion should be included in this as well as the O&M section 3.7.2 that follows to summarize the periodic visual monitoring and inspection that occurred in 2018, as well as those ongoing activities that will be necessary in future periodic review periods.	Accepted. The following text will be added to the second to last paragraph of Section 3.7.1: In 2018, additional surface water sampling as well as a site and landfill cap visual inspection were performed. The observations noted during the site and landfill cap inspection are presented in Section 5.4.4. **ADEC-Accepted June 30, 2020** Section 3.7.2 will be revised to include the remaining issue regarding the implementation of LUCs through the filing of deed notices (anticipated to be in the form of Environmental Covenants) and the anticipated completion date of 2024 for these covenants. The completion date of the next Periodic Review will also be included in this section.

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				ADEC-Accepted June 30, 2020 Please note that the anticipated completion date for the filing of deed notices is 2021. This update has been made to Section 3.7.2. **ADEC-Accepted August 18, 2020**
19.		3.8	All applicable narrative discussions, tables, table notes (as well as related figures and other attachments to the document as applicable), should be revised/amend in order to adequately present the determinations, decisions, and future recommendations that were included in the final 2020 Sites 21 and 28 FYR, as they pertain to the current and future site evaluation and management decisions associated with the MOC; e.g. plumes left in place which extend on both sides of the boundary between what has historically been considered Site 28 and the MOC, further management of contamination, etc. Please apply those related comments and respective revisions applicable to this section to all other related sections in this Multisite PR.	Accepted. Site 28 will be added to this document as a Periodic Review site and issues and recommendations associated with the MOC and Site 28 resulting from comment resolution during the 2020 FYR will be incorporated into this document. **ADEC-Accepted June 30, 2020**
20.		4.0	Table 4.1: The format presentation of the information that is included in Table 4-1 is difficult for the reader to follow and discern since actions are summarized in various years and site lists that are not chronological and/or symmetrical, the table header/title interchanges from 'Actions Since First FYR' to 'Actions Since Previous Periodic Review', column headers interchange from displaying a year to 'Action', etc. Please revise/amend the narrative and table to better present/clarify the information and include additional table notes if necessary.	Accepted. The table will be reorganized and reformatted to present information by site in reverse chronological order. **ADEC-Accepted June 30, 2020** The table title will be updated to "Actions Since First FYR" on both pages. **ADEC-Accepted June 30, 2020** "Action" and "Year" will be separated into columns. **ADEC-Accepted June 30, 2020** The revised table has been included at the end of this comment response form. **ADEC-Accepted June 30, 2020**

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21.	5-12	5.3.3.2	Please amend the last paragraph to discuss more detail re: the field team observations during the site visit and the decisions that were agreed upon by USACE and ADEC; please see and apply related prior comments above. **ADEC-Accepted June 30, 2020; ADEC concurs with the focused RTC, however requests that the applicable respective narrative sections adequately describe the field evaluation and determinations/concurrence by USACE and ADEC PMs to also reevaluate the CSM and future site monitoring needs as needed.**	Accepted. The referenced paragraph will be modified as follows: Although a sediment monitoring effort was planned for 2018, no sampling occurred due to the lack of sediment (as defined in the DD as "continuously submerged") in the DUs, to provide enough sampling and analytical data to perform representative monitoring. **ADEC-Accepted June 30, 2020; please see and apply additional comment on the left.** Accepted. The following text will be added to the referenced section: Although a sediment monitoring effort was planned for 2018, no sampling occurred because too little sediment material was present in the DUs to perform the planned monitoring. Due to the lack of sediment in the DUs, it is recommended the use of an ISM as described in the DD be discontinued until a supplemental soil investigation is completed and the approach to future monitoring is re-evaluated. The purpose of the supplemental soil investigation would be to delineate the lateral and vertical extent of contamination east of the 2016 sampling area and evaluate the location of the historic pipeline spill, which was revised based upon the 2016 sample data. After which, the exposure risk and whether

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				or not additional action is necessary to achieve protectiveness should be further evaluated. **ADEC-Accepted August 18, 2020**
22.	7-1	7.0	The narrative and tables of this section should be amended and revised based upon those revisions resulting from ADEC's comments and revision requests throughout this template. Issues and recommendations need to include continuing inspections, of sites, signs, remedy performance, monitoring and additional investigation as identified in this PR, UECA requirements, etc.; in addition to those stated in the narrative of this section.	Clarification. The issues and recommendations stated here are actions required to achieve or improve protectiveness that are not currently a component of the DD-selected remedies. **ADEC-Accepted June 30, 2020** An additional issue associated with the change from LUCs to Environmental Covenants under UECA, as well as issues associated with Site 28 will be added to this section. **ADEC-Accepted June 30, 2020** Section 7 will be updated as appropriate with the above applicable listed responses. **ADEC-Accepted June 30, 2020**
23.	7-2	7.0	Table 7-1: Please see and apply comments above related to ADEC's position that all currently incomplete remedies result in affects to current protectiveness and should be stated as such in tables and references throughout the document.	Accepted. Issue 1 will be updated to "Yes" for "Affects Current Protectiveness". **ADEC-Accepted June 30, 2020**
24.	8-2	8.0	Table 8-1: Please see and apply prior comments above re: to UECA requirements vs. LUCs, NECs, etc.	Accepted. The following issue and recommendation will be added for all sites requiring LUCs (3, 6, 8, 9, 10, 11, 13, 15, 16, 19, 27): Issue: Clarification for components of the LUC Remedy is needed due to a newly promulgated ADEC regulation. **ADEC-Accepted June 30, 2020**

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				Recommendation: The anticipated change from LUC and deed notices to UECA and Environmental Covenants should be addressed in an ESD document. **ADEC-Accepted June 30, 2020**
25.		9.0	Please apply applicable prior comments above, both site specific and to other sites in general as applicable, associated with protectiveness statements.	Accepted. Prior applicable comments above will be incorporated into the protectiveness statements. **ADEC-Accepted June 30, 2020**
26.	10-1	10.0	Need to specify the date and/or dates that will trigger future periodic reviews; whether this will be one document for all PR sites or whether individual reviews will be necessary for specific sites on different schedules.	Accepted. The triggering action date will be the completion date of this Periodic Review and the due date will be five years after the triggering action date. **ADEC-Accepted June 30, 2020** Section 10 "Next Review" will be revised to: Reviews are necessary at Sites 3, 6, 8, 9, 10, 11, 13, 15, 16, 19, and 27 on a periodic basis until all selected remedies are complete. <u>These reviews should be completed under one cover on a five-year periodic basis. The triggering action date of the next Periodic Review is the completion date of this Periodic Review. The due date of the next Periodic Review is five years following the triggering action (i.e., completion) date of this Periodic Review.</u> **ADEC-Accepted June 30, 2020**
27.			**<u>Appendix A</u>**: Please see and apply comment in Appendix C below to this and other appendices and other narratives, figures, tables, etc. throughout the document where applicable.	Accepted. Every effort will be made to apply relevant comments from appendices in the draft 2019 Site

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				7 Second PR and the final 2020 Sites 21 and 28 FYR reports to this report. **ADEC-Accepted June 30, 2020**
			The figures in this section are very well presented and provide excellent documentation and visual references for site conditions and the CSM; and are appreciated by ADEC.	Thank you.
28.			**Appendix B**: Please see and apply comment in Appendix C below to this and other appendices and other narratives, figures, tables, etc. throughout the document where applicable.	Accepted. Every effort will be made to apply relevant comments from appendices in the draft 2019 Site 7 Second PR and the final 2020 Sites 21 and 28 FYR reports to this report. **ADEC-Accepted June 30, 2020**
29.			**Appendix C**: For the purpose of reducing overall comments as well as respective time required that would result from duplicating comments, please see ADEC's comments (and RTC review determinations as applicable) on the draft 2019 Site 7 Second PR and the final 2020 Sites 21 and 28 FYR reports as any of that information may pertain specifically and/or in general to this document; e.g. questions, responses, narrative section discussions, references, and attachments that may be related/pertinent to Field Documentation, Community Issues, Meeting Minutes, Interviews, Inspection Checklists, etc. and also figures, photograph logs, etc. ADEC realizes that these are three separate documents, however the two drafts of comments ADEC has provided for the two referenced document above include many of the applicable comments to the respective information in this document (e.g. narrative discussions, figures, attachments, the context and/or interpretation and site management requirements, decisions, etc.).	Accepted. Every effort will be made to apply relevant comments from appendices in the draft 2019 Site 7 Second PR and the final 2020 Sites 21 and 28 FYR reports to this report. **ADEC-Accepted June 30, 2020**

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30.			**<u>Appendix E</u>:** ADEC's review of the draft 2018 MOC MNA report resulted in numerous comments on the presentation and context of information throughout the report and attachments. For the purpose of limiting the overall comments for this FYR effort, ADEC may determine to submit additional itemized comments on the Appendix E report in the near future, that can be added as a memorandum to the file and considered by USACE and ADEC during scoping for the next field efforts during the upcoming periodic review period. Many of these comments include information that would be clarification in nature and/or should be included for future monitoring/inspection events such as seasonal impacts, changes in site conditions over time throughout the frost-free season, etc.	Noted. **ADEC- June 30, 2020; ADEC has not completed additional review and does not have any additional comment to submit at this time.** Noted.
31.		Attachment E-1	<u>Figure E-3.1</u>: The legend depiction for 'building' should be amended/revised to indicate those building structures that remain at the site vs. those which previously existed and/or were indicated on as-built drawings however no longer exist. Further, remaining buildings would be better depicted with a different color border in order to be more discernible.	Accepted. "Existing Building" and "Former Building" will be distinguished from each other using a discernible color. **ADEC-Accepted June 30, 2020**
			<u>Notes</u>: Please amend this and other similar references in figures and other narrative sections throughout Appendix E and the entirety of the document where applicable to always clearly explain and reference the difference between what is considered the administrative boundary vs. the MOC boundary, vs. limits (boundaries) of contamination plumes.	Accepted. The Figure note will be revised as follows: The Administrative Site Boundary (depicted as the "MOC Boundary") is based primarily… This is the only reference to MOC boundary within this appendix. **ADEC-Accepted June 30, 2020**
			Please include additional representations of the approximate groundwater flow direction arrow in all applicable figures	Please note that the groundwater flow direction is presented on Figure E-3.1 and Figures E-4 through E-12 adjacent to the title block.

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			throughout the document in order to provide a better visual and relative representation.	Groundwater flow direction cannot be displayed on Figures E-3.2 and E-3.3 because of the cross-sectional view, however, groundwater flow direction is shown relative to the cross-sectional lines on Figure E-3.1. **ADEC-Accepted June 30, 2020**
			Figure E-3.2: Should the green line that is stated as 'elevation' actually be revise to 'ground surface'? If so please apply to all similar figures and/or other references throughout the document where applicable.	Accepted. Figures E-3.2 and E-3.3 will be revised as requested. **ADEC-Accepted June 30, 2020** Additionally, 'Northeast Cape' will be removed from the title block to maintain consistency with all other Appendix E figures. **ADEC-Accepted June 30, 2020**
			Figure E-6: Please include a figure note that further clarifies the cleanup level information that is included in the call out box; whether the value listed is the specified Table C cleanup level, and whether red is intended to indicate an exceedance, vs. black font.	Accepted. Figures E-5 through E-12 will be updated with a note that states: "Bold and red text with gray shading indicate result is greater than or equal to the Site-Specific Cleanup Level and the 2018 ADEC Method Two Table C Groundwater Cleanup Level." **ADEC-Accepted June 30, 2020** Or "Bold and black text with red shading indicate result is greater than the Site-Specific Cleanup Level and the 2018 ADEC Method Two Table C Groundwater Cleanup Level." And "Bold and red text with gray shading indicate result is greater than or equal to the 2018 ADEC

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				Method Two Table C Groundwater Cleanup Level.” **ADEC-Accepted June 30, 2020** Please note that when the cleanup level is based on the Table C cleanup level, it is indicated as such in the table title. **ADEC-Accepted June 30, 2020**
			Figure E-8: The report narrative should discuss the site conditions that are either confirmed or postulated in association with the increases in concentration(s) observed at 14MW02 and other wells with similar conditions versus the decrease in concentration(s) observed at 14MW05 and other wells with similar conditions.	Accepted. The final bullet in Section 7.0 will be revised with the following underlined sentence: Other in-plume monitoring wells at the MOC (14MW01, 14MW02) indicate DRO concentrations continue to increase based on statistical trends. This may be due to the presence of upgradient soil contamination remaining in the MOC, such as at the 2012 excavation confirmation sample locations 12NCMOCSS039, 12NCMOCSS033, 12NCMOCSS037, where excavation terminated at 2-feet below the groundwater surface. A recommendation to complete the implementation of the remedy (remove DRO-contaminated soil) for Site 15 has been included in this Periodic Review. **ADEC-Accepted June 30, 2020**
			Figure E-10: Please include a reference to what ADEC presumes is the 2009 DD for the stated as the SSCL in the callout box. Further, ADEC notes that there were no SSCLs for groundwater approved by ADEC or identified in association with the 2009 DD. This should be revised and clarified further in this and other applicable	Accepted. The 2009 DD will be referenced for the stated SSCLs for groundwater in the callout box. **ADEC-Accepted June 30, 2020** The SSCLs for groundwater are on page 75 of the 2009 DD and apply only to the Main

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			figures, tables, and narrative sections in Appendix E and the entire document wherever applicable.	Operations Complex (MOC), as this is the only site considered a potential future drinking water source. **ADEC-Accepted June 30, 2020**
			Figure E-11: Is the status of current extents, protectiveness evaluation, and/or path forward recommendations adequately addressed in the period review report? Further clarification is needed for dissolved vs. total and whether there may be sampling and/or reporting discrepancies going forward.	The current extents, protectiveness evaluation, and path forward recommendations are adequately addressed in the Periodic Review Report and will receive additional updates as the result of this comment form. **ADEC-Accepted June 30, 2020** Total and dissolved metals were collected during each of the monitoring efforts and should not cause reporting discrepancies going forward. **ADEC-Accepted June 30, 2020**
32.		Attachment E2-4	This attachment was empty in the electronic version of the draft document distributed to ADEC. Were the laboratory deliverables already reviewed by ADEC in association with prior documents?	Clarification. The laboratory deliverables are not part of the compiled PDF but are within the CD provided with the hard copy version of the Draft document. The laboratory deliverables for the MOC would not have been included in association with prior documents. **ADEC-Partially Accepted June 30, 2020; noting that ADEC's current preference is to receive electronic copies of all draft and final documents, and the respective data and files should be included with the electronic transmittals.** Accepted. The laboratory deliverables will be included in the compiled PDF of the final document. **ADEC-Accepted August 18, 2020**

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33.			**<u>Appendix F</u>**: ADEC's review of the draft 2018 Site 9 report resulted in numerous comments on the presentation and context of information throughout the report and attachments. For the purpose of limiting the overall comments for this FYR effort, ADEC may determine to submit additional itemized comments on the Appendix E report in the near future, that can be added as a memorandum to the file and considered by USACE and ADEC during scoping for the next field efforts during the upcoming periodic review period.	Noted. **ADEC- June 30, 2020; ADEC has not completed additional review and does not have any additional comment to submit at this time.** Noted.
			<u>Attachment F-1, Figure F-3</u>: Please clarify the reason(s) for the differences in sampling locations for the two northernmost groups of samples.	Clarification. The differences in sampling locations were due to the variability in site conditions from the previous sampling locations. The water was sampled at a representative location that could be collected with the sampling equipment without disturbing the underlying sediment and contained enough flow/volume for a surface water sample. **ADEC-Accepted June 30, 2020; however please ensure the RTC is adequately specified and clarified.** Accepted. The reasons for the variability from the previous sampling locations will be included in a figure note and within the applicable narrative sections of Appendix F. **ADEC-Accepted August 18, 2020**
			Please clarify why the landfill cap boundary is depicted with the portion that runs parallel to Cargo Beach Road but perpendicular to the Site 9 access road. Further, please provide labels of road and other Site features which are visible in respective figures	Accepted. The landfill cap boundary should not extend to and travel parallel along Cargo Beach Road. The boundary will be revised.

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			throughout the Appendix F report, as well as the Appendix E report and the Appendix A PR figures.	**ADEC-Accepted June 30, 2020** Additionally, road names and other pertinent site features will be labeled throughout the document. **ADEC-Accepted June 30, 2020**
34.			Attachment F-2, Table F-2.1: Please see and apply ADEC's comments and resolution discussion in the final 2020 Sites 21 and 28 Second FYR report re: issues associated with applicable surface water criteria in addition to the limited POL contaminants which are identified in tables and this report.	Clarification. Water at Site 9 is not a reasonably expected future drinking water source, therefore, the applicable DD cleanup levels for surface water include TAH, TAqH, and the absence of sheen (as stated in pages 75-76 of the 2009 DD). **ADEC-Accepted June 30, 2020; ADEC does not disagree with the RTC, however ADEC notes that even if a water sources is not reasonable expected to be a future drinking water source, that any potential or confirmed contamination must still be managed.** Noted. **ADEC-Noted August 18, 2020**
			End of ADEC Comments	

Table 4-1
Actions Since First FYR

Site	Year	Action
NEC Site	2014	Debris, including wire, antenna components, and rusted drums were removed from NEC Sites and from the vicinity of and on top of the Site 7 landfill cap. The debris removal totaled 10.97 tons.
Site 6	2014	As identified in the first FYR, a data gap existed regarding a 2009 pre-construction sample containing an estimated PCB concentration of 2.2 mg/kg. The sample location was relocated using a professional land surveyor and a Trimble GPS unit. Due to a discrepancy between the two located points, both points were test-pitted and sampled (Test Pit 1 and Test Pit 2 in Figure A-4). PCBs were not detected in any of the soil samples.
Site 8	2018	An attempt to complete MNA sampling occurred at revised DUs (Figure A-5). Incremental sediment MNA samples were not collected at Site 8 due to the lack of sediment which met the DD definition of as “continuously submerged” and above the vegetative mat.
	2016	A total of 83 discrete samples were collected from 75 sample locations at Site 8. This sampling effort was completed to assess sediment distribution across the DD established DUs.
	2014	Two historical surface water locations (12NC08SWA01 and 12NC08SWA02/03) were relocated and additional surface water samples were collected and analyzed for GRO, DRO, RRO, BTEX, and PAHs. Sample 14NC08SWA02 and field duplicate sample 14NC08SWA03, located approximately 20 feet from the revised pipeline break location, exceeded the TAqH cleanup level stated in the DD of 0.015 mg/L, no sheen was observed.
MOC	2018	The monitoring well network of 15 wells was sampled for GRO, DRO, RRO, BTEX, PAHs, PCB, and methane, sulfate, alkalinity, and metals (both total and dissolved arsenic, barium, cadmium, chromium, lead, mercury, nickel, selenium, silver, vanadium, and zinc), Monitoring wells MW10-1 and 14MW06, downgradient of Site 10, were also sampled for ethylene glycol. Additional MNA parameters nitrate and ferrous iron were measured using field test kits.
	2016	The monitoring well network of 15 wells was sampled for GRO, DRO, RRO, BTEX, PCB, PAHs, methane, sulfate, alkalinity, and metals (both total and dissolved arsenic, barium, cadmium, chromium, lead, mercury, nickel, selenium, silver, vanadium, and zinc). Monitoring wells MW10-1 and 14MW06, downgradient of Site 10, were also sampled for ethylene and propylene glycol. Additional MNA parameters nitrate and ferrous iron were measured using field test kits.
	2015	The monitoring well network of 15 wells was sampled for GRO, DRO, RRO, BTEX, PAHs, PCBs, methane, and metals (both total and dissolved arsenic, barium, cadmium, chromium, lead, mercury, nickel, selenium, silver, vanadium, and zinc). Monitoring well MW10-1, downgradient of Site 10, was also sampled for diethylene, ethylene, propylene, and triethylene glycol. MNA parameters manganese, ferrous iron, sulfate, nitrate and alkalinity were measured using field test kits.
	2014	Seven groundwater monitoring wells were installed at the MOC gravel pad. Locations include 14MW01 through 14MW07.
		Wells 22MW3 and 18MW1 were decommissioned in accordance with applicable ADEC guidance (ADEC 2009a).
		MW88-3 was re-developed and added to the monitoring network. The well had been classified as damaged due to a blockage located above the screened interval identified in 2010; however, the blockage was no longer present when investigated in 2014.

Site	Year	Action
		Wells MW10-1, MW88-1, MW88-10, 17MW1, 20MW1, 22MW2, and 26MW1 were repaired.
		Groundwater samples were collected from eight existing and seven newly installed monitoring wells within the MOC. Analyses included GRO, DRO, RRO, BTEX, and metals (total and dissolved). MW10-1 was also analyzed for ethylene and propylene glycol, and full-suite VOCs.
		Excavation and removal were completed within the E1 and E2 units. Twenty primary and three duplicate samples were collected from the excavation sidewalls. Seven primary and one duplicate soil samples were collected from the excavation floor. All final confirmation samples of DRO and RRO were below the SSCL of 9,200 mg/kg. The USACE considers soil removal at Plume E complete.
		Excavation and removal were completed at Plume C. Twelve primary and two duplicate samples were collected from the excavation sidewalls. Three soil samples were collected from the excavation floor. All final confirmation samples of DRO and RRO were below the SSCL of 9,200 mg/kg. The USACE considers soil removal at Plume C complete.
		Excavation and removal were completed at Plume I1. Two confirmation sidewall samples and one duplicate were collected from soil directly above the groundwater interface; one confirmation soil sample was collected from the excavation floor. All final confirmation samples of DRO and RRO were below the SSCL of 9,200 mg/kg. The USACE considers soil removal at Plume I complete.
		Before, during and after soil removal activities at the MOC, surface water samples were collected from three locations in Site 28 (MOCSW01, MOCSW02, MOCSW03) to assess the impact of removal activities on surface water. Analyses included GRO, DRO, RRO, BTEX, and PAHs. Analytical results were used to calculate TAH and TAqH results. TAH and TAqH did not exceed DD criteria in any sample.
		After excavations were backfilled, the MOC was regraded to prevent ponding of water and erosion at the site.
		A total of 107.35 tons of arsenic-contaminated waste was removed from Site 21. Thirty-one primary and four duplicate confirmation samples were collected during excavation. One sample, 14NC21S004 contained arsenic at a concentration of 13 mg/kg, which exceeded the SSCL of 11 mg/kg but was below the targeted removal concentration of 17 mg/kg. No further excavation occurred at this location.
MOC/ Cargo Beach	2014	In 2014, three bag staging areas at the MOC were sampled after all bulk bags were removed from the MOC, and Cargo Beach received a post-construction round of incremental sampling methodology (ISM) soil sampling after all bulk bags were removed from the island. ISM samples collected from the bag storage areas at the MOC and Cargo Beach were analyzed for GRO, DRO, RRO and BTEX. ISM samples collected from the fuel containment area at the MOC were analyzed for GRO, DRO, and RRO. No ISM samples contained contaminant concentrations greater than the SSCLs.
Site 10	2014	Excavation activities occurred following up on a recommendation from the first FYR to investigate five historic samples that contained concentrations of DRO greater than 9,200 mg/kg (94NE10SS104, 94NE10SS107, 94NE10SS125, 94NE10SS126, and 94NESS127). Forty-two primary and five duplicate samples were collected from the Site 10 excavations. Forty bulk bags were filled with 265.5 tons of contaminated soil and shipped offsite for disposal.

Site	Year	Action
Site 21	2014	At the completion of removal in 2013, arsenic remained at seven locations in concentrations that exceeded the SSCL of 11 mg/kg: samples 13NC21SS023 (25 mg/kg), 13NC21SS026 (79 mg/kg), 13NC21SS043 (17 mg/kg), 13NC21SS045 (19 mg/kg), 13NC21SS046 (21 mg/kg), and 13NC21SS047 (29 mg/kg). Additional delineation was requested to further characterize the extent of arsenic contamination. During Phase I, 120 soil samples were collected from 40 borings at 1-foot up to 3-foot intervals. An additional nine borings were advanced to depths between 3 and 4 feet Twenty-seven primary samples and three duplicate samples were collected from these borings. Following the analysis of the data collected, it was decided that arsenic greater than 17 mg/kg was targeted for removal.
Site 27	2014	In the DD, a single soil confirmation sample (UST-CS-27_EN-04-01) was identified as having naphthalene above the SSCL of 120 mg/kg at a concentration of 191 mg/kg. The sample was relocated by a survey crew and appeared to be within an area of the E plume where soil had previously been excavated and removed. A test pit was advanced to the depth of the original sample and samples collected from 12.5 to 13.5 feet bgs and analyzed for DRO, RRO, and naphthalene. No analytes were detected above the SSCLs and the previous exceedance was likely excavated during previous remedial actions.
Site 28	2018	Field activities included sediment thickness measurement, surveying the extent of surface water bodies, and the collection of sediment samples. A total of 54 sediment samples were collected from 0 to 2 feet bgs. The drainage was mapped with a combination of RTK GPS and sediment probe measurements.
Site 29	2016	A total of 11 sediment and five surface water samples were collected from the Suqi River and estuary. Collocated sediment and surface water samples were collected from four locations along the Suqi River. Stream depth and velocity measurements were also collected from these four locations. Surface water samples were analyzed for BTEX and PAHs. Sediment samples were analyzed for DRO, RRO, PAHs, PCBs, and metals, including arsenic, chromium, lead, and zinc.
Site 32	2014	Excavation activities occurred following the relocation and resampling of historic sample locations with known contamination that had not been adequately addressed through previous remedial actions. Historic locations 01NE32SS102, 01NE32SS122, and 03NEC32SS07 were found to have remaining DRO concentrations ranging from 14,000 mg/kg to 18,000 mg/kg. Approximately 50 tons of contaminated soil were removed and five primary confirmation samples and two duplicate samples were collected. Final confirmation samples did not contain DRO or RRO exceeding SSCLs. Following receipt of sample results, the excavation was backfilled, graded, and seeded. The USACE considers soil removal at Site 32 complete.

Note:
For definitions, refer to the Acronyms and Abbreviations section.