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Annual Landfill Monitoring Report, September 2005

Operable Unit A

Former Naval Complex

Adak, Alaska

Department of the Navy

Naval Facilities Engineering Command Northwest

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EXECUTIVE SUMMARY

The U.S. Navy (Navy), through Naval Facilities Engineering Command Northwest, has tasked URS Group, Inc., with reporting the results of the annual groundwater, sediment, and surface water monitoring at four landfills located at the Former Adak Naval Complex, Adak Island, Alaska. This report includes results from the monitoring that was performed by the sample collection contractor, Integrated Concepts and Research Corporation, in September 2005. Monitoring results were compared to endpoint criteria established in Appendix F of the Comprehensive Monitoring Plan (CMP), Revision 2 (U.S. Navy 2005b) and background concentrations established for inorganic analytes in sediment and groundwater on Adak.

PALISADES LANDFILL

During the 2005 landfill monitoring event, surface water and sediment samples were collected at the Palisades Landfill as specified in the CMP, Revision 2 (U.S. Navy 2005b). Sediment samples were collected at three locations (101, 102, and 103), and surface water samples were collected at two locations (101 and 102). All samples were sent to the laboratory for analysis. A summary of the sediment and surface water sampling results is provided below.

Sediments

Sediment samples were analyzed for semivolatile organic compounds (SVOCs), total inorganics (TIN), total organic carbon (TOC), and grain-size distribution. Sediment samples were not analyzed for polychlorinated biphenyls (PCBs) in 2005. Because of the low detection frequency of PCBs in sediment samples from Palisades Landfill at concentrations above the reporting limits, the presence of PCBs in the upgradient sediment sample, and the lack of partitioning to surface water, the Navy recommended that PCB monitoring in sediment samples at this site be reduced to once every other year in the last annual landfill monitoring report (U.S. Navy 2005a). The Alaska Department of Environmental Conservation (DEC) and the U.S. Environmental Protection Agency (EPA) concurred, and this change was incorporated into the CMP, Revision 2 (U.S. Navy 2005b). Therefore, analysis for PCBs in sediment samples will occur every other year, with the next scheduled analysis to occur in 2006.

Sixteen SVOCs were detected in the sediment sample collected from location 102 at the Palisades Landfill during the 2005 sampling event. No SVOCs were detected in the sediment samples collected from locations 101 and 103 at the Palisades Landfill. All sixteen of the detected SVOCs are included on the target analyte list for the Palisades Landfill: 2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene,

benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, fluoranthene, fluorene, indeno(1,2,3-c,d)pyrene, naphthalene, phenanthrene, and pyrene. Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and chrysene were detected at concentrations above either the freshwater human health risk-based screening criteria (RBSC), or the freshwater ecological RBSC. Chrysene was detected above the freshwater ecological RBSC, and the other three chemicals were detected above the freshwater sediment human health RBSC. In addition, the reporting limits for benzo(a)pyrene at locations 101 and 103 were greater than the endpoint criteria.

Three of the four total inorganics included on the target analyte list for the Palisades Landfill were detected above the Adak background concentrations, the endpoint criteria, or both in one or more of the three sediment samples. Arsenic was detected at concentrations above the marine and freshwater human health endpoint criteria in all three samples. In addition, the concentration of arsenic in the sediment sample from location 102 was above the Adak freshwater background concentration. Chromium and nickel were detected in the sediment samples from locations 102 and 103 at concentrations above the freshwater and marine sediment background concentrations for Adak.

In addition to the inorganics included on the target analyte list, beryllium, lead, and zinc were detected above endpoint criteria in the sediment samples collected from one or more of the sediment sampling locations. Beryllium was detected at location 101 at a concentration greater than the freshwater and marine human health endpoint criterion. The concentrations of lead and zinc in the sample collected at location 102 were greater than the ecological RBSCs for these compounds. In addition, the concentrations of cadmium, lead, and zinc in the sediment sample from location 102 exceeded the Adak freshwater background concentrations. Finally, beryllium was detected at location 103 at a concentration greater than the freshwater and marine human health endpoint criterion. The concentration of lead and zinc in the sediment sample from location 103 exceeded the Adak marine background concentrations.

Surface Water

Surface water samples were analyzed for TIN and dissolved inorganics (DIN). Surface water samples were not analyzed for PCBs in 2005. Because of the lack of detected PCBs in surface water, the low solubility of PCBs, and the low concentrations of PCBs that have been infrequently measured in sediments at the site, the Navy recommended that PCB monitoring in surface water at Palisades Landfill be terminated (U.S. Navy 2005a). The Alaska DEC and the EPA concurred, and this change was incorporated into the CMP, Revision 2 (U.S. Navy 2005b). Therefore, analysis of PCBs in surface water samples was discontinued. No DIN or TIN included on the target analyte list for the Palisades Landfill were detected. All inorganics not on the target analyte list were either not detected or detected at concentrations less than the endpoint criteria.

Recommendations

Based on the 2005 sampling results, the Navy recommends that sampling of sediments for SVOCs, TIN, TOC, and grain size be continued at the Palisades Landfill, in accordance with the CMP, Revision 2 (U.S. Navy 2005b). SVOCs and TIN continue to be detected at concentrations above the endpoint criteria. Therefore, continued sampling is warranted. PCB monitoring has been reduced to once every other year at the Palisades Landfill. PCB analyses will be performed on samples collected in 2006.

Based on the 2003 through 2005 sampling results, the Navy recommends that surface water sampling continue at the Palisades Landfill for TIN and DIN, in accordance with the Final CMP, Revision 2 (U.S. Navy 2005b). TIN and DIN were not detected at concentrations above the endpoint criteria during the 2004 and 2005 sampling events. However, exceedances of endpoint criteria did occur during the 2003 sampling event for analytes not on the target analyte list. Therefore, continued sampling is warranted.

METALS LANDFILL

During the 2005 landfill monitoring event, groundwater samples were collected at the Metals Landfill as specified in the CMP, Revision 2 (U.S. Navy 2005b). Groundwater samples were collected at eight monitoring wells: MW13-1 (location 401), MW13-2 (location 402), MW13-3 (location 403), MW13-4 (location 404), MW13-5 (location 405), MW-603 (location 603), MW-604 (location 604), and MW-605 (location 605). All samples were sent to the laboratory for analysis. A summary of the groundwater sampling results is provided below.

Groundwater

Groundwater samples were analyzed for TIN and DIN. Groundwater samples were not analyzed for volatile organic compounds (VOCs), SVOCs, and water quality parameters in 2005, because groundwater samples will only be analyzed for these chemicals every other year. Since bis(2-ethylhexyl)phthalate has not been detected above the endpoint criterion since 2000, and none of the VOCs included on the target analyte list have been detected above the endpoint criterion since 1998, the Navy recommended that groundwater monitoring for SVOCs, VOCs, and water quality parameters be reduced to once every other year in the last annual landfill monitoring report (U.S. Navy 2005a). The Alaska DEC and EPA concurred, and the changes were incorporated into the CMP, Revision 2 (U.S. Navy 2005b). In addition, methylene blue active substance (MBAS), a water quality parameter (WQP), is no longer being tested for in any of the surface water or groundwater samples collected at the four Adak landfills. Monitoring for this parameter was discontinued because the Alaska Administrative Code and federal regulations

have no established surface water or groundwater cleanup levels for MBAS. In addition, the holding time for MBAS is 48 hours, which is very difficult and expensive to accommodate at this remote location. Analysis for VOCs, SVOCs, and WQPs in groundwater samples will occur in 2006. However, monitoring for MBAS will not be included in 2006 at this site.

Arsenic was not detected above the endpoint criteria. However, dissolved arsenic was detected in groundwater samples at concentrations above the Adak background concentrations. Dissolved arsenic exceeded the Adak background concentration in samples collected from MW13-1, MW13-2, and MW-605. Dissolved and total barium were not measured at concentrations greater than the endpoint criterion. Total and dissolved barium were measured at concentrations greater than the Adak background concentration in the 2005 samples from well MW-605. All inorganics not on the target analyte list were either not detected or detected at concentrations less than their respective endpoint criteria.

Recommendations

Based on the September 2005 sampling results, it is recommended that sampling be continued at the Metals Landfill for total arsenic and barium and dissolved arsenic and barium, because of the exceedances of Adak background concentrations. SVOC and VOC monitoring has been reduced to once every other year at the Metals Landfill. SVOC and VOC analyses will be performed on samples collected in 2006.

WHITE ALICE LANDFILL

The White Alice Landfill was not scheduled for monitoring in 2005, in accordance with the CMP, Revision 2 (U.S. Navy 2005b). Monitoring at the White Alice Landfill has been reduced to once every other year, with the next sampling scheduled for 2006. Since none of the surface water or groundwater target analytes have been detected above endpoint criteria in any of the samples collected since 1996, the Navy recommended decreasing the surface water and groundwater monitoring frequency at White Alice Landfill to once every other year in the last annual landfill monitoring report (U.S. Navy 2005a). The Alaska DEC and EPA concurred, and the changes were incorporated into the CMP, Revision 2.

ROBERTS LANDFILL

During the 2005 landfill monitoring event, surface water and groundwater samples were collected at the Roberts Landfill as specified in the CMP, Revision 2. Surface water samples were collected from five locations (RLSW01, RLSW02, RLSW03, RLSW04, and RLSW05),

and groundwater samples were collected from four monitoring wells (A-2, A-3, A-5, and B-1). All samples were sent to the laboratory for analysis. A discussion of the surface water and groundwater sampling results is provided below.

Surface Water

Surface water samples were analyzed for VOCs, TIN, DIN, and WQPs. In accordance with the CMP, Revision 2 (U.S. Navy 2005b), MBAS is no longer being tested for in any of the surface water or groundwater samples collected at the four Adak landfills. Monitoring for this parameter was discontinued, because the Alaska Administrative Code and federal regulations have no established surface water or groundwater cleanup levels for MBAS. In addition, the holding time for MBAS is 48 hours, which is very difficult and expensive to accommodate at this remote location.

No VOCs included on the target analyte list for the Roberts Landfill were detected in the samples collected in September of 2005. In addition, VOCs not on the target analyte list were not detected in the samples collected in September of 2005.

One inorganic on the target analyte list for the Roberts Landfill was detected at a concentration greater than the endpoint criterion. Total copper was detected at locations RLSW03 and RLSW05 at concentrations above the endpoint criteria, which is based on the Alaska Water Quality Standards (18 AAC 70) for aquatic life. There is no endpoint criterion for dissolved copper in surface water. In addition, the reporting limits for total silver and total and dissolved mercury exceeded the endpoint criteria.

Groundwater

Groundwater samples were analyzed for VOCs, TIN, DIN, and WQPs. In accordance with the CMP, Revision 2 (U.S. Navy 2005b), MBAS is no longer being tested for in any of the surface water or groundwater samples collected at the four Adak landfills. Monitoring for this parameter was discontinued, because the Alaska Administrative Code and federal regulations have no established surface water or groundwater cleanup levels for MBAS. In addition, the holding time for MBAS is 48 hours, which is very difficult and expensive to accommodate at this remote location.

None of the VOCs included on the target analyte list for the Roberts Landfill were detected in the four groundwater samples collected at the site. However, naphthalene was detected in the groundwater sample collected from well A-2 and trichlorofluoromethane was detected in the groundwater sample collected from well B-1. There is no endpoint criterion established for

trichlorofluoromethane, and the estimated concentration of naphthalene did not exceed the endpoint criterion.

No DIN or TIN included on the target analyte list for the Roberts Landfill were detected above the endpoint criteria. One of the 13 TIN included on the target analyte list was detected at a concentration above the Adak background concentration in the groundwater sample collected from well A-3. Total copper was detected at a concentration above the Adak background concentration of 69.5 µg/L.

Recommendations

Although VOCs have not been detected at concentrations above endpoint criteria in surface water samples collected at Roberts Landfill from 2001 through 2005, the Navy recommends that surface water monitoring for VOCs be continued on an annual basis, because only three years of post-closure monitoring data have been collected. Based on 2001 through 2005 sampling results for surface water samples collected at Roberts Landfill, the Navy recommends that surface water monitoring for inorganics continue on an annual basis, because of the exceedances of the endpoint criterion for copper.

Because only three years of post-closure monitoring data have been collected at Roberts Landfill, the Navy recommends that groundwater monitoring for VOCs be continued on an annual basis. Based on 2001 through 2005 sampling results for groundwater samples collected at Roberts Landfill, the Navy recommends that groundwater monitoring for inorganics continue on an annual basis, because of the endpoint criteria exceedances in 2003 for three inorganics and exceedances of Adak background concentrations for copper from 2001 through 2005.

**FINAL
ANNUAL LANDFILL MONITORING REPORT,
SEPTEMBER 2005
OPERABLE UNIT A**

**FORMER ADAK NAVAL COMPLEX
ADAK ISLAND, ALASKA**

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ABBREVIATIONS AND ACRONYMS

AAC	Alaska Administrative Code
ASTM	American Society for Testing and Materials
BTEX	benzene, toluene, ethylbenzene, and xylenes
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CMP	comprehensive monitoring plan
DEC	Department of Environmental Conservation (State of Alaska)
DIN	dissolved inorganics
DQO	data quality objective
EPA	U.S. Environmental Protection Agency
FFA	Federal Facilities Agreement
FFCA	Federal Facilities Compliance Agreement
FS	feasibility study
ICMP	institutional control management plan
IRA	interim remedial action
µg/kg	microgram per kilogram
µg/L	microgram per liter
MBAS	methylene blue active substance
MDL	method detection limit
mg/kg	milligram per kilogram
ml	milliliter
ml/min	milliliter per minute
MS/MSD	matrix spike/matrix spike duplicate
MW	monitoring well
NAVFAC NW	Naval Facilities Engineering Command Northwest
Navy	U.S. Navy
NCA	North Creek Analytical, Inc.
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
OU	operable unit
OSWER	Office of Solid Waste and Emergency Response
PAHs	polycyclic aromatic hydrocarbon
PCBs	polychlorinated biphenyls
PQL	practical quantitation limit
PR	percent recovery
PRG	preliminary remediation goal
PSE-2	preliminary source evaluation 2

ABBREVIATIONS AND ACRONYMS (Continued)

QA	quality assurance
QC	quality control
QAPP	quality assurance project plan
RBSC	risk-based screening concentration
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
ROD	Record of Decision
RPD	relative percent difference
SARA	Superfund Amendments and Reauthorization Act
SAERA	State-Adak Environmental Restoration Agreement
SIM	selected ion monitoring
SOP	standard operating procedure
SVOCs	semivolatile organic compound
SWMU	solid waste management unit
TIN	total inorganics
TOC	total organic carbon
URS	URS Group, Inc.
VOC	volatile organic compound
WQPs	water quality parameters

1.0 INTRODUCTION

This document has been prepared under contract with Naval Facilities Engineering Command Northwest (NAVFAC NW) for the 2005 monitoring at three landfills (Metals, Palisades, and Roberts Landfills) located at the former Adak Naval Complex, Adak Island, Alaska. Adak Island is located approximately 1,300 air miles southwest of Anchorage and 350 miles west of Unalaska/Dutch Harbor on the Aleutian Island chain (Figure 1-1). The White Alice Landfill was not scheduled for monitoring in 2005, in accordance with the Comprehensive Monitoring Plan (CMP), Revision 2 (U.S. Navy 2005b). The locations of the four landfills are shown on Figure 1-2. The results of the September 2005 sampling activities at the three landfills are reported in this document. Sampling activities were performed by Integrated Concepts and Research Corporation, contracted directly to NAVFAC NW under a separate contract.

The Palisades and Metals Landfills are regulated by the U.S. Environmental Protection Agency (EPA) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and have undergone remedial actions in accordance with the Operable Unit A (OU A) Record of Decision (ROD) (U.S. Navy, Alaska DEC, and USEPA 2000). The White Alice and Roberts Landfills are managed under the State of Alaska's solid waste disposal regulations (18 Alaska Administrative Code [AAC] 60), and both landfills have been closed under these regulations. All four landfills are in the post-closure care period. As part of the post-closure care, in accordance with the CMP, Revision 2 (U.S. Navy 2005b), annual monitoring of groundwater, sediment, and surface water is required at three of the four landfills: Metals, Palisades, and Roberts. In accordance with the CMP, Revision 2, monitoring at the White Alice Landfill was reduced to once every other year, with the next sampling scheduled for 2006. The monitoring program was developed to meet the objectives specified in the OU A ROD and the landfill closure plans. In addition, visual inspections of the monitoring wells are also required annually.

This document summarizes analytical data from the September 2005 sampling event. Appendix A provides a copy of the field logbooks. Appendix B provides the groundwater monitoring well visual inspection summary. Appendix C provides completed sampling deviation forms. Appendix D provides the field sampling parameters. Appendix E provides a summary of the historical analytical laboratory data. Appendix F provides the laboratory analytical data packages for the September 2005 sampling event, and Appendix G provides the data validation report. Appendix H provides the tide chart for September 2005.

1.1 PURPOSE OF MONITORING

The purpose of landfill monitoring is to ensure that the environmental cleanup remedies and the landfill closure actions remain compliant with the applicable laws and regulations and are protective of human health and the environment. In addition, analytical data are being collected at the landfill sites for comparison to historical analytical data and endpoint criteria specified in the CMP, Revision 2 (U.S. Navy 2005b). Finally, the results of the monitoring will be used to determine if monitoring activities need to be modified in response to changing site conditions.

1.2 SCOPE OF MONITORING ACTIVITIES

The OU A ROD identified seven landfills requiring further action:

- Solid Waste Management Unit (SWMU) 2, Causeway Landfill
- SWMU 4, South Davis Road Landfill
- SWMU 11, Palisades Landfill
- SWMU 13, Metals Landfill
- SWMUs 18/19, White Alice Landfill
- SWMU 25, Roberts Landfill
- SWMU 29, Finger Bay Landfill

Of these seven landfills, environmental media sampling is required at only four of the landfills (Palisades, Metals, White Alice, and Roberts Landfills). These four landfills are addressed in this report. The remaining three landfills (Causeway, South Davis Road, and Finger Bay Landfills) are inspected and reported on separately, in compliance with the Institutional Control Management Plan (ICMP) (see Appendix D of U.S. Navy 2005b).

The scope of the 2005 monitoring activities was to collect samples at three landfills, Palisades Landfill (sediment and surface water), Metals Landfill (groundwater), and Roberts Landfill (surface water and groundwater); to summarize the analytical results for the collected samples; and to perform visual inspections of the groundwater monitoring wells as required in the CMP, Revision 2 (U.S. Navy 2005b). As previously stated, the White Alice Landfill was not scheduled for monitoring in 2005, in accordance with the CMP, Revision 2. Field logbooks for sample collection are provided in Appendix A. Groundwater monitoring wells visual inspection checklists are provided in Appendix B. Other visual inspections required by the OU A ROD and the CMP, Revision 2, for these four landfills are being performed and reported under a separate contract.

The monitoring program for the four landfills addressed in this report is described in the CMP, Revision 2 (U.S. Navy 2005b). The CMP, Revision 2, describes the U.S. Navy's (Navy's) approach for environmental sampling activities at the landfills and includes standard operating procedures (SOPs) that were used when conducting the groundwater, surface water, and sediment sampling. For all media, sampling locations were selected to provide representative coverage of landfill operations, with an emphasis on sample collection in areas immediately downgradient of solid waste accumulations. Findings from this monitoring event will be used to determine the scope of additional sampling to be performed at these four landfill sites as part of the long-term monitoring effort required for post-closure monitoring.

1.3 REGULATORY OVERVIEW

In 1986, an initial assessment study was conducted on the former Adak Naval Complex as the first phase of the Navy Assessment and Control of Installation Pollutants Program. The former Adak Naval Complex, then known as Naval Air Facility Adak, was proposed for the National Priorities List (NPL) in October 1992 and formally listed in May 1994. For technical and administrative purposes, the former Adak Naval Complex was divided into two OUs (OU A and OU B) in 1998. In general, OU A encompasses the entire military reservation, with respect to chemical contamination, while OU B encompasses the entire military reservation, with respect to ordnance contamination. OU A includes 58 CERCLA sites (including the four landfills addressed in this report) and 128 petroleum sites.

The EPA, Navy, and Alaska Department of Environmental Conservation (Alaska DEC) entered into a Federal Facilities Agreement (FFA) in 1993 to ensure that environmental impacts associated with past practices were investigated and remedial actions were completed as required to protect human health and the environment. The FFA stated that the 128 petroleum-related contaminated sites would be evaluated under a two-party agreement between the Navy and the State of Alaska. This agreement, the State-Adak Environmental Restoration Agreement (SAERA), was signed in April 1994 and amended in February 2002.

The Palisades and Metals Landfills are regulated by the EPA under CERCLA. Although the White Alice and Roberts Landfills are managed under the State of Alaska's solid waste disposal regulations (18 AAC 60), these landfills were included in the ROD for OU A. The following paragraphs provide a summary of the regulatory history of the four landfills, with more detailed information following in the sections below.

In 1995 prior to the completion of the remedial investigation (RI) and feasibility study (FS) for OU A, an interim action ROD was developed to address the potential for releases of hazardous substances from the Palisades and Metals Landfills that may present an imminent and substantial

endangerment to public health, welfare, and/or the environment. The selected interim remedial actions (IRAs) for Palisades and Metals Landfills were developed in accordance with CERCLA, as amended by the Superfund Amendments and Reauthorization Act (SARA), and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The interim action ROD for the Palisades and Metals Landfills was signed in May 1995 (U.S. Navy, Alaska DEC and USEPA 1995).

In 1997, the White Alice Landfill was closed and covered according to State of Alaska regulations, and closure activities began at the Roberts Landfill. In March 2002, the Navy submitted a permit renewal application to extend operations at Roberts Landfill through 2002. Following additional disposal activities in 2002, the Navy received approval for closure from Alaska DEC at the end of 2002 (U.S. Navy 2002). The closure plans for the White Alice and Roberts Landfills are in compliance with 18 AAC 60.397, Post-closure Care Requirements for a Class I or Class II Municipal Solid Waste Landfill.

Final remedial actions were selected for the landfill sites at Adak Island in the OU A ROD, which was signed in April 2000. These remedies were designed to mitigate both human health and ecological risks quantified for the various environmental media impacted by chemicals. The selected remedies employ a host of remedial technologies that were applied to each site, either singly or in combination. All of the selected remedies included institutional controls. An ICMP, consistent with the OU A ROD, was prepared by the Navy and approved by the EPA and Alaska DEC (U.S. Navy 2001a). Subsequent to the signing of the ROD, the CMP was developed to ensure that the environmental cleanup remedies selected in the OU A ROD remain applicable with environmental laws and regulations (U.S. Navy 2001b). The CMP, Revision 2 (U.S. Navy 2005b) includes the latest version of the ICMP and is the document currently applicable to the landfill sites.

1.3.1 Interim Remedial Action Record of Decision

The Palisades and Metals Landfills were included in the 1995 interim action ROD (U.S. Navy, Alaska DEC, and USEPA 1995). The 1995 interim action ROD specified the following IRAs for the landfills: construction of landfill caps, construction of small interceptor ditches on the uphill side of the landfills, rerouting Palisades Creek, establishing vegetation on the new caps, inspection and removal of material that could adversely affect the marine environment, installation of monitoring wells, initiation of a monitoring program, and implementation of institutional controls. A complete assessment of potential human and ecological risks was not performed prior to a decision to take remedial action. The IRAs implemented at the Palisades and Metals Landfills complied with federal and state requirements, which were legally applicable or relevant and appropriate to the remedial actions and were cost effective.

Because the selected remedies were IRAs, a review of the remedies' protectiveness and a thorough evaluation of the remedial actions were conducted as part of the base-wide RI/FS performed for the Adak Naval Complex in 1996 (U.S. Navy 1997). The RI/FS also included a base-wide comprehensive risk assessment that included Palisades Landfill and Metals Landfill. In addition, since the selected interim remedies could have resulted in possible hazardous substances remaining on site, a review was conducted within 5 years after commencement of the remedial actions to ensure that the remedies continued to provide adequate protection of human health and the environment (U.S. Navy 2001c).

1.3.2 Alaska Department of Environmental Conservation Requirements

Two landfills, the White Alice Landfill (SWMUs 18/19) and the Roberts Landfill (SWMU 25) were operated on Adak Island under Alaska DEC solid waste regulations (18 AAC 60). The White Alice Landfill was closed and covered per State of Alaska regulations in 1997. Closure entailed placement of a soil cover over the landfill, grading and contouring, surface water/erosion controls, access restrictions, and installation of a vegetative cover per Alaska solid waste landfill closure requirements. Closure activities began at the Roberts Landfill in April 1997 and included placing a low-permeability soil cover over the landfill, grading and contouring, implementing access restrictions, installing surface water/erosion controls, placing a vegetative cover, securing adjacent bunkers filled with asbestos materials, maintaining the cover, periodic monitoring, and institutional controls for land use. In March 2002, the Navy submitted a permit renewal application to extend operations at Roberts Landfill through 2002. The application was made to accommodate operation of an inert demolition waste monofill and one cell for disposal of approximately 10 cubic yards of asbestos-containing material (U.S. Navy 2002). The fill operation was in support of the Navy's cabin demolition project, which was completed in September 2002, at which time the landfill was regraded and covered. Following that activity, the Navy received approval for closure from Alaska DEC at the end of 2002 (U.S. Navy 2002). The closure plans for the White Alice and Roberts Landfills are in compliance with 18 AAC 60.397, Post-closure Care Requirements for a Class I or Class II Municipal Solid Waste Landfill.

1.3.3 OU A Record of Decision

Remedial actions completed under the 1995 interim action ROD for the Palisades and Metals Landfills and the remedial actions completed under the closure plans for the White Alice and Roberts Landfills were selected as the final remedies in the OU A ROD. The ROD was accepted and signed by all parties on April 13, 2000 (U.S. Navy, Alaska DEC, and USEPA 2000).

Palisades Landfill

The remedial action objectives for Palisades Landfill (SWMU 11) are to (a) reduce human health and ecological risks by minimizing migration of contaminants from the landfill to adjacent groundwater, surface water, and sediment; (b) prevent risk to receptors and minimize erosion by preventing landfill contents and contaminated soils from contacting surface water and human and ecological receptors; and (c) prevent landfill off-gassing from adversely affecting human and ecological receptors by maintaining vapors below the lower explosive limits. Palisades Landfill was included in the 1995 interim action ROD that specified the placement of a cover over the landfill, monitoring, and institutional controls. The OU A ROD selected the interim actions as the final remedy for Palisades Landfill. The capping, monitoring, and institutional control actions performed under the interim action ROD were evaluated and determined to be protective. The landfill is now in the post-closure care period.

Metals Landfill

The remedial action objectives for Metals Landfill (SWMU 13) are to (a) reduce human health and ecological risks by minimizing migration of contaminants from the landfill to adjacent groundwater, surface water, and sediment; (b) prevent risk to receptors and minimize erosion by preventing landfill contents and contaminated soils from contacting surface water and human and ecological receptors; and (c) prevent landfill off-gassing from adversely affecting human and ecological receptors by maintaining vapors below the lower explosive limits. Metals Landfill was included in the 1995 interim action ROD that specified the placement of a cover over the landfill, monitoring, and institutional controls. The OU A ROD selected the interim actions as the final remedy for Metals Landfill. The capping, monitoring, and institutional control actions completed under the interim action ROD were evaluated and determined to be protective. The northern edge of Metals Landfill was found in the past to have been partially eroded by winter ocean storms. The Navy evaluated the best methods to stop the erosion and to protect this area from future storms and initiated erosion controls in 2000. The landfill is now in the post-closure care period.

White Alice Landfill

As previously stated, the White Alice Landfill (SWMUs 18 and 19) was permitted and closed under the State of Alaska solid waste regulations (18 AAC 60). The remedial action objectives for the White Alice Landfill are to meet the post-closure care requirements of Alaska DEC solid Waste Regulations (18 AAC 60) by maintaining the surface water/erosion controls, access restrictions, and vegetative cover and by performing periodic monitoring. These selected remedies complied with 18 AAC 60 and the permit requirements for closure of the sites. These actions were also consistent with presumptive remedies for landfills under EPA Office of Solid

Waste and Emergency Response (OSWER) Directive 9355.0-67FS – 1996. The landfill is now in the post-closure care period.

Roberts Landfill

As previously stated, the Roberts Landfill (SWMU 25) was permitted and closed under State of Alaska solid waste regulations (18 AAC 60). The remedial action objectives for Roberts Landfill are to meet the post-closure care requirements of Alaska Solid Waste Regulations (18 AAC 60) by maintaining the surface water/erosion controls, access restrictions, and vegetative cover and by performing periodic monitoring. These selected remedies complied with 18 AAC 60 and the permit requirements for closure of the site. These actions were also consistent with presumptive remedies for landfills under EPA OSWER Directive 9355.0-67FS – 1996. In addition, annual site inspections for the Roberts Landfill will be performed for 5 years. Five-year site reviews are being conducted by the Navy and appropriate agencies to evaluate monitoring data and site conditions to determine the need for additional action or reduction of controls, as appropriate. The landfill is now in the post-closure care period.

1.4 ANALYTICAL PROGRAM

During the 2005 sampling program, all groundwater, surface water, and sediment samples were sent to North Creek Analytical, Inc. (NCA) located in Beaverton, Oregon, for analyses. Analytical methods performed on the groundwater, surface water, and sediment samples collected at the landfills are listed in Table 1-1. The historical schedule of sampling events for each landfill is shown in Table 1-2. This shows only the dates where groundwater, surface water, and/or sediment samples were collected. A summary of the sampling program that was performed during the 2005 annual monitoring event is shown in Table 1-3. Finally, Table 1-4 summarizes the frequency of sampling by medium and analyte for each of the four landfills.

1.5 EVALUATION OF ENDPOINT CRITERIA

The sediment endpoint criteria for SWMU 11 would be much higher than the endpoint criteria presented in Appendix F of the CMP, Revision 2, if selected today. For polychlorinated biphenyls (PCBs) in sediment at SWMU 11, the endpoint criterion based on ecological health was 0.005 mg/kg and was derived using a lowest effect concentration selected as a screening level during the preliminary source evaluation 2 (PSE-2) process (U.S. Navy 1996). Screening concentrations are typically more conservative than cleanup levels and are used only to assess whether a site requires further investigation, not to establish whether a health risk is actually present. Thus, the ROD established 1 mg/kg for PCBs in sediment at SWMU 11 as an “action

level” that was sufficiently protective of ecological health. Continuing to monitor until a PCB concentration of 0.005 mg/kg is reached is unnecessary to protect ecological health. As a result, most of the PCB exceedances reported in sediment would not be exceedances using the ROD-established action level. Table 1-5 shows the difference between the current endpoint criterion specified by the CMP, Revision 2, and the Alaska DEC soil cleanup level for Aroclor 1260.

Similar arguments could be made for the carcinogenic polycyclic aromatic hydrocarbons (PAHs), where the risk-based screening concentration (RBSC) values were the EPA Region 10 values, assuming a 1×10^{-7} target cancer risk goal. Most target cancer risks are 1×10^{-6} . Alaska soil cleanup levels are even higher. Therefore, long-term monitoring of sediment at SWMU 11 should be reviewed relative to revised RBSC values, assuming a 1×10^{-6} cancer risk. Table 1-5 shows how much higher current EPA Region 9 preliminary remediation goal (PRG) values would be for the PAHs assuming a 1×10^{-6} target risk goal.

For the purposes of this report and consistency with previous monitoring events, analytical results for each media type were compared to the endpoint criteria presented in Appendix F of the CMP, Revision 2 (U.S. Navy 2005b). In addition, analytical results for inorganic analytes in sediments and groundwater were compared to Adak background concentrations. Adak background concentrations were established in the final RI/FS (U.S. Navy 1997) for sediments and in the final background study report (U.S. Navy 1995) for groundwater. However, the Navy will evaluate sediment endpoint criteria during the second five-year review currently being conducted.

1.6 QUALITY ASSURANCE/QUALITY CONTROL

Quality assurance (QA), as applied to monitoring data, is defined as the total integrated program for ensuring the reliability of such data. Quality control (QC) is defined as the application of established procedures for obtaining prescribed standards of performance in the monitoring process.

QC checks of both field sampling and laboratory sample analyses were used to assess and document data quality and to identify any discrepancies in the measurement process. QC samples were used to determine the precision of sample collection and handling procedures, the thoroughness of the decontamination procedures, and the accuracy of field equipment and laboratory analysis.

Field duplicates were collected for at least 5 percent of all environmental samples. Sampling locations where duplicate samples were collected were identified in the field and noted in the logbook. As an additional QC measure, 1 matrix spike/matrix spike duplicate (MS/MSD) was collected as a pair for every 20 environmental samples (5 percent frequency) to evaluate the accuracy and precision of the sample analysis. Trip blanks were submitted with every cooler containing samples for volatile organic compound (VOC) analysis.

1.6.1 Data Quality Objectives

The objectives of the QA program were to ensure the following:

- The procedures used would not detract from the quality of the results
- All activities, findings, and results were documented, defensible, and consistent with the data quality objectives (DQOs)

The DQOs were based on those requirements outlined in the State of Alaska guidelines and the CMP, Revision 2 (U.S. Navy 2005b). This project's QA program included the following provisions:

- Project personnel received adequate indoctrination and training on all project plans prior to initiation of project activities.
- Established procedures and protocols from the CMP, Revision 2, were followed for sample collection, chain-of-custody process, sample shipment, laboratory analysis, data review, and final reporting.
- Changes to the QA program followed project procedures, which required significant changes to be noted in the final document, with appropriate justification and assessment of the potential or real impacts on the results. DQOs applicable to this project for water, sediment, water quality parameters, and field measurements are presented in Tables 1-6 through 1-9, respectively.

1.6.2 Quality Assurance Objectives for Chemical Data Measurement

The QA objective for measurement of data is that environmental data of known and acceptable quality are provided. Specifically, QA objectives for this project were designed to ensure the following:

- Sample acquisition, chemical analysis, and chemical parameter measurements were performed so that the resulting data met and supported data use requirements.
- The chemical data were acquired, documented, verified, and reported to ensure that the precision, accuracy, representativeness, comparability, completeness, and sensitivity requirements specified in the work plan were achieved.

The DQOs of field screening were to obtain immediate reasonably accurate field data sufficient to make field decisions.

Based on the above objectives, all data collected in the field (including on-site or in situ measurements) met CMP, Revision 2 (U.S. Navy 2005b) requirements. All samples sent off site to a fixed base laboratory met the requirements of the work plan. The QA objectives for laboratory analytical data are defined as follows.

Precision

Precision measures the reproducibility of measurements under a given set of conditions. Precision is expressed in terms of relative percent difference (RPD). RPD is calculated as follows:

$$RPD = \frac{(S - D)}{[(S + D)/2]} \times 100$$

Where: S = Sample Result
D = Duplicate Sample Result

The laboratory objective for precision is to equal or exceed the precision demonstrated for similar samples (laboratory specific control limits). In general, the matrix spike (sample result) and matrix duplicate (duplicate sample result) were used to determine the precision, in accordance with typical laboratory SOPs.

Accuracy

Accuracy is a measure of the bias or error in a measurement. Examples of bias include contamination and errors made in sample collection, preservation, handling, and analysis. Accuracy was assessed by the collection of field/trip blanks and in the laboratory by the use of known and unknown QC samples and matrix spikes. Accuracy was measured as the percent

recovery based on matrix spike or surrogate recoveries. Percent recovery (PR) is calculated as follows:

$$PR = \frac{SSR - SR}{SA} \times 100$$

Where: SSR = spike sample result
SR = sample (unspiked) result
SA = spike added

The laboratory objective for accuracy is to equal or exceed the accuracy demonstrated for the analytical methods on similar samples (laboratory-specific control limits) and will fall within the established EPA control limits.

Representativeness

Representativeness is the degree to which the sample data accurately and precisely represent an environmental condition. Sampling locations were selected to represent the range of environmental conditions observed. An adequate number of samples were collected, as determined in the CMP, Revision 2 (U.S. Navy 2005b).

Completeness

Completeness is measured as the percent of results that are judged to be valid. Complete data means that a sufficient number of the planned samples were taken and requisite analyses performed to generate an adequate database. Completeness is determined by comparing the number of analyses planned to the number of subsequent data points judged to be usable for the designated purpose(s).

Comparability

Comparability expresses the confidence with which one data set can be compared to another. The objective for the QA program is to produce data with the greatest possible degree of comparability. The number of matrices that are sampled and the range of field conditions encountered are considered in determining comparability. Comparability is achieved by using standard methods for sampling and analysis, reporting data in standard units, normalizing results to standard conditions, and using standard and comprehensive reporting formats. Complete field data collection documentation supports the assessment of comparability. Historical

comparability is achieved through consistent use of methods and documentation procedures throughout the project.

Sensitivity

Sensitivity expresses the degree of response that a given analytical method has to a given target analyte. It is usually defined in terms of a method detection limit (MDL), or practical quantitation limit (PQL), for a given matrix.

1.6.3 Field Measurement Quality Assurance

The quality assurance requirements for field measurements were implemented as specified in the CMP, Revision 2 (U.S. Navy 2005b).

1.6.4 Quality Control Samples

QC samples are necessary to evaluate the precision, accuracy, representativeness, and comparability of the data. Three types of QC samples analyzed for this project were field duplicates, trip blanks, and MS/MSDs. The field duplicate and MS/MSD were collected in the field at the same time the environmental sample was collected, while the analytical laboratory provided the trip blank.

For every 20 samples taken, 1 duplicate sample was collected and submitted for laboratory analysis. The duplicate samples were intended to be identical to the original sample and were submitted to gain precision information on homogeneity, handling, shipping, storage, preparation, and analysis. Duplicate sampling was used to identify possible field variations or errors. The duplicate sample was collected at the same time and location as the environmental sample.

For every 20 samples taken, 1 MS/MSD sample was collected and submitted to the laboratory. The MS/MSD samples were intended to evaluate the calibration of the analytical methods.

Trip blanks were prepared with analyte-free water and taken from the laboratory to the sampling site and returned to the laboratory with the VOC samples. One trip blank accompanied each cooler containing samples that were submitted for EPA Method 8260 analysis. The trip blanks are used to assess the adequacy of sample preservation, packing, shipping, and storage.

1.6.5 Sampling Locations and Procedures

The specific sampling locations at each landfill are identified in Tables 4-1 and 4-2 of Appendix B of the CMP, Revision 2 (U.S. Navy 2005b). Appendix B, Landfill Monitoring Plan,

describes sampling locations, design, and sampling techniques; decontamination procedures; sampling equipment; and calibration procedures. The methods and techniques to be used while performing sampling in accordance with the QC protocols to meet the requirements for QA are specified in the SOPs found in Appendix I of the CMP, Revision 2.

1.6.6 Sample Handling and Preservation

To maintain the integrity of the samples from the time they were collected until the analyses were completed, the samples were preserved at the time of collection to prevent or retard chemical degradation or modification while samples were in transit to the laboratory. The handling techniques and type of preservation for each analytical method was established in the Appendix B of the CMP, Revision 2, Tables 5-1 and 5-2 (U.S. Navy 2005b).

1.6.7 Sample Custody and Holding Time Requirements

The history of each sample was documented from the time the sample was collected through all transfers of custody until it was received at the analytical laboratory. Sample custody procedures specified in the SOPs found in Appendix I of the CMP, Revision 2 (U.S. Navy 2005b) were followed.

Because of the remote nature and limited accessibility to and from the site, holding time requirements were considered when collecting analytical samples. The holding time requirements followed EPA or state method guidance, except as noted below. Tables 5-1 and 5-2 in Appendix B of the CMP, Revision 2, summarizes these requirements. During this sampling event, holding times were met on all sample analyses, with the exception of the mercury samples collected on September 13, 2005, at the Palisades Landfill. The holding times for the mercury samples collected at all locations at the Palisades Landfill were missed by 30 days. Mercury is not a target analyte at the Palisades Landfill. Because of the missed holding time, the data reviewer labeled the analytical data for the mercury samples collected on September 13, 2005, as estimated (“J” qualified) for detected concentrations and undetected concentrations (“U” qualified). Sediment at the Palisades Landfill was resampled on January 24 and 25, 2006. The mercury analyses were conducted in accordance with the CMP, Revision 2 (U.S. Navy 2005b).

1.7 DATA QUALITY REVIEW

As specified in the Landfill Monitoring Plan, Appendix B of the CMP, Revision 2 (U.S. Navy 2005b), all quantitative laboratory data were validated at Level 3. Level 3 validation (also referred to as data review) consists of a review of the data summary forms that are generated for

a set of data. At a minimum, chain-of-custody records, the case narrative, and the summary results for samples and QC analyses are reviewed. Data were reviewed based on method performance criteria and QC criteria documented in the quality assurance project plan (QAPP) (see Attachment B-1 of the Landfill Monitoring Plan [U.S. Navy 2005b]). The data validation report is provided in Appendix G.

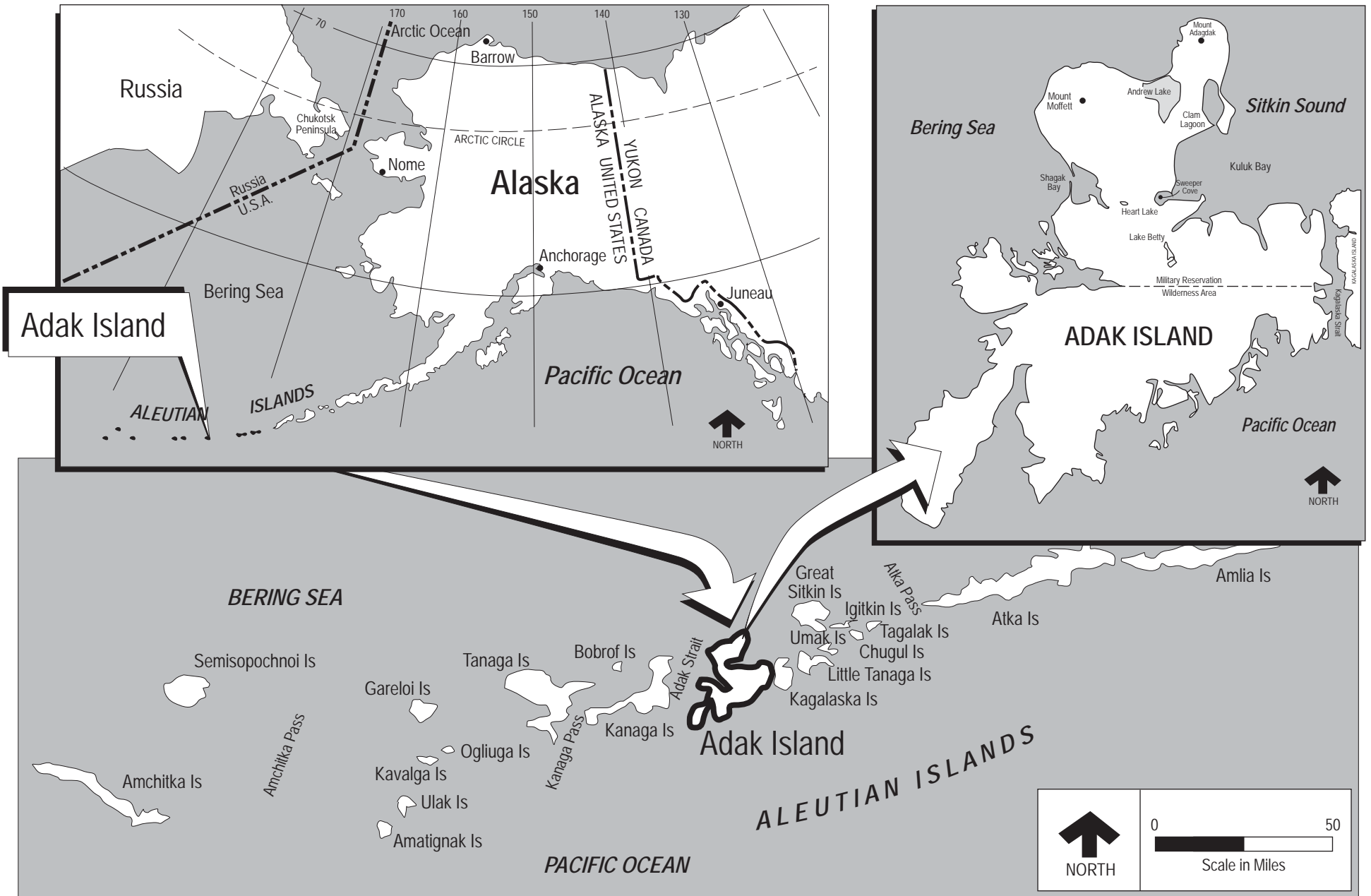
1.8 DEVIATIONS FROM THE COMPREHENSIVE MONITORING PLAN

Based on the requirements of the CMP, Revision 2 (U.S. Navy 2005b), the following deviations from the CMP occurred during the 2005 sampling event. Sampling deviation forms are provided in Appendix C.

The CMP specifies that at least 500 ml of water flow through a 0.45-micron membrane in-line filter prior to collecting a sample to be analyzed for dissolved inorganics. Well A-3 at the Roberts Landfill pumped dry twice during purging at as low a rate as possible (approximately 100 ml/min) and again during sampling. To complete sampling for dissolved inorganics, a minimum of 100 ml of water was passed through the filter before collecting the sample, instead of the 500 ml specified in the CMP. This deviation does not adversely impact the DQOs for the 2005 monitoring event.

The holding times for the mercury sediment samples collected at all locations at the Palisades Landfill were missed by 30 days. Because of the missed holding time, the data validator labeled the analytical data for the mercury samples collected on September 13, 2005, as estimated (“J” qualified). Because mercury is slightly volatile, the analytical results may have been understated because of the missed holding time. However, the sediments were resampled on January 24 and 25, 2006 and the analyses were conducted in accordance with the requirements of the CMP, Revision 2 (U.S. Navy 2005b).

The CMP, Revision 2 (U.S. Navy 2005b), specifies that total Kjeldahl nitrogen was to be analyzed using EPA Method 351.3. However, EPA Method 351.2 was used. This deviation does not impact the DQOs or the impact decision-making ability using these data.

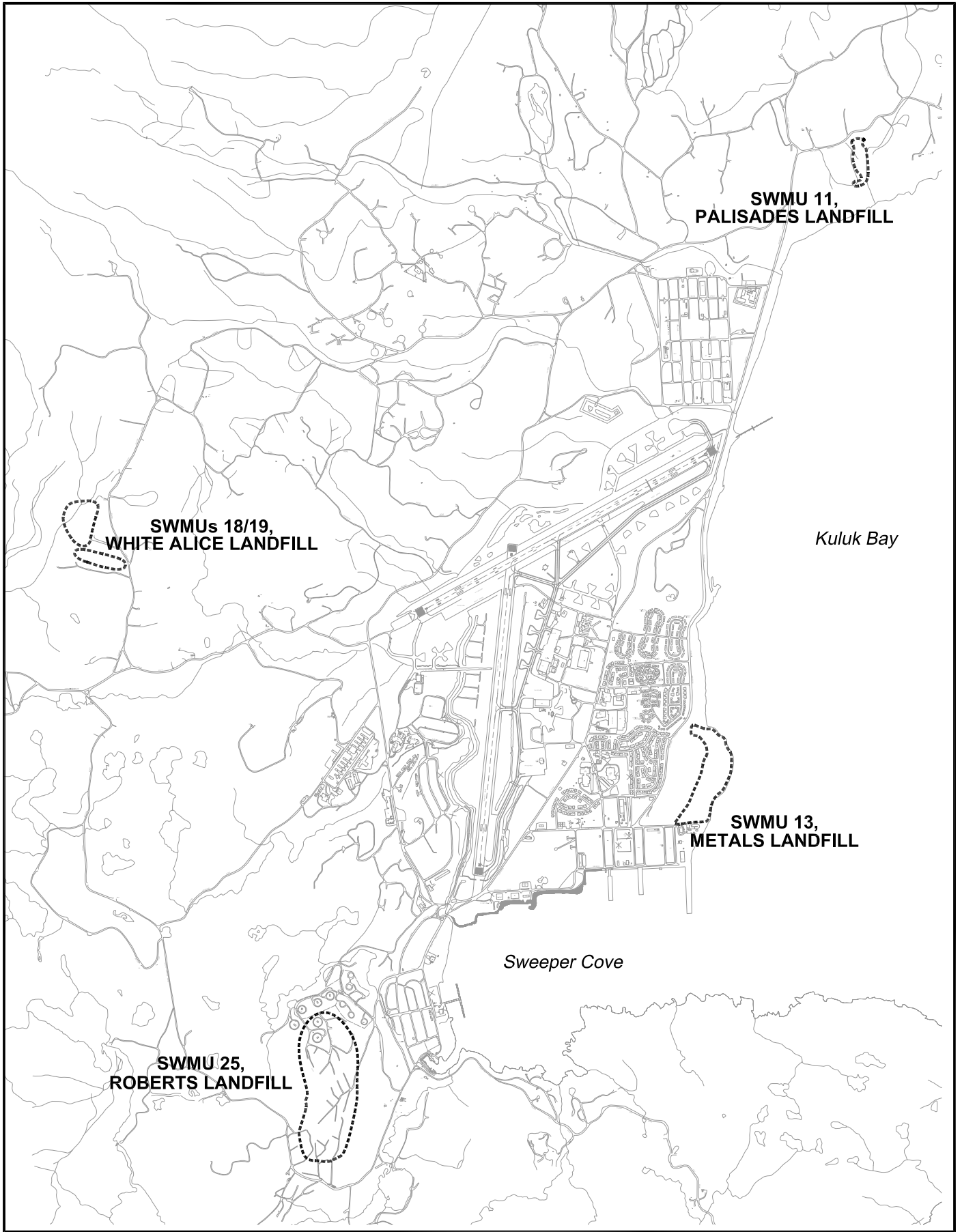


U.S.NAVY

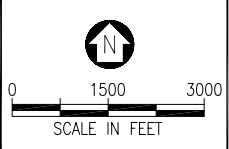
Figure 1-1
Location Map, Adak Island, Alaska

Delivery Order 0008
 Adak Island, AK
 2005 ANNUAL LANDFILL
 MONITORING REPORT

FILENAME: T:\ADAK\IDIQ\Sub-Tasks\DO 8\05 ANNUAL LANDFILL\FIG 1-2 LANDFILLS.dwg
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U.S. NAVY



**Figure 1-2
Landfills Vicinity**

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MONITORING REPORT

**Table 1-1
 Analytical Methods**

Parameter	Analytical Method	
	Water	Soil/Sediment
Volatile organic compounds (VOCs)	EPA 8260B	NA
Semivolatile organic compounds (SVOCs)	EPA 8270C/8270 SIM	EPA 8270C/8270 SIM
Polychlorinated biphenyls (PCBs)	EPA 8082	EPA 8082
Total inorganics (TIN)	EPA 6020/7470A	EPA 6020/7471A
Dissolved Inorganics (DIN)	EPA 6020/7470A	NA
Water Quality Parameters (WQPs)		
- Inorganic ions (chloride, nitrate/nitrite, sulfate)	EPA 300.0	NA
- Total Kjeldahl nitrogen (TKN)	EPA 351.2	NA
- Ammonia	EPA 350.1	NA
- Alkalinity	EPA SM 2320B	NA
- Chemical oxygen demand (COD)	EPA 410.4	NA
- Total dissolved solids (TDS)	EPA 160.1	NA
Total organic carbon (TOC)	NA	EPA 9060 modified
Percent Moisture	NA	NCA SOP
Grain-size distribution	NA	ASTM D422

Notes:

ASTM - American Society for Testing and Materials
 EPA - U.S. Environmental Protection Agency
 NA - not applicable
 NCA - North Creek Analytical, Inc.
 SIM - selected ion monitoring
 SOP - standard operating procedure

**Table 1-2
 Landfill Monitoring Schedule to Date**

Site Name	Dates of Sampling ^a																		
	March 1996	May 1996	June 1996	July 1996	Aug 1996	Sept 1996	Oct 1996	Nov 1996	Feb 1997	May 1997	Dec 1997	June 1998	Sept 1999	Nov 2000	Sept 2001	Oct 2002	Oct 2003	Sept 2004	Sept 2005
Palisades Landfill	-	•	-	-	•	-	-	•	•	• ^b	-	•	•	•	•	•	•	•	•
Metals Landfill	-	-	-	•	-	-	-	•	-	•	•	•	•	•	•	•	•	•	•
White Alice Landfill	•	-	•	-	-	•	•	-	-	-	•	•	•	•	•	•	•	•	- ^c
Roberts Landfill	•	-	•	-	-	•	•	-	-	-	•	•	•	•	•	•	•	•	•

^aSampling dates include only those dates where groundwater, surface water, and sediment samples were obtained. Dates where only marine tissue sampling was performed are not shown.

^bThe full suite of chemicals that constitute the annual sampling at Palisades Landfill for calendar year 1997 was completed in May 1997.

^cWhite Alice Landfill is scheduled to be monitored every other year, in accordance with the CMP, Revision 2 (U.S. Navy 2005b). Next scheduled monitoring is in 2006.

Notes:

- completed sampling event
- sampling event not scheduled or performed

**Table 1-3
 Summary of Landfill Analytical Samples Collected in September 2005**

Site Name	Location ID	Location Cross-Reference	Field Sample Number ^a	Sample Date	Sample Matrix	Analytical Testing								
						VOCs	SVOCs	PCBs (Aroclors)	TIN	DIN	WQPs ^b	TOC	TDS	Grain Size
SWMU 11, Palisades Landfill	101	101	231060 (231062)	9/13/05	SW				•	•				
	101	101	231064	9/13/05	SD		•		•			•		•
	101 ^d	101 ^d	231531 231755 ^e	1/25/2006	SD				•					
	102	102	231058	9/13/05	SW				•	•				
	102	102	231052	9/13/05	SD		•		•			•		•
	102 ^d	102 ^d	231528 231752 ^e	1/24/06	SD				•					
	103	103	231054 (231070)	9/13/05	SD		•		•			•		•
	103 ^d	103 ^d	231529 231753 ^e	1/25/06	SD				•					
SWMU 13, Metals Landfill	401	MW13-1	231115	9/19/05	GW				•	•				
	402	MW13-2	231136	9/19/05	GW				•	•				
	403	MW13-3	231117	9/19/05	GW				•	•				
	404	MW13-4	231138	9/19/05	GW				•	•				
	405	MW13-5	231119	9/19/05	GW				•	•				

Table 1-3 (Continued)
Summary of Landfill Analytical Samples Collected in September 2005

Site Name	Location ID	Location Cross-Reference	Field Sample Number ^a	Sample Date	Sample Matrix	Analytical Testing								
						VOCs	SVOCs	PCBs (Aroclors)	TIN	DIN	WQPs ^b	TOC	TDS	Grain Size
SWMU 13, Metals Landfill (Continued)	603	MW-603	231113	9/19/05	GW				•	•				
	604	MW-604	231134	9/19/05	GW				•	•				
	605	MW-605	231140 (231142) ^c	9/19/05	GW				•	•				
SWMUs 18/19, White Alice Landfill	200	21-3												
	204	21-4												
	201	WASW01												
	202	WASW02												
	203	WASW03												
SWMU 25, Roberts Landfill	320	A-2	231112 (231114)	9/17/05	GW	•			•	•	•		•	
	307	A-3	231106	9/17/05	GW	•			•	•	•		•	
	308	A-5	231093	9/17/05	GW	•			•	•	•		•	
	306	B-1	231091	9/15/04	GW	•			•	•	•		•	
	301	RLSW01	231110	9/17/05	SW	•			•	•	•		•	
	302	RLSW02	231108	9/17/05	SW	•			•	•	•		•	

Table 1-3 (Continued)
Summary of Landfill Analytical Samples Collected in September 2005

Site Name	Location ID	Location Cross-Reference	Field Sample Number ^a	Sample Date	Sample Matrix	Analytical Testing								
						VOCs	SVOCs	PCBs (Aroclors)	TIN	DIN	WQPs ^b	TOC	TDS	Grain Size
SWMU 25, Roberts Landfill (Continued)	303	RLSW03	231085 (231087)	9/17/05	SW	•			•	•	•		•	
	304	RLSW04	231089	9/17/05	SW	•			•	•	•		•	
	305	RLSW05	231083	9/17/05	SW	•			•	•	•		•	

^aField sample numbers provided as they exist on the chain-of-custody forms and laboratory reports. Unless otherwise noted, field sample numbers are identical to company sample numbers in the Installation Restoration Information Management System (IRIMS) database.

^bWater quality parameters (WQPs): sulfate (EPA 300.0), total Kjeldahl nitrogen (TKN) (EPA 351.2), ammonia (EPA 350.1), alkalinity (total, bicarbonate, carbonate, hydroxide) (EPA SM 2320B), chemical oxygen demand (COD) (EPA 410.4), total dissolved solids (TDS) (EPA 160.1)

^cA new sample number, 231175, was assigned to the field duplicate sample collected from MW-605, because field sample number 231142 was accidentally used for two different samples. Field sample number 231142 was also used for a groundwater sample collected at SWMU 55, Public Works Transportation Department Waste Storage Area. The new sample number, 231175, is the company sample number in the IRIMS database for the sample collected from MW-605.

^dLocation was resampled for mercury only in January 2006 due to missed hold time

^eInstallation Restoration Information Management System sample number

Notes:

Sample number in () is a duplicate sample.

DIN - dissolved inorganics (EPA 6020/7470A)

EPA - U.S. Environmental Protection Agency

GW - groundwater

Grain size - ASTM D422

PCBs (Aroclors) - polychlorinated biphenyls (EPA 8082)

Table 1-3 (Continued)
Summary of Landfill Analytical Samples Collected in September 2005

SD - sediment
SVOCs - semivolatile organic compounds (EPA 8270C/8270 SIM)
SW - surface water
SWMU - solid waste management unit
TIN - total inorganics (EPA 6020/7470A for surface water and EPA 6020/7471A for sediment)
TOC - total organic carbon (EPA 9060 modified)
TDS - total dissolved solids
VOCs - volatile organic compounds (EPA 8260B)

**Table 1-4
 Summary of Sampling Frequency by Medium and Analyte**

Medium	DIN	TIN	VOCs	SVOCs	PCBs	Grain Size	TOC
Palisades Landfill							
Surface Water	Annually	Annually	NA	NA	NA	NA	NA
Sediment	NA	Annually	NA	Annually	Every other year; next sample in 2006	Annually	Annually
Metals Landfill							
Groundwater	Annually	Annually	Every other year; next sample in 2006	Every other year, next sample in 2006	NA	NA	NA
White Alice Landfill							
Groundwater	Every other year; next sample in 2006	Every other year; next sample in 2006	Every other year; next sample in 2006	NA	NA	NA	NA
Surface Water	Every other year; next sample in 2006	Every other year; next sample in 2006	Every other year; next sample in 2006	NA	NA	NA	NA
Roberts Landfill							
Groundwater	Annually	Annually	Annually	NA	NA	NA	NA
Surface Water	Annually	Annually	Annually	NA	NA	NA	NA

Notes:

- DIN - dissolved inorganics
- NA - not applicable
- PCBs - polychlorinated biphenyls
- SVOCs - semivolatile organic compounds
- TIN - total inorganics
- TOC - total organic carbon
- VOCs - volatile organic compounds

**Table 1-5
 Endpoint Criteria for Freshwater/Marine Sediments for Palisades Landfill**

Analyte	CMP Endpoint Criterion (mg/kg) ^a	Basis	Current Alaska Soil Cleanup Level (mg/kg)	Current Region 9 PRG Residential Soil (mg/kg)	Background From RI/FS 1997 (mg/kg)
Semivolatile Organic Compounds					
Benzo(a)anthracene	0.0875	HH RBSC ^c	5.5	0.62	--
Benzo(a)pyrene	0.00875	HH RBSC ^c	0.9	0.062	--
Benzo(b)fluoranthene	0.0875	HH RBSC ^c	9	0.62	--
Benzo(g,h,i)perylene	821	HH RBSC ^c	1,400	--	--
Benzo(k)fluoranthene	0.875	HH RBSC ^c	93	6.2	--
Bis(2-ethylhexyl)phthalate	4.56	HH RBSC ^c	490	35	--
Indeno(1,2,3-cd)pyrene	0.0875	HH RBSC ^c	9	0.62	--
Pesticides/Aroclors					
Aroclor 1260	0.005	Eco RBSC ^c	1	--	--
Total Inorganics					
Antimony	2	Eco RBSC ^c	--	--	10 (1.5) ^b
Arsenic	0.0365	HH RBSC ^c	1.8	0.39	5.46 (7.5) ^b
Chromium	80 (260) ^b	Eco RBSC ^c	--	--	12.91 (6.04) ^b
Nickel	30	Eco RBSC ^c	--	--	10.05 (5.01) ^b

^aUnits are in mg/kg total organic carbon (TOC) (normalized concentration). To normalize to a TOC concentration, the dry-weight concentration of each parameter is divided by the decimal fraction representing the percent TOC content of the sediment. For the purposes of ecological risk assessment and comparison to certain regulations, it is necessary to carbon normalize certain chemicals. If the TOC content of the environmental sample is less than 0.5 percent, then the dry-weight concentration of the chemical parameter is used. For a TOC content greater than 0.5 percent, the carbon-normalized value is used. In the absence of organic carbon data, a default value of 1 percent is used.

^bThe value listed is for freshwater sediment and the value in parenthesis is for marine sediment.

^cFinal preliminary source evaluation 2 guidance document for Adak (U.S. Navy 1996).

Notes:

CMP - Comprehensive Monitoring Plan (U.S. Navy 2005b)

Eco - ecological

HH - human health

mg/kg - milligram per kilogram

PRG - preliminary remediation goal

RBSC - risk-based screening concentration

RI/FS - remedial investigation/feasibility study (U.S. Navy 1997)

**Table 1-6
 Data Quality Objectives for Water Samples**

Analysis	Analytical Method	Method Detection Limit (µg/L)	Practical Quantitation Limit (µg/L)	Cleanup Level (µg/L)	Laboratory Control Limits for Accuracy (% Recovery)		Laboratory Control Limits for Precision (RPD)
					LCS	MS/MSD	
Volatile Organic Compounds							
1,1-Dichloroethane	8260B	0.157	1.00	3,650	70-135	77-128	0-20%
1,1-Dichloroethene	8260B	0.197	1.00	7	70-130	74-140	0-20%
1,1,1-Trichloroethane	8260B	0.0859	1.00	200	65-130	77-124	0-20%
1,1,2-Trichloroethane	8260B	0.301	1.00	5	75-125	80-120	0-20%
1,2-Dichlorobenzene	8260B	0.0859	1.00	600	70-120	75-125	0-20%
1,2-Dichloroethane	8260B	0.142	1.00	5	70-130	84-128	0-20%
1,2-Dichloropropane	8260B	0.266	1.00	5	75-125	71-140	0-20%
1,2,4-Trichlorobenzene	8260B	0.213	1.00	70	65-135	75-125	0-20%
1,3-Dichlorobenzene	8260B	0.132	1.00	NE	75-125	76-124	0-20%
1,4-Dichlorobenzene	8260B	0.187	1.00	75	75-125	78-119	0-20%
Acetone	8260B	2.34	25.0	3,650	40-140	44-152	0-20%
Benzene	8260B	0.147	1.00	5.0	80-120	80-120	0-20%
Carbon disulfide	8260B	0.233	10.0	3,650	35-160	68-128	0-20%
Carbon tetrachloride	8260B	0.140	1.00	5	65-140	75-125	0-20%
Chlorobenzene	8260B	0.136	1.00	100	80-120	80-120	0-20%
Chloroethane	8260B	0.327	1.00	NE	60-135	66-133	0-20%
Chloromethane	8260B	0.159	5.00	NE	40-125	61-129	0-20%
Cis-1,2-Dichloroethene	8260B	0.170	1.00	70	70-125	82-128	0-20%
1,2-Dibromo-3-chloropropane	8260B	0.405	5.00	0.2	50-130	58.5-143	0-20%
Ethylbenzene	8260B	0.110	1.00	700	75-125	75-125	0-20%
Ethylene dibromide	8260B	0.117	1.00	0.05	75-125	76.4-131	0-20%

Table 1-6 (Continued)
Data Quality Objectives for Water Samples

Analysis	Analytical Method	Method Detection Limit (µg/L)	Practical Quantitation Limit (µg/L)	Cleanup Level (µg/L)	Laboratory Control Limits for Accuracy (% Recovery)		Laboratory Control Limits for Precision (RPD)
					LCS	MS/MSD	
Volatile Organic Compounds (Continued)							
Methylene Chloride	8260B	0.454	2.00	5.0	55-140	62-140	0-20%
Styrene	8260B	0.0723	1.00	100	65-135	85-124	0-20%
Tetrachloroethene	8260B	0.109	1.00	5.0	45-150	75-125	0-20%
Toluene	8260B	0.155	1.00	1,000	75-120	75-120	0-20%
m,p-Xylene	8260B	0.295	2.00	10,000 ^a	75-130	75-130	0-20%
o-Xylene	8260B	0.187	1.00	10,000 ^a	80-120	75-130	0-20%
Trans-1,2-Dichloroethene	8260B	0.175	1.00	100	60-140	76-123	0-20%
Trichloroethene	8260B	0.241	1.00	5.0	70-125	74-127	0-20%
Vinyl Chloride	8260B	0.152	1.00	2	50-145	64-124	0-20%
Semivolatile Organic Compounds							
2-Methylnaphthalene	8270SIM	0.0500	0.100	1,500	30-125	30-126	0-50%
Acenaphthene	8270SIM	0.0500	0.100	1,500	27-133	27-133	0-50%
Acenaphthylene	8270SIM	0.0500	0.100	2,200	--	--	--
Anthracene	8270SIM	0.0500	0.100	11,000	--	--	--
Benzo(a)pyrene	8270SIM	0.0500	0.100	0.2	41-139	41-139	0-50%
Benzo(a)anthracene	8270SIM	0.0500	0.100	1.0	--	--	--
Benzo(b)fluoranthene	8270SIM	0.0500	0.100	1.0	--	--	--
Benzo(g,h,i)perylene	8270SIM	0.0500	0.100	1,100	--	--	--
Benzo(k)fluoranthene	8270SIM	0.0500	0.100	10	--	--	--
Bis(2-ethylhexyl)phthalate	8270SIM	0.300	0.500	6	40-125	40-125	0-40%
Chrysene	8270SIM	0.0500	0.100	100	--	--	--

Table 1-6 (Continued)
Data Quality Objectives for Water Samples

Analysis	Analytical Method	Method Detection Limit (µg/L)	Practical Quantitation Limit (µg/L)	Cleanup Level (µg/L)	Laboratory Control Limits for Accuracy (% Recovery)		Laboratory Control Limits for Precision (RPD)
					LCS	MS/MSD	
Semivolatile Organic Compounds (Continued)							
Dibenz(a,h)anthracene	8270SIM	0.100	0.200	0.1	--	--	--
Fluoranthene	8270SIM	0.0500	0.100	1,460	--	--	--
Fluorene	8270SIM	0.0500	0.100	1,460	--	--	--
Indeno(1,2,3-c,d)pyrene	8270SIM	0.0500	0.100	1.0	--	--	--
Napthalene	8270SIM	0.0500	0.100	700	--	--	--
Pentachlorophenol	8270SIM	1.00	1.00	1	24-147	24-147	0-50%
Phenanthrene	8270SIM	0.0500	0.100	11,000	--	--	--
Pyrene	8270SIM	0.0500	0.100	1,100	--	--	--
Priority Pollutant Inorganics				(TIN/DIN Cleanup Levels)			
Antimony	6020	0.192	1.00	6/NE	75-125	80-120	0-20%
Arsenic	6020	0.420	1.00	50/150	80-120	75-125	0-20%
Beryllium	6020	0.377	1.00	4/NE	80-120	75-125	0-20%
Cadmium	6020	0.073	0.100	5/0.16	80-120	75-125	0-20%
Chromium	6020	0.720	1.00	100/74	80-120	75-125	0-20%
Copper	6020	0.788	2.00	1,300/9	80-120	75-125	0-20%
Lead	6020	0.224	1.00	15/2.5	80-120	75-125	0-20%

**Table 1-6 (Continued)
 Data Quality Objectives for Water Samples**

Analysis	Analytical Method	Method Detection Limit (µg/L)	Practical Quantitation Limit (µg/L)	Cleanup Level (µg/L)	Laboratory Control Limits for Accuracy (% Recovery)		Laboratory Control Limits for Precision (RPD)
					LCS	MS/MSD	
Priority Pollutant Inorganics (Continued)				(TIN/DIN Cleanup Levels)			
Mercury	7470	0.0630	0.200	2.0/NE	85-115	75-125	0-20%
Nickel	6020	0.376	2.00	100/52	80-120	75-125	0-20%
Selenium	6020	0.876	2.00	10,000/5	80-120	75-125	0-20%
Silver	6020	0.0566	1.00	50	80-120	75-125	0-20%
Thallium	6020	0.0307	1.00	2/NE	80-120	75-125	0-20%
Zinc	6020	1.50	5.00	11,000/120	80-120	75-125	0-20%

^aCleanup level is specified for total xylenes

Notes:

- Method detection limits (MDLs), practical quantitation limits, and control limits for accuracy and precision provided by North Creek Analytical, Portland, Oregon. Laboratory performing analysis should perform MDL study prior to analysis of samples.
- The cleanup level listed was generated by using the endpoint criterion presented in Appendix F of the Comprehensive Monitoring Plan (CMP), Revision 2 (U.S. Navy 2005b). The values listed are from either the background found, the Alaska cleanup levels, or Federal maximum contaminant levels (MCLs). Values reported for inorganics are listed for total inorganic concentrations (18 AAC 75)/dissolved inorganic concentrations (Federal Ambient Water Quality Criteria). The values were chosen to ensure that the data generated by this sampling would meet or exceed the cleanup level required. The final assessment of compliance with endpoint criteria must be conducted using Appendix F of the CMP, Revision 2, to ensure that all criteria are taken into consideration. These values are strictly for the purpose of creating data quality objectives for the sampling and analysis.
- Please check specific criteria for LCS in Attachment B-4 of the Comprehensive Monitoring Plan, Revision 2 (U.S. Navy 2005b).

Table 1-6 (Continued)
Data Quality Objectives for Water Samples

DIN - dissolved inorganics
LCS - laboratory control sample
 $\mu\text{g/L}$ - microgram per liter
MS/MSD - matrix spike/matrix spike duplicate
NE - not established
RPD - relative percent difference
SIM - selected ion monitoring
TIN - total inorganics

**Table 1-7
 Data Quality Objectives for Sediment Samples**

Analysis	Analytical Method	Method Detection Limit (mg/kg)	Practical Quantitation Limit (mg/kg)	Cleanup Level (mg/kg)	Laboratory Control Limits for Accuracy (% Recovery)		Laboratory Control Limits for Precision (RPD)
					LCS	MS/MSD	
Semivolatile Organic Compounds							
2-Methylnaphthalene	8270SIM	0.00330	0.0134	NE	45-115	10-160	0-50%
2-Methylphenol	8270	0.0700	0.330	NE	--	--	--
Acenaphthene	8270SIM	0.00330	0.0134	NE	33-139	33-139	0-50%
Acenaphthylene	8270SIM	0.00330	0.0134	NE	--	--	--
Anthracene	8270SIM	0.00330	0.0134	NE	--	--	--
Benzo(a)anthracene	8270SIM	0.00330	0.0134	NE	--	--	--
Benzo(a)pyrene	8270SIM	0.00330	0.0134	NE	45-149	45-149	0-50%
Benzo(b)fluoranthene	8270SIM	0.00330	0.0134	NE	--	--	--
Benzo(g,h,i)perylene	8270SIM	0.00330	0.0134	NE	--	--	--
Benzo(k)fluoranthene	8270SIM	0.00330	0.0134	NE	--	--	--
Benzoic acid	8270	0.500	1.00	NE	--	--	--
bis(2-ethylhexyl)phthalate	8270SIM	0.0134	0.0134	NE	45-125	40-125	0-40%
Carbazole	8270	NP	NP	NE	--	--	--
Chrysene	8270SIM	0.00330	0.0134	NE	--	--	--
Dibenz(a,h)anthracene	8270SIM	0.00330	0.0134	NE	--	--	--
Di-n-butylphthalate	8270SIM	0.0134	0.0134	NE	55-110	NE	0-40%
Di-n-octylphthalate	8270SIM	0.0134	0.0134	NE	40-130	50-120	0-40%
Fluoranthene	8270SIM	0.00330	0.0134	NE	--	--	--
Fluorene	8270SIM	0.00330	0.0134	NE	--	--	--
Indeno(1,2,3-cd)pyrene	8270SIM	0.00330	0.0134	NE	--	--	--
Naphthalene	8270SIM	0.00330	0.0134	NE	--	--	--

Table 1-7 (Continued)
Data Quality Objectives for Sediment Samples

Analysis	Analytical Method	Method Detection Limit (mg/kg)	Practical Quantitation Limit (mg/kg)	Cleanup Level (mg/kg)	Laboratory Control Limits for Accuracy (% Recovery)		Laboratory Control Limits for Precision (RPD)
					LCS	MS/MSD	
Semivolatile Organic Compounds (Continued)							
Pentachlorophenol	8270SIM	0.067	0.067	NE	14-176	14-176	0-60%
Phenanthrene	8270SIM	0.00330	0.0134	NE	--	--	--
Phenol	8270	0.0700	0.330	NE	35-100	35-100	0-40%
Pyrene	8270SIM	0.00330	0.0134	NE	39-138	39-138	0-50%
Aroclors							
Aroclor-1016	8082	0.0167	0.0333	NE	40-140	37-145	0-20%
Aroclor-1221	8082	0.0333	0.0670	NE	50-130	50-130	0-20%
Aroclor-1232	8082	0.0167	0.0333	NE	50-130	50-130	0-20%
Aroclor-1242	8082	0.0167	0.0333	NE	50-130	50-130	0-20%
Aroclor-1248	8082	0.0167	0.0333	NE	50-130	50-130	0-20%
Aroclor-1254	8082	0.0167	0.0333	NE	50-130	50-130	0-20%
Aroclor-1260	8082	0.0167	0.0333	NE	60-130	25-144	0-20%
Inorganics							
Antimony	6020	0.0675	0.500	NE	80-120	75-125	0-20%
Arsenic	6020	0.451	0.500	7.5	80-120	75-125	0-20%
Beryllium	6020	0.109	0.500	NE	80-120	75-125	0-20%
Cadmium	6020	0.0995	0.500	NE	80-120	75-125	0-20%
Chromium	6020	0.226	0.500	10.7	80-120	75-125	0-20%
Copper	6020	0.325	2.00	98	80-120	75-125	0-20%
Lead	6020	0.102	0.500	10.9	80-120	75-125	0-20%

Table 1-7 (Continued)
Data Quality Objectives for Sediment Samples

Analysis	Analytical Method	Method Detection Limit (mg/kg)	Practical Quantitation Limit (mg/kg)	Cleanup Level (mg/kg)	Laboratory Control Limits for Accuracy (% Recovery)		Laboratory Control Limits for Precision (RPD)
					LCS	MS/MSD	
Inorganics (Continued)							
Mercury	7471A	0.00800	0.100	NP	80-120	75-125	0-20%
Nickel	6020	0.160	1.00	14.9	80-120	75-125	0-20%
Selenium	6020	0.367	0.500	6.4	80-120	75-125	0-20%
Silver	6020	0.0560	0.500	NP	80-120	75-125	0-20%
Thallium	6020	0.0635	0.500	3.8	80-120	75-125	0-20%
Zinc	6020	0.407	2.00	8.3	80-120	75-125	0-20%

Notes:

- Method detection limits (MDLs), practical quantitation limits, and control limits for accuracy and precision provided by North Creek Analytical, Portland, Oregon. Laboratory performing analysis should perform MDL study prior to analysis of samples.
- The cleanup level listed was generated by using the endpoint criterion presented in Appendix F of the Comprehensive Monitoring Plan (CMP), Revision 2 (U.S. Navy 2005b). The values listed are from either the background found, the Alaska Cleanup Levels, or Federal maximum contaminant levels (MCLs). Values reported for inorganics are listed for total inorganic concentrations (18 AAC 75)/dissolved inorganic concentrations (Federal Ambient Water Quality Criteria). The values were chosen to ensure that the data generated by this sampling would meet or exceed the cleanup level required. The final assessment of compliance with endpoint criteria must be conducted using Appendix F of the CMP, Revision 2, to ensure that all criteria are taken into consideration. These values are strictly for the purpose of creating data quality objectives for the sampling and analysis.
- Please check specific criteria for LCS in Attachment B-4 of the Comprehensive Monitoring Plan, Revision 2 (U.S. Navy 2005b).

LCS - laboratory control sample
 mg/kg - milligram per kilogram
 MS/MSD - matrix spike/matrix spike duplicate

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OU A, Former Adak Naval Complex
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Contract No. N44255-05-D-5100
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Table 1-7 (Continued)
Data Quality Objectives for Sediment Samples

NE - not established
NP - not provided
RPD - relative percent difference
SIM - selected ion monitoring

**Table 1-8
 Data Quality Objectives for Laboratory Water Quality Parameters**

Water Quality Parameter	Analytical Method	Method Detection Limit (mg/L)	Practical Quantitation Limit (mg/L)	Laboratory Control Limits for Accuracy (% Recovery)	Laboratory Control Limits for Precision (RPD)
Alkalinity	310.1 or SM 2320B	0.6	2	NP	0–20%
Chemical oxygen demand	410.4	2	5	85–115	0–20%
Sulfate	300.0	0.03	0.2	90–110	0–20%
Total dissolved solids	160.1	5	25	NA	0–20%

Notes:

Please check specific criteria for laboratory control sample in Attachment B-4 of the Comprehensive Monitoring Plan, Revision 2 (U.S. Navy 2005b).

mg/L - milligram per liter

NA - not applicable

NP - not provided

RPD - relative percent difference

**Table 1-9
 Data Quality Objectives for Field Measurements**

Field Measurement	Sampling Rationale	Measurement Method	Range	Accuracy	Detection Limit
Temperature	Stabilization criteria	Horiba U-22	0–55°C	+/- 1.0°C	NA
pH	Stabilization criteria	Horiba U-22	0–14	+/- 0.1 pH	NA
Oxygen-reduction potential (eH)	Stabilization criteria	Horiba U-22	+/- 1999 mV	+/- 15 mV	NA
Turbidity	Stabilization criteria	Horiba U-22	0–800 NTU	+/- 5%	NA
Conductivity	Stabilization criteria	Horiba U-22	0–4%	+/- 0.3%	NA
Salinity	Stabilization criteria	Horiba U-22	0–4%	+/- 0.3%	NA
Dissolved oxygen	Stabilization criteria	Horiba U-22	0–19.99 mg/L	+/- 0.2 mg/L	NA

Notes:

°C - degree Celsius

mg/L - milligram per liter

mV - millivolt

NA - not applicable

NTU - nephelometric turbidity unit