

2.0 PALISADES LANDFILL

2.1 BACKGROUND

Palisades Landfill (SWMU 11) is located approximately 1 mile north of the main downtown area of Adak and was used as the primary disposal area for all operations on Adak Island from the 1940s to approximately 1970. The landfill area, which is approximately 6 acres, covers portions of the coastal uplands immediately adjacent to Kuluk Bay and part of a canyon or ravine. The ravine is approximately 1,200 feet long, 5 to 300 feet wide, and 5 to 150 feet deep, with a small stream (Palisades Creek) running through it. The mouth of the ravine opens immediately to Kuluk Bay (U.S. Navy 2001c).

The landfill received wastes from the 1940s to 1970. Approximately 80,000 to 100,000 cubic yards of solid waste are located in the landfill. A wide variety of materials were reportedly disposed of at Palisades Landfill, including waste petroleum, oils, and lubricants; chlorinated and nonchlorinated solvents; paint waste; sanitary trash; scrap vehicles; lead and mercury batteries; construction waste; and mercury. The landfill was covered with local soils in the early 1970s after disposal practices were stopped. A portion of the disposed material within the ravine has no cover and is on a steep slope. The exposed waste in the ravine consists primarily of barrels, assorted metal debris, and building demolition waste. The waste in the ravine completely covers a portion of Palisades Creek and dams the flow, detaining the water in a large pond before it continues through the landfill and empties into Kuluk Bay. The landfill does not extend into Kuluk Bay. Groundwater occurs locally under the site and discharges into the marine environment at the downgradient boundary (U.S. Navy 2001c).

Surface soil, groundwater, surface water, and stream sediment samples were collected during 1992 and 1998 site investigations. VOCs, semivolatile organic compounds (SVOCs), PCBs, and inorganic analytes were detected in the sediment and surface water. Although no RI or risk assessment was performed at the time, the FFA parties concluded that performing an IRA was the best option for this site (U.S. Navy 2001c).

In the summer of 1996, Palisades Landfill was closed according to the 1995 interim action ROD as an IRA. Closure entailed installation of a landfill cover, institutional controls for access and land use, surface water controls, a vegetative cover, and long-term monitoring. The final OU A ROD (U.S. Navy, Alaska DEC, and USEPA 2000) determined that the selected interim actions met CERCLA requirements and no further remedial actions were required. Because of the presence of hazardous materials that do not allow for unrestricted use and unlimited access, Palisades Landfill will continue to be evaluated under the CERCLA 5-year review process. The

Adak 5-year review report was completed in November 2001 (U.S. Navy 2001c) and will be updated in 2006.

2.2 SAMPLING HISTORY RELATED TO CLOSURE MONITORING

Sediment and surface water have been sampled at Palisades Landfill periodically since May 1996. As of September 2005, 13 sampling events have occurred at the Palisades Landfill (see Table 1-2). In May 1996, prior to landfill closure activities, two surface water and sediment locations were sampled and analyzed for pesticides/PCBs, SVOCs, and total inorganics (TIN). Surface water samples were also analyzed for dissolved inorganics (DIN); benzene, toluene, ethylbenzene, and xylenes (BTEX); and turbidity. Sediment samples were also analyzed for total organic carbon (TOC). In August and November 1996, following landfill closure, samples were collected again and analyzed for the same chemicals and parameters. In February and May of 1997, sampling of sediment and surface water was performed at the same locations (U.S. Navy 2001c). In June 1998, September 1999, November 2000, September 2001, October 2002, October 2003, September 2004, and September 2005, sediment and surface water sampling was performed. The analytical results from the sampling conducted at Palisades Landfill from 1996 through 2004 are presented in Appendix E.

In 2005, samples were analyzed for the following target analytes in surface water and sediment, as specified in the CMP, Revision 2 (U.S. Navy 2005b):

- Bis(2-ethylhexyl)phthalate
- Selected PAHs
- Antimony
- Arsenic
- Chromium
- Nickel

Sediment samples and surface water samples were not analyzed for 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). In addition, 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 also recommended that PCB monitoring in surface water at Palisades Landfill be terminated. The Alaska DEC and the EPA concurred, and these changes were 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, and analysis of PCBs in surface water samples was discontinued.

2.3 DISCUSSION OF RESULTS

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) and sent to the laboratory for analysis. The locations where samples were collected during the 2005 event are shown on Figure 2-1. Field logbooks are provided in Appendix A, and the field sampling parameters collected during sampling are included in Appendix D. A summary of the analytical results from the 2005 sampling event and the endpoint criteria are provided for sediment and surface water in Tables 2-1 and 2-2, respectively. These tables provide analytical results for the target analytes as defined in the CMP, Revision 2. The analytical results for all 2005 analytes are provided in Appendix F. In addition, inspections relative to institutional controls were conducted during the 2005 monitoring event and are reported in a separate report by the sampling contractor.

Analytical results for sediment and surface water were compared to the endpoint criteria presented in Appendix F of the CMP, Revision 2. In addition, analytical results for inorganic analytes in sediments were compared to Adak background concentrations, where established. Analytical results that exceeded the endpoint criteria or the Adak background concentrations for sediment are summarized in Tables 2-3.

2.3.1 Sediments

Sediment samples were collected at three locations (101, 102, and 103) and analyzed for SVOCs (EPA Methods 8270C/8270 selected ion monitoring [SIM]), TIN (EPA Methods 6020/7471A), TOC (EPA Method 9060 modified), and grain-size distribution (American Society for Testing and Materials [ASTM] Method D422). Sampling location 101 represents the upgradient location along the Palisades Creek flow path northwest of the landfill before it enters the ponded area. Sampling location 102 is located where the surface water exits the landfill at the base of the metal debris. Sampling location 103 is located in the sandy bank of Palisades Creek just before it enters Kuluk Bay and represents a downgradient sampling point intended to evaluate the migration of contaminants beyond location 102. The sediment sampling locations are shown on Figure 2-1. Sediment samples from locations 101 and 102 are considered freshwater sediment samples, and the sediment sample from location 103 is considered a marine sediment sample.

A summary of the analytical results from the 2005 sampling event and the endpoint criteria are provided for sediment in Table 2-1. Results of the grain-size analyses are provided in Appendix F. Analytical results that exceeded the endpoint criteria or the Adak background concentrations are summarized in Table 2-3.

It should be noted that the ecological endpoint criteria for the following selected chemicals provided in Tables 2-1 and 2-3 are based on $\mu\text{g}/\text{kg}$ of TOC: benzo(a)anthracene (freshwater), benzo(b)fluoranthene (freshwater), benzo(k)fluoranthene (freshwater), bis(2-ethylhexyl)phthalate (freshwater and marine), fluoranthene (marine), indeno(1,2,3-cd)pyrene (freshwater), and pyrene (marine). These endpoint criteria were derived from the ecological RBSC provided in the PSE-2 guidance document (U.S. Navy 1996). The ecological RBSCs presented in the PSE-2 document were calculated for these chemicals assuming that sediment samples would contain 1 percent TOC, and, therefore, the units of the ecological RBSC presented in the PSE-2 are microgram of analyte per kilogram of sediment.

Because of this assumption, the ecological RBSC provided in the PSE-2 document is only valid for sediment samples with a TOC content close to 1 percent. Two of the three sediment samples collected at the Palisades Landfill had TOC contents considerably different than 1 percent. Therefore, the ecological RBSC in the PSE-2, which is based on a 1 percent TOC content, are not valid for these two sediment samples. To convert the ecological RBSC in the PSE-2 document to units of microgram of analyte per kilogram of TOC (which is valid for any sediment sample, regardless of the TOC content), the ecological RBSCs in the PSE-2 document were divided by 0.01, the assumed decimal fraction of TOC.

The resulting ecological RBSCs, which are presented in Tables 2-1 and 2-3, are based on microgram of analyte per kilogram of TOC. To compare the analytical results for the chemicals listed above to the ecological RBSC based on units of microgram of analyte per kilogram of TOC, the analytical results must be carbon normalized. To carbon normalize the analytical results to a TOC concentration, the dry-weight concentration of the target analyte is divided by the decimal fraction representing the percent TOC content of the sediment sample. If the TOC content of the sample is less than 0.5 percent, then the dry-weight concentration is divided by 0.005 (the decimal fraction of 0.5 percent).

Analytical results for SVOCs and TIN in the sediment samples collected at the Palisades Landfill are discussed below. As discussed above, sediment samples were not analyzed for PCBs during 2005.

Semivolatile Organic Compounds

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 estimated concentrations above the freshwater human health 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 criterion.

Total Inorganics

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 criterion of 0.0365 mg/kg in all three samples. In addition, the concentration of arsenic in the sediment sample from location 102 was above the Adak freshwater background concentration of 5.46 mg/kg. Chromium was detected in the sediment samples from locations 102 and 103 at estimated concentrations of 14.1 and 13.5 mg/kg, respectively. These concentrations are above the freshwater (12.91 mg/kg) and marine (6.04 mg/kg) sediment background concentrations for Adak. Nickel was detected in the sediment samples from locations 102 and 103 at concentrations of 16.6 and 20.4 mg/kg (estimated), respectively. These concentrations are also above the freshwater (10.05 mg/kg) and marine (5.01 mg/kg) 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 (see Appendix F). Beryllium was detected at location 101 at an estimated concentration of 0.138 mg/kg, which is greater than the freshwater and marine human health endpoint criterion of 0.015 mg/kg. The concentrations of lead and zinc in the sample collected at location 102 were 136 and 554 mg/kg, respectively. These concentrations were greater than the endpoint criteria of 35 and 120 mg/kg, respectively, for these compounds. These endpoint criteria are based on the ecological RBSCs. In addition, the concentrations of cadmium, lead, and zinc in the sediment sample from location 102 exceeded the Adak freshwater

background concentrations. The Adak freshwater background concentrations for cadmium, lead, and zinc are 0.66, 8.32, and 44.82 mg/kg, respectively. Finally, beryllium was detected at location 103 at an estimated concentration of 0.142 mg/kg, which is greater than the freshwater and marine human health endpoint criterion of 0.015 mg/kg. The concentrations of lead and zinc in the sediment sample from location 103 exceeded the Adak marine background concentrations of 2.57 and 31.9 mg/kg, respectively.

2.3.2 Surface Water

Surface water samples were collected at two locations (101 and 102) and analyzed for TIN (EPA Methods 6020/7470A) and DIN (EPA Methods 6020/7470A). As previously discussed, sampling location 101 represents the upgradient location along the Palisades Creek flow path northwest of the landfill, before it enters the ponded area. Sampling location 102 was taken where the surface water exits the landfill at the base of the metal debris. The surface water sampling locations are shown on Figure 2-1.

A summary of the analytical results from the 2005 sampling event and the endpoint criteria are provided for surface water in Table 2-2. The results for all analytes are provided in Appendix F. None of the target analytes exceeded endpoint criteria in surface water.

No DIN or TIN included on the target analyte list for the Palisades Landfill were detected. In addition, reporting limits were all below endpoint criteria for the target analytes. All inorganics not on the target analyte list were either not detected or detected at concentrations less than the endpoint criteria (see Appendix F).

2.4 CONCLUSIONS

The analytical data for the period 2001 through 2005 was reviewed for the compounds included on the target analyte list and for those nontarget analytes that exceeded the endpoint criteria during the 2005 sampling event. The purpose of the analysis of the recent historical data is to determine if overt trends exist in the concentration data for the Palisades Landfill.

2.4.1 Sediments

Semivolatile Organic Compounds

Acenaphthene, acenaphthylene, anthracene, benzo(g,h,i)perylene, benzo(k)fluoranthene, bis(2-ethylhexyl)phthalate, fluoranthene, indeno(1,2,3-c,d)pyrene, naphthalene, phenanthrene, and pyrene have not been detected at concentrations above the endpoint criteria in sediment samples collected during the 2001, 2002, 2003, 2004, and 2005 sampling events. However, the reporting

limits for acenaphthene, acenaphthylene, anthracene, benzo(k)fluoranthene, bis(2-ethylhexyl)phthalate, fluoranthene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, and pyrene in one or more sediment samples collected during 2001 and/or 2004 were above the endpoint criteria.

2-Methylnaphthalene, benzo(a)anthracene, benzo(b)fluoranthene, and fluorene have only been detected at concentrations above the endpoint criteria once during the 2001 through 2005 time frame. 2-Methylnaphthalene was detected in 2002 at location 101, benzo(a)anthracene was detected in 2005 at location 102, benzo(b)fluoranthene was detected in 2005 at location 102, and fluorene was detected in 2002 at location 101 above the endpoint criteria. However, the reporting limits were above the endpoint criteria for all of these compounds in two or more sediment samples collected during 2001 and/or 2004.

Benzo(a)pyrene and chrysene are the only two SVOCs that were included on the target compound list that were detected at concentrations greater than the endpoint criteria more than once. Benzo(a)pyrene was detected at location 102 in 2005, locations 101, 102, and 103 in 2004, at location 103 in 2003, and at location 101 in 2002. Benzo(a)pyrene was not detected in 2001. However, the reporting limit for this compound was above the endpoint criterion for all three sediment samples collected in 2001. Chrysene was detected at location 102 in 2005 and at location 101 in 2003. Chrysene was not detected in 2001 or 2004. However, the reporting limit was above the endpoint criterion for two of the three sediment samples collected in 2001 and 2004. There appears to be no clear concentration trend for PAHs during the 2001 to 2005 time period. Evaluation of concentration trends is difficult to interpret, because of the variable reporting limits during the 2001 through 2005 time frame.

Total Inorganics

Antimony was not detected above the endpoint criterion during the 2002, 2003, 2004, and 2005 sampling events. However, it was detected above the endpoint criterion in the sample collected from location 102 during 2001. Arsenic has been detected above the endpoint criterion in all samples collected during the 2001, 2002, 2003, 2004, and 2005 sampling events. Chromium was detected in the sediment sample from location 102 during the 2003 sampling event at a concentration greater than the endpoint criterion. Nickel was detected in the sediment sample from location 102 at a concentration greater than the endpoint criterion during 2001, 2003, and 2004, and it was detected at a concentration greater than the endpoint criterion in the sample collected from location 103 during 2002. It was not detected above the endpoint criterion in 2005 in any of the sediment samples.

In general, the concentrations of the inorganics included on the target analyte list appear to be decreasing over the 2001 through 2005 time period, with the exception of chromium and nickel at location 103. Chromium and nickel concentrations appear to be increasing slightly over the last 3 years. In addition, three inorganics not included on the target analyte list were detected above endpoint criteria in one or more sediment samples collected during the 2005 sampling event: beryllium, lead, and zinc. The concentrations of these chemicals have exceeded the endpoint criteria during previous sampling events, and the detected concentrations during the 2005 sampling event were generally lower than during the 2004 sampling event.

2.4.2 Surface Water

Inorganics

None of the dissolved inorganics or total inorganics included on the target analyte list for the Palisades Landfill were detected above the endpoint criteria during the 2001 through 2005 time period. (Note that the reporting limit for arsenic during the 2001 sampling event was greater than the endpoint criterion.)

2.5 RECOMMENDATIONS

2.5.1 Sediments

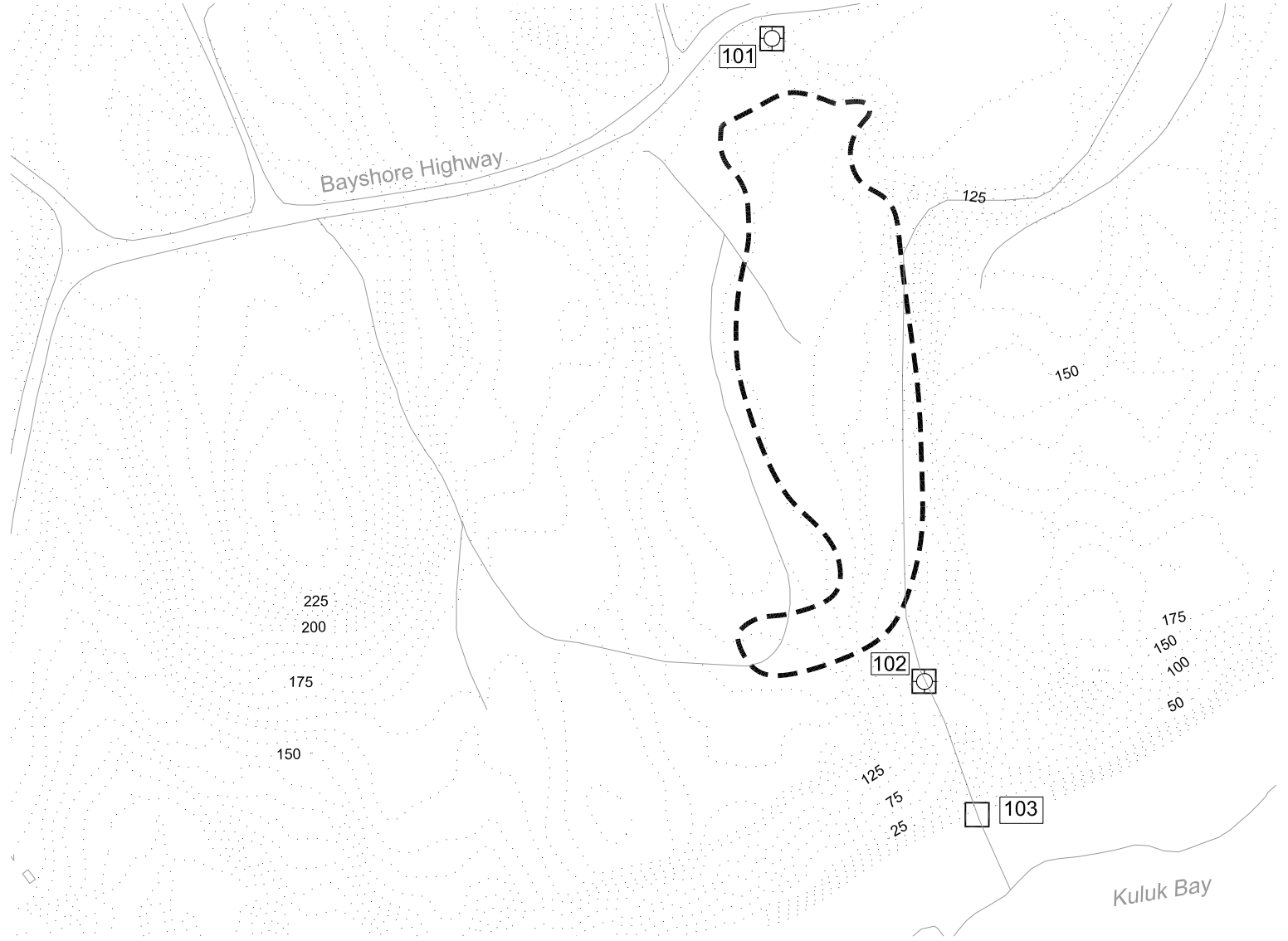
Based on the September 2005 sampling results, the Navy recommends that sampling of sediments for SVOCs, TIN, TOC, and grain size be continued at the Palisades Landfill, in accordance with the CMP, Revision 2 (U.S. Navy 2005b). SVOCs and TIN continue to be detected at concentrations above the endpoint 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.

2.5.2 Surface Water

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 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.

LEGEND

- 25 Elevation Contour (ft Above MLLW)
- Road
- Surface Water Sample Location
- Sediment Sample Location
- Landfill Boundary



NOTE:
Palisades Landfill surface water location 103 has the following latitude/longitude coordinates based upon the GPS unit using NAD 27 reference: 51-54-20.1 and 176-36-34.7. For triangulation, the point is located as follows: from south marker 133 feet; from north marker 108 feet.

U.S. NAVY

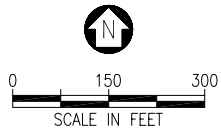


Figure 2-1
Sampling Locations at SWMU 11, Palisades Landfill

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

Table 2-1
Summary of Sediment Analytical Results at Palisades Landfill, September 2005

Target Analyte	Location 101 ^a 9/13/05	Location 101 ^{a,b} Carbon Normalized 9/13/05	Location 102 ^a 9/13/05	Location 102 ^{a,b} Carbon Normalized 9/13/05	Location 103 ^c 9/13/05	Location 103 ^{b,c} Carbon Normalized 9/13/05	Adak Background Concentration		Endpoint Criterion		
							Freshwater	Marine	Human Health RBSC ^d Freshwater and Marine	Ecological RBSC ^d	
										Freshwater	Marine
SVOCs–Bis(2-ethylhexyl)phthalate and PAHs (µg/kg)											
2-Methylnaphthalene	15.7 U	NA	6.64 J	NA	15.7 U	NA	NA	NA	1,100,000	65	NE
Acenaphthene	15.7 U	NA	15.3 J	NA	15.7 U	NA	NA	NA	1,640,000	150	NE
Acenaphthylene	15.7 U	NA	10.7 J	NA	15.7 U	NA	NA	NA	1,100,000	660	NE
Anthracene	15.7 U	NA	38.4 J	NA	15.7 U	NA	NA	NA	8,210,000	85	NE
Benzo(a)anthracene	15.7 U	526.8 U	115 J^e	14,303.5 J	15.7 U	NA	NA	NA	87.5	110,000 ^g	NE
Benzo(a)pyrene	15.7 U^f	NA	105 J^e	NA	15.7 U^f	NA	NA	NA	8.75	400	NE
Benzo(b)fluoranthene	15.7 U	526.8 U	121 J^e	15,049.8 J	15.7 U	NA	NA	NA	87.5	230,000 ^g	NE
Benzo(g,h,i)perylene	15.7 U	NA	50.6 J	NA	15.7 U	NA	NA	NA	821,000	NE	NE
Benzo(k)fluoranthene	15.7 U	526.8 U	87.5 J	10,883.1 J	15.7 U	NA	NA	NA	875	230,000 ^g	NE
Bis(2-ethylhexyl)phthalate	15.7 U	526.8 U	33.5 U	4,166.7 U	15.7 U	3,140 U	NA	NA	4,560	47,000 ^g	47,000 ^g
Chrysene	15.7 U	NA	137 J^e	NA	15.7 U	NA	NA	NA	8,750	40	NE
Fluoranthene	15.7 U	NA	193 J	NA	15.7 U	3,140 U	NA	NA	1,100,000	600	160,000 ^g
Fluorene	15.7 U	NA	19.1 J	NA	15.7 U	NA	NA	NA	1,100,000	35	NE
Indeno(1,2,3-c,d)pyrene	15.7 U	526.8 U	40.9 J	5,087.1 J	15.7 U	NA	NA	NA	87.5	34,000 ^g	NE
Naphthalene	15.7 U	NA	4.25 J	NA	15.7 U	NA	NA	NA	1,100,000	340	NE

Table 2-1 (Continued)
Summary of Sediment Analytical Results at Palisades Landfill, September 2005

Target Analyte	Location 101 ^a 9/13/05	Location 101 ^{a,b} Carbon Normalized 9/13/05	Location 102 ^a 9/13/05	Location 102 ^{a,b} Carbon Normalized 9/13/05	Location 103 ^c 9/13/05	Location 103 ^{b,c} Carbon Normalized 9/13/05	Adak Background Concentration		Endpoint Criterion		
							Freshwater	Marine	Human Health RBSC ^d Freshwater and Marine	Ecological RBSC ^d	
										Freshwater	Marine
SVOCs–Bis(2-ethylhexyl)phthalate and PAHs (µg/kg) (Continued)											
Phenanthrene	15.7 U	NA	147 J	NA	15.7 U	NA	NA	NA	1,100,000	225	225
Pyrene	15.7 U	NA	206 J	NA	15.7 U	3,140 U	NA	NA	821,000	350	1,000,000 ^e
PCBs (Aroclors) (µg/kg)^h											
Aroclor 1016	NA	NA	NA	NA	NA	NA	NA	NA	8.3	7	NE
Aroclor 1221	NA	NA	NA	NA	NA	NA	NA	NA	NE	NE	NE
Aroclor 1232	NA	NA	NA	NA	NA	NA	NA	NA	8.3	NE	NE
Aroclor 1242	NA	NA	NA	NA	NA	NA	NA	NA	NE	NE	NE
Aroclor 1248	NA	NA	NA	NA	NA	NA	NA	NA	8.3	30	NE
Aroclor 1254	NA	NA	NA	NA	NA	NA	NA	NA	8.3	60	NE
Aroclor 1260	NA	NA	NA	NA	NA	NA	NA	NA	8.3	5	NE
Total Inorganics (mg/kg)											
Antimony	0.565 UJ	NA	1.31 J	NA	0.595 UJ	NA	10	1.5	11	2	2
Arsenic	2.64 J^e	NA	6.94 J^{e,i}	NA	4.16 J^e	NA	5.46	7.5	0.0365	33	57
Chromium	6.3	NA	14.1 Jⁱ	NA	13.5 Jⁱ	NA	12.91	6.04	27,400	80	260
Nickel	6.18	NA	16.6ⁱ	NA	20.4 Jⁱ	NA	10.05	5.01	203	30	30

^aFreshwater sediment sample

^bUnits are in µg/kg total organic carbon (TOC) (carbon-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 divided by 0.005 (decimal fraction of 0.5 percent). For a TOC content greater than 0.5 percent, the carbon-normalized value is used. The TOC content of the samples obtained from the Palisades Landfill were 2.98, 0.804, and 0.485 percent for locations 101, 102, and 103, respectively.

Table 2-1 (Continued)
Summary of Sediment Analytical Results at Palisades Landfill, September 2005

^cMarine sediment sample

^dFinal PSE-2 guidance document for Adak (U.S. Navy 1996)

^eValue exceeds endpoint criterion.

^fReporting limit exceeds endpoint criterion.

^gUnits are in $\mu\text{g}/\text{kg}$ total organic carbon (TOC). The ecological RBSC in the preliminary source evaluation 2 (PSE-2) guidance document (U.S. Navy 1996) was calculated assuming a 1 percent TOC content and was provided on a basis of μg of analyte per kg of sediment. Because of this assumption, the RBSC provided in the PSE-2 document is only valid for sediment samples with a TOC content close to 1 percent. Two of the three sediment samples collected had TOC contents considerably different than 1 percent. Therefore, the RBSC based on a 1 percent TOC content is not valid for these two sediment samples. To convert the RBSC in the PSE-2 document to a unit of μg of analyte per kg of TOC, the RBSC in the PSE-2 document was divided by 0.01, the assumed decimal fraction of TOC in the sample. The carbon-normalized concentration of an analyte was then compared to the carbon-normalized RBSC to determine exceedances.

^hIn accordance with the comprehensive monitoring plan for Adak (U.S. Navy 2005b), sediment samples were not analyzed for PCBs in 2005. Sediment samples are analyzed for PCBs every other year. Therefore, sediment samples will be analyzed for PCBs during 2006.

ⁱValue exceeds Adak background concentration.

Notes:

Bolded value exceeds either the Adak background concentration or the endpoint criterion.

J - estimated value

$\mu\text{g}/\text{kg}$ - microgram per kilogram

mg/kg - milligram per kilogram

NA - not applicable

NE - not established

PAHs - polycyclic aromatic hydrocarbon

PCBs - polychlorinated biphenyls

RBSC - risk-based screening concentration

SVOCs - semivolatiles organic compounds

U - not detected; value shown is the reporting limit

**Table 2-2
 Summary of Surface Water Analytical Results at
 Palisades Landfill, September 2005**

Target Analyte	Location 101 9/13/2005 (µg/L)	Location 102 9/13/2005 (µg/L)	Endpoint Criterion	
			Alaska Water Quality Standards, 18 AAC 70 ^a	
			Aquatic Life (µg/L)	Human Health (Organisms Only) (µg/L)
Total Inorganics				
Antimony	1 U	1 U	None	45,000
Arsenic	1 U	1 U	None	1.4 ^b
Chromium	1 U	1 U	210 ^{c,d}	None
Nickel	2 U	2 U	160 ^c	100
Dissolved Inorganics				
Antimony	1 U	1 U	None	45,000
Arsenic	1 U	1 U	190	1.4 ^b
Chromium	1 U	1 U	None	None
Nickel	2 U	2 U	None	100

^aCriteria existing in 18 AAC 70 when Record of Decision for Operable Unit A and landfills were signed (Changes to some of these criteria were adopted in an 18 AAC 70 amendment on March 24, 2003, but these changes are not shown in this table.)

^bHuman health criteria for carcinogens come from U.S. Environmental Protection Agency promulgation of human health criteria for carcinogens for Alaska at the 10⁻⁵ risk level in the National Toxics Rule (40 CFR 131.36), in accordance with on-line Alaska Department of Environmental Conservation guidance at <www.state.ak.us/dec/dawq/wqs/documents/carcinogens.htm>, accessed April 10, 2003.

^cAt 100 milligrams per liter hardness

^dValue provided is for chromium III. The criterion for chromium VI is 11 µg/L.

Notes:

AAC - Alaska Administrative Code

CFR - Code of Federal Regulations

µg/L - microgram/liter

U - not detected; value shown is the reporting limit

**Table 2-3
 Summary of Exceedances of Endpoint Criteria in Sediments at
 Palisades Landfill, September 2005**

Target Analyte	Location 101 ^a 9/13/05	Location 101 ^{a,b} Carbon Normalized 9/13/05	Location 102 ^a 9/13/05	Location 102 ^{a,b} Carbon Normalized 9/13/05	Location 103 ^c 9/13/05	Location 103 ^{b,c} Carbon Normalized 9/13/05	Adak Background Concentrations		Endpoint Criteria		
							Freshwater	Marine	Human Health RBSC ^d Freshwater and Marine	Ecological RBSC ^d	
										Freshwater	Marine
SVOCs–Bis(2-ethylhexyl)phthalate and PAHs (µg/kg)											
Benzo(a)anthracene	15.7 U	526.8 U	115 J^e	14,303.5 U	15.7 U	NA	NA	NA	87.5	110,000 ^f	NE
Benzo(a)pyrene	15.7 U^g	NA	105 J^e	NA	15.7 U^g	NA	NA	NA	8.75	400	NE
Benzo(b)fluoranthene	15.7 U	526.8 U	121 J^e	15,049.6 U	15.7 U	NA	NA	NA	87.5	230,000 ^f	NE
Chrysene	15.7 U	NA	137 J^e	NA	15.7 U	NA	NA	NA	8,750	40	NE
Total Inorganics (mg/kg)											
Arsenic	2.64 J^e	NA	6.94 J^{e,h}	NA	4.16 J^e	NA	5.46	7.5	0.0365	33	57
Chromium	6.3	NA	14.1 J^h	NA	13.5 J^h	NA	12.91	6.04	27,400	80	260
Nickel	6.18	NA	16.6^h	NA	20.4 J^h	NA	10.05	5.01	203	30	30

^aFreshwater sediment sample

^bUnits are in µg/kg total organic carbon TOC (carbon-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 divided by 0.005 (decimal fraction of 0.5 percent). For a TOC content greater than 0.5 percent, the carbon-normalized value is used. The TOC content of the samples obtained from the Palisades Landfill was 2.98, 0.804, and 0.485 percent for locations 101, 102, and 103, respectively.

^cMarine sediment sample

Table 2-3 (Continued)
Summary of Exceedances of Endpoint Criteria in Sediments at
Palisades Landfill, September 2005

^dFinal PSE-2 guidance document for Adak (U.S. Navy 1996)

^eValue exceeds endpoint criterion.

^fUnits are in µg/kg total organic carbon (TOC). The ecological RBSC in the preliminary source evaluation 2 (PSE-2) guidance document (U.S. Navy 1996) was calculated assuming a 1 percent TOC content, and was provided on a basis of µg of analyte per kg of sediment. Because of this assumption, the RBSC provided in the PSE-2 document is only valid for sediment samples with a TOC content close to 1 percent. Two of the three sediment samples collected had TOC contents considerably different than 1 percent. Therefore, the RBSC based on a 1 percent TOC content is not valid for these two sediment samples. To convert the RBSC in the PSE-2 document to a unit of µg of analyte per kg of TOC, the RBSC in the PSE-2 document was divided by 0.01, the assumed decimal fraction of TOC in the sample. The carbon-normalized concentration of an analyte was then compared to the carbon-normalized RBSC to determine exceedances.

^gReporting limit exceeds endpoint criterion.

^hValue exceeds Adak background concentration.

Notes:

Bolded value exceeds either the Adak background concentration or the endpoint criterion.

J - estimated value

µg/kg - microgram/kilogram

mg/kg - milligram/kilogram

NA - not applicable

NE - not established

PAHs - polycyclic aromatic hydrocarbon

RBSC - risk-based screening concentration

SVOCs - semivolatile organic compounds

U - not detected; value shown is the reporting limit

3.0 METALS LANDFILL

3.1 BACKGROUND

The Metals Landfill (SWMU 13) is located immediately southeast of the central community of Adak and is bounded by Monument Hill to the west and Kuluk Bay to the east. The total volume of landfill waste and soil in the Metals Landfill is approximately 400,000 cubic yards. The total site area is approximately 28 acres, while approximately 19 acres were formally used as a landfill (U.S. Navy 2001c).

The Metals Landfill began operations in the 1940s and received a variety of waste materials including sanitary trash, construction waste, paints, chlorinated and nonchlorinated solvents, batteries, scrap vehicles, medical waste, and sewage sludge. In 1970, restrictions were placed on the types of materials that could be disposed of at the landfill. Beginning in 1988, when a sludge press was installed at the sewage treatment plant, dewatered sewage sludge was disposed of on the southern end of the eastern section of the landfill. The landfill stopped receiving wastes in 1989 (U.S. Navy 2001c).

A site inspection of Metals Landfill was conducted in 1989 by regulatory agencies. The investigation discovered four drums with liquid, one cracked vehicle battery, and one acetylene cylinder scattered in one small area of the landfill. As a result of the inspection, the regulatory agency determined that the battery area contains hazardous waste and, therefore, was deemed a hazardous waste pile under the Resource Conservation and Recovery Act (RCRA). This is the only area of the landfill to have a RCRA issue. The remaining landfill has been designated as a solid waste management unit under RCRA. The presence of the batteries resulted in a Federal Facilities Compliance Agreement (FFCA) being signed and issued by the EPA in November 1990 (U.S. Navy 2001c).

In 1996, the discrete waste pile within the Metals Landfill was closed as a waste pile under the RCRA guidelines. Closure entailed verification of the collection and disposal of five batteries from the site at a permitted hazardous waste landfill and the completion of a survey plat that included a note restricting the disturbance of the hazardous waste disposal unit in accordance with regulations.

In the summer of 1996, the entire Metals Landfill was closed per the 1995 ROD as an IRA (U.S. Navy, Alaska DEC, and USEPA 1995). Closure included evaluation and removal of shoreline debris, implementation of surface water erosion controls, construction of a landfill cap, placement of a vegetative cover, implementation of institutional controls for access and land use, and long-term monitoring. The final OU A ROD determined that the selected interim actions

met CERCLA requirements and no further remedial actions were required. Because of the presence of hazardous materials that do not allow for unrestricted use and unlimited access, Metals Landfill, together with Palisades Landfill, will continue to be evaluated under the CERCLA 5-year review process (U.S. Navy 2001d). The 5-year review report was completed in November 2001 (U.S. Navy 2001c) and will be updated in 2006.

3.2 SAMPLING HISTORY RELATED TO CLOSURE MONITORING

Groundwater has been sampled at the Metals Landfill periodically since July 1996. To date, 12 sampling events at the Metals Landfill have occurred from 1996 through 2005 (see Table 1-2). In July 1996 and November 1996, groundwater was sampled at eight locations for VOCs, SVOCs, PCBs/pesticides, TIN, and DIN. In May 1997, December 1997, June 1998, September 1999, November 2000, September 2001, October 2002, October 2003, September 2004, and September 2005, groundwater sampling was also performed. All eight locations were sampled during these events with the exception of locations 401 and 404 during the November 2000 event. The analytical results from the sampling conducted at Metals Landfill from 1996 through 2005 are presented in Appendix E.

In 2005, samples were analyzed for the following target analytes in groundwater as specified in the CMP, Revision 2 (U.S. Navy 2005b):

- Arsenic
- Barium

Groundwater samples were not analyzed for 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 criteria 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 the EPA concurred, and the changes were incorporated into the CMP, Revision 2 (U.S. Navy 2005b). In addition, MBAS, a water quality parameter, 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 not established surface water and 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 water quality parameters in groundwater samples will occur in 2006.

3.3 DISCUSSION OF GROUNDWATER SAMPLING RESULTS

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) and sent to the laboratory for analysis. The locations where samples were collected during this sampling event are shown on Figure 3-1. Field logbooks are provided in Appendix A, and the field sampling parameters collected during sampling are included in Appendix D. A summary of the analytical results from the 2005 sampling event and the endpoint criteria are provided for groundwater in Table 3-1. This table provides analytical results for the target analytes as defined in the CMP, Revision 2. The analytical results for all 2005 analytes are provided in Appendix F.

Analytical results for groundwater were compared to the endpoint criteria presented in Appendix F of the CMP, Revision 2 (U.S. Navy 2005b). In addition, analytical results for inorganics in groundwater were compared to Adak background concentrations, where established. Analytical results that exceeded the endpoint criteria or the Adak background concentrations are summarized in Table 3-2.

Visual inspections of the groundwater monitoring wells at Metals Landfill were also completed during the groundwater sampling event. All wells were functional at the time of inspection. However, total depth of two of the wells, MW 13-2 and MW-603, increased significantly between 2004 and 2005. The total depth of MW13-2 increased by 1.35 feet and the total depth of MW-603 increased by 0.27 foot from 2004 to 2005. The reason for these increases is not known, but it could indicate that the wells are broken, or had silt buildup in 2004. A summary of the results of the well inspections is provided in Appendix B. Inspections relative to institutional controls were conducted during the 2005 monitoring event and are reported in a separate report by the sampling contractor.

Groundwater samples were collected from 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). Groundwater samples were analyzed for TIN (EPA Methods 6020/7470A) and DIN (EPA Methods 6020/7470A). Based on historical groundwater level data, monitoring wells are positioned at locations that are hydraulically downgradient of the solid waste at the Metals Landfill. All groundwater sampling locations are shown on Figure 3-1.

A summary of the analytical results from the 2005 sampling event and the endpoint criteria are provided for groundwater in Table 3-1. As previously discussed, this table provides analytical results for the target analytes as defined in the CMP, Revision 2 (U.S. Navy 2005b). The analytical results for all 2005 analytes are provided in Appendix F. Analytical results that

exceeded the endpoint criteria are summarized in Table 3-2. Analytical results for TIN and DIN in the groundwater samples collected at the Metals Landfill are discussed below.

Inorganics

Arsenic was not detected above the endpoint criterion. However, dissolved arsenic was detected in groundwater samples at concentrations above the Adak background concentration. Dissolved arsenic exceeded the Adak background concentration of 2 µg/L 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 (Tables 3-1 and 3-2). All inorganics not on the target analyte list were either not detected or detected at concentrations less than their respective endpoint criteria (see Appendix F).

3.4 CONCLUSIONS

The analytical data for the period 2001 through 2005 were reviewed for the compounds included on the target analyte list and for those compounds that exceeded the endpoint criteria during the 2005 sampling event and that are not included on the target analyte list. The purpose of the analysis of the recent historical data is to determine if overt trends exist in the concentration data for the Metals Landfill.

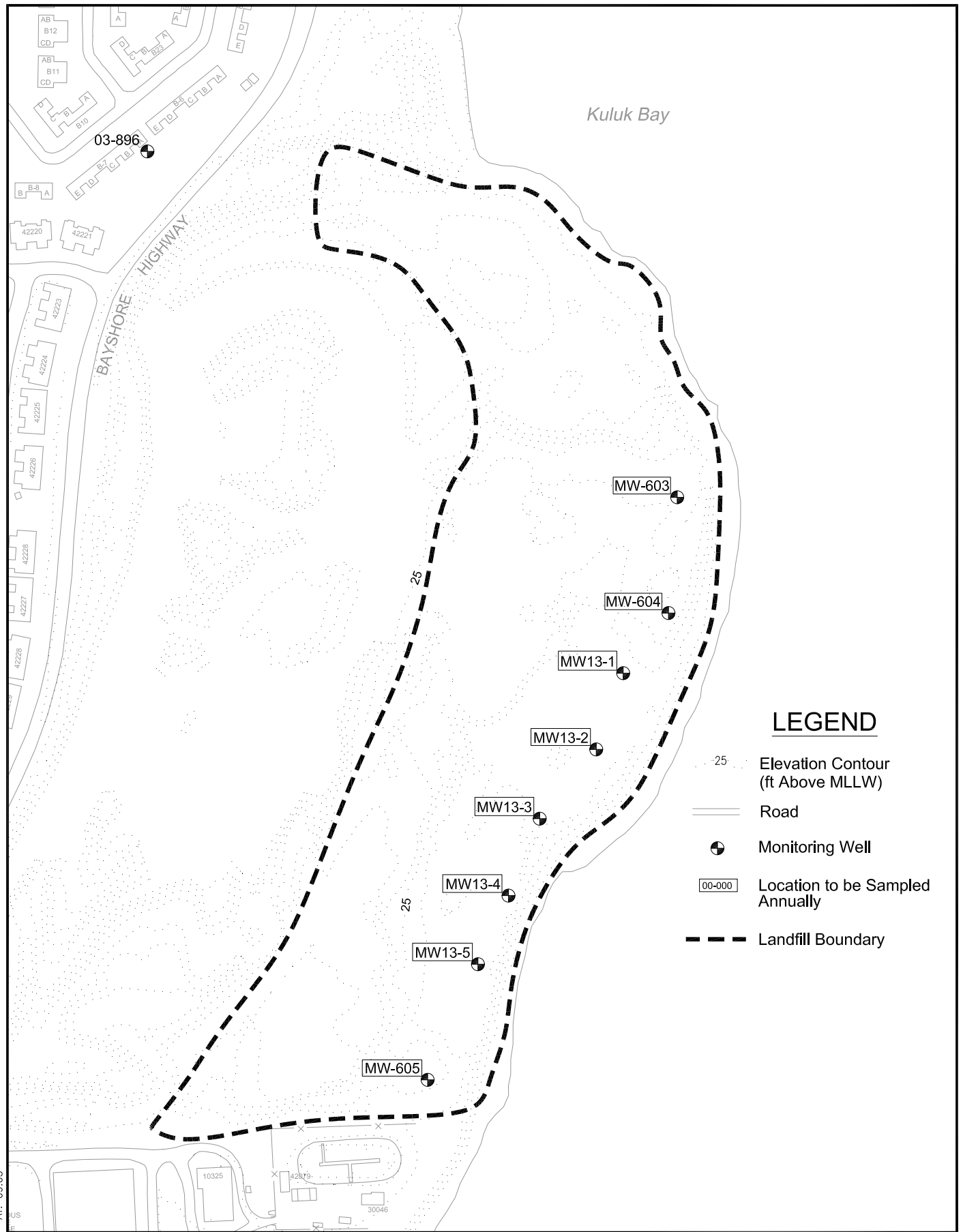
Inorganics

No dissolved inorganics or total inorganics included on the target analyte list for the Metals Landfill have been detected above the endpoint criteria during the 2001 through 2005 time period.

3.5 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. In addition, wells MW13-2 and MW-603 should be inspected to determine the discrepancy in the total depth readings between 2004 and 2005 and to determine whether the wells may require replacing.

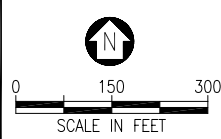
FILENAME: T:\ADAK\IDIC\Sub-Tasks\DO 8\05 ANNUAL LANDFILL\FIG 3-1 SWMU 13 LANDFILL.dwg
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LEGEND

- 25 Elevation Contour (ft Above MLLW)
- Road
- Monitoring Well
- Location to be Sampled Annually
- Landfill Boundary

U.S. NAVY



**Figure 3-1
 Sampling Locations at
 SWMU 13, Metals Landfill**

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

Table 3-1
Summary of Groundwater Analytical Results at Metals Landfill, September 2005

Target Analyte	Location 401 (MW13-1) 9/19/05 (µg/L)	Location 402 (MW13-2) 9/19/05 (µg/L)	Location 403 (MW13-3) 9/19/05 (µg/L)	Location 404 (MW13-4) 9/19/05 (µg/L)	Location 405 (MW13-5) 9/19/05 (µg/L)	Location 603 (MW-603) 9/19/05 (µg/L)	Location 604 (MW-604) 9/19/05 (µg/L)	Location 605 (MW-605) 9/19/05 (µg/L)	Adak Background Concentration (µg/L)	Endpoint Criterion
	Alaska Cleanup Level 18 AAC 75.345 ^a (µg/L)									
Volatile Organic Compounds^b										
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	7
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	None
1,4-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	75
Chlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	100
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	70
Tetrachloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	5
trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	100
Trichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	5
Semivolatile Organic Compounds^b										
Bis(2-ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	6
Total Inorganics										
Arsenic	7.86	6.51	0.54 J	0.57 J	1.2	0.92 J	3.62	7.05	13.3	50
Barium	13.6	7.72	3.4	3.19	5.6	1.39	3.71	64.3	54.4	2,000
Dissolved Inorganics										
Arsenic	4.83	6.3	0.49 J	0.54 J	0.72 J	0.63 J	1.76	3.56 J	2	50
Barium	12.9	2.8	1.52	2.8	3.34	1.04	1.68	57.8	45.2	2,000

Table 3-1 (Continued)
Summary of Groundwater Analytical Results at Metals Landfill, September 2005

^aCleanup levels shown are applicable if groundwater is a source of drinking water at the site. A concentration equal to 10 times the concentration shown may be used if Alaska Department of Environmental Conservation determines groundwater is not a current source of drinking water.

^bIn accordance with the comprehensive monitoring plan for Adak, groundwater samples were not analyzed for volatile organic compounds or semivolatile organic compounds in 2005. Groundwater samples are analyzed for these chemicals every other year. Therefore, groundwater samples will be analyzed for these chemicals during 2006.

Notes:

Bolded value exceeds the Adak background concentration.

AAC - Alaska Administrative Code

J - estimated value

µg/L - microgram per liter

NA - not applicable

**Table 3-2
 Summary of Exceedances of Background or Endpoint Criteria in Groundwater at
 Metals Landfill, September 2005**

Target Analyte	Location 401 (MW13-1) 9/19/05 (µg/L)	Location 402 (MW13-2) 9/19/05 (µg/L)	Location 403 (MW13-3) 9/19/05 (µg/L)	Location 404 (MW13-4) 9/19/05 (µg/L)	Location 405 (MW13-5) 9/19/05 (µg/L)	Location 603 (MW-603) 9/19/05 (µg/L)	Location 604 (MW-604) 9/19/05 (µg/L)	Location 605 (MW-605) 9/19/05 (µg/L)	Adak Background Concentration (µg/L)	Endpoint Criterion Alaska Cleanup Level 18 AAC 75.345 ^a (µg/L)
	Total Inorganic Compounds									
Barium	13.6	7.72	3.4	3.19	5.6	1.39	3.71	64.3	54.4	2000
Dissolved Inorganics										
Arsenic	4.83	6.3	0.49 J	0.54 J	0.72 J	0.63 J	0.176	3.56 J	2	50
Barium	12.9	2.8	1.52	2.3	3.34	1.04	1.68	57.8	45.2	2000

^aCleanup levels shown are applicable if groundwater is a source of drinking water at the site. A concentration equal to 10 times the concentration shown may be used if Alaska Department of Environmental Conservation determines groundwater is not a current source of drinking water.

Notes:

Bolded value exceeds the Adak background concentration.

AAC - Alaska Administrative Code

J - estimated value

µg/L - microgram/liter

4.0 WHITE ALICE LANDFILL

4.1 BACKGROUND

The White Alice Landfill (SWMUs 18/19) is located in the vicinity of an abandoned quarry west of the downtown area and is comprised of the former South Sector Drum Disposal Area and the Quarry Metal Disposal Area. The South Sector Drum Disposal Area was located at the base of the abandoned quarry. Approximately twenty 55-gallon drums were disposed of on low-lying tundra. The drums were heavily rusted and were most likely deposited during the 1940s. There is no information on the contents of the drums, or any other history available (U.S. Navy 2001c). The Quarry Metal Disposal Area was a small scrap metal disposal area located in the abandoned quarry. Scrap metal, including material from demolition of Quonset huts, has been placed on the floor of the quarry. The disposal area was active from 1980 to 1985. No information was available on the history of any contaminant releases at the site (U.S. Navy 2001c).

Once combined to form the White Alice Landfill, the areas received construction waste into the 1990s. In 1997, the landfill was closed according to the State of Alaska's solid waste regulations (18 AAC 60). Closure entailed placement of a landfill cover, grading and contouring, surface water/erosion controls, access restrictions in the form of a sign and a gate, and a vegetative cover according to Alaska solid waste landfill closure requirements (18 AAC 60).

4.2 SAMPLING HISTORY RELATED TO CLOSURE MONITORING

Groundwater and surface water has been sampled at the White Alice Landfill periodically since March 1996. To date, 12 sampling events have occurred from 1996 through 2004 (see Table 1-2). Sampling at the White Alice Landfill has consisted of four quarterly rounds and eight annual rounds of sampling at two monitoring wells and three surface water seeps. The quarterly sampling rounds were completed in March, June, September, and October of 1996. Eight annual sampling rounds were subsequently completed in December 1997, June 1998, September 1999, November 2000, September 2001, October 2002, October 2003, and September 2004. 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 (Appendix E), 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 the EPA concurred, and the changes were incorporated into the CMP, Revision 2. The analytical results

FINAL ANNUAL LANDFILL MONITORING REPORT
OU A, Former Adak Naval Complex
Naval Facilities Engineering Command Northwest
Contract No. N44255-05-D-5100
Delivery Order 0008

Section 4.0
Revision No.: 0
Date: 05/31/06
Page 4-2

from the sampling conducted at White Alice Landfill from 1996 through 2004 are presented in Appendix E. The locations where samples were collected during the historical sampling events are shown on Figure 4-1.

LEGEND

- 25 Elevation Contour (ft Above MLLW)
- Road
- Fence
- Landfill Boundary
- Monitoring Well
- Surface Water Sample Location
- 00-000 Sampling Location



U.S. NAVY

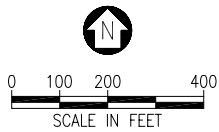


Figure 4-1
Sampling Locations at SWMUs 18/19, White Alice Landfill

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

5.0 ROBERTS LANDFILL

5.1 BACKGROUND

Roberts Landfill (SWMU 25) is located approximately 1 mile southwest of the downtown area, Adak Island, Alaska. The landfill covers approximately 15 acres. The landfill operated from the early 1950s until 1972 and from 1975 until 2002. During the initial operation, wastes managed included sanitary trash, metal debris, batteries, solvents, waste paints, and construction rubble. From 1975 until closure at the end of 2002, the landfill only accepted sanitary trash. Roberts Landfill is unlined (U.S. Navy 2001c).

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 applied for and received approval for closure from Alaska DEC at the end of 2002 (U.S. Navy 2002).

5.2 SAMPLING HISTORY RELATED TO CLOSURE MONITORING

Groundwater and surface water has been sampled at the Roberts Landfill periodically since March 1996. To date, 13 sampling events have occurred from 1996 through 2005 (see Table 1-2). Sampling at Roberts Landfill has consisted of four quarterly rounds and eight annual rounds of sampling at four monitoring wells and five surface water seeps. The quarterly sampling rounds were completed in March, June, September, and October of 1996. Nine annual sampling rounds were subsequently completed in December 1997, June 1998, September 1999, November 2000, September 2001, October 2002, October 2003, September 2004, and September 2005. The analytical results from the sampling conducted at Roberts Landfill from 1996 through 2005 are summarized in Appendix E.

In 2005, samples were analyzed for the following target analytes in surface water and groundwater as specified in the CMP, Revision 2 (U.S. Navy 2005b):

- Ethenes
- BTEX
- Aluminum
- Priority pollutant total metals antimony, arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc

5.3 DISCUSSION OF RESULTS

During the 2005 landfill monitoring event, surface water and groundwater samples were collected at the Roberts Landfill as specified in the CMP, Revision 2 (U.S. Navy 2005b) and sent to the laboratory for analysis. The locations where samples were collected during this sampling event are shown on Figure 5-1. Field logbooks are provided in Appendix A, and the field sampling parameters collected during sampling are included in Appendix D. A summary of the analytical results from the 2005 sampling event and the endpoint criteria are provided for surface water and groundwater in Tables 5-1 and 5-2, respectively. These tables provide analytical results for the target analytes as defined in the CMP, Revision 2. The analytical results for all analytes are provided in Appendix F.

Analytical results for surface water and groundwater were compared to the endpoint criteria presented in Appendix F of the CMP, Revision 2 (U.S. Navy 2005b). In addition, analytical results for inorganics in groundwater were compared to Adak background concentrations, where established. Analytical results that exceeded the endpoint criteria or the Adak background concentrations are summarized in Tables 5-3 and 5-4.

Visual inspections of the groundwater monitoring wells at Roberts Landfill were also completed during the groundwater sampling event. All wells were functional at the time of inspection. A summary of the well inspections is provided in Appendix B. Inspections relative to institutional controls were conducted during the 2005 monitoring event and are reported in a separate report by the sampling contractor.

5.3.1 Surface Water

Surface water samples were collected from five locations (RLSW01, RLSW02, RLSW03, RLSW04, and RLSW05) and analyzed for VOCs (EPA Method 8260B), TIN (EPA Methods 6020/7470A), DIN (EPA Methods 6020/7470A), and WQPs, including inorganic ions (EPA Method 300.0), total Kjeldahl nitrogen (EPA Method 351.2), ammonia (EPA

Method 350.1), alkalinity (EPA Method SM 2320B), chemical oxygen demand (EPA Method 410.4), and total dissolved solids (EPA Method 160.1).

Two surface water samples were collected from the water diversion channels on either side of the landfill. RLSW01 is located within the diversion channel just before it exits the fenced area of the landfill at the northeastern corner. RLSW02 is located in the diversion channel that runs along the eastern edge of the landfill at the most upgradient point where free-flowing water existed. The third sample was collected at RLSW03, from a small pond fed by a stream that flows from the eastside of the landfill, daylighting behind the old Veterans of Foreign Wars building. A fourth sample was collected from RLSW04, which is within the stream east of the landfill, across Happy Valley Road. The fifth surface water sample was collected from RLSW05 at the mouth of Mitt Creek where it flows into Mitt Lake. The sampling locations are shown on Figure 5-1.

A summary of the analytical results from the 2005 sampling event and the endpoint criteria are provided for surface water in Table 5-1. As previously discussed, this table provides analytical results for the target analytes as defined in the CMP, Revision 2 (U.S. Navy 2005b). The analytical results for all 2005 analytes are provided in Appendix F. Analytical results that exceeded the endpoint criteria are summarized in Table 5-3. Analytical results for VOCs, TIN, and DIN in the surface water samples collected at the Roberts Landfill are discussed below.

Volatile Organic Compounds

No VOCs included on the target analyte list for the Roberts Landfill were detected in the samples collected in September of 2005. VOCs not on the target analyte list were not detected in the samples collected in September of 2005 (see Appendix F).

Inorganic Analytes

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 RLSW03 and RLSW05 at concentrations of 122 and 32.5 µg/L, both of which are above the endpoint criterion of 12 µg/L. The endpoint criterion for copper 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 limit for total silver exceeded the aquatic life Alaska Water Quality Standards (0.12 µg/L). The reporting limit for total mercury exceeded both the aquatic life (0.012 µg/L) and the human health (0.15 µg/L) Alaska Water Quality Standards, and the reporting limit for dissolved mercury exceeded the human health Alaska Water Quality Standard (0.15 µg/L).

Total aluminum has been measured in surface water samples from 1997 to 2005 (Appendix E). The Alaska DEC *Water Quality Manual for Toxic and Other Deleterious Organic and Inorganic Substances* Table III (Aquatic Life Criteria for Fresh Waters) specifies acute and chronic maximum concentrations of 750 and 87 µg/L for aluminum in fresh water. Surface water samples from RLSW03 have been greater than both the chronic and acute maximum concentrations since 1997. Aluminum concentrations at this location have shown a steady decrease from 13,100 µg/L in 1997 to 1,160 µg/L in 2005. Surface water samples collected from location RLSW05 between 1997 and 2005 have not contained total aluminum greater than the chronic freshwater maximum concentration of 87 µg/L. Surface water samples from locations RLSW01, RLSW02, and RLSW04 have not contained total aluminum at concentrations greater than the chronic maximum concentration since at least 2002.

Water Quality Parameters

Total alkalinity was measured in surface water samples at concentrations ranging from an estimated 0.68 to 85.5 mg/L. Chemical oxygen demand was measured in surface water samples at concentrations ranging from an estimated 4.59 to 11.5 mg/L. Sulfate was measured in surface water samples at concentrations ranging from 11.4 to 65.9 mg/L. Total dissolved solids were measured in surface water samples at concentrations ranging from 80 to 148 mg/L. Total Kjeldahl nitrogen was measured in surface water samples at concentrations ranging from an estimated 0.133 mg/L to an estimated 0.331 mg/L. Ammonia nitrogen was not measured at concentrations greater than the practical quantitation limit of 50 µg/L in all but one of the five 2005 surface water samples. Ammonia nitrogen was measured at an estimated concentration of 21.2 µg/L in the sample from location RLSW01. 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.

5.3.2 Groundwater

Groundwater samples were collected from four monitoring wells (A-2, A-3, A-5, and B-1) and were analyzed for VOCs (EPA Method 8260B), TIN (EPA Methods 6020/7470A), DIN (EPA Methods 6020/7470A), and WPQs, including inorganic ions (EPA Method 300.0), total Kjeldahl nitrogen (EPA Method 351.2), ammonia (EPA Method 350.1), alkalinity (EPA Method SM 2320B), chemical oxygen demand (EPA Method 410.4), and total dissolved solids (EPA Method 160.1). Three wells (A-3, A-5, and B-1) are located downgradient along the east flank of the Roberts Landfill. Well A-2 is located downgradient of the west flank of the landfill. All groundwater sampling locations are shown on Figure 5-1.

A summary of the analytical results from the 2005 sampling event and the endpoint criteria are provided for groundwater in Table 5-2. As previously discussed, this table provides analytical results for the target analytes as defined in the CMP, Revision 2 (U.S. Navy 2005b). The analytical results for all 2005 analytes are provided in Appendix F. Analytical results that exceeded the endpoint criteria are summarized in Table 5-4. Analytical results for VOCs, TIN, and DIN in the groundwater samples collected at the Roberts Landfill are discussed below.

Volatile Organic Compounds

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 (see Appendix F). Naphthalene and trichlorofluoromethane were detected at concentrations of 1.44 µg/L (estimated) and 2.33 µg/L, respectively. There is no endpoint criterion established for trichlorofluoromethane, and the estimated concentration of naphthalene did not exceed the endpoint criterion of 700 µg/L.

Inorganics

No dissolved inorganics or total inorganics included on the target analyte list for the Roberts Landfill were detected above the endpoint criteria. One of the 13 total inorganics 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 of 198 µg/L, which is above the Adak background concentration of 69.5 µg/L.

Total aluminum has been measured in groundwater samples from 1997 to 2005 (Appendix E). Endpoint criteria have not been established for aluminum in groundwater. Total aluminum concentrations in groundwater samples from wells A-1, A-5, and B-1 have generally decreased from 1997 to 2005. Total aluminum concentrations in groundwater samples from well A-3 have increased from 860 µg/L in 1997 to 153,000 µg/L in 2003 and decreased to 2,140 µg/L in 2005.

Water Quality Parameters

Total alkalinity was measured in groundwater samples at concentrations ranging from undetected at a reporting limit of 5 mg/L to 107 mg/L. Chemical oxygen demand was measured in groundwater samples at concentrations ranging from an estimated 3.48 to 7.09 mg/L. Sulfate was measured in groundwater samples at concentrations ranging from 38.4 to 61.9 mg/L. Total dissolved solids were measured in groundwater samples at concentrations ranging from 100 to 221 mg/L. Total Kjeldahl nitrogen was measured in surface water samples at concentrations ranging from an estimated 0.257 mg/L to undetected at 0.5 mg/L. Ammonia nitrogen was not

measured at concentrations greater than the practical quantitation limit of 50 µg/L in all four 2005 groundwater samples. 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.

5.4 CONCLUSIONS

The analytical data for the period 2001 through 2005 were reviewed for the compounds included on the target analyte list. No compounds that are not included on the target analyte list exceeded the endpoint criteria. The purpose of the analysis of the recent historical data is to determine if trends exist in the concentration data for the Roberts Landfill.

5.4.1 Surface Water

Volatile Organic Compounds

No VOCs included on the target analyte list for the Roberts Landfill were detected in the samples collected in September 2005. In addition, none of the target analytes were detected during the 2001, 2002, 2003, and 2004 sampling events.

Inorganics

One inorganic (copper) on the target analyte list for the Roberts Landfill was detected at concentrations greater than the endpoint criterion at two locations during the 2005 sampling event. In addition, total copper was detected at concentrations above the endpoint criterion at two locations during the 2001, 2002, 2003, and 2004 sampling events. Total zinc was detected during 2002 and 2003 at concentrations greater than the endpoint criterion at one location. It was not detected above the endpoint criterion during the 2004 or 2005 sampling events. All of the other inorganics included on the target analyte list for the Roberts Landfill were either not detected, or detected at concentrations less than the endpoint criteria. However, the reporting limits for total arsenic exceeded the endpoint criterion in 2001; total and dissolved mercury exceeded the endpoint criterion in 2001, 2002, 2003, 2004, and 2005; and total silver exceeded the endpoint criterion in 2001, 2002, 2003, 2004, and 2005. Total aluminum concentrations in surface water have been greater than the chronic maximum fresh water aquatic life concentration at one location (RLSW03) since 1997. However, these concentrations have been consistently decreasing since 1997.

5.4.2 Groundwater

Volatile Organic Compounds

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 during 2005. In addition, none of the target analytes were detected during the 2001, 2002, 2003, and 2004 sampling events.

Inorganics

No dissolved inorganics or total inorganics included on the target analyte list for the Roberts Landfill were detected above the endpoint criteria during 2005. However, copper was detected at a concentration above the Adak background concentration in the groundwater sample collected from well A-3 during 2005. Concentrations of copper during 2001 through 2004 were also above the Adak background concentration in the groundwater sample collected from well A-3. In addition, three of the total inorganics included on the target analyte list—chromium, lead, and nickel—were detected above the endpoint criteria in the groundwater sample collected from one location during the 2003 sampling event. These were not detected above the endpoint criteria during the 2001, 2002, 2004, and 2005 sampling events.

Total aluminum has been measured in groundwater samples from 1997 to 2005 (Appendix E). Endpoint criterion have not been established for aluminum in groundwater. Total aluminum concentrations in groundwater samples from wells A-3, A-5, and B-1 have generally decreased from 1997 to 2003. Total aluminum concentrations in groundwater samples from well A-3 have increased from 860 µg/L in 1997 to 153,000 µg/L in 2003, and decreased to 2,140 µg/L in 2005.

5.5 RECOMMENDATIONS

5.5.1 Surface Water

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.

5.5.2 Groundwater

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 exceedances of endpoint criteria in 2003 for three inorganics and exceedances of Adak background concentrations for copper from 2001 through 2005. Total aluminum concentrations in groundwater samples from wells A-3, A-5, and B-1 have generally decreased from 1997 to 2005. Total aluminum concentrations in groundwater samples from well A-3 have increased from 1997 to 2003 and decreased from 2003 to 2005.

LEGEND

-  25 Elevation Contour (ft Above MLLW)
-  Road
-  Fence
-  Landfill Boundary
-  Monitoring Well
-  Surface Water Sample Location
-  00-000 Sampling Location



Note: Wells in Housing Area Not Shown.

U.S. NAVY

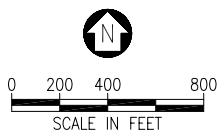


Figure 5-1
Sampling Locations at SWMU 25, Roberts Landfill

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

Table 5-1
Summary of Surface Water Analytical Results at Roberts Landfill, September 2005

Target Analyte	Location 301 (RLSW01) 9/17/05 (µg/L)	Location 302 (RLSW02) 9/17/05 (µg/L)	Location 303 (RLSW03) 9/17/05 (µg/L)	Location 304 (RLSW04) 9/17/05 (µg/L)	Location 305 (RLSW05) 9/17/05 (µg/L)	Endpoint Criterion	
						Alaska Water Quality Standards, 18 AAC 70 ^a	
						Aquatic Life (µg/L)	Human Health (Organisms Only) (µg/L)
Volatile Organic Compounds							
1,1-Dichloroethene	1 U	1 U	1 U	1 U	1 U	None	320 ^b
Benzene	1 U	1 U	1 U	1 U	1 U	None	710 ^b
cis-1,2-Dichloroethene	1 U	1 U	1 U	1 U	1 U	None	None
Ethylbenzene	1 U	1 U	1 U	1 U	1 U	None	3,280
m,p-Xylenes	2 U	2 U	2 U	2 U	2 U	None	None
o-Xylenes	1 U	1 U	1 U	1 U	1 U	None	None
Tetrachloroethene	1 U	1 U	1 U	1 U	1 U	None	88.5 ^b
Toluene	1 U	1 U	1 U	1 U	1 U	None	424,000
trans-1,2-Dichloroethene	1 U	1 U	1 U	1 U	1 U	None	None
Trichloroethene	1 U	1 U	1 U	1 U	1 U	None	810 ^b
Total Inorganics							
Antimony	1 U	1 U	1 U	0.263 J	1 U	None	45,000
Arsenic	0.546 J	0.508 J	1 U	1 U	1 U	None	1.4 ^b
Beryllium	1 U	1 U	1 U	1 U	1 U	None	None
Cadmium	1 U	1 U	0.06 J	1 U	1 U	1.1 ^c	None

Table 5-1 (Continued)
Summary of Surface Water Analytical Results at Roberts Landfill, September 2005

Target Analyte	Location 301 (RLSW01) 9/17/05 (µg/L)	Location 302 (RLSW02) 9/17/05 (µg/L)	Location 303 (RLSW03) 9/17/05 (µg/L)	Location 304 (RLSW04) 9/17/05 (µg/L)	Location 305 (RLSW05) 9/17/05 (µg/L)	Endpoint Criterion	
						Alaska Water Quality Standards, 18 AAC 70 ^a	
						Aquatic Life (µg/L)	Human Health (Organisms Only) (µg/L)
Total Inorganics (Continued)							
Chromium	1 U	1 U	1 U	1 U	1 U	210 ^{c,d}	None
Copper	1.92 J	2.95	122	2.71	32.5	12 ^c	None
Lead	1 U	0.318 J	0.337 J	0.224 J	1 U	3.2 ^c	None
Mercury	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.012	0.15
Nickel	2 U	2 U	3.05	2 U	0.993 J	160 ^c	100
Selenium	2 U	2 U	2 U	2 U	2 U	5	None
Silver	1 U	1 U	1 U	1 U	1 U	0.12	None
Thallium	1 U	1 U	1 U	1 U	1 U	None	48
Zinc	50.8	5 U	14.6	5 U	7.76 J	110 ^c	None
Dissolved Inorganics							
Antimony	1 U	1 U	1 U	0.211 J	1 U	None	45,000
Arsenic	1 U	1 UJ	1 U	1 U	1 U	190	1.4 ^b
Beryllium	1 U	1 U	1 U	1 U	1 U	None	None
Cadmium	1 U	1 U	0.1 U	1 U	1 U	None	None
Chromium	1 U	1 U	1 U	1 U	1 U	None	None

Table 5-1 (Continued)
Summary of Surface Water Analytical Results at Roberts Landfill, September 2005

Target Analyte	Location 301 (RLSW01) 9/17/05 (µg/L)	Location 302 (RLSW02) 9/17/05 (µg/L)	Location 303 (RLSW03) 9/17/05 (µg/L)	Location 304 (RLSW04) 9/17/05 (µg/L)	Location 305 (RLSW05) 9/17/05 (µg/L)	Endpoint Criterion	
						Alaska Water Quality Standards, 18 AAC 70 ^a	
						Aquatic Life (µg/L)	Human Health (Organisms Only) (µg/L)
Dissolved Inorganics (Continued)							
Copper	1.68 J	2.93	120	2.15	28.8	None	None
Lead	1 U	1 U	0.367 J	1 UJ	1 U	None	None
Mercury	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	None	0.15
Nickel	2 U	2 U	3.03	2 U	1.01 J	None	100
Selenium	2 U	2 U	2 U	2 U	2 U	None	None
Silver	1 U	1 U	1 U	1 U	1 U	None	None
Thallium	1 U	1 U	1 U	1 U	1 U	None	48
Zinc	48.1	5 U	13	5 U	5 U	None	None

^aCriterion existing in 18 AAC 70 when Record of Decision for Operable Unit A and landfills were signed (Changes to some of these criteria were adopted in an 18 AAC 70 amendment on March 24, 2003, but these changes are not shown in this table.)

^bHuman health criteria for carcinogens come from U.S. Environmental Protection Agency promulgation of human health criteria for carcinogens for Alaska at the 10⁻⁵ risk level in the National Toxics Rule (40 Code of Federal Regulations 131.36), in accordance with on-line Alaska Department of Environmental Conservation guidance at <www.state.ak.us/dec/dawq/wqs/documents/carcinogens.htm>, accessed April 10, 2003.

^cAt 100 milligram per liter hardness

^dValue provided is for chromium III. The criterion for chromium VI is 11µg/L.

Notes:

Bolded value exceeds the endpoint criterion.

FINAL ANNUAL LANDFILL MONITORING REPORT
Former Adak Naval Complex
Naval Facilities Engineering Command Northwest
Contract No. N44255-05-D-5100
Delivery Order 0008

Section 5.0
Revision No.: 0
Date: 05/31/06
Page 5-13

Table 5-1 (Continued)
Summary of Surface Water Analytical Results at Roberts Landfill, September 2005

AAC - Alaska Administrative Code
J - estimated value
 $\mu\text{g/L}$ - microgram per liter
U - not detected, value shown is the reporting limit

**Table 5-2
 Summary of Groundwater Analytical Results at
 Roberts Landfill, September 2005**

Target Analyte	Location 320 (A-2) 9/17/05 (µg/L)	Location 307 (A-3) 9/17/05 (µg/L)	Location 308 (A-5) 9/17/05 (µg/L)	Location 306 (B-1) 9/17/05 (µg/L)	Adak Background Concentration (µg/L)	Endpoint Criterion
						Alaska Cleanup Level 18 AAC 60 (µg/L)
Volatile Organic Compounds						
1,1-Dichloroethene	1 U	1 U	1 U	1 U	NA	7
Benzene	1 U	1 U	1 U	1 U	NA	5
cis-1,2-Dichloroethene	1 U	1 U	1 U	1 U	NA	70
Ethylbenzene	1 U	1 U	1 U	1 U	NA	700
m,p-Xylenes	2 U	2 U	2 U	2 U	NA	10,000 ^a
o-Xylenes	1 U	1 U	1 U	1 U	NA	10,000 ^a
Tetrachloroethene	1 U	1 U	1 U	1 U	NA	5
Toluene	1 U	1 U	1 U	1 U	NA	1,000
trans-1,2-Dichloroethene	1 U	1 U	1 U	1 U	NA	100
Trichloroethene	1 U	1 U	1 U	1 U	NA	5
Total Inorganics						
Antimony	1 U	1 U	1 U	1 U	NE	6
Arsenic	2.7	1 U	0.939 J	0.576 J	13.3	50
Beryllium	1 U	1 U	1 U	1 U	NE	4
Cadmium	1 U	0.18	1 U	0.08 J	8.3	5
Chromium	1 U	3.18	1 U	1 U	9.4	100
Copper	2.31	198	0.891 J	31.9	69.5	1,300
Lead	0.229 J	0.443 J	1 U	1 U	11.8	15
Mercury	0.2 U	0.2 U	0.2 U	0.2 U	NE	2
Nickel	2.64	2.68	1.63 J	4.16	NE	100
Selenium	2 U	2 U	2 U	2 U	NE	50
Silver	1 U	1 U	1 U	1 U	NE	180
Thallium	1 U	1 U	1 U	1 U	NE	2
Zinc	5.72 J	9.18 J	5.71	19.5	320	11,000
Dissolved Inorganics						
Antimony	1 U	1 U	1 U	1 U	6.2	6
Arsenic	1.87	1 U	1 U	1 U	2	50
Beryllium	1 U	1 U	1 U	1 U	NE	4

Table 5-2 (Continued)
Summary of Groundwater Analytical Results at
Roberts Landfill, September 2005

Target Analyte	Location 320 (A-2) 9/17/05 (µg/L)	Location 307 (A-3) 9/17/05 (µg/L)	Location 308 (A-5) 9/17/05 (µg/L)	Location 306 (B-1) 9/17/05 (µg/L)	Adak Background Concentration (µg/L)	Endpoint Criterion
						Alaska Cleanup Level 18 AAC 60 (µg/L)
Dissolved Inorganics (Continued)						
Cadmium	0.1 U	0.1 U	0.1 U	0.1 U	4.8	5
Chromium	1 U	1 U	1 U	1 U	NE	100
Copper	2 U	220	2 U	31.1	NE	1,300
Lead	1 U	1 U	1 U	1 U	NE	15
Mercury	0.2 U	0.2 U	0.2 U	0.2 U	NE	2
Nickel	2.58	2.16	1.85 J	4.11	37.6	100
Selenium	2 U	2 U	2 U	2 U	NE	50
Silver	1 U	1 U	1 U	1 U	NE	180
Thallium	1 U	1 U	1 U	1 U	NE	2
Zinc	5 U	6.78 J	5.36 J	16.8	25.4	11,000

^aValue is for total xylenes.

Notes:

Bolded value exceeds the Adak background concentration.

AAC - Alaska Administrative Code

J - estimated value

µg/L - microgram per liter

NA - not applicable

NE - not established

U - not detected; value shown is the reporting limit

Table 5-3
Summary of Exceedances of Endpoint Criteria in Surface Water at Roberts Landfill, September 2005

Target Analyte	Location 301 (RLSW01) 9/17/05 (µg/L)	Location 302 (RLSW02) 9/17/05 (µg/L)	Location 303 (RLSW03) 9/17/05 (µg/L)	Location 304 (RLSW04) 9/17/05 (µg/L)	Location 305 (RLSW05) 9/17/05 (µg/L)	Endpoint Criterion	
						Alaska Water Quality Standards, 18 AAC 70 ^a	
						Aquatic Life (µg/L)	Human Health (Organisms Only) (µg/L)
Total Inorganics							
Copper	1.92 J	2.95	122	2.71	32.5	12 ^b	None
Mercury	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.012	0.15
Silver	1 U	1 U	1 U	1 U	1 U	0.12	None
Dissolved Inorganics							
Mercury	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	None	0.15

^aCriteria existing in 18 AAC 70 when Record of Decision for Operable Unit A and landfills were signed (Changes to some of these criteria were adopted in an 18 AAC 70 amendment on March 24, 2003, but these changes are not shown in this table.)

^bAt 100 milligrams per liter hardness

Notes:

Bolded value exceeds the endpoint criterion.

AAC - Alaska Administrative Code

J - estimated value

µg/L - microgram per liter

U - not detected; value shown is the reporting limit

Table 5-4
Summary of Exceedances of Endpoint Criteria in Groundwater
at Roberts Landfill, September 2005

Target Analyte	Location 320	Location 307	Location 308	Location 306	Adak Background Concentration (µg/L)	Endpoint Criterion
	(A-2) 9/17/05 (µg/L)	(A-3) 9/17/05 (µg/L)	(A-5) 9/17/05 (µg/L)	(B-1) 9/17/05 (µg/L)		Alaska Cleanup Level 18 AAC 60 (µg/L)
Total Inorganics						
Copper	2.31	198	0.891 J	31.9	69.5	1,300

Notes:

Bolded value exceeds the Adak background concentration.

AAC - Alaska Administrative Code

J - estimated value

µg/L - microgram per liter

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