

## 26.0 SWMU 62, NEW HOUSING FUEL LEAK

This section presents the results of groundwater sampling performed at the SWMU 62, New Housing Fuel Leak site during September 2005. The remedy specified for this site in the OU A ROD is free-product recovery (U.S. Navy, Alaska DEC, and USEPA 2000). The post-free-product recovery remedy for this site has yet to be determined (U.S. Navy 2004). A decision on the post-free-product recovery remedy for this site is planned for 2006. To comply with requirements specified for this remedy, the Navy has conducted periodic groundwater monitoring at two locations (03-155 and MW134-11) at the site. Monitoring was switched from well 03-619 to well MW134-11 between 2004 and 2005 as part of the CMP, Revision 2 (U.S. Navy 2005a). Groundwater samples are collected from these wells to evaluate groundwater quality relative to Alaska groundwater cleanup levels (18 AAC 75.345). On September 22, 2005, groundwater samples were collected from wells 03-155 and MW134-11 and subsequently analyzed for DRO, GRO, and BTEX.

Figure 26-1 shows the locations of the monitoring wells relative to existing structures at the site. Both wells were installed downgradient from a known petroleum-release source area within the Sandy Cove Housing area to evaluate the downgradient extent of petroleum-related chemicals dissolved in groundwater. These wells are located approximately 1,200 feet (03-155) and 1,700 feet (MW134-11) upgradient from Sweeper Cove, the closest downgradient surface water body.

The following sections present field and laboratory data resulting from monitoring activities conducted at this site, a comparison of target analyte concentration data to endpoint criteria specified in Section 4, trend evaluation analyses for target analyte concentration data obtained since 1999, conclusions based on these analyses, and recommendations for future monitoring activities at the site.

### 26.1 FIELD MEASUREMENTS

Field measurements were recorded in the field logbooks during monitoring well purging activities. These field measurements include depth to groundwater, free-product thickness, and physical groundwater parameters. The physical groundwater parameters consisted of pH, specific conductance, turbidity, DO, temperature, salinity, and ORP. Table 26-1 lists the final field measurements recorded at each monitoring well prior to sample collection. Appendix A provides copies of the field logbooks containing field measurements recorded during well purging activities at this site. A review of the field measurement data reported for this site indicates that all groundwater parameters stabilized to within the criteria specified by the CMP, Revision 2 (U.S. Navy 2005a) prior to sample collection.

Depth to water and product thickness were measured in the monitored wells during the 2005 event. These measurements are summarized in Appendix F.

## **26.2 NATURAL ATTENUATION MONITORING**

Based on data collected prior to the 2005 sampling event and summarized in the 2004 report (U.S. Navy 2005b), natural attenuation of dissolved petroleum hydrocarbons has been demonstrated at this site and NAPs were not monitored during the 2005 event. The CMP, Revision 2, requires collection of NAP data once every 5 years, with the next NAP sampling scheduled for 2009.

## **26.3 TARGET ANALYTE RESULTS**

The groundwater samples collected from monitoring locations 03-155 and MW134-11 were submitted to an analytical laboratory for selected analyses. The samples were analyzed for DRO according to Method AK 102.0, GRO according to Method AK 101.0, and BTEX according to EPA Method 8260B. Table 26-2 presents results of these analyses.

DRO was reported at a concentration of 2,070  $\mu\text{g/L}$  in the 2005 sample from well 03-155, which is greater than the cleanup level of 1,500  $\mu\text{g/L}$ . GRO and BTEX compounds were not detected in the 2005 sample from well 03-155 at concentrations above their respective PQLs. DRO concentrations have increased at well 03-155 from 750  $\mu\text{g/L}$  in 2003 to 2,070  $\mu\text{g/L}$ . GRO and BTEX concentrations have remained below their respective PQLs in groundwater samples collected from this well in 2003, 2004, and 2005.

DRO was reported at a concentration of 3,500  $\mu\text{g/L}$  in the 2005 sample from well MW134-11, which is also greater than the cleanup level. GRO and BTEX compounds were not measured in the 2005 sample from well MW134-11 at concentrations above their respective cleanup levels. DRO concentrations have decreased at well MW134-11 from 7,450  $\mu\text{g/L}$  in 2001 to 3,500  $\mu\text{g/L}$  in 2005. GRO and BTEX concentrations were below their respective cleanup levels in the 2001 and 2005 samples collected from this well.

The analytical results obtained for these locations from 2001 through 2005 are summarized in Appendix D. Laboratory forms presenting the 2005 results are provided in Appendix E.

## 26.4 TREND EVALUATION

The purpose of this evaluation is to determine whether increasing or decreasing concentration trends could be statistically verified for site-specific target analytes. The trend evaluation was limited to the target analytes for which laboratory-reported concentrations exceeded endpoint criteria during either of the last two sampling events and where there were at least four data points.

Trend evaluations were not conducted on DRO concentration data from wells 03-155 and MW134-11, because only three monitoring events have been conducted at these locations since 1999, and a minimum of four are required for the evaluation. Trend evaluations were not conducted on GRO and BTEX concentration data for wells 03-155 and MW134-11, because these analytes have not been measured at concentrations greater than the cleanup levels in samples collected since 1999.

Data to be used for future trend evaluations for this site are summarized in Table 26-3.

## 26.5 CONCLUSIONS

This section presents the conclusions based on a review of analytical results obtained for groundwater samples collected at the SWMU 62, New Housing Fuel Leak site between 1999 and 2005. The conclusions are as follows:

- Field measurements recorded during 2005 well purging indicate that groundwater parameters stabilized to within the criteria specified by the CMP, Revision 2 (U.S. Navy 2005a) prior to sample collection.
- DRO concentrations remain above the cleanup level in groundwater samples collected from wells 03-155 and MW134-11.
- GRO and BTEX concentrations remain below cleanup levels in groundwater samples collected from wells 03-155 and MW134-11.
- GRO and BTEX concentrations have reached their monitoring endpoints at well 03-155.
- An insufficient number of data points are available to conduct trend evaluations for DRO concentration data at the wells monitored at this site in 2005.

## **26.6 RECOMMENDATIONS**

Although GRO and BTEX concentrations have met their monitoring endpoint criteria at well 03-155, the post-free-product recovery remedy at this site is yet to be determined. In addition, DRO concentrations in groundwater at both locations monitored in 2005 remain above the cleanup level. For these reasons, it is recommended that annual monitoring be continued as prescribed in the CMP, Revision 2 (U.S. Navy 2005a).

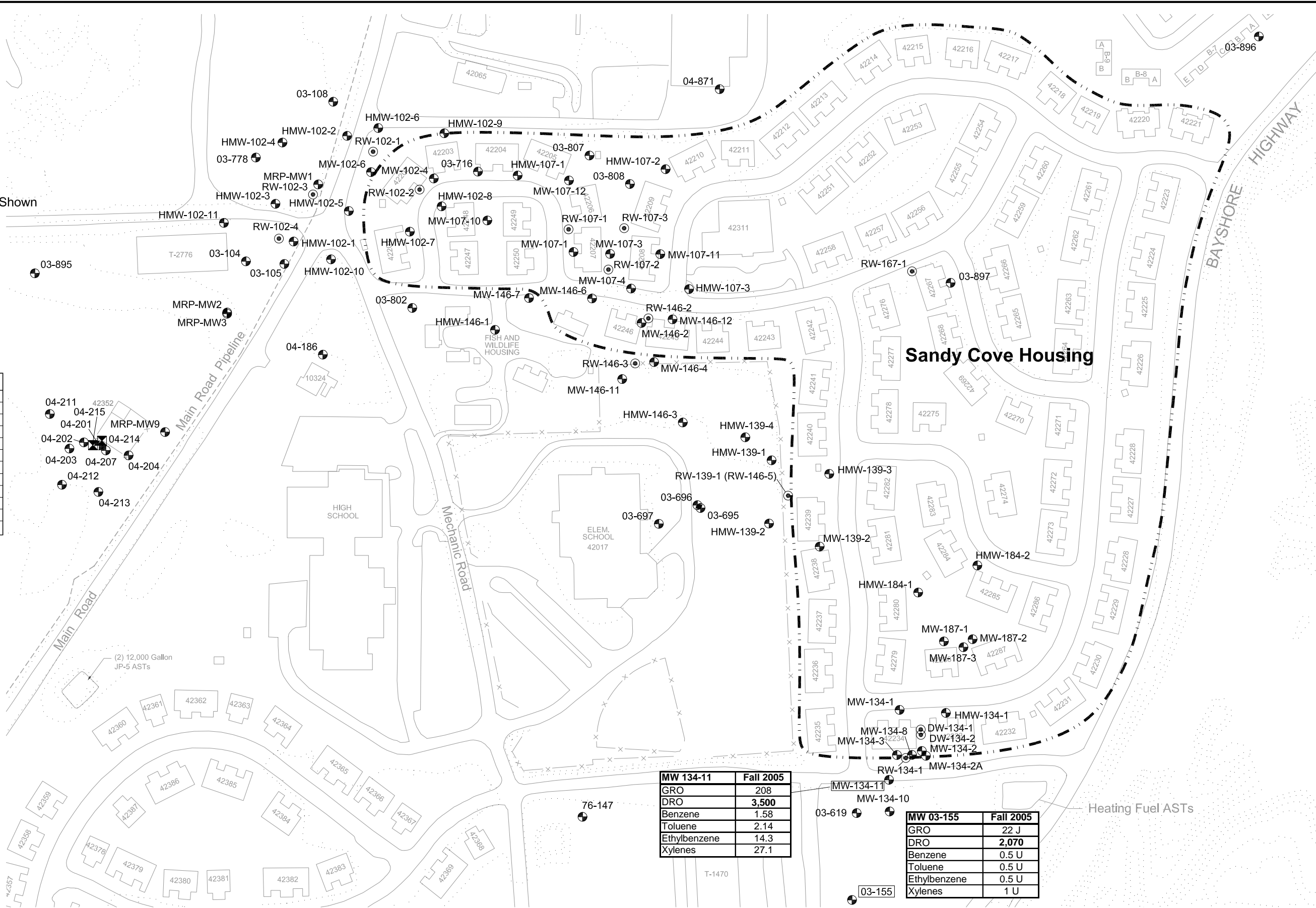
**Legend**

- 25 --- Elevation Contour (ft Above MLLW)
- - - Limits of Sandy Cove Housing Area
- ⊕ Monitoring Well
- ⊗ Geoprobe Well
- ⊙ Recovery Well
- 00-000 Well to be Sampled Annually
- U Not Detected at the Value Shown
- J Estimated Value

**Notes:**

1. Concentrations in micrograms per liter (ug/L).
2. Bolded Value is Exceedance of Endpoint Criterion.

Endpoint Criteria	
GRO	1,300 ug/L
RRO	1,100 ug/L
DRO	1,500 ug/L
Benzene	5 ug/L
Toluene	1,000 ug/L
Ethylbenzene	700 ug/L
Xylenes	10,000 ug/L
Lead-Dissolved	15 ug/L
Lead-Total	15 ug/L
Methylene Chloride	5 ug/L
Tetrachloroethene	5 ug/L
bis(2-Ethylhexyl)phthalate	6 ug/L

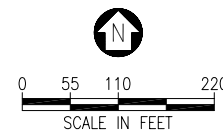


MW 134-11	Fall 2005
GRO	208
DRO	<b>3,500</b>
Benzene	1.58
Toluene	2.14
Ethylbenzene	14.3
Xylenes	27.1

MW 03-155	Fall 2005
GRO	22 J
DRO	<b>2,070</b>
Benzene	0.5 U
Toluene	0.5 U
Ethylbenzene	0.5 U
Xylenes	1 U

**U.S. NAVY**

Delivery Order 0008  
Adak Island, AK  
ANNUAL MONITORING  
REPORT



**Figure 26-1**  
**SWMU 62, New Housing Fuel Leak**  
**(Sandy Cove Housing)**

**Table 26-1**  
**2005 Field Measurements for SWMU 62, New Housing Fuel Leak**

Well Location	Physical Measurements				Groundwater Parameters						
	Casing Elevation (foot MLLW)	Depth to Water (foot BTOC)	Groundwater Surface Elevation (foot MLLW)	Measured Product Thickness (foot)	pH (SU)	Specific Conductance (mS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Temperature (°C)	Salinity (%)	ORP (mV)
03-155	26.27	19.11	7.16	0	6.61	0.270	32.9	6.1	7.7	0	19
MW134-11	23.35	18.22	5.13	0	6.86	0.687	54	5.3	7.9	0	-24

Notes:

The reported casing elevation is the surveyed elevation resident within the Navy Installation Restoration Information Management System (IRIMS) database.

The last groundwater parameter measurement prior to sample collection is reported.

BTOC- below top of casing

°C - degree Celsius

mg/L - milligram per liter

MLLW - mean lower low water

mS/cm - milliSiemens per centimeter

mV - millivolts

NTU - nephelometric turbidity unit

ORP - oxidization-reduction potential

SU - standard unit

SWMU - solid waste management unit

**Table 26-2**  
**Analytical Results for Petroleum-Related Chemicals for**  
**SWMU 62, New Housing Fuel Leak**

Well Location	Date	DRO (µg/L)	GRO (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Total Xylenes (µg/L)
03-155	2001	NP	NP	NP	NP	NP	NP
	2002	NP	NP	NP	NP	NP	NP
	2003	750	43 J	2 U	2 U	2 U	4 U
	2004	<b>1,660</b>	61.5 UJ	0.5 U	0.5 U	0.5 U	1 U
	2005	<b>2,070</b>	22 J	0.5 U	0.5 U	0.5 U	1 U
MW134-11	2001	<b>7,450</b>	214	3.56	1.24	14.3	34.1
	2002	NP	NP	NP	NP	NP	NP
	2003	NP	NP	NP	NP	NP	NP
	2004	NP	NP	NP	NP	NP	NP
	2005	<b>3,500</b>	208	1.58	2.14	14.3	27.1
Alaska DEC Cleanup Level		1,500	1,300	5	1,000	700	10,000

Notes:

**Bold** indicates reported concentration is greater than Alaska Department of Environmental Conservation (DEC) groundwater cleanup level for groundwater used as a drinking water source.

DRO - diesel-range organics

GRO - gasoline-range organics

J - estimated value

µg/L - microgram per liter

NP - not planned

SWMU - solid waste management unit

U - analyte not detected at specified quantitation limit

UJ - not detected at estimated value shown

**Table 26-3**  
**Concentration Trend Evaluation for SWMU 62, New Housing Fuel Leak**

Well ID	Target Analyte	Exceeds Endpoint Criteria <sup>a</sup>	Highest Concentration Last Two Sampling Periods (µg/L)	Endpoint Criteria <sup>a</sup> (µg/L)	Sampling Periods (n)	Mann-Kendall Statistic (s)	Mann-Kendall Probability (p)	Statistically Significant Trend	Sen Median Slope	Lower Limit Slope (80% Confidence)	Upper Limit Slope (80% Confidence)
03-155	DRO	Yes	2,070	1,500	3	Insufficient number of data points to complete trend evaluation					
	GRO	No	61.5 UJ	1,300	3	Meet endpoint criteria; 2 consecutive results below endpoint criteria					
	Benzene	No	0.5 U	5	3						
	Ethylbenzene	No	0.5 U	700	3						
	Toluene	No	0.5 U	1,000	3						
	Total xylenes	No	1 U	10,000	3						
MW134-11	DRO	No	3,500	1,500	2	Insufficient number of data points to complete trend evaluation					
	GRO	No	208	1,300	2						
	Benzene	No	1.58	5	2						
	Ethylbenzene	No	2.14	700	2						
	Toluene	No	14.3	1,000	2						
	Total xylenes	No	37.1	10,000	2						

<sup>a</sup>Endpoint criteria are the Alaska Department of Environmental Conservation (DEC) groundwater cleanup levels established for groundwater used as a drinking water source.

Notes:

Mann-Kendall probability (p) greater than 0.05; Sen slopes were not calculated.

DRO - diesel-range organics

GRO - gasoline-range organics

FINAL ANNUAL GROUNDWATER MONITORING REPORT  
OU A, Former Naval Complex, Adak  
U.S. Navy, Engineering Field Activity, Northwest  
Contract No. N44255-05-D-5100  
Delivery Order No. 0008

Section 26.0  
Revision No.: 0  
Date: 05/31/06  
Page 26-10

**Table 26-3 (Continued)**  
**Concentration Trend Evaluation for**  
**SWMU 62, New Housing Fuel Leak**

J - estimated value  
µg/L - microgram per liter (parts per billion)  
SWMU - solid waste management unit  
U - analyte not detected at specified quantitation limit  
UJ - not detected at estimated value shown

## **27.0 TANKER SHED, UST 42494**

This section presents the results of groundwater sampling performed at the Tanker Shed, UST 42494 site during September 2005. The remedy specified for this site in the OU A ROD is free-product recovery (U.S. Navy, Alaska DEC, and USEPA 2000). The Navy and Alaska DEC have selected free-product recovery and MNA with institutional controls as the post-free-product recovery remedy for this site (U.S. Navy and Alaska DEC 2005). To comply with requirements specified for this remedy, the Navy conducts periodic groundwater monitoring at five locations (04-175, 04-290, 04-306, 04-601, and TS-01) at the site. Well TS-01 is designated as a surface water protection monitoring location. An additional well will be installed at the site in the future (designated 04-602) that will also serve as a surface water protection monitoring location. Groundwater samples are collected from these wells to evaluate groundwater quality relative to Alaska groundwater cleanup levels (18 AAC 75.345) and to verify that natural attenuation is occurring. On September 10, 2005, groundwater samples were collected from these wells for DRO, GRO, and BTEX analyses.

Figure 27-1 shows the locations of the monitored wells relative to site features. Well 04-175 is the most upgradient well and is positioned within a former UST excavation. Wells 04-306, 04-290, 04-601, and TS-01 are positioned approximately 70, 230, 450, and 660 feet, respectively, downgradient of well 04-175.

The following subsections present field and laboratory data resulting from monitoring activities conducted at this site, a comparison of target analyte concentration data to endpoint criteria specified in Section 4, trend evaluation analyses for target analyte concentration data obtained since 1999, conclusions based on these analyses, and recommendations for future monitoring activities at the site.

### **27.1 FIELD MEASUREMENTS**

Field measurements were recorded in the field logbooks during monitoring well purging activities. These field measurements include depth to groundwater, free-product thickness, and physical groundwater parameters. The physical groundwater parameters consisted of pH, specific conductance, turbidity, DO, temperature, salinity, and ORP. Table 27-1 lists the final field measurements recorded at each monitoring well prior to sample collection. Appendix A provides copies of the field logbooks containing field measurements recorded during well purging activities at this site. A review of the field measurement data reported for this site indicates that all groundwater parameters stabilized to within the criteria specified by the CMP, Revision 2 (U.S. Navy 2005a) prior to sample collection.

Depth-to-water and product thickness measurements were collected from 16 wells at the site during the 2005 monitoring. These measurements are summarized in Appendix F. TS-02 is a well reportedly located upgradient of the Tanker Shed Building. However, the field crew was unable to locate this well during the 2005 monitoring. The field crew identified a bentonite plug in the area where the well was reported to be, suggesting that this well has been either damaged or abandoned. Product was measured in well 04-309 at a thickness of 0.49 foot. Approximately 2.5 gallons of product were recovered from this well. Product was not measured in any of the other wells monitored at the site. Depth to water ranged from 6.61 to 10.51 feet BTOC. Groundwater flows to the west across the site, with an average gradient of approximately 0.003.

## **27.2 NATURAL ATTENUATION MONITORING**

Based on data collected prior to the 2005 sampling event and summarized in the 2004 report (U.S. Navy 2005b), natural attenuation of dissolved petroleum hydrocarbons has been demonstrated at this site and NAPs were not monitored during the 2005 event. The CMP, Revision 2, requires collection of NAP data once every 5 years, with the next NAP sampling scheduled for 2009.

## **27.3 TARGET ANALYTE RESULTS**

The groundwater samples collected from wells 04-175, 04-290, 04-306, 04-601, and TS-01 were submitted to an analytical laboratory for DRO analysis according to Method AK 102.0, GRO analysis according to the Method AK 101.0, and BTEX analysis according to EPA Method 8260B. Table 27-2 summarizes results of these analyses.

DRO was measured at concentrations greater than the cleanup level of 1,500 µg/L in the 2005 groundwater samples from wells 04-175 (an estimated 7,080 µg/L), 04-290 (an estimated 2,890 µg/L), 04-306 (an estimated 2,500 µg/L), and 04-601 (2,850 µg/L).

DRO concentrations have decreased in groundwater at 04-175 from 16,900 µg/L in 2001 to 7,080 µg/L in 2005. DRO concentrations have also decreased in groundwater at 04-290 from 9,220 µg/L in 2001 to an estimated 2,890 µg/L in 2005. The 2005 groundwater sample from well 04-306 is the only sample collected from this well during 2001 to 2005. DRO concentrations have fluctuated in groundwater at 04-601 from 1,000 µg/L in 2003 to 2,850 µg/L in 2005. Overall there has been an increase of DRO concentrations in groundwater at this well from 2,620 µg/L in 2001 to 2,850 µg/L in 2005.

GRO was measured in the 2005 sample from well 04-306 at a concentration of 1,460 µg/L, which is greater than the cleanup level of 1,300 µg/L. None of the other samples collected from the site in 2005 contained GRO at a concentration greater than the cleanup level. BTEX constituents were not measured at concentrations greater than their respective cleanup levels in any of the 2005 groundwater samples from this site

DRO, GRO, and BTEX constituents have not been detected in groundwater samples from surface water protection well TS-01 at concentrations greater than their respective PQLs or cleanup levels.

The analytical results obtained for these locations from 1999 through 2005 are summarized in Appendix D. Laboratory forms presenting the 2005 results are provided in Appendix E.

#### **27.4 TREND EVALUATION**

The purpose of this evaluation is to determine whether increasing or decreasing concentration trends could be statistically verified for site-specific target analytes. The trend evaluation was limited to the target analytes for which laboratory-reported concentrations exceeded endpoint criteria during either of the last two sampling events and where there were at least four data points.

Trend evaluations were not conducted for DRO, GRO, and BTEX concentration data at wells 04-175, 04-290, and 04-306, because these wells have been sampled only two to three times since 1999, and a minimum of four data points are required to conduct the trend evaluations. A trend evaluation was conducted for DRO concentration data from well 04-601, but was not conducted for GRO and BTEX concentration data from this well, because these analytes have met the monitoring endpoint criteria. Trend evaluations were not conducted for DRO, GRO and BTEX concentration data from well TS-01, because these analytes have met the monitoring endpoint criteria.

Results of trend evaluations performed for this site are summarized in Table 27-3. The trend evaluation conducted for target analytes at the Tanker Shed, UST 42494 site uses concentration data obtained during previous sampling periods 1999 through 2005. Concentrations of target analytes in historical groundwater samples obtained from this site used for trend evaluations are presented in Appendix D.

The nonparametric Mann-Kendall test was used to determine whether target analyte concentrations are decreasing, increasing, or remaining constant over time. For this test, all chemical concentration trends are assumed to equal zero, signifying that no statistically

significant trend is present. The calculated Mann-Kendall statistic ( $s$ ) is a measure of relative concentration change over time. A positive value represents more increasing concentrations than decreasing concentrations during the trend evaluation period. A negative value represents more decreasing concentrations than increasing concentrations during the trend evaluation period. A zero value represents an equal number of increasing and decreasing concentrations during the trend evaluation period (no concentration change). However, the Mann-Kendall statistic ( $s$ ) is considered to be statistically significant only if the Mann-Kendall probability ( $p$ ) is less than the critical value of 0.05. If the ( $p$ ) value is less than 0.05, the null hypothesis of no trend is rejected, and the alternative hypothesis that the concentration trend is significantly different from zero is accepted.

A Mann-Kendall statistic ( $s$ ) of 15 was calculated for DRO concentration data from well 04-601 (Table 27-3). This indicates a potentially upward concentration trend. A Mann-Kendall probability ( $p$ ) estimated for the DRO data (0.015) is less than 0.05. This indicates that the null hypothesis (no statistically significant trend) is rejected, and the upward trend hypothesis is accepted. Because the trend is upward, the slope of the concentration was not calculated, and the evaluation was terminated at this point.

DRO concentrations reported in groundwater samples from monitoring location 04-601 appear to be increasing over time, and this trend is statistically significant.

## 27.5 CONCLUSIONS

This section presents conclusions based on a review of analytical results obtained for groundwater samples collected at the Tanker Shed, UST 49424 site between 1999 and 2005. The conclusions are as follows:

- Field measurements recorded during 2005 well purging indicate that groundwater parameters stabilized to within the specified criteria prior to sample collection.
- DRO was measured at concentrations greater than the cleanup level of 1,500  $\mu\text{g/L}$  in four of the five monitored wells: 04-175 (7,080  $\mu\text{g/L}$ ), 04-290 (2,890  $\mu\text{g/L}$ ), 04-306 (2,500  $\mu\text{g/L}$ ), and 04-601 (2,850  $\mu\text{g/L}$ ).
- GRO was measured at a concentration greater than the cleanup level of 1,300  $\mu\text{g/L}$  in one of the four monitored wells: 04-306 (1,460  $\mu\text{g/L}$ ).
- BTEX constituents were not measured at concentrations greater than the cleanup levels in any of the monitored wells.

- Target analytes DRO, GRO, and BTEX have not been measured at concentrations greater than the cleanup levels in the 2003, 2004, and 2005 groundwater samples from surface water protection well TS-01. These results indicate that the downgradient surface water body is not threatened by current site conditions.
- A trend evaluation of the DRO concentration data from well 04-601 indicates a statistically significant increasing DRO concentration trend.

## **27.6 RECOMMENDATIONS**

Because DRO and GRO concentrations remain in groundwater at concentrations greater than their respective cleanup levels, annual monitoring should continue as prescribed in the CMP, Revision 2, (U.S. Navy 2005a).

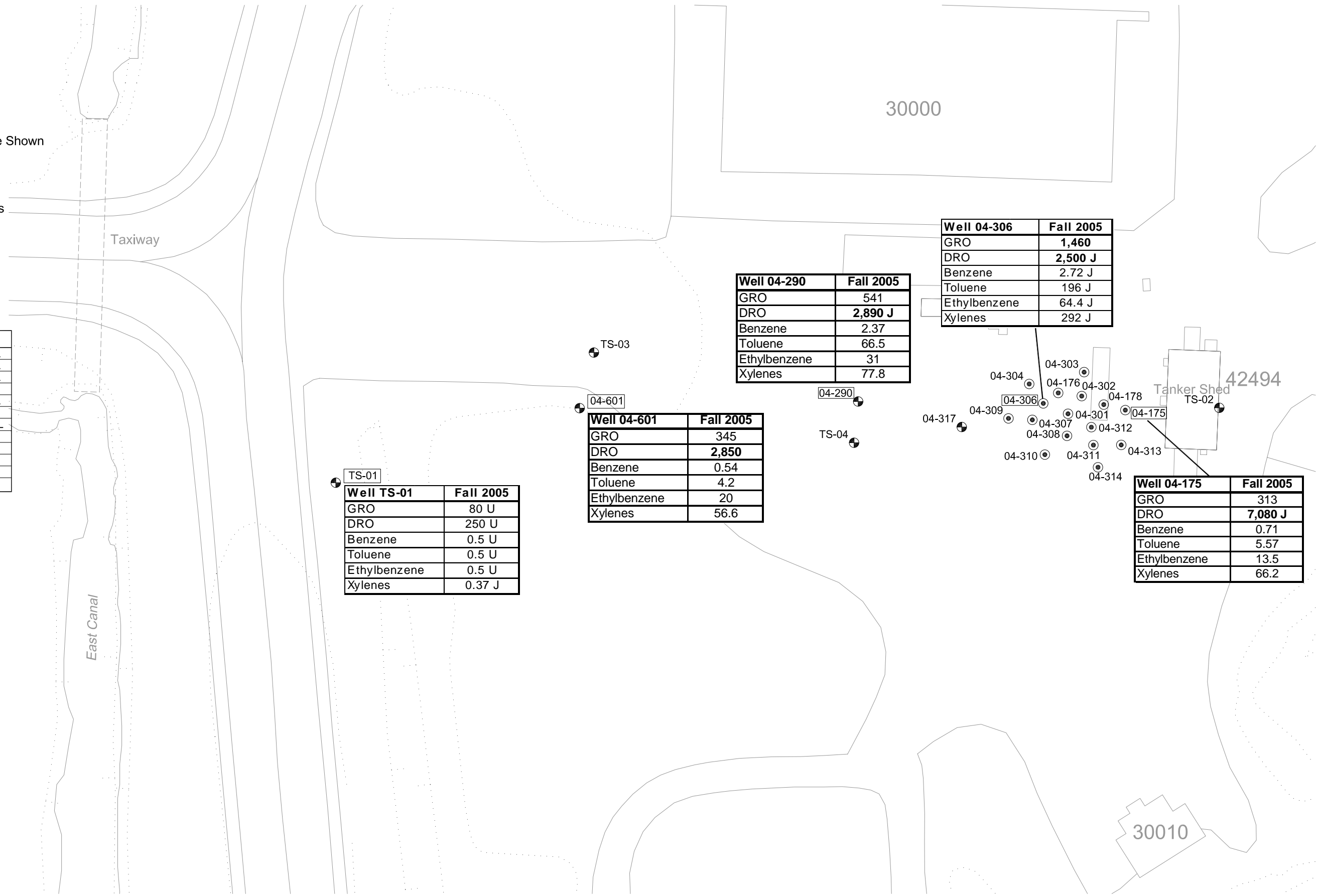
**Legend**

- 25 Elevation Contour (ft Above MLLW)
- Monitoring Well
- Recovery Well
- Well to be Sampled Annually
- U Not Detected at the Value Shown
- J Estimated Value

**Notes:**

1. Concentrations in micrograms per liter (ug/L).
2. Bolded Value is Exceedance of Endpoint Criterion.
3. The location of well TS-01 is estimated.

Endpoint Criteria	
GRO	1,300 ug/L
RRO	1,100 ug/L
DRO	1,500 ug/L
Benzene	5 ug/L
Toluene	1,000 ug/L
Ethylbenzene	700 ug/L
Xylenes	10,000 ug/L
Lead-Dissolved	15 ug/L
Lead-Total	15 ug/L
Methylene Chloride	5 ug/L
Tetrachloroethene	5 ug/L
bis(2-Ethylhexyl)phthalate	6 ug/L



Well TS-01		Fall 2005	
GRO	80	U	
DRO	250	U	
Benzene	0.5	U	
Toluene	0.5	U	
Ethylbenzene	0.5	U	
Xylenes	0.37	J	

Well 04-601		Fall 2005	
GRO	345		
DRO	<b>2,850</b>		
Benzene	0.54		
Toluene	4.2		
Ethylbenzene	20		
Xylenes	56.6		

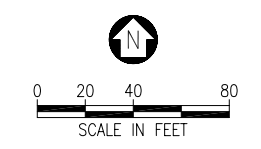
Well 04-290		Fall 2005	
GRO	541		
DRO	<b>2,890 J</b>		
Benzene	2.37		
Toluene	66.5		
Ethylbenzene	31		
Xylenes	77.8		

Well 04-306		Fall 2005	
GRO	<b>1,460</b>		
DRO	<b>2,500 J</b>		
Benzene	2.72	J	
Toluene	196	J	
Ethylbenzene	64.4	J	
Xylenes	292	J	

Well 04-175		Fall 2005	
GRO	313		
DRO	<b>7,080 J</b>		
Benzene	0.71		
Toluene	5.57		
Ethylbenzene	13.5		
Xylenes	66.2		

**U.S. NAVY**

Delivery Order 0008  
Adak Island, AK  
ANNUAL MONITORING  
REPORT



**Figure 27-1  
Tanker Shed  
UST 42494**

**Table 27-1  
 2005 Field Measurements for Tanker Shed, UST 42494**

Well Location	Physical Measurements				Groundwater Parameters						
	Casing Elevation (foot MLLW)	Depth to Water (foot BTOC)	Groundwater Surface Elevation (foot MLLW)	Measured Product Thickness (foot)	pH (SU)	Specific Conductance (mS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Temperature (°C)	Salinity (%)	ORP (mV)
04-175	11.34	6.91	4.43	0	6.10	0.427	4	0	9.66	0	-95
04-290	11.19	7.40	3.79	0	6.28	0.304	23	0	8.89	0	-92
04-306	11.17	7.48	3.69	0	6.17	0.295	66	0.57	9.09	0	-84
04-601	13.72	10.51	3.21	0	6.18	0.314	11	0.91	8.48	0	-33
TS-01	11.40	9.32	2.08	0	6.18	0.273	0	15.5	10.24	0	108

Notes:

The reported casing elevation is the surveyed elevation resident within the Navy Installation Restoration Information Management System (IRIMS) database.

The last groundwater parameter measurement prior to sample collection is reported.

BTOC - below top of casing

°C - degree Celsius

mg/L - milligram per liter

MLLW - mean lower low water

mS/cm - milliSiemens per centimeter

mV - millivolt

NTU - nephelometric turbidity unit

ORP – oxidization-reduction potential

SU - standard unit

UST - underground storage tank

**Table 27-2**  
**Analytical Results for Petroleum-Related Chemicals for**  
**Tanker Shed, UST 42494**

Well Location	Date	DRO (µg/L)	GRO (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Total Xylenes (µg/L)
04-175	2001	<b>16,900</b>	316	1.44	6	20.8	64.8
	2002	NP	NP	NP	NP	NP	NP
	2003	NP	NP	NP	NP	NP	NP
	2004	NP	NP	NP	NP	NP	NP
	2005	<b>7,080 J</b>	313	0.71	5.57	13.5	66.2
04-290	2001	<b>9,220</b>	<b>3,190</b>	<b>29.6 J</b>	753 J	142 J	504 J
	2002	NP	NP	<b>6.8</b>	294	82.4	250.2
	2003	NP	NP	NP	NP	NP	NP
	2004	NP	NP	NP	NP	NP	NP
	2005	<b>2,890 J</b>	541	2.37	66.5	31	77.8
04-306	2001	NP	NP	NP	NP	NP	NP
	2002	NP	NP	NP	NP	NP	NP
	2003	NP	NP	NP	NP	NP	NP
	2004	NP	NP	NP	NP	NP	NP
	2005	<b>2,500 J</b>	<b>1,460</b>	2.72 J	196 J	64.4 J	292 J
04-601	2001	<b>2,620 J</b>	132	<b>13.3</b>	1.51	7.9	15.7 J
	2002	<b>2,600</b>	570	<b>10.4</b>	22	54	130
	2003	1,000	160	3.3	2 U	8.3	9.8
	2004	<b>2,520</b>	619	0.56	1.74	29.4	72.6
	2005	<b>2,850</b>	345	0.54	4.2	20	56.6
TS-01	2001	240	50 U	2 U	0.5 U	0.5 U	1 U
	2002	NS	NS	NS	NS	NS	NS
	2003	73 J	11 J	2 U	2 U	2 U	4 U
	2004	87.9 J	80 U	0.5 U	0.5 U	0.5 U	1 U
	2005	250 U	80 U	0.5 U	0.5 U	0.5 U	0.37 J
Alaska DEC Cleanup Level		1,500	1,300	5	1,000	700	10,000

Notes:

**Bold** indicates reported concentration is greater than Alaska Department of Environmental Conservation (DEC) groundwater cleanup level for groundwater used as a drinking water source.

**Table 27-2 (Continued)**  
**Analytical Results for Petroleum-Related Chemicals for**  
**Tanker Shed, UST 42494**

DRO - diesel-range organics  
GRO - gasoline-range organics  
J - estimated value  
 $\mu\text{g/L}$  - microgram per liter (parts per billion)  
NS - not sampled  
U - analyte not detected at specified practical quantitation limit  
UST - underground storage tank

**Table 27-3  
 Concentration Trend Evaluation for Tanker Shed, UST 42494**

Well ID	Target Analyte	Exceeds Endpoint Criteria <sup>a</sup>	Highest Concentration Last Two Sampling Periods (µg/L)	Endpoint Criteria <sup>a</sup> (µg/L)	Sampling Periods (n)	Mann-Kendall Statistic (s)	Mann-Kendall Probability (p)	Statistically Significant Trend	Sen Median Slope	Lower Limit Slope (80% Confidence)	Upper Limit Slope (80% Confidence)
04-175	DRO	Yes	7,080 J	1,500	2	Insufficient number of data points to complete trend evaluation					
	GRO	No	313	1,300	2						
	Benzene	No	0.71	5	2						
	Toluene	No	5.57	1,000	2						
	Ethylbenzene	No	13.5	700	2						
	Xylenes	No	66.2	10,000	2						
04-290	DRO	Yes	2,890 J	1,500	2	Insufficient number of data points to complete trend evaluation					
	GRO	No	541	1,300	2						
	Benzene	No	2.37	5	3						
	Toluene	No	66.5	1,000	3						
	Ethylbenzene	No	31	700	3						
	Xylenes	No	77.8	10,000	3						
04-306	DRO	Yes	2,500 J	1,500	2	Insufficient number of data points to complete trend evaluation					
	GRO	Yes	1,460	1,300	2						
	Benzene	No	2.72 J	5	2						
	Toluene	No	196 J	1,000	2						
	Ethylbenzene	No	64.4 J	700	2						

**Table 27-3 (Continued)**  
**Concentration Trend Evaluation for Tanker Shed, UST 42494**

Well ID	Target Analyte	Exceeds Endpoint Criteria <sup>a</sup>	Highest Concentration Last Two Sampling Periods (µg/L)	Endpoint Criteria <sup>a</sup> (µg/L)	Sampling Periods (n)	Mann-Kendall Statistic (s)	Mann-Kendall Probability (p)	Statistically Significant Trend	Sen Median Slope	Lower Limit Slope (80% Confidence)	Upper Limit Slope (80% Confidence)
04-601	Xylenes	No	292 J	10,000	2						
	DRO	Yes	2,850	1,500	6	15	0.015	Yes (Up)	NC	NC	NC
	GRO	No	619	1,300	6	Meet endpoint criteria; 2 consecutive results below endpoint criteria					
	Benzene	No	0.56	5	6						
	Toluene	No	4.2	1,000	6						
	Ethylbenzene	No	29.4	700	6						
TS-01	Xylenes	No	72.6	10,000	6						
	DRO	No	250U	1,500	3	Meet endpoint criteria; 2 consecutive results below endpoint criteria					
	GRO	No	10J	1,300	3						
	Benzene	No	2U	5	3						
	Toluene	No	2U	1,000	3						
	Ethylbenzene	No	2U	700	3						
	Xylenes	No	2U	10,000	3						

<sup>a</sup>Endpoint criteria are the Alaska Department of Environmental Conservation (DEC) groundwater cleanup levels established for groundwater used as a drinking water source.

**Table 27-3 (Continued)**  
**Concentration Trend Evaluation for Tanker Shed, UST 42494**

Notes:

Mann-Kendall probability (p) greater than 0.05; Sen slopes were not calculated.

DRO - diesel-range organics

GRO - gasoline-range organics

J - estimated value

µg/L - microgram per liter (parts per billion)

NC - not calculated

U - analyte not detected at specified practical quantitation limit

UST - underground storage tank

## 28.0 YAKUTAT HANGAR, UST T-2039-A

This section presents the results of groundwater sampling performed at the Yakutat Hangar, UST T-2039-A site during September 2005. The remedy specified for this site in the OU A ROD is free-product recovery (U.S. Navy, Alaska DEC, and USEPA 2000). The Navy and Alaska DEC have selected limited groundwater monitoring as the post-free-product recovery remedy for this site (U.S. Navy and Alaska DEC 2005). To comply with requirements specified for this remedy, the Navy initiated periodic groundwater monitoring at six locations (05-221, 05-244, 05-250, 05-389, 05-801, and MW-2) at the site in 2005. Monitoring is conducted at wells 05-389 and 05-801 for surface water protection purposes. The downgradient water body is South Sweeper Creek. Groundwater samples are collected from these wells to evaluate groundwater quality relative to 10 times the Alaska groundwater cleanup levels (18 AAC 75.345) and to verify that concentrations of target analytes are decreasing. The *Final Decision Document for Petroleum Sites with No Unacceptable Risk* (U.S. Navy and Alaska DEC 2005) specifies that groundwater at this site is not reasonably expected to be a potential future source of drinking water. On September 18, 19, and 20, 2005, groundwater samples were collected from these wells for DRO analyses.

Figure 28-1 shows the location of the monitoring wells relative to potential source areas at the site and the downgradient surface water body, South Sweeper Creek. Well 05-244 is located near the northwest corner of Yakutat Hangar (T-2039). Well 05-250 is located approximately 60 feet east (cross-gradient) of well 05-244. Well MW-2 is located approximately 70 feet north-northwest (downgradient) of well 05-244 and is positioned in a product recovery trench. Well 05-221 is located approximately 170 feet north (downgradient) of well 05-244. Wells 05-389 and 05-801 are located approximately 325 feet north (downgradient) and 420 feet north-northeast (downgradient and cross-gradient) of well 05-244, respectively.

The following sections present field and laboratory data resulting from monitoring activities conducted at this site, a comparison of target analyte concentration data to endpoint criteria specified in Section 4, trend evaluation analyses for target analyte concentration data obtained since 1999, conclusions based on these analyses, and recommendations for future monitoring activities at the site.

### 28.1 FIELD MEASUREMENTS

Field measurements were recorded in the field logbooks during monitoring well purging activities. These field measurements include depth to groundwater, free-product thickness, and physical groundwater parameters. The physical groundwater parameters consisted of pH,

specific conductance, turbidity, DO, temperature, salinity, and ORP. Table 28-1 lists the final field measurements recorded at each monitoring well prior to sample collection. Appendix A provides copies of the field logbooks containing field measurements recorded during well purging activities at this site. A review of the field measurement data reported for this site indicates that all groundwater parameters stabilized to within the criteria specified by the CMP, Revision 2 (U.S. Navy 2005a) prior to sample collection.

Depth-to-groundwater and product thickness measurements were collected from 11 wells at the site. These measurements are summarized in Appendix F. Product was not observed at the site. Depth to water ranged from 1.13 to 6.63 feet BTOC. Groundwater flow across the site is generally to the north-northeast, with an average hydraulic gradient of approximately 0.009.

## **28.2 TARGET ANALYTE RESULTS**

The groundwater samples collected from wells 05-221, 05-244, 05-250, 05-389, 05-801, and MW-2 were submitted to an analytical laboratory for DRO analysis according to Method AK 102.0. Table 28-2 summarizes results of these analyses.

DRO was not measured in any of the groundwater samples collected from the site at a concentration greater than the cleanup level of 15,000 µg/L.

The analytical results obtained for these locations from 1999 through 2005 are summarized in Appendix D. Laboratory forms presenting the 2005 results are provided in Appendix E.

## **28.3 TREND EVALUATION**

Since DRO has not been measured at concentrations above their respective PQL and or the Alaska DEC cleanup level in groundwater samples from the monitored wells, trend evaluations were not performed on the 1999 through 2005 results from any of the wells monitored in 2005.

A summary of the data to be used in future trend evaluations is provided in Table 28-3.

## **28.4 CONCLUSIONS**

This section presents conclusions based on a review of analytical results obtained for groundwater samples collected at the Yakutat Hangar, UST T-2039-A site between 1999 and 2005. The conclusions are as follows:

- Field measurements recorded during 2005 well purging indicate that groundwater parameters stabilized to within the specified criteria prior to sample collection.
- DRO was not measured at a concentration greater than the cleanup level of 15,000µg/L in any of the wells monitored at the site in 2005.
- Petroleum hydrocarbons have not migrated in groundwater to the surface water protection points.

## **28.5 RECOMMENDATIONS**

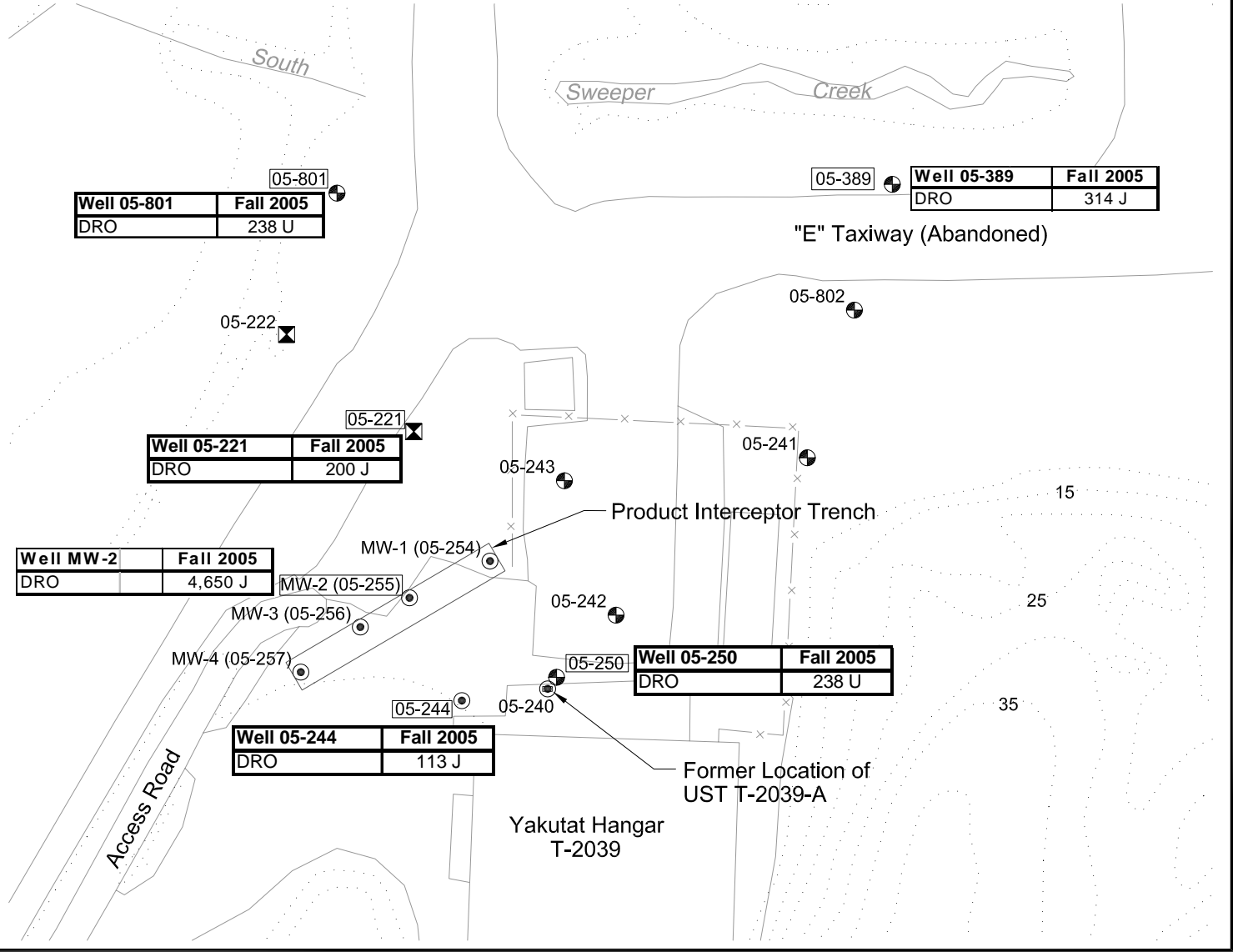
Monitoring should be continued at this site as prescribed in the CMP, Revision 2 (U.S. Navy 2005a). If DRO is not measured at a concentration greater than the cleanup level of 15,000 µg/L during the 2006 monitoring event, the site would be eligible for “No Further Action” consideration.

**Legend**

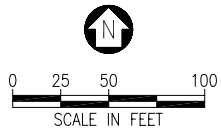
- 25 --- Elevation Contour (ft Above MLLW)
- ⊕ Monitoring Well
- ⊗ Geoprobe Well
- ⊙ Recovery Well
- 00-000 Well to be Sampled Annually
- U Not Detected at the Value Shown
- J Estimated Value

**Note:**  
Concentrations in micrograms per liter (ug/L).

Endpoint Criteria	
GRO	13,000 ug/L
RRO	11,000 ug/L
DRO	15,000 ug/L
Benzene	50 ug/L
Toluene	10,000 ug/L
Ethylbenzene	7,000 ug/L
Xylenes	100,000 ug/L



**U.S. NAVY**



**Figure 28-1  
Yakutat Hangar  
UST T-2039-A**

Delivery Order 0008  
Adak Island, AK  
ANNUAL MONITORING  
REPORT

**Table 28-1  
 2005 Field Measurements for Yakutat Hangar, UST T-2039-A**

Well Location	Physical Measurements				Groundwater Parameters						
	Casing Elevation (foot MLLW)	Depth to Water (foot BTOC)	Groundwater Surface Elevation (foot MLLW)	Measured Product Thickness (foot)	pH (SU)	Specific Conductance (mS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Temperature (°C)	Salinity (%)	ORP (mV)
05-221	13.26	4.26	9.00	0	6.28	0.320	4	0	10.08	0	-75
05-244	12.47	1.69	10.78	0	6.70	0.189	120	0	8.59	0	-120
05-250	11.91	1.42	10.49	0	6.63	0.230	55	0	8.47	0	-57
05-389	13.47	6.63	6.84	0	6.69	0.239	0	0	11.19	0	-115
05-801	12.75	3.31	9.44	0	6.51	0.188	2	2.02	7.33	0	131
MW-2	38.14	1.66	36.48	0	6.56	0.341	10	0	10.64	0	-96

Notes:

The reported casing elevation is the surveyed elevation resident within the Navy Installation Restoration Information Management System (IRIMS) database.

The last groundwater parameter measurement prior to sample collection is reported.

BTOC - below top of casing

°C - degree Celsius

mg/L - milligram per liter

MLLW - mean lower low water

mS/cm - milliSiemens per centimeter

mV - millivolt

NTU - nephelometric turbidity unit

ORP - oxidization-reduction potential

SU - standard unit

UST - underground storage tank

**Table 28-2  
 Analytical Results for DRO for  
 Yakutat Hangar, UST T-2039-A**

Well Location	Date	DRO (µg/L)
05-221	2001	NP
	2002	430
	2003	NP
	2004	NP
	2005	200 J
05-244	2001	NP
	2002	240
	2003	NP
	2004	NP
	2005	113 J
05-250	2001	NP
	2002	160 U
	2003	NP
	2004	NP
	2005	238 U
05-389	2001	568 U
	2002	410
	2003	201
	2004	294
	2005	314 J
05-801	2001	543 U
	2002	160 U
	2003	110 U
	2004	250U
	2005	238 U
MW-2	2001	NP
	2002	3,700
	2003	NP
	2004	NP
	2005	4,650 J
Alaska DEC Cleanup Level		15,000

Notes:

**Bold** indicates reported concentration is greater than Alaska Department of Environmental Conservation (DEC) groundwater cleanup level for groundwater used as a drinking water source.

**Table 28-2 (Continued)**  
**Analytical Results for DRO for**  
**Yakutat Hangar, UST T-2039-A**

DRO - diesel-range organics

J - estimated value

µg/L - microgram per liter (parts per billion)

NP - not planned

U - analyte not detected at specified practical quantitation limit

UST - underground storage tank

**Table 28-3  
 Concentration Trend Evaluation for Yakutat Hangar, UST T-2039-A**

Well ID	Target Analyte	Exceeds Endpoint Criteria <sup>a</sup>	Highest Concentration Last Two Sampling Periods (µg/L)	Endpoint Criteria <sup>a</sup> (µg/L)	Sampling Periods (n)	Mann-Kendall Statistic (s)	Mann-Kendall Probability (p)	Statistically Significant Trend	Sen Median Slope	Lower Limit Slope (80% Confidence)	Upper Limit Slope (80% Confidence)
05-221	DRO	No	200 J	15,000	2	Insufficient number of data points to complete trend evaluation					
05-244	DRO	No	113 J	15,000	2	Insufficient number of data points to complete trend evaluation					
05-250	DRO	No	238 U	15,000	2	Insufficient number of data points to complete trend evaluation					
05-389	DRO	No	314 J	15,000	2	Insufficient number of data points to complete trend evaluation					
05-389	DRO	No	310	15,000	7	Meets endpoint criterion; 2 consecutive results below endpoint criterion					
05-801	DRO	No	250 U	15,000	7	Meets endpoint criterion; 2 consecutive results below endpoint criterion					

<sup>a</sup>Endpoint criteria are 10 times the Alaska Department of Environmental Conservation (DEC) groundwater cleanup levels established for groundwater used as a drinking water source.

Notes:

Mann-Kendall probability (p) greater than 0.05; Sen slopes were not calculated.

DRO - diesel-range organics

J - estimated value

µg/L - microgram per liter (parts per billion)

U - analyte not detected at specified practical quantitation limit

UST - underground storage tank

## **29.0 CHRONOLOGY OF ADAK GROUNDWATER MONITORING PROGRAM**

The table provided in this section summarizes how the groundwater monitoring program on Adak Island has changed over time. Table 29-1 is intended to serve as a quick reference for the sampling program by monitoring period and to provide a history of monitoring program changes starting in 2003. The rationale for the proposed 2006 groundwater monitoring program at the sites reported herein is provided in the preceding site-specific results sections.

**Table 29-1  
 Monitoring History and Proposed Monitoring for 2006**

<b>Location Cross-Reference</b>	<b>Monitoring Purpose</b>	<b>2003 Analyte Sampling Program</b>	<b>2004 Analyte Sampling Program</b>	<b>2005 Analyte Sampling Program</b>	<b>Proposed 2006 Analyte Sampling Program</b>
<b>Antenna Field, USTs ANT-1, ANT-2, ANT-3, and ANT-4</b>					
ANT-601	MNA	DRO, RRO, and NAPs	DRO, RRO, and NAPs	DRO	DRO
<b>Former Power Plant, Building T-1451</b>					
01-118	MNA	DRO, RRO, and NAPs	DRO, RRO, and NAPs	DRO and RRO	DRO and RRO
01-150	MNA	DRO, RRO, and NAPs	DRO, RRO, and NAPs	DRO	DRO
01-151	MNA	DRO, RRO, and NAPs	DRO, RRO, and NAPs	DRO	DRO
E-701	MNA NAP Background	DRO, GRO, BTEX, and NAPs	DRO, GRO, BTEX, and NAPs	NAPs	NAPs
<b>GCI Compound, UST GCI-1</b>					
04-100	MNA	DRO, GRO, BTEX, and NAPs	DRO, GRO, BTEX, and NAPs	DRO, GRO, BTEX, and NAPs	DRO, GRO, BTEX, and NAPs
04-202	MNA	Sampling not planned	Sampling not planned	DRO, GRO, BTEX, and NAPs	DRO, GRO, BTEX, and NAPs
04-204	MNA	Sampling not planned	Sampling not planned	Sampling not planned	DRO, GRO, BTEX, and NAPs
04-210	MNA	Sampling not planned	Sampling not planned	GRO, BTEX, and NAPs	GRO, BTEX, and NAPs
04-701	MNA	GRO, BTEX, and NAPs	GRO, BTEX, and NAPs	GRO, BTEX, and NAPs	GRO, BTEX, and NAPs
<b>Housing Area (Arctic Acres)</b>					
03-416	MNA	DRO, RRO, and NAPs	DRO, RRO, and NAPs	Next Sample 2006	DRO (every other year)
03-420	MNA	DRO, RRO, and NAPs	DRO, RRO, and NAPs	DRO	DRO
03-421	MNA	Sampling not planned	Sampling not planned	DRO	DRO
03-890	MNA	Sampling not planned	Sampling not planned	DRO	DRO

**Table 29-1 (Continued)**  
**Monitoring History and Proposed Monitoring for 2006**

Location Cross-Reference	Monitoring Purpose	2003 Analyte Sampling Program	2004 Analyte Sampling Program	2005 Analyte Sampling Program	Proposed 2006 Analyte Sampling Program
AA-01	MNA	DRO, RRO, and NAPs	DRO, RRO, and NAPs	Next Sample 2006	DRO (every other year)
<b>NORPAC Hill Seep Area</b>					
04-145	LGM	Sampling not planned	Sampling not planned	DRO	DRO
04-146	SWP	Sampling not planned	Sampling not planned	DRO	DRO and Shoreline Inspection
04-147	SWP	Sampling not planned	Sampling not planned	DRO	DRO
04-403	LGM	Sampling not planned	Sampling not planned	DRO	DRO
04-405	LGM	Sampling not planned	Sampling not planned	DRO	DRO
NS-2	LGM	Sampling not planned	Sampling not planned	DRO	DRO
<b>ROICC Contractor's Area, UST ROICC-7</b>					
08-175	NAE	GRO, BTEX, and NAPs	GRO, BTEX, and NAPs	Next Sample 2006	BTEX (every other year)
08-200	NAE	GRO, BTEX, and NAPs	GRO, BTEX, and NAPs	GRO and BTEX	BTEX
08-202	NAE	GRO, BTEX, and NAPs	GRO, BTEX, and NAPs	GRO and BTEX	BTEX
<b>Runway 5-23 Avgas Valve Pit</b>					
14-100	MNA	GRO, GRO fractions, BTEX, and NAPs	GRO, GRO fractions, BTEX, and NAPs	GRO annually and BTEX every other year beginning in 2006	GRO and BTEX (every other year)
14-110	MNA	GRO, GRO fractions, BTEX, and NAPs	GRO, GRO fractions, BTEX, and NAPs	GRO and BTEX	GRO and BTEX (every other year)
<b>SA 78, Old Transportation Building, USTs 10583, 10584, and ASTs</b>					
12-145	MNA	Sampling not planned	Sampling not planned	DRO, GRO, and BTEX	DRO, GRO, and BTEX

**Table 29-1 (Continued)**  
**Monitoring History and Proposed Monitoring for 2006**

Location Cross-Reference	Monitoring Purpose	2003 Analyte Sampling Program	2004 Analyte Sampling Program	2005 Analyte Sampling Program	Proposed 2006 Analyte Sampling Program
<b>SA 78, Old Transportation Building, USTs 10583, 10584, and ASTs (Continued)</b>					
12-152	MNA	Sampling not planned	Sampling not planned	DRO, GRO, and BTEX	DRO, GRO, and BTEX
MW-116	MNA	Sampling not planned	Sampling not planned	DRO, GRO, and BTEX	DRO, GRO, and BTEX
MW-117	MNA	Sampling not planned	Sampling not planned	DRO, GRO, and BTEX	DRO, GRO, and BTEX
12-801	SWP	DRO, GRO, and BTEX	DRO, GRO, and BTEX	DRO, GRO, and BTEX	DRO, GRO, and BTEX
12-802	SWP/NAP Background	DRO, GRO, and BTEX	DRO, GRO, BTEX, and NAPs	DRO, GRO, and BTEX, NAPs	DRO, GRO, BTEX, and NAPs
<b>SA 79, Main Road Pipeline, North End and South End</b>					
02-230	SWP/NAE	DRO, GRO, BTEX, and NAPs	DRO and NAPs	DRO and visual inspections	DRO and visual inspections
MRP-MW8	NAE	DRO, GRO, BTEX, and NAPs	DRO and NAPs	DRO and visual inspections	DRO and visual inspections
MRP-MW15	Compliance	Total and dissolved lead	Total and dissolved lead	Met endpoint criteria	Met endpoint criteria
<b>SA 80, Steam Plant 4, USTs 27089 and 27090</b>					
04-103	MNA	DRO and NAPs	DRO and NAPs	DRO	DRO
04-158	MNA	Sampling not planned	Sampling not planned	DRO	DRO
04-159	MNA	Sampling not planned	Sampling not planned	DRO	DRO
04-173	MNA	Sampling not planned	DRO, GRO, and BTEX	DRO	DRO
04-801	MNA	Sampling not planned	Sampling not planned	DRO	DRO
SP4-3	MNA	DRO and NAPs	DRO and NAPs	DRO	DRO
<b>SA 82, P-80/P-81 Buildings, UST 10587 and AST 10333</b>					
12-170	LGM	Sampling not planned	Sampling not planned	DRO	DRO
12-172	LGM	Sampling not planned	Sampling not planned	DRO	DRO

**Table 29-1 (Continued)**  
**Monitoring History and Proposed Monitoring for 2006**

Location Cross-Reference	Monitoring Purpose	2003 Analyte Sampling Program	2004 Analyte Sampling Program	2005 Analyte Sampling Program	Proposed 2006 Analyte Sampling Program
<b>SA 82, P-80/P-81 Buildings, UST 10587 and AST 10333 (Continued)</b>					
12-180	LGM	Sampling not planned	Sampling not planned	DRO	DRO
12-401	SWP	DRO	DRO	DRO	DRO
<b>SA 88, P-70 Energy Generator, UST 10578</b>					
12-162	LGM	Sampling not planned	DRO, GRO, and BTEX	DRO	DRO
12-163	LGM	Sampling not planned	DRO, GRO, and BTEX	DRO	DRO
12-197	LGM	Sampling not planned	Sampling not planned	DRO	DRO
12-198	LGM	Sampling not planned	DRO, GRO, and BTEX	DRO	DRO
12-252	LGM	Sampling not planned	DRO, GRO, and BTEX	DRO	DRO
12-701	SWP	DRO	DRO	DRO	DRO
12-702	SWP	Sampling not planned	Sampling not planned	Sampling not planned	DRO
<b>South of Runway 18-36 Area</b>					
02-231	SWP	DRO, GRO, and BTEX	DRO, GRO, and BTEX	DRO, GRO, and BTEX, visual inspection	DRO, GRO, and BTEX, visual inspection
02-232	SWP	DRO	DRO	DRO, visual inspection	DRO, visual inspection
E-208	SWP	DRO	DRO	DRO	DRO
E-216	SWP	DRO	NS – free-product observed	DRO	DRO, visual inspection
E-218	SWP	DRO	DRO	DRO, visual inspection	DRO, visual inspection
MRP-12	SWP	DRO	DRO	DRO	DRO

**Table 29-1 (Continued)**  
**Monitoring History and Proposed Monitoring for 2006**

Location Cross-Reference	Monitoring Purpose	2003 Analyte Sampling Program	2004 Analyte Sampling Program	2005 Analyte Sampling Program	Proposed 2006 Analyte Sampling Program
<b>SWMU 14, Old Pesticide Storage and Disposal Area</b>					
01-153	MNA	DRO, GRO, GRO fractions, BTEX, and NAPs	DRO, GRO, GRO fractions, BTEX, and NAPs	GRO and BTEX	DRO (every other year) GRO, and BTEX
	Compliance	Total and dissolved lead Total thallium Trichloroethene Tetrachloroethene 1,1-Dichloroethene cis-1,2-Dichloroethene trans-1,2-Dichloroethene Vinyl chloride Methylene chloride Bis(2-ethylhexyl)phthalate	Total and dissolved lead Total thallium Trichloroethene Tetrachloroethene 1,1-Dichloroethene cis-1,2-Dichloroethene trans-1,2-Dichloroethene Vinyl chloride Methylene chloride Bis(2-ethylhexyl)phthalate	Total and dissolved lead Trichloroethene Tetrachloroethene 1,1-Dichloroethene cis-1,2-Dichloroethene trans-1,2-Dichloroethene Vinyl chloride Methylene chloride Bis(2-ethylhexyl)phthalate	Total and dissolved lead Trichloroethene Tetrachloroethene 1,1-Dichloroethene cis-1,2-Dichloroethene trans-1,2-Dichloroethene Vinyl chloride
MW14-5	MNA	DRO, GRO, GRO fractions, BTEX, and NAPs	DRO, GRO, GRO fractions, BTEX, and NAPs	DRO, GRO, BTEX	DRO, GRO, BTEX

**Table 29-1 (Continued)**  
**Monitoring History and Proposed Monitoring for 2006**

Location Cross-Reference	Monitoring Purpose	2003 Analyte Sampling Program	2004 Analyte Sampling Program	2005 Analyte Sampling Program	Proposed 2006 Analyte Sampling Program
<b>SWMU 14, Old Pesticide Storage and Disposal Area (Continued)</b>					
01-153 (Cont.)	Compliance	Total and dissolved lead Total thallium Trichloroethene Tetrachloroethene 1,1-dichloroethene cis-1,2-Dichloroethene trans-1,2-Dichloroethene Vinyl chloride Methylene chloride Bis(2-ethylhexyl)phthalate	Total and dissolved lead Total thallium Trichloroethene Tetrachloroethene 1,1-dichloroethene cis-1,2-Dichloroethene trans-1,2-Dichloroethene Vinyl chloride Methylene chloride Bis(2-ethylhexyl)phthalate	Total and dissolved lead Trichloroethene Tetrachloroethene 1,1-Dichloroethene cis-1,2-Dichloroethene trans-1,2-Dichloroethene Vinyl chloride	Met endpoint criteria
<b>SWMU 15, Future Jobs/DRMO</b>					
MW15-3	MNA	DRO, GRO, GRO fractions, BTEX, and NAPs	Met endpoint criteria; monitoring discontinued	Met endpoint criteria	Met endpoint criteria
	Compliance	Trichloroethene Tetrachloroethene 1,1-Dichloroethene cis-1,2-Dichloroethene trans-1,2-Dichloroethene Vinyl chloride Methylene chloride	Trichloroethene Tetrachloroethene 1,1-Dichloroethene cis-1,2-Dichloroethene trans-1,2-Dichloroethene Vinyl chloride Methylene chloride	Trichloroethene Tetrachloroethene 1,1-Dichloroethene cis-1,2-Dichloroethene trans-1,2-Dichloroethene Vinyl chloride	Trichloroethene Tetrachloroethene 1,1-Dichloroethene cis-1,2-Dichloroethene trans-1,2-Dichloroethene Vinyl chloride

**Table 29-1 (Continued)**  
**Monitoring History and Proposed Monitoring for 2006**

Location Cross-Reference	Monitoring Purpose	2003 Analyte Sampling Program	2004 Analyte Sampling Program	2005 Analyte Sampling Program	Proposed 2006 Analyte Sampling Program
<b>SWMU 15, Future Jobs/DRMO (Continued)</b>					
MW15-424	MNA	DRO, GRO, GRO fractions, BTEX, and NAPs	Met endpoint criteria; monitoring discontinued	Met endpoint criteria; monitoring discontinued	Met endpoint criteria; monitoring discontinued
	Compliance	Trichloroethene Tetrachloroethene 1,1-Dichloroethene cis-1,2-Dichloroethene trans-1,2-Dichloroethene Vinyl chloride Methylene chloride	Met endpoint criteria; monitoring discontinued	Met endpoint criteria; monitoring discontinued	Met endpoint criteria; monitoring discontinued
<b>SWMU 17, Power Plant No. 3 Area</b>					
05-375	SWP	DRO, GRO, and BTEX	DRO, GRO, and BTEX	DRO, GRO, and BTEX	DRO, GRO, and BTEX
05-735	Compliance	Trichloroethene Tetrachloroethene 1,1-Dichloroethene cis-1,2-Dichloroethene trans-1,2-Dichloroethene Vinyl chloride Methylene chloride Bis(2-ethylhexyl)phthalate	Trichloroethene Tetrachloroethene 1,1-Dichloroethene cis-1,2-Dichloroethene trans-1,2-Dichloroethene Vinyl chloride Methylene chloride Bis(2-ethylhexyl)phthalate	Trichloroethene Tetrachloroethene 1,1-Dichloroethene cis-1,2-Dichloroethene trans-1,2-Dichloroethene Vinyl chloride Methylene chloride Bis(2-Ethylhexyl)phthalate	Trichloroethene Tetrachloroethene 1,1-Dichloroethene cis-1,2-Dichloroethene trans-1,2-Dichloroethene Vinyl chloride Methylene chloride
05-810	SWP	DRO, GRO, BTEX, and NAPs	DRO, GRO, BTEX, and NAPs	DRO, GRO, and BTEX	DRO, GRO, and BTEX
05-811	SWP	DRO, GRO, BTEX, and NAPs	DRO, GRO, BTEX, and NAPs	DRO, GRO, and BTEX	DRO, GRO, and BTEX

**Table 29-1 (Continued)**  
**Monitoring History and Proposed Monitoring for 2006**

Location Cross-Reference	Monitoring Purpose	2003 Analyte Sampling Program	2004 Analyte Sampling Program	2005 Analyte Sampling Program	Proposed 2006 Analyte Sampling Program
<b>SWMU 17, Power Plant No. 3 Area (Continued)</b>					
05-815	SWP	DRO, GRO, BTEX, and NAPs	DRO, GRO, BTEX, and NAPs	DRO, GRO, and BTEX	DRO, GRO, and BTEX
R-1	Compliance	DRO and RRO Trichloroethene Tetrachloroethene 1,1-Dichloroethene cis-1,2-Dichloroethene trans-1,2-Dichloroethene Vinyl chloride Methylene chloride Bis(2-ethylhexyl)phthalate	DRO, RRO, and bis(2-ethylhexyl)phthalate	DRO, RRO, and bis(2-ethylhexyl)phthalate	DRO and RRO
R-6	Compliance	DRO and RRO Trichloroethene Tetrachloroethene 1,1-Dichloroethene cis-1,2-Dichloroethene trans-1,2-Dichloroethene Vinyl chloride Methylene chloride Bis(2-ethylhexyl)phthalate	DRO, RRO, and bis(2-ethylhexyl)phthalate	DRO, RRO, and bis(2-ethylhexyl)phthalate	DRO and RRO

**Table 29-1 (Continued)**  
**Monitoring History and Proposed Monitoring for 2006**

Location Cross-Reference	Monitoring Purpose	2003 Analyte Sampling Program	2004 Analyte Sampling Program	2005 Analyte Sampling Program	Proposed 2006 Analyte Sampling Program
<b>SWMU 55, Public Works Transportation Department Waste Storage Area</b>					
55-145	Compliance	Dissolved antimony Trichloroethene Tetrachloroethene 1,1-Dichloroethene cis-1,2-Dichloroethene trans-1,2-Dichloroethene Vinyl chloride Methylene chloride Bis(2-ethylhexyl)phthalate	Trichloroethene Tetrachloroethene 1,1-Dichloroethene cis-1,2-Dichloroethene trans-1,2-Dichloroethene Vinyl chloride Methylene chloride Bis(2-ethylhexyl)phthalate	Trichloroethene Tetrachloroethene 1,1-Dichloroethene cis-1,2-Dichloroethene trans-1,2-Dichloroethene Vinyl chloride Methylene chloride	Trichloroethene Tetrachloroethene 1,1-Dichloroethene cis-1,2-Dichloroethene trans-1,2-Dichloroethene Vinyl chloride
55-146	Compliance	Dissolved antimony Trichloroethene Tetrachloroethene 1,1-Dichloroethene cis-1,2-Dichloroethene trans-1,2-Dichloroethene Vinyl chloride Methylene chloride Bis(2-ethylhexyl)phthalate	Trichloroethene Tetrachloroethene 1,1-Dichloroethene cis-1,2-Dichloroethene trans-1,2-Dichloroethene Vinyl chloride Methylene chloride Bis(2-ethylhexyl)phthalate	PCE and daughter products to be monitored every other year, with the next sampling in 2006  Methylene chloride and bis(2-ethylhexyl)phthalate annually	PCE and daughter products to be monitored every other year, with the next sampling in 2006
<b>SWMU 58 and SA 73, Heating Plant 6</b>					
12-101	MNA	Sampling not planned	Sampling not planned	DRO, GRO, and BTEX	DRO, GRO, and BTEX
12-110	MNA	Sampling not planned	Sampling not planned	DRO, GRO, and BTEX	DRO, GRO, and BTEX
12-114	MNA	Sampling not planned	Sampling not planned	DRO, GRO, and BTEX	DRO, GRO, and BTEX
12-120	MNA	Sampling not planned	Sampling not planned	DRO, GRO, and BTEX	DRO, GRO, and BTEX

**Table 29-1 (Continued)**  
**Monitoring History and Proposed Monitoring for 2006**

<b>Location Cross-Reference</b>	<b>Monitoring Purpose</b>	<b>2003 Analyte Sampling Program</b>	<b>2004 Analyte Sampling Program</b>	<b>2005 Analyte Sampling Program</b>	<b>Proposed 2006 Analyte Sampling Program</b>
12-121	MNA	Sampling not planned	Sampling not planned	DRO, GRO, and BTEX	DRO, GRO, and BTEX
12-203	MNA	Sampling not planned	DRO, GRO, and BTEX	DRO, GRO, and BTEX	DRO, GRO, and BTEX
12-601	SWP	DRO, GRO, and BTEX	DRO, GRO, and BTEX	DRO, GRO, and BTEX	DRO, GRO, and BTEX
12-604	SWP	DRO, GRO, and BTEX	DRO, GRO, and BTEX	DRO, GRO, and BTEX	DRO, GRO, and BTEX
12-611	SWP	DRO, GRO, and BTEX	DRO, GRO, and BTEX	DRO, GRO, and BTEX	DRO, GRO, and BTEX
<b>SWMU 60, Tank Farm A</b>					
LC5A	MNA	DRO, GRO, BTEX, and NAPs	DRO and NAPs	DRO and visual inspection	DRO and visual inspection
MW E006	MNA	DRO, GRO, BTEX, and NAPs	BTEX and NAPs	BTEX	BTEX
MW E501	MNA	DRO, GRO, BTEX, and NAPs	Met endpoint criteria; monitoring discontinued	Met endpoint criteria	Met endpoint criteria
<b>SWMU 61, Tank Farm B</b>					
14-113	MNA/SWP	GRO, BTEX, and NAPs	GRO, BTEX, and NAPs	GRO, BTEX, and visual inspection	GRO, BTEX, and visual inspection
14-210	MNA/SWP	GRO, BTEX, and NAPs	GRO, BTEX, and NAPs	GRO, BTEX, and visual inspection	GRO, BTEX, and visual inspection
TFB-MW-4A	MNA	GRO, BTEX, and NAPs	Met endpoint; criteria monitoring discontinued	Met endpoint criteria	Met endpoint criteria
TFB-MW-4B	MNA	GRO, BTEX, and NAPs	GRO, BTEX, and NAPs	GRO and BTEX	GRO and BTEX

**Table 29-1 (Continued)**  
**Monitoring History and Proposed Monitoring for 2006**

Location Cross-Reference	Monitoring Purpose	2003 Analyte Sampling Program	2004 Analyte Sampling Program	2005 Analyte Sampling Program	Proposed 2006 Analyte Sampling Program
<b>SWMU 62, New Housing Fuel Leak</b>					
03-155	TBD	DRO, GRO, BTEX, and NAPs	DRO, GRO, BTEX, and NAPs	DRO, GRO, and BTEX	DRO, GRO, and BTEX
MW134-11	TBD	Sampling not planned	Sampling not planned	DRO, GRO, and BTEX	DRO, GRO, and BTEX
03-619	TBD	DRO, GRO, BTEX, and NAPs	DRO, GRO, BTEX, and NAPs	Switched to MW134-11	Switched to MW134-11
<b>Tanker Shed, UST 42494</b>					
04-175	MNA	Sampling not planned	Sampling not planned	DRO, GRO, and BTEX	DRO, GRO, and BTEX
04-290	MNA	Sampling not planned	Sampling not planned	DRO, GRO, and BTEX	DRO, GRO, and BTEX
04-306	MNA	Sampling not planned	Sampling not planned	DRO, GRO, and BTEX	DRO, GRO, and BTEX
04-601	MNA	Sampling not planned	Sampling not planned	DRO, GRO, and BTEX	DRO, GRO, and BTEX
04-601	SWP	DRO, GRO, BTEX, and NAPs	DRO, GRO, BTEX, and NAPs	DRO, GRO, and BTEX	DRO, GRO, and BTEX
TS-01	TBD	DRO, GRO, BTEX, and NAPs	DRO, GRO, BTEX, and NAPs	DRO, GRO, and BTEX	DRO, GRO, and BTEX
<b>Yakutat Hangar, UST 2039-A</b>					
05-221	LGM	Sampling not planned	Sampling not planned	DRO	DRO
05-244	LGM	Sampling not planned	Sampling not planned	DRO	DRO
05-250	LGM	Sampling not planned	Sampling not planned	DRO	DRO
05-389	SWP	DRO, GRO, and BTEX	DRO, GRO, and BTEX	DRO	DRO
05-801	SWP	DRO, GRO, and BTEX	DRO, GRO, and BTEX	DRO	DRO
MW-2	LGM	Sampling not planned	Sampling not planned	DRO	DRO

**Table 29-1 (Continued)**  
**Monitoring History and Proposed Monitoring for 2006**

Notes:

AST - aboveground storage tank  
BTEX - benzene, toluene, ethylbenzene, and total xylenes  
DRO - diesel-range organics  
DRMO - Defense Reutilization Marketing Office  
GCI - General Communications, Inc.  
GRO - gasoline-range organics  
LGM - limited groundwater monitoring  
MNA - monitored natural attenuation  
NAE - natural attenuation evaluation  
NAPs - natural attenuation parameters  
ROICC - resident officer in charge of construction  
RRO - residual-range organics  
SA - source area  
SWMU - solid waste management unit  
SWP - surface water protection  
TBD - to be determined  
UST - underground storage tank

### 30.0 REFERENCES

- Alaska Department of Environmental Conservation (Alaska DEC). 2001. *Application of Water Quality Standards to Contamination Cleanup Projects*. Technical Memorandum 01-055 R.1. Division of Spill Prevention and Response, Contaminated Sites Remediation and Storage Tank Program. Anchorage, Alaska. January 2001.
- Gilbert, Richard, O. 1987. *Statistical Methods for Environmental Pollution Monitoring*. Van Nostrand Reinhold Co., Inc. New York, New York.
- Sokal, R.R. and F.J. Rohlf. 1995. *Biometry. The Principles and Practice of Statistics in Biological Research*. Third Ed. W.H. Freeman and Company, New York.
- U.S. Geological Survey (USGS). 1995. "Rapid Toluene Mineralization by Aquifer Microorganisms at Adak Alaska; Implications for Intrinsic Bioremediation in Cold Environments," by Paul M. Bradley and Francis H. Chapelle. *Environmental Science & Technology*. Vol. 29, No. 11.
- U.S. Navy 2005a. *Final Comprehensive Monitoring Plan, Revision 2, Operable Unit A, Former Adak Naval Complex, Adak, Alaska*. Prepared by URS Group, Inc., for Engineering Field Activity, Northwest, under Contract No. N44255-02-D-2008, Delivery Order 0055. Poulsbo, Washington. July 2005.
- . 2005b. *Final Annual Groundwater Monitoring Report, October 2004, Operable Unit A, Former Adak Naval Complex, Adak, Alaska*. Prepared by URS Group, Inc., for Engineering Field Activity, Northwest, under Contract No. N44255-02-D-2008, Delivery Order 0048. Poulsbo, Washington. May 2005.
- . 2004. *Final Site Characterization Report, Part 1, Free-Product Recovery Petroleum Sites with Risks Below Target Health Goals, Former Adak Naval Complex, Adak Island Alaska*. Prepared by URS Group, Inc. for Engineering Field Activity, Northwest, under Contract No. N44255-02-D-2008. Poulsbo, Washington. September 15, 2004.
- . 2003. *Final Annual Groundwater Monitoring Report, October 2002, Former Adak Naval Complex, Adak Island, Alaska*. Prepared by Integrated Concepts and Research Corporation for Engineering Field Activity, Northwest, under Contract No. N44255-02-D-2538, Delivery Order 0008. Poulsbo, Washington. July 2003.

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

Section 30.0  
Revision No.: 0  
Date: 05/31/06  
Page 30-2

U.S. Navy and Alaska DEC. 2005. *Final Decision Document for Petroleum Sites with No Unacceptable Risk*, Prepared by URS Group, Inc. for Engineering Field Activity, Northwest, under Contract No. N44255-02-D-2008, Delivery Order 0037. Poulsbo, Washington. April 2005.

U.S. Navy, Alaska Department of Environmental Conservation (Alaska DEC), and U.S. Environmental Protection Agency (USEPA). 2000. *Draft Final Record of Decision, Operable Unit A, Former Adak Naval Complex, Adak Island, Alaska*. Prepared by URS Greiner, Inc., for Engineering Field Activity, Northwest, under CLEAN Contract No. N62474-89-D-9295. Poulsbo, Washington. Accepted as final April 2000.