6.0 REMEDIAL ACTION OBJECTIVES AND CLEANUP LEVELS

This section describes the remedial action objectives (RAOs) and the cleanup levels established for the NMCB Building Expanded Area.

6.1 REMEDIAL ACTION OBJECTIVES

Based on the risk analysis conducted for this site and the regulatory requirements, the following RAOs were developed for the protection of human health at the NMCB Building Expanded Area:

- Prevent human and ecological exposure to petroleum hydrocarbons in soil that would result in adverse health effects
- Reduce petroleum hydrocarbons in groundwater to concentrations less than or equal to the Alaska DEC groundwater cleanup levels established for groundwater not currently used for, or not reasonably expected to be used for, drinking water.
- Prevent potential future migration of contaminants to surface water at concentrations that could result in adverse ecological effects
- Minimize exposure to free-phase petroleum product

The necessity of establishing cleanup levels to protect ecological receptors from exposure to petroleum hydrocarbons released to soil at the site was evaluated. Because the ecological risk based cleanup level for GRO would be greater than the cleanup level for GRO derived to protect human health, the cleanup level derived to protect human health is protective of ecological receptors. Therefore, no cleanup level is presented in Section 6.2 for GRO in soil based on the protection of ecological receptors.

6.2 CLEANUP LEVELS

Chemical-specific screening criteria and cleanup levels for soil and groundwater have been established for petroleum-contaminated sites at the former Adak Naval Complex in accordance with Alaska DEC regulation 18 AAC 75. Screening criteria were used to estimate the potential extent of contamination. Cleanup levels are the specified concentrations for remediation. The soil and groundwater screening criteria and cleanup levels for the NMCB Building Expanded Area are provided in Table 6-1.

The Alaska regulations establish four methods for determining cleanup levels for soil [18 AAC 75.340]. The Alaska DEC Method Two cleanup levels, the most stringent cleanup levels for soil, were established to prevent migration of contaminants from soil to groundwater in the over 40 inches of rainfall zone (18 AAC 75.341, Tables B1 and B2). The Alaska DEC Method Two cleanup levels were used as screening criteria for the NMCB Building Expanded Area to estimate the potential extent of soil impacted by petroleum contamination at the site (see Section 4). ACLs are specified for remediation of soil and are based on Alaska DEC Method Four [18 AAC 75.340(a)(4)], which uses site-specific risk assessments to establish cleanup levels. Site-specific ACLs were calculated as discussed in Section 5. The ACLs are established at concentrations such that risks from hazardous substances do not exceed the following target health goals:

- Cumulative carcinogenic risk of 1 in 100,000
- Cumulative noncarcinogenic HI of 1.0 (18 AAC 75.325(h))

The Alaska regulations establish three methods for determining cleanup levels for groundwater [18 AAC 75.345]. The tabulated groundwater cleanup levels [18 AAC 75.345(b)(1), Table C] were used as screening criteria to estimate the potential extent of groundwater impacted by petroleum contamination at the site (see Section 4). Cleanup levels specified for remediation of groundwater at the NMCB Building Expanded Area are based on 10 times these values because groundwater is not reasonably expected to be a potential future source of drinking water [18 AAC 75.345(b)(2)].

For surface water, Alaska regulation 18 AAC 70 establishes water use classes and subclasses for the water bodies of the state. Waters of Sweeper Cove and the lower reach of South Sweeper Creek fall within the marine water class, and the following subclasses:

- Water supply aquaculture
- Secondary recreation
- Growth and propagation of fish, shellfish, other aquatic life, and wildlife

The water quality standards established for this use class (and these subclasses) specify that TAqH in the water column may not exceed 15 µg/L and that TAH in the water column may not exceed 10 µg/L. In addition, there may be no concentrations of petroleum hydrocarbons, animal fats, or vegetable oils in shoreline or bottom sediments that cause deleterious effects to aquatic life. Surface waters and adjoining shorelines must be virtually free from floating oil, film, sheen, or discoloration [18AAC70.020(b)(17)(A)(i), 18AAC70.020(b)(17)(B)(ii), and 18AAC70.020(b)(17)(C)].

The canals of the airport ditch system, including the East Canal, fall within the fresh water class, and the secondary recreation subclass. The water quality standards established for this use class

and subclass specify that petroleum hydrocarbons, oils and grease may not cause a film, sheen, or discoloration on the surface or floor of the water body or adjoining shorelines, and surface waters must be virtually free from floating oils [18AAC70.020(b)(5)(B)(ii)].

Alaska State Regulations do not establish cleanup levels for sediment. Therefore, sediment cleanup levels are established based on the results of the ecological risk assessment. Because no ecological risks above target health goals were found in sediment, no cleanup levels are necessary for sediment. The results of the ecological risk assessment are discussed in the Section 5.

6.3 EXTENT OF CONTAMINATION

The media of concern for which RAOs were established in Section 6.1 include soil, groundwater, and free-phase product. The extent of contamination for these media based on the cleanup levels presented in Section 6.2 is summarized below.

The ACLs were used to delimit the area that exceeds acceptable risk for human exposure to petroleum hydrocarbons in soil. ACLs have been defined for both GRO and DRO although the risk driver is GRO. Their ACLs are:

- GRO 1,700 mg/kg
- DRO 31,000 mg/kg

Three separate areas shown on Figure 6-1 were identified as containing soil with COC concentrations exceeding the ACLs. These three areas encompass a total of approximately 120,000 ft^2. This estimated area excludes the area of riprap adjacent to the shoreline. Because surface water and sediment concentrations in Sweeper Cove result in ecological hazards below target health goals, the riprap area is assumed to be uncontaminated. Soil exceeding the ACLs was found in the areas shown on Figure 6-1 between 4 and 11 feet bgs, generally near the groundwater surface. Soil exceeding the ACLs was found only in one location at the maximum depth of 11 feet bgs. All other exceedances were at depths less than 10 feet bgs.

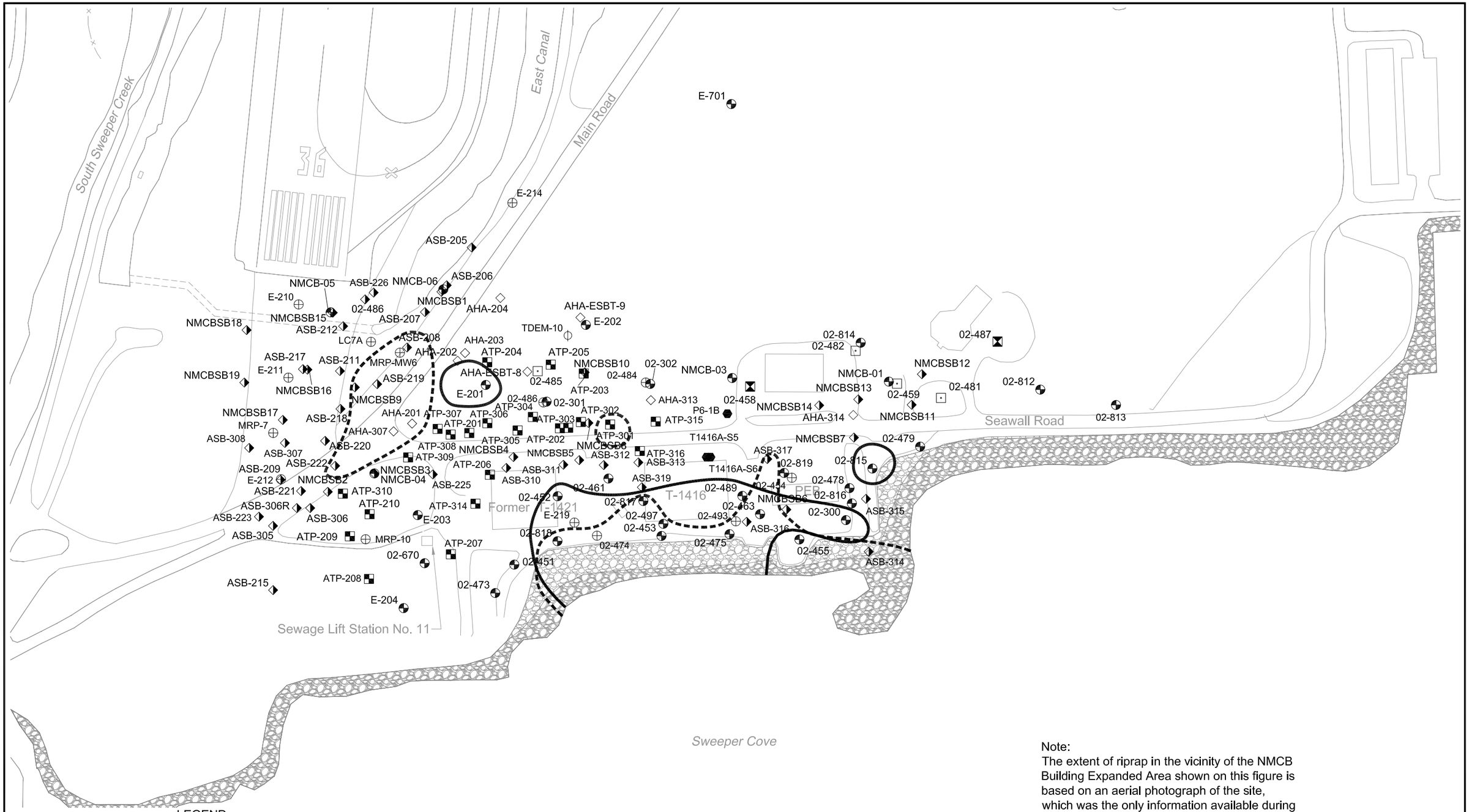
The volume of soil exceeding ACLs was assumed to extend to the minimum groundwater elevation (i.e., the maximum depth to water measured during groundwater monitoring). In all three areas where soil concentrations exceed the ACLs, the maximum depth to water is 10 feet bgs. Based on this depth and the area provided in the paragraph above, the volume of soil exceeding ACLs from ground surface to the maximum measured depth to groundwater is approximately in-place 44,000 cubic yards (cy).

The extent of groundwater that exceeds Alaska DEC Criteria established for groundwater not currently used for, or not reasonably expected to be used for drinking water is delimited in Figure 6-1. The Alaska DEC Criteria established for groundwater not currently used for, or not reasonably expected to be used for drinking water are:

- Benzene 50 µg/L (0.05 mg/L)
- DRO 15,000 µg/L (15 mg/L)
- GRO 13,000 µg/L (13 mg/L)
- Lead 150 µg/L (0.15 mg/L)

The three areas that potentially exceed the Alaska DEC Criteria for groundwater not used for drinking water total approximately 130,000 ft^2, and include the area of riprap adjacent to the shoreline.

The approximate extent of free product remaining on the site is presented in Section 4. Figure 4-1 shows the estimated extent of residual free product for three different timeframes. During 2004, measurable thicknesses of free product were detected in three areas as presented on Figure 4-1. These three areas total approximately 24,000 ft^2.



LEGEND

- Monitoring Well
- Abandonded/ Lost Monitoring Well
- Geoprobe Well
- Geoprobe Boring
- Ground Surface Sample
- Groundwater Grab Sample
- Hand Augar
- Bore Hole
- Test Pit
- Approximate Extent of Riprap
- Extent of Soil Contamination in Excess of Risk-Based ACLs
- Generalized Extent of Groundwater Contamination in Excess of the Proposed Groundwater Cleanup Levels

Note:
The extent of riprap in the vicinity of the NMCB Building Expanded Area shown on this figure is based on an aerial photograph of the site, which was the only information available during preparation of the NMCB Building Expanded Area FFS. The extent of riprap on this figure was not updated based on field measurements collected in September of 2005.

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Adak Island, AK
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Figure 6-1
Extent of Soil and Groundwater Contamination
NMCB Building Expanded Area

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Table 6-1
Soil and Groundwater Screening Criteria and Cleanup Levels, NMCB Building Expanded Area

Chemical	Soil		Groundwater	
	Screening Criteria (Method Two)[a] (mg/kg)	ACLs (Method Four)[b] (mg/kg)	Screening Criteria (Table C)[a] (mg/L)	Ten Times Table C[b] (mg/L)
Total Petroleum Hydrocarbons				
DRO[c]	230	31,000	1.5	15
GRO[c]	260	1,700	1.3	13
Volatile Organic Compounds				
Benzene[c]	0.02	NC	0.005	0.05
cis-1,2-dichloroethene	0.2	NC	0.07	0.7
Ethylbenzene	5	NC	0.7	7
Methylene Chloride	0.01	NC	0.005	0.05
Toluene	4.8	NC	1	10
Total Xylenes	69	NC	10	100
Trichloroethene	0.02	NC	0.005	0.05
Semivolatile Organic Compounds				
2-Methylnaphthalene	19	NC	1.5	15
Benzo(a)pyrene	2.4	NC	0.0002	0.002
Benzo(a)anthracene	5.5	NC	0.001	0.01
Benzo(b)fluoranthene	170	NC	0.001	0.01
Carbazole	2	NC	0.04	0.4
Dibenz(a,h)anthracene	5	NC	0.0001	0.001
Naphthalene	19	NC	0.7	7
Inorganics				
Arsenic	1.8	NC	0.05	0.5
Beryllium	38	NC	0.004	0.04
Cadmium	4.5	NC	0.005	0.05
Chromium	1,000	NC	0.1	1
Lead[c]	1,000	NC	0.015	0.15
Nickel	78	NC	0.1	1

[a]Used as screening criteria to determine potential extent of contamination
[b]Used as cleanup levels for remediation
[c]Concentrations of this chemical in groundwater exceeded ten times the Table C values in one or more samples collected at the site. Concentrations of all other chemicals in groundwater did not exceed ten times the Table C values.

Notes:
ACL - alternative cleanup level
DEC - Department of Environmental Conservation
DRO - diesel-range organics
GRO - gasoline-range organics
mg/kg - milligrams per kilogram
mg/L - milligram per liter
NC - not calculated, risk less than target health goal