ADEC
ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION

NAVFAC
Naval Facilities Engineering Command

FINAL
AUGUST 2006

Decision Document
South of Runway 18-36 Area

Former Adak Naval Complex
Adak, Alaska

ADEC Database Record Key 200025X110667

Department of the Navy
Naval Facilities Engineering Command Northwest
1101 Tautog Circle
Silverdale, WA 98315

Alaska Department of Environmental Conservation
555 Cordova St
Anchorage, AK 99502

FINAL DECISION DOCUMENT
SOUTH OF RUNWAY 18-36 AREA
FORMER ADAK NAVAL COMPLEX
ADAK ISLAND, ALASKA

COVER SHEET AND SIGNATURE PAGE

SITE NAME: South of Runway 18-36 Area

ALASKA DEC DATABASE RECORD KEY: 200025X110667

ALASKA DEC REGULATORY AUTHORITY: Oil and Other Hazardous Substances Pollution Control [18 Alaska Administrative Code (AAC) 75, Article 3]

RESPONSIBLE PARTY: Department of the Navy
BRAC Program
Management Office, West
1455 Frazee Road, Suite 900
San Diego, CA 92108-4310

CHEMICALS OF POTENTIAL CONCERN (COPC)/MEDIA IMPACTED:

Soil: Petroleum hydrocarbons, semivolatile organic compounds (SVOCs), and volatile organic compounds (VOCs)
Groundwater: Petroleum hydrocarbons, SVOCs, and VOCs
Sediment: Petroleum hydrocarbons and SVOCs
Surface water: Petroleum hydrocarbons and SVOCs

ON-SITE CONTAMINANT CONCENTRATIONS:

Diesel-range organics (DRO) were detected in groundwater at concentrations greater than 10 times the tabulated groundwater cleanup levels [18 AAC 75.345(b)(1), Table C]. The maximum and minimum detected concentrations for DRO in groundwater are provided in Table 1. 2-Methylnaphthalene, DRO, gasoline-range organics (GRO), and phenanthrene were detected in sediment at concentrations greater than the risk-based cleanup levels. The maximum and minimum detected concentrations for these chemicals in sediment are provided in Table 2. DRO, GRO, indeno(1,2,3-cd)pyrene were detected in surface water at concentrations greater than the risk-based cleanup levels, and total aromatic hydrocarbons (TAH) and total aqueous hydrocarbons (TAqH) were detected in surface water at concentrations greater than water quality standards (18 AAC Chapter 70). The maximum and minimum detected concentrations for these chemicals in surface water are provided in Table 3. The risk assessment for this site established that the existing concentrations in soil do not pose a risk to humans or the environment above target health goals. Therefore, contaminant concentrations for soil are not tabulated below.

Table 1
Concentrations of Chemicals Exceeding Ten Times the Tabulated Groundwater Cleanup Levels

Chemical	Groundwater	
	Min. Conc. (µg/L)	Max. Conc. (µg/L)
DRO	100	45,000

Notes:
conc. - concentration
DRO - diesel-range organics
max. - maximum
mg/kg - milligram per kilogram
µg/L - microgram per liter
min. - minimum

Table 2
Concentrations of Chemicals in Sediment Exceeding Risk-Based Cleanup Levels

Chemical	Sediment	
	Min. Conc. (mg/kg)	Max. Conc. (mg/kg)
2-Methylnaphthalene	0.13 J	0.13 J
Phenanthrene	0.015	1.4 J
DRO	160	9,380
GRO	8	28

Notes:
conc. - concentration
DRO - diesel-range organics
GRO - gasoline-range organics
J - estimated value
max. - maximum
mg/kg - milligram per kilogram
min. - minimum

Table 3
Concentrations of Chemicals in Surface Water Exceeding Risk-Based Cleanup Levels or Water Quality Standards

Chemical	Surface Water	
	Min. Conc. (µg/L)	Max. Conc. (µg/L)
Indeno(1,2,3-cd)pyrene	0.32 J	0.32 J
DRO	300	79,000
GRO	150	650
TAH	1.4	36.1
TAqH	1.74	78.6

Notes:
conc. - concentration
DRO - diesel-range organics
GRO - gasoline-range organics
J - estimated value
max. - maximum
µg/L - microgram per liter
min. - minimum
TAH - total aromatic hydrocarbons
TAqH - total aqueous hydrocarbons

CLEANUP LEVELS:

Soil: The Alaska Department of Environmental Conservation (DEC) Method Four cleanup levels [18 AAC 75.340(a)(4)], which are based on site-specific risk assessments, were used to establish cleanup levels for the site. However, the risk assessment for this site established that the existing concentrations in soil do not pose a risk to humans or the environment above target health goals. Therefore, soil concentrations remaining at the site meet cleanup level requirements because they do not represent a health risk for the site-specific population.

Groundwater: Cleanup levels are based on 10 times the tabulated groundwater cleanup levels [18 AAC 75.345(b)(1), Table C] because groundwater is not reasonably expected to be a potential future source of drinking water [18 AAC 75.345(b)(2)]. The groundwater cleanup level for the South of Runway 18-36 Area is:

- DRO 15,000 micrograms per liter (µg/L) (15 milligrams per liter [mg/L])

Sediment: Alaska State Regulations do not establish chemical-specific cleanup levels for sediment. Therefore, sediment cleanup levels were established based on the results of the ecological risk assessment. Site-specific risk-based cleanup levels were calculated for those chemicals that could potentially pose an unacceptable risk to ecological receptors due to exposure to sediment in South Sweeper Creek. The sediment cleanup levels for the South of Runway 18-36 Area are:

- 2-Methylnaphthalene 0.0202 milligrams per kilogram (mg/kg)
- Phenanthrene 0.225 mg/kg
- DRO 90.6 mg/kg
- GRO 12.2 mg/kg

Surface water: Alaska regulation 18 AAC Chapter 70 establishes water quality standards for South Sweeper Creek based on the marine water use class. The water quality standards established for this use class 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)]. Because Alaska State Regulations do not establish surface water cleanup levels for individual chemicals, DRO, or GRO; the results of the ecological risk assessment were used to establish additional risk-based cleanup levels for chemicals in surface water that may result in a potential risk to ecological receptors. However, the risk-based cleanup level for DRO (0.014 µg/L) is below the laboratory practical quantitation limit (PQL) for test method AK102. Therefore, the cleanup level for DRO was set at the PQL. These risk-based cleanup levels are additional cleanup levels for surface water, and do not replace the TAqH and TAH criteria specified in 18 AAC Chapter 70. The surface water cleanup levels for the South of Runway 18-36 Area are:

- DRO 0.25 µg/L
- GRO 114 µg/L
- Indeno(1,2,3-cd)pyrene 0.28 µg/L
- TAH 10 µg/L
- TAqH 15 µg/L

CLEANUP REMEDY:

Alternative 2 – Institutional Controls, Passive Free-Product Recovery and Containment, Monitored Natural Attenuation (MNA) for Groundwater, and Natural Recovery for Surface Water and Sediment – is selected as the remedial alternative for the South of Runway 18-36 Area. Free product will be contained with the installation of a free-product collection/containment trench, free product will be removed from the free-product collection/containment trench and new and existing wells using passive skimmers and/or sorbent socks, petroleum concentrations in groundwater, surface water, and sediment will be reduced through natural attenuation, and institutional controls will be used to protect human health and the environment as long as groundwater concentrations are greater than the groundwater cleanup levels (URS 2005).

REVIEW OF CLEANUP ACTION AFTER SITE CLOSURE:

Under 18 AAC 75.380(d)(1), the Alaska DEC may require the Navy to perform additional cleanup if new information is discovered which leads Alaska DEC to make a

determination that the cleanup described in this decision document is not protective of human health, safety, and welfare or the environment, or if new information becomes available which indicates the presence of previously undiscovered contamination or exposure routes related to Navy activities.

ACCEPTANCE BY PARTIES:

The State of Alaska and the Navy have agreed to the decisions outlined in this document.

10/3/06

Ted P. Jones, P.E.
Adak BRAC Environmental Coordinator
U.S. Navy, Naval Facilities Engineering
Command Northwest

Date

Sept 20 2006

Jennifer Roberts
Federal Facilities Environmental Restoration
Program Manager
Alaska Department of Environmental Conservation

Date

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ABBREVIATIONS AND ACRONYMS

AAC	Alaska Administrative Code
ACL	alternative cleanup level
ARC	Adak Reuse Corporation
ARAR	applicable or relevant and appropriate requirements
avgas	aviation gasoline
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and total xylenes
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
COC	chemicals of concern
COPC	chemicals of potential concern
COPEC	chemicals of potential ecological concern
CPM	comprehensive monitoring plan
CR	cancer risk
CSM	conceptual site model
cy	cubic yard
DD	decision document
DEC	Department of Environmental Conservation
DO	dissolved oxygen
DOT	Department of Transportation
DRO	diesel-range organics
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
FFA	Federal Facilities Agreement
FFS	focused feasibility study
ft^2	square feet
GRO	gasoline-range organics
HI	hazard index
ICMP	institutional control management plan
J	estimated value
JP	jet petroleum
µg/L	microgram per liter
mg/kg	milligram per kilogram
mg/L	milligram per liter
MNA	monitored natural attenuation
mogas	motor vehicle gasoline
NA	not applicable
Navy	U.S. Navy

ABBREVIATIONS AND ACRONYMS (Continued)

NPDES	National Pollution Discharge Elimination System
NPL	National Priorities List
NSGA	Naval Security Group Activity
O&M	operation and maintenance
ORP	oxidation-reduction potential
OU	operable unit
PCB	polychlorinated biphenyl
PQL	practical quantitation limit
RAB	Restoration Advisory Board
RAO	remedial action objectives
RBSC	risk-based screening concentration
RME	reasonable maximum exposure
ROD	Record of Decision
SA	source area
SAERA	State-Adak Environmental Restoration Agreement
SARA	Superfund Amendments and Reauthorization Act of 1986
SOP	standard operating procedure
SVOC	semi-volatile organic compound
SWMU	solid waste management unit
TAC	The Aleut Corporation
TAH	total aromatic hydrocarbons
TPH	total petroleum hydrocarbons
UCL95	95 upper confidence limit
UST	underground storage tank
VOC	volatile organic compound

DECLARATION

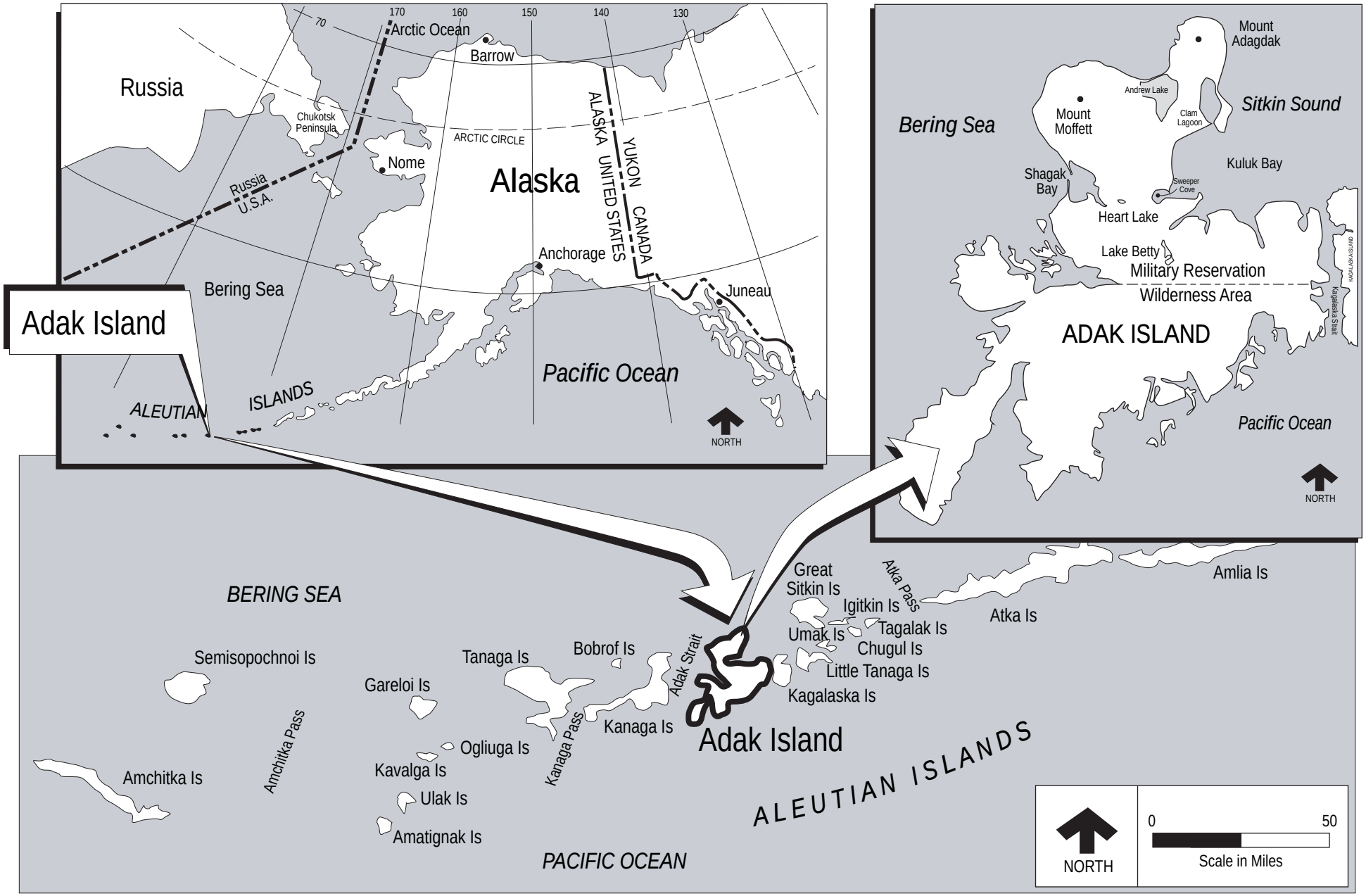
1.0 INTRODUCTION

This decision document (DD) presents the selected cleanup alternative and the supporting rationale for cleanup of the South of Runway 18-36 Area at the former Adak Naval Complex, Adak Island, Alaska. The decisions documented in this DD are based on supporting documents in the Administrative Record located at the offices of Naval Facilities Engineering Command Northwest in Silverdale, Washington. The State of Alaska and U.S. Navy (Navy) have agreed to the decisions outlined in this document. Also, The Aleut Corporation (TAC), the current property owner, has concurred with the selected cleanup alternative. The Navy is responsible for implementing the cleanup alternative presented in this DD.

The former Adak Naval Complex is located on Adak Island, which is approximately 1,200 air miles southwest of Anchorage, Alaska, in the Aleutian Island chain (Figure 1-1). Figure 1-2 shows the general location of the South of Runway 18-36 Area. A legal description specifying the boundary of the site is included as Appendix A. A site map showing the legal boundary of the South of Runway 18-36 Area is also provided (Figure 1-3). The legal boundary was developed for land transfer purposes and does not necessarily correspond with the extent of contamination.

Alternative 2 – Institutional Controls, Free-Product Recovery and Containment, Monitored Natural Attenuation (MNA) for Groundwater, and Natural Recovery for Surface Water and Sediment – is selected as the remedial alternative for the South of Runway 18-36 Area. The selected cleanup alternative for the South of Runway 18-36 Area is discussed in more detail in Section 9.

This DD was developed in accordance with State of Alaska regulations governing petroleum-release sites, the Alaska Department of Environmental Conservation (DEC) Oil and Other Hazardous Substances Pollution Control Regulations (18 Alaska Administrative Code [AAC] Chapter 75). Other regulatory requirements applicable to the implementation of the selected cleanup alternative are provided in Section 10.



U.S.NAVY

Figure 1-1
Adak Island Vicinity

Adak Island, AK
DECISION DOCUMENT

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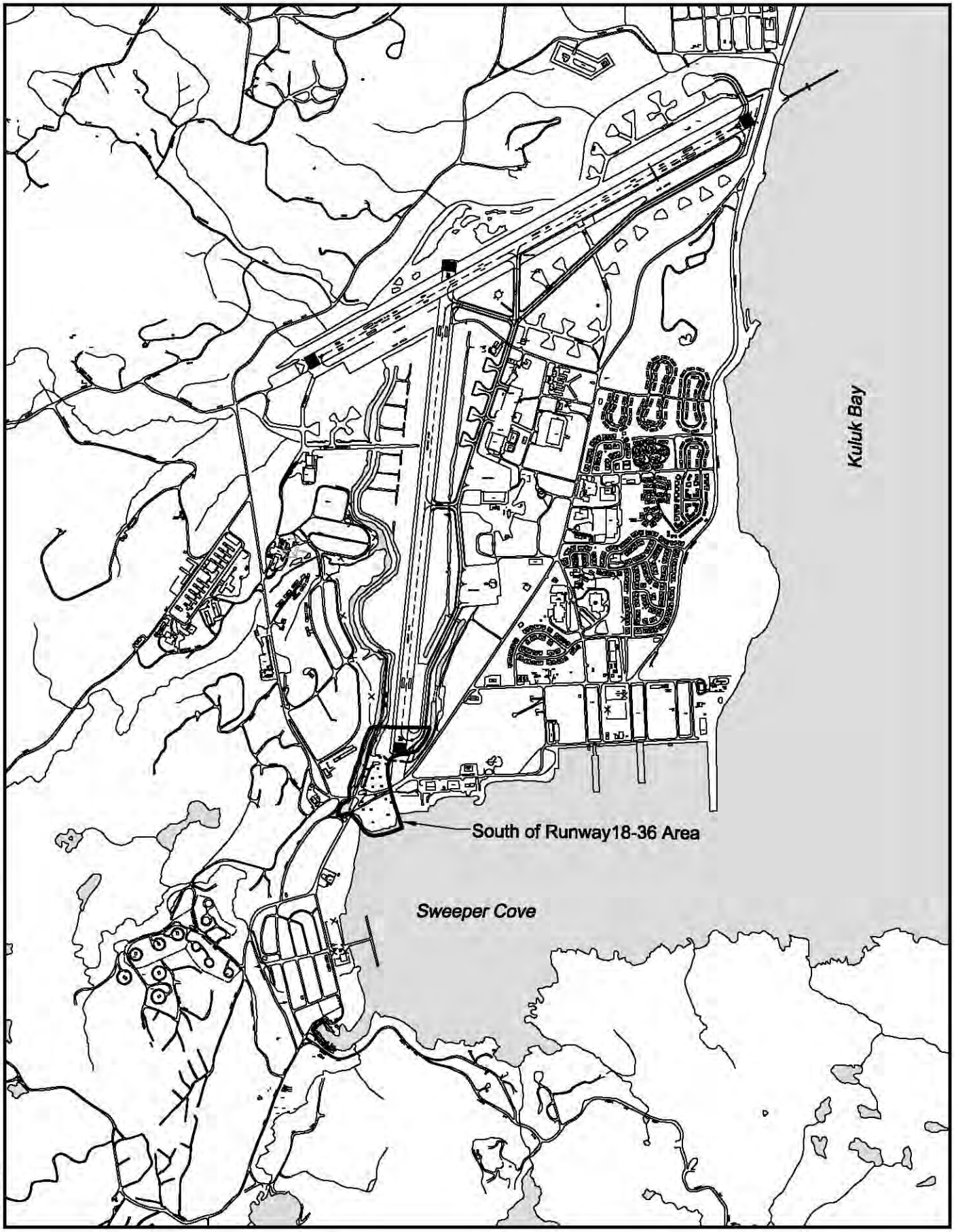

U.S. NAVY	N 0 500 1,000 2,000 SCALE IN FEET	**Figure 1-2** **Site Location** **South of Runway 18-36 Area**	Adak Island, AK DECISION DOCUMENT

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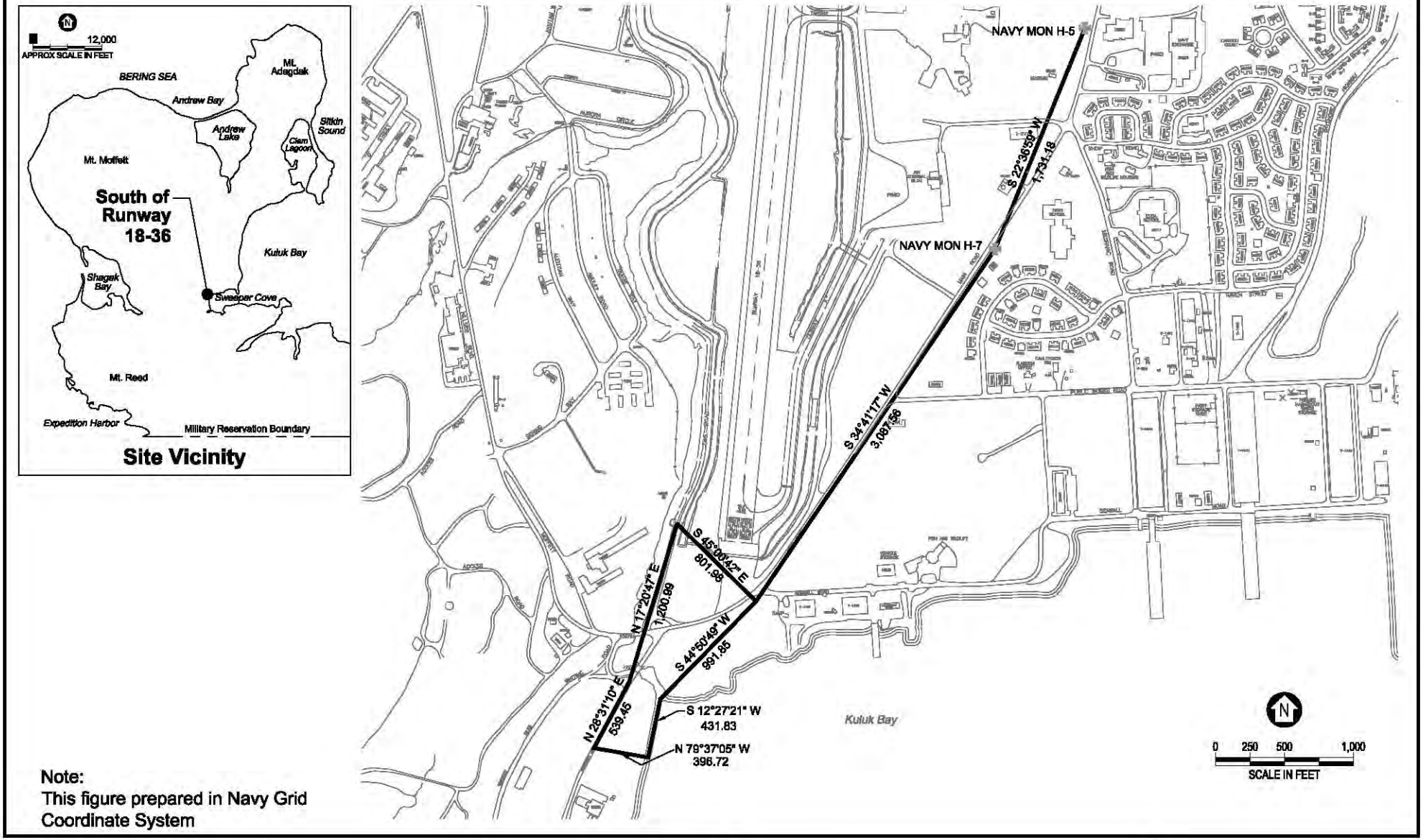

Note:
This figure prepared in Navy Grid Coordinate System

Scale as Shown	**Figure 1-3** **Legal Boundaries,** **South Runway of 18-36 Area**	Adak Island, AK DECISION DOCUMENT

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2.0 BACKGROUND

General background information for the South of Runway 18-36 Area is provided in this section. Additional information for the South of Runway 18-36 Area is provided in the focused feasibility study (FFS) report (URS 2005).

2.1 SITE HISTORY

Military presence on Adak began in 1942 with its occupation as a staging area to mount a counter-offensive to dislodge the Japanese from Attu and Kiska Islands. The Navy presence at Adak was officially recognized by Public Land Order 1949, dated August 19, 1959, which withdrew the northern portion of Adak Island, comprising approximately 76,800 acres, for use by the Navy for military purposes. The Navy also used the base to conduct a variety of Cold War-era military activities. Naval Air Facility Adak was on the list of Department of Defense installations recommended for closure in 1995, and that recommendation became final when Congress did not disapprove the list. The active Navy mission ceased, and the base operationally closed on March 31, 1997.

From April 1997 through September 2000, critical facilities such as the power plant, airfield, and environmental cleanup systems were operated by the Navy through a caretaker contractor. In June 1998, the Navy entered into a lease with the Adak Reuse Corporation (ARC), the designated local redevelopment authority that authorized ARC to use or sublease property in the developed core of the military reservation for commercial reuse purposes. In October 2000, ARC commenced operation of community facilities such as the airfield and utility systems in support of reuse activities under the authority of this lease.

In September 2000, the federal government entered into a land transfer agreement with TAC, a Native corporation, as documented in the Agreement Concerning the Conveyance of Property at the Adak Naval Complex, Adak, Alaska. This agreement set forth the terms and conditions for the conveyance of approximately 47,000 acres of the former Adak Naval Complex property to TAC. The actual conveyance or transfer of property occurred on March 17, 2004. The land transfer included all of the downtown area, housing units, and industrial facilities. Excluded from this transfer were any offshore islands, islets, rocks, reefs, and spires; those fixtures and equipment owned by the United States and associated with the airfield; those improvements owned by the United States and managed by the Federal Aviation Administration (FAA); and those improvements owned by the United States and managed by the Fish and Wildlife Service. TAC transferred the portion of the former Naval Air Facility known as Adak Airport and associated facilities and aviation easements, not including FAA navigation aids or weather

reporting equipment, to the State of Alaska. As a result of the land transfer agreement, TAC owns the South of Runway 18-36 Area.

The transferred land has institutional controls currently in place as specified in the Interim Conveyance document. The institutional controls that have been implemented at the former Adak Naval Complex through the final institutional control management plan (ICMP) (U.S. Navy 2004) include:

1. Land use restrictions, primarily limited to areas designated for commercial or industrial use

2. Notification to the Navy of intrusive soil excavation activities deeper than 2 feet

3. Groundwater restrictions that prohibit use of the downtown aquifer as a drinking water resource

These institutional controls are discussed in more detail in Section 2.7.

2.1.1 Site Regulatory History

Investigation and cleanup of petroleum-contaminated sites at the former Adak Naval Complex have been ongoing since 1986. Adak was initially proposed for placement on the National Priorities List (NPL) in 1992 and was officially listed in 1994. The Navy, as lead agency, entered into a three-party Federal Facilities Agreement (FFA) with the U.S. Environmental Protection Agency (EPA) and Alaska DEC as well as a two-party State-Adak Environmental Restoration Agreement (SAERA) with the Alaska DEC to facilitate investigation and cleanup activities.

In 1993, the Navy, EPA, and Alaska DEC signed the FFA, which incorporates the EPA's cleanup process under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). The CERCLA exclusion of petroleum as a hazardous substance required that cleanup of petroleum-related chemicals would follow State of Alaska regulations. Therefore, the FFA stated that petroleum-contaminated sites, such as those containing underground storage tanks (USTs) and leaking underground fuel lines, would be evaluated under a separate two-party agreement between the Navy and the State of Alaska. This agreement, the SAERA, was signed in April 1994.

The former Adak Naval Complex was divided into two operable units (OUs), OU A and OU B, for investigation and cleanup activities. OU A includes CERCLA and petroleum sites, and OU B includes ordnance explosive sites. A total of 180 sites were evaluated within OU A. The

FFA listed 84 CERCLA sites, and the SAERA listed 128 petroleum sites. The number of CERCLA sites plus the number of petroleum sites is greater than 180, because some sites that were originally listed as CERCLA sites were evaluated under SAERA and some sites were evaluated under both CERCLA and SAERA. In May 1997, the Navy and Alaska DEC agreed to integrate the cleanup decision process for petroleum sites with the cleanup decision process being conducted for hazardous substance release sites under CERCLA. As a result, the Record of Decision (ROD) for OU A was prepared for both the petroleum-contaminated sites and the hazardous-substance-release sites. The ROD was signed by the Navy, the EPA, and the Alaska DEC in 2000.

The OU A ROD selected final or interim remedies for each of the 128 petroleum-contaminated sites identified on Adak Island. The interim remedy, free-product recovery, was selected for 14 sites that contained measurable quantities of free-phase petroleum product. In addition, the OU A ROD specified that these 14 sites would require future remedy selection pursuant to the two-party SAERA. To clarify regulatory authority, the OU A ROD was amended in 2003 to remove these petroleum sites and 48 others with further action from CERCLA authority. Therefore, final remedies for the 14 petroleum-contaminated sites will be selected in accordance with Alaska State regulation 18 AAC 75.325 through AAC 75.390 which provides the regulatory procedures and requirements for petroleum cleanup decisions.

This DD addresses one of the 14 free-product recovery sites. The 10 sites where the remaining petroleum-related chemicals pose no risk to human health or the environment above target health goals, provided that institutional controls remain in effect, were previously addressed in a separate DD (U.S. Navy and ADEC 2005b). This site is one of the three sites where petroleum-related chemicals pose a potential risk to human health or the environment above target health goals. The other two sites (the Naval Mobile Construction Battalion [NMCB] Building T-1416 Expanded Area and the Solid Waste Management Unit [SWMU] 62 New Housing Fuel Leak site) will be addressed in separate DDs. The NMCB Building T-1416 Expanded Area DD will be executed in 2006. The SWMU 62 New Housing Fuel Leak site DD will be issued later in 2006. The SWMU 17 Power Plant No. 3 site was originally included as one of the sites where petroleum-related chemicals pose a potential risk to human health or the environment above target health goals, because the initial draft FFS prepared in August 2004 (using information current through November 2002) concluded that contaminants in sediment in Yakutat Creek posed a potential unacceptable risk. Because risks were only slightly above target health goals, the data used to evaluate the ecological risk were more than 6 years old and samples were collected before the upgradient contaminant sources were remediated, the Navy performed additional sediment sampling in Yakutat Creek in June 2005. Risks were recalculated using the additional data. As a result, the revised risk assessment concluded that contaminants in Yakutat Creek are unlikely to pose a significant risk. The SWMU 17 Power Plant No. 3 site DD will be issued in a separate DD based on these conclusions later in 2006.

2.1.2 Site Release History

In September 1990, an abandoned 6-inch diameter jet petroleum (JP)-5 fuel line located near the southeast corner of runway 18-36 was uncovered during the installation of a new fuel line adjacent to Main Road (Figure 2-1). Residual product was observed in the excavated trench indicating that a fuel release had occurred at the site (EMCON 1996). The fuel line was left in place. Subsequent site investigation activities indicated the presence of petroleum hydrocarbons in subsurface soil and groundwater over a large area South of Runway 18-36 Area. Measurable quantities of free product have been periodically observed in and recovered from groundwater monitoring wells at the site.

All known or presumed releases of petroleum hydrocarbons at the South of Runway 18-36 Area have occurred in the subsurface. Petroleum hydrocarbons have not been reported associated with surface soils at the site. Potential sources of the petroleum hydrocarbons present at the site include various pipelines that crisscross the site, as identified on Figure 2-1. In addition to the 6-inch diameter JP-5 fuel line discussed above, several additional pipelines present at the site may be sources of potential releases. These include one 8-inch diameter motor vehicle gasoline (mogas) pipeline (the more northerly of the two 8-inch diameter mogas pipelines), one 4-inch diameter mogas pipeline, and one 10-inch diameter aviation gasoline (avgas) pipeline that were cleaned and closed in 2003; one 8-inch diameter mogas pipeline that was abandoned in the late 1950s, and a 12-inch diameter diesel fuel transfer pipeline that was also abandoned in the late 1950s.

2.2 PHYSICAL CHARACTERISTICS

Adak Island experiences a polar maritime climate characterized by persistently overcast skies, high winds, frequent and often violent storms, and a narrow range of temperature fluctuation throughout the year. The average total annual precipitation for Adak Island is about 60 inches, most of which falls as rain in the lower elevations. Average monthly precipitation varies from a low of about 3 inches during June and July to a high of 7 to 8 inches during November and December. Snowfall averages over 100 inches a year at sea level.

The South of Runway 18-36 Area consists of the lowland area surrounding the southern portion of Runway 18-36 (Figure 1-2). It extends from the East Canal of the airport ditch system on the east to South Sweeper Creek on the west and south to Sweeper Cove. To the east this site adjoins to another large petroleum release site; the NMCB Building T-1416 Expanded Area. The primary physical features on the site include the southern portion of Runway 18-36, Main Road, the northern end of Transit Road south to the Transit Road Bridge, and the southern portion of the West Canal and the Crossover Canal of the airport ditch system. The canals that constitute the airport ditch system are engineered structures used to divert surface water from the

vicinity of Runway 18-36. Because the site is within the low-fly zone established for the airfield, no buildings are located within the site boundaries.

Groundwater is found as a regional aquifer beneath the site. The water table is approximately 5 to 10 feet below ground surface (bgs). Groundwater flow in the lowland area occupied by the site is complex and controlled to a large extent by the water level in the East and West Canals. In general, groundwater flow is toward the nearest surface water body: East Canal, West Canal, South Sweeper Creek, or Sweeper Cove (Figure 2-2). Nearshore groundwater in the vicinity of Sweeper Cove and South Sweeper Creek is tidally influenced, while mechanical pumping of water from the West Canal into South Sweeper Creek influences groundwater elevations near the airport ditch system. Because of the multidirectional groundwater flow in the vicinity, the East Canal, the West Canal, South Sweeper Creek, and Sweeper Cove are all considered to be downgradient surface water bodies.

South Sweeper Creek is located at the western boundary of the site and receives surface water and groundwater from approximately 30 percent of the Sweeper Cove drainage basin. The mouth of South Sweeper Creek forms an estuary where it discharges into Sweeper Cove. The shoreline of Sweeper Cove is sandy near the discharge of South Sweeper Creek. The East Canal and the West Canal of the airport ditch system are steeply sloped, manmade channels lined with tundra grass. The Crossover Canal is totally contained in underground culverts that allow water to flow between the East and West Canals. These canals provide drainage and water level control surrounding Runway 18-36. Water in the East Canal flows through the Crossover Canal and into the West Canal, where it is transferred through turbine pumps into South Sweeper Creek. This renders the airport ditch system an isolated, intrastate, and non-navigable waterway. Therefore, west canal is not considered an ecological endpoint, as is South Sweeper Creek and Sweeper Cove. South Sweeper Creek and Sweeper Cove are considered navigable waters of the United States.

2.3 DESCRIPTION OF CONTAMINANTS AND MEDIA IMPACTED

Decisions documented in this DD are based upon information gathered from various environmental field investigations performed by the Navy at the site between 1989 and 2001, as indicated in Table 2-1. These investigations included a site investigation, release investigations, and a remedial investigation to evaluate subsurface conditions and investigate potential sources of contamination. Results of these investigations indicated that petroleum-related chemicals and selected volatile organic compounds (VOCs) were present in samples of subsurface soil, groundwater, sediment, and surface water collected from several locations at the South of Runway 18-36 Area. In addition, the concentrations of petroleum hydrocarbons in both soil and groundwater exceeded the applicable Alaska DEC cleanup levels. However, Alaska regulations

have not established numerical cleanup criteria for individual petroleum hydrocarbons in surface water and sediment.

2.4 CLEANUP ACTIVITIES PERFORMED TO DATE

Cleanup activities that have been implemented at the South of Runway 18-36 Area include:

- Soil capping
- Sediment removal
- Replacement of crossover canal with metal culverts and contaminated soil excavation
- Installation of a product interception device
- Pipeline cleaning and closures
- Free-product recovery
- Natural attenuation monitoring

A summary of the cleanup activities performed at the site is provided in Table 2-2. In addition, results of the free-product recovery activities performed at the site are provided in Table 2-3. Additional information on the cleanup activities performed at the site is provided in the FFS (URS 2005).

Soil Capping

In August 1998, petroleum aesthetic corrective action work was completed in the South of Runway 18-36 Area. Corrective action activities included capping 270 feet of stained soil within the West Canal south of the Crossover Canal, and removing a section of wooden pipeline (BEESC 1998). The south end of West Canal was lined with geotextile and backfilled with clean pit run (quarry material) and covered with topsoil (Figure 2-1).

Sediment Removal

Removal, treatment, and disposal of polychlorinated biphenyl (PCB)-contaminated sediment from South Sweeper Creek were completed from April to August 1999. Approximately 5,400 cy were removed and treated. Sampling was conducted during excavation activities to confirm

removal to the required cleanup level. Results of sampling are included in the resulting closure report (BEESC 1999).

Replacement of Crossover Canal with Metal Culverts and Contaminated Soil Excavation

Airport ditch culvert installation activities occurred from May to September 2001 to reduce the potential for contamination to seep into the airport ditch drainage system (BEESC 2001a). The activities included installing two metal culverts north of the west ditch portion of Crossover Canal from the existing culverts in the South of Runway 18-36 Area to the south end of the West Canal. Approximately 70 cubic yards (cy) of petroleum-contaminated soil on the south bank of the Crossover Canal were removed for treatment and disposal. The area around the newly installed culverts and the former Crossover Canal ditch section were backfilled with clean material (Figure 2-1).

Installation of a Product Interception Device

During August 2001, a product interception device was installed along the bank of South Sweeper Creek to prevent release of petroleum into the creek by eliminating an observed seep (BEESC 2001a). This product interception device was installed adjacent to and east from the Transit Road Bridge.

Pipeline Cleaning and Closures

During June 2003, the cleaning and closure of three pipelines that cross the South of Runway 18-36 Area was completed (GeoEngineers 2003). The closed 10-inch avgas, 8-inch mogas, and 4-inch mogas pipelines are shown on Figure 2-1.

Free-Product Recovery

Free-product recovery has been conducted at the South of Runway 18-36 Area from June 1997 through May 1998, July 1998 through November 2000, May 2001 through November 2001, May 2002 through November 2002, and August 2004 through July 2005. Free-product recovery data through November 2004 are summarized in Table 2-3. Approximately 215 gallons of free product were recovered at the site based on data through November 2004.

Natural Attenuation Monitoring

To evaluate the potential for natural processes to attenuate petroleum-related chemicals at the South of Runway 18-36 Area, natural attenuation monitoring was conducted in the six monitoring wells that were sampled at the site during 2002 as part of the annual groundwater monitoring activities. Analyses were performed on the groundwater samples for natural

attenuation indicator parameters. These natural attenuation indicator parameters consist of dissolved oxygen (DO), nitrate/nitrite, ferrous iron, sulfate/sulfide, dissolved methane, alkalinity, chloride, and oxidation-reduction potential (ORP). Typically comparisons are made relative to upgradient locations versus source area and down-gradient locations. Because no wells are located at the site such that groundwater samples represent upgradient conditions, comparisons were made relative to downgradient wells where petroleum-related chemicals have not been reported in groundwater samples. Taken as a body of evidence, the natural attenuation parameters measured at the South of Runway 18-36 Area indicate both aerobic and anaerobic conditions were present at the site during the 2002 sampling event. Aerobic conditions predominate in the areas beyond the limits of the dissolved petroleum plumes, while anaerobic conditions predominate within the dissolved petroleum plumes. These conditions indicate that biologic degradation of petroleum hydrocarbons is occurring within groundwater beneath the South of Runway 18-36 Area.

In addition to the natural attenuation monitoring performed at the South of Runway 18-36 Area, natural attenuation monitoring was performed at 10 sites on Adak in May and June of 2003 (USGS 2005). The site closest to the South of Runway 18-36 Area that was monitored during this investigation was the Former Power Plant Building T-1451. The report concluded that the natural attenuation parameter data that have been collected to date demonstrate that biodegradation plays a significant role in natural attenuation in the downtown area of Adak Island.

2.5 LAND USE

The land that makes up South of Runway 18-36 Area has been extensively altered since the military first arrived on Adak Island during World War II. This area was part of a back-beach lagoon prior to the arrival of military forces. The lagoon was filled with sand and rock and was converted to a military airstrip and fuel receipt and distribution center to support the United States' Aleutian campaign during World War II. The South of Runway 18-36 Area is crossed by six former underground fuel transfer pipelines that are part of this fuel distribution system (Figure 2-1). After the war, the area continued to be used for these purposes until the military drawdown on Adak resulted in a reduction of fuel usage and air traffic (URSG 1999a).

Future land use at South of Runway 18-36 Area is classified for either aviation or public facilities reuse (ARC 2000) (Figure 2-3). The portion of the site north and west of Main Road is designated for aviation reuse. The portion of the site between Main Road and Sweeper Cove is designated for public facilities reuse. This area includes roads and harbor facilities present in the vicinity of the South of Runway 18-36 Area.

2.6 GROUNDWATER USE

According to Alaska regulations (18 AAC 65.350), groundwater is considered to be a drinking water source unless it can be demonstrated that the groundwater is not currently being used as a drinking water source and groundwater is not a reasonably expected potential future source of drinking water. Groundwater has not historically been used as a drinking water source on Adak Island, nor is it currently being used as such. Future human use of groundwater on Adak Island as a drinking water source is not expected because of the following:

- Surface water from Lake Bonnie Rose is used as the sole drinking water source on Adak Island.
- The Interim Conveyance document issued by the United States to TAC imposes institutional controls that prohibit the future use of the downtown groundwater aquifer as a drinking water source.

Institutional controls, as described in the Institutional Controls Management Plan for Adak Island, are currently in place to prevent the use of the downtown aquifer as a future drinking water resource. These institutional controls include a prohibition of well drilling and excavation for the purpose of installing a private or public domestic use well and a requirement to notify the Navy prior to any excavation deeper than 2 feet. Although institutional controls are in place preventing the use of the downtown aquifer, groundwater is still considered a potential future source of drinking water according to the Alaska DEC if potable water could be obtained from a well installed at the site. However, because saltwater was shown to intrude into nearshore groundwater in the vicinity of the South of Runway 18-36 Area in the Saltwater Intrusion Investigation Report (URS 2001), groundwater is not considered a reasonably expected potential future drinking water source at the site. Therefore, groundwater cleanup levels identified for this sites are 10 times those presented in Table C of Alaska Regulation 18 AAC 75.345(b)(1).

2.7 INSTITUTIONAL CONTROLS

Institutional controls are measures to prevent or limit exposure to hazardous substances left in place at a site, or assure effectiveness of the chosen remedy until cleanup levels are achieved. Institutional controls are placed on property where contaminants remain at levels above regulatory requirements for cleanup, and where exposure pathways, if they exist, may cause harm to human health and the environment. For the South of Runway 18-36 Area addressed in this DD, the institutional controls specified in the Interim Conveyance document include land use restrictions, excavation restrictions, and groundwater restrictions. The land use restrictions and excavation restrictions are discussed in more detail below.

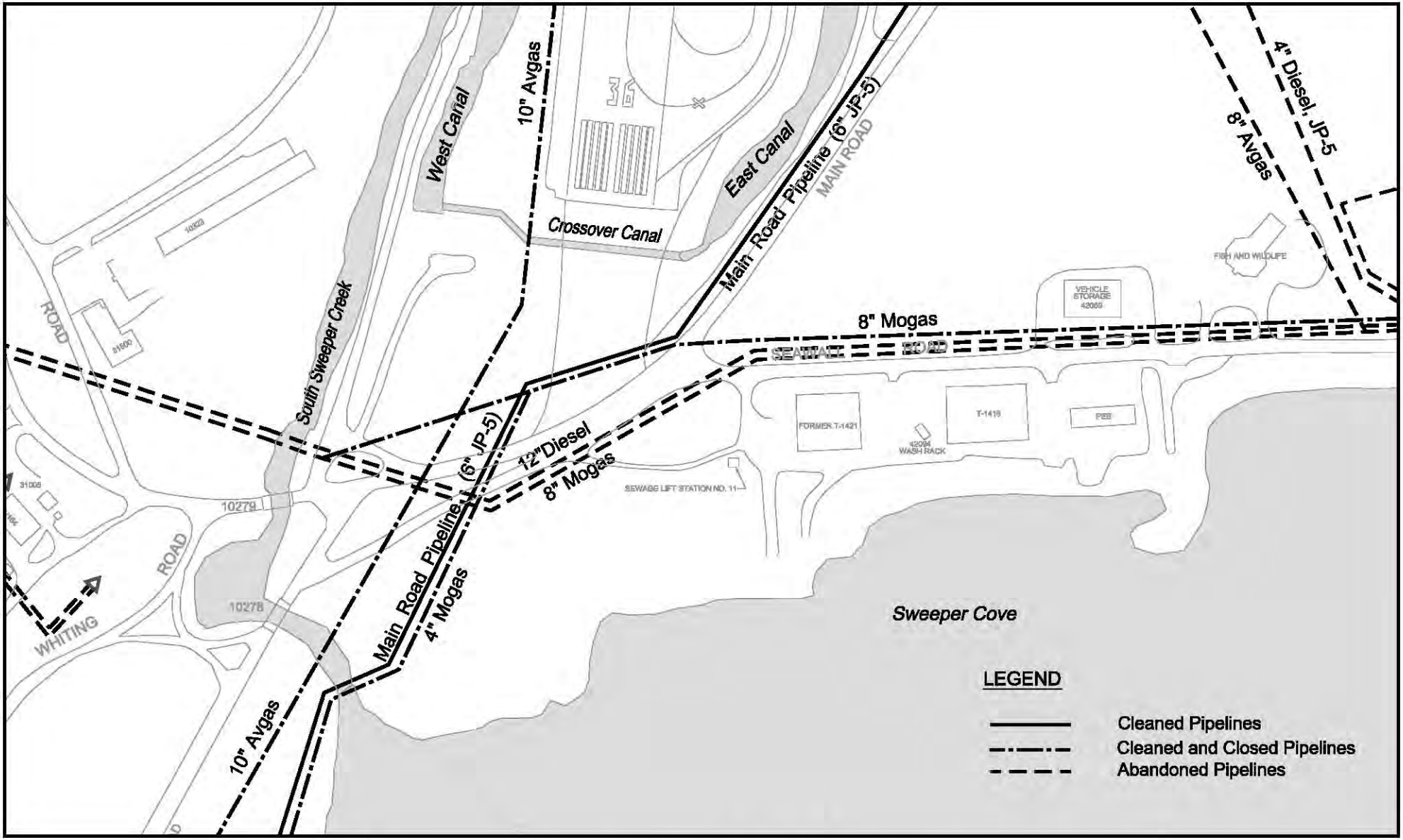
2.7.1 Land Use Restrictions

The Alaska Oil and Hazardous Substances Pollution Control regulations (18 AAC 75) require cleanup of hazardous substances that have been released into the environment to a degree that is determined to be protective of human health and the environment. The purpose of institutional controls is to ensure compliance with land use assumptions used to establish cleanup levels. Residential land use, including permanent or temporary living accommodations, childcare facilities, schools, playgrounds, and hospitals are prohibited at the South of Runway 18-36 Area by the Interim Conveyance document.

2.7.2 Excavation Restrictions

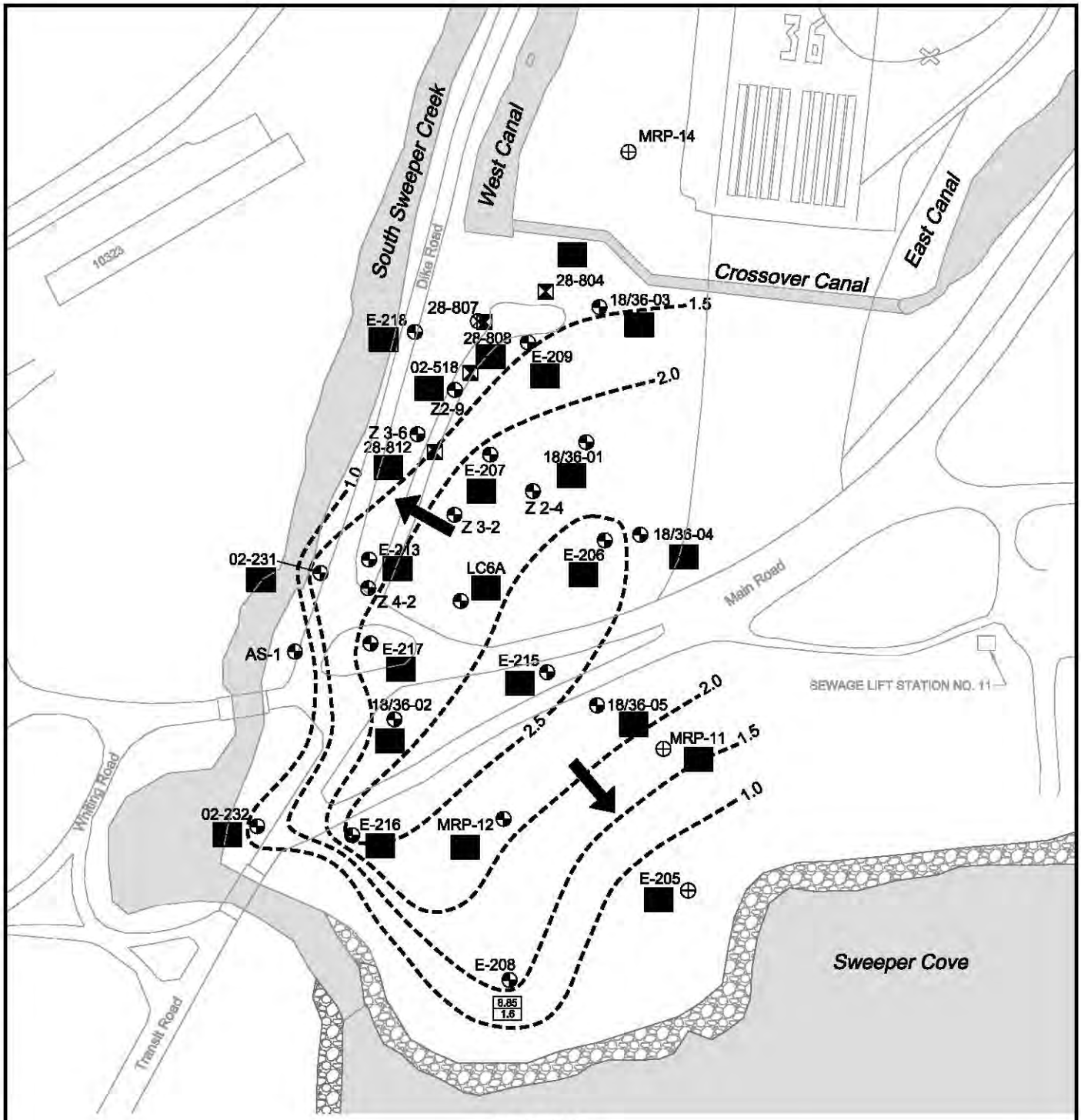
There are two types of soil excavation restrictions implemented at the former Adak Naval Complex through the Interim Land Conveyance document: (1) excavation notifications and (2) absolute excavation prohibitions. Excavation notification is required for proposed excavations below 2 feet at each of the institutional controls sites, including the South of Runway 18-36 Area. The notifications are evaluated by the Navy to determine whether a proposed project at a site is consistent with the land use assumptions. The notifications are an additional tool for the Navy to receive timely information to monitor land use restrictions. The primary purpose of the Excavation Notification is to apprise the Navy of changes to land use. Excavation notification also ensures that contaminated materials excavated during site development activities are properly managed.

At some sites, such as former landfills, or where the remedy in place is a protective cover, excavation by non-Navy personnel is absolutely prohibited. Absolute excavation prohibitions are not applicable to the South of Runway 18-36 Area. Excavation for the purpose of digging a domestic use well in the downtown area is also prohibited. Excavation prohibitions have been implemented through the Interim Conveyance document and the final ICMP (U.S. Navy 2004).



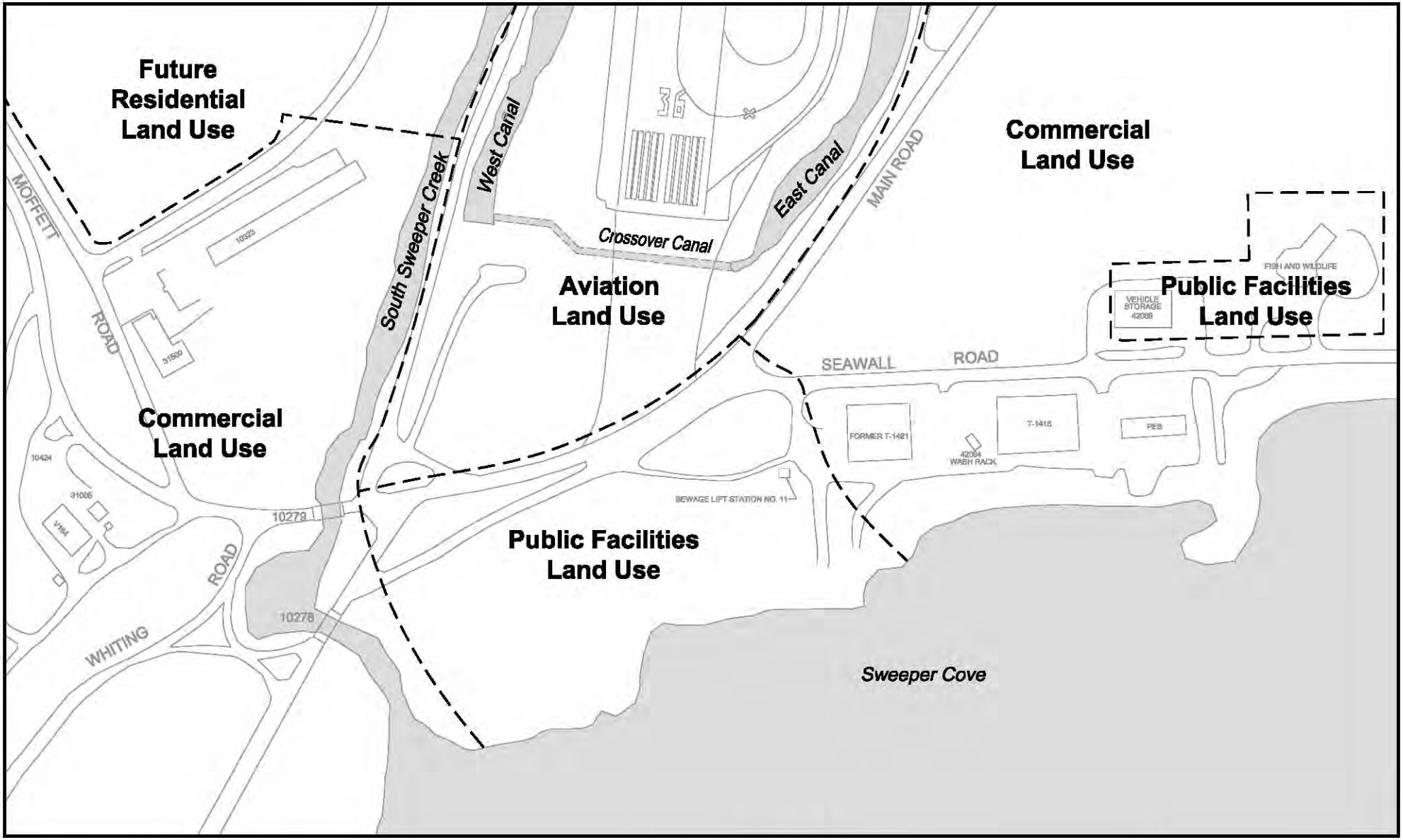
U.S. NAVY	N 0 150 300 SCALE IN FEET	**Figure 2-1** **Potential Petroleum Sources at the South of Runway 18-36 Area**	Adak Island, AK DECISION DOCUMENT

FILENAME: T:\ADAK\IDIQ\Sub-Tasks\DO 3\S RUNWAY DEC DOC\INTERNAL DRAFT\Fig 2-1 POT PETRO PIPES.dwg
EDIT DATE: 05/04/06 AT: 11:11



FILENAME: T:\ADAK\DIQ\Sub-Tasks\DO 3\S RUNWAY DEC DOC\INTERNAL DRAFT\FIG 2-2 GW FLOW.dwg
EDIT DATE: 05/04/06 AT: 11:33

U.S. NAVY	N 0 50 100 200 SCALE IN FEET	**Figure 2-2** **Groundwater Flow Map** **South of Runway 18-36 Area**	Adak Island, AK DECISION DOCUMENT



U.S. NAVY	0 150 300 SCALE IN FEET	Figure 2-3 Proposed Future Land Use South of Runway 18-36 Area	Adak Island, AK DECISION DOCUMENT

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Table 2-1
Summary of Environmental Field Investigations, South of Runway 18-36 Area

Date	Investigation Activity
1989	Phased site investigation to evaluate the extent of petroleum fuel released in the vicinity of Tank Farm A (URS 1990, 1991)
1994	Release investigation in the vicinity of Tank Farm A to supplement the 1989 investigation (EMCON 1994)
1994	Release investigation to evaluate the extent of fuels released in the vicinity of the Main Road Pipeline (URS 1994)
1996	Release investigation work plan to summarize site conditions (EMCON 1996)
1999	Preparation of a site summary report to present all site data collected to that point (URSG 1999a)
2001	Remedial investigation to delineate the lateral extent of dissolved-phase petroleum-related chemicals in groundwater at the site (URS 2005)

Table 2-2
Summary of Site Cleanup Activities, South of Runway 18-36 Area

Date	Cleanup Activity
1997–2004[a]	Free-product recovery (total of 215 gallons recovered)
1998	Petroleum aesthetic corrective action that included capping stained soil within West Canal south of Crossover Canal and removing a section of wooden pipeline
1999	Removal, treatment, and disposal of PCB-contaminated sediment from South Sweeper Creek
2001	Installation of two metal culverts in the airport ditch system from existing culverts in Crossover Canal to the south end of West Canal including removal of 70 cubic yards of petroleum-contaminated soil
2001	Installation of product interception device along the bank of South Sweeper Creek near Transit Road Bridge
2002	Natural attenuation monitoring
2003	Cleaning and closure of three pipelines: 10-inch avgas, 8-inch mogas, and 4-inch mogas

[a]Intermittent operation

Notes:
avgas - aviation gasoline
mogas - motor vehicle gasoline
PCB - polychlorinated biphenyls

Table 2-3
Free-Product Recovery Data South of Runway 18-36 Area

Date	Gallons Recovered	Date	Gallons Recovered	Date	Gallons Recovered	Date	Gallons Recovered
January 1997	---	January 1998	1.81[1]	January 1999	0[1]	January 2000	? [3]
February 1997	---	February 1998	0.52[1]	February 1999	1[1]	February 2000	18.24[3]
March 1997	---	March 1998	1.67[1]	March 1999	1[1]	March 2000	0.0
April 1997	---	April 1998	1.68[1]	April 1999	2[1]	April 2000	6.0
May 1997	---	May 1998	0.73[1]	May 1999	1.05[1]	May 2000	8.13
June 1997	4.0[1]	June 1998	---	June 1999	0.26[1]	June 2000	3.95
July 1997	4.0[1]	July 1998	27	July 1999	0.15[1]	July 2000	13.22
August 1997	4.39[1]	August 1998	1.92	August 1999	0.31[1]	August 2000	9.4
September 1997	0.51[1]	September 1998	0.7[1]	September 1999	0.04	September 2000	5.8
October 1997	1.76[1]	October 1998	0.6[1]	October 1999	0	October 2000	2
November 1997	0.6[1]	November 1998	0[1]	November 1999	3	November 2000	1.2
December 1997	1.53[1]	December 1998	0[1]	December 1999	0	December 2000	---
1997 TOTAL	**17**	**1998 TOTAL[2]**	**37**	**1999 TOTAL[2]**	**9**	**2000 TOTAL[2]**	**68**
January 2001	---	January 2002	---	January 2003	---	January 2004	---
February 2001	---	February 2002	---	February 2003	---	February 2004	---
March 2001	---	March 2002	---	March 2003	---	March 2004	---
April 2001	---	April 2002	---	April 2003	---	April 2004	---
May 2001	5.33	May 2002	4.71	May 2003	---	May 2004	---
June 2001	12.61	June 2002	2.66	June 2003	---	June 2004	---
July 2001	2.73	July 2002	5.62	July 2003	---	July 2004	---
August 2001	9.43	August 2002	10.02	August 2003	---	August 2004	1.19
September 2001	1.63	September 2002	11.06	September 2003	---	September 2004	2.47
October 2001	4.02	October 2002	6.67	October 2003	---	October 2004	1.12
November 2001	2	November 2002	0.52	November 2003	---	November 2004	1.39
December 2001	---	December 2002	--	December 2003	---	December 2004	---
2001 TOTAL	**38**	**2002 TOTAL**	**41**	**2003 TOTAL**	**---**	**2004 TOTAL**	**6.2**
Total quantity of product recovered at the site = 215 gallons							

Table 2-3 (Continued)
Free-Product Recovery Data South of Runway 18-36 Area

Notes:
--- = Recovery system not operating
[1] Recovered using passive skimmers only
[2] Automated passive skimmer installed in E-204 experienced operational difficulties from September 1998 through June 2000. These difficulties affected recovery rates.
[3] Bimonthly total estimated due to frozen fluid in product recovery tank

3.0 IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN

Petroleum hydrocarbons, semivolatile organic compounds (SVOCs), VOCs, and lead have been detected in soil, groundwater, surface water, and sediment at the South of Runway 18-36 Area. The concentrations of contaminants in these media at this site were compared to Alaska DEC cleanup criteria and/or human health and ecological risk-based screening criteria to identify the chemicals of potential concern (COPCs). The COPCs in soil, groundwater, surface water, and sediment are presented below.

3.1 SOIL

A chemical was identified as a COPC if its concentration exceeded the Alaska Method Two cleanup levels 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) or if it was identified as a COPC in the human health risk assessment. No COPCs were identified for soil in the ecological risk assessment, because concentrations of petroleum hydrocarbons were less than the ecological risk-based screening criteria. The following is a listing of the COPCs identified at the South of Runway 18-36 Area:

- 2-Methylnaphthalene
- Naphthalene
- Benzene
- Ethylbenzene
- Diesel-range organics (DRO)
- Gasoline-range organics (GRO)

Concentrations of benzene, DRO, ethylbenzene, and GRO in soil at the site exceeded the most stringent Alaska DEC Method Two soil criteria in one or more samples. Benzene and ethylbenzene were included as COPCs for the site, because their concentrations in soil exceeded the most stringent Alaska DEC Method Two soil criteria in one or more samples. However, they were not included as a COPC in the human health risk assessment because the magnitude of the exceedances was low, because of infrequent detection, or because of infrequent exceedance of the screening criteria. 2-Methylnaphthalene and naphthalene were included in the list above because they were identified as COPCs in the human health risk assessment even though their concentrations did not exceed the most stringent Alaska DEC Method Two soil criteria.

3.2 GROUNDWATER

A chemical was identified as a COPC if its concentration exceeded the Alaska DEC groundwater cleanup levels [18 AAC 75.345(b)(2)] or if it was identified as a COPC in the human health risk assessment. The following is a listing of the COPCs identified at the South of Runway 18-36 Area:

- 2-Methylnaphthalene
- Naphthalene
- Acetone
- Benzene
- Ethylbenzene
- DRO
- GRO
- Xylenes

All chemicals that exceeded the Alaska DEC groundwater cleanup levels (benzene, DRO, and GRO) in one or more groundwater samples were also included as COPCs in the human health risk assessment. 2-Methylnaphthalene, acetone, ethylbenzene, naphthalene, and xylenes were included in the list above, because they were identified as COPCs in the human health risk assessment even though their concentrations did not exceed the Alaska DEC groundwater cleanup levels.

3.3 SURFACE WATER AND SEDIMENT

A chemical was identified as a COPC in surface water if its concentration exceeded the risk-based screening concentration (RBSC) for ecological receptors or the Alaska DEC water quality standards (18 AAC Chapter 70). The human health risk assessment concluded that the exposure pathways to surface water at the South of Runway 18-36 Area were insignificant. Therefore, no chemicals were identified as COPCs based on the human health risk assessment. The following is a listing of the COPCs identified for surface water at the South of Runway 18-36 Area:

- Indeno(1,2,3-cd)pyrene
- DRO
- GRO
- Total aromatic hydrocarbons (TAH)
- Total aqueous hydrocarbons (TAqH)

TAH and TAqH exceeded the Alaska DEC water quality standards, and GRO and indeno(1,2,3-cd)pyrene were identified as COPCs for the site because they were identified as COPCs in the human health risk assessment.

A chemical was identified as a COPC in sediment if its concentration exceeded the RBSC for ecological receptors. The human health risk assessment concluded that the exposure pathways to sediment at the South of Runway 18-36 Area were insignificant. Therefore, no chemicals were identified as COPCs based on the human health risk assessment. The following is a listing of the COPCs identified for sediment at the South of Runway 18-36 Area:

- 2-Methylnaphthalene
- Fluorene
- Phenanthrene
- DRO
- GRO

4.0 CONTAMINANT CONCENTRATIONS AND POTENTIAL EXTENT OF CONTAMINATION

Decisions documented in this DD are based upon information gathered from various environmental field investigations performed at the South of Runway 18-36 Area between 1989 and 2002. The environmental field investigations that have been performed at or in the vicinity of the South of Runway 18-36 Area are summarized in Table 2-1.

Results of these investigations indicated that petroleum-related chemicals and selected VOCs were confirmed in samples of subsurface soil, groundwater, sediment, and surface water collected from several locations at the South of Runway 18-36 Area. In addition, free product continues to be detected in wells at the site. Detailed characterization information for the site is provided in the FFS (URS 2005) and is summarized below.

Extent of Free Product

Between November 1992 and July 2005, monitoring wells within the vicinity of the South of Runway 18-36 Area were gauged periodically for the presence of free product. However, only data through December of 2004 are reported here. Between November 1992 and December 2004, free product was detected in 19 of the 26 wells installed at the site. The maximum measured free-product thickness reported at the site was 2.15 feet, in well E-216 on May 11, 2002. Figure 4-1 shows the estimated extent of residual free product at the site based on the maximum measured free-product thickness reported in each well during three monitoring periods: November 1992 through October 2000, January 2001 through October 2003, and August through December 2004. The extent of free product for the initial monitoring period (November 1992 through June 2000) is estimated at approximately 265,000 square feet (ft^2). This was the largest extent of residual free product estimated at the site for these three monitoring periods. Product recovery activities at the South of Runway 18-36 Area reduced the areal extent of residual free product from an estimated area of 265,000 ft^2 during the period from November 1992 through June 2000, to approximately 107,000 ft^2 for the period from January 2001 through October 2003. However, the maximum product thickness measurements obtained at the site during 2004 indicate an increase in the estimated areal extent of residual free product to approximately 164,000 ft^2. Based on the 2004 product thickness measurements through November 2004, an estimated 1,040 to 5,200 gallons of recoverable free product may remain in the subsurface at the site.

Free-product recovery has been conducted at the South of Runway 18-36 Area from June 1997 through May 1998, July 1998 through November 2000, May 2001 through November 2001, May 2002 through November 2002, and August 2004 through July 2005. Free-product recovery data

through November 2004 are summarized in Table 2-3. Approximately 215 gallons of free product were recovered at the site based on data through November 2004.

Free-product removal began in June 1997 with the installation of passive-style product skimmers in wells E-207, E-209, and E-217 (URSG 1999a). These skimmers were moved from well to well as warranted by the presence of free product. Passive skimmer operations produced approximately 17 gallons of recovered product at South of Runway 18-36 Area between June and December 1997 (Table 2-3). Sufficient product was recovered to warrant installation of an automated skimmer system in well E-207. Records indicate that this automated skimmer was deployed during June 1998 and became fully operational during July. For the remainder of 1998, product recovery at the South of Runway 18-36 Area was conducted using the automated skimmer in well E-207 and two passive skimmers that were moved from well to well on an as-needed basis. Problems with the automated skimmer limited its operational effectiveness from September through December. Recovery operations at the South of Runway 18-36 Area produced approximately 37 gallons of recovered product during 1998. The bulk of this recovered product (approximately 29 gallons) was recovered during July and August when the automated skimmer was operating effectively. During 1999, the automated skimmer experienced several operational problems that resulted in failure. The unit was shut down for most of the year. Four passive skimmers, a peristaltic pump, and product absorbent materials were used to recover product at the site. These recovery operations produced approximately 9 gallons of recovered product during 1999. Problems with the automated skimmer in well E-207 continued to plague the system. The unit was returned to the manufacturer for repairs and resumed service in well E-207 on June 15, 2000. The system operated more or less continuously until it was removed from the well for winter storage on November 7, 2000. The use of passive skimmers and absorbent materials to recover product also continued at the site until November. During the year 2000, approximately 68 gallons of free product were recovered at the South of Runway 18-36 Area.

Product recovery activities were restarted at the South of Runway 18-36 Area on May 11, 2001, and continued until November 12, 2001, when all recovery activities were terminated for the winter. During the seven months of recovery activities during 2001, approximately 38 gallons of free product were recovered at the site. Product recovery activities were restarted at the South of Runway 18-36 Area on May 11, 2002, and continued through November 8, 2002. During these six months of recovery activities, approximately 41 gallons of free product were recovered at the site. Product recovery did not occur at the site during 2003. However, product recovery activities were restarted on August 3, 2004. Passive skimmers were installed in wells E-207 and 02-231 during August. These skimmers remained in these wells through November 2004. A third passive skimmer was installed in well E-216 during September. On September 26, 2004, this passive skimmer was replaced with an automated skimmer, which remained deployed in well E-216 through November. Additional passive skimmers were installed in wells E-209,

E-217, 18/36-02, and 18/36-03 during October 2004, and remained deployed at these locations through November. During August through November 2004, 6.2 gallons of free product were recovered at the site. As of July 2005, free-product recovery at the South of Runway 18-36 Area was discontinued in existing site wells because free-product recovery conducted as an interim remedial action, had met the practicable endpoint established for the shut down of product recovery as specified in the OU A ROD (TetraTech 2006). The technically practicable endpoint for product recovery systems not dependent on water table depression is as follows:

> *When the monthly volume of recovered product averaged over the most recent 6 months (6-month moving average) is less than 5 gallons of product recovered per month, the technically practicable endpoint for recovery has been reached. If this endpoint criterion has been met for a period of 12 months of product recovery, the system is considered to meet the technically practicable endpoint and recovery can be discontinued (URSG 1999b).*

Potential Extent of Contamination in Soil and Groundwater

The potential extent of contamination in soil and groundwater at the South of Runway 18-36 Area was estimated in the FFS (URS 2005) and is summarized in this DD. The potential extent of contamination in soil and groundwater was based on data collected through 2002. Because no soil samples were collected after 2002 and groundwater samples were only collected from six wells at the South of Runway 18-36 Area, data collected after 2002 do not change the conclusions regarding the potential extent of contamination. The potential extent of contamination was estimated by comparing site concentrations from samples collected between 1992 and 2002 to the Alaska DEC cleanup levels. Locations where the concentrations exceeded the Alaska DEC cleanup levels were identified and then used to delineate the area of potential contamination on Figure 4-2.

The Alaska DEC Method Two cleanup levels 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) were used to estimate the potential extent of soil impacted by petroleum contamination at the South of Runway 18-36 Area. The tabulated groundwater cleanup levels [18 AAC 75.345(b)(1), Table C] were used to estimate the potential extent of groundwater impacted by petroleum contamination at the site. The potential extents of contamination shown in Figure 4-2 are based solely on exceedances of the Alaska DEC cleanup levels. The potential extents of contamination shown on this figure do not necessarily represent areas where risks are unacceptable or where cleanup actions will be required. However, these areas were considered to be a potential concern and therefore required further evaluation in a risk assessment. The site data used to estimate the potential extents of contamination were used in the risk assessment to determine if contaminant concentrations at the site pose an unacceptable risk to humans and ecological receptors.

The analytical results for benzene, ethylbenzene, DRO, GRO, toluene, and xylenes are provided on Plates 1 and 2 for soil and groundwater, respectively. Analytical results obtained for benzene, ethylbenzene, DRO, and GRO are included in the analysis conducted to establish the potential extent of contamination at the site. No other chemicals were detected at concentrations greater than Alaska DEC cleanup levels. Basic summary statistics for all COPCs in soil and groundwater are provided in Table 4-1. The COPCs were previously identified in Section 3. These statistics include:

- The total number of samples collected at the South of Runway 18-36 Area including field duplicates
- Samples used in the risk assessment
- The minimum concentration used in the risk assessment
- The maximum concentration used in the risk assessment
- The location of the maximum concentration used in the risk assessment
- The detection frequency
- The range of detection

The concentrations of contaminants at the site were compared to Alaska DEC cleanup criteria and/or human health and ecological risk-based screening criteria to identify the COPCs in soil, groundwater, surface water, and sediment. Therefore, some chemicals listed in Table 4-1 may only have been detected at concentrations which exceeded the human health and/or ecological risk-based screening criteria and not the Alaska DEC cleanup levels.

The extent of contamination in soil at the site was estimated by comparing analytical results to the most stringent Alaska DEC soil cleanup criteria which were established for the protection of groundwater in the over 40-inches of rainfall zone. Detected concentrations of DRO, GRO, benzene and ethylbenzene greater than their respective Alaska DEC soil cleanup levels were reported in 44 soil samples collected from 31 locations. These 31 locations, shown on Plate 1, occur over a large area across the site from the shore of South Sweeper Creek on the west nearly to the eastern boundary of the site, and from the Crossover Canal on the north, south to the Transit Road Bridge. The site area estimated to contain detected concentrations of chemicals in soil at concentrations greater than their respective most stringent Alaska DEC soil criteria or free-phase petroleum product during 2002 is indicated by the dashed line on Figure 4-2. This area is estimated to be approximately 5.6 acres.

The potential extent of contamination in groundwater was estimated by comparing analytical results to their respective Alaska DEC groundwater cleanup levels which were established for groundwater that is used as a drinking water source. Monitoring wells at the site have been sampled multiple times on a nonuniform schedule. In addition, groundwater samples collected from the monitoring wells were chemically analyzed for a nonuniform list of chemicals. Only the most recent information available for each chemical at each location is compared to the groundwater cleanup levels to determine the potential extent of contamination in groundwater.

Detected concentrations of DRO, GRO, or benzene were reported in the most recent groundwater samples collected from 11 locations at concentrations greater than their respective Alaska DEC groundwater cleanup criteria for groundwater that is used as a drinking water source. These 11 locations (LC6A, E-207, E-213, E-215, E-216, E-217, 02-231, 02-232, 18/36-01, 18/36-02, and 28-808) are shown on Plate 2. They occur over a relatively broad portion area of the site extending from South Sweeper Creek near the Transit Road Bridge north to location 28-808, approximately 100 feet south of the West Canal. In addition, a measurable thickness of free product was reported in 11 monitoring wells (E-207, E-209, E-213, E-215, E-216, E-217, 02-231, 18/36-01, 18/36-02, 18/36-03, and 28-812) at the South of Runway 18-36 Area during 2004 product recovery activities. These 11 locations (see Figure 4-2) are included within the area estimated to contain petroleum-related chemicals in groundwater at concentrations greater than Alaska DEC groundwater cleanup criteria.

The site area estimated to contain petroleum-related chemicals in groundwater at concentrations greater than the Alaska DEC criteria for groundwater that is used as a drinking water source is estimated to be approximately 6 acres (Figure 4-2).

Potential Extent of Contamination in Surface Water and Sediment

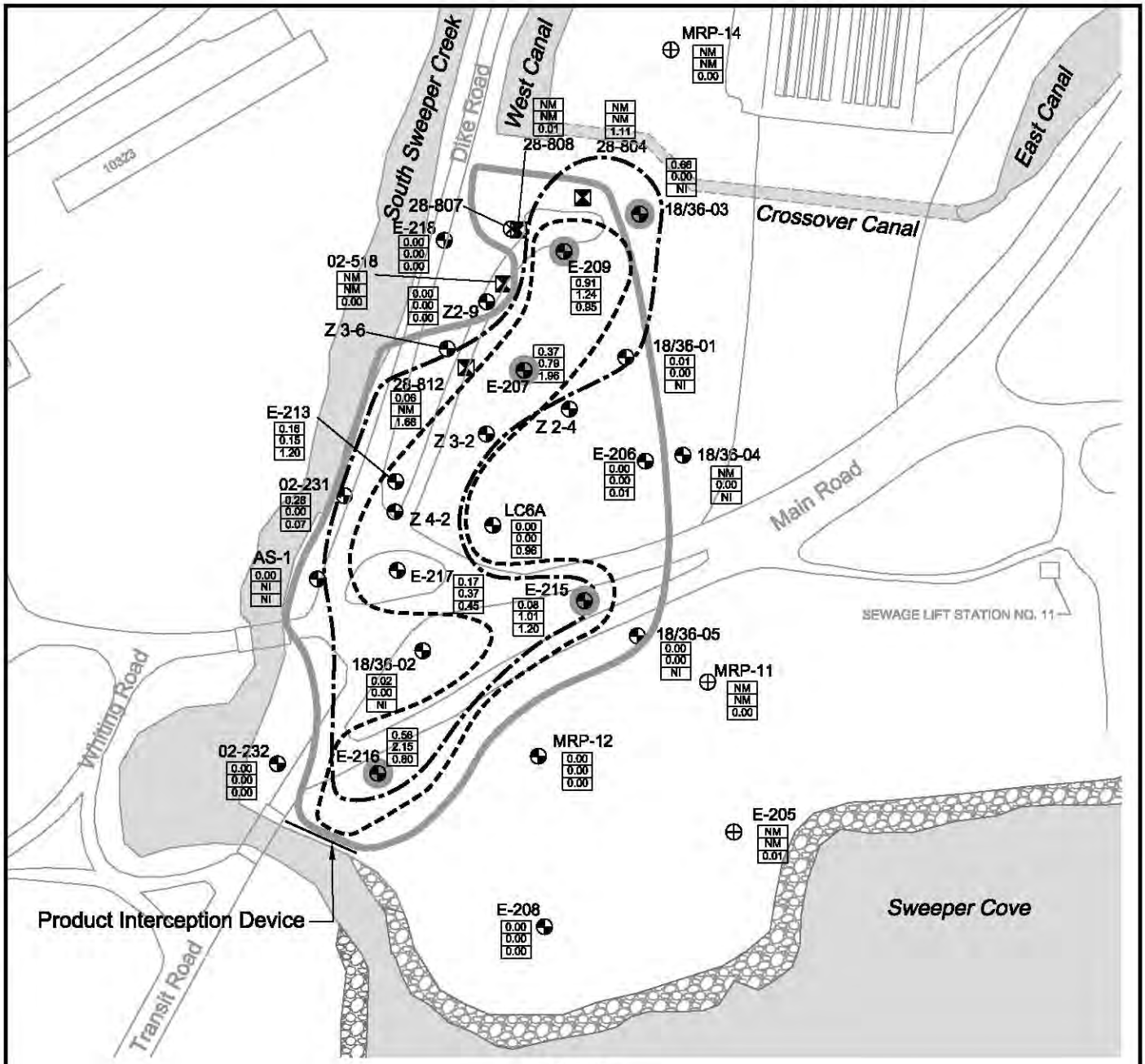
The potential extent of contamination in sediment and surface water at the South of Runway 18-36 Area was estimated in the FFS (URS 2005) and is summarized in this DD. Analytical results for petroleum-related chemicals in sediment and surface water were obtained for 17 sediment samples collected from 15 locations between July 1996 and September 1998, and for 12 surface water samples collected from 9 locations between September 1993 and September 1998. Because of completed remedial actions at the South of Runway 18-36 Area, some of these samples are no longer representative of current conditions at the site. The aesthetic corrective actions performed subsequent to sediment and surface water sampling events at South of Runway 18-36 Area have eliminated surface exposure to contaminated sediment and surface water in the former crossover canal (locations 514, 763, 764, 765, 766, 801, and 850), and in the former southern extension of the West Canal (locations 516, 761, 762, 805, and 809). Sediment and surface water samples collected from these locations are not included in the analysis of the potential extent of contamination. Therefore, analytical results from only eight sediment samples

collected from six locations and only seven surface water samples collected from six locations were used in the analysis of the potential extent of contamination in sediment and surface water.

Potential extent of contamination in sediment was estimated by comparing site concentrations to the ecological RBSCs. Detected concentrations of chemicals greater than ecological RBSCs were reported in sediment samples collected from five locations (see Figure 4-3). These five locations include four locations within South Sweeper Creek and one location within West Canal. The chemicals that exceeded the ecological RBSCs in sediment at the site include 2-methylnaphthalene, fluorene, phenanthrene, DRO, and GRO. Analytical results for these chemicals in sediment are provided on Figure 4-3. These five chemicals are the COPCs for the site as previously identified in Section 3. Although fluorene was identified as a COPC, the ecological risk assessment did not evaluate risks from exposure to this chemical, because the ecological risk assessment only included data collected after January 1, 1998, and the only detected concentration of fluorene above the RBSCs occurred in a sample collected in 1996. Basic summary statistics for the COPCs in sediment, including fluorene, are provided in Table 4-1.

Potential extent of contamination in surface water was estimated by comparing site concentrations to the Alaska DEC water quality standards and the ecological RBSCs. Detected concentrations of chemicals were reported in surface water samples collected from four locations at concentrations greater than the Alaska DEC water quality standards or the ecological RBSCs (see Figure 4-4). These four locations include two locations within South Sweeper Creek and two locations within West Canal. The chemicals that exceeded the ecological RBSCs include DRO, GRO, indeno(1,2,3-cd)pyrene, benzene, toluene, ethylbenzene and xylenes (BTEX, also referred to as TAH), and TAqH. Analytical results for these chemicals in surface water are provided on Figure 4-4. These chemicals are the COPCs for the site as previously identified in Section 3. Basic summary statistics for the COPCs in surface water are provided in Table 4-1.

The five sediment sampling locations and the four surface water sampling locations identified on Figures 4-3 and 4-4 where COPCs were detected at concentrations greater than the Alaska DEC water quality standards or ecological RBSCs do not necessarily represent areas where cleanup actions will be required. These locations were considered to be a potential concern and therefore required further evaluation in an ecological risk assessment. However, only site data collected after January 1, 1998 was used in the ecological risk assessment to determine if contaminant concentrations at the site pose an unacceptable risk to ecological receptors. Data collected prior to January 1, 1998 were not considered representative of site conditions in the ecological risk assessment. In addition, sediment and surface water samples collected from the West Canal (locations 515, 527, and 767) were not included in the ecological risk assessment, because the West Canal is an engineered diversionary structure that does not provide high quality ecological habitat.



LEGEND

- Geoprobe Well
- Monitoring Well
- Abandoned/Lost Monitoring Well
- Recovery Well
- MLLW Mean Lower Low Water
- NM Not Measured
- NI Not Installed
- Approximate Extent of Riprap
- Estimated Extent of Free Product Based on Measurements From August Through November 2004.
- Estimated Extent of Free Product Based on Measurements From January 2001 Through October 2003.
- Estimated Extent of Free Product Based on Measurements From November 1992 Through October 2000.
- 0.02 / 2.33 / 1.65 — August - December 2004 / January 2001 - October 2003 / November 1992 - October 2000
- Locations Where Free-Product Thickness Exceeded 0.5 Feet January 2001 Through December 2004

FILENAME: T:\ADAK\DIQ\Sub-Tasks\DO 3\S RUNWAY DEC DOC\INTERNAL DRAFT\FIG 4-1 FREE PROD.dwg
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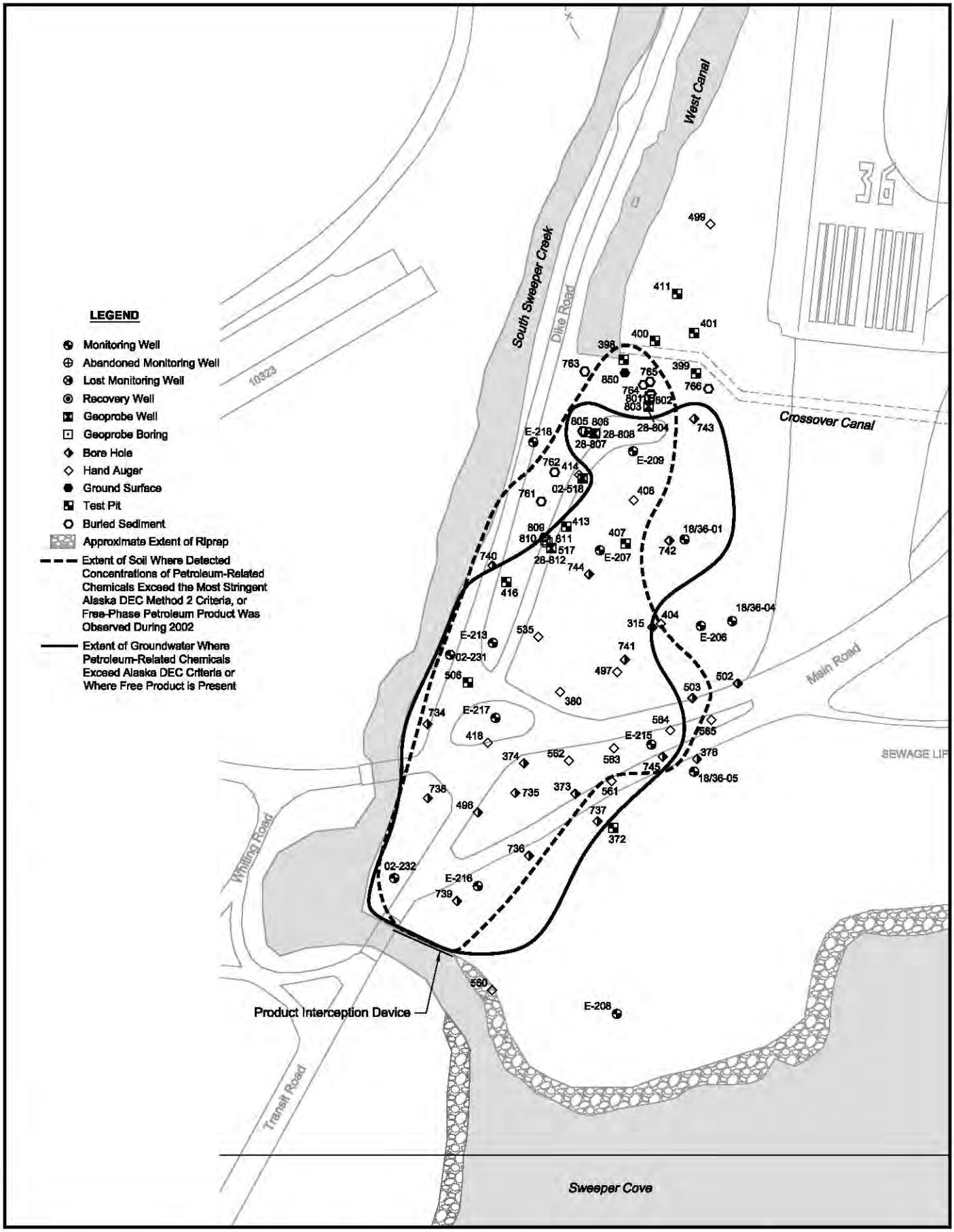
0 50 100 200
SCALE IN FEET

Figure 4-1
Estimated Extent of Residual Free Product South of Runway 18-36 Area

Adak Island, AK
DECISION DOCUMENT



FILENAME: T:\ADAK\IDIQ\Sub-Tasks\DO 3\S RUNWAY DEC DOC\INTERNAL DRAFT\FIG 4-2 CONTAM SOIL_GW.dwg
EDIT DATE: 08/15/06 AT: 09:26

U.S. NAVY

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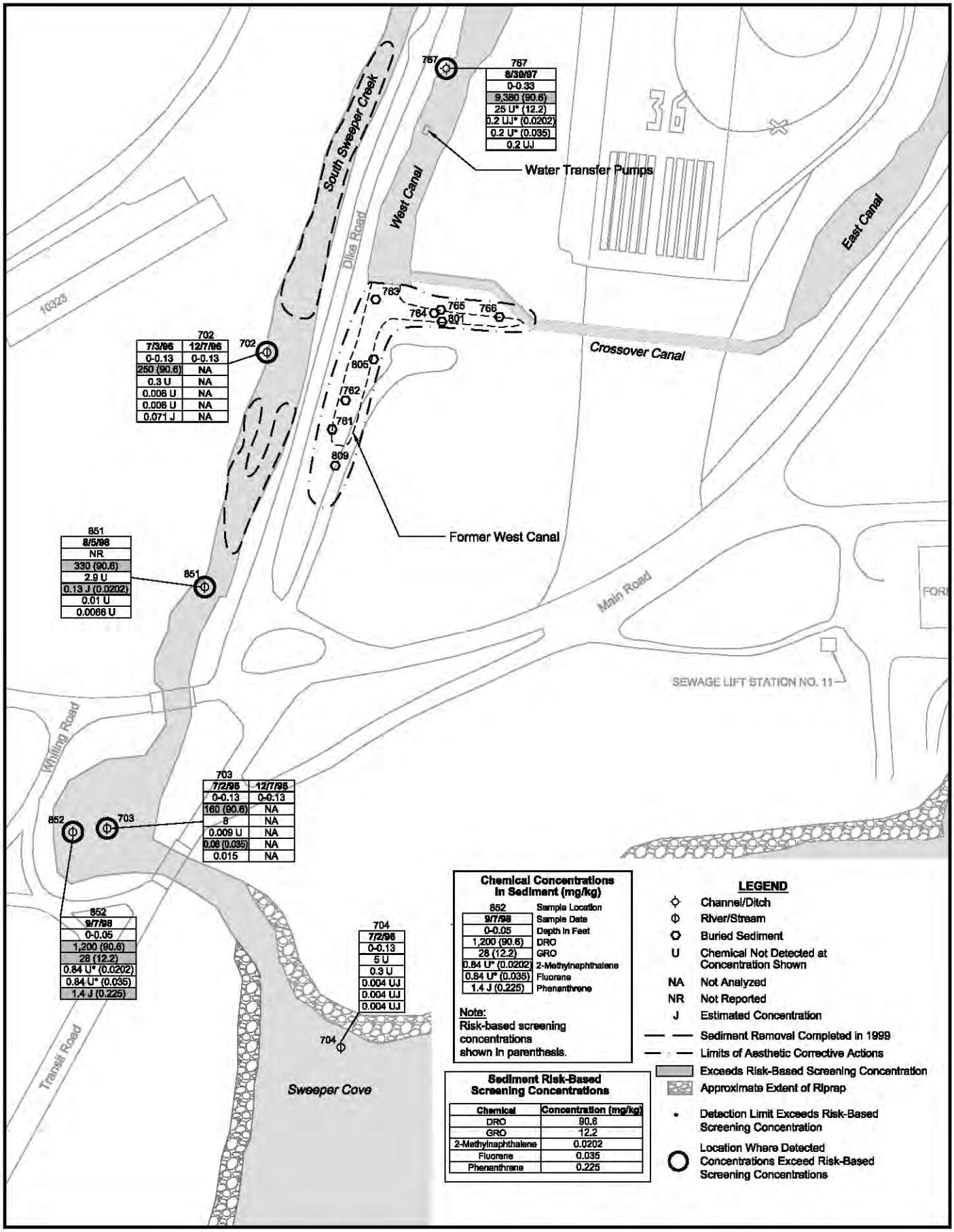
SCALE IN FEET

Figure 4-2
Estimated Potential Extent of Soil and Groundwater Contamination South of Runway 18-36 Area

Adak Island, AK
DECISION DOCUMENT



FILENAME: T:\ADAK\IDIQ\Sub-Tasks\DO 3\S RUNWAY DEC DOC\INTERNAL DRAFT\FIG 4-3 PETRO SED.dwg
EDIT DATE: 08/15/06 AT: 09:25

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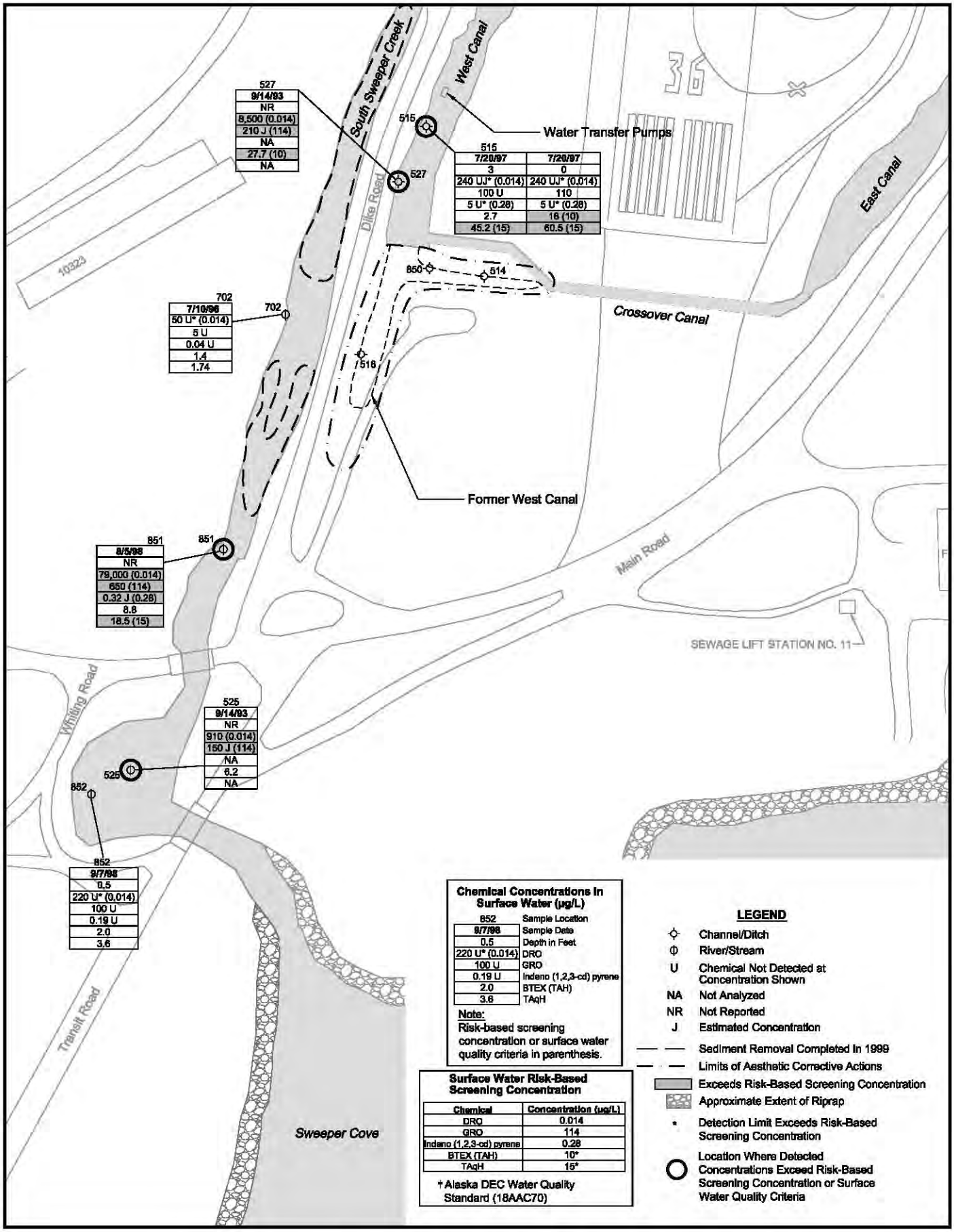
SCALE IN FEET

Figure 4-3
Locations where Petroleum-Related Chemicals in Sediment Exceeded Risk-Based Screening Concentrations
South of Runway 18-36 Area

Adak Island, AK
DECISION DOCUMENT



FILENAME: T:\ADAK\IDIQ\Sub-Tasks\DO 3\S RUNWAY DEC DOC\INTERNAL DRAFT\FIG 4-4 PETRO SW.dwg
EDIT DATE: 08/15/06 AT: 10:51

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0 50 100 200
SCALE IN FEET

Figure 4-4
Locations Where Petroleum-Related Chemicals in Surface Water Exceeded Risk-Based Screening Concentrations or Surface Water Quality Criteria South of Runway 18-36 Area

Adak Island, AK
DECISION DOCUMENT

Table 4-1
Summary of Analytical Results for Chemicals of Potential Concern, South of Runway 18-36 Area

Chemical	Total Number of Samples Collected (1)	Number of Samples Used in Risk Assessment (2, 3)	Minimum Concentration (4)	Minimum Qualifier	Maximum Concentration (4)	Maximum Qualifier	Unit	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits
SOIL										
Volatile Organic Compounds (VOCs)										
2-Methylnaphthalene(5)	6	4	61		61		mg/kg	02-231	1/4	0.2-4
Benzene	95	78	0.023		1.67	J	mg/kg	734	3/78	0.0095-0.58
Ethylbenzene	95	78	0.014	J	15.8	J	mg/kg	734	25/78	0.01-0.5
Naphthalene	6	4	14		14		mg/kg	02-231	1/4	0.2-4
Total Petroleum Hydrocarbons (TPHs)										
Diesel-Range Organics	109	92	4.44	J	75,000		mg/kg	E-209	71/92	4-50
Gasoline-Range Organics	95	78	2.86	J	2,700		mg/kg	E-209	32/78	0.3-6.15
GROUNDWATER										
Volatile Organic Compounds (VOCs)										
2-Methylnaphthalene (5)	17	15	0.74	J	143	J	ug/L	E-217	8/15	2 - 2.11
Acetone	4	3	320	J	320	J	ug/L	LC6A (OLD 1)	1/3	10
Benzene	71	62	0.389		39		ug/L	02-231	14/62	0.2 - 500
Ethylbenzene	71	62	0.22		97	J	ug/L	LC6A (OLD 1)	33/62	0.2 - 10
Naphthalene	21	19	1.45	J	189	J	ug/L	E-217	9/19	0.02 - 2.11
Xylenes	71	62	0.44		580		ug/L	LC6A (OLD 1)	33/62	0.2-2.0
Total Petroleum Hydrocarbons (TPHs)										
Diesel-Range Organics	81	53	100		45,000		ug/L	LC6A (OLD 1)	37/53	100 - 1000000
Gasoline-Range Organics	68	61	21		2,800		ug/L	02-231	26/61	5 - 1000000
SEDIMENT										
Semivolatile Organic Compounds (SVOCs)										
2-Methylnaphthalene (5)	13	1	0.13		0.13		mg/kg	851	1/1	0.2-0.84
Fluorene (6)	13	0	NA		NA		mg/kg	NA	NA	NA
Phenanthrene	13	1	1.4		1.4		mg/kg	852	1/1	0.0066
Total Petroleum Hydrocarbons (TPHs)										
Diesel-Range Organics	16	2	330		1,200		mg/kg	852	2/2	NA
Gasoline-Range Organics	13	1	28		28		mg/kg	852	1/1	0.3-2.9

Table 4-1 (Continued)
Summary of Analytical Results for Chemicals of Potential Concern, South of Runway 18-36 Area

Chemical	Total Number of Samples Collected (1)	Number of Samples Used in Risk Assessment (2, 3)	Minimum Concentration (4)	Minimum Qualifier	Maximum Concentration (4)	Maximum Qualifier	Unit	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits
SURFACE WATER										
Semivolatile Organic Compounds (SVOCs)										
Indeno(1,2,3-cd)pyrene	11	1	0.32		0.32		ug/L	851	1/1	0.19
Total Petroleum Hydrocarbons (TPHs)										
Diesel-Range Organics (7)	14	0	NA		NA		ug/L	NA	NA	NA
Gasoline-Range Organics	14	1	650		650		ug/L	851	1/1	100
Total Aromatic Hydrocarbons (TAHs)	10	0	NA		NA		ug/L	NA	NA	NA
Total Aqueous Hydrocarbons (TAqHs)	10	0	NA		NA		ug/L	NA	NA	NA

Notes:

(1) Number includes field duplicates. Number also includes sediment and surface water samples collected from former Crossover Canal and the southern extension of West Canal which are no longer representative of current site conditions because of completed remedial actions.

(2) Number does not include soil samples collected at depths greater than 15 feet below ground surface.

(3) Number does not include groundwater samples analyzed using VPH or AK-102-AA.

(4) Minimum/maximum detected concentration

(5) The following surrogate chemicals used for screening values:

Chemical Name	Surrogate Chemical
2-Methylnaphthalene	Naphthalene
Phenanthrene	Anthracene
Acenaphthylene	Acenaphthene

(6) Fluorene was not included in the ecological risk assessment because the only detected concentration was in a sample collected prior to 1998. All samples collected prior to January 1, 1998 were not included in the ecological risk assessment, because data were too old.

(7) DRO not evaluated in the risk assessment, because concentrations were in excess of maximum water solubility.

Definitions: J - estimated value
ug/L - micrograms per liter
mg/kg - milligrams per kilogram
NA - not available
SVOC - semivolatile organic compound
TAH - total aromatic hydrocarbon
TAqH - total aqueous hydrocarbon
TPH - total petroleum hydrocarbon
VOC - volatile organic compound

5.0 SUMMARY OF RISK ASSESSMENT

Baseline human health and ecological risk assessments were conducted to determine if residual petroleum at the South of Runway Area 18-36 would pose unacceptable risk to human health or the environment if no cleanup actions were to take place. Contaminant concentrations reported in Section 4 were used to calculate risks and hazards. Risks and hazards calculated for human exposures to chemicals in soil and groundwater were found below target health goals. Hazards calculated for ecological exposures to chemicals in estuarine surface water and sediment in South Sweeper Creek in the vicinity of the South of Runway 18-36 Area were greater than target health goals. Target health goals established for free-product petroleum sites at the former Adak Naval Complex are the following:

- Human health cancer risk (CR) of 1×10^{-5}
- Human health hazard index (HI) of 1 based on compounds other than total petroleum hydrocarbon (TPH) compounds
- Human health HI of 1 based on TPH
- Ecological HI of 1

5.1 HUMAN HEALTH

Alaska DEC provides guidance for four methods of determining cleanup levels (beginning with Method One) that increase in level of effort and site-specificity. Method Four uses risk assessment to determine site specific cleanup levels (ADEC 2000a). Sufficient site information is available to determine Method Four cleanup levels and the results are summarized below. Details are provided in Appendix C of the FFS report (URS 2005).

Previous investigations have identified petroleum compounds in soil and groundwater at concentrations above regulatory levels at the site resulting from leaks associated with a currently abandoned fuel line that likely transported JP-5. While there were subsurface pipelines running through the area containing a variety of fuel types, the analytical data indicate a predominantly diesel range petroleum release. The risk assessment, conducted according to the risk assessment procedures specified by Alaska DEC (2000a), evaluated whether potential health risks were present if people encountered these petroleum-impacted materials in their environment. Exposure pathways were determined to be complete and significant based on the site-specific human health conceptual site model (CSM). The human health CSM for the South of Runway Area 18-36 Area is depicted on Figure 5-1. This section provides a summary of the human

health risk assessment conducted for this site. The complete, detailed human health risk assessment is included as Appendix C of the FFS report (URS 2005).

5.1.1 Human Health Risk Assessment Procedures

A baseline risk assessment typically consists of four major steps: (1) data evaluation, (2) exposure assessment, including development of a CSM, (3) toxicity assessment, and (4) risk characterization and calculation of cleanup levels. A final step is a qualitative analysis of the major uncertainties involved in risk assessment calculations. Details of the procedures used to calculate the health risks are summarized below.

Data Evaluation

At step one, the data applicable to human health exposures are selected and compared to de minimis health-based screening levels. Chemicals with concentrations greater than the de minimis levels are selected as "COPCs" for evaluation in the risk assessment. Eight chemicals were selected as COPCs in groundwater:

- 2-Methylnaphthalene
- Acetone
- Benzene
- Ethylbenzene
- Naphthalene
- Xylenes
- DRO
- GRO

The following four chemicals were selected as COPCs in soil:

- 2-Methylnaphthalene
- Naphthalene
- DRO
- GRO

Exposure Assessment

Once COPCs are selected, the second step in risk assessment is an evaluation of the exposure pathways by which people could encounter chemicals. The exposure assessment identifies the populations potentially exposed to chemicals at the site, the means by which exposure occurs, and the amount of chemical received from each exposure medium (i.e., the dose). Only complete exposure pathways are quantitatively evaluated. Complete pathways consist of four

elements: (1) a source and mechanism of chemical release, (2) a retention or transport medium (e.g., groundwater), (3) a point of potential human contact with the affected medium, and (4) a means of entry into the body at the contact point. Figure 5-1 presents the CSM, which depicts the complete pathways for this site.

Residential land use, including permanent or temporary living accommodations, childcare facilities, schools, playgrounds, and hospitals are prohibited at the NMCB Building Expanded Area by the Interim Conveyance Document. Thus, no residential populations would be exposed to chemicals at the site. Because there is no impacted surface soil and chemicals in groundwater are moving away from the residential areas, off-site populations would not be exposed to chemicals migrating from the site to the residential areas. Child trespassers would not be exposed at West Canal Ditch, because the airport runway area is restricted to airport personnel; therefore, any exposures to surface water and sediment would likely be infrequent and of short duration. In addition, impacted sediment has mostly been removed from the South Sweeper Creek and covered in abandoned areas of the airport ditch system in the vicinity of the site. Further control of seeps has likely improved surface water quality, and recent sampling show levels below concentrations that would be a concern for human health. For these reasons, child recreational users playing in surface water of South Sweeper Creek at the site, while a potentially complete pathway, is likely insignificant.

People have been observed fishing and harvesting shellfish at the mouth of South Sweeper Creek where it drains into Sweeper Cove. Therefore, the fish ingestion pathway could represent a potentially complete pathway. However, part of the remedial action for Sweeper Cove is the issuance of a fish advisory which limits the amount of shellfish ingested from Sweeper Cove (U.S. Navy 2004). While the South of Runway 18-36 Area does not have any restrictions on shellfish consumption, shellfish are not expected to be present in the South of Runway 18-36 Area in great numbers. The fish advisory in place for Sweeper Cove is expected to be protective of potential shellfish contamination at the mouth of South Sweeper Creek. Therefore, the fish ingestion pathway was not evaluated for this site, because it is being addressed by the remedial actions in place for Sweeper Cove.

Current and future exposures to chemicals in soil and groundwater at the South of Runway 18-36 Area were therefore evaluated for potential construction workers who could be involved in tasks requiring subsurface intrusion. The following exposure pathways were selected for quantitative evaluation under current and future conditions:

- Construction workers potentially disturbing soil in the course of construction activity could be exposed through incidental ingestion, dermal contact, and inhalation of chemicals in soil (to a depth of 15 feet bgs).

- Construction workers conducting intrusive subsurface work could be exposed to chemicals in shallow groundwater (less than 15 feet bgs) through dermal contact and inhalation of volatile chemicals.

Ingestion of groundwater is considered an incomplete pathway for all receptors. Institutional controls are currently in place for groundwater, which restrict the use of groundwater as drinking water. In addition, salt water intrusion makes the groundwater at the South of Runway 18-36 Area an unlikely potential future drinking water source.

The exposure factors used in the risk calculations for construction worker exposures to groundwater and soil are summarized on Tables 5-1 and 5-2, respectively.

5.1.2 Toxicity Assessment

The third step in risk assessment is an evaluation of the toxicity of the COPCs by an assessment of the relationship between the dose of a chemical and the occurrence of toxic effects. Chemical toxicity criteria, which are based on this relationship, consider both cancer effects and effects other than cancer (noncancer effects). Tables 5-3 and 5-4 present the cancer and noncancer criteria, respectively. The toxicity criteria are combined with the exposure factors when quantifying potential health risks for each COPC. The toxicity criteria are required in order to quantify the potential health risks due to the COPCs. Benzene and ethylbenzene were evaluated for cancer effects, and the other chemicals (where toxicity information exists) were evaluated for noncancer effects.

Note, only noncancer toxicity criteria are available for the petroleum groups. Carcinogenic effects are not evaluated for the petroleum ranges. Rather, the individual carcinogenic compounds present in petroleum (i.e., benzene) are evaluated separately.

5.1.3 Risk Characterization

The last step in human health risk assessment is a characterization of the health risks. The exposure factors, media concentrations, and toxicity criteria are combined to calculate health risks. Health risks are calculated differently for chemicals that cause cancer and for chemicals that cause noncancer effects. The calculation of CR assumes that no level of the chemical is without some risk, whereas for chemicals with noncancer effects, a “threshold” dose exists. Risks (for cancer) and hazards (for noncancer effects) are calculated for the reasonable maximum exposure (RME) for each pathway, a calculation that overestimates risks for the majority of the population in order to ensure that public health is protected. CR estimates represent the potential for cancer effects by estimating the probability of developing cancer over a lifetime due to site exposures. Noncancer hazards assume there is a level of chemical intake that is not associated with an adverse health effect even in sensitive individuals.

Tables 5-5 and 5-6 summarize the CRs and noncancer hazards calculated for construction worker exposures to petroleum compounds in soil and groundwater, respectively. In addition, the exposure point concentrations (EPCs) used to calculate these risks and hazards are also presented on Tables 5-5 and 5-6. Table 5-7 presents the cumulative risks and hazards from exposure to both groundwater and soil during construction activities. Cumulative CRs for the construction worker scenario were 4×10^{-8}, and the non-TPH and TPH hazard indices were 0.09 and 0.9, respectively. These values do not exceed the Alaska DEC target health goals of no more than a 1×10^{-5} chance of developing cancer and a hazard quotient for noncarcinogenic chemicals that does not exceed 1. Therefore, neither groundwater nor soil were found to be a health risk for construction workers, and no actions are necessary to protect public health from chemicals in soil or groundwater at the South of Runway 18-36 Area.

Note that the primary driving factor for noncancer hazards at the site is DRO in soil, as indicted in Table 5-7. The EPC for DRO was based on the 95 percent upper confidence limit (UCL95) of the mean concentration for DRO of 9,280 mg/kg (Table 5-5). Based on Alaska DEC requirements that 80 percent of the UCL95 is assumed to aliphatic and 40 percent is assumed to be aromatic, risk calculations used concentrations of 7,424 mg/kg for aliphatic diesel-range hydrocarbons and 3,712 mg/kg for aromatic diesel-range hydrocarbons to estimate the health risks for DRO as shown in Table 5-5. The target health goal of a hazard quotient of 1 was not exceeded for DRO; therefore, a UCL95 higher than 9,280 mg/kg could be present on the site and health goals would not be exceeded. In fact, if a hazard quotient of 1 is the target goal, the UCL95 concentrations of DRO could be as high as 30,000 mg/kg without a health concern for the Adak construction worker scenario. Therefore, soil concentrations remaining at the site meet cleanup level requirements because they do not represent a health risk for the site-specific population.

Free-product recovery has been conducted at the South of Runway 18-36 Area intermittently from September 1997 through November 2004. An estimated 1,040 to 5,200 gallons of free product may still be present in the central portion of the site. While exposures to free product cannot be quantitatively evaluated in risk assessments, exposures to free product may represent an unacceptable health risk. The degree of risk would depend on a number of factors, including the specific type and location of the project and the actual amount of material disturbed. Therefore, in the event that free product is encountered, the appropriate measures should be taken to minimize contact and exposure. Free-product removal will continue at the site, ultimately reducing the potential hazards from exposure to free product.

Because depth to groundwater is on average less than 15 feet bgs, construction workers could potentially come into contact with free product while performing subterranean activities. Free product is also migrating toward South Sweeper Creek. Therefore, recreational users of the creek could potentially come into contact with free product while engaged in outdoor activities, if the product intercept device fails. However, recreational exposures to surface water and

sediment along the creek were considered an insignificant pathway based on infrequent exposures and exposures of only short duration. This assumption would still apply if sediment concentrations increased due to the potential presence of free product in surface water. Therefore, the presence of free product in surface water is not likely to present a health concern for recreational exposures in South Sweeper Creek. However, Alaska DEC surface water criteria state that no contamination which could cause a sheen on surface water is permitted. Therefore, while the presence of free product in South Sweeper Creek would not likely present a health concern for intermittent recreational exposures, Alaska DEC surface water criteria would be exceeded.

Because the risk assessment for the South of Runway 18-36 Area established that the existing concentrations in soil at the site do not pose a risk to humans or the environment (refer to Section 5.2) above target health goals at their present contamination level, no separate alternative cleanup levels (ACLs) were calculated. By default, the existing contaminant levels become the site-specific cleanup levels. The minimum and maximum concentrations of COPCs detected in soil at the site are presented in Table 5-8. Through enforcement of equitable servitude, the higher concentrations presented on Table 5-8 should pose no threat to human health or the environment.

Site-specific cleanup levels for groundwater were not calculated. The proposed groundwater cleanup levels for South of Runway 18-36 Area are the Alaska DEC cleanup levels established for groundwater not currently used for, or not reasonably expected to be used for drinking water, because the water is not potentially potable (i.e., saltwater intrusion makes the water undrinkable). In addition, institutional controls are currently in place for groundwater, which restrict the use of groundwater as a drinking water source.

5.2 ECOLOGICAL

Ecological hazards to terrestrial and aquatic biota resulting from exposure to petroleum compounds in soil, marine sediment, and marine surface water were estimated for each complete, significant exposure pathway. Exposure pathways were determined to be complete and significant based on the site-specific ecological CSM. The ecological CSM for the NMCB Building Expanded Area is depicted on Figure 5-2. The ecological risk assessment concluded that a potential ecological threat exists to aquatic life and benthic biota from COCs in freshwater and estuarine surface water and sediment in South Sweeper Creek in the vicinity of the South of Runway 18-36 Area. This section provides a summary of the ecological risk assessment conducted for this site. The complete, detailed ecological risk assessment is included as Appendix C of the FFS report (URS 2005).

5.2.1 Ecological Risk Assessment Procedures

Ecological risk assessment procedures begin with determining whether a detailed ecological risk assessment of that site is required. A detailed ecological risk assessment of a given site is required whenever the potential for an ecological threat from chemicals exists. The decision on whether to perform a detailed ecological risk assessment or not is made during the problem formulation stage of the risk assessment process. Before a decision can be made on the need for a detailed ecological risk assessment of a given site, a determination is made regarding the following:

1. The presence of sensitive environments, critical habitats, or sensitive species at a site

2. The presence of complete exposure pathways which result in the exposure of ecological receptors to site contaminants

If it is determined that no sensitive environments, critical habitats or sensitive species are present at a given site, and complete exposure pathways cannot be identified, Alaska DEC guidance permits the ecological risk assessment process for that site to be terminated.

5.2.2 Problem Formulation

An ecological checklist (found in Appendix B of the Alaska DEC Risk Assessment Procedures Manual (ADEC 2000a) and included in Appendix C-II of the FFS [URS 2005]) was completed, describing the location and characteristics (e.g., environmental setting, land use, environmental fate-and-transport, and ecological receptors) of specific environments within the boundaries of the South of Runway Area. Through this exercise, it was determined that critical habitat for anadromous salmonids is present in South Sweeper Creek and nearshore marine areas of Sweeper Cove near the South of Runway 18-36 Area. Note that the airport ditch system is an engineered diversionary structure that does not provide high quality ecological habitat. Therefore, references to surface water and sediment in this section refer exclusively to South Sweeper Creek and nearshore marine areas of Sweeper Cove.

An ecological CSM was also prepared for the South of Runway 18-36 Area, describing the completeness and significance of exposure pathways by which ecological receptors may potentially be exposed to site contaminants. The CSM (included as Figure 5-2) revealed that the following complete exposure pathways exist at the South of Runway 18-36 Area that result in the ecologically significant exposure of ecological receptors to site contaminants:

1. Aquatic receptors may be exposed to site contaminants in marine and estuarine waters and sediments of South Sweeper Creek.

2. Terrestrial receptors may be exposed to site contaminants in surface soil 0 to 6 feet below ground surface.

Based on this assessment, a potential ecological threat exists to ecological receptors from petroleum release products in South Sweeper Creek and nearshore marine areas of Sweeper Cove at the South of Runway 18-36 Area. Therefore, an ecological effects evaluation that quantitatively described the potential ecological risk associated with exposure to site contaminants was conducted. Details of this evaluation are provided in Appendix C of the FFS report (URS 2005).

5.2.3 Screening Level Ecological Risk Assessment

Ecological risk at the South of Runway 18-36 Area was estimated for contaminants in surface soil, fresh and estuarine surface water of South Sweeper Creek, and freshwater and estuarine sediments of South Sweeper Creek. A screening level ecological risk assessment was conducted to determine whether any of the contaminants detected in these media onsite might present an unacceptable risk to ecological receptors. Hazard quotients were derived for the detected contaminants; chemicals with hazard quotients greater than or equal to 1.0 were retained as chemicals of potential ecological concern (COPECs).

The results of the screening level ecological risk assessment to identify COPECs are presented in Table 5-9 for soil, Table 5-10 for surface water, and Table 5-11 for sediment. No COPECs were identified in soil during this risk assessment.

Three surface water contaminants were identified as COPECs:

- Indeno(1,2,3-cd)pyrene
- DRO
- GRO

Four sediment contaminants were identified as COPECs:

- 2-Methylnaphthalene
- Phenanthrene
- DRO
- GRO

COPECs identified during the screening level risk assessment were forwarded to the baseline ecological risk assessment.

5.2.4 Baseline Ecological Risk Assessment

In the risk characterization phase of a baseline risk assessment, hazard quotients are calculated in a similar manner as in a screening level risk assessment. However, the 95 percent upper confidence limit (UCL95) of the COPC is compared to the respective RBSC rather than the maximum detected concentration.

All of the COPECs identified during the screening level portion of this ecological risk assessment were also identified as chemicals of concern (COCs) during the risk characterization phase of the baseline ecological risk assessment. The results of the baseline ecological risk assessment are presented in Table 5-12 for surface water, and Table 5-13 for sediment and are summarized below.

Surface Water

The HQs of 1.1 for indeno(1,2,3-cd)pyrene and 5.7 for GRO in surface water both exceeded the target hazard quotient of 1. Indeno(1,2,3-cd)pyrene concentrations in surface water exceed its RBSC at one location (851) in South Sweeper Creek. GRO concentrations in surface water exceeded its RBSC at two locations (525 and 851) in South Sweeper Creek. These locations are situated in the lower portion of South Sweeper Creek between the 1999 sediment removal areas and Sweeper Cove.

DRO in surface water exceeded its solubility concentration (0.014 microgram per liter [µg/L]), used as the RBSC, wherever it is detected in surface water of South Sweeper Creek. The presence of DRO at concentrations greater than this solubility concentration could produce a sheen on the surface waters of South Sweeper Creek. While not toxicologically quantifiable, such sheen can be associated with physical toxicity to aquatic biota (e.g., covering of respiratory surfaces) and wildlife (e.g., coating of fur or feathers, hypothermia). Alaska water quality standards (18 AAC 70.020[b]) for growth and propagation of fish, shellfish, other aquatic life, and wildlife require that surface waters and adjoining shorelines must be virtually free from floating oil, film, sheen, or discoloration.

Sediment

The HQs calculated for 2-methylnapthalene (HQ=6.4), phenanthrene (HQ=6.2), DRO (HQ=13.2), and GRO (HQ=2.3) in sediment all exceeded the target hazard quotient of 1.

Concentrations of 2-methylnaphthalene in sediment exceeded its RBSC at one location (851) in South Sweeper Creek. Phenanthrene and GRO concentrations in sediment exceeded their RBSCs at one location (852) in South Sweeper Creek. DRO concentrations in sediment exceeded its RBSC at four locations (702, 703, 851, and 852) in South Sweeper Creek. Similar

to locations where chemicals in surface water exceeded RBSCs, these locations are situated in the lower portion of South Sweeper Creek between the 1999 sediment removal areas and Sweeper Cove.

5.2.5 Conclusion

Based on these data, a potential ecological threat exists to aquatic life and benthic biota from COCs in freshwater and estuarine surface water and sediment in South Sweeper Creek in the vicinity of the South of Runway 18-36 Area. However, this potential threat is likely lessening over time because of the continuing source area free-product removal activities and former sediment removal activities that have occurred in South Sweeper Creek. Surface soils at the South of Runway 18-36 Area do not pose quantifiable risks to any ecological receptor.

Alaska State Regulations do not establish cleanup levels for sediment (ADEC 2004). Therefore, the RBSCs derived for sediment were selected as the risk-based cleanup levels for chemicals identified as COCs in sediment: 0.02 milligram per kilogram (mg/kg) for 2-methylnaphthalene, 0.225 mg/kg for phenanthrene, 90.6 mg/kg for DRO, and 12.2 mg/kg for GRO.

For surface water, the water quality standards established by Alaska regulation 18 AAC 70 specifies that "TAqH in the water column may not exceed 15 µg/L. TAH in the water column may not exceed 10 µg/L. 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" [18 AAC 70.020(b)(17)(A)(i), 18 AAC 70.020(b)(17)(B)(ii), 18 AAC 70.020(b)(17)(C)]. These water quality criteria are the cleanup levels for surface water of South Sweeper Creek in the vicinity of the South of Runway 18-36 Area.

Alaska State Regulations do not establish cleanup levels for individual chemicals, DRO and GRO in surface water. Therefore, the RBSCs derived for surface water were selected as the risk-based cleanup levels for the individual chemicals that were identified as COCs in surface water of South Sweeper Creek with the exception of DRO. The RBSC for DRO (0.014 µg/L) is below the laboratory practical quantitation limit (PQL). Therefore, the cleanup level for DRO was set at the PQL. The cleanup levels for COCs in surface water are 0.28 µg/L for indeno(1,2,3-cd)pyrene, 0.014 µg/L for DRO, and 114 µg/L for GRO. These are additional cleanup levels and do not replace the surface water quality criteria applicable to the site, as described in the previous paragraph.

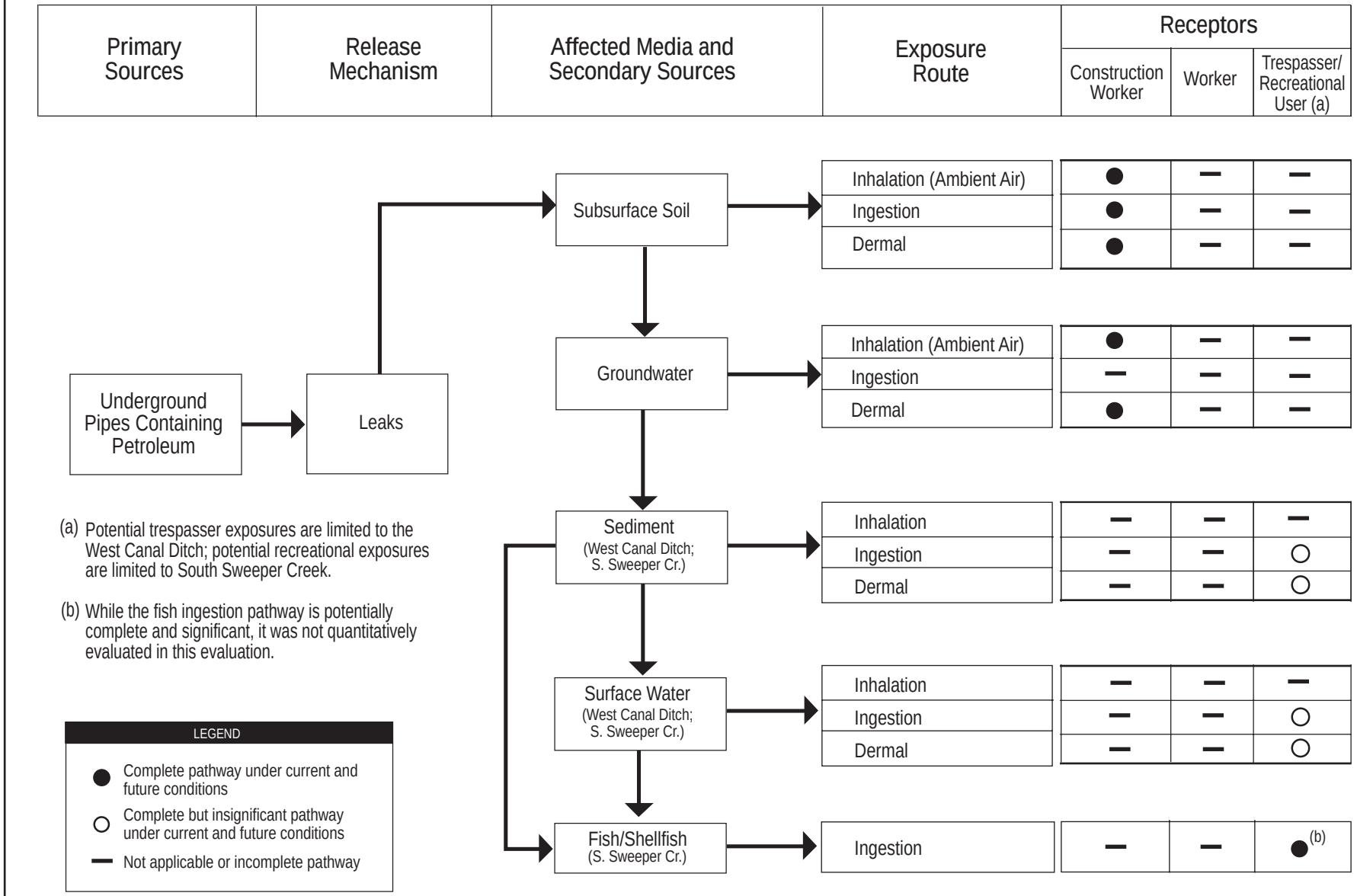

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Figure 5-1
Human Health Conceptual Site Model
South of Runway 18-36 Area

Adak Island, AK
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Primary Source	Primary Release Mechanism	Secondary Source	Secondary Release Mechanism	Tertiary Source	Tertiary Release Mechanism	Exposure Medium	Exposure Route	Potential Ecological Receptors									
								Terrestrial Biota				Aquatic Biota					
								Plants	Invertebrates	Birds	Mammals	Macrophytes	Phytoplankton/ Zooplankton	Benthic and Epibenthic Invertebrates	Fish	Birds	Marine Mammals
ASTs, ags Pipes, Fuel Dispensers, Drums, FCTs, Fill Spouts on USTs, and/or Unknown	Spills/Leaks of Chemicals into Soil	On-Site Surface Soil	Dust Generation and Volitilization		Particulate and Volatile Emissions	Air	Inhalation	—	—	○	○	—	—	—	—	—	—
						On-Site Surface Soil (0-6 feet bgs)	Incidental Ingestion	—	●	●	●	—	—	—	—	—	—
							Dermal Contact/ Root Uptake	●	●	●	●	—	—	—	—	—	—
							Food Web	—	○	○	○	—	—	—	—	—	—
USTs, bgs Pipes, Disposal Area, and/or Unknown		On-Site Subsurface Soil	Overland Runoff			On-Site Subsurface Soil (>6 feet bgs)		—	—	—	—	—	—	—	—	—	—
							Incidental Ingestion	—	—	—	—	—	—	—	—	—	—
							Dermal Contact/ Root Uptake	—	—	—	—	—	—	—	—	—	—
			Leaching and Infiltration	Groundwater	Discharge to Drainage Ditch	Sweeper Creek Sweeper Cove Surface Water	Incidental Ingestion	—	○	○	○	—	●	●	●	●	●
								○	○	○	○	●	●	●	●	●	●
							Food Web	—	○	○	○	—	●	●	●	●	●
Storm and Wastewater Discharge	Spills/Leaks of Chemicals into South Sweeper Creek																
			Slope Erosion			Sweeper Creek Sweeper Cove Sediments	Incidental Ingestion	—	○	○	○	—	—	●	●	●	●
							Dermal Contact/ Root Uptake	○	○	○	○	●	●	●	●	●	●
			Sedimentation, Sorption				Food Web	—	○	○	○	—	●	●	●	●	●

LEGEND

- ● Potentially Complete Pathway
- ○ Minor or Insignificant Pathway
- — Incomplete Pathway
- ags Above Ground Surface
- AST Above Ground Storage Tank
- bgs Below Ground Surface
- FCT Field Constructed Tank
- UST Underground Storage Tank

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Figure 5-2
Ecological Conceptual Site Model
South of Runway 18-36 Area

Table 5-1
Construction Worker Exposures to Groundwater, Exposure Assumptions and Intake Equations

Equations:

Chemical intake (mg/kg-day) = CW * SIF

$$SIF_{derm} = \frac{CF1 \cdot CF2 \cdot SA \cdot EF \cdot ET \cdot ED \cdot PC}{BW \cdot AT}$$

$$SIF_{inh} = \frac{CF1 \cdot InhR \cdot EF \cdot ED \cdot VFw}{BW \cdot AT}$$

Where:

SIF_{derm} (L-mg/ug-kg-day) = summary intake factor for dermal contact with groundwater
SIF_{inh} (L-mg/ug-kg-day) = summary intake factor for inhalation of groundwater vapors

Parameter	Definition	Value	Units	Source
CW	Chemical concentration in groundwater	chemical specific	ug/L	analytical data
CF1	Conversion factor	1.00E-03	mg/ug	not applicable
CF2	Conversion factor	1.00E-03	L/cm^3	not applicable
SA	Skin surface area	3300	cm^2	default value, USEPA 2002c
PC	Dermal permeability constant	chemical specific	cm/hr	USEPA 2003b
InhR	Inhalation rate	20	m^3/day	default value, USEPA 2002c
VFw	Volatilization factor for water	0.01	L/m^3	site-specific, USEPA 1999a
EF	Exposure frequency	190	days/year	site-specific
ET	Exposure time	8	hours/day	site-specific
ED	Exposure duration	1	years	site-specific
BW	Body weight	70	kg	default value, USEPA 2002c
ATnc	Averaging time (noncarcinogen)	ED x 365 days/year	days	default value, USEPA 2002c
ATca	Averaging time (carcinogen)	25,550	days	default value, USEPA 2002c

Notes:
cm - centimeters
cm^2 - centimeters squared
cm^3 - cubic centimeters
hr - hour
kg - kilograms
L - liters
m^3 - cubic meters
mg - milligrams
ug - micrograms
USEPA - United States Environmental Protection Agency

Table 5-2
Construction Worker Exposures to Soil,
Exposure Assumptions and Intake Equations

Equations:

Chemical intake (mg/kg-day) = CS * SIF

$$SIF_{ing} = \frac{IR \cdot CF \cdot EF \cdot ED}{BW \cdot AT}$$

$$SIF_{derm} = \frac{CF \cdot SA \cdot AF \cdot ABS \cdot EF \cdot ED}{BW \cdot AT}$$

$$SIF_{inh} = \frac{InhR \cdot EF \cdot ED \cdot (1/PEF)}{BW \cdot AT}$$

Where:

SIF_{ing} (day^{-1}) = summary intake factor for ingestion of soil
SIF_{derm} (day^{-1}) = summary intake factor for dermal contact with soil
SIF_{inh} (day^{-1}) = summary intake factor for inhalation of fugitive dust

Parameter	Definition	Value	Units	Source
CS	Chemical concentration in soil	chemical specific	mg/kg	analytical data
IR	Ingestion rate	330	mg/day	default value, USEPA 2002c
CF	Conversion factor	1.00E-06	kg/mg	not applicable
SA	Surface area	3300	cm^2	default value, USEPA 2002c
AF	Soil to skin adherence factor	0.3	mg/cm^2-day	default value, USEPA 2002c
ABS	Absorption factor	chemical specific	unitless	USEPA 2003b
InhR	Inhalation rate	20	m^3/day	default value, USEPA 2002c
PEF	Particulate emission factor	5.09E+08	m^3/kg	site-specific, USEPA 2002c
EF	Exposure frequency	190	days/year	site-specific
ED	Exposure duration	1	years	default value, USEPA 2002c
BW	Body weight	70	kg	default value, USEPA 2002c
ATnc	Averaging time (noncarcinogen)	ED x 365 days/year	days	default value, USEPA 2002c
ATca	Averaging time (carcinogen)	25,550	days	default value, USEPA 2002c

Notes:
cm^2 - centimeters squared
kg - kilograms
m^3 - cubic meters
mg - milligrams
USEPA - United States Environmental Protection Agency

Table 5-3
Carcinogenic Toxicity Criteria for the Chemicals of Potential Concern

Chemical	Oral Cancer: Slope Factor $(mg/kg\text{-}day)^{-1}$	Inhalation Cancer: Slope Factor $(mg/kg\text{-}day)^{-1}$	Tumor Type	EPA Cancer Classification[a]	Reference
2-Methylnaphthalene	None	None	NA	Not classified	NA
Acetone	None	None	NA	EPA Group D carcinogen	USEPA 2003a
Benzene	0.055	0.029	Leukemia (human)	EPA Group A carcinogen	USEPA 2003a
Ethylbenzene	None	0.0039	Renal and testicular cancer (male rates)	EPA Group D carcinogen[b]	USEPA 2002a
Naphthalene	None	None	NA	EPA Group D carcinogen	USEPA 2002a
Xylenes	None	None	NA	EPA Group D carcinogen	USEPA 2002a
DRO aliphatics	None	None	NA	Not classified	ADEC 2000b
DRO aromatics	None	None	NA	Not classified	ADEC 2000b
GRO aliphatic	None	None	NA	Not classified	ADEC 2000b
GRO aromatics	None	None	NA	Not classified	ADEC 2000b

Notes:
[a] EPA's Weight-of-Evidence Classification System:
Group A - human carcinogen (sufficient evidence in humans)
Group B1 - probable human carcinogen (limited human data available)
Group B2 - probable human carcinogen (sufficient evidence in animals, inadequate or no evidence in humans)
Group C - possible human carcinogen (limited evidence in animals)
Group D - not classifiable as to human carcinogenicity
[b] The IRIS file has not been updated yet to reflect the carcinogenicity of ethylbenzene. Therefore, the cancer classification will likely change.
ADEC - Alaska Department of Environmental Conservation
mg/kg-day - milligram per kilogram per day
NA - not applicable
SF - slope factor
USEPA - United States Environmental Protection Agency

Table 5-4
Noncarcinogenic Chronic and Subchronic Toxicity Criteria for the Chemicals of Potential Concern

Chemical	Chronic RfD (mg/kg-day)	Toxic Endpoint	Critical Study	Chronic RfD UF[a]	RfD Source	Adjustment from Chronic to Subchronic	Subchronic RfD (mg/kg-day)	EPA Subchronic Source[b]
Inhalation Exposures								
2-Methylnaphthalene	none[c]	--	--	--	NCEA-S-1400 (USEPA 2003c)	insufficient information	--	
Acetone	none[d]	Inhalation hazards will not be quantified, uncertainties will be	--	--	--	insufficient information	--	
Benzene	0.009	Decreased lymphocyte count	subchronic human	300	IRIS	no adjustment for subchronic warranted, primary study is already	0.009	
Ethylbenzene	0.29	Developmental toxicity	subchronic female rats	300	IRIS	Based on developmental effects during gestational exposures. No subchronic to chronic UF used; therefore, no subchronic value proposed.	0.29	
Naphthalene	0.00086	Nasal effects	chronic mouse	3,000	IRIS	remove adjustment from 5 to 7 days[e]	0.0043	
Xylenes	0.029	Hyperactivity, decreased body weight, and increased mortality	subchronic male rats	300	IRIS	remove UF of 3 for subchronic to chronic	0.09	
DRO aliphatics	0.29	hepatic and hematological changes	NA	NA	ADEC 2000b	The petroleum fraction RfD values presented in ADEC guidance were not adjusted because of their status in State guidance and because of insufficient information on how those values were derived.	0.29	
DRO aromatics	0.06	Decreased body weight	NA	NA	ADEC 2000b		0.06	
GRO aliphatics	5.3	Neurotoxicity	NA	NA	ADEC 2000b		5.3	
GRO aromatics	0.11	Hepatotoxicity and nephrotoxicity	NA	NA	ADEC 2000b		0.11	
Oral Exposures								
2-Methylnaphthalene	0.009	pulmonary alveolar proteinosis	chronic male mice	1,000	NCEA-S-1400 (USEPA 2003c)	no adjustment for subchronic warranted because no UF applied for subchronic to chronic.	0.009	
Acetone	0.1	Nephropathy	subchronic rat	1,000	IRIS	remove UF of 10 for subchronic to chronic	1	HEAST
Benzene	0.004	Decreased lymphocyte count	subchronic human	300	IRIS	no adjustment for subchronic warranted, primary study is already	0.004	
Ethylbenzene	0.10	Liver and kidney toxicity	subchronic mouse	1,000	IRIS	remove UF of 10 for subchronic to chronic	1	
Naphthalene	0.02	Decreased body weight	subchronic rat	3,000	IRIS	remove UF of 10 for subchronic to chronic	0.2	
Xylenes	0.2	Hyperactivity, decreased body weight, and increased mortality	chronic rat	1,000	IRIS	remove adjustment from 5 to 7 days[e]	0.25	
DRO aliphatics	0.1	hepatic and hematological changes	NA	NA	ADEC 2000b	The petroleum fraction RfD values presented in ADEC guidance were not adjusted because of their status in State guidance and because of insufficient information on how those values were derived.	0.1	
DRO aromatics	0.04	Decreased body weight	NA	NA	ADEC 2000b		0.04	
GRO aliphatics	5.00	Neurotoxicity	NA	NA	ADEC 2000b		5.00	
GRO aromatics	0.2	Hepatotoxicity and nephrotoxicity	NA	NA	ADEC 2000b		0.2	

Notes

[a]EPA indicates that there are generally 5 areas of uncertainty where an application of a UF may be warranted:
1 variation between species (applied when extrapolating from animal to human)
2 variation within species (applied to account for differences in human response and sensitive subpopulations)
3 use of a subchronic study to evaluate chronic exposure
4 use of a LOAEL, rather than a NOAEL
5 deficiencies in the data base

[b] If a subchronic value was obtained from a published source, rather than calculated, the source is listed in this column.

[c] No inhalation criteria are available for this chemical and NCEA specifically states the route-to-route extrapolation from oral to inhalation is not recommended for this chemical (NCEA-S-1400, April 2003).

[d]No inhalation criteria are available for this chemical.

[e] EPA adjusted the 5-day per week exposure of the NOAEL to a 7-day NOAEL to account for continuous exposure (chronic), rather than subchronic, exposures.

ADEC: Alaska Department of Environmental Conservation
DRO: diesel-range organics
GRO: gasoline-range organics
HEAST: Health Effects Assessment Summary Table
IRIS: EPA's Integrated Risk Information System (on-line data base) (USEPA 2003a)
LOAEL: lowest-observed-adverse-effect-level
mg/kg-day: milligram per kilogram per day
NA: not applicable
NCEA: EPA's National Center for Environmental Assessment
NOAEL: no-observed-adverse-effect-level
RfD: Reference Dose
UF: Uncertainty factor
USEPA: United States Environmental Protection Agency

Table 5-5
Summary of EPCs and RME Hazards for the Construction Worker From Soil[a]

Chemicals of Potential Concern	EPC for Soil (mg/kg)	Total HI	Ingestion HQ	Dermal HQ	Inhalation HQ
2-Methylnaphthalene	61[b]	0.02	0.02	--	--
Naphthalene	14[b]	0.04	0.0002	--	0.04
Non-TPH Total Hazard[c]	--	0.06	0.02	--	0.0440
DRO aliphatics	7,424	0.2	0.2	0.05	0.000007
DRO aromatics	3,712	0.3	0.2	0.07	0.00002
GRO aliphatics	238	0.02	0.0001	--	0.02
GRO aromatics	170	0.2	0.002	--	0.2
TPH Total Hazard[c]	--	0.7	0.4	0.1	0.2

[a] No chemicals selected as COPCs in soil are associated with carcinogenic effects. Therefore, this table presents only the noncancer hazards from exposures to soil.

[b] A UCL95 cannot be calculated for this chemical because there are fewer than 10 samples in the data set. Therefore, the maximum detected concentration was used as the EPC.

[c] Risk and hazard estimates are presented to one significant figure. Total risk and hazard values were calculated by summing unrounded values. Therefore, the total values may not equal the sum of the rounded values.

Notes:
COPCs - chemicals of potential concern
DRO - diesel-range organics
EPC - exposure point concentration
GRO - gasoline-range organics
HI - hazard index
HQ - hazard quotient
mg/kg - milligram per kilogram
RME - reasonable maximum exposure
TPH - total petroleum hydrocarbon
UCL95 - 95 percent upper confidence limit
-- - not evaluated; toxicity criteria are not available to quantify exposures by this pathway.

Table 5-6
Summary of EPCs and Total RME Risks and Hazards for the Construction Worker From Groundwater

Chemicals of Potential Concern	EPC for Groundwater (µg/L)	Total		Dermal		Inhalation	
		HI	CR	HI	CR	HI	CR
2-Methylnaphthalene	33.8	b	NA	b	NA	b	NA
Acetone	320[c]	b	NA	b	NA	b	NA
Benzene	14.3	0.01	4E-08	0.01	3E-08	0.002	9E-09
Ethylbenzene	12.7	0.0002	1E-09	0.0001	NA	0.00007	1E-09
Naphthalene	44.6	0.02	NA	0.002	NA	0.02	NA
Xylenes	55.9	0.003	NA	0.002	NA	0.0009	NA
Non-TPH Total Hazard/Risk[1]	--	0.03	4E-08	0.02	3E-08	0.02	1E-08
DRO aliphatics	25,012	b	NA	b	NA	a	NA
DRO aromatics	12,506	b	NA	b	NA	a	NA
GRO aliphatics	15,312	0.004	NA	b	NA	0.004	NA
GRO aromatics	10,937	0.1	NA	b	NA	0.1	NA
TPH Total Hazard/Risk[1]	--	0.2	NA	b	NA	0.2	NA

[1]Risk and hazard estimates are presented to one significant figure. Total risk and hazard values were calculated by summing unrounded values. Therefore, the total values may not equal the sum of the rounded values.

Notes:
CR - cancer risk
DRO - diesel-range organics
EPC - exposure point concentration
GRO - gasoline-range organics
HI - hazard index
NA - not applicable; these chemicals are not considered carcinogenic by this pathway.
RME - reasonable maximum exposure
µg/L - micrograms per liter
TPH - total petroleum hydrocarbons
UCL95 - 95 percent upper confidence limit
a - Chemical is not considered volatile; Pathway is only complete for volatile chemicals.
b - Toxicity criteria are not available to quantify exposures by this pathway.
c - A UCL95 cannot be calculated for this chemical because there are fewer than 10 samples in the data set. Therefore, the maximum detected concentration was used as the EPC.

Table 5-7
Summary of Total RME Risks and Hazards for the Construction Worker From Groundwater and Soil

Chemicals of Potential Concern	Total		Groundwater		Soil	
	HI	CR	HI	CR	HI	CR
2-Methylnaphthalene	0.02	NA	b	NA	0.02	NA
Acetone	b	NA	b	NA	a	a
Benzene	0.01	4E-08	0.01	4E-08	a	a
Ethylbenzene	0.0002	1E-09	0.0002	1E-09	a	a
Naphthalene	0.062	NA	0.02	NA	0.04	NA
Xylenes	0.003	NA	0.003	NA	a	a
Non-TPH Total Hazard/Risk[1]	0.09	4E-08	0.03	4E-08	0.06	--
DRO aliphatics	0.2	NA	b	NA	0.2	NA
DRO aromatics	0.3	NA	b	NA	0.3	NA
GRO aliphatics	0.02	NA	0.004	NA	0.02	NA
GRO aromatics	0.3	NA	0.1	NA	0.2	NA
TPH Total Hazard/Risk[1]	0.9	NA	0.2	NA	0.7	NA

[1]Risk and hazard estimates are presented to one significant figure. Total risk and hazard values were calculated by summing unrounded values. Therefore, the total values may not equal the sum of the rounded values.

Notes:
CR - cancer risk
DRO - diesel-range organics
GRO - gasoline-range organics
HI - hazard index
NA - not applicable; these chemicals are not considered carcinogenic by this pathway
NE - not evaluated
RME - reasonable maximum exposure
TPH - total petroleum hydrocarbon
-- - no value
a - Chemical was not selected as a COPC in this media
b - Toxicity criteria are not available to quantify exposures to this media.

Table 5-8
Minimum and Maximum Concentrations for the Chemicals of Potential Concern Detected in Soil, South of Runway 18-36 Area

Chemical	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)
Volatile Organic Compounds (VOCs)		
2-Methylnaphthalene	61	61
Benzene	0.023	1.67 J
Ethylbenzene	0.014 J	15.8 J
Naphthalene	14	14
Total Petroleum Hydrocarbons (TPHs)		
Diesel-Range Organics	4.44 J	75,000
Gasoline-Range Organics	2.86 J	2,700

Notes:

J - estimated value

Table 5-9
Results of the Screening Level Ecological Risk Assessment to Identify COPECs in Soil at the South of Runway 18-36 Area

Chemical	Maximum Detected Concentration (mg/kg)	RBSC (mg/kg)	Hazard Quotient	Poses Potential Ecological Risk?	Rationale
TPH - Diesel range organics	9,100	20,100	0.5	**NO**	Site chemical concentration lower than RBSC
TPH - Gasoline range organics	2.86	1840	0.002	**NO**	Site chemical concentration lower than RBSC

Notes:
COPEC - Chemical of potential ecological concern
mg/kg - milligrams contaminant per kilogram of soil
RBSC - Risk-based screening concentration
TPH - Total petroleum hydrocarbons

Table 5-10
Results of the Screening Level Ecological Risk Assessment to Identify COPECs in Surface Water at the South of Runway 18-36 Area

Chemical	Maximum Detected Concentration (µg/L)	RBSC (µg/L)	Hazard Quotient	Poses Potential Ecological Risk?	Rationale
2-Methylnaphthalene	1.5	72	0.02	**NO**	Site chemical concentration lower than RBSC
Benzo(a)anthracene	0.84	2.2	0.4	**NO**	Site chemical concentration lower than RBSC
Benzo(a)pyrene	0.34	0.96	0.4	**NO**	Site chemical concentration lower than RBSC
Benzo(b)fluoranthene	0.5	0.68	0.7	**NO**	Site chemical concentration lower than RBSC
Benzo(g,h,i)perylene	0.33	0.44	0.8	**NO**	Site chemical concentration lower than RBSC
Benzo(k)fluoranthene	0.27	0.64	0.4	**NO**	Site chemical concentration lower than RBSC
Chrysene	1.5	2	0.8	**NO**	Site chemical concentration lower than RBSC
Ethylbenzene	1.5	6400	0.0002	**NO**	Site chemical concentration lower than RBSC
Fluorene	3.5	39.3	0.09	**NO**	Site chemical concentration lower than RBSC
Indeno(1,2,3-cd)pyrene	0.32	0.28	1.1	**YES**	Site chemical concentration exceeds RBSC
Toluene	1.1	3500	0.0003	**NO**	Site chemical concentration lower than RBSC
TPH - Diesel range organics	79000	0.014	NC	**UNKNOWN**	RBSC cannot be used to quantify risks when concentration of diesel-range organics is in excess of maximum water solubility
TPH - Gasoline range organics	650	114	5.7	**YES**	Site chemical concentration exceeds RBSC
Xylenes	5.7	332	0.02	**NO**	Site chemical concentration lower than RBSC

Notes:
COPEC - Chemical of potential ecological concern
µg/L - micrograms contaminant per liter of water
NC - not calculated
RBSC - Risk-based screening concentration
TPH - Total petroleum hydrocarbons

Table 5-11
Results of the Screening Level Ecological Risk Assessment to Identify COPECs in Sediment at the South of Runway 18-36 Area

Chemical	Maximum Detected Concentration (mg/kg)	RBSC (mg/kg)	Hazard Quotient	Poses Potential Ecological Risk?	Rationale
2-Methylnaphthalene	0.13	0.0202	6.4	**YES**	Site chemical concentration exceeds RBSC
Ethylbenzene	0.03	14	0.002	**NO**	Site chemical concentration lower than RBSC
Fluoranthene	0.05	0.6	0.08	**NO**	Site chemical concentration greater than RBSC
Naphthalene	0.13	0.99	0.1	**NO**	Site chemical concentration greater than RBSC
Phenanthrene	1.4	0.225	6.2	**YES**	Site chemical concentration exceeds RBSC
Pyrene	0.03	0.35	0.09	**NO**	Site chemical concentration greater than RBSC
Toluene	0.07	4.6	0.01	**NO**	Site chemical concentration lower than RBSC
TPH - Diesel range organics	1200	90.6	13.2	**YES**	Site chemical concentration exceeds RBSC
TPH - Gasoline range organics	28	12.2	2.3	**YES**	Site chemical concentration exceeds RBSC
Xylenes	0.2	0.79	0.3	**NO**	Site chemical concentration lower than RBSC

Notes:
COPEC - Chemicals of potential ecological concern
mg/kg - milligrams contaminant per kilogram of sediment
RBSC - Risk-based screening concentration
TPH - Total petroleum hydrocarbons

Table 5-12
Results of the Baseline Ecological Risk Assessment to Identify COCs in Surface Water at the South of Runway 18-36 Area

Chemical	Exposure Point Concentration (µg/L)	RBSC (µg/L)	Hazard Quotient	Poses Potential Ecological Risk?	Rationale
Indeno(1,2,3-cd)pyrene	0.32	0.28	1.14	**YES**	Site chemical concentration exceeds RBSC
TPH - Diesel range organics	79,000	0.014	NC	**UNKNOWN**	RBSC not available to quantify risks when DRO concentration is in excess of maximum water solubility
TPH - Gasoline range organics	650	114	5.7	**YES**	Site chemical concentration exceeds RBSC

Notes:
COC - Chemical of concern
DRO - diesel-range organics
µg/L - micrograms contaminant per liter of water
NC - not calculated
RBSC - Risk-based screening concentration
TPH - Total petroleum hydrocarbons

Table 5-13
Results of the Baseline Ecological Risk Assessment to Identify COCs in Sediment at the South of Runway 18-36 Area

Chemical	Exposure Point Concentration (mg/kg)	RBSC (mg/kg)	Hazard Quotient	Poses Potential Ecological Risk?	Rationale
2-Methylnaphthalene	0.13	0.0202	6.4	**YES**	Site chemical concentration exceeds RBSC
Phenanthrene	1.4	0.225	6.2	**YES**	Site chemical concentration exceeds RBSC
TPH - Diesel range organics	1200	90.6	13.2	**YES**	Site chemical concentration exceeds RBSC
TPH - Gasoline range organics	28	12.2	2.3	**YES**	Site chemical concentration exceeds RBSC

Notes:
COC - Chemical of concern
mg/kg - milligrams contaminant per kilogram of sediment
RBSC - Risk-based screening concentration
TPH - Total petroleum hydrocarbons

6.0 REMEDIAL ACTION OBJECTIVES AND CLEANUP LEVELS

This section describes the remedial action objectives (RAOs) and the cleanup levels established for the South of Runway 18-36 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 South of Runway 18-36 Area:

- 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
- Minimize exposure to free-phase product

Based on the risk analysis conducted for this site and the regulatory requirements, the following RAOs were developed for the protection of the environment at the South of Runway 18-36 Area:

- Prevent the migration of petroleum hydrocarbons to sediments that would result in adverse health effects to ecological receptors
- Prevent the migration of petroleum hydrocarbons to surface water that would result in adverse health effects to ecological receptors and/or an exceedance of the Alaska surface water quality standards.
- Prevent ecological exposure to petroleum hydrocarbons in surface water and sediment that would result in adverse health effects to ecological receptors or an exceedance of the Alaska surface water quality standards.

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 Chapter 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 South of Runway 18-36 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 South of Runway 18-36 Area to estimate the potential extent of soil impacted by petroleum contamination at the site (see Section 4). The Alaska DEC Method Four cleanup levels [18 AAC 75.340(a)(4)], which are based on site-specific risk assessments, were used to establish cleanup levels for the site. However, the risk assessment for this site established that the existing concentrations in soil do not pose a risk to humans or the environment above target health goals. Therefore, soil concentrations remaining at the site meet cleanup level requirements because they do not represent a health risk for the site-specific population.

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 South of Runway 18-36 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 bodies of the state, Alaska regulation 18 AAC Chapter 70 establishes water quality standards based on water use classes and subclasses. 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 West 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)].

Because Alaska State Regulations do not establish surface water cleanup levels for individual chemicals, DRO, or GRO; the results of the ecological risk assessment were used to establish additional risk-based cleanup levels for chemicals in surface water that may result in a potential risk to ecological receptors. Site-specific risk-based cleanup levels for surface water were calculated for individual chemicals as discussed in Section 5. The risk-based cleanup levels for surface water are provided in Table 6-2. Note that the cleanup level for DRO was set at the laboratory PQL, because the risk-based cleanup level for DRO (0.014 µg/L) is below the PQL for test method AK102. These risk-based cleanup levels are additional cleanup levels for surface water, and do not replace the TAqH and TAH criteria specified in 18 AAC Chapter 70. Both the risk-based cleanup levels and the surface water quality criteria established by Alaska regulation 18 AAC Chapter 70 apply to South Sweeper Creek. However, the risk-based cleanup levels do not apply to West Canal because it is an engineered diversionary structure that does not provide high quality ecological habitat.

Alaska State Regulations do not establish chemical-specific cleanup levels for sediment. Therefore, sediment cleanup levels were established based on the results of the ecological risk assessment. Site-specific risk-based cleanup levels were calculated for individual chemicals as discussed in the Section 5. Risk-based cleanup levels were only established for those chemicals that could potentially pose an unacceptable risk to ecological receptors due to exposure to sediment in South Sweeper Creek. The risk-based cleanup levels for sediment are also provided in Table 6-2.

6.3 EXTENT OF CONTAMINATION

The media of concern for which RAOs were established in Section 6.1 include groundwater, free-phase product, surface water, and sediment. The extent of contamination for these media, based on the cleanup levels presented in Section 6.2, is summarized below and shown on Figures 4-1 and 6-1.

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. The extent of free product for the initial monitoring period (November 1992 through June 2000) is estimated at approximately 265,000 ft^2. This was the largest extent of residual free product estimated at the site for these three monitoring periods. Product recovery activities at the South of Runway 18-36 Area reduced the areal extent of residual free product from an estimated area of 265,000 ft^2 during the period from November 1992 through June 2000, to approximately 107,000 ft^2 for the period from January 2001 through October 2003. However, the maximum

product thickness measurements obtained at the site during 2004 indicate an increase in the estimated areal extent of residual free product to approximately 164,000 ft^2. In addition, Figure 4-1 shows the locations where free-product thicknesses exceeded 0.5 feet from January 2001 through December 2004. An estimated 1,040 to 5,200 of recoverable free product may remain in the subsurface at the site.

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 on Figure 6-1. The Alaska DEC criterion established for groundwater not currently used for, or not reasonably expected to be used for drinking water applicable to this site is:

- DRO 15,000 µg/L (15 milligrams per liter [mg/L])

The area that potentially exceeds the Alaska DEC criteria for groundwater not used for drinking water totals approximately 27,000 ft^2.

The risk-based cleanup levels and the Alaska DEC surface water quality standards described in Section 6.2 were used to delimit the area that exceeds acceptable risk for ecological exposure to petroleum hydrocarbons in surface water and/or exceeds the surface water quality standards. Risk-based cleanup levels and surface water quality standards have been defined for the following COCs in surface water:

- Indeno(1,2,3-cd)pyrene 0.28 µg/L
- GRO 114 µg/L
- DRO 0.25 µg/L
- TAqH 15 µg/L
- TAH 10 µg/L

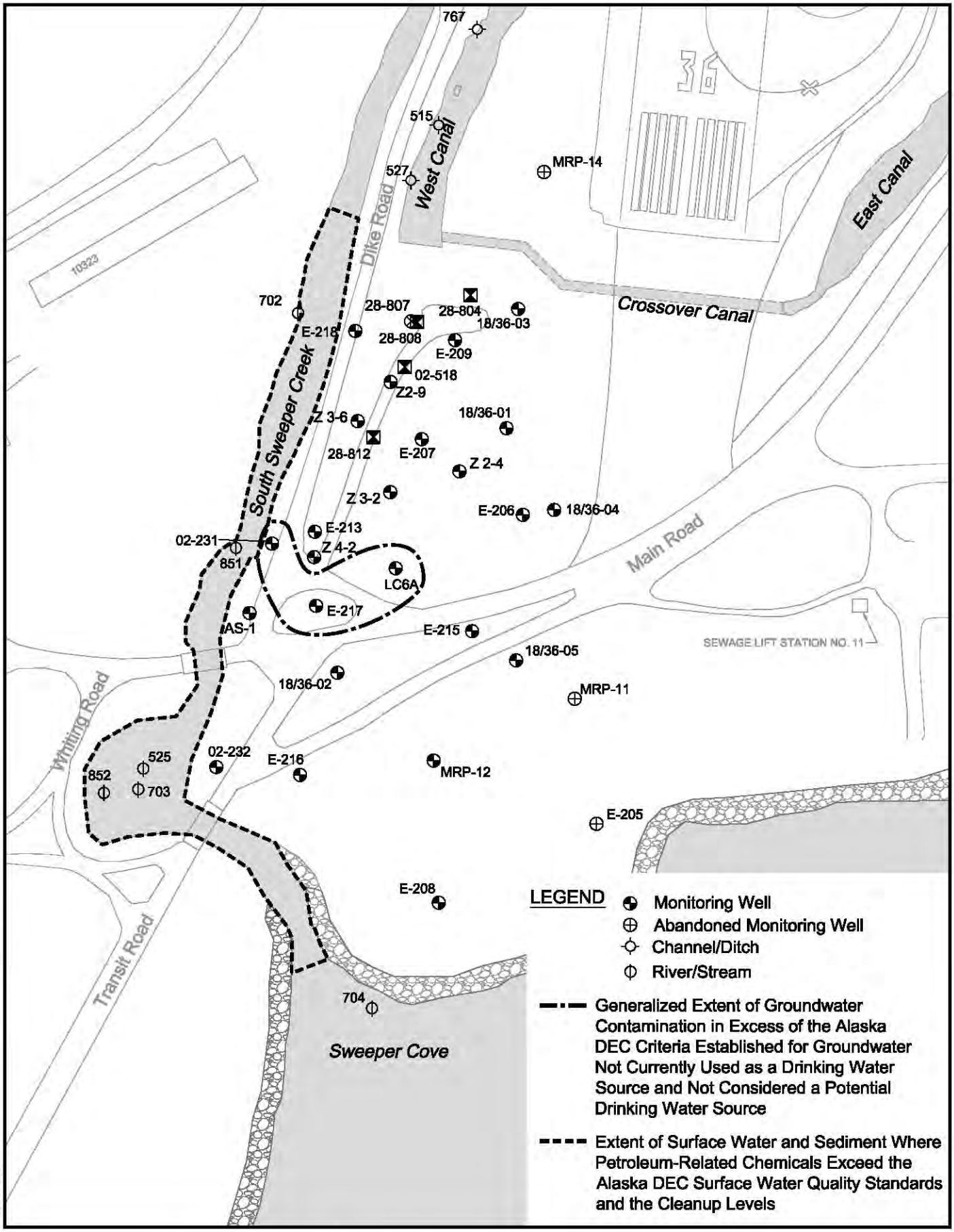
Note that the cleanup level for DRO was set at the laboratory PQL, because the risk-based cleanup level for DRO (0.014 µg/L) is below the PQL. The extent of surface water that exceeds these cleanup levels is shown on Figure 6-1.

The risk-based cleanup levels described in Section 6.2 were used to delimit the area that exceeds acceptable risk for ecological exposure to petroleum hydrocarbons in sediment. Risk-based cleanup levels have been defined for the following COCs in sediment:

- 2-Methylnaphthalene 0.0202 mg/kg
- Phenanthrene 0.225 mg/kg
- GRO 12.2 mg/kg
- DRO 90.6 mg/kg

The extent of sediment that exceeds these cleanup levels is shown on Figure 6-1.

The area on Figure 6-1 containing surface water and sediment with COC concentrations exceeding the risk-based cleanup levels and/or surface water quality standards encompasses a total of approximately 87,000 ft^2. The depth of sediments contaminated with petroleum-related hydrocarbons is not known, because only surface sediments were collected at the site. Assuming that the top 2 feet of sediment is contaminated with petroleum-related compounds at concentrations greater than risk-based cleanup levels, approximately 6,400 cy of contaminated sediment exist at the site.



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U.S. NAVY	N 0 100 200 SCALE IN FEET	**Figure 6-1** **Extent of Groundwater, Surface Water, and Sediment Contamination** **South of Runway 18-36 Area**	Adak Island, AK DECISION DOCUMENT

Table 6-1
Soil and Groundwater Screening Criteria and Cleanup Levels, South of Runway 18-36 Area

Chemical	Soil[a]	Groundwater	
	Screening Criteria (Method Two)[b] (mg/kg)	Screening Criteria (Table C)[b] (mg/L)	Ten Times Table C[c] (mg/L)
Total Petroleum Hydrocarbons			
DRO[d]	230	1.5	15
GRO	260	1.3	13
Volatile Organic Compounds			
Benzene	0.02	0.005	0.05
Ethylbenzene	5	0.7	7

[a]Cleanup levels for soil are not presented here because risks in soil are below target health goals. Cleanup levels for soil are therefore established at existing soil concentrations
[b]Used as screening criteria to determine potential extent of contamination
[c]Used as cleanup levels for remediation
[d]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:
DRO - diesel-range organics
GRO - gasoline-range organics
mg/kg - milligrams per kilogram
mg/L - milligram per liter

Table 6-2
Sediment and Surface Water Cleanup Levels, South of Runway 18-36 Area

Chemical	Sediment[a]	Surface Water[a]	
	Risk-Based Cleanup Levels[b,c] (mg/kg)	Risk-Based Cleanup Levels[b,c] (µg/L)	Alaska DEC Quality Standards[c] (µg/L)
Total Petroleum Hydrocarbons			
DRO	90.6	0.25[d]	NA
GRO	12.2	114	NA
TAH	NA	NA	10
TAqH	NA	NA	15
Polycyclic Aromatic Hydrocarbon Compounds			
2-Methylnaphthalene	0.0202	NC	NA
Indeno(1,2,3-cd)pyrene	NC	0.28	NA
Phenanthrene	0.225	NC	NA

[a]Sediment and surface water cleanup levels apply to South Sweeper Creek.
[b]Used as screening criteria to determine potential extent of contamination
[c]Used as cleanup levels for remediation
[d]The risk-based cleanup level for DRO (0.014 µg/L) is below the laboratory PQL. Therefore, the cleanup level for DRO was set at the PQL.

Notes:
DRO - diesel-range organics
GRO - gasoline-range organics
mg/kg - milligrams per kilogram
µg/L - microgram per liter
NA - not applicable
NC - not calculated, risk less than target health goal
PQL - practical quantitation limit
RBSC - risk-based screening criteria
TAH - total aromatic hydrocarbons
TAqH - total aqueous hydrocarbons

7.0 REMEDIAL ACTION ALTERNATIVES

Remedial technology types and process options were identified and screened first for the downtown sites as a group, because focused feasibility studies will be prepared for four downtown Adak petroleum sites (NMCB Building Expanded Area, South of Runway, solid waste management unit [SWMU] 17, and SWMU 62) that have similar characteristics. Then, the technology types and process options determined to be applicable to the downtown petroleum sites (i.e., the "short list") were evaluated using site-specific information to identify those applicable to the South of Runway 18-36 Area. This evaluation was conducted with respect to protectiveness, ability to meet cleanup levels, and implementability, which are the three criteria identified in Alaska DEC guidance (Alaska DEC 1999). The technologies and process options that passed the screening steps were combined to form candidate remedial alternatives for the South of Runway 18-36 Area. These candidate remedial alternatives represent the most effective combination of actions for meeting the RAOs. A conceptual design for each alternative was developed and used to estimate capital, operation and maintenance (O&M), and present worth costs for each alternative.

Brief descriptions of the candidate remedial alternatives, including costs, are as follows:

- **Alternative 1 – No Action:** No action or monitoring would be implemented with this alternative. Institutional controls (equitable servitude restrictions), as described in the Institutional Controls Management Plan, are currently in place for the site. Equitable servitude restrictions applicable to this site include restrictions on land development (i.e., residential land development would be prohibited), the downtown groundwater use prohibition, and the soil excavation notification requirements. This alternative would rely solely on natural attenuation to reduce concentrations of petroleum in the soil and groundwater. However, because monitoring is not included as part of this alternative, there would be no way to verify whether the cleanup levels and RAOs had been achieved. This alternative was retained as the baseline alternative with which the other alternatives were compared.

  Cost: $0

- **Alternative 2 – Institutional Controls, Passive Free-Product Recovery and Containment, MNA for Groundwater, and Natural Recovery for Surface Water and Sediment:** This alternative consists of institutional controls that are already in place for soil and groundwater as described in the Institutional Controls Management Plan, installation of one free-product collection/containment trench, disposal of excavated trench soil, installation of seven new monitoring wells for

free-product recovery and groundwater monitoring, free-product recovery from the free-product collection/containment trench and new and existing wells, MNA for groundwater, and natural recovery for surface water and sediment (Figure 7-1). Free product would initially be removed from the free-product collection/containment trench using automated passive skimmers. The automated passive skimmers would be replaced with sorbent socks when free product is no longer effectively recovered with the automated passive skimmers. Free product would be recovered from 7 new wells and 10 existing wells using passive skimmers or sorbent socks. Petroleum concentrations in groundwater, surface water, and sediment would be reduced through MNA and natural recovery, and institutional controls would be used to protect human health and the environment as long as groundwater concentrations were greater than groundwater cleanup levels.

Cost: Capital - $1.8 million, Annual O&M for Free-Product Recovery in Free-Product Collection/Containment Trenches - $150,000 for years 1-2 and $100,000 for years 3-20, Annual O&M for Free-Product Recovery in Wells - $210,000, Annual O&M for MNA in Groundwater - $66,000, Annual O&M for Natural Recovery in Surface Water and Sediment - $53,000, Total Present Worth Cost - $5.0 million

- **Alternative 3 – Institutional Controls, Passive Free-Product Recovery and Containment, Creek Bank Soil Excavation, iSOC™ and MNA for Groundwater, and Natural Recovery for Surface Water and Sediment:** This alternative consists of institutional controls that are already in place for soil and groundwater as described in the Institutional Controls Management Plan, installation of two free-product collection/containment trenches, installation of one in situ submerged oxygen curtain by Inventures Technologies Incorporated (iSOC™) systems, excavation and disposal of soil from target creek bank treatment areas, installation of 7 new monitoring wells for free-product recovery and groundwater monitoring, free-product recovery from the free-product collection/containment trenches and new and existing wells, iSOC™ system operation for contaminated groundwater containment, MNA for groundwater, and natural recovery for surface water and sediment (Figure 7-2). Free product would initially be removed from the free-product collection/containment trenches using automated passive skimmers. The automated passive skimmers would be replaced with sorbent socks when free product is no longer effectively recovered with the automated passive skimmers. Free product would be recovered from 6 new wells and 9 existing wells using passive skimmers or sorbent socks. The iSOC™ system would be used to reduce petroleum concentrations in groundwater

discharging into South Sweeper Creek, and target creek bank soil would be excavated to quickly eliminate the potential source of sheen on the creek. Petroleum concentrations in groundwater, surface water, and sediment would be reduced through MNA and natural recovery, and institutional controls would be used to protect human health and the environment as long as groundwater concentrations were greater than groundwater cleanup levels.

Cost: Capital - $2.7 million, Annual O&M for Free-Product Recovery in Free-Product Collection/Containment Trenches - $200,000 for years 1-2 and $140,000 for years 3-18, Annual O&M for Free-Product Recovery in Wells - $190,000, Annual O&M for iSOC™ System Operation - $62,000, Annual O&M for MNA in Groundwater - $66,000, Annual O&M for Natural Recovery in Surface Water and Sediment - $53,000, Total Present Worth Cost - $6.5 million

- **Alternative 4 – Institutional Controls, Passive Free-Product Recovery and Containment, Creek Bank/Hot Spot Soil Excavation, iSOC™ and MNA for Groundwater, Sediment Removal, and Natural Recovery for Surface Water:** This alternative consists of institutional controls that are already in place for soil and groundwater as described in the Institutional Controls Management Plan, installation of three free-product collection/containment trenches, installation of one iSOC™ system for contaminated groundwater containment, excavation, thermal treatment, and backfill of soil from target creek bank and hot spot treatment areas, excavation, thermal treatment, and backfill of sediment from the sediment removal area, installation of 9 new monitoring wells for free-product recovery and groundwater monitoring, free-product recovery from the free-product collection/containment trenches and new and existing wells, iSOC™ system operation for contaminated groundwater containment, MNA for groundwater, and natural recovery for surface water (Figure 7-3). Free product would initially be removed from the free-product collection/containment trenches using automated passive skimmers. The automated passive skimmers would be replaced with sorbent socks when free product is no longer effectively recovered with the automated passive skimmers. Free product would be recovered from 3 new wells and 4 existing wells using passive skimmers or sorbent socks. The iSOC™ system would be used to reduce petroleum concentrations in groundwater discharging into South Sweeper Creek, and target creek bank soil would be excavated to quickly eliminate the potential source of sheen on the creek. Sediment risk based-cleanup levels would be quickly achieved through excavation and disposal of sediment, and hot spot soil excavation would be used to reduce the cleanup timeframe. Finally, petroleum concentrations in groundwater and surface water would be reduced through MNA and natural

recovery, and institutional controls would be used to protect human health and the environment as long as groundwater concentrations were greater than groundwater cleanup levels.

Cost: Capital - $16 million, Annual O&M for Free-Product Recovery in Free-Product Collection/Containment Trenches - $260,000 for years 1-2 and $190,000 for years 3-12, Annual O&M for Free-Product Recovery in Wells - $110,000, Annual O&M for iSOC™ System Operation - $62,000, Annual O&M for MNA in Groundwater - $66,000, Annual O&M for Natural Recovery in Surface Water and Sediment - $36,000, Total Present Worth Cost - $19 million

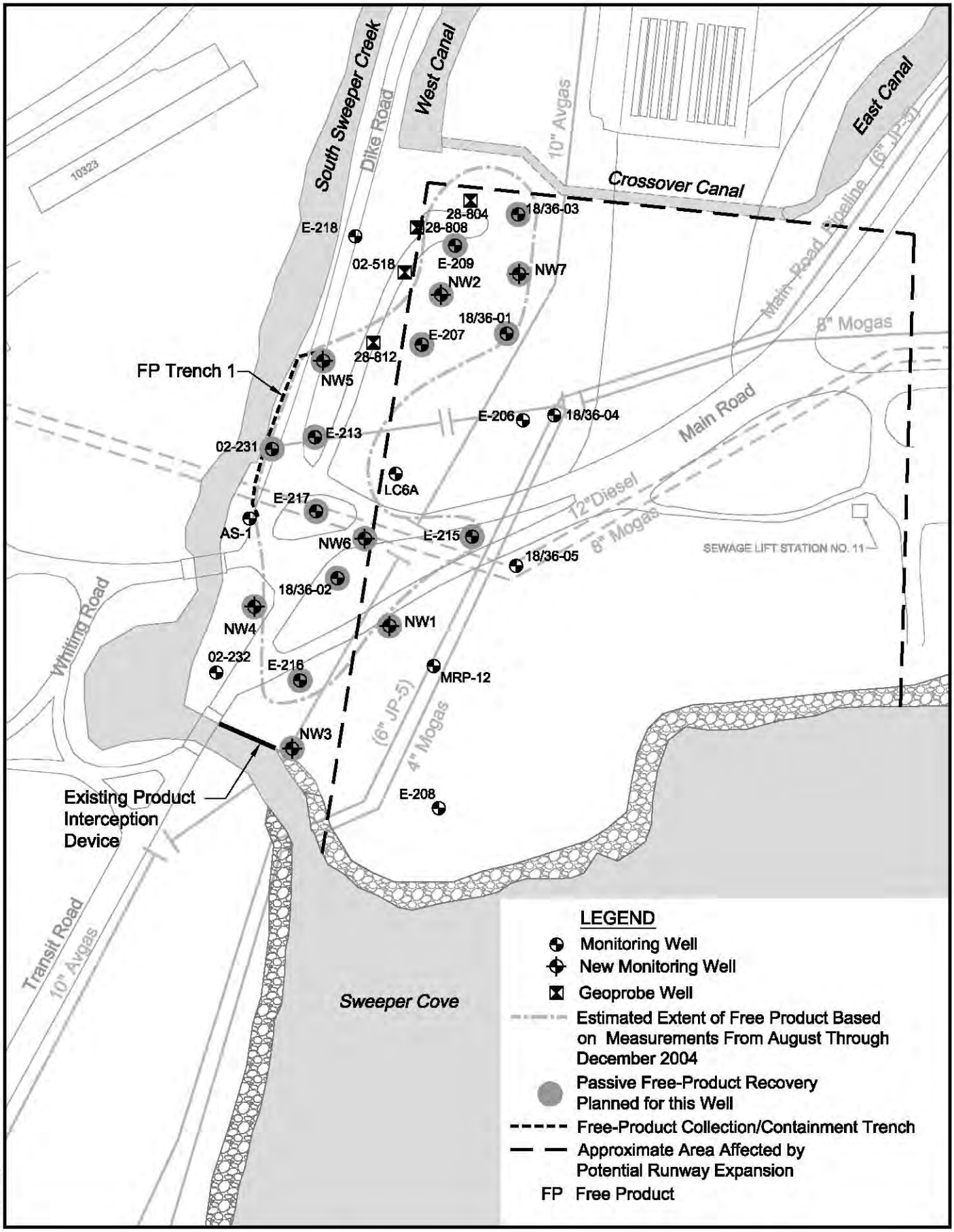

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Figure 7-1
Alternative 2 - Passive Free-Product Recovery and Containment South of Runway 18-36 Area

Adak Island, AK
DECISION DOCUMENT

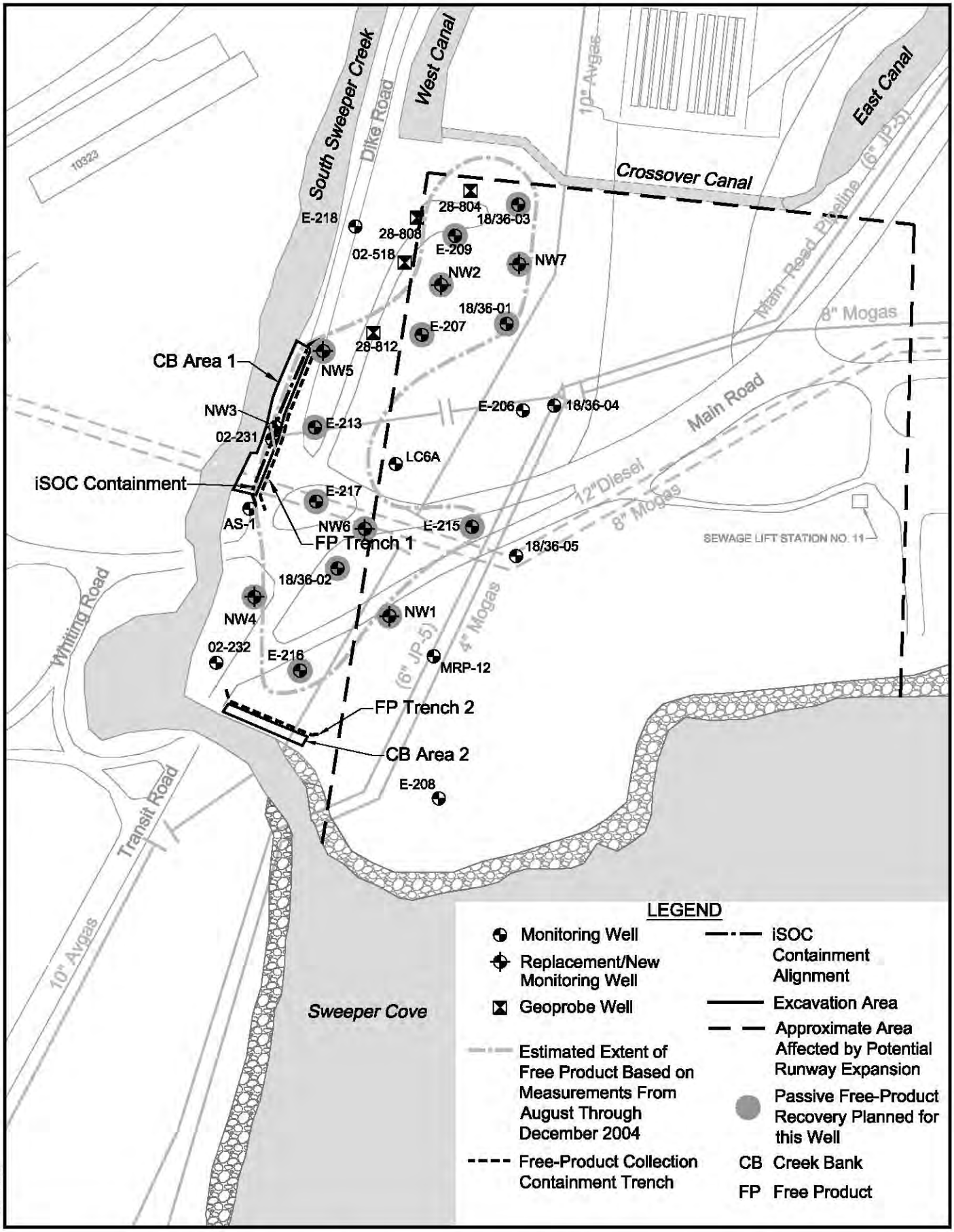

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Figure 7-2
Alternative 3 - Passive Free-Product Recovery and Containment, Creek Bank Excavation, and ISOC Containment South of Runway 18-36 Area

Adak Island, AK
DECISION DOCUMENT

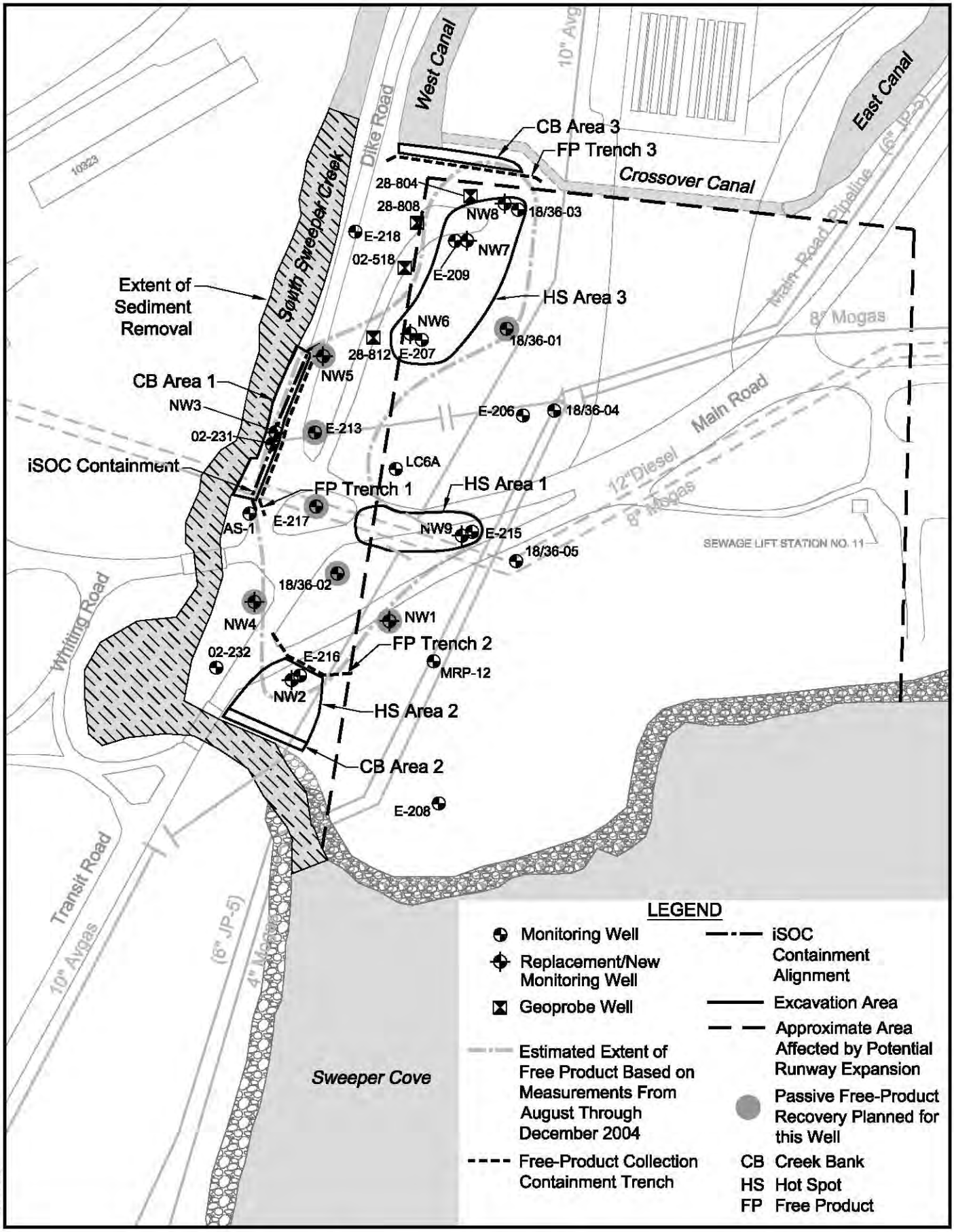

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Figure 7-3
Alternative 4 - Passive Free-Product Recovery and Containment, Creek Bank, Hot Spot and Sediment Excavation, and ISOC Containment, South of Runway 18-36 Area

Adak Island, AK
DECISION DOCUMENT

8.0 COMPARATIVE ANALYSIS OF ALTERNATIVES

Each alternative for the South of Runway 18-36 Area was evaluated using the five criteria established by the Alaska DEC in *Guidance on Decision Documentation under the Site Cleanup Rules* (Alaska DEC 1999): protectiveness; practicability; short- and long-term effectiveness; regulations; and public input. These criteria are summarized in Table 8-1. Public input was not evaluated in the FFS (URS 2005), because comments had not yet been solicited from the public. Therefore, public input was evaluated after public comments on the proposed plan were received, and the evaluation is included in this document. Each remedial alternative was assessed and assigned a rating of poor, fair, good, excellent, or superior for each evaluation criteria as presented in Figure 8-1. Based on the evaluation of the individual criteria, each alternative was also given an overall rating (poor, fair, good, excellent, or superior).

Alternatives 2 and 3 were both given an overall rating of good. Alternative 2 was given an overall rating of good for different reasons than Alternative 3. Alternative 2 provides superior implementability and excellent cost effectiveness and short-term effectiveness. In addition, it provides good protectiveness, long-term effectiveness, and compliance with regulations. Although Alternative 2 takes longer to achieve the RAOs, this alternative costs significantly less than Alternative 3 and is easier to implement on Adak Island, given the remoteness of this island. Alternative 3 was given an overall rating of good, because it provides excellent protectiveness, long-term effectiveness, and compliance with regulations, and good short-term effectiveness and time to achieve cleanup goals. Alternative 3 is capable of achieving the surface water and sediment cleanup goals in significantly less time than Alternative 2, and protection of both human and ecological receptors is expected within five years of the target creek bank soil excavation and iSOC™ and free-product collection/containment trench installation. However, there are additional short-term risks and costs associated with this alternative when compared to Alternative 2.

Alternative 4 was given an overall rating of fair. This alternative was rated lower than Alternatives 2 and 3 because of the difficulty of implementing this complex alternative on Adak Island, the high cost, and the additional short-term risks associated with this alternative. This alternative received superior ratings for long-term effectiveness and regulations and an excellent rating for protectiveness and time to achieve cleanup goals. Although this alternative provides superior long-term effectiveness, it achieves that through additional remedial actions, which have additional short-term risks and costs.

Alternative 1 was given a rating of poor. This alternative received poor ratings for protectiveness, time to achieve cleanup goals, regulations, and long-term effectiveness. Although this alternative would be easy to implement and would cost nothing, the alternative would not be protective of human health and the environment.

Alternatives 2 and 3 both received the highest overall rating in the final FFS. Therefore, only these two alternatives were considered for selection at the South of Runway 18-36 Area. A summary of the issues at the South of Runway 18-36 Area and how Alternatives 2 and 3 address these issues is provided in Table 8-2. A summary of the advantages and disadvantages of these two alternatives is provided in Table 8-3. Based on these comparisons, Alternative 2 – Institutional Controls, Free-Product Recovery, MNA, and Natural Recovery – was selected as the remedial alternative for the South of Runway 18-36 Area. This alternative will provide an appropriate, cost-effective remedy that protects human health and the environment and that can be implemented at the earliest possible time. The Alaska DEC concurs with the selection of this alternative and it is acceptable to the public.

Alternative 2 is selected for South of Runway 18-36 Area because the additional costs associated with Alternative 3 are not warranted given that Alternative 2 is protective of human health in the short term and long term and the environment in the long term. Although risks to ecological receptors may not be effectively controlled in the short-term with Alternative 2, calculated risks are based on data collected between 1996 and 1998 and actual risks currently present at the site are expected to be lower due to free-product recovery activities and other cleanup activities that were implemented after the surface water and sediment data were collected. In addition, potential risks would be reduced with time through additional passive free-product recovery activities and natural recovery. TAqH concentrations were above water quality criteria in only one sample from South Sweeper Creek in 1998, and none of the measured TAH concentrations in South Sweeper Creek exceeded water quality criteria. The exceedance of the TAqH water quality criteria was prior to most of the free-product recovery activities at the site and all other cleanup activities implemented at the site. Finally, groundwater concentrations of TAH in the well closest to the surface water exceedance of TAqH have shown a steady decline since 1998 (no TAqH concentration data available). If concentrations of TAqH are not currently below water quality criteria, the concentrations should decline below water quality criteria with the free-product recovery efforts and MNA included as part of Alternative 2. Because Alternative 2 would be much easier to implement and more cost-effective than Alternative 3 and Alternative 2 would be protective of human health and the environment in the long term, Alternative 2 is the preferred cleanup alternative for the South of Runway 18-36 Area.

Alaska DEC Criteria	Rating of Alternatives			
	Alternative 1 No Action	Alternative 2 Institutional Controls, Free-Product Recovery, MNA, and Natural Recovery	Alternative 3 Free-Product Recovery, Creek Bank Excavation, iSOC, MNA, and Natural Recovery	Alternative 4 Free-Product Recovery, Creek Bank, Hot Spot and Sediment Excavation, iSOC, MNA, and Natural Recovery
Protectiveness	○	◒	◔	◔
Practicable - Implementability	◔	●	◒	○
Practicable - Cost Effectiveness	●	◔	◒	○
Short- and Long-term Effectiveness Short-term Effectiveness	●	◔	◒	○
Short- and Long-term Effectiveness Time to Achieve Cleanup Goals	○	◔	◒	◔
Short- and Long-term Effectiveness Long-term Effectiveness	○	◒	◔	●
Regulations	○	◒	◔	●
Public Input	○	◒	◒	◒
Overall	○	◒	◒	◔

○ Poor ◔ Fair ◒ Good ◔ Excellent ● Superior

Notes:
MNA - monitored natural attenuation
iSOC - in situ Submerged Oxygen Curtain by Inventures Technologies Inc.

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Figure 8-1
Evaluation of Remedial Alternatives
South of Runway 18-36 Area

Adak Island, AK
DECISION DOCUMENT

Table 8-1
Alaska DEC Criteria for Evaluating Remedial Alternatives

Criteria	Description
Protectiveness	Whether the remedial alternatives protect human health and the environment both during and after the cleanup actions by eliminating, reducing, or controlling exposures to hazardous substances or contaminants and by protecting human health from physical and other hazards directly associated with the cleanup action
Practicable	Whether the remedial alternatives can be designed, constructed, and implemented in a reliable and cost-effective manner. For ease of evaluation, this criterion is subdivided into two separate criteria; implementability and cost.
Short- and Long-term Effectiveness	Ability of the alternatives to protect human health and the environment during the construction/implementation phase (short-term) and after completion of the cleanup (long-term). The speed with which the alternatives achieve the cleanup goals is also evaluated. For ease of evaluation, this criterion is subdivided into three separate criteria; short-term effectiveness, time to achieve cleanup goals, and long-term effectiveness.
Regulations	Ability of alternatives to attain federal and state applicable or relevant and appropriate requirements or to provide justification for invoking a waiver.
Public input	Whether the public agrees with, opposes, or has no comment on the preferred alternative. Public input will be evaluated after receipt of the public comments on this proposed plan.

Note:
DEC - Department of Environmental Conservation

Table 8-2
What Are the Key Issues at South of Runway 18-36 Area and How Do the Alternatives Address These Issues?

Issue	How is the Issue Addressed?	
	Alternative 2	**Alternative 3**
Free product in groundwater and sheen in South Sweeper Creek	Institutional controls (excavation notification), passive free-product recovery and containment, and natural recovery	Institutional controls (excavation notification), passive free-product recovery and containment, creek bank excavation, and natural recovery
Groundwater concentrations exceed groundwater cleanup levels (10 times Table C values)	Institutional controls (downtown groundwater use prohibition), passive free-product recovery, and monitored natural attenuation	Institutional controls (downtown groundwater use prohibition), passive free-product recovery, and monitored natural attenuation
Unacceptable ecological risks in surface water and sediment	Passive free-product recovery and containment and natural recovery	Creek bank excavation, passive free-product recovery and containment, iSOC, and natural recovery
Historical surface water concentrations exceed water quality standards for TAH and TAqH	Passive free-product recovery and containment and natural recovery	Creek bank excavation, passive free-product recovery and containment, iSOC, and natural recovery

Notes:
iSOC™ - in situ Submerged Oxygen Curtain by Inventures Technologies
TAH - total aromatic hydrocarbons
TAqH - total aqueous hydrocarbon

Table 8-3
Summary of Advantages and Disadvantages of Alternatives 2 and 3, South of Runway 18-36 Area

Advantages and Disadvantages	Alternative 2 – Institutional Controls, Free-Product Recovery and Containment, MNA, and Natural Recovery	Alternative 3—Institutional Controls, Free-Product Recovery and Containment, Creek Bank Excavation, iSOC™, MNA, and Natural Recovery
Advantages	• Effectively controls exposure to groundwater through institutional controls • Reduces volume of free product in subsurface through passive free-product recovery and containment • Reduces sheen on surface water through free-product containment • Reduces groundwater concentrations through passive free-product recovery and natural attenuation • Reduces migration of petroleum hydrocarbons to sediments and surface water through free-product containment • Reduces surface water and sediment concentrations through natural recovery • Relatively inexpensive • Easy to implement	• Effectively controls ecological risk through creek bank excavation, free-product containment, and iSOC™ • Effectively controls exposure to groundwater through institutional controls • Reduces volume of free product in subsurface through passive free-product recovery and containment • Reduces sheen on surface water through creek bank excavation and free-product containment • Reduces groundwater concentrations through passive free-product recovery and natural attenuation • Reduces migration of petroleum hydrocarbons to sediments and surface water through creek bank excavation, free-product containment, and iSOC™ • Reduces surface water and sediment concentrations through natural recovery • TAH and TAqH concentrations in surface water reduced through creek bank excavation, iSOC™, and natural recovery
Disadvantages	• Risks to ecological receptors may not be effectively controlled in the short-term. However, ▪ Calculated risks based on concentration data collected between 1996 and 1998 before the majority of the free-product recovery activities had occurred and before all other cleanup activities were implemented at the site	• Relatively expensive • Relatively difficult to implement for the following reasons: ▪ Creek bank soil excavation below the groundwater table complicated by dewatering and shoring requirements and creek diversion ▪ Soil excavation on Adak complicated by the high rainfall

Table 8-3 (Continued)
Summary of Advantages and Disadvantages of Alternatives 2 and 3, South of Runway 18-36 Area

Advantages and Disadvantages	Alternative 2 – Institutional Controls, Free-Product Recovery and Containment, MNA, and Natural Recovery	Alternative 3—Institutional Controls, Free-Product Recovery and Containment, Creek Bank Excavation, iSOC™, MNA, and Natural Recovery
Disadvantages (continued)	• Passive free-product recovery and containment and natural recovery may require time to reduce TAH and TAqH concentrations in surface water to below water quality criteria. However, ▪ Only one location within South Sweeper Creek had TAqH concentrations that exceeded the water quality standards and no locations had TAH concentrations that exceeded water quality standards ▪ Surface water samples were collected and analyzed for TAH and TAqH in 1998 before the majority of the free-product recovery activities had occurred and before all other cleanup activities were implemented at the site ▪ Groundwater concentrations of TAH in the well closest to the surface water exceedance of TAqH have shown a steady decline since 1998 (no TAH concentration data available)	▪ Treatment of water from excavation dewatering complicated because of the extensive treatment required to meet marine surface water quality criteria • Implementation of iSOC™ adds complexity

Notes:
iSOC™ - in situ Submerged Oxygen Curtain by Inventures Technologies
MNA - monitored natural attenuation
TAH - total aromatic hydrocarbons
TAqH - total aqueous hydrocarbons

9.0 DESCRIPTION OF SELECTED CLEANUP ACTION

Alternative 2 – Institutional Controls, Passive Free-Product Recovery and Containment, MNA for Groundwater, and Natural Recovery for Surface Water and Sediment – is selected as the remedial alternative for the South of Runway 18-36 Area. This cleanup alternative was selected for the South of Runway 18-36 Area based on its ability to meet the two human health RAOs and the three ecological RAOs. The human health RAOs are:

- 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
- Minimize exposure to free-phase product

The ecological RAOs are:

- Prevent the migration of petroleum hydrocarbons to sediments that would result in adverse health effects to ecological receptors
- Prevent the migration of petroleum hydrocarbons to surface water that would result in adverse health effects to ecological receptors and/or an exceedance of the Alaska surface water quality standards.
- Prevent ecological exposure to petroleum hydrocarbons in surface water and sediment that would result in adverse health effects to ecological receptors and/or an exceedance of the Alaska surface water quality standards.

The selected cleanup alternative is shown on Figure 9-1 and described below.

The selected cleanup alternative, Alternative 2, consists of:

- Institutional controls for soil, groundwater, surface water, and sediment
- Passive free-phase product containment and recovery
- MNA for groundwater
- Natural recovery for surface water and sediment

One free-product collection/containment trench will be installed to prevent migration of free-phase product to surface water, thus eliminating the source of the sheen to one area of South Sweeper Creek. The existing free-product interception device adjacent to Transit Bridge will continue to be used to control sheen in that area. Sorbent booms will be used as an interim

measure to reduce surface water sheen in South Sweeper Creek until the free-product collection/containment trench effectively eliminates the source of the sheen to South Sweeper Creek. Sorbent booms will also be used in West Canal to control sheen until free-product recovery activities eliminate free-product migration to surface water. In addition, seven new wells will be installed, and free-phase product will be removed from site wells using passive skimmers and sorbent socks. Institutional controls will be used to protect human health and the environment until groundwater no longer exceeds Alaska DEC groundwater cleanup levels, surface water and sediment no longer exceed the ecological RBSCs, and surface water no longer exceeds the Alaska DEC water quality standards for sheen, TAqH, and TAH. In addition, because all on-site work will be performed within the obstacle free area of Runway 18-36, all work will be coordinated with the Adak airport manager. The Navy will follow all badging, security, and safety measures required by the Adak airport manager and the Alaska Department of Transportation.

The MNA timeframe for the site cannot be accurately predicted at this time. Therefore, the timeframe needed to achieve the Alaska DEC groundwater cleanup levels will be estimated after 5 years of monitoring has been completed. However, for costing purposes, MNA was assumed to continue for 20 years. The actual cleanup timeframe may vary considerably from this estimated value.

Surface water cleanup goals consist of a requirement for no sheen and meeting Alaska DEC water quality standards and ecological RBSCs for the dissolved phase. Soils between the surface water body and the free-product collection/containment trench will not be excavated, and these soils will act as a continuing source of sheen until the remaining free product in between the trench and the creek is flushed from the soils. Very small amounts of free product can result in a sheen on the surface water body. However, the large rainfall amounts on Adak combined with tidal influences are expected to result in relatively quick flushing of the free product from creek bank soils. Based on this, it is estimated that within approximately 8 years of construction of the free-product collection/containment trench, no sheen will be visible on the adjacent segment of South Sweeper Creek. Recovery from the free-product collection/containment trench will continue until free-product has been reduced to thicknesses less than 0.01 feet or no sounding of the oil/water interface probe has been experienced for 1 year or more (estimated at 20 years). Based on current recovery rates, it is estimated that the technically practicable endpoint for free-product recovery in the wells could be reached within 1 year, which would allow for discontinuation of product recovery in the wells. In addition, as long as concentrations in groundwater are above cleanup goals, it was assumed that the concentrations in surface water would be above cleanup goals. Therefore, 20 years were assumed to achieve Alaska DEC water quality standards and ecological RBSCs in surface water.

The time required to achieve the cleanup goals in sediments was estimated to be 13 years. As long as free product is discharging to South Sweeper Creek, sediments will continue to be

chemically impacted. Assuming that free product would continue to discharge for 8 years as discussed above, and natural recovery of sediments would require 5 years after the discharge stopped, it was estimated that concentrations in sediment would be above cleanup goals for 13 years.

Short-term risks associated with free-product collection/containment trench installation, new well installation, MNA, natural recovery, and product recovery will be controlled through the use of personal protective equipment. Once groundwater concentrations have been reduced to levels less than the Alaska DEC groundwater cleanup levels established for groundwater not currently used for, or not reasonably expected to be used for, drinking water; surface water and sediment concentrations no longer exceed the ecological RBSCs; surface water concentrations no longer exceed the Alaska DEC water quality standards for sheen, TAqH, and TAH; and free product has been removed to the extent practicable in accordance with the OU A ROD (the technically practical endpoint for free-product recovery is defined in Section 4); residual risks at the site are expected to be acceptable. Note that pockets of free product may remain at the site, even if none is detected in on-site wells. Therefore, some residual risk may remain at a site once cleanup actions have been completed. However, if groundwater concentrations are below cleanup levels throughout the site, the extent of free product is expected to be very limited.

The institutional controls implemented at this site consist of equitable servitude restrictions including restrictions on land development (i.e., residential land development would be prohibited), downtown groundwater use prohibition, and soil excavation notification requirements. These institutional controls have already been implemented on Adak Island. The Navy has an established institutional controls program that was developed to ensure that institutional controls, including the equitable servitude restrictions selected in the OU A ROD, remain effective and reliable. The Navy has prepared an ICMP (U.S. Navy 2004) documenting the approach the Navy will use to ensure that the equitable servitude restrictions remain protective. The ICMP provides details of the institutional controls management program, and therefore, a detailed description of the equitable servitude restrictions to be implemented at the South of Runway 18-36 Area is not included here. Institutional controls are expected to remain on the site indefinitely in order to ensure appropriate land uses are maintained at the site (i.e., no residential use). This is necessary because the risk assessment assumed the site would not be used for residential purposes, and cleanup levels were developed based on these land use assumptions.

Access restrictions; site inspections; and monitoring will also be implemented at the site. Access restrictions include fences and signs used to prevent access to contaminated materials during free-product collection/containment trench installation. Site inspections will be used to evaluate compliance with equitable servitude restrictions and access restrictions (fences and signs). Monitoring of groundwater, surface water, and sediment will continue until groundwater cleanup

goals are achieved and petroleum concentrations in surface water and sediment are below ecological RBSCs and Alaska DEC water quality standards (TAqH and TAH).

Monitoring of natural attenuation will consist of periodic groundwater sampling at the site for a period of time sufficient to assess the progress of the natural degradation of petroleum hydrocarbons in groundwater. Details of the monitoring program will be incorporated into subsequent versions of the comprehensive monitoring plan for the Former Adak Naval Complex (CMP) (URS 2004). The CMP describes the existing monitoring program for groundwater as prescribed in the OU A ROD. Groundwater monitoring will be conducted at a frequency to be established by the Navy and Alaska DEC to evaluate whether petroleum-related chemicals in the groundwater are attenuating to concentrations below applicable Alaska DEC groundwater cleanup levels, as well as the ecological RBSCs and the Alaska DEC water quality standards (TAqH and TAH), at locations to be specified in the monitoring plan. Concentrations of petroleum-related chemicals currently exceeding the Alaska DEC cleanup levels, ecological RBSCs, and Alaska DEC water quality standards will be monitored, as well as natural attenuation indicator parameters. Groundwater sampling will be conducted following procedures specified in the appropriate Navy Standard Operating Procedures (SOPs) as specified in future versions of the CMP. Groundwater samples will only be collected for chemical analyses from individual wells if the measured product thickness in the well is less than 0.02 foot. The Navy proposes to initiate remedy-based MNA at this site in conjunction with annual monitoring activities planned for 2006 as specified in the CMP. All groundwater monitoring activities at South of Runway 18-36 Area will be coordinated with the ongoing annual monitoring activities described in the CMP.

Natural recovery will be used for surface water and sediment in South Sweeper Creek to evaluate if the terrestrial remedy (i.e., free-product recovery and containment) is effectively reducing petroleum hydrocarbon concentrations in surface water and sediment. Details of the monitoring program will be incorporated into subsequent versions of the CMP including surface water and sediment monitoring frequency. Periodic monitoring will include sampling for petroleum constituents currently exceeding the ecological RBSCs in surface water and sediment and sampling for TAqH and TAH in surface water. Monitoring will be conducted until petroleum concentrations in surface water and sediment are below ecological RBSCs, established by the risk assessment, and Alaska DEC water quality standards (TAqH and TAH). The Navy proposes to initiate remedy-based natural recovery at this site in conjunction with annual monitoring activities planned for 2006 as specified in the CMP. All surface water and sediment monitoring activities at South of Runway 18-36 Area will be coordinated with the ongoing annual monitoring activities described in the CMP.

All available site-specific groundwater, surface water, and sediment data will be evaluated after each year of monitoring is completed. These data evaluations will be performed to assess whether specified institutional controls are being successfully implemented at the sites,

concentrations of petroleum-related chemicals in groundwater, surface water, and sediment are decreasing, and/or free product is being recovered to the extent practicable. These analyses will incorporate historical, site-specific data where appropriate. Once the annual data evaluation is completed, the Navy will make recommendations for modifications to the monitoring program or for discontinuing the monitoring program, as appropriate. If the groundwater contaminant plume is shown to be stable or shrinking during three consecutive annual monitoring events, then the Navy will petition Alaska DEC for less frequent monitoring. If the concentrations of the petroleum constituents currently exceeding the ecological RBSCs in surface water and sediment and TAH and TaqH in surface water are shown to be decreasing during three consecutive annual monitoring events, then the Navy will petition Alaska DEC for less frequent monitoring. MNA and free-product monitoring will be discontinued once the Alaska DEC groundwater cleanup levels for groundwater, which is not reasonably expected to be used for drinking water, are achieved during three consecutive monitoring events in all site wells selected for monitoring in the CMP. Natural recovery will be discontinued once the ecological RBSCs for surface water and sediment and the Alaska DEC water quality standards for sheen, TAqH, and TAH are achieved during three consecutive monitoring events in all samples collected at the site in accordance with the CMP.

As part of the 5-year reviews required by Amendment Number 3 to the Adak FFA (U.S. Navy, USEPA, and ADEC 2002) and Amendment Number 0001 to the SAERA between the Navy and ADEC (U.S. Navy and ADEC 2002), the results of monitoring will be summarized by the Navy and submitted for review by the Alaska DEC. The 5-year reviews will evaluate the effectiveness of the selected remedy at the South of Runway 18-36 Area. Based on these reviews, the Navy and the Alaska DEC will decide whether continued monitoring, or additional actions, are necessary at the site.

One free-phase product collection/containment trench (FP Trench 1) will be installed in the general area shown on Figure 9-1. This general location was selected primarily based on the occurrence of measured free-product thicknesses in well 02-231 (which is adjacent to surface water) based on measurements from August 1, 2004 through December 4, 2004. Exceedances of TAH and TAqH in adjacent surface water and exceedances of RBSCs for DRO and GRO in adjacent surface water and sediment were also considered when selecting the general location for the free-phase product collection/containment trench. The trench will be constructed such that free product will be collected within the maximum range of groundwater fluctuation. Sumps for free-product recovery will be installed in the trench. Because of the uncertainty of the recoverable free-product volume remaining at the South of Runway 18-36 Area, initially, automated passive skimmers will be installed in each sump to recover free-phase product. Recovery rates are assumed to decline with time, and the automated passive skimmers will be replaced with sorbent socks. Recovery from the free-product collection/containment trench will

continue until product has been reduced to less than 0.01 inches or no sounding of the oil/water probe has been experienced for 1 year or more.

Groundwater encountered during trench excavation will be pumped to a water treatment system. Recovered product from the water treatment system will be placed in 55-gallon drums for off-site disposal or recycled on-island. The treated water will be discharged to South Sweeper Creek. (Note that the conceptual design presented in the FFS included discharge to an infiltration trench.) The discharged water will meet all Alaska DEC surface water criteria (18 AAC 70). Since EPA has deferred authority to the Alaska DEC and the total volume that will be discharged to surface water is anticipated to be less than 250,000 gallons, Alaska DEC has determined that permits will not be required. However, the discharge must meet the substantive requirements of the Alaska DEC General Excavation Dewatering Permit 2004DB0101. Soil from the free-phase product collection/containment trench excavation will be shipped to the mainland for treatment and disposal, unless the soil treatment could be timed to coincide with the thermal desorption of soil from other sites on Adak. Estimated costs for this alternative assumed off-site treatment/disposal because thermal desorption for soils from this site alone would not be cost effective, and concurrent work with another site cannot be guaranteed.

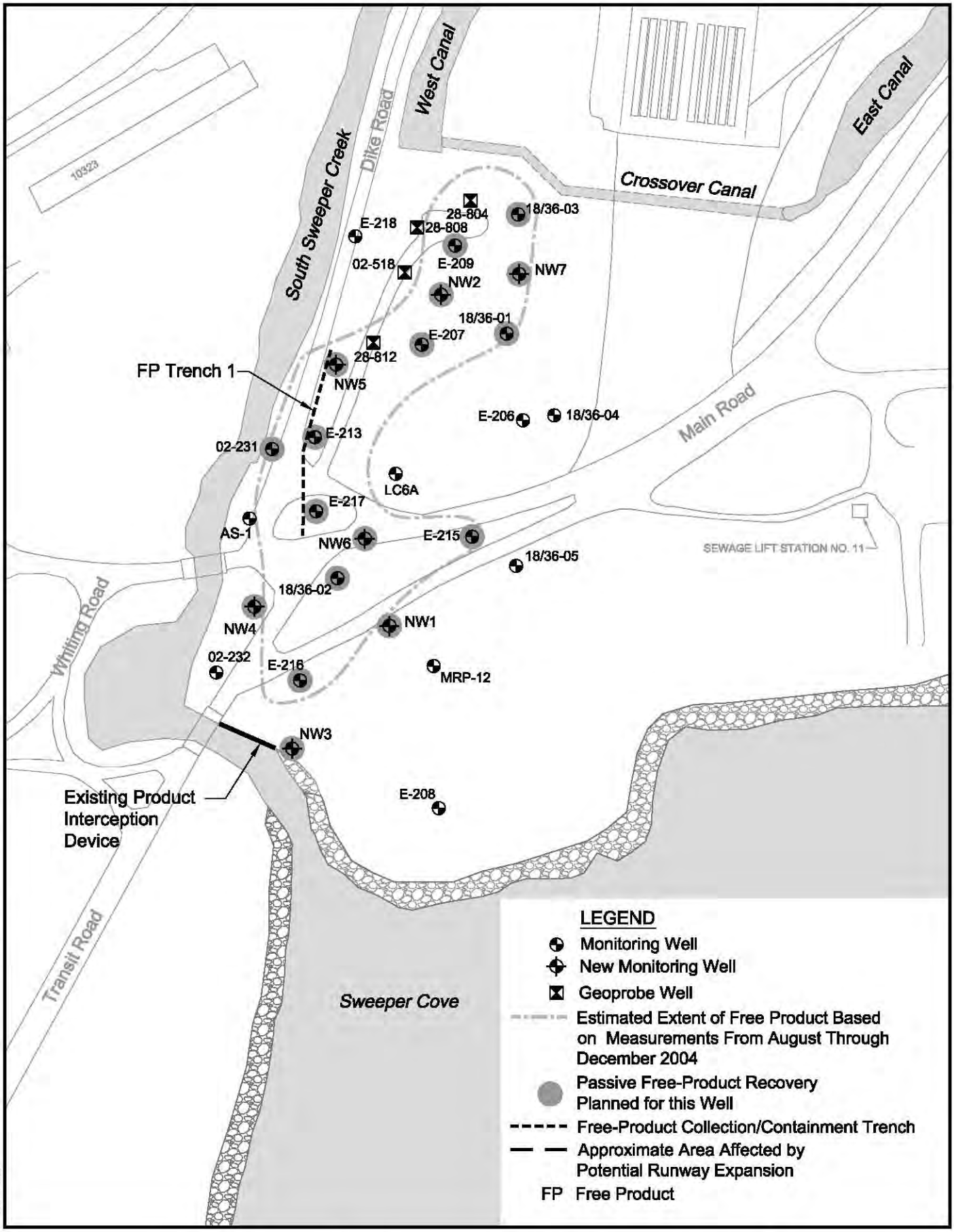
Recoverable product will also be removed from existing site wells and seven new wells using passive skimmers or sorbent socks (see Figure 9-1). Passive skimmers or sorbent socks will be installed in existing wells E-207, E-209, E-213, E-215, E-216, E-217, 02-231, 18/36-01, 18/36-02, and 18/36-03, where measurable quantities of free product have been found during the 2004 free-product recovery activities at the South of Runway 18-36 Area. Seven new wells, NW1 through NW7, will be installed in locations between two wells containing product or in locations to be used to better define the extent of free product. The new wells will also be used for groundwater monitoring. The goal of installing new wells will be to increase the effective area of product recovery and decrease the recovery duration, thereby optimizing recovery. If free product is detected in these new wells, passive skimmers will be installed. Free-product recovery in all wells will occur on a schedule commensurate with skimmer capacity. This schedule may be modified to optimize the recovery rate. The wells utilized to recover product may change due to changes in site conditions. In addition, the technology used to recover free product will change with time as free product is recovered at the site. Passive skimmers will be replaced with sorbent socks as the volume of recoverable product declines at the site.

Free-product occurrence will be measured in additional wells as part of the monitoring of natural attenuation to evaluate if free product is migrating and if additional wells should be added to the recovery system. The installation of additional product recovery or monitoring wells, if needed, is considered a contingent component of the selected remedy. Any future decision by the Navy and ADEC to install and operate additional product recovery or monitoring wells will not be considered a basis for amending or reopening this DD. Removal of free-phase product from on-

site wells will continue until the technically practicable endpoint for free-phase product recovery, as defined in the OU A ROD (U.S. Navy et al. 2000), is achieved.

The costs for this alternative are presented in Table 9-1 and are based on the conceptual design presented in the FFS (URS 2005). These cost estimates include capital costs, periodic maintenance, and monitoring. The capital costs for installation of the free-product collection/containment trench with automated passive skimmers, the seven new wells with passive skimmers, and the passive skimmers and/or sorbent socks in 10 existing wells, including mobilization and demobilization, are estimated to be $1.8 million. Annual O&M costs to operate the free-product collection/containment trench are $150,000 for the first two years and $100,000 for years 3 to 20. Annual O&M costs to recover free product from 17 wells are $210,000. Costs to implement MNA for groundwater are estimated to be $66,000 per year. The costs associated with MNA are the incremental costs associated with the South of Runway 18-36 Area, which are above the base program costs associated with monitoring activities specified in the CMP. The MNA estimate includes the costs associated with sample collection at the South of Runway 18-36 Area, sample analysis, and the incremental reporting and mobilization costs. Costs to implement natural recovery for surface water and sediment are estimated to be $53,000 per year. The natural recovery estimate includes the costs associated with sample collection at the South of Runway 18-36 Area, sample analysis, and the incremental reporting and mobilization costs.

The present worth cost for this alternative based on the conceptual design presented in the FFS assuming a 5 percent discount rate, a 20-year natural attenuation monitoring period, a 20-year natural recovery monitoring period, 20 years of free-product recovery from the free-product collection/containment trench, and 2 years of passive free-phase recovery from the new and existing wells is $5.0 million (URS 2005). Total capital and O&M costs (no present worth) for this alternative are estimated to be $6.7 million. Costs associated with the implementation of institutional controls at this site were not estimated because island-wide institutional controls would cover site-specific restrictions. The duration of monitoring and product recovery may vary substantially from the estimated values used in the cost estimate. Actual duration of monitoring and product recovery will be based on endpoints specified earlier in this section.



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SCALE IN FEET

Figure 9-1
Selected Cleanup Alternative
South of Runway 18-36 Area

Adak Island, AK
DECISION DOCUMENT

Table 9-1
South of Runway 18-36 Area
Cost Estimate For Alternative 2:
PASSIVE FREE-PHASE PRODUCT RECOVERY AND CONTAINMENT

Item	Unit Cost	Units	Quantity	Cost
CAPITAL DIRECT COSTS (INSTALLED)				
Free-Product Collection/Containment Trench Installation				
Mobilization of Excavation Equipment				
Mobilize/Demobilize	$75,000	LS	1	$75,000
Barge to Adak Island (round trip)	$150,000	LS	1	$150,000
Trench Installation				
Excavate/backfill trench with gravel	$2.75	SF	4,400	$12,100
Geomembrane/geotextile installation	$1.75	SF	5,500	$9,625
12-inch stainless steel sumps	$350	LF	110	$38,500
Automated passive skimmers	$2,500	EA	7	$17,500
Installation of remote system/battery power	$4,500	EA	7	$31,500
Equipment installation	$8,000	Week	1	$8,000
Dewatering and Treatment				
Dewatering	$160	Days	3	$480
Water distribution infrastructure	$500	LS	1	$500
Treatment - Oil/Water Separator	$25,000	EA	1	$25,000
Treatment - Activated Carbon Filtration	$600	Day	5	$3,000
Haul water to SWMU 62 Recharge System	$5,000	LS	1	$5,000
Off-island landfill disposal of trench soil	$525	CY	1000	$525,000
Sorbent boom installation and disposal	$1.50	LF	400	$600
Well Installation Costs				
Mob/Demob crew/equip	$20,000	LS	1	$20,000
Per Diem	$4,700	Week	1	$4,700
Equipment Rental	$2,200	Week	1	$2,200
Well Construction (Labor)	$15,000	Week	1	$15,000
Well Construction (Materials)	$1,000	Well	7	$7,000
Passiver Skimmer and Sorbent Sock Installation				
Passive skimmers	$450	Well	9	$4,050
Sorbent socks	$8.50	Well	8	$68
Equipment Install	$8,000	Week	1	$8,000
Subtotal Capital Costs				$962,823
Contingency Allowances		%	25	$240,706
TOTAL CAPITAL DIRECT COSTS (DC)				$1,200,000

Table 9-1 (Continued)
South of Runway 18-36 Area
Cost Estimate For Alternative 2:
PASSIVE FREE-PHASE PRODUCT RECOVERY AND CONTAINMENT

Item	Unit Cost	Units	Quantity	Cost
CAPITAL INDIRECT COSTS				
Preliminary Design	DC	%	5	$60,000
Engineering Design	DC	%	10	$120,000
Regulatory Compliance	DC	%	5	$60,000
Construction QA and Management	DC	%	7	$84,000
System Startup	DC	%	5	$60,000
Closure Documentation	DC	%	5	$60,000
TOTAL CAPITAL INDIRECT COSTS				$440,000
Total Direct and Indirect Capital Costs				$1,640,000
Site Inspection and Overhead Costs	Total Costs	%	8	$131,200
TOTAL CAPITAL COSTS				**$1,800,000**
ANNUAL O&M COSTS				
Annual Free-Product Collection/Containment Trench (Years 1-2)				
Mobilization				
Mobilize/Demobilize	$2,000	Month	12	$24,000
Shipping	$7.00	CF	600	$4,200
Monitoring/Maintenance				
Project Management/Coordination	$1,440	EA	7	$10,080
Field Labor	$2,400	EA	7	$16,800
Supplies	$3,000	EA	7	$21,000
Sorbent boom maintenance at interception device	$1,200	LS	1	$1,200
Free-Product Recycling/Disposal	$10,000	YR	1	$10,000
Battery/remote system repair/replacement	$25,000	YR	1	$25,000
SUBTOTAL TRENCH COSTS (YEARS 1-2)				$112,280
Contingency Allowances		%	25	$28,070
Site Inspection and Overhead Costs		%	8	$11,228
TOTAL ANNUAL TRENCH COST (YRS 1-2)				**$150,000**
Cost Projection for 2 years				**$300,000**
2-Yr Present Worth Trench*				**$280,000**
Annual Free-Product Collection/Containment Trench (Years 3-20)				
Mobilization				
Mobilize/Demobilize	$2,000	Month	12	$24,000
Shipping	$7.00	CF	400	$2,800
Monitoring/Maintenance				
Project Management/Coordination	$1,440	EA	7	$10,080
Field Labor	$2,400	EA	7	$16,800
Supplies	$2,000	EA	7	$14,000
Sorbent boom maintenance at interception device	$1,200	LS	1	$1,200
Sorbent disposal	$7,500	YR	1	$7,500
SUBTOTAL TRENCH COSTS (YEARS 3-20)				$76,380

Table 9-1 (Continued)
South of Runway 18-36 Area
Cost Estimate For Alternative 2:
PASSIVE FREE-PHASE PRODUCT RECOVERY AND CONTAINMENT

Item	Unit Cost	Units	Quantity	Cost
SUBTOTAL TRENCH COSTS (YEARS 3-20)				$76,380
Contingency Allowances		%	25	$19,095
Site Inspection and Overhead Costs		%	8	$7,638
TOTAL ANNUAL TRENCH COST (YRS 3-20)				**$100,000**
Cost Projection for 18 years				**$1,800,000**
18-Yr Present Worth Trench*				**$1,000,000**
Annual Free-Product Recovery in Wells				
Mobilization				
Mobilize/Demobilize	$2,000	Month	12	$24,000
Shipping	$7.00	CF	500	$3,500
Monitoring/Maintenance				
Project Management/Coordination	$1,440	EA	17	$24,480
Field Labor	$2,400	EA	17	$40,800
Supplies	$3,000	EA	17	$51,000
Free-Product Recycling/Sorbent Disposal	$10,000	YR	1	$10,000
SUBTOTAL RECOVERY COSTS				$153,780
Contingency Allowances		%	25	$38,445
Site Inspection and Overhead Costs		%	8	$15,378
TOTAL FREE PRODUCT RECOVERY COSTS				**$210,000**
Cost Projection for 2 years				**$420,000**
2-Yr Present Worth Free-Product Recovery*				**$390,000**
Annual MNA Costs				
Mobilization				
Mobilize/Demobilize	$2,000	LS	1	$2,000
Shipping	$7.00	CF	500	$3,500
Monitoring				
Project Management/Coordination	$120	Well	25	$3,000
Field Labor	$480	Well	25	$12,000
Hydrogeologist	$100	Well	25	$2,500
Equipment Rental	$1,620	Week	2	$3,240
Sampling Supplies	$45	Well	25	$1,125
Analytical (DRO, GRO, BTEX, SVOCs)	$850	Well	25	$21,250
SUBTOTAL MNA COSTS				$48,615
Contingency Allowances		%	25	$12,154
Site Inspection and Overhead Costs		%	8	$4,862
TOTAL ANNUAL MNA COST				**$66,000**
Cost Projection for 20 years				**$1,320,000**
20-Yr Present Worth MNA*				**$820,000**

Table 9-1 (Continued)
South of Runway 18-36 Area
Cost Estimate For Alternative 2:
PASSIVE FREE-PHASE PRODUCT RECOVERY AND CONTAINMENT

Item	Unit Cost	Units	Quantity	Cost
Annual Natural Recovery Costs				
Mobilization				
Mobilize/Demobilize	$2,000	LS	1	$2,000
Shipping	$7.00	CF	1,000	$7,000
Monitoring				
Project Management/Coordination	$120	EA	17	$2,040
Field Labor	$480	EA	17	$8,160
Environmental Scientist	$100	EA	17	$1,700
Equipment Rental	$1,620	Week	2	$3,240
Sampling Supplies	$45	EA	17	$765
Analytical (DRO, GRO, BTEX, SVOCs)	$850	EA	17	$14,450
SUBTOTAL NATURAL RECOVERY COSTS				$39,355
Contingency Allowances		%	25	$9,839
Site Inspection and Overhead Costs		%	8	$3,936
TOTAL ANNUAL NATURAL RECOVERY COST				**$53,000**
Cost Projection for 20 years				**$1,060,000**
20-Yr Present Worth Natural Recovery*				**$660,000**
TOTAL CAPITAL COSTS				**$1,800,000**
TOTAL O&M COSTS (20 YEARS)				**$4,900,000**
TOTAL CAPITAL AND O&M COSTS (20 YEARS)				**$6,700,000**
PRESENT WORTH O&M COSTS*				**$3,200,000**
TOTAL PROJECT PRESENT WORTH*				**$5,000,000**

* Present worth costs calculated using a 5% discount rate.
Notes:
CF = Cubic Feet
EA = Each
LB = Pound
LS = Lump Sum
YR = Year

10.0 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Applicable or relevant and appropriate requirements (ARARs) are promulgated federal and state laws and regulations that are either applicable to the conditions at a cleanup site or are relevant and appropriate. Relevant and appropriate requirements address problems or situations sufficiently similar to those encountered at the site that their use is well suited to the site. Three kinds of ARARs exist for cleanup of petroleum release sites on Adak Island: chemical-specific, location-specific, and action-specific.

10.1 CHEMICAL-SPECIFIC ARARS

Chemical-specific ARARs are generally risk-based concentration limits or discharge limits for specific chemicals. When a specific chemical is subject to more than one discharge or exposure limit, the more stringent requirement is used. Chemical-specific ARARs for the South of Runway 18-36 Area include Alaska DEC regulations 18 AAC 75 and 18 AAC 70 and the Clean Water Act.

As discussed in Section 6, Alaska DEC regulation 18 AAC 75 specifies soil and groundwater cleanup criteria established for petroleum-release sites located within the State of Alaska. Cleanup levels specified for soil at free-product recovery petroleum sites on the Former Adak Naval Complex are based on Alaska DEC Method Four criteria [18 AAC 75.340(a)(4)]. Cleanup levels specified for groundwater at the South of Runway 18-36 Area are based on 10 times the tabulated groundwater cleanup levels [18 AAC 75.345(b)(1), Table C] because groundwater is not reasonably expected to be a potential future source of drinking water [18 AAC 75.345(b)(2)]. Alaska regulations [18 AAC 75.345(f)] specify that groundwater hydrologically connected to nearby surface water may not cause a violation of the water quality standards in 18 AAC 70 for surface water. In addition, ambient water quality criteria (33 United States Code 1314, Clean Water Act) are relevant and appropriate for surface water that could be impacted by plume migration.

10.2 LOCATION-SPECIFIC ARARS

Location-specific ARARs are those requirements that relate to the geographic position or physical condition of the site. These requirements may limit the type of remedial activities that can be implemented or may impose additional constraints. There are no potential location-specific ARARs for South of Runway 18-36 Area because remedial actions are not proposed in sensitive environments.

10.3 ACTION-SPECIFIC ARARS

Action-specific ARARs generally set performance, design, or other similar action-specific controls or restrictions on particular kinds of activities. Potentially applicable action-specific ARARs for the selected cleanup alternative include the following:

- Alaska Air Quality Control (18 AAC 50.300 through 50.380)
- Resource Conservation and Recovery Act (RCRA) regulations (40 Code of Federal Regulations [CFR] Parts 261, 262, 268)
- Alaska Hazardous Waste Disposal Regulation (18 AAC 62)
- Alaska Oil and Hazardous Substances Pollution Control (18 AAC 75.325 through 375)
- Alaska Water Quality Standards (18 AAC 70.20)
- Alaska Wastewater Disposal (18 AAC 72.500 through 72.610)
- Federal Clean Water Act – National Pollution Discharge Elimination System (NPDES) Program (40 CFR Part 131)

11.0 PUBLIC INVOLVEMENT

11.1 PUBLIC INVOLVEMENT ACTIVITIES

The Navy established a community involvement program in 1994 to provide interested Alaska citizens and Adak residents with timely and updated information on the environmental cleanup and the transfer and reuse of Navy land and facilities. The community involvement program also provides a mechanism for public input on environmental cleanup decisions. Information is conveyed to the public via fact sheets and newsletters, Restoration Advisory Board (RAB) meetings and other formal public meetings, web site announcements (www.adakupdate.com), information repositories on Adak Island (Bob Reeve High School building, second floor) and in Anchorage (University of Alaska library, reserve room), and the administrative record file located at Naval Facilities Engineering Command Northwest, Silverdale, Washington. In addition, a mailing list is maintained and updated to inform concerned citizens of upcoming meetings and significant activities, such as public comment periods. Public input is obtained through RAB meetings and other formal public meetings, community interviews, requests for public comments, and a telephone hotline.

The proposed plan (U.S. Navy and Alaska DEC 2005a) was provided to the public for review during the 30-day public comment period beginning on August 16, 2005. In addition, TAC (the current landowner) and the Alaska Department of Transportation (ADOT) were provided a copy of the FFS (URS 2005) and the proposed plan (U.S. Navy and Alaska DEC 2005a) and were invited to comment on these documents.

11.2 FUTURE CONTACTS

Adak community members are encouraged to contact Navy and Alaska DEC site managers with questions or comments. The Navy and Alaska DEC site managers are:

Gary D. Simmons
Naval Facilities Engineering Command Northwest
1101 Tautog Circle
Silverdale, WA 98315
Phone: (360) 396-0911
Fax: (360) 396-0857
Email: gary.d.simmons@navy.mil

Jason Weigle
Project Manager, Federal Facilities Environmental Restoration Program,
Contaminated Sites Program
Alaska Department of Environmental Conservation
555 Cordova St.
Anchorage, AK 99502
Phone: (907) 269-7528
Fax: (907) 269-7649
Email: jason_weigle@dec.state.ak.us

12.0 RESPONSIVENESS SUMMARY

Comment received from Ron Stroman at the Alaska Department of Transportation via e-mail on December 16, 2005:

> *I've read the proposed work for the Navy at Adak, at the end of runway 18/36. Please make it a requirement of your approval that the Navy precede their work by getting with the airport manager for badging, security, and safety. Because work will be performed within the runway OFA (obstacle free area), the airport manager must issue a NOTAM (Notice To Airmen) to inform incoming aircraft that there is an obstruction within the approach to runway 18. There are also requirements for lighting of equipment within this area, the need for radios (tuned to the local CTAF [citizen's traffic advisory frequency]), etc. But the airport manager will direct the Navy on what is necessary.*
>
> *I usually include the appropriate permits to allow construction within the airport but as long as they coordinate with me and the local airport manager I'll defer to your office issuing approval. Please copy me on any material submitted back and forth with the Navy.*

Response: The Navy will coordinate with the Adak airport manager and the Alaska Department of Transportation to meet all badging, security, and safety requirements. Text in Section 9 was updated to include this requirement.

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APPENDIX A

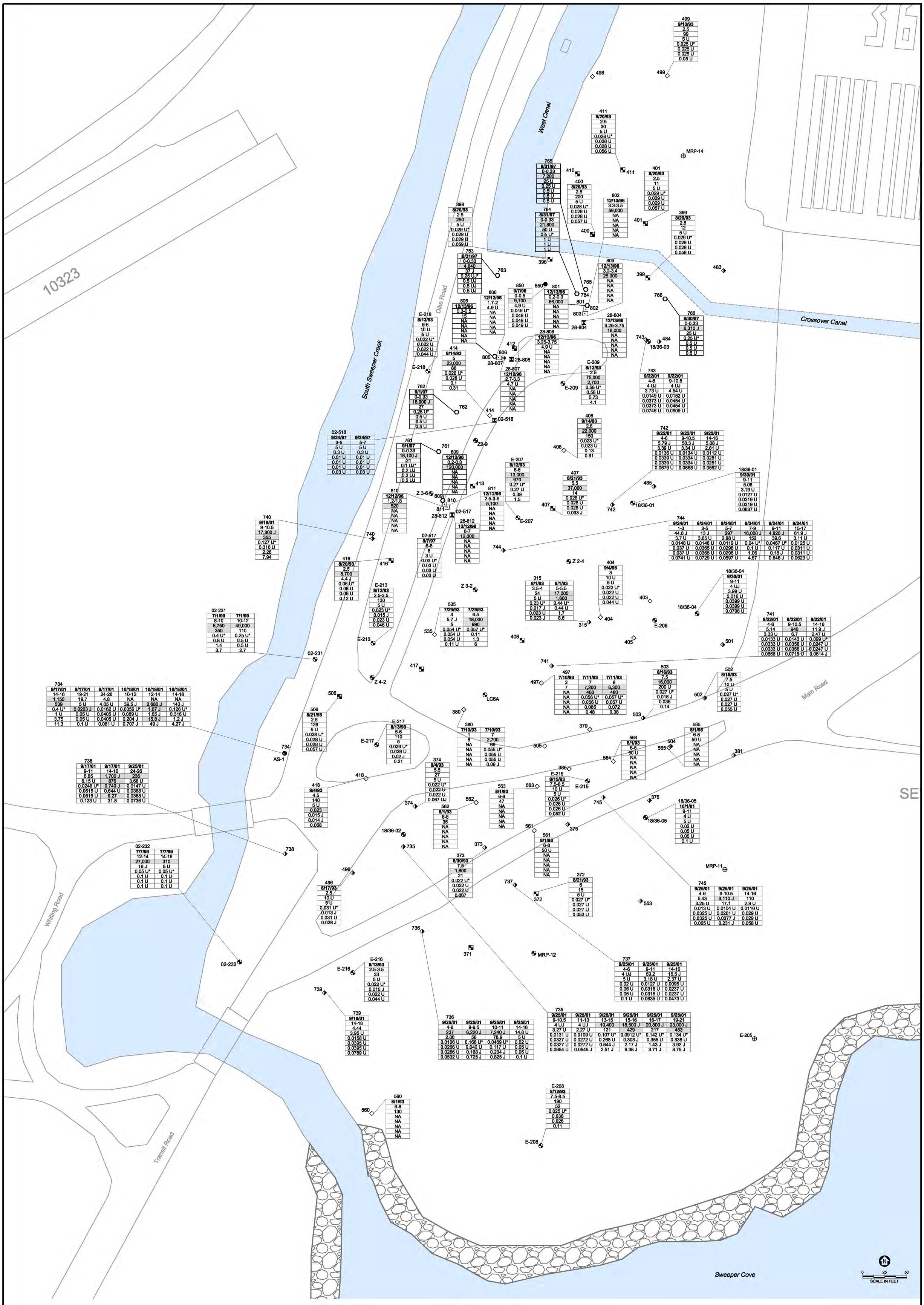
Legal Description

APPENDIX A

Legal Description

That portion of Adak Island, State of Alaska, described as follows:

Commencing at U.S. Navy control point H-7 (NAD 83 - N=317,457.30 E=3,135,573.38), which is South 22°36′59″ West 1,731.18 feet from U.S. Navy control point H-5; thence South 34°41’17” West 3,087.56 feet to the POINT OF BEGINNING; thence South 44°50’49” West 991.85 feet; thence South 12°27’21” West 431.83 feet; thence North 79°37’05” West 396.72 feet; thence North 28°31’10” East 539.45 feet; thence North 17°20’47” East 1,200.99 feet; thence South 45°00’42” East 801.98 to the POINT OF BEGINNING. Containing 16.17 acres more or less.



Chemical Concentrations in Soil (mg/kg)

04-211	Location Number
10/10/96	Sample Date
15-17	Sample Depth Interval (ft bgs)
12	DRO
12	GRO
0.06	Benzene
0.08	Toluene
0.38	Ethylbenzene
1.4	Total Xylenes

U Chemical Not Detected at Concentration Shown
J Estimated Concentration
bgs Below Ground Surface
NA Not Analyzed
Exceeds Cleanup Criteria
* Detection Limit Exceeds Most Stringent Screening Criteria

LEGEND

- Monitoring Well
- Abandoned Monitoring Well
- Lost Monitoring Well
- Recovery Well
- Geoprobe Well
- Geoprobe Boring
- Bore Hole
- Hand Auger
- Ground Surface
- Test Pit
- Buried Sediment
- Approximate Extent of Riprap

Alaska DEC Method 2 Soil Criteria Over 40-Inch Rainfall Zone

	Ingestion	Inhalation	Migration to Groundwater
DRO	8,250 mg/kg	12,500 mg/kg	230 mg/kg
GRO	1,400 mg/kg	1,400 mg/kg	260 mg/kg
Benzene	120 mg/kg	6.4 mg/kg	0.02 mg/kg
Toluene	17,000 mg/kg	180 mg/kg	4.8 mg/kg
Ethylbenzene	8,300 mg/kg	89 mg/kg	5 mg/kg
Total xylenes	166,000 mg/kg	81 mg/kg	69 mg/kg

Note: These criteria levels are specified for petroleum release sites at Adak in the Record of Decision for Operable Unit A.

Plate 1
DRO, GRO, and BTEX Concentrations in Soil South of Runway 18-36 Area

U.S. NAVY

Adak Island, AK
DECISION DOCUMENT

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10323

South Sweeper Creek

West Channel

Dike Road

Crossover Canal

Main Road

Whiting Road

Sweeper Cove

Product Interception Device

SE

⊕ MRP-14

9/4/93	9/4/96
250 U	100
250 U	5 U
1 U	0.2 U
1 U	0.2 U
1 U	0.2 U
2 U	0.4 U

E-218

8/31/93	9/4/96	8/23/99	11/15/99	2/25/00	7/5/00	10/2/01	10/9/02
250 U	200	NA	150 J	190	160 UJ	267	170 U
250 U	5 U	21	20 U	20 U	35	50 U	NA
1 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	NA
1 U	0.2 U	0.3 U	0.3 U	0.3 U	0.3 U	0.5 U	NA
1 U	0.2 U	0.22	0.2 U	0.2 U	0.59 J	0.5 U	NA
2 U	0.4 U	0.69	0.2 U	0.2 U	1.1	1 U	NA

28-804

12/16/96
1,300
100 U
1 U
1 U
1 U
1 U

18/36-03

10/1/01
100 UJ
50 U
0.2 U
0.5 U
0.5 U
1 U

28-807

28-808

12/16/96
7,100
100 U
1 U
1.2
1.6
5.2

E-209

9/3/96
700
1,000 UJ
0.2 U
10 UJ
10 UJ
14 J

Z2-9

Z 3-6

28-812

12/16/96
1,300
100 U
1 U
1 U
4.4
8.4

E-207

9/1/93	9/2/96
1,800	1,900
520	100 UJ
0.2 U	1 U
0.5 J	1 UJ
7.6	9.4 J
31	61 J

Z2-4

18/36-01

10/1/01
2,310 J
50 U
0.2 U
0.5 U
0.5 U
1 U

Z3-2

E-213

9/3/96	9/30/01
2,000	4,840
150 J	186
10 UJ	0.389 J
1.1 J	0.5 U
3.4 J	3.56
9.5 J	5.59

Z4-26

E-206

8/31/93	9/4/96	9/30/01	9/30/01
250 U	200	776	825
250 U	5 U	50 U	50 U
1 U	1 U	0.2 U	0.2 U
1 U	0.2 U	0.5 U	0.5 U
1 U	0.2 U	0.5 U	0.5 U
2 U	0.4 U	1 U	1 U

18/36-04

10/1/01	10/1/01
114 UJ	671 J
50 U	50 U
0.2 U	0.2 U
0.5 U	0.5 U
0.5 U	0.5 U
1 U	1 U

02-231

8/15/99	11/15/99	6/30/00	10/2/01	10/15/01	10/9/02
NA	1,200	1,200 J	23,800	15,550	1,400
2,400	2,200	2,800	1,690 J	NA	910
35 NJ	24 J	39	33.4	NA	33
6 U	6 U	4.3	4.37	NA	3.2
63	60	52	47.3	NA	34
262	222	220	157	NA	150

LC6A

8/19/92	11/12/92	3/3/93	9/4/93	1/21/97	8/9/98	9/30/01
NA	NA	1,000,000 U*	45,000	13,000	4,300 J	4,130
NA	NA	1,000,000 U*	770	180	470	338 J
10 U*	10 U*	500 U*	1 U	8.1	2.6	1.69
10 U	4 J	500 U	0.9 J	2.9	1.5	0.62
22	16	97 J	15	12	13	12
80	66	580	57	44	48	43.5

AS-1

E-217

8/31/93	1/15/97	10/20/97	9/30/01
27,000	28,000	3,600 J	11,000
2,300	280 J	810	766 J
0.2 U	16	5.7 J	30.1
1	2 J	NA	2.02
13	9.3 J	NA	48.9
88	35 J	NA	172

E-215

8/27/93	1/7/97	9/30/01
4,600	2,100	1,910
350	100 U	83
1 UJ	1 U	0.516
1 U	1 U	0.5 U
2.3	1.2	2.72
7.8	2.5	6.5

18/36-02

10/2/01
5,200
474 J
1.69
0.5 U
52.3
56.3

18/36-05

10/1/01
605 J
50 U
0.2 U
0.5 U
0.5 U
1 U

MRP-11

1/22/97
250 U
100 U
1 U
1.2
1 U
1 U

8/15/99	11/15/99	2/8/00	6/30/00	10/2/01	10/10/02
NA	150	160 U	160 UJ	1,780	2,800
26	28	24	38 J	50 U	NA
0.4 U	0.2 U	0.2 U	0.2 U	0.2 U	NA
0.6 U	0.3 U	0.3 U	0.3 U	0.5 U	NA
0.6	0.51	0.2 U	0.46 J	0.5 U	NA
0.8 U	0.95	0.2 U	0.44	1 U	NA

02-232

MRP-12

9/2/93	8/31/96	10/1/01	10/10/02
250 U	250 U	169 J	160 U
250 U	100U	50 U	NA
1 U	1 U	0.2 U	NA
1 U	1 U	0.5 U	NA
1 U	1 U	0.5 U	NA
2 U	1 U	1 U	NA

E-216

8/27/93	1/13/97	2/15/00	10/25/02
5,600	8,200	370 J	5,000
250 U	100 U	51	NA
1 U	1 U	1 U	NA
1 U	1 U	0.3 U	NA
0.9 J	1.2	0.9	NA
3.1	3	1.3	NA

E-205

9/2/93	8/31/96
250 U	250 U
250 U	100 U
1 U	1 U
1 U	1 U
1 U	1 U
2 U	1 U

E-208

8/27/93	8/31/96	2/15/00	7/8/00	10/1/01	10/10/02
250 U	250 U	270 J	160 J	129 J	170 U
250 U	100 U	20 U	20 UJ	50 U	NA
1 UJ	1 U	1 U	0.2 U	0.2 U	NA
1 U	1 U	0.3 U	0.3 U	0.5 U	NA
1 U	1 U	0.2 U	0.2 U	0.5 U	NA
2 U	1 U	0.2 U	0.2 UJ	1 U	NA

N

0 25 50

SCALE IN FEET

LEGEND

- Monitoring Well
- ⊕ Abandoned Monitoring Well
- ⊗ Lost Monitoring Well
- Recovery Well
- Geoprobe Well
- Approximate Extent of Riprap

Note: Concentrations in ug/L

E-217	Location Number
10/25/96	Sample Date
3,900	DRO
100 U	GRO
1 U	Benzene
1 U	Toluene
13	Ethylbenzene
32	Total Xylenes

U Chemical Not Detected at Concentration Shown

J Estimated Concentration

NA Not Analyzed

Alaska DEC Groundwater Criteria	
DRO	1,500 ug/L
GRO	1,300 ug/L
Benzene	5 ug/L
Toluene	1,000 ug/L
Ethylbenzene	700 ug/L
Total xylenes	10,000 ug/L

Note: These criteria are for groundwater used as a drinking water source (18 AAC 75).

Exceeds Cleanup Criteria

* Detection Limit Exceeds Most Stringent Screening Criteria

Plate 2
DRO, GRO, and BTEX Concentrations in Groundwater South of Runway 18-36 Area

U.S. NAVY

Adak Island, AK
DECISION DOCUMENT

FILENAME: T:\ADAK\IDIQ\Sub-Tasks\DO 3\S RUNWAY DEC DOC\INTERNAL DRAFT\PLATE 2 DRO GW.dwg
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