EPA/ROD/R10-95/111
June 1995

EPA Superfund Record of Decision:

Adak Naval Air Station (OU 1), Adak, AK 3/31/1995

DECLARATION OF THE RECORD OF DECISION

SITE NAME AND LOCATION

Naval Air Facility Adak
Site 11 (Palisades Landfill) and Site 13 (Metals Landfill)
Adak Island, Alaska

STATEMENT OF PURPOSE

This decision document presents the selected interim remedial actions (IRAs) for Sites 11 and 13 (Palisades Landfill and Metals Landfill), which are part of Operable Unit A at the Naval Air Facility (NAF) Adak, Adak Island, Alaska. The remedies selected in this decision document were developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act, as amended by the Superfund Amendments and Reauthorization Act, and the National Oil and Hazardous Substances Pollution Contingency Plan. The documents supporting the decision are in NAF Adak's Administrative Record.

The United States Navy (Navy) is the lead agency for this decision. The interim remedial actions proposed in this plan were reached as part of the Federal Facilities Agreement (FFA) for NAF Adak, which is a legal agreement between the Navy, the United States Environmental Protection Agency (EPA), and the Alaska Department of Environmental Conservation (ADEC). EPA approves of this decision, and along with ADEC, has participated in the evaluation of remedial action alternatives. The State of Alaska concurs with the selected remedy.

These FFA parties entered into a joint agreement to evaluate and clean up hazardous substances on Adak Island. The agreement follows both state and federal regulations. This agreement went into effect on November 24, 1993.

For the two landfills discussed in this Record of Decision (ROD), a complete assessment of potential human and ecological risk was not performed prior to a decision to take remedial action. The remedial investigation (RI) for NAF Adak, scheduled to begin in October 1996, will include a basewide comprehensive risk assessment that will include Palisades and Metals Landfills. Following that assessment, the FFA parties may propose additional remedial actions at the landfill sites as part of a final basewide remedial action.

ASSESSMENT OF THE SITE

Releases of hazardous substances from Palisades and Metals Landfills, if not addressed by implementing the response actions selected in this ROD, may potentially present an imminent and substantial endangerment to public health, welfare, and/or the environment.

DESCRIPTION OF THE SELECTED AND CONTINGENT REMEDIES

The selected IRAs at Palisades and Metals Landfills, at NAF Adak, Adak Island, Alaska, address the potential chemical exposures and associated risks to human health and the environment by minimizing the potential for exposures to site contaminants and off-site contaminant migration. The following lists provide the major components of the IRA for each landfill.

Palisades Landfill—Selected Alternative

- Reroute Palisades Creek to reduce surface water contact with landfill waste.

- Construct small interceptor ditches along the uphill side of the landfill to collect water flowing off the hillside. The water will be routed around the perimeter of the landfill and into Palisades Creek.

- Add landfill cover over approximately 6 acres.

- Establish vegetation over the newly constructed landfill surface by seeding and take measures to prevent erosion. Erosion control measures may include jute matting, filter fabric fences, and hay/straw bales.

- Implement institutional controls such as residential use restrictions and controls and installation of signs around the perimeter of the landfill to warn the public of its contents, and conduct a boundary survey of the landfill.

- Conduct a monitoring program that will involve sampling and analyzing water and sediments collected from the mouth of Palisades Creek, and inspecting the overall physical condition of the landfill and landfill cover to determine whether erosion or settlement has occurred that could be detrimental to the landfill cover or could lead to potential danger to human health and/or the environment.

Metals Landfill—Selected Alternative

- Conduct a site removal evaluation on the shoreline debris located in the northern section of the landfill. The shoreline debris will be inspected and material that could adversely affect the marine environment will be removed from the shoreline and properly disposed. Sediment samples will be taken and the results will be screened against risk-based screening concentrations (RBSCs). If exceedances of RBSC can be linked to the debris present, that debris will be removed from the shoreline and placed in the landfill. The debris will be evaluated for stability and, if necessary, measures will be taken to prevent further debris from contacting the marine environment.

- Construct small interceptor ditches on the uphill side of the landfill at the base of Monument Hill to collect surface water flowing off the hill above the landfill. The ditches will divert the water into Kuluk Bay.

- Add a landfill cover over approximately 17 acres.

- Install five additional groundwater monitoring wells near the east and north perimeter of the landfill, toward Kuluk Bay to provide adequate coverage near the shoreline.

- Establish vegetation over the newly constructed landfill cover and take measures to prevent erosion.

- Implement institutional controls such as residential use restrictions and controls and installation of signs around the perimeter of the landfill to warn the public of its contents, and conduct a boundary survey of the landfill.

- Conduct a monitoring program that will involve sampling and analyzing groundwater, and inspecting the overall physical condition of the landfill and landfill cover to determine whether erosion or settlement has occurred that could be detrimental to the landfill cover or could lead to potential danger to human health and/or the environment.

Metals Landfill—Contingent Alternative

- Include all elements listed under Selected Alternative with the exception of the landfill cover.

- Construct an engineered landfill cap over approximately 17 acres.

STATUTORY DETERMINATIONS

The selected and contingent IRAs for Palisades and Metals Landfills comply with federal and state requirements that are legally applicable or relevant and appropriate to the remedial actions, and are cost-effective. These remedies utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. However, because treatment of the "principal threat" at each site was not found to be practicable, the remedies do not satisfy the statutory preference for treatment as a principal element of a CERCLA remedy. As shown in the evaluation of alternatives, the size of the sites, volumes of wastes and debris, and remote location preclude a practicable remedy that includes excavation and effective treatment.

Since the selected interim remedies will result in possible hazardous substances remaining on site, a review must be conducted within 5 years after commencement of the remedial actions to ensure that the remedies continue to provide adequate protection of human health and the environment. Because the selected remedies are IRAs, a review of the remedies' protectiveness and a thorough evaluation of the statutory elements will be conducted as part of the basewide RI.

Signature sheet for the Naval Air Facility Adak, Interim Remedial Action, Record of Decision, Sites 11 and 13, between the United States Navy, the United States Environmental Protection Agency, and the Alaska Department of Environmental Conservation.

LWCrane ________________________________ 17 Mar 95 ____________
Date

Captain L.W. Crane
Commanding Officer, Naval Air Facility Adak
United States Navy

Signature sheet for the Naval Air Facility Adak, Interim Remedial Action, Record of Decision, Sites 11 and 13, between the United States Navy, the United States Environmental Protection Agency, and the Alaska Department of Environmental Conservation.

Chuck Clarke — 3/31/95

Chuck Clarke
Regional Administrator, Region 10
United States Environmental Protection Agency

Date

Signature sheet for the Naval Air Facility Adak, Interim Remedial Action, Record of Decision, Sites 11 and 13, between the United States Navy, the United States Environmental Protection Agency, and the Alaska Department of Environmental Conservation.

Marianne G. See ——— March 13, 1995

Marianne G. See
Regional Administrator, Southcentral Region
Alaska Department of Environmental Conservation

Date

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ABBREVIATIONS AND ACRONYMS

ADEC	Alaska Department of Environmental Conservation
ARAR	applicable or relevant and appropriate requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CLEAN	Comprehensive Long-Term Environmental Action Navy
CRP	community relations plan
CTO	contract task order
EFA	Engineering Field Activity
EPA	United States Environmental Protection Agency
ESI	expanded site investigation
FFA	Federal Facilities Agreement
FFCA	Federal Facilities Compliance Agreement
FS	feasibility study
HDPE	high-density polyethylene
IAS	initial assessment study
IRA	interim remedial action
JP-4	jet petroleum #4
JP-5	jet petroleum #5
MCL	maximum contaminant level
mogas	motor vehicle gasoline
MW	monitoring well
NAF	Naval Air Facility
NAS	Naval Air Station
NPL	National Priorities List
O&M	operation and maintenance
OU	operable unit
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
POL	petroleum, oil, and lubricants
RAO	remedial action objective
RBSC	risk-based screening concentrations
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
ROD	Record of Decision

ABBREVIATIONS AND ACRONYMS (Continued)

SA	source area
SARA	Superfund Amendments and Reauthorization Act of 1986
SI	site investigation
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TPH	total petroleum hydrocarbons
URS	URS Consultants, Inc.
USFWS	United States Fish and Wildlife Service
VOC	volatile organic compound

UNITS OF MEASURE

cfs	cubic feet per second
ft	feet
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
ppm	parts per million
μg/L	micrograms per liter

DECISION SUMMARY

1.0 INTRODUCTION

The United States Navy (Navy) is required to address contaminated sites or potential releases of contaminants to the environment at the Naval Air Facility (NAF) on Adak Island in a manner consistent with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). The selected interim remedial actions (IRAs) for two inactive landfills, Palisades Landfill (Site 11) and Metals Landfill (Site 13), at NAF Adak will comply with applicable or relevant and appropriate requirements (ARARs), as determined by the United States Environmental Protection Agency (EPA) and the Alaska Department of Environmental Conservation (ADEC). The IRAs are intended to reduce possible chemical exposures and associated risks to human health and the environment by minimizing the potential for exposure to site contaminants and off-site contaminant migration.

The particular IRAs selected in this Record of Decision (ROD) were reached as part of a deliberative process set out in the Federal Facilities Agreement (FFA) for NAF Adak, a legal agreement between the Navy, EPA, and ADEC. The FFA went into effect on November 24, 1993. The FFA parties entered into a joint agreement to evaluate and clean up sites contaminated with hazardous substances on Adak Island in accordance with established state and federal regulations. NAF Adak was placed on the National Priorities List (NPL) on May 31, 1994.

For the two inactive landfills discussed in this ROD, actions were deemed necessary to protect human health and the environment prior to a complete assessment of potential human and ecological risk. The action being proposed, therefore, is called an IRA. The remedial investigation (RI) for NAF Adak, scheduled to begin in October 1996, will include a basewide comprehensive risk assessment that will include Palisades and Metals Landfills. Following that assessment, the FFA parties may propose additional remedial actions at the landfill sites as part of a final basewide remedial action.

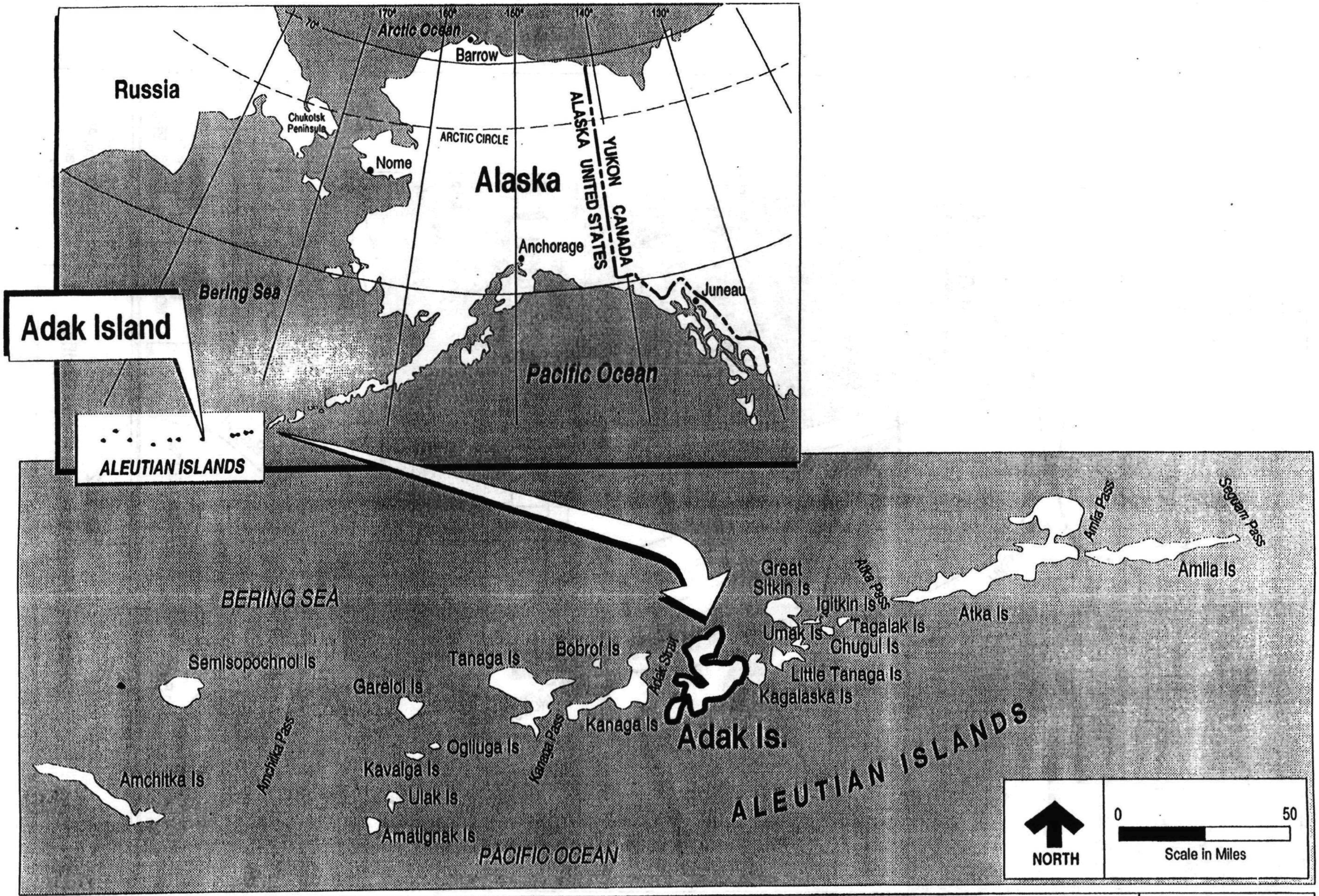
2.0 SITE NAMES, LOCATIONS, AND DESCRIPTIONS

Adak Island is located off the southwest coast of Alaska, near the western end of the Aleutian Islands (Figure 1). Adak Island is included in the Alaska Maritime National Wildlife Refuge and has been so designated since 1913. The wildlife refuge is managed by the United States Fish and Wildlife Service (USFWS). The Navy has a formal withdrawal from the refuge and has the right to manage Navy-occupied land until the withdrawal is revoked. NAF Adak is located on the northern half of the island (Figure 2).

In 1942, Adak Island was commissioned as an Army base for attacking the nearby Japanese-occupied islands (Attu and Kiska) during World War II. In 1951, it became a Navy facility designated Naval Air Station (NAS) Adak. The NAS Adak principal missions have been air operations, communications functions, and oceanographic research. The facility was redesignated Naval Air Facility (NAF) Adak, effective July 1, 1994, to reflect its revised active status and reduction in military personnel. Palisades and Metals Landfills are located near the main activity center for NAF Adak (Figure 2).

2.1 PALISADES LANDFILL (SITE 11)

Palisades Landfill is located several miles north of the central community of Adak and was used as the primary disposal area for all operations on Adak Island from the 1940s to approximately 1970. The landfill area, which is approximately 6 acres, covers portions of the coastal uplands immediately adjacent to Kuluk Bay and part of a canyon or ravine. Figure 3 shows the primary area of the landfill. Aerial photographs suggest that the original landfill boundary extended beyond the present western boundary. It is assumed that the landfill waste formerly located in this western area was placed in the present landfill area. The ravine is approximately 1,200 feet long, 5 to 300 feet wide, and 5 to 150 feet deep, with a small stream (Palisades Creek) running through it. The mouth of the ravine opens immediately to Kuluk Bay. Wastes within the landfill include, but are not limited to, petroleum products, solvents, paint waste, batteries, sanitary trash, construction waste, scrap vehicles, and mercury. Approximately 80,000 to 100,000 cubic yards of solid waste are located in the landfill. Soil covers most of the landfill materials, although a portion of the disposed material within the ravine has no cover and is on a slope. The exposed waste in the ravine consists primarily of barrels and construction



CLEAN COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY	**Figure 1** **The Aleutian Island Chain**	CTO 0154 Adak Island, AK Sites 11 and 13 ROD

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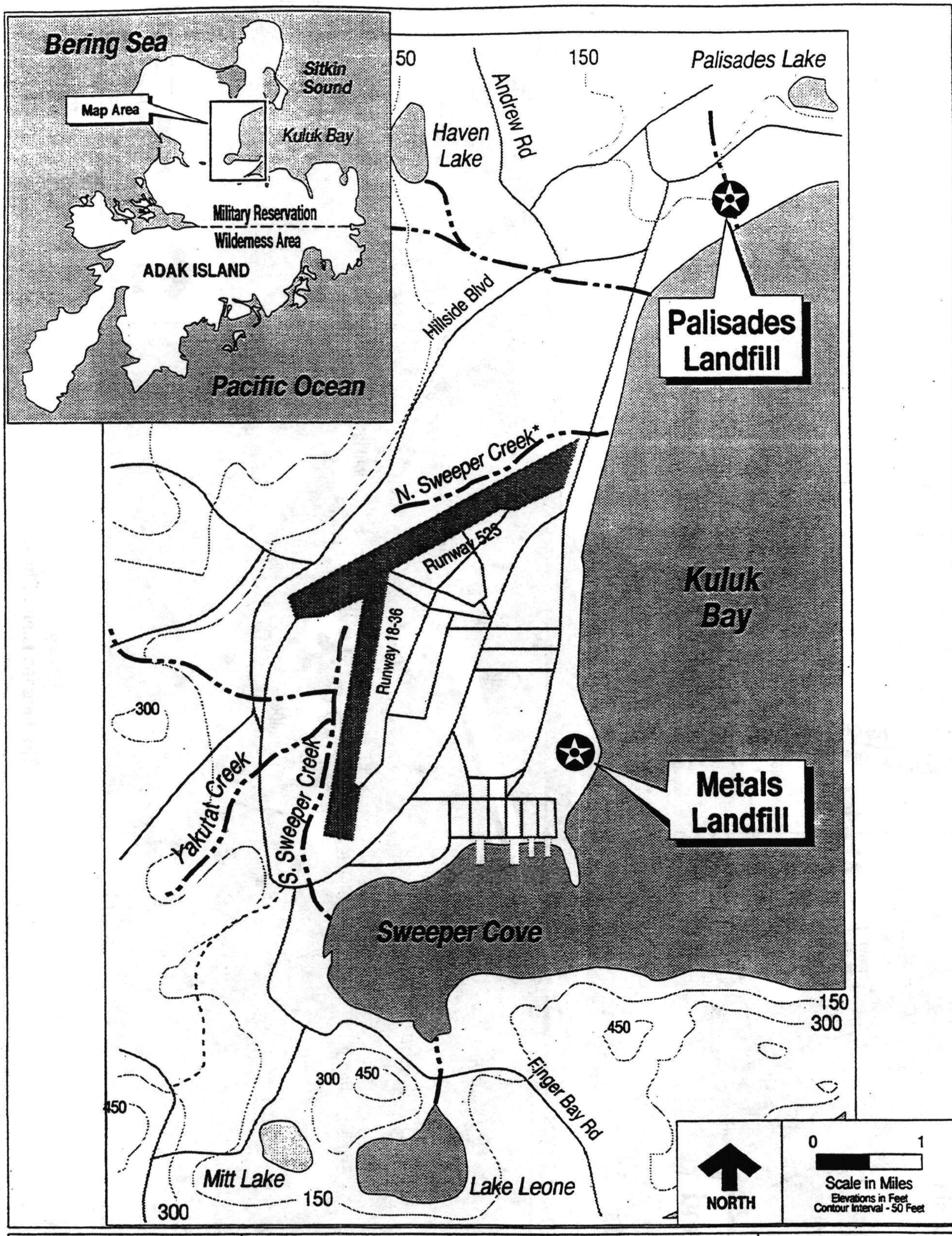

CLEAN COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY	**Figure 2** **Location of Palisades and Metals Landfills**	CTO 0154 Adak Island, AK Sites 11 and 13 ROD

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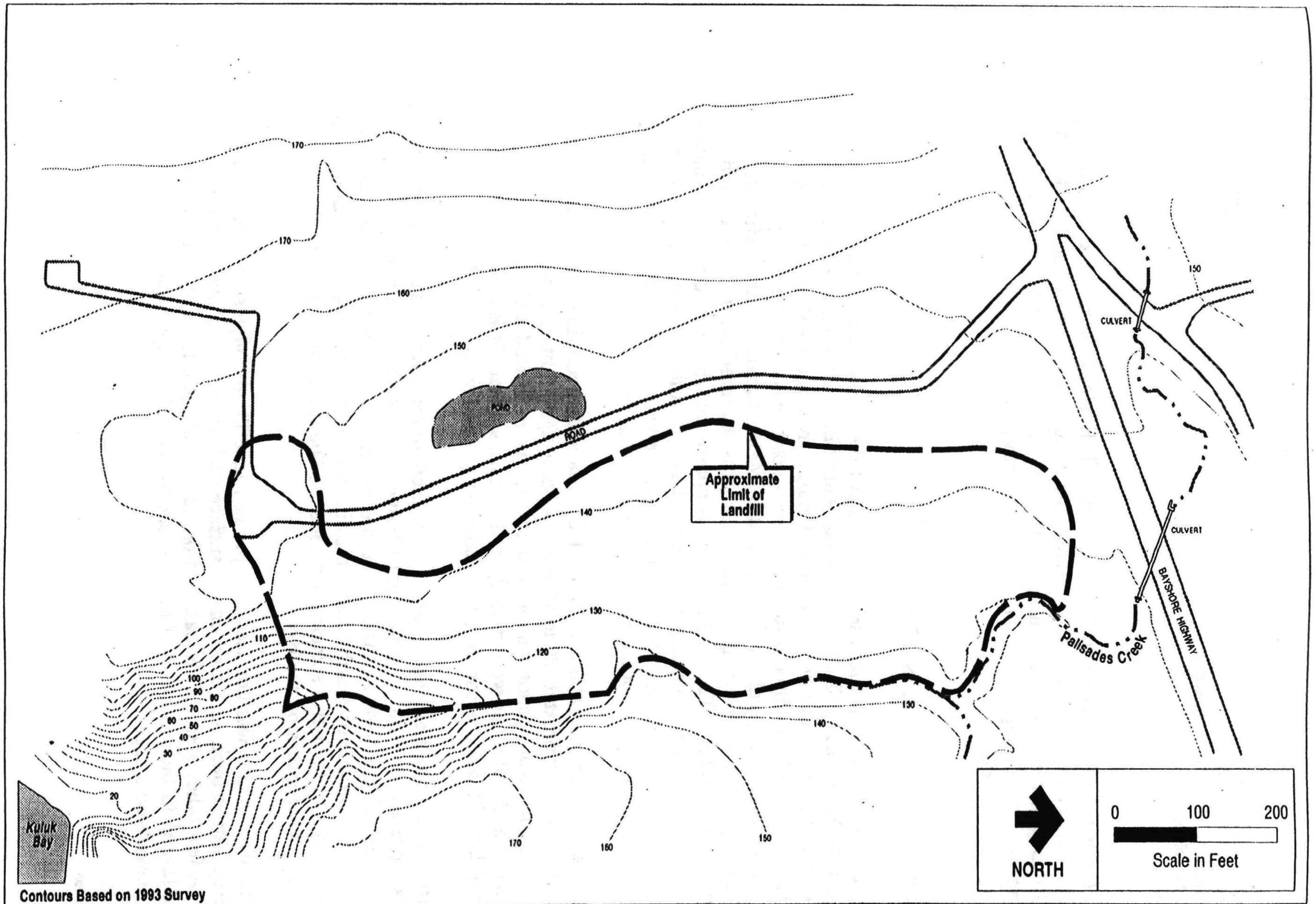

CLEAN COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY	**Figure 3** **Palisades Landfill**	CTO 0154 Adak Island, AK Sites 11 and 13 ROD

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waste. The waste in the ravine covers a portion of Palisades Creek, which runs through the landfill before emptying into Kuluk Bay. The landfill does not extend into Kuluk Bay. Groundwater occurs locally under the site and discharges into the marine environment at the downgradient boundary. Groundwater is not a source of drinking water for Adak residents.

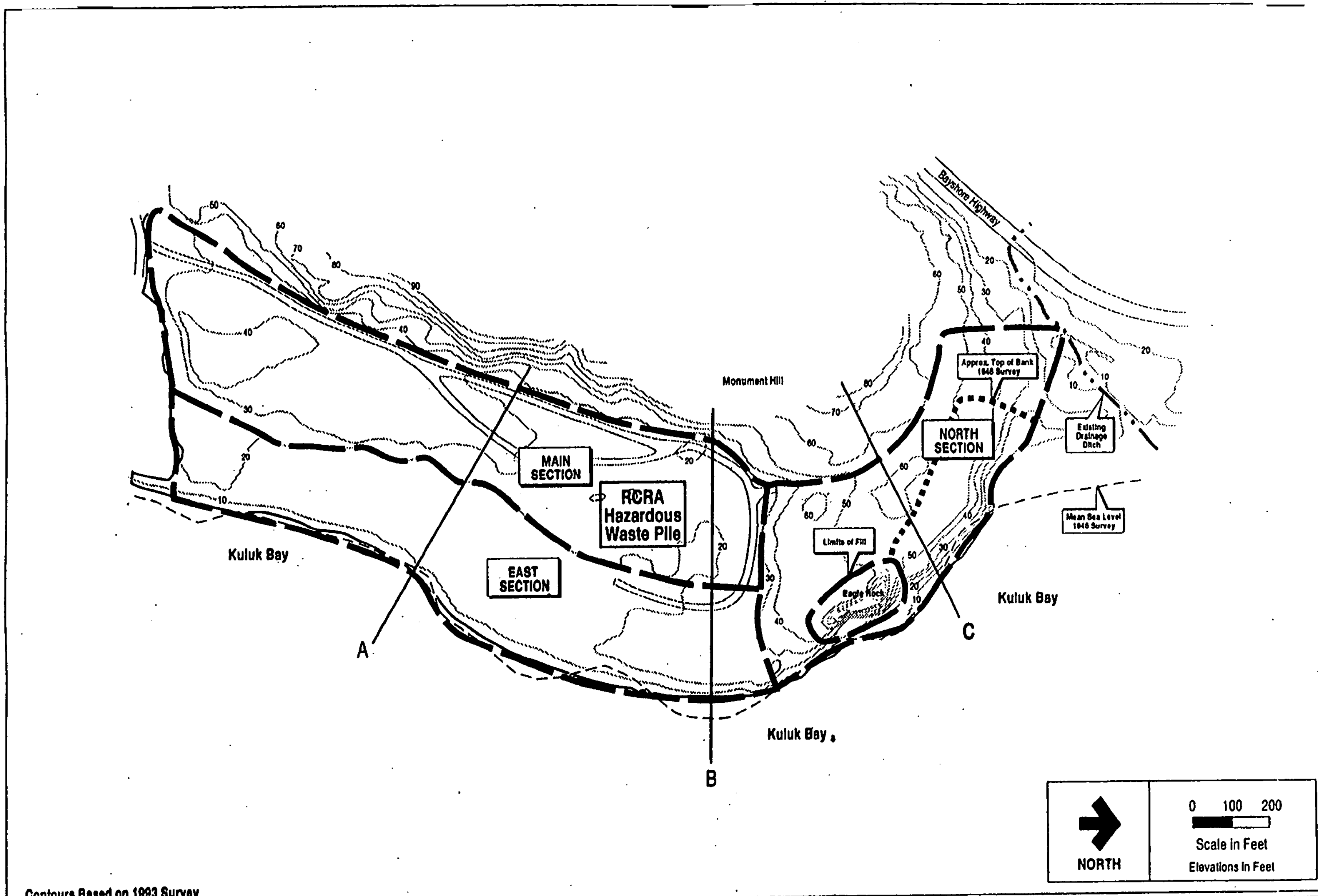
2.2 METALS LANDFILL (SITE 13)

Metals Landfill is located immediately southeast of the central community of Adak and is bounded by Monument Hill to the west and Kuluk Bay to the east. The landfill received wastes similar to those in Palisades Landfill from the 1940s to 1989. Metals Landfill is subdivided into three distinct sections—north, east, and main (Figures 4 and 5). The total volume of landfill waste and soil in Metals Landfill is approximately 400,000 cubic yards, not including the material that is scattered on the surface and adjacent to the shoreline. The total site area is approximately 28 acres; approximately 19 acres (the main and north sections) were used as a landfill. Groundwater occurs locally under the site and discharges into the marine environment at the downgradient boundary. Groundwater is not a source of drinking water for Adak residents.

The main section, covering about 12 acres, has apparently been filled to an elevation that varies from approximately 20 to 40 feet. Also, a significant amount of waste was scattered over the main section without any cover. An estimated 275,000 cubic yards of landfill waste and soil cover were placed on this main section. It is estimated that the majority of landfill waste is composed of metal scrap and debris.

The north section, covering about 7 acres, was filled above the original elevation, and the waste was covered with soil. A significant volume of waste was apparently pushed over the side of the original bank and is exposed on the steep bank. Some of this waste now extends to the shoreline of Kuluk Bay. An estimated 50,000 cubic yards of material are in the main area of the north section, and about 75,000 cubic yards of material are on the bank that encroaches on the bay.

The 9-acre east section was not used as a primary landfill, although some wastes (mostly metal scraps) have been deposited on the surface and on the shore side of the east section. A few other areas in the east section have small quantities of scattered waste. A sludge lagoon in the south end of the east section contains approximately 5,000 cubic yards of dewatered sludge.



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COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY

Figure 4
Metals Landfill

CTO 0154
Adak Island, AK
Sites 11 and 13
ROD

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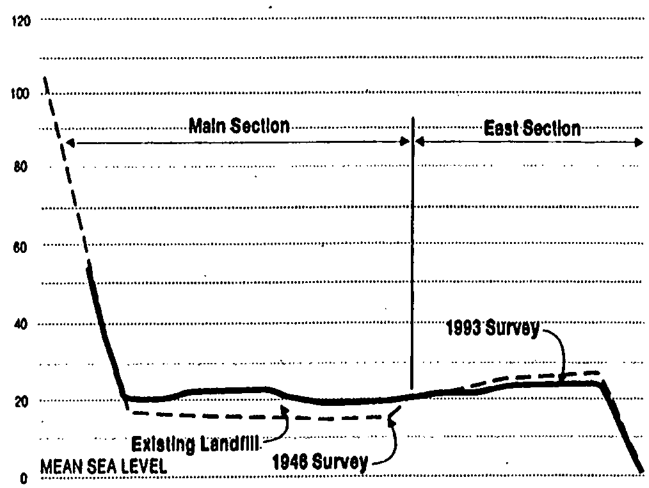
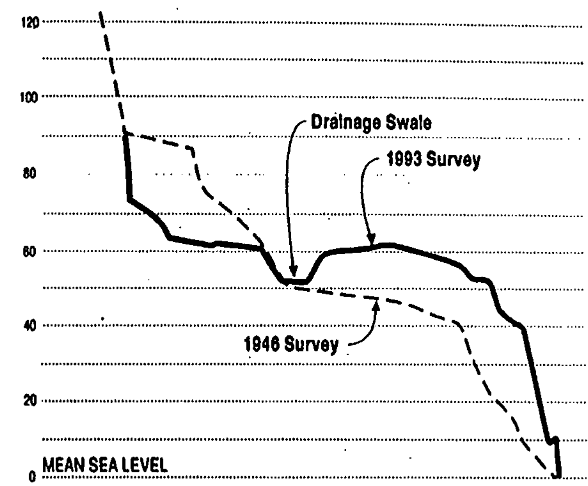
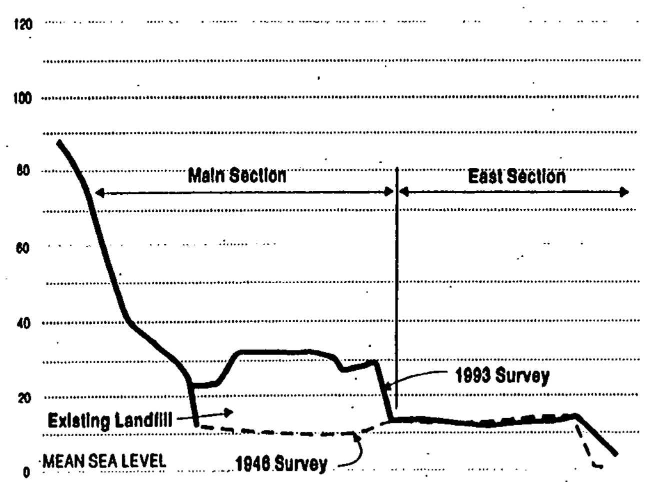


B – TYPICAL SECTION THRU NORTH END MAIN AND EAST SECTIONS



C – TYPICAL SECTION THRU NORTH SECTION



A – TYPICAL SECTION THRU SOUTH END MAIN AND EAST SECTIONS

CLEAN COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY	**Figure 5** **Metals Landfill** **Typical Sections**	CTO 0154 Adak Island, AK Sites 11 and 13 ROD

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3.0 SITE HISTORY

On August 15, 1942, Adak Island was selected to become a military base by order of the Western Defense Command. Currently, there are approximately 1,000 residents on Adak Island and the majority are associated with the Navy, either as active duty Navy personnel, civil servants, or government contractors. Also, the USFWS conducts activities on the island.

Beginning in the 1940s, Palisades and Metals Landfills were among the properties on which Navy personnel disposed of solid waste. No accurate records were kept of the volume and nature of the materials disposed of at these nonpermitted landfills.

3.1 PALISADES LANDFILL

Palisades Landfill was used as the primary disposal area for all operations on Adak Island from the 1940s to approximately 1970. A wide variety of materials were reportedly disposed of at Palisades Landfill, including waste petroleum, oils, and lubricants (POL); chlorinated and nonchlorinated solvents; paint waste; sanitary trash; scrap vehicles; lead and mercury batteries; construction waste; and mercury (ESE 1986). The landfill was covered with local soils in the early 1970s after disposal practices were stopped. Palisades Landfill has not been designated as a Resource Conservation and Recovery Act (RCRA) hazardous waste landfill.

3.2 METALS LANDFILL

Metals Landfill began operations in the 1940s and received a variety of waste materials including sanitary trash; construction waste; POL; paints; chlorinated and nonchlorinated solvents; lead, lithium, and mercury batteries; scrap vehicles; medical waste; sewage sludge; pesticides; transformers; and possibly unexploded ordnance (ESE 1986). In 1970, restrictions were placed on the types of materials that could be disposed of at the landfill. Beginning in 1988, when a sludge press was installed at the sewage treatment plant, dewatered sewage sludge was disposed of on the southern end of the eastern section of the landfill (Tetra Tech 1989). The landfill stopped receiving wastes in 1989, but some disposal and retrieval practices continued until 1991.

A site inspection of Metals Landfill was conducted in 1989 by regulatory agencies. The investigation discovered four drums with liquid, one cracked vehicular battery, and one acetylene cylinder scattered in one small area of the landfill. As a result of the inspection, the regulatory agencies determined that the battery area contains hazardous waste and, therefore, is considered a hazardous waste pile under RCRA. This is the only area of the landfill to have a RCRA violation; the remaining landfill has been designated as a solid waste management unit under RCRA. The presence of the batteries resulted in a Federal Facilities Compliance Agreement (FFCA) being signed and issued by the EPA in November 1990 (Document Number 1090-0205-6001). A RCRA Closure Plan is being developed for the hazardous waste pile located in the limits of Metals Landfill. This hazardous waste pile will be closed under RCRA guidelines and is not included as part of this IRA.

4.0 COMMUNITY RELATIONS

4.1 INFORMATION REPOSITORIES

The community relations plan (CRP) for the contaminated sites at NAF Adak, including Palisades and Metals Landfills, is available for review in the information repositories. The specific requirements for public participation pursuant to CERCLA, as amended by SARA, include releasing the proposed plan to the public. The proposed plan was released to the public in April 1994 and has been placed in the Administrative Record and information repositories. A copy of the Administrative Record for the IRA is located at the following information repository:

NAF Adak
Administration Building (30004)
Environmental Safety Department, 2nd Floor
Adak, Alaska
(907) 592-8152
Point of Contact: NAF Adak Environmental Officer

The Administrative Record is on file at the following locations:

Engineering Field Activity, Northwest
1040 Hostmark Road
Poulsbo, Washington 98370
(206) 396-5984
Point of Contact: Alaska Operations Manager

United States Bureau of Land Management
222 W. 7th, #36
Anchorage, Alaska
(907) 271-5025
Point of Contact: Librarian

The documents included in the Administrative Record, which were used in the decision-making process for this ROD, are listed in Appendix A.

Notices regarding the availability of the proposed plan, public meetings on the proposed plan, and the public comment period have been published in the *Anchorage Daily News* and the NAF Adak *Eagle's Call*. A public comment period was held from April 29 to May 29, 1994. Two public meetings on the proposed plan were held. One meeting was held in Anchorage, Alaska, on May 9, 1994, and the other meeting was held in Adak, Alaska, on May 11, 1994. The public meetings were conducted by the Navy, EPA, and ADEC. A total of 8 people attended the Anchorage meeting and 11 people attended the Adak meeting.

During the public comment period for the proposed plan, a total of 23 comments were received by the Navy. Seventeen comments were orally submitted and discussed at the public meetings, and six comments were submitted through the mail. The public comments are summarized and the responses presented in the Responsiveness Summary in Appendix B of this ROD.

Because of the changes from the proposed plan's preferred alternative to the ROD's selected alternative, a second comment period was conducted from January 16, 1995, to February 7, 1995. The comment period was initiated through a fact sheet, with no public meetings being conducted during the second comment period. No public comments were received during the second comment period.

4.2 GOALS AND OBJECTIVES OF THE COMMUNITY RELATIONS PLAN

The goals of the basewide CRP arise directly from responses to the community interviews, from requirements stated in the community relations section of the Navy's Installation Restoration Program, and from federal and state regulations. The goals are written to address the primary concerns of the public through a community relations program designed for the Adak Naval Complex. Each goal has several objectives devised to achieve that goal through specifically designed activities.

The interviews conducted during preparation of the CRP show that the community has a strong interest in specific aspects of the Adak Naval Complex's environmental situation. The CRP, which contains the goals and objectives reflecting the community's concerns, is available at the information repositories and in the Administrative Record file, as described in Section 4.1.

5.0 OPERABLE UNIT DESIGNATION

As of May 1993, 84 sites either known or suspected to be contaminated have been identified in the Adak FFA, including Palisades and Metals Landfills. Sites have been labeled as either RCRA solid waste management units (SWMUs) or source areas (SAs). For the purposes of implementing the FFA, the two labels have similar meanings; however, EPA designated SWMUs during, or pursuant to, a RCRA facility assessment in 1991. The Navy subsequently designated a number of the sites as SAs as a result of additional visual inspections and a review of historical records. Currently, there are 63 SWMUs and 21 SAs.

Palisades and Metals Landfills have been designated as SWMU No. 11 and SWMU No. 13, respectively, and are included under Operable Unit A (OU A). OU A includes 6 no further action sites, 45 SWMUs and 7 SAs, as listed in the FFA.

The 50 remaining sites (not included in this IRA or designated as no further action in the FFA) will be addressed through the preliminary source evaluation (PSE) process.

6.0 SITE CHARACTERISTICS

This section discusses the physical and biological characteristics of the landfill areas, including topography, surface water, geology and soils, groundwater, and ecological profile.

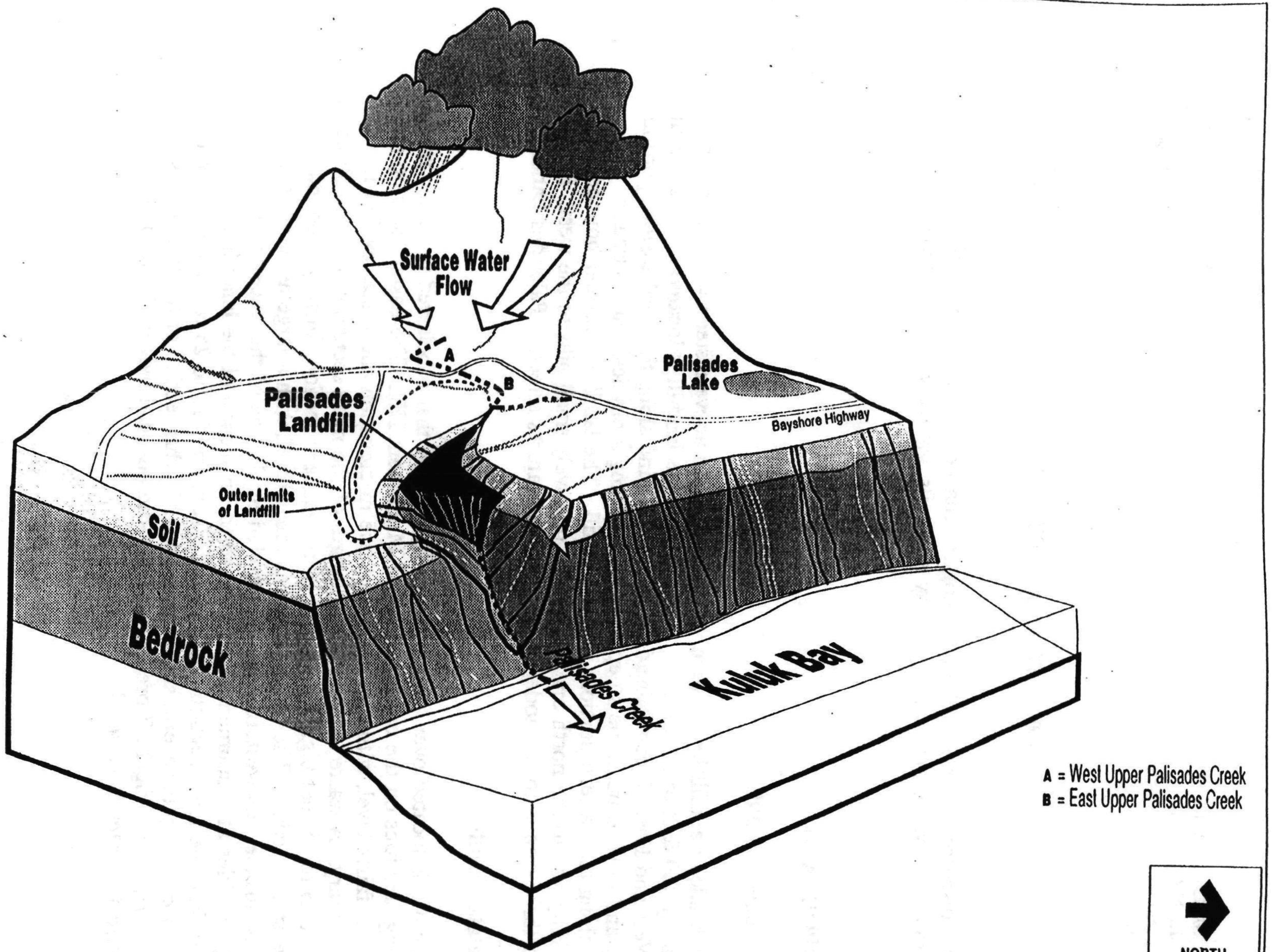
6.1 TOPOGRAPHY

6.1.1 Palisades Landfill

Most of Palisades Landfill lies in relatively level terrain above a steep vertical drop of approximately 150 feet to Kuluk Bay. A portion of the landfill is located in an adjacent ravine. West and East Upper Palisades Creeks combine along the northeastern portion of the site and flow through the steep ravine, providing a physical and hydraulic boundary along the eastern portions of the landfill. The landfill is further bounded by Bayshore Highway to the north and a series of relatively small hills to the west. Figure 6 presents a three-dimensional model of the surface features affecting Palisades Landfill.

6.1.2 Metals Landfill

Metals Landfill is located over an infilling of Kuluk Bay that is believed to be the result of quarrying activities on the eastern slope of Monument Hill. The eastern section of the landfill is fairly level, with a 8- to 15-foot rise in elevation above sea level at its eastern boundary. A waste scarp runs the length of the main section of the landfill at an elevation of 15 to 25 feet higher than that of the eastern section, forming a boundary with the eastern section. The main section is fairly level, with a large amount of waste covering its surface. Its western edge is bounded by the toe of the slope left by the quarrying activities at Monument Hill. The northern section of the landfill is 10 to 15 feet higher than the main section, and the main section is 15 to 25 feet higher than the eastern section. Despite several small depressions in this section of the landfill, its surface is fairly level. Figure 7 presents a three-dimensional model of the surface features affecting Metals Landfill.



CLEAN COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY	**Figure 6** **Palisades Landfill Three-Dimensional Model**	CTO 0154 Adak Island, AK Sites 11 and 13 ROD

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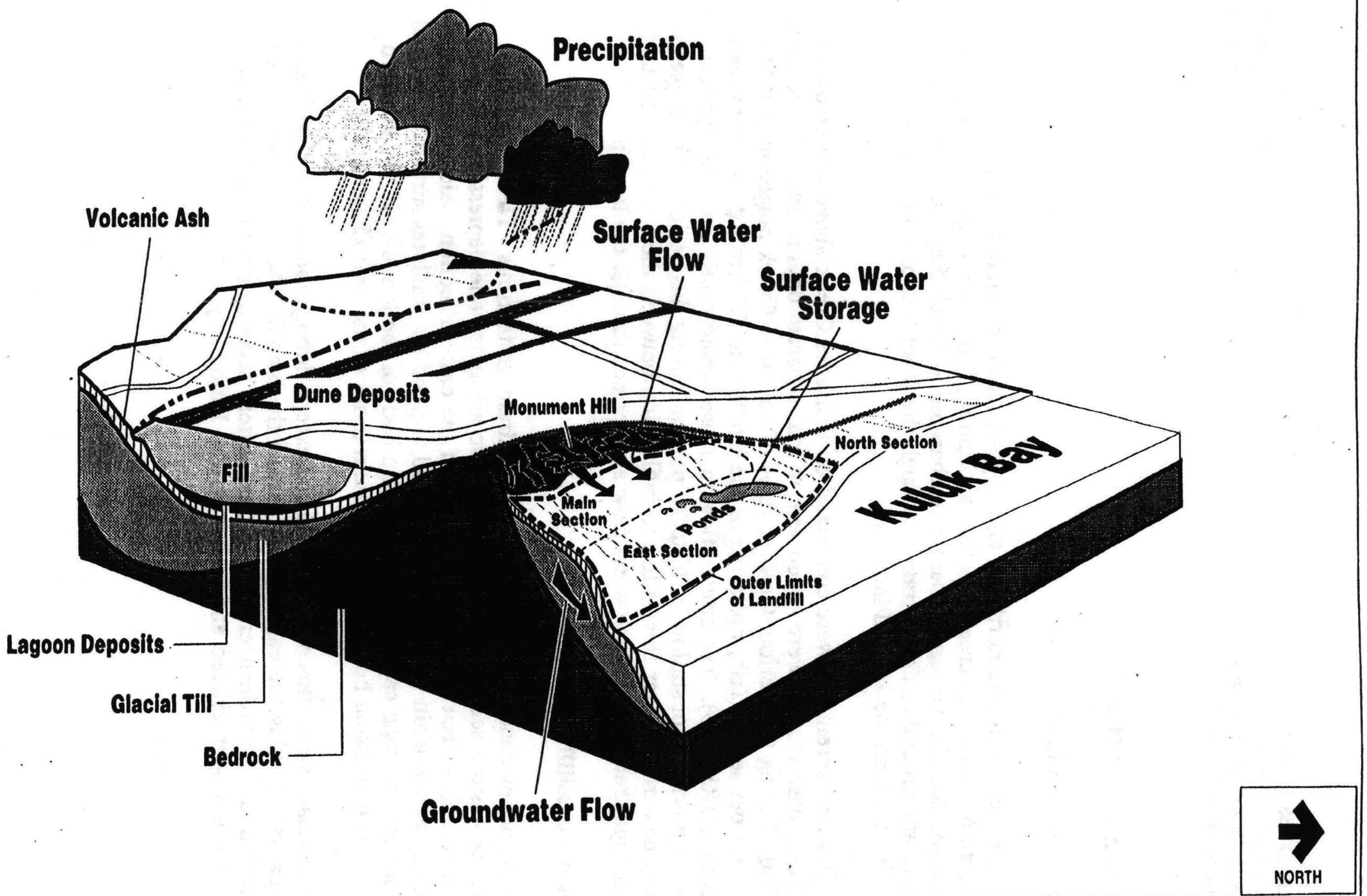

CLEAN COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY	**Figure 7** **Metals Landfill Three-Dimensional Model**	CTO 0154 Adak Island, AK Sites 11 and 13 ROD

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6.2 SURFACE WATER

6.2.1 Palisades Landfill

Two drainage areas converge northeast and upgradient of the landfill to form Palisades Creek (Figure 6). Once the creek reaches the landfill, it flows through the landfill debris and re-emerges deep in the canyon before discharging to Kuluk Bay. As a result of precipitation and groundwater infiltrating through the landfill debris, the flow volume of Palisades Creek within the landfill increases.

In-stream flow measurements were conducted on Palisades Creek above and below the landfill. The measurements were conducted on four separate days in late July and early August 1990. During this period, the flow rates of Palisades Creek ranged from 0.47 to 1.52 cubic feet per second (cfs) upstream of the landfill and 0.52 to 2.2 cfs downstream of the landfill (URS 1993). The stream flow increased consistently from the upstream station to the downstream station by 10 to 20 percent during this period. This suggests that little to no surface water flow is lost to infiltration between these stations and that groundwater may recharge surface water flow as it passes through the landfill.

6.2.2 Metals Landfill

There is minimal evidence of established surface drainage features. Three ponds are located on the eastern section of the landfill. Two are manmade depressions and the third is a natural low area at the northern end of the eastern section. Along the access road transversing the main section of the landfill, a pond accumulates surface water and flows down from the sand cap covering the main body of the landfill. In the northern section, a small depression holds water at certain times of the year (Figure 8).

There is no surface water flow from the landfill except during storm surges that break over the sea wall forming the eastern boundary of the landfill. According to evidence of surface erosion in the northeastern area of the eastern section, a significant amount of cover material has been eroded and transported to Kuluk Bay.

6.3 GEOLOGY AND SOILS

6.3.1 Palisades Landfill

The Palisades Landfill area is underlain by basalts and tuffs of the Finger Bay Volcanics below a thin mantle of unconsolidated deposits. The 1988 site investigation (SI) identified four stratigraphic units: manufactured fill materials, volcanic ash deposits, glacial drift, and igneous bedrock (Tetra Tech 1989).

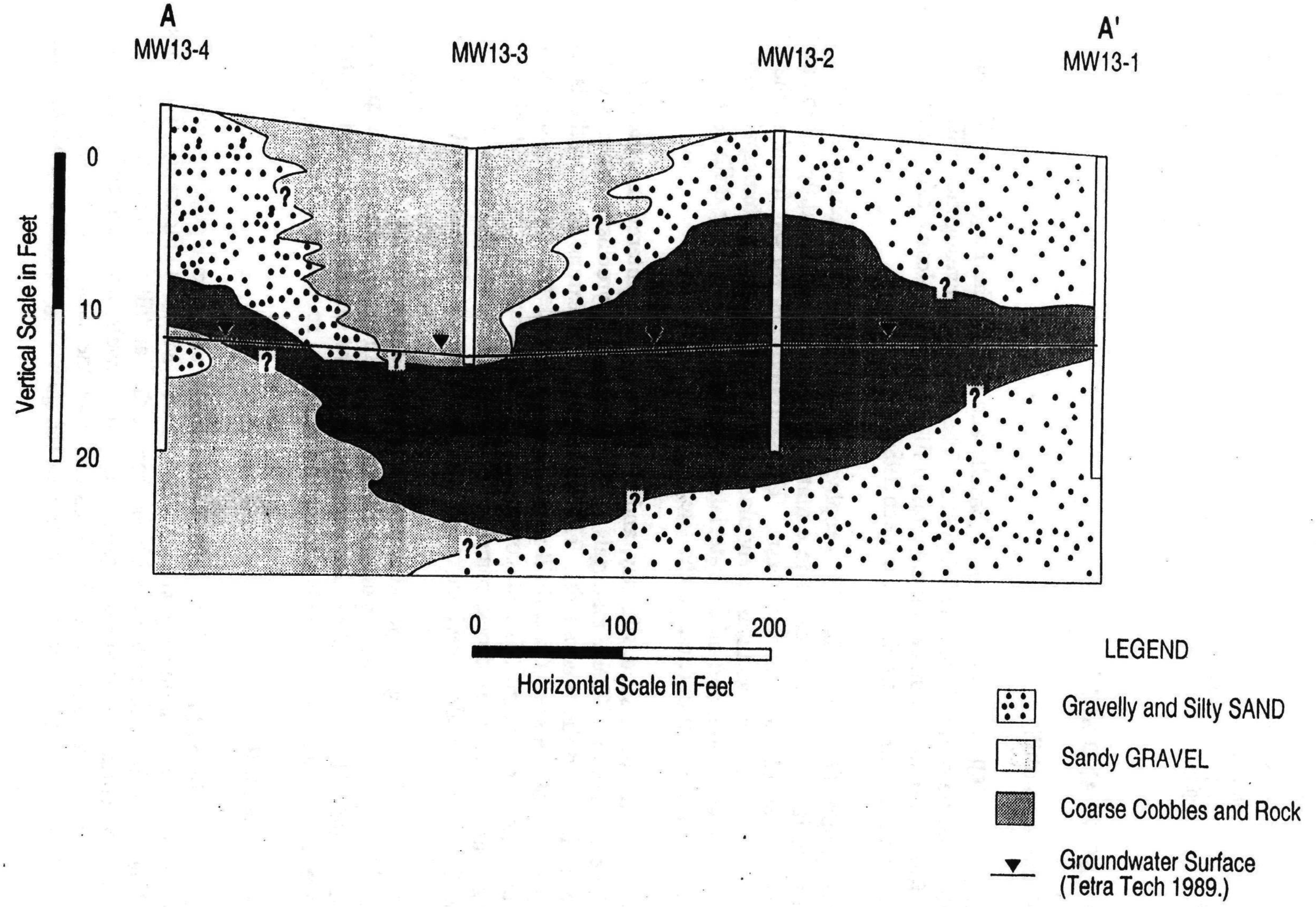
Aerial photographs (1973) and the 1988 geophysical survey show the delineation of landfilled materials across the area. These materials consist predominantly of sand and rock fill, metal debris, and municipal waste. The sand and rock fill was found in the upper 5 feet across the site and was likely placed to cap the landfill. Municipal waste, composed of paper, wood, and other materials, was encountered during drilling in the western and northwestern portions of the site.

Interbedded organic peat, sand, silt, clay, and gravels were encountered in undisturbed areas outside the landfill. These materials represent ash and pyroclastic deposits from volcanic eruptions and the tundra soils. These materials may extend beneath the landfill waste in portions of the site. Glacial till was encountered at depths ranging from 10 to 22 feet below ground surface. The till consists of a dense, gray-green, clayey matrix containing coarse gravels. Bedrock, composed primarily of basalt, is exposed in the eastern wall of the Palisades Creek ravine and in the wave-cut cliffs south of the site.

The results of the 1988 SI geophysical survey and observations made during the 1990 investigation indicate that approximately half of the landfill area contains large quantities of metallic waste. The landfill area also contains a shallow surface water pond, portions of an active and an abandoned access road, and the buried reaches of Palisades Creek.

6.3.2 Metals Landfill

Boring logs from the SI (Tetra Tech 1989) were used to construct a geologic cross section extending from monitoring well MW13-1 to well MW13-4 (Figure 8). The cross section shows that the soils in the eastern section of the landfill are highly varied (Figure 9). The surface soils are generally sands and gravels, with variable amounts of silts. A layer of coarse cobbles and boulders underlies the surface soils. This consolidated layer is believed to be remnants of the quarrying activities on Monument



CLEAN
COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY

Figure 9
Metals Landfill
Geologic Cross Section A-A'

CTO 0154
Adak Island, AK
Sites 11 and 13
ROD

533154002-9-1011295

Hill and provides the foundation upon which the landfill was built. Figure 9 shows soils underlying the main section of the landfill.

Monument Hill is an andesite porphyry dome with a well-developed columnar structure that dips to the northwest. The overburden that covers major portions of the landfill is developed from this rock and comes from the use of Monument Hill as a quarry.

6.4 GROUNDWATER

6.4.1 Palisades Landfill

Two monitoring wells were installed at Palisades Landfill in 1990 to provide information on the characteristics of the local groundwater zones. An upgradient monitoring well was installed, and a second well was installed along the western border of the landfill, downgradient from a surface water pond. Each well has a 5-foot screen interval in the uppermost groundwater zone. Water surface elevation, temperature, pH, conductivity, and turbidity measurements were collected from the groundwater at these locations during groundwater sampling in July, August, and October 1990. The results of these field measurements show a difference of approximately 2 feet in water surface elevation between the wells. On average, pH, conductivity, and turbidity were lower at the landfill than at the upgradient sampling location.

6.4.2 Metals Landfill

During the SI, four monitoring wells were installed on the eastern edge of the eastern section of the landfill (Tetra Tech 1989). During the expanded site investigation (ESI), it was determined that two of these wells needed to be replaced and a fifth well installed at the southeastern corner of the eastern section of the landfill (URS 1992); (see Figure 8).

The wells were placed at the eastern boundary to determine whether contaminants were migrating out of the landfill and into Kuluk Bay. The soils overlying the groundwater surface at the site are highly permeable. The groundwater flow and elevation are provided in Figures 7 and 9. Saturated hydraulic conductivities are estimated to range from 10 to 1,000 ft/day (Tetra Tech 1989).

6.5 ECOLOGICAL PROFILE

6.5.1 Palisades Landfill

The Palisades Landfill is located on a coastal upland area and comprises five habitats:

- Freshwater stream (Palisades Creek)
- Freshwater wetlands associated with Palisades Creek
- Perennial ponded water on the landfill
- Deep-loam terrestrial
- Marine (Kuluk Bay)

The landfill was created within a large ravine. Palisades Creek enters the ravine from the north near Bayshore Highway, flows through the landfill, drops approximately 80 feet in elevation, and discharges to Kuluk Bay. The creek is a perennial freshwater channel that drains a small watershed extending approximately 1.5 miles inland. Water flow in Palisades Creek varies with precipitation. The creek flows through the landfill for approximately 300 feet and then emerges to descend into Kuluk Bay. The steep, shallow outlet traverses a cobble substrate. These factors would preclude the use of Palisades Creek by anadromous fish (e.g., Dolly Varden and salmon). However, non-anadromous varieties of Dolly Varden may inhabit reaches upstream of the landfill. Small forage fish were casually observed in the lower Palisades Creek by URS during unrelated site visits in 1990. The most likely species of small fish observed in the lower creek may be the threespine stickleback. The creek is presumed to sustain populations of insects and other aquatic invertebrates that are typical of temperate sub-boreal aquatic ecosystems. The riparian vegetation bordering Palisades Creek is dominated by sedges.

A perennial water area of approximately 0.25 acre is present in the southwest quarter of the site. Other small perennial water areas are located in the central portion of the landfill. These areas usually have standing water throughout the growing season. These areas appear to be man-made or created due to landfill settlement. Marsh vegetation is dominated by the long-awn sedge (*Carex macrochaeta*). Wildlife commonly found in perennial water habitats includes a variety of wading birds, such as snipes, curlews, sandpipers, and phalaropes.

The remainder of the landfill is characterized as a deep-loam habitat. Floral communities in the deep-loam habitats are the most diverse and productive of those on Adak Island and are represented by 22 plant species. The landfill consists of two areas:

- A high bench area west of the ravine
- A steeply sloping ravine

The bench area is capped with coarse-grained sand and is fairly level. Vegetative cover on the bench is relatively sparse, compared to undisturbed sites. Dominant plant species include horsetail (*Equisetum spp.*), sedge (*Carex macrochaeta*), and rush (*Juncus arcticus*), with less abundant buttercup (*Ranunculus occidentalis*), saxifrage (*Parnassia kotzebuei*), wild snapdragon (*Mimulus guttatus*), bog orchid (*Platanthera commutatum*), wild celery (*Calamogrostis nutkaensis*), and grass (*Phleum commutatum*). Mosses cover much of the soil surface. The slopes of the ravine are dominated by a lush cover of grass (*Elymus arenaris subsp. mollis*).

Bird species commonly seen on the landfill include the Lapland longspur (*Calcarius lapponicus*), rosy finch (*Leucosticte arctoa*), savannah sparrow (*Passerculus sandwichensis*), and song sparrow (*Melospiza melodia*). Potential residents of this site are the arctic fox (*Alopex lagopus*); rock ptarmigan (*Lagopus mutus*), which is common in lowland and alpine tundra habitats; and the Norway rat (*Rattus norvegicus*).

Palisades Creek empties into the Kuluk Bay marine habitat. The substrate at the steep outlet of the creek consists of cobbles and large rocks. Macroalgae and invertebrates (e.g., bivalves, limpets, and barnacles) typical of rocky habitats in the north Pacific Ocean are expected to be present in Kuluk Bay. Adak Island hosts a wide variety of seabirds (i.e., puffin, gulls, scoter, tubenoses, and cormorants) that may use the Kuluk Bay shoreline. Sea otters (*Enhydra lutris*) have been observed along the shoreline, and other marine mammals may also visit the area.

6.5.2 Metals Landfill

The Metals Landfill is located on a coastal lowland area and is composed of terrestrial and marine (Kuluk Bay) habitats.

The landfill was created by the infilling of Kuluk Bay with quarry material from the eastern slope of Monument Hill and the disposal of wastes from naval base operations. It was active between the 1940s and 1989. The terrestrial habitat is highly disturbed and is divided into three sections: main, northern, and eastern.

The northern section of the landfill occupies about 7 acres and is 10 to 15 feet higher in elevation than the main section. This section is covered by a soil cap, and the soil surface is strewn with small waste and is sparsely vegetated by grasses and sedges. The northern section currently provides little habitat for terrestrial wildlife.

The main section of the landfill occupies about 12 acres due east of Monument Hill. Although some portions of the main section are capped with soil, most of the surface is covered by landfill waste. The section is sparsely vegetated and currently provides little or no habitat for terrestrial wildlife.

The eastern section of the landfill occupies about 9 acres east of the main section and is about 5 to 10 feet lower than the main section. Several small perennial water bodies exist in the eastern section, including a 0.25-acre area in the northern end. One small dewatered sewage sludge pond is located along the southern boundary of the landfill. Waste is scattered throughout the section, which is densely vegetated with sedge (*Carex macrochaeta*), rush (*Juncus arcticus*), bog orchid (*Platanthera commutatum*), grass (*Phleum commutatum*), and cow parsnip (*Heracleum lanatum*). Wildlife commonly observed in the eastern section include the mallard (*Anas platyrhynchos*), green-winged teal (*Anas crecca*), blue-winged teal (*Anas discors*), Lapland longspur (*Calcarius lapponicus*), rosy finch (*Leucosticte arctoa*), and Norway rat (*Rattus norvegicus*).

Kuluk Bay forms the eastern and northern boundaries of this site. The eastern limit of the site is stabilized with a seawall of large boulders. Exposed waste is scattered on the shore. At low tide, portions of sandy beach are exposed. The north face of the landfill, which ends at Kuluk Bay, also has much exposed waste. Macroalgae and invertebrates (e.g., bivalves, limpets, and barnacles) exist along the rocky shoreline, but kelp beds are absent in the near-shore areas, except for a small bed about 100 meters offshore where the eastern and northern landfill sections meet. A rock outcrop is present in the landfill at this point and apparently extends into Kuluk Bay. The presence of beaches and lack of kelp along much of the landfill shore suggest that the near-shore substrate is composed predominantly of unconsolidated sand. Adak Island hosts a wide variety of seabirds that use the Kuluk Bay shoreline for nesting, perching, and foraging. Tufted puffins (*Fratercula cirrhata*) nest just south of the sewage treatment plant along the breakwater, which is contiguous with the Metals Landfill seawall. Marine mammals such as the sea otter (*Enhydra lutris*), harbor seal (*Phoca vitualina*), and Steller's sea lion (*Eumetropias jubata*) are commonly observed along the landfill shoreline.

7.0 WASTE CHARACTERIZATION AND PREVIOUS INVESTIGATIONS

Information related to waste sources and chemicals associated with these sources are presented in this section.

7.1 POTENTIAL WASTE SOURCES

During World War II, Navy and Army air units stationed at Adak Island were engaged primarily in aircraft support, maintenance, and repair. Because the island could be supplied with troops and material only by way of ship and aircraft, the island also had ship/boat support and maintenance and repair facilities. The types of waste reportedly associated with the aircraft facilities included refuse, sanitary wastes, photographic and lithographic wastes, POL, solvents (chlorinated and nonchlorinated), lead-based paints, and pesticides. The ship/boat facilities reportedly produced lubricating-oil waste, batteries, lead-based paints, thinners (chlorinated and nonchlorinated), sanitary waste, and bilge water containing residual fuels. The waste streams from both activities were disposed of at the island's landfills (ESE 1986).

After the war, the following naval commands and support departments were identified as possible generators of waste streams: Public Works Department, which encompassed the carpenter/paint shop, machine shop, power plant utility, steam plant utility, and transportation maintenance; Navy Exchange, which encompassed the dry cleaning detachment and the commissary; Operations Department, which encompassed the ships division, photo laboratory, and paint shop; and the Recreational Services Department, which encompassed the auto hobby shop and photographic hobby shop (ESE 1986). Naval Support Group Activity operational departments identified as probable generators of waste streams were the Public Works Department, which encompassed the sewage treatment plant, potable water treatment plant, and the transportation maintenance shop; and the Recreational Services Department, which consisted of the auto hobby shop (ESE 1986). The Mount Moffett Detachment consisted of the sanitary treatment system and the antenna maintenance shop (ESE 1986). The Zeto Point Detachment consisted of the maintenance shop (ESE 1986). Tenant operations identified as probable waste generators were the Naval Facility; the branch hospital, which was composed of the dental clinic, medical clinic, and pharmacy; the Naval Mobile Construction Battalion; the Naval Oceanographic Command Detachment; the Fixed Wing Patrol Squadron; the Aircraft Intermediate Maintenance Department, which encompassed the airframe shop, non-destruct inspection laboratory, tire shop, hydraulic shop, engine shop, paint shop, ground support equipment shop, and electronics shop (ESE 1986). Other support and military operations identified as probably contributing to waste-stream generation were the USFWS, the calibration laboratory, pesticide operations, firefighting training, and ordnance training and disposal activities (ESE 1986).

The waste types associated with these naval commands, detachments, and tenant commands were lacquers, thinners, waste/residual paints, solvents (chlorinated and nonchlorinated), lubricating oils, hydraulic oils, fuel sludges, mineral spirits, POL, battery acids, battery cases, antifreeze, sanitary sludge, sanitary sewage, sanitary refuse, bilge wastes, waste fuels, photographic developer and fixatives, inks, diesel fuel, mercury, Freon, detergents, medical wastes, x-ray films and solutions, discarded drugs, jet fuels, pesticides, and Stoddard solvent. These miscellaneous items were reportedly disposed of at one of the NAF landfills (ESE 1986). Palisades and Metals Landfills are only two of a number of landfills located at NAF Adak.

7.1.1 General Classification of Waste Sources at Palisades Landfill

The report of the initial assessment study (IAS) conducted in 1985 details the World War II and postwar history of Adak Island (ESE 1986). The report also explains the operations, processes, and probable waste streams generated by the combined services and tenant commands from about 1940 to 1986. The IAS report estimates that more than 5,000 gallons of POL wastes per year were disposed of at Palisades Landfill from the 1940s to 1970 (ESE 1986). These POL wastes included motor vehicle gasoline (mogas), jet petroleum #4 (JP-4), jet petroleum #5 (JP-5), and lubricating oil. The estimated volumes of some of the other wastes disposed of at Palisades Landfill include approximately 62,000 gallons of chlorinated solvents (including carbon tetrachloride, trichloroethane, trichloroethene, and tetrachloroethene), 47,000 gallons of nonchlorinated solvents (including Stoddard solvent, toluene, and benzene), 8,400 batteries, and 50 pounds of mercury (ESE 1986). During its operational period, the site was occasionally burned, reducing the total amount of flammable wastes that were present. The waste estimates developed in the IAS were based primarily on a search of available records. However, the specific sources that were used to develop these estimates were not cited in the IAS, and the accuracy of these estimates is uncertain. A large amount of the visible waste disposed of at Palisades Landfill consists of scrap metal, construction debris, building materials, and sanitary trash.

7.1.2 General Classification of Waste Sources at Metals Landfill

The IAS details the World War II and postwar history of Adak Island (ESE 1986). The report also explains the operations, processes, and probable waste streams generated by the combined services and tenant commands from about 1940 to 1986. The IAS report (ESE 1986) estimates that the following materials were disposed of at Metals Landfill: 10,000 gallons of waste POL (e.g., mogas, JP-4, JP-5, and lubricating oils); 5,000 gallons of polychlorinated biphenyl (PCB) fluids; 500 gallons of chlorinated solvents (e.g., carbon tetrachloride, trichloroethane, trichloroethene, and tetrachloroethene); 500 gallons of nonchlorinated solvents (e.g., Stoddard solvent, lacquer thinner, benzene, and toluene); 500 pounds of pesticides; 2,500 lead batteries; 50 mercury batteries; 800 lithium batteries; and undisclosed quantities of scrap metal, sanitary trash, construction waste, sewage sludge, and possibly unexploded ordnance. These volume estimates are based upon a records search of historical operations, which are limited and are, therefore, highly uncertain. A large amount of the wastes disposed of at Metals Landfill consists of scrap metal, construction debris, and building materials.

7.2 SUMMARY OF PREVIOUS INVESTIGATIONS

Several previous limited investigations were conducted at both Palisades and Metals Landfills. An IAS of NAF Adak was conducted in 1985 (ESE 1986). Additional investigations were conducted on the island after the IAS.

7.2.1 Palisades Landfill

Previous investigations at Palisades Landfill include an SI (Tetra Tech 1989) and additional SI activities (URS 1993). Analytical results from these studies are provided in Appendix C.

1988 Site Investigation

The Palisades Landfill site was part of an SI conducted on Adak Island in 1988 (Tetra Tech 1989). This investigation included a geophysical survey to define the portion of the landfill used for the disposal of metals. Sediment and surface water samples were collected from the streams flowing into the landfill. Surface soil, sediment, and surface water samples were also collected in the drainage downgradient of the landfill that eventually discharges to Kuluk Bay. The number of samples collected in this investigation was limited (i.e., only a single composite soil sample was collected from the downstream slope of the ravine, and surface water and sediment sampling in Palisades Creek was limited to one upstream and one downstream sample). All samples were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), organochlorine pesticides, PCBs, and metals. Surface water samples were also analyzed for total petroleum hydrocarbons (TPH). Results of the SI sampling are described below and summarized in Appendix C, Table C-1.

Surface Water. The analytical results for the surface water samples indicated that lead was the only metal detected at concentrations above the contract-required detection limit. VOCs, SVOCs, organochlorine pesticides, PCBs, and petroleum hydrocarbons were not detected.

Surface Soil. The analytical results for the single composite surface soil sample indicated the presence of SVOCs, PCBs, and metals. Detected metals were arsenic, cadmium, chromium, copper, lead, nickel, silver, and zinc. The detected concentrations were not compared with reference station concentrations, because background sampling was only recently done and values were not available.

Sediment. The analytical results for the upstream sediment sample indicated the presence of trace hydrocarbons and the following metals: arsenic, cadmium, chromium, copper, lead, nickel, silver, and zinc. VOCs, SVOCs, organochlorine pesticides, and PCBs were not detected.

The analytical results for the downstream sediment samples (including field composite duplicates) indicated the presence of SVOCs, PCBs, and metals. The detected metals were arsenic, cadmium, chromium, copper, lead, nickel, silver, and zinc. VOCs and organochlorine pesticides were not detected.

1990 Site Investigation

Additional SI activities were conducted at Palisades Landfill in 1990 (URS 1993). Samples were taken from groundwater, surface water, soil, and stream sediments. These samples were analyzed for VOCs, SVOCs, organochlorine pesticides, PCBs, and total metals. The samples were collected from three areas, or zones (Figure 10). Zone 1 was located upgradient or north of Palisades Landfill; Zone 2 included Palisades Landfill; and Zone 3 was downgradient or south of the landfill, within the bottom of the ravine near Kuluk Bay. The analytical results are summarized in Appendix C, Tables C-2, C-3, and C-4.

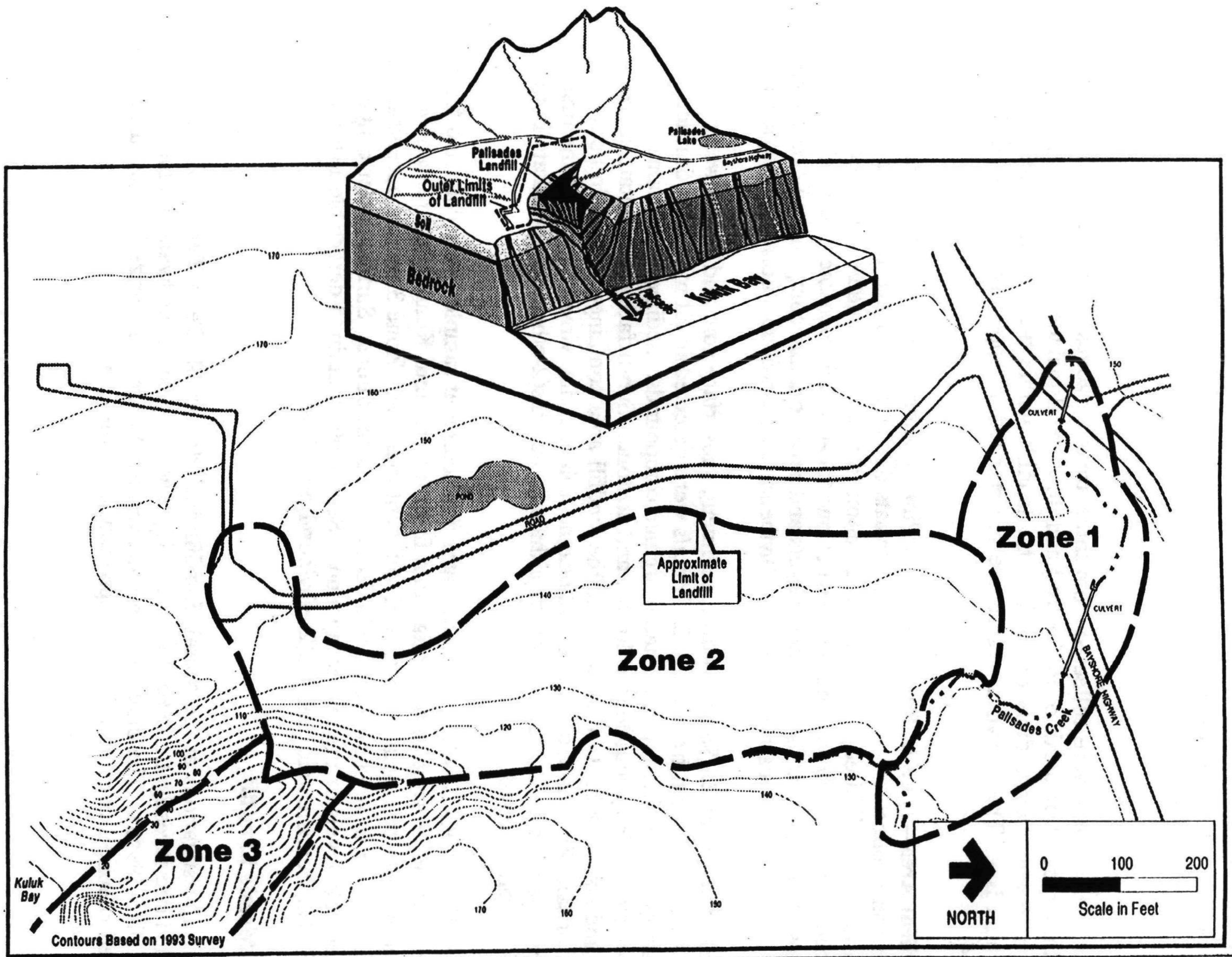
Upgradient Area—Zone 1. Surface water, sediment, subsurface soil, and groundwater samples were collected from Zone 1. Chemicals detected in surface water and groundwater were limited to metals. In addition to metals, sediments contained polycyclic aromatic hydrocarbons (PAHs) at one location and benzoic acid at all locations. Subsurface soils contained metals and seven organic compounds (2-butanone, acetone, benzoic acid, carbon disulfide, ethylbenzene, methylene chloride, and xylenes).

Landfill Area—Zone 2. Surface water, sediment, subsurface soil, and groundwater samples were collected from Zone 2. Metals were detected in all matrices. Surface water samples contained no detectable organic compounds. Sediments contained benzoic acid, PAHs, methylene chloride, and acetone. Subsurface soils contained six VOCs and six SVOCs. Groundwater in the landfill area contained xylenes in both rounds of sampling: 2-butanone, ethylbenzene, toluene, and vinyl chloride in the first sampling round and 4-methylphenol, naphthalene, and bis(2-ethylhexyl)phthalate in the second sampling round.

Downgradient Area—Zone 3. Surface water and sediment samples were collected from Zone 3 to evaluate contaminant migration from the site into Kuluk Bay. Metals were detected in both the surface water and sediment matrices. Zone 3 metal concentrations in surface water were comparable with Zone 1 concentrations. Surface water contained no detectable levels of organic compounds. Sediments contained detectable levels of eight PAHs, benzoic acid, and bis(2-ethylhexyl)phthalate.

7.2.2 Metals Landfill

Previous investigations at the Metals Landfill included an SI (Tetra Tech 1989), an expanded site investigation (ESI) (URS 1992), and a 1-year groundwater monitoring study (URS 1994a). The analytical results from the SI are summarized as maximum detected chemical concentrations in Appendix C, Table C-5.



CLEAN COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY	**Figure 10** **Pallsades Landfill** **1990 Investigation Zones**	CTO 0154 Adak Island, AK Sites 11 and 13 ROD

533154002-10-05069

1989 Site Investigation

The SI included a geophysical survey of the landfill, surface and subsurface soil sample collection, and the installation of monitoring wells (Tetra Tech 1989). Samples were analyzed for VOCs, SVOCs, pesticides, PCBs, and total metals. SI sampling was limited to two surface soil stations, one subsurface soil station, and four well locations that were all situated in the eastern and main sections of the landfill.

1992 Expanded Site Investigation

During the ESI, surface soil, groundwater, surface water, and freshwater sediment samples were collected (URS 1992). All samples were analyzed for VOCs, SVOCs, pesticides, PCBs, and metals. Two surface soil and two sediment samples were analyzed for dioxins and furans. Surface soil samples were collected from 30 stations distributed on a grid across the entire landfill. In each grid block, soil samples were collected from six locations and composited. Two surface water and sediment samples were collected from each of two ponds located on the eastern section of the landfill. Groundwater samples were collected from each of the five monitoring wells. Analytical results are summarized as maximum detected concentrations in Appendix C, Table C-6.

Congener-specific dioxins/furans analysis showed that many congeners were detected in soil and sediment samples. No 2,3,7,8-tetrachlorodibenzo-p-dioxin was detected.

Quarterly Groundwater Sampling Program

A quarterly groundwater program was established for a 1-year period beginning in the second quarter of 1992. The scope of the groundwater sampling program was to collect quarterly groundwater samples from selected wells at various sites within NAF Adak and to perform chemical analyses to evaluate the presence of contamination in the groundwater. The five monitoring wells located on the Metals Landfill (MW-1 through MW-5) were included in this program. The four sampling quarters were May-June 1992, August 1992, October-November 1992, and February-March 1993. During the initial sampling rounds, all well samples were analyzed for VOCs, SVOCs, metals, pesticides/PCBs, and TPH. During the later sampling rounds, analyses were eliminated for those compounds not detected in the earlier rounds. Analytical results are summarized in Appendix C, Table C-7, and are evaluated below.

Metals. Several of the naturally occurring elements in soil and groundwater (i.e., aluminum, calcium, iron, magnesium, potassium, sodium, and zinc) were detected in all five monitoring wells during at least one sampling round. Manganese was detected in each monitoring well at least once during the four rounds of sampling; concentrations ranged from 1,110 to 34,100 μg/L. Chromium was detected in four of the five monitoring wells at least once during the four rounds of sampling. Chromium concentrations ranged from 12.1 to 75.8 μg/L. Metal concentrations were not detected above regulatory maximum contaminant levels (MCLs).

VOCs. VOCs were not detected during the first two quarterly sampling rounds. VOCs were not analyzed for in samples from wells MW13-4 and 13-5 during the second round of sampling or in samples from any of the wells during the final two rounds of sampling.

SVOCs. SVOCs were not detected above MCLs at Site 13 during the first sampling round and were, therefore, not evaluated in subsequent rounds.

Pesticides/PCBs. Pesticides/PCBs were not detected above MCLs at Site 13 during the first sampling round and were, therefore, not evaluated in subsequent rounds.

TPH. TPH was detected in well MW13-3 above State of Alaska regulatory limits (at a concentration of 2,600 mg/L) during the June 1992 sampling event. TPH was not found in samples from the other site wells during the first sampling round and was, therefore, not evaluated in subsequent rounds.

8.0 SUMMARY OF SITE RISKS

The usual Superfund remedial process proceeds from a remedial investigation/feasibility study (RI/FS) to a decision regarding the need for remedial action. As part of the RI, a risk assessment is completed to determine whether contaminants associated with the site pose an unacceptable health risk to humans or impact to the environment (i.e., to ecological receptors such as plants and animals). The risk assessment focuses on possible risks and impacts resulting from conditions associated with the site, now and in the future. The ecological portion of the risk assessment focuses particularly on the range of nonhuman habitats (including terrestrial, marine, and freshwater, as appropriate).

The type of IRA selected for Palisades and Metals Landfill have been influenced by two important risk factors. These factors are:

- Based on previous investigation data, the groundwater beneath the landfills appears to be localized (basically, limited to the sites themselves). Since the landfills are located along Kuluk Bay, it is impossible to access the groundwater for drinking water purposes at any downgradient, off-site location.

- Analytical data on soil, sediment, surface water, and groundwater at the landfills and as presented in Section 7.2 and Appendix C of this ROD indicate that the concentration and migration of chemicals from the landfills are limited. The majority of chemical concentrations detected did not exceed regulatory MCLs. Although no risk assessment has been performed on these landfills, unacceptable risks to the marine environment are not known to exist and do not appear to be imminent.

The FFA parties concluded that conducting an IRA prior to the RI/FS is the best option for the two landfills because of the following:

- The potential for exposure to contaminants in the environment in concentrations high enough to pose unacceptable human health risks or ecological impacts based on the estimated nature and volume of wastes disposed of, as outlined in Sections 7.1.1 and 7.1.2

- The toxic nature of the materials disposed of (e.g., chlorinated solvents were reportedly disposed of at both sites)

- The proximity of the two sites to sensitive marine environments

- The limited number of cost-effective remedial alternatives available for landfills

- The perception that the benefit gained by performing a detailed RI/FS prior to choosing an appropriate remedy would be offset by the cost of that investigation and the delay in implementing an action

- The need to stabilize the landfills and minimize further degradation

- Inter-program and state-federal issues, as described below:
  - *Palisades Landfill.* Prior to signing the FFA, the Navy agreed to comply with a state solid waste regulation that in effect led to the rerouting of Palisades Creek (or conversely, the removal of the landfill from the creek). The proposed interim action will incorporate the stream revision activity within the overall action.
  - *Metals Landfill.* In November 1990, the Navy and the EPA signed an FFCA to begin closure actions on several RCRA hazardous waste units at Adak. As part of the FFCA, the Navy was obligated to close Metals Landfill as an interim status hazardous waste landfill. Since the signing of the FFCA, all but approximately 1 acre of Metals Landfill is expected to be redesignated as a solid waste management unit (SWMU). The remaining 1 acre, which is known to have received hazardous waste, is expected to be treated as a hazardous waste pile. Currently, RCRA Closure Plans are being developed for the hazardous waste pile.

    During FFA negotiations, the Navy, ADEC, and the EPA agreed to remediate Metals Landfill in an interim action as part of the Superfund process. The action described in this ROD will address the portion of the landfill designated as a SWMU.

8.1 PALISADES LANDFILL

At Palisades Landfill, humans could be exposed to site contaminants through several pathways. Humans may potentially be exposed to soils at the sites (through inadvertent ingestion or dermal contact). They may also be exposed to contaminants by eating fish or shellfish that have been affected by the site. Similarly, ecological receptors may be exposed to site contaminants at Palisades Landfill in several habitats and by a variety of exposure pathways. The habitats present at Palisades Landfill include terrestrial, marine, and freshwater. A comprehensive definition of ecological receptors awaits completion of the basewide RI/FS. Marine mammals are known to inhabit Kuluk Bay, however, and are expected to be one of the primary classes of ecological concern. If not addressed by implementing the action selected in this ROD, potential exposure to landfill waste presents an imminent and substantial endangerment to human health and/or the environment.

8.2 METALS LANDFILL

Humans may potentially be exposed to contamination at Metals Landfill through the same exposure pathways identified for Palisades Landfill. Ecological receptors could also be exposed to site contaminants at Metals Landfill in several habitats and by a variety of exposure pathways. The habitats present at Metals Landfill include terrestrial and marine. As at Palisades Landfill, a comprehensive definition of ecological receptors awaits completion of the basewide RI/FS. Marine mammals are known to inhabit Kuluk Bay and are expected to be one of the primary classes of ecological concern. If not addressed by implementing the action selected in this ROD, potential exposure to landfill waste presents an imminent and substantial endangerment to human health and/or the environment. In addition to the no-action alternative, two IRA alternatives were evaluated for each site.

9.0 DESCRIPTION OF ALTERNATIVES

The following is a discussion of the alternatives presented in the April 1994 proposed plan. The interim remedial alternatives presented in this ROD were developed from site-specific remedial action objectives (RAOs). RAOs are statements of remedial purpose designed to focus remedial actions to meet acceptable cleanup standards. Because this ROD has been issued prior to the completion of a risk assessment, RAOs are based primarily on limited analytical data from previous site investigations and preliminary fate and transport modeling. By meeting RAOs in the design and implementation of the IRAs, it is the intent of the FFA parties to reduce the potential risk to humans and the environment to acceptable levels.

Under CERCLA, the no-action alternative must be considered at every site to establish a baseline for comparison. In addition to the no-action alternative, two IRA alternatives were evaluated for each site. These alternatives are based on the RAOs listed for each site.

The primary RAOs for both landfills include:

- Ensuring that the nearshore marine environment is not adversely impacted by landfill releases
- Preventing harmful exposures to landfill contaminants by minimizing the potential terrestrial receptors to contact, or intrude into, wastes

9.1 PALISADES LANDFILL

The three alternatives evaluated for Palisades Landfill were Alternative 1—no action with monitoring; Alternative 2—stream rerouting, slope stabilization, and installation of a landfill cap; and Alternative 3—waste removal from the creek bed and installation of a landfill cap.

9.1.1 Alternative 1: No Action

Under the no-action alternative, the Navy would take no additional action other than annual monitoring. Annual monitoring would include sampling the surface water and sediments from Palisades Creek downstream of Palisades Landfill and testing for contaminants, monitoring at the perimeter of the landfill for the presence of landfill gas by using a combustible gas meter, and visually inspecting the entire landfill to determine whether any detrimental erosion or settlements have occurred.

The no-action alternative monitoring program would be conducted annually over a period of time, as required by regulations. The monitoring would begin immediately and would continue until finalization of the base-wide ROD. At that time, long-term monitoring concerns would be addressed.

For the purpose of estimating costs, it has been assumed that monitoring would be conducted annually for 30 years. The no-action monitoring program would establish specific methods, intervals, and action levels for monitoring the landfill before the OU A basewide ROD is released (scheduled for 1998). The basewide ROD, or its post-ROD documents, will then establish the long-term monitoring requirements for the site.

9.1.2 Alternative 2: Stream Rerouting and Landfill Cap

Alternative 2 would involve diverting surface water; installing a leachate collection system; rerouting Palisades Creek; implementing institutional controls; stabilizing the slope; constructing a landfill cap and installing gas vents, as required; establishing vegetation; and conducting an annual monitoring program over a period of time, as required by regulations.

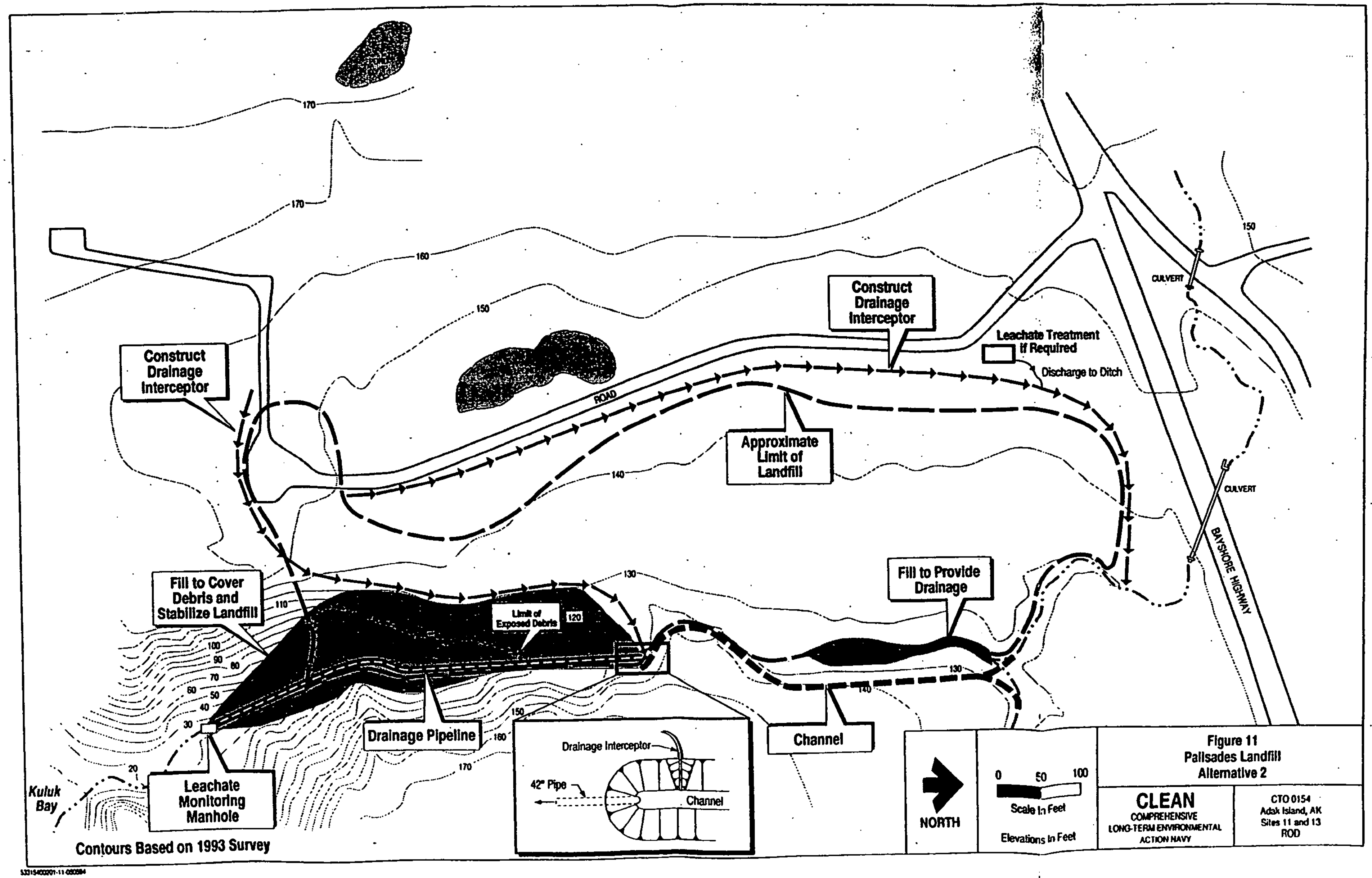
Surface Water Control

Controlling surface water would reduce potential erosion to the landfill surface and steep ravine embankment. Also, the potential of water infiltrating the landfill wastes would be reduced. A small interceptor swale would be constructed on the west (uphill) side of the landfill to collect water flowing off the hillside above the landfill and to route the water into Palisades Creek (Figure 11). This diversion would consist of a V-shaped channel approximately 1 foot deep. Additional interceptor swales (and berms) would be constructed on the south, north, and east sides of the upland portion of the landfill. The interceptor swales would route the water from those areas into the channel near the upstream end of the pipeline that is part of the proposed Palisades Creek diversion (Figure 11). A swale across the top of the slope stabilization fill would collect runoff from the east hill.

Leachate Collection

The installation of a leachate collection system would provide a method for collecting and transporting the leachate to a central location and allow for the monitoring or sampling of the leachate. The collector would be designed so that a treatment system could be added later if needed. Details of the proposed leachate collector design are shown in Figure 12. It is assumed that no leachate treatment system would be required at this time.

It is estimated that any leachate flowing out from the landfill would be confined by the top of the underlying rock-like formation, which has low porosity. A perforated pipe (approximately 75 feet long), laid in a bed of select gravel material, would be installed in the bottom of the Palisades Creek ravine to intercept the leachate. Fill material would be placed along the bottom of Palisades Creek prior to placement of the perforated pipe. A manhole would be placed near the downstream end of the leachate collector to



Construct Drainage Interceptor
Construct Drainage Interceptor
Leachate Treatment if Required
Discharge to Ditch
ROAD
Approximate Limit of Landfill
CULVERT
CULVERT
BAYSHORE HIGHWAY
Fill to Cover Debris and Stabilize Landfill
Limit of Exposed Debris
Fill to Provide Drainage
Drainage Pipeline
Channel
Drainage Interceptor
42" Pipe
Channel
Leachate Monitoring Manhole
Kuluk Bay
Contours Based on 1993 Survey
170
170
160
150
140
130
130
140
150
160
170
120
110
100
90
80
70
60
50
40
30
20
NORTH
0 50 100
Scale in Feet
Elevations in Feet
Figure 11
Palisades Landfill
Alternative 2
CLEAN
COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY
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Adak Island, AK
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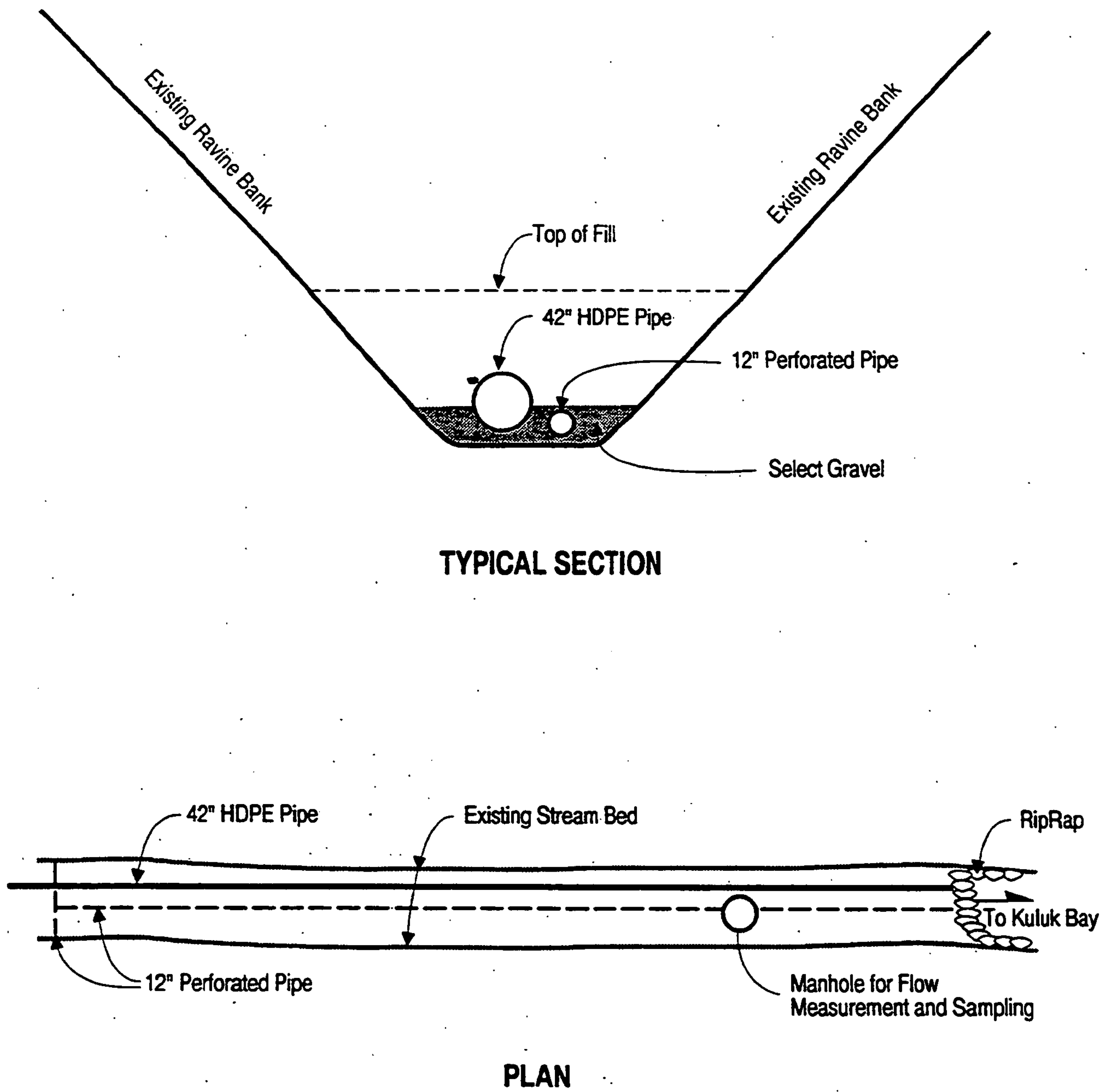
ROD



CLEAN COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY	**Figure 12 Leachate Collector, Alternative 2 Palisades Landfill**	CTO 0154 Adak Island, AK Sites 11 and 13 ROD

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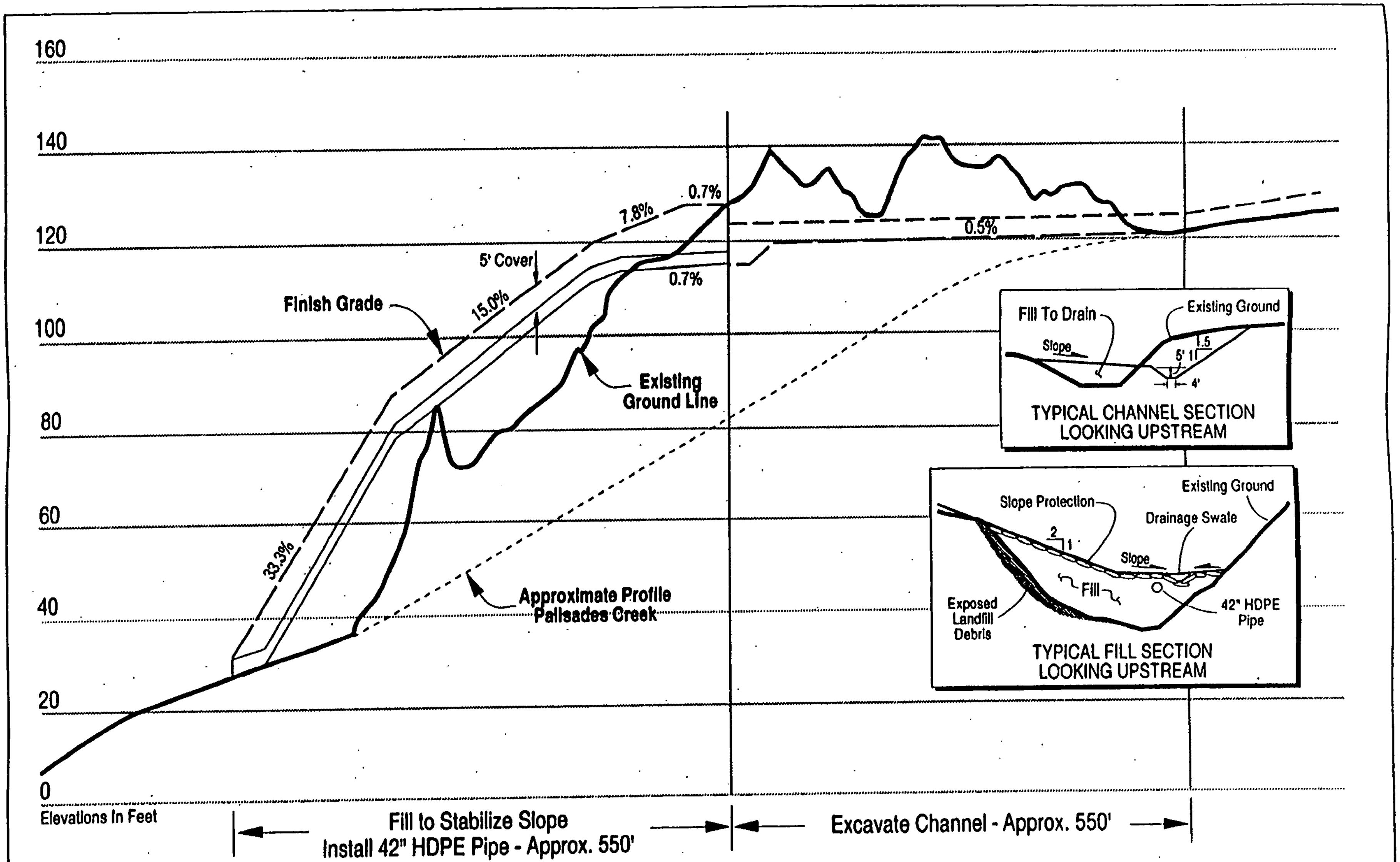
provide an access point for measuring the leachate flow and for sampling. The leachate would then discharge into Palisades Creek.

Palisades Creek Rerouting

Alaska state regulations prohibit the location of landfills in areas that contact surface waters. As a consequence, Palisades Creek would be rerouted as part of the actions included in Alternative 2. The rerouting operation would be designed to reduce the potential for leaching of landfill wastes located in the streambed. Palisades Creek currently flows through or under the portion of the landfill that is in the ravine. The drainage area for this creek, at the upper end of the landfill, is approximately 330 acres. The proposed diversion is based on handling runoff resulting from a once-in-100-years recurrent storm event. Estimated runoff was calculated by using the Rational Method with a runoff coefficient of 0.2. The peak runoff from the 100-year storm event is estimated at 95 cfs (URS 1994b).

An open channel would be constructed on the east side of the ravine in native soil and/or rock from near where the two streams merge to a point approximately 550 feet downstream. To provide surface drainage, it would be necessary to place approximately 2,000 cubic yards of fill in the low area where the current stream flows under the landfill. Approximately 550 lineal feet of drainage pipe would be placed in the ravine. For discussion and cost estimating purposes, it is assumed 42-inch, high-density polyethylene (HDPE) will be used as the drainage pipe. The exact size and type of drainage pipe to be used will be determined during the remedial design stage. The fill material to be used for the slope stabilization work, as described under "slope stabilization," would also be used as bedding and cover material for the 42-inch HDPE pipe. Rock riprap would be placed around the entrance and exit of the pipe to minimize erosion. Figure 11 shows the overall drainage plan, and Figure 13 shows a profile of the proposed diversion.

Other options for Palisades Creek rerouting were investigated but were not considered for various reasons. Use of a ditch around the western side of the landfill was not considered further because excavation to a depth of about 25 feet would be required, making maintenance access to the landfill difficult. Placement of a lined ditch through the existing landfill was not examined further. Because of potential differential settlement of landfill debris below a lined ditch, maintaining the integrity of the ditch would require considerable maintenance.



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ACTION NAVY

Figure 13
Palisades Creek Profile and Typical Sections

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Institutional Controls

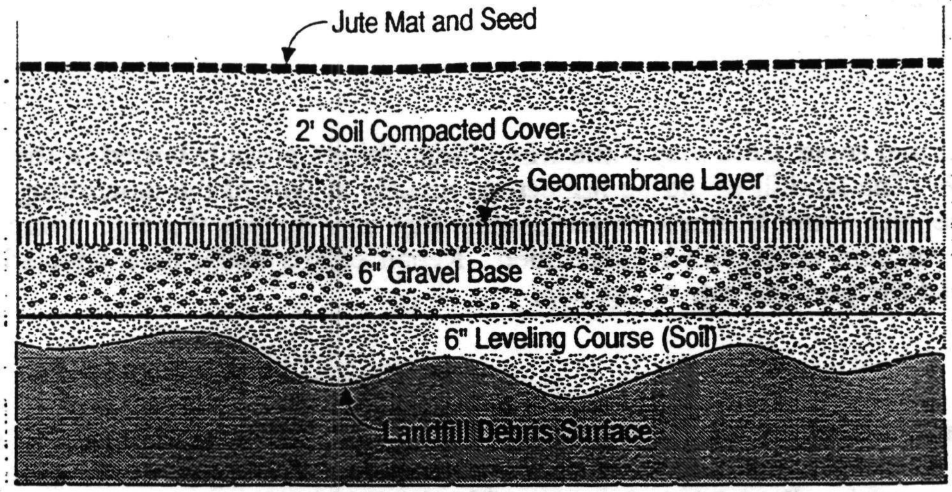
Institutional controls would involve land use restrictions and controls established under the authority of the NAF Adak Commanding Officer. Because of the instability of the landfill and potential physical hazards posed by the landfill debris, institutional controls would restrict future land use at the landfill and warn the public of the landfill contents. Property transfer for Palisades Landfill would require that a deed restriction be attached. The boundaries of the landfill would be referenced to the survey system and existing monuments on Adak Island. Signs would be installed at equally spaced intervals around the perimeter of the landfill to warn the public of its contents. Signs would also be installed at the bottom of the ravine. Long-term institutional controls would be addressed as part of the basewide ROD.

Slope Stabilization

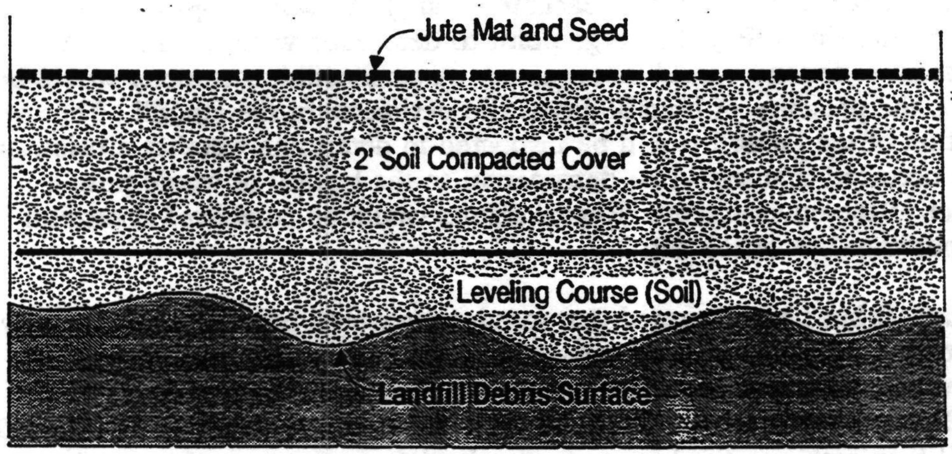
The primary reason for slope stabilization is to prevent further sliding of exposed wastes into Palisades Creek. Landfill waste has been placed on approximately 0.5 acre of a steep, exposed slope that shows evidence of sliding as a result of its steepness. Placing approximately 33,000 cubic yards of rock or soil over the top of the waste is proposed to stabilize the slope. This activity would be performed in conjunction with the creek relocation described previously. Any low places would be filled to provide a uniformly graded surface. A geotextile with filled concrete cells would be placed on the graded, steep slopes to permanently control erosion. Figure 11 shows the location of the proposed improvements. Figure 13 shows two typical sections illustrating slope stabilization and creek diversion.

Landfill Cap

The purpose of the landfill cap is to minimize human exposure, direct or control run-on or runoff, and reduce infiltration from precipitation and thereby minimize leachate generation. A cap would be installed over the top of the landfill after slope stabilization and stream relocation are complete. The exact design for a cap would be completed after predesign studies and geotechnical testing on the landfill area are complete. The cap design would meet federal and state regulations. A cross section of two caps being considered is shown in Figure 14. To ventilate any gas that might accumulate under the cap, gas vents would be installed if a geomembrane cap is used.



TYPICAL SECTION – GEOMEMBRANE CAP



TYPICAL SECTION – SOIL CAP

CLEAN COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY	Figure 14 Typical Section - Landfill Cap	CTO 0154 Adak Island, AK Sites 11 and 13 ROD

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It is anticipated that some areas may settle when large objects possibly buried in the landfill collapse. The landfill would be inspected annually as part of the monitoring program, and repairs would be made to settlements that may rupture the cap. Some erosion may occur until vegetation is established. Repair efforts would be conducted if erosion degraded the performance of the cap.

Vegetation

After the cap and soil cover have been installed and graded, the disturbed areas would be seeded and measures would be taken to prevent erosion. Erosion control measures may include jute matting, filter fabric fences, and hay/straw bales.

Monitoring Program

It will be necessary to monitor the landfill in order to evaluate the effectiveness of the IRA. Under Alternative 2, the upstream and downstream flow rate would be measured to determine the contribution from the leachate (if any). Stream samples would be collected close to the Kuluk Bay discharge point to determine water quality. Also, sampling of stream sediments would be required. A combustible gas meter would be used to monitor the presence of landfill gas at the perimeter of the landfill. The overall physical condition of the landfill would be inspected to determine whether erosion or settlement has occurred that would be detrimental to the landfill or would pose a potential danger to the environment. Repair efforts would be conducted if erosion degraded the performance of the cap.

To estimate costs, it has been assumed that monitoring would be conducted annually for 30 years. Interim remedial design and/or action documents would establish specific methods, intervals, and action levels for monitoring the landfill before the OU A basewide ROD is released (scheduled for 1998). The basewide ROD, or its post-ROD documents, will then establish the long-term monitoring requirements for the site.

9.1.3 Alternative 3: Waste Removal From Creek Bed and Installation of Landfill Cap

Alternative 3 would involve diverting surface water, removing waste from within the ravine and reconsolidating the waste on the upland area of the landfill, installing a leachate collection system, removing and appropriately managing any hazardous waste encountered, constructing a landfill cap and installing gas vents as required, providing institutional controls, establishing vegetation, and conducting a monitoring program.

Figure 15 provides an overall plan view of the work that would be performed under Alternative 3.

Surface Water Control

Controlling surface water would reduce potential erosion to the landfill surface and steep ravine embankment. Also, the potential of water infiltrating the landfill wastes would be reduced. The control of surface water under Alternative 3 would be identical to that described under Alternative 2, with the exception that the ditches and swales would discharge to Palisades Creek at the north and south ends of the relocated waste and the re-established Palisades Creek would collect runoff from the east.

Removal of Waste Within Ravine and Reconsolidation of Waste on Upland Area of Landfill

The reason for removing waste within the ravine is to eliminate contact between Palisades Creek and the waste and to prevent further sliding of wastes into Palisades Creek. This activity would include removing approximately 50,000 cubic yards of the landfill contents from within the limits of the original ravine. The contents would be deposited on approximately 4 acres of the remaining upland area immediately west of the ravine. A layer of soil would be placed over the top of the waste as a base for a cap. The surface would be graded so that it drains into the ravine. The location and depth of reconsolidated waste would need further evaluation during design phases. Expansion onto land that is not former landfill must be avoided to preclude the invocation of new regulatory requirements. Feasibility and cost-effectiveness would be maintained by placing reconsolidated fill to depths of approximately 15 feet near the edge of the ravine. The locations of the proposed improvements are shown on Figure 15.

Leachate Collection

The installation of a leachate collection system would provide a method for collecting and transporting the leachate to a central location and allow for the monitoring or sampling of the leachate. The leachate collection system under Alternative 3 would be identical to that described under Alternative 2, with the exception that the perforated pipe would be installed in a trench on top of the underlying rock.

Hazardous Waste Handling

The handling of hazardous waste is necessary to properly categorize and dispose of or treat the waste. As waste is removed from the ravine, it would be inspected to determine whether any material could be classified as hazardous waste. If hazardous waste is suspected, then field tests would be conducted or samples would be taken and shipped off the island for laboratory analysis to classify the material. After the material is classified, a range of disposal or treatment options would be available.

Because there is no accurate basis for determining whether hazardous waste is in the landfill and the types and quantities involved, an allowance of 0.25 percent of the total excavation has been made for estimating. It is assumed that 150 cubic yards of hazardous waste would be removed from the ravine. It is also assumed that half of this material would be bulky and contaminated in such a manner that it could be cleaned on site by wiping or washing and the other half of the material would be disposed of or treated as hazardous waste.

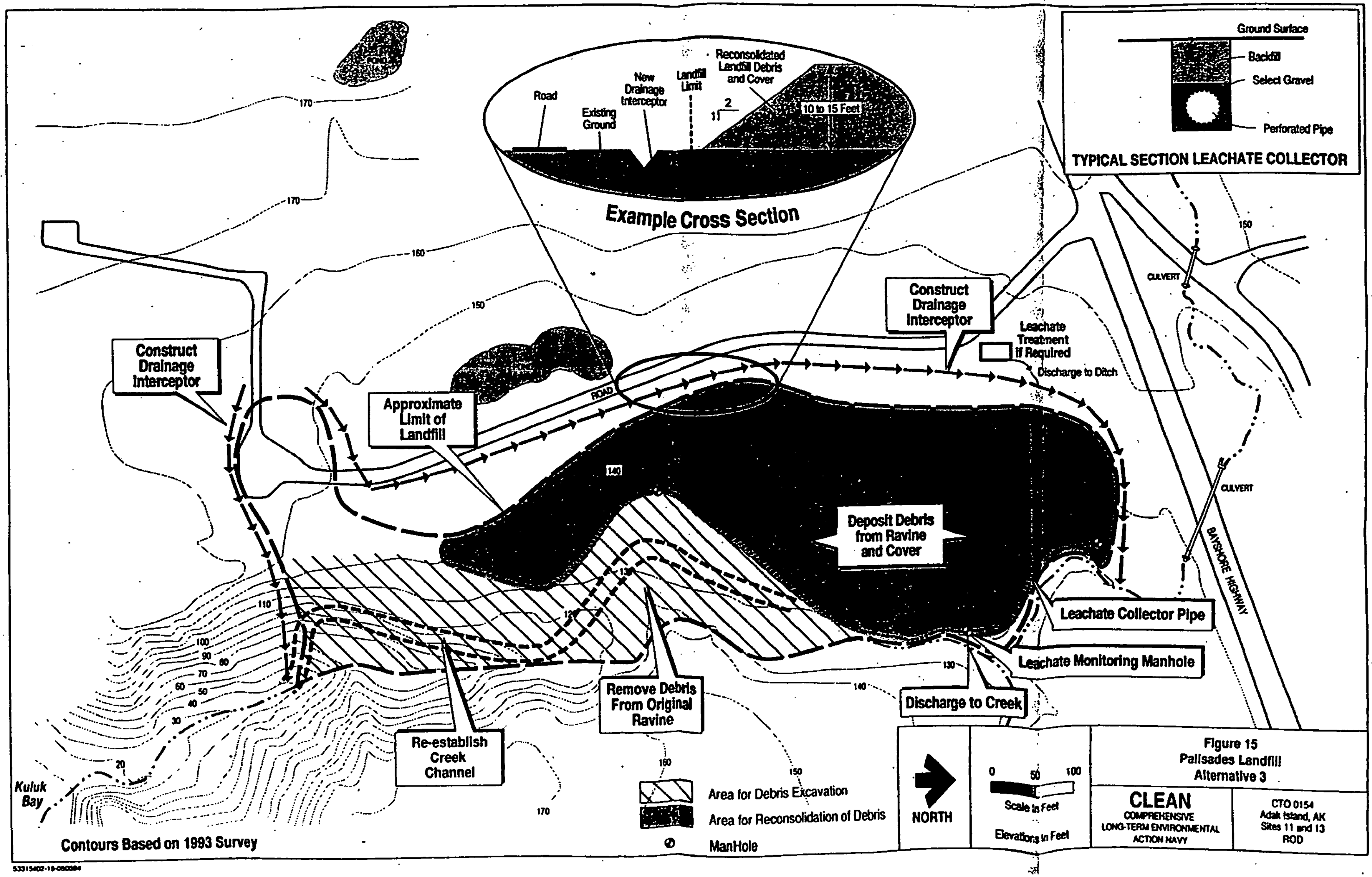
Handling of the hazardous waste would entail packaging the waste in suitable containers and shipping the material off the island to a hazardous waste disposal site. The waste would then be treated or disposed of at a disposal site in accordance with applicable regulations.

Landfill Cap

The purpose of the landfill cap is to minimize human exposure, direct or control run-on or runoff, and reduce infiltration from precipitation, thereby minimizing leachate generation. After the waste is reconsolidated and covered, a cap would be placed over the top of the entire landfill, including the reconsolidated waste. The landfill cap description and requirements would be identical to those described under Alternative 2. Repair efforts would be conducted if erosion degraded the performance of the cap.

Institutional Controls

Institutional controls would involve land use restrictions and controls established under the authority of the NAF Adak Commanding Officer. Because of the instability of the landfill and potential physical hazards posed by the landfill debris, institutional controls would restrict future land use at the landfili and warn the public of the landfill contents. Long-term institutional controls would be addressed as part of the basewide ROD.



Example Cross Section
Road
Existing Ground
New Drainage Interceptor
Landfill Limit
Reconsolidated Landfill Debris and Cover
10 to 15 Feet
TYPICAL SECTION LEACHATE COLLECTOR
Ground Surface
Backfill
Select Gravel
Perforated Pipe
Construct Drainage Interceptor
Approximate Limit of Landfill
Construct Drainage Interceptor
Leachate Treatment if Required
Discharge to Ditch
Deposit Debris from Ravine and Cover
CULVERT
CULVERT
BAYSHORE HIGHWAY
ROAD
Leachate Collector Pipe
Leachate Monitoring Manhole
Discharge to Creek
Remove Debris From Original Ravine
Re-establish Creek Channel
Kuluk Bay
Contours Based on 1993 Survey
Area for Debris Excavation
Area for Reconsolidation of Debris
ManHole
NORTH
Scale in Feet
Elevations in Feet
Figure 15
Palisades Landfill
Alternative 3
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Institutional controls for Alternative 3 would be identical to those outlined for Alternative 2.

Vegetation

Under Alternative 3, vegetation would be established as described for Alternative 2.

Monitoring Program

It will be necessary to monitor the landfill in order to evaluate the effectiveness of the IRA. The monitoring program for Alternative 3 would be identical to that described under Alternative 2.

9.2 METALS LANDFILL

The three alternatives evaluated for Metals Landfill were Alternative 1—no action with monitoring; Alternative 2—excavation, segregation, reconsolidation of the landfill, and installation of a cap on the entire landfill; and Alternative 3—waste removal from shoreline areas and installation of a landfill cap.

9.2.1 Alternative 1: No Action

Under the no-action alternative, the Navy would take no additional action other than annual monitoring. Annual monitoring would include sampling the groundwater and testing the samples for contaminants, monitoring at the perimeter of the landfill for the presence of landfill gas by using a combustible gas meter, and visually inspecting the entire landfill to determine whether any detrimental erosion or settlement has occurred.

The no-action alternative monitoring program would be conducted annually over a period of time, as required by regulations. Monitoring would begin immediately and would continue until finalization of the basewide ROD. At that time, long-term monitoring concerns would be addressed.

To estimate costs, it has been assumed that monitoring would be conducted annually for 30 years. The no-action monitoring program would establish specific methods, intervals, and action levels for monitoring the landfill before the OU A basewide ROD is released (scheduled for 1998). The basewide ROD, or its post-ROD documents, will then establish the long-term monitoring requirements for the site.

9.2.2 Alternative 2: Excavation, Segregation, Reconsolidation, and Capping the Entire Landfill

Alternative 2 would involve diverting surface water; excavating, segregating into hazardous and solid wastes, and reconsolidating the entire contents of the landfill (approximately 400,000 cubic yards); removing and appropriately managing any hazardous wastes encountered; cleaning up the east section of the landfill; monitoring groundwater; installing a soil landfill cap; establishing vegetation; implementing institutional controls; and conducting a monitoring program (Figures 16 and 17).

Surface Water Control

Small interceptor swales would be constructed on the uphill side of the landfill at the base of Monument Hill to collect water flowing off the hill above the landfill and to route the water into Kuluk Bay (Figure 16). A V-shaped channel approximately 1 foot deep would collect and transport the water.

Excavation, Segregation, and Reconsolidation of Landfill Waste

An estimated 400,000 cubic yards of landfill waste have been placed on approximately 19 acres (north and main sections). All waste would be removed, and hazardous wastes would be segregated from non-hazardous waste. After sorting and reconsolidating, the waste would be redeposited in the main section of the landfill, and a layer of soil would be placed over the top of the waste as a base for the cap. Any tanks encountered would be cleaned and cut up or filled with sand. Large objects may need to be cut up in order to consolidate the material without leaving large voids.

Hazardous Waste Handling

As waste is removed from the landfill, it would be inspected to determine whether any material may be classified as hazardous waste. If hazardous waste is suspected, field tests would be conducted or samples would be taken and shipped off the island for laboratory analysis to classify the material.

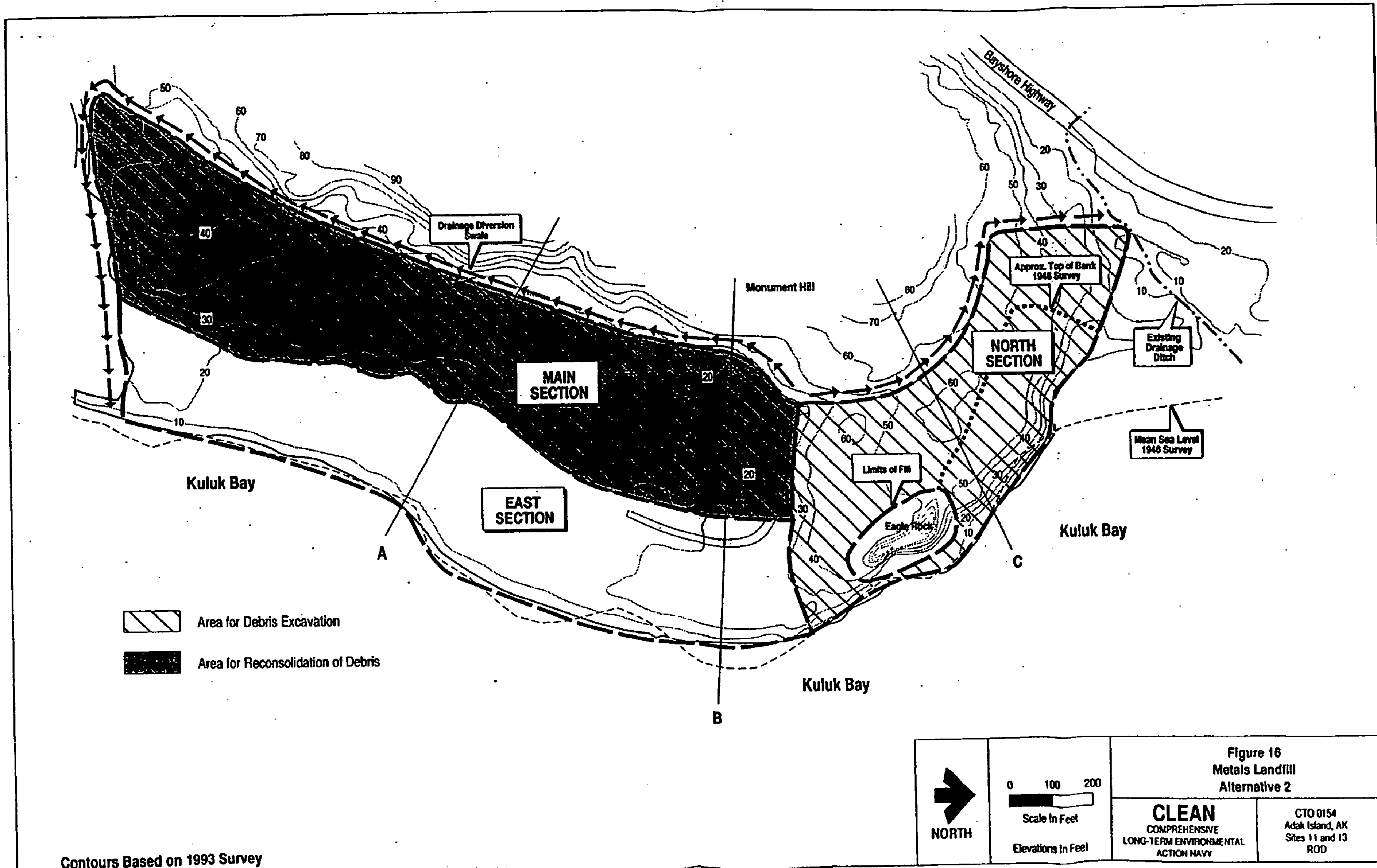

Figure 16
Metals Landfill
Alternative 2

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Because there is no accurate basis for determining whether hazardous waste material is in the landfill and the types and quantities involved, an allowance of 0.25 percent of the total excavation has been made for estimating. It is assumed that 1,000 cubic yards of hazardous waste will be removed from the landfill. It is also assumed that half of this material would be bulky and contaminated in such a manner that it could be cleaned on site by washing or wiping and that the other half of the material would be disposed of or treated as hazardous waste.

Handling the hazardous waste would entail packaging the waste in suitable containers and shipping the material off the island to a hazardous waste disposal site. The waste would then be treated or disposed of at a disposal site in accordance with applicable regulations.

Cleanup of East Section of Landfill

The scattered waste in the east section, along the shoreline of the east section, and on the east side of Eagle Rock would be removed and deposited and consolidated in the main section. Treated sludge would be removed and deposited on the waste in the main section or treated with lime and covered in place. Large objects may need to be cut up to consolidate the material without leaving large voids.

Groundwater Monitoring

Groundwater monitoring provides a monitoring system to enable the FFA parties to determine whether post-closure escape of chemicals poses an unacceptable hazard. Five existing monitoring wells have been drilled on site. It is estimated that five additional monitoring wells would be drilled, at a spacing of approximately 200 feet on center, as monitoring points near the eastern perimeter of the site toward Kuluk Bay. It is believed that Monument Hill is a barrier to groundwater movement from the upland area of the island and that any leachate would be derived principally from percolation through the landfill. The surface of the landfill would be graded to provide drainage to reduce the quantity of water that percolates through the landfill.

Landfill Cap

The purpose of the landfill cap is to minimize human exposure, direct or control run-on or runoff, and reduce infiltration from precipitation, thereby minimizing leachate generation. The landfill cap would be installed over the top of the remaining 12-acre landfill (main section) after the waste is reconsolidated. The exact design for a cap conforming to federal and state regulations would not be determined until after extensive geotechnical testing has been completed. A cross section of two caps being considered is shown in Figure 14. If a geomembrane cap is used, it would be necessary to install gas vents to ventilate any gas that might accumulate under the cap.

It is anticipated that some areas may settle when large objects possibly buried in the landfill collapse. The landfill would be inspected annually as part of the monitoring program, and repairs would be made to settlements that may rupture the cap. Some erosion may occur until vegetation is established. Repair efforts would be conducted if erosion degraded the performance of the cap.

Vegetation

A minimum of 2 feet of soil would be placed over the top of the landfill as part of the installation of the cap that was discussed previously. After the cap and soil cover have been graded, the area would be seeded and measures taken to prevent erosion. Erosion control measures may include jute matting, filter fabric fences, and hay/straw bales.

Institutional Controls

Institutional controls would involve land use restrictions and controls established under the authority of the NAF Adak Commanding Officer. Property transfer for Metals Landfill would require that a deed restriction be attached. The boundaries of the landfill would be referenced to the survey system and existing monuments on Adak Island. Warning signs would be installed at equally spaced intervals around the perimeter of the landfill to warn the public of its contents. Long-term institutional controls would be addressed as part of the basewide ROD.

Monitoring Program

It will be necessary to monitor the landfill. The groundwater would be sampled for water quality. The presence of gas in the landfill would be monitored for at the perimeter of the landfill with the use of a combustible gas meter. The overall physical condition of the landfill would be inspected annually to ensure that systems are still performing adequately and to determine whether erosion or settlement has occurred that would be detrimental to the landfill or would pose a potential danger to the environment. Repair efforts would be conducted if erosion degraded the performance of the cap.

To estimate costs, it has been assumed that monitoring would be conducted annually for 30 years. Interim remedial action design and/or action documents would establish specific methods, intervals, and action levels for monitoring the landfill before the OU A basewide ROD is released (scheduled for 1998). The basewide ROD, or its post-ROD documents, will then establish the long-term monitoring requirements for the site.

9.2.3 Alternative 3: Debris Removal From Shoreline Areas and Landfill Cap

Alternative 3 would involve diverting surface water, removing waste from surface water, removing and appropriately managing any hazardous wastes encountered, cleaning up the east section of the landfill, monitoring groundwater, installing a landfill cap, establishing vegetation, implementing institutional controls, and conducting a monitoring program over approximately a 30-year period (Figures 17 and 18).

Surface Water Control

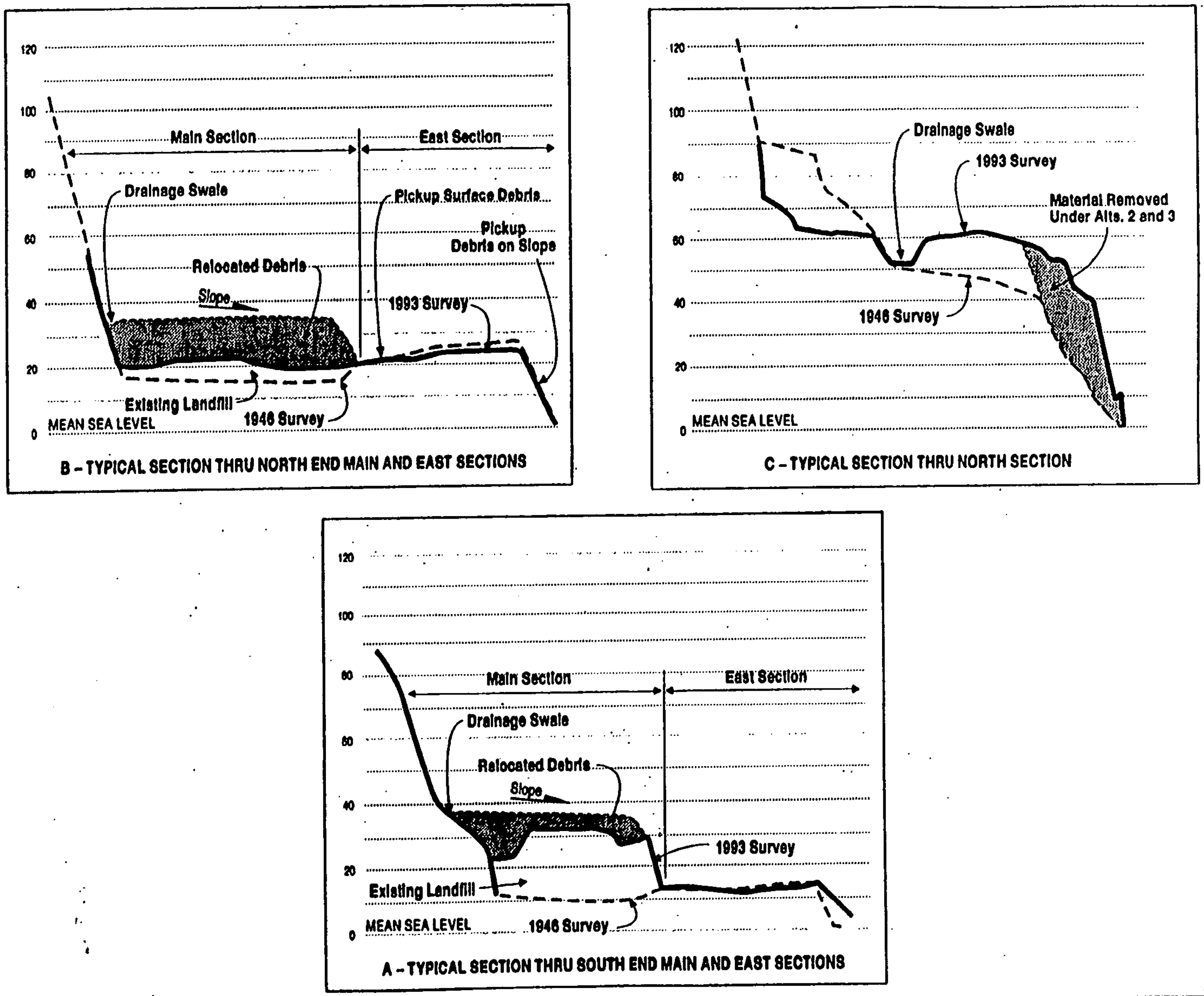
The control of surface water under Alternative 3 would be identical to that described for Alternative 2.

Waste Removal From Surface Water

Approximately 75,000 cubic yards of material have been pushed over the bank of the north section of the landfill and are in contact with Kuluk Bay. This material would be excavated, deposited, and reconsolidated in the north end of the main section of the landfill (Figures 17 and 18). The limits of removal would be based on the amount of material that is in contact with Kuluk Bay and the area necessary for a stable slope along the bay. A layer of soil would be placed over the top of the waste as a base for the cap. Any tanks encountered would be cleaned and cut up or filled with sand. Large objects would need to be cut up to make consolidation possible.

Hazardous Waste Handling

Any hazardous waste encountered would be handled in the same manner as described under Alternative 2. At 0.25 percent of the total excavation, the quantity allowance for



CLEAN COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY	**Figure 17** **Metals Landfill** **Typical Sections**	CTO 0154 Adak Island, AK Sites 11 and 13 ROD

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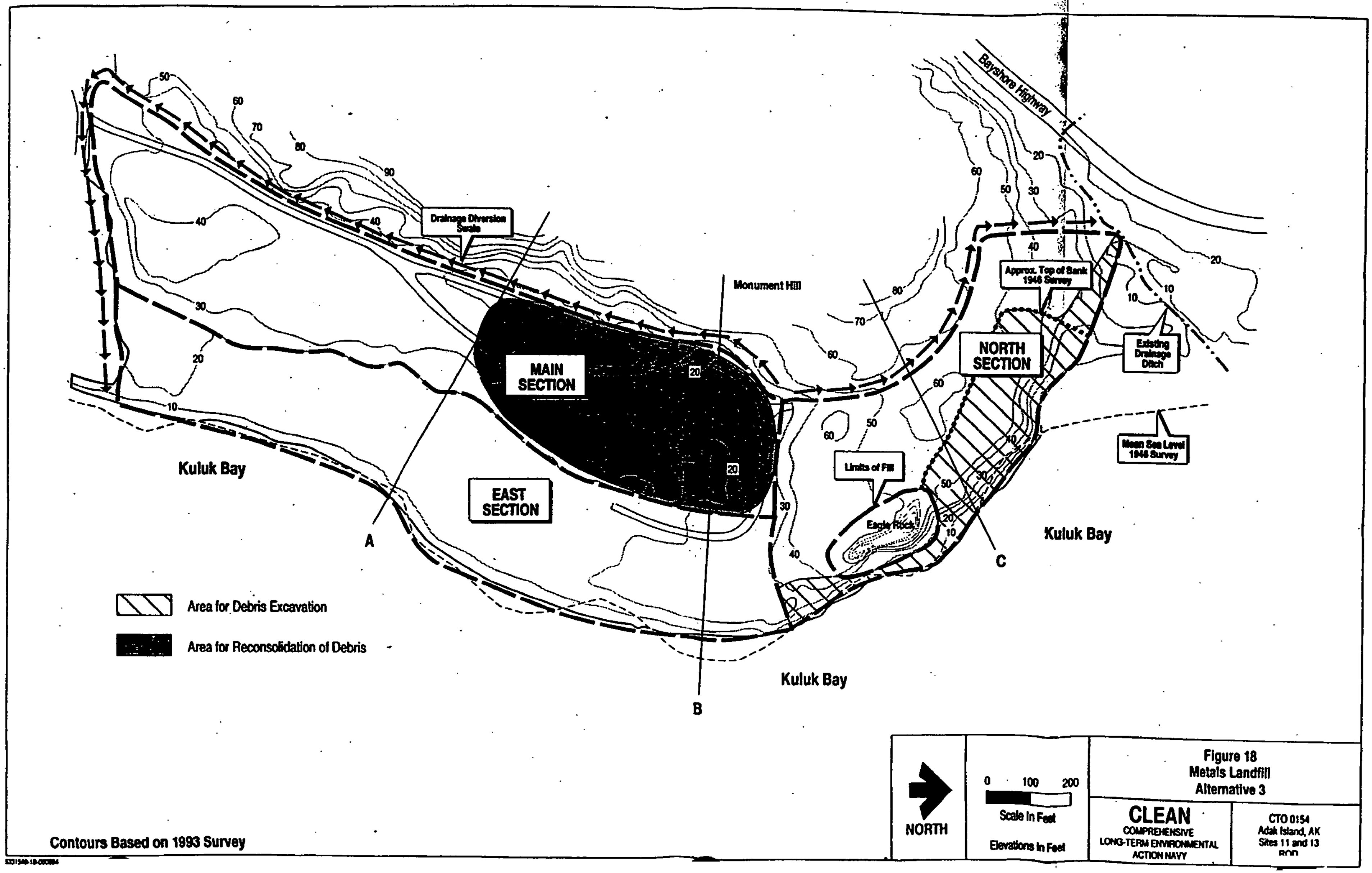
Bayshore Highway
Drainage Diversion Swale
Monument Hill
Approx. Top of Bank 1946 Survey
Existing Drainage Ditch
Mean Sea Level 1946 Survey
Limits of Fill
Eagle Rock
MAIN SECTION
EAST SECTION
NORTH SECTION
Kuluk Bay
Kuluk Bay
Kuluk Bay
A
B
C
Area for Debris Excavation
Area for Reconsolidation of Debris
Contours Based on 1993 Survey
NORTH
0 100 200
Scale In Feet
Elevations In Feet
Figure 18
Metals Landfill
Alternative 3
CLEAN
COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY
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this alternative is 200 cubic yards because of the smaller quantity of material to be handled.

Cleanup of East Section of Landfill

Cleanup of the east section of Metals Landfill would be identical to that described for Alternative 2.

Groundwater Monitoring

Groundwater monitoring would be identical to that described for Alternative 2.

Landfill Cap

The purpose of the landfill cap is to minimize human exposure, direct or control run-on or runoff, and reduce infiltration from precipitation, thereby minimizing leachate generation.

A landfill cap would be placed over the top of a landfill after the waste is reconsolidated. It is estimated that the landfill cap would cover all of the main section and about 5 acres of the north section. All but about 8 acres of this area have an existing soil cover that would serve as a minimum cap. The exact design for a cap conforming to federal and state regulations will not be determined until after extensive geotechnical testing is complete. A cross section of the two caps being considered is shown in Figure 14.

It is anticipated that some areas may settle when large empty objects possibly buried in the landfill collapse. The landfill would be inspected annually as a part of the coordinated monitoring program, and repairs would be made where settlements may have created depressions or exposed landfill contents. Some erosion may occur until vegetation is established. Repair efforts would be conducted if erosion degraded the performance of the cap.

Vegetation

Under Alternative 3, vegetation would be established as described for Alternative 2.

Institutional Controls

Implementing the institutional controls under Alternative 3 would follow the procedures outlined for Alternative 2.

Monitoring Program

The monitoring program for Alternative 3 would be identical to the program outlined under Alternative 2. Long-term institutional controls would be addressed as part of the basewide ROD.

10.0 EVALUATION OF ALTERNATIVES

Three cleanup alternatives were evaluated for each landfill by using the nine evaluation criteria established by the NCP:

- ***Overall protection of human health and environment***—whether a remedy provides adequate protection and how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls

- ***Compliance with ARARs***—whether a remedy will meet all of the ARARs (or other federal and state environmental statutes) and/or provide grounds for invoking a waiver

- ***Long-term effectiveness and permanence***—the magnitude of residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time once cleanup goals have been met

- ***Reduction of toxicity, mobility, or volume through treatment***—the anticipated performance of the treatment technologies that may be employed in a remedy

- ***Short-term effectiveness***—the speed with which the remedy achieves protection, as well as the remedy's potential to create adverse impacts on human health and the environment during the construction and implementation period

- *Implementability*—the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement the chosen solution

- *Cost*—capital and operation and maintenance costs

- *State acceptance*—whether the state concurs with, opposes, or has no comment on the preferred alternative

- *Community acceptance*—assessed in the ROD following review of the public comments received on the proposed plan and its supporting documentation in the Administrative Record

Overall protection of human health and the environment and compliance with ARARs are threshold criteria. These two criteria relate directly to statutory findings. The primary balancing criteria are the primary criteria on which the analysis is based. The five primary balancing criteria are long-term effectiveness and permanence; reduction of toxicity, mobility, and volume through treatment; short-term effectiveness; implementability; and cost. The final two criteria, state acceptance and community acceptance, are modifying criteria.

10.1 PALISADES LANDFILL

The following sections evaluate the three April 1994 alternatives according to the nine EPA evaluation criteria. The no-action alternative was included as a baseline comparison.

10.1.1 Overall Protection of Human Health and the Environment

The FFA parties believe that Alternative 1 may not adequately protect human health and the environment. Although this alternative includes long-term monitoring, it is possible that receptors could become exposed to harmful levels of contaminants. This could occur by contacting wastes at or near the landfill surface. It could also occur in the nearshore marine environment if future releases from the landfill carry contaminants into Kuluk Bay. The probability of such a release is difficult to estimate. Alternatives 2 and 3 would meet all the RAOs identified for this site. Alternatives 2 and 3 would reduce possible contaminant exposure and migration by implementing effective containment measures and would include monitoring and annual inspection. Alternative 2 would minimize contact between wastes and surface waters by rerouting the creek that currently flows through the landfill. The creek would run through an engineered channel in the upper reaches of the landfill and then be routed through a pipe as it travels through the ravine. Alternative 3 would remove all waste in the ravine, making the pipe unnecessary.

Alternatives 2 and 3 would be designed to minimize releases of hazardous substances into the air or surface water. Monitoring would ensure that the alternatives meet this goal. Based on the results of sampling conducted to date and the goals of the remedial design, it is anticipated that neither a landfill gas system nor a leachate treatment system would be required to meet RAOs. If monitoring shows that harmful levels of landfill gases are being released to the atmosphere, then a gas collection and treatment system would need to be installed. Similarly, if harmful levels of contaminants are detected in water emanating downgradient of the landfill, then those waters would need to be treated prior to discharge to Kuluk Bay. Interim remedial design and/or action documents would establish specific methods, intervals, and action levels for monitoring the landfill before the OU A basewide ROD is released (scheduled for 1998). The basewide ROD, or its post-ROD documents, will then establish the long-term monitoring requirements for the site.

10.1.2 Compliance With Applicable or Relevant and Appropriate Federal and State Requirements

Unless waived, ARARs must be met when a remedial action becomes necessary. Because Alternative 1 does not entail taking action, ARARs would not be triggered (and no requirements would therefore be identified). Both Alternatives 2 and 3 would be designed and implemented to attain ARARs, including the substantive requirements of RCRA Subtitle C, Part 261 and state solid waste closure requirements (18 AAC 60).

At the time of the proposed plan, the two action alternatives presented for Palisades Landfill were conceived specifically to meet the relevant and appropriate portions of RCRA's 40 CFR 264 landfill closure requirements. Since issuance of the proposed plan, however, the FFA parties have modified the remedial action objectives for the site. As a consequence, the RCRA cap is not required. Therefore, the RCRA capping requirements pertaining to minimizing infiltration are no longer considered relevant and appropriate. See Section 12.2 for a discussion of those requirements now considered applicable or relevant and appropriate for the site.

10.1.3 Long-Term Effectiveness and Permanence

Alternative 1 would take no action and, therefore, would not have long-term effectiveness or permanence. Alternatives 2 and 3 would be designed for long-term effectiveness and permanence. Alternative 3, which would remove all the waste from the ravine, may be more permanent than Alternative 2, which would reroute the existing creek to an engineered channel and pipe. Rerouting of the creek would, however, be designed to maximize long-term effectiveness.

The magnitude of residual risk and the ability of the selected remedy to maintain reliable protection of human health and the environment over time would be reevaluated as part of the findings and conclusions of the basewide RI/FS. Long-term monitoring for all three alternatives may be used to confirm the effectiveness of the action. Long-term monitoring requirements for Palisades Landfill would be established under the basewide ROD or its associated post-ROD documents.

10.1.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

None of the alternatives assumes that the contaminants will require treatment. Alterative 1 would not reduce the toxicity, mobility, or volume of contaminants. Alternatives 2 and 3 use "containment" measures, that is, measures to minimize contaminant mobility by placing a landfill cap or cover over the site and effective drainage controls to reduce infiltration and minimize leachate generation. None of the three alternatives would actively reduce the toxicity or volume of contaminants; however, Alternative 3 might reduce the volume of hazardous substances in the excavated portion of the landfill.

10.1.5 Short-Term Effectiveness

Alternative 1 would not provide protection but would not create adverse impacts either. Alternatives 2 and 3 would be designed to safely contain all landfilled waste, reduce human exposure to wastes and leached contaminants, and reduce the generation and migration of leachate. Because Alternative 3 would involve excavation of portions of the existing landfill, the potential for releases to the environment and exposure of on-site personnel to hazardous substances would be much greater than that for Alternative 2. Alternative 3 would require appropriate construction techniques to minimize short-term contaminant releases that may affect on-site personnel and the environment during remedial operations.

10.1.6 Implementability

The Navy would be able to implement any of the three alternatives. In Alternative 3, excavation of the waste from the ravine would be technically more difficult to execute than rerouting the creek. Construction activities for Alternative 2 or 3 would incur similar costs for mobilizing equipment and personnel to a remote location. Alternatives 2 and 3 would require approximately 18 months to implement. Variations within these projected timeframes depend on the availability of supplies and equipment, completion and acceptance of work plans, and on-island environmental conditions.

10.1.7 Cost

The projected cost of Alternative 1 is $229,000 for annual inspection and monitoring. The projected capital cost of Alternative 2 is $4,681,000, with projected operation and maintenance (O&M) costs of $568,000. The estimated total cost for Alternative 2 is $5,249,000. The projected capital cost for Alternative 3 is $8,287,000, with O&M costs projected at $506,000. The estimated total cost for Alternative 3 is $8,793,000. To estimate costs, it is assumed that the annual inspection and monitoring under Alternative 1 and the O&M under Alternatives 2 and 3 will be conducted over a 30-year period. Also, the landfill cap in Alternatives 2 and 3 is assumed to be a geomembrane cap, as shown in Figure 14. The initial cost of Alternative 3 is greater than that of Alternative 2 because of the expense of removing waste from the ravine and consolidating it in another part of the landfill; however, Alternative 2 will require slightly higher annual operation costs over 30 years than Alternative 3. The higher O&M cost for Alternative 2 is due to the additional slope stabilization and Palisades Creek rerouting activities.

The capital and O&M cost estimates for the Palisades Landfill alternatives are presented in Table 1. The 30-year O&M costs are the present worth of the annual costs at an interest rate of 5 percent. The cost estimates provide an accuracy of +50 percent to -30 percent in accordance with EPA guidelines.

Table 1
Proposed Plan Alternatives and Costs
Palisades Landfill

Alternatives	Capital Cost ($)	30-Year Operation and Maintenance Cost ($)	Total Cost ($)
Alternative 1: No Action (Required by CERCLA to Be Considered)			
Monitoring	0	229,000	229,000
Alternative 2: Stream Rerouting, Slope Stabilization, and Landfill Cap			
Mobilization	750,000	0	750,000
Slope stabilization	985,000	36,000	1,021,000
Palisades Creek rerouting	140,000	16,000	156,000
Landfill cap	1,294,000	219,000	1,513,000
Leachate collection	12,000	0	12,000
Leachate treatment	0	0	0
Surface water diversion	10,000	16,000	26,000
Institutional controls	5,000	5,000	10,000
Establishing vegetation	32,000	61,000	93,000
Monitoring	0	215,500	215,500
Subtotal	3,228,000	568,000	3,796,000
Weather conditions[a]	484,000	0	484,000
Miscellaneous unlisted items[b]	323,000	0	323,000
Engineering and management[c]	646,000	0	646,000
Total	4,681,000	568,000	5,249,000
Alternative 3: Debris Removal From Creek Bed and Landfill Cap			
Mobilization	750,000	0	750,000
Removal of debris from ravine; reconsolidation of debris upland	3,404,000	0	3,404,000
Hazardous waste handling	86,000	0	86,000
Landfill cap	1,286,000	219,000	1,505,000
Leachate collection	147,000	0	147,000
Leachate treatment	0	0	0

Table 1 (Continued)
Proposed Plan Alternatives and Costs
Palisades Landfill

Alternatives	Capital Cost ($)	30-Year Operation and Maintenance Cost ($)	Total Cost ($)
Alternative 3 (Continued)			
Surface water diversion	10,000	16,000	26,000
Institutional controls	5,000	5,000	10,000
Establishing vegetation	27,000	51,000	78,000
Monitoring	0	215,000	215,000
Subtotal	5,715,000	506,000	6,221,000
Weather conditions[a]	857,000	0	857,000
Miscellaneous unlisted items[b]	572,000	0	572,000
Engineering and management[c]	1,143,000	0	1,143,000
Total	8,287,000	506,000	8,793,000

Note:
All costs are 1994 dollars.

[a]Weather conditions - A cost for downtime or reduction in productivity during construction due to inclement weather conditions has been added. The cost is based on 15 percent of the construction subtotal cost.

[b]Miscellaneous unlisted items - The level of detail available for this estimate does not permit establishing costs for every detail in the plan. An additional 10 percent of the construction subtotal cost has been added to cover this item.

[c]Engineering and management - An allowance totaling 20 percent of the construction subtotal cost has been added to include project engineering and management. This allowance is broken down into 5 percent for engineering and geotechnical investigations, 3 percent for administrative and legal costs, 6 percent for engineering design cost, and 6 percent for construction oversight and management.

10.1.8 State Acceptance

The Alaska Department of Environmental Conservation (ADEC) was involved in the preparation of this plan and supports the selected remedial alternative pursuant to the state cleanup requirements set forth in 18 AAC 75 and AS 40.09.020.

10.1.9 Community Acceptance

Community acceptance was evaluated as part of the public comment period. The FFA parties have reviewed and considered public comments on this ROD and have incorporated comments to the decisionmaking process. The Responsiveness Summary (Appendix B) provides responses to public comments. In general, the public comments supported the preferred alternative presented in the proposed plan.

10.2 METALS LANDFILL

The following sections evaluate the three April 1994 alternatives according to the nine EPA evaluation criteria. The no-action alternative was included as a baseline comparison.

10.2.1 Overall Protection of Human Health and the Environment

The FFA parties believe that Alternative 1 may not adequately protect human health and the environment. Although this alternative includes long-term monitoring, it is possible that receptors could become exposed to harmful levels of contaminants. This could occur by contacting wastes at or near the landfill surface. It could also occur in the nearshore marine environment if future releases from the landfill carry contaminants into Kuluk Bay. The probability of such a release is difficult to estimate. Alternatives 2 and 3 would meet all the RAOs identified for this site. Both Alternative 2 and Alternative 3 would reduce possible contaminant exposure and migration by implementing effective containment measures and would include monitoring and annual inspections. Alternative 2 would segregate and remove all recoverable hazardous waste within the landfill and treat and/or dispose of it, thus greatly reducing potential threats to human and ecological receptors. All remaining solid wastes would be consolidated, and an effective cap would be installed to minimize infiltration and the generation of leachate. Alternative 3 would effectively remove all waste from contact with the Kuluk Bay shoreline and segregate any hazardous wastes from solid wastes excavated during the action. The solid waste would be reconsolidated onto the main area of the landfill, and the hazardous wastes would be treated and/or properly disposed of. A cap would then be installed over the remaining landfill areas to control infiltration and reduce leachate generation and migration.

Alternatives 2 and 3 would be designed to significantly minimize releases of hazardous substances into the air or surface water. Monitoring would ensure that the alternatives meet this goal. Based on the results of sampling conducted to date and the goals of the remedial design, it is anticipated that neither a landfill gas system nor a leachate treatment system would be required to meet RAOs. If monitoring shows that harmful levels of landfill gases are being released to the atmosphere, a gas collection and treatment system would need to be installed. Similarly, if harmful levels of contaminants are detected in water emanating downgradient of the landfill, then those waters would need to be treated prior to discharge to Kuluk Bay. Interim remedial design and/or action documents would establish specific methods, intervals, and action levels for monitoring the landfill before the OU A basewide ROD is released (scheduled for 1998). The basewide ROD, or its post-ROD documents, will then establish the long-term monitoring requirements for the site.

10.2.2 Compliance With Applicable or Relevant and Appropriate Federal and State Requirements

Unless waived, ARARs must be met when a remedial action becomes necessary. Because Alternative 1 does not entail taking action, ARARs would not be triggered (and no requirements would therefore be required). Both Alternative 2 and Alternative 3 would be designed and implemented to attain the ARARs, including the substantive requirements of both RCRA Subtitle C, Parts 261 and 264, and state solid waste closure requirements (18 AAC 60).

At the time of the proposed plan, Metals Landfill was designated as a RCRA hazardous waste landfill. The two action alternatives presented in the plan, therefore, were conceived specifically to meet RCRA's 40 CFR 264 landfill closure requirements. At this time, it is likely that only a portion of the site will require closure as a RCRA hazardous waste unit. For the remainder of the site, certain RCRA closure requirements will be relevant and appropriate. See Section 12.2 for a discussion of these requirements.

10.2.3 Long-Term Effectiveness and Permanence

Alternative 1 would take no action and, therefore, would not have long-term effectiveness or permanence. Both Alternatives 2 and 3 would be designed for long-term effectiveness and permanence. The long-term effectiveness and permanence of Alternative 2 may be greater than Alternative 3. Under Alternative 2, the entire landfill contents—approximately 400,000 cubic yards—would be excavated and inspected for hazardous wastes. Any hazardous waste discovered would be removed prior to reconsolidation of the landfill materials. Under Alternative 3, only the landfill material in contact with Kuluk Bay—approximately 75,000 cubic yards—would be removed. Any hazardous waste detected during the removal would be segregated.

The magnitude of residual risk and the ability of the selected remedy to maintain reliable protection of human health and the environment over time would be reevaluated as part of the findings and conclusions of the basewide RI/FS. Long-term monitoring for all three alternatives would be used to confirm the effectiveness of the action.

10.2.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

None of the alternatives assumes that the contaminants will be treated. Alternative 1 would not reduce the toxicity, mobility, or volume of contaminants. Both Alternatives 2 and 3 use "containment" measures, that is, measures to minimize contaminant mobility by placing a landfill cap over a portion of the site and effective drainage controls to reduce infiltration and minimize leachate generation. None of the three alternatives would actively reduce the toxicity of the contaminants; however, Alternatives 2 and 3 may reduce the volume of hazardous substances in the excavated portion of the landfill.

10.2.5 Short-Term Effectiveness

Alternative 1 would not provide protection but would not create adverse impacts either. Alternatives 2 and 3 would be designed to safely contain all landfilled waste and remove any detected hazardous wastes during excavation activities, reduce human exposure to wastes and leached contaminants, and reduce the generation and migration of leachate. Because Alternative 2 would involve excavating the entire landfill, the potential for releases to the environment and exposure of on-site personnel to hazardous substances would be much greater than that for Alternative 3. Alternatives 2 and 3 would require appropriate construction techniques to minimize short-term contaminant releases that may affect on-site personnel and the environment during remedial operations.

10.2.6 Implementability

The Navy would be able to implement any of the three alternatives. Alternative 2 would require large-scale construction activities as well as major hazardous waste management operations. Because of the proposed reduction of naval operations on Adak, support activities and facilities may not be available to support the scale of operations required for Alternative 2. Alternative 2 would require approximately 30 months to implement; Alternative 3 would require approximately 18 months. Variations within these projected timeframes depend on the availability of supplies and equipment, completion and acceptance of work plans, and on-island environmental conditions.

10.2.7 Cost

The projected cost of Alternative 1 is $270,000 for annual inspection and monitoring. The projected capital cost of Alternative 2 is $38,251,000, with a projected O&M cost of $785,000. The total estimated cost for Alternative 2 is $39,036,000. The projected capital cost of Alternative 3 is $14,184,000, with O&M costs projected at $927,000. The total estimated cost for Alternative 3 is $15,111,000. To estimate costs, it is assumed that the annual inspection and monitoring under Alternative 1 and the O&M under Alternatives 2 and 3 will be conducted over a 30-year period. Also, the landfill cap in Alternatives 2 and 3 is assumed to be a geomembrane cap, as shown in Figure 14. The initial cost of Alternative 2 is greater than that of Alternative 3 because of the difference in scale and the expense of segregation and treating and/or disposing of all recoverable hazardous wastes within the landfill; however, Alternatives 2 and 3 will require the same operational costs over 30 years.

The capital and O&M cost estimates for Alternatives 2 and 3 for Metals Landfill are presented in Table 2. The 30-year O&M costs are the present worth of the annual costs at an interest rate of 5 percent. The cost estimates provide an accuracy of +50 percent to -30 percent in accordance with EPA guidelines.

10.2.8 State Acceptance

ADEC was involved in the preparation of this plan and supports the selected remedial alternative pursuant to the State cleanup requirements set forth in 18 AAC 75 and AS 40.09.020.

Table 2
Proposed Plan Alternatives and Costs
Metals Landfill

Alternatives	Capital Cost ($)	30-Year Operation and Maintenance Cost ($)	Total Cost ($)
Alternative 1: No Action (Required by CERCLA to Be Considered)			
Monitoring	0	270,000	270,000
Alternative 2: Excavation, Segregation, Reconsolidation, and Capping of the Entire Landfill			
Mobilization	750,000	0	750,000
Excavation, segregation, and reconsolidation of landfill debris	22,220,000	0	22,220,000
Hazardous waste handling	495,000	0	495,000
Landfill cap	2,586,000	227,000	2,813,000
Groundwater monitoring	100,000	0	100,000
Surface water diversion	20,000	16,000	36,000
Institutional controls	6,000	5,000	11,000
Establishing vegetation	138,000	122,000	260,000
Cleanup of east section	65,000	0	65,000
Monitoring program	0	415,000	415,000
Subtotal	26,380,000	785,000	27,165,000
Weather conditions[a]	3,957,000	0	3,957,000
Miscellaneous unlisted items[b]	2,638,000	0	2,638,000
Engineering and management[c]	5,276,000	0	5,276,000
Total	38,251,000	785,000	39,036,000
Alternative 3: Debris Removal From Shoreline Areas and Landfill Cap			
Mobilization	750,000	0	750,000
Debris removal from surface water	4,985,000	0	4,985,000

Table 2 (Continued)
Proposed Plan Alternatives and Costs
Metals Landfill

Alternatives	Capital Cost ($)	30-Year Operation and Maintenance Cost ($)	Total Cost ($)
Alternative 3: (Continued)			
Hazardous waste handling	102,000	0	102,000
Landfill cap	3,607,000	227,000	3,834,000
Groundwater monitoring	109,000	0	109,000
Surface water diversion	20,000	16,000	36,000
Institutional controls	6,000	5,000	11,000
Establishing vegetation	138,000	172,000	310,000
Cleanup of east section	65,000	0	65,000
Monitoring program	0	507,000	507,000
Subtotal	9,782,000	927,000	10,709,000
Weather conditions[a]	1,467,000	0	1,467,000
Miscellaneous unlisted items[b]	978,000	0	978,000
Engineering and management[c]	1,957,000	0	1,957,000
Total	14,184,000	927,000	15,111,000

Note:
All costs are 1994 dollars.

[a]Weather conditions - A cost for downtime or reduction in productivity during construction due to inclement weather conditions has been added. The cost is based on 15 percent of the construction subtotal cost.

[b]Miscellaneous unlisted items - The level of detail available for this estimate does not permit establishing costs for every detail in the plan. An additional 10 percent of the construction subtotal cost has been added to cover this item.

[c]Engineering and management - An allowance totaling 20 percent of the construction subtotal cost has been added to include project engineering and management. This allowance is broken down into 5 percent for engineering and geotechnical investigations, 3 percent for administrative and legal costs, 6 percent for engineering design cost, and 6 percent for construction oversight and management.

10.2.9 Community Acceptance

Community acceptance was evaluated as part of the public comment period. The FFA parties have reviewed and considered public comments on this ROD and have incorporated comments to the decisionmaking process. The Responsiveness Summary (Appendix B) provides responses to public comments. In general, the public comments supported the preferred alternative presented in the proposed plan.

11.0 SUMMARY OF SELECTED ALTERNATIVE

Following consideration of public comment, the Navy, EPA, and ADEC selected a modified version of the proposed plan's preferred alternative for each site. Compared to other alternatives, the FFA parties believe the two selected remedies best achieve the goals of the NCP's nine evaluation criteria.

11.1 PALISADES LANDFILL

11.1.1 Rationale for the Selected Alternative

Alternative 2 was the preferred alternative identified in the April 1994 proposed plan. A modified version of Alternative 2, stream rerouting and site cover, is the selected interim action. This alternative has been selected because it achieves RAOs, and among the options evaluated, achieves them most cost-effectively.

The selected alternative will:

- Reduce potential erosion to the landfill surface and reduce the potential of water infiltrating the landfill debris by constructing small interceptor swales around the perimeter of the landfill.

- Reroute, via a pipe, a portion of Palisades Creek to separate non-contaminated stream water from contacting the landfill debris. This will provide an opportunity in the future to collect and treat leachate if contaminant levels become unacceptably high.

- Provide a landfill cover to minimize human exposure, direct or control run-on or runoff, and protect terrestrial receptors from contact with wastes and debris

- Provide institutional controls to restrict future land use at the landfill, warn the public of the landfill contents, and minimize the potential for activities at or near the surface of the site that could disturb the integrity of the cover

- Perform stream and sediment monitoring at the mouth of Palisades Creek to detect any releases to the nearshore marine environment

Very few public comments were received on the interim remedial action proposed plan. Although the comments did not voice unanimous approval for the preferred alternative at the landfill, there appeared to be little opposition to these actions. Commonly this would lead directly to selection and implementation of the preferred alternative. In this case, however, the FFA parties have concluded that certain modifications to the preferred alternative will improve the cost-effectiveness of the actual implemented actions. The reasons for these modifications at Palisades Landfill are as follows:

- Levels of hazardous substances do not currently appear to be releasing from the site at concentrations that would adversely affect the marine environment.

- While Palisades Landfill was the site of disposal of hazardous substances, the disposal date back in many cases to the late 1940s and 1950s. It is, therefore, likely that much of the hazardous disposal during those early years has subsequently released, volatilized, or biodegraded in the intervening period.

- Although Alternative 2 in the proposed plan (the preferred alternative) was designed to be as cost-effective as possible, overall costs were still considerable (potentially as high as $5 million plus). Much of the cost, especially the portion of the cost that went beyond $2 million, would be incurred by preparing the slopes of the Palisades ravine, and then installing a sitewide cap that would act as an infiltration barrier. As discussed below, the FFA parties now believe that, based on past sampling at the site, and the history of disposal, it is unlikely that a cap acting as an infiltration barrier may be needed at Palisades Landfill.

In scrutinizing the proposed plan's preferred alternative (April 1994) for Palisades Landfill, the FFA parties looked carefully at the nature of the site today, what its potential might be for environmental damage in the future, and what costs would be incurred by implementing different elements of the alternative. It appeared that significant cost savings could be realized if, because of the age of the site and the nature of the materials disposed of, a site-wide infiltration barrier would not be required to protect the marine environment from releases within the landfill.

There is the possibility that harmful levels of contaminants continue to exist in Palisades Landfill; however, a presumption that the current contents of the landfill will not pose a future risk to receptors is insufficiently conservative by itself. For example, there may be a number of petroleum or solvent drums that are present at the site and have yet to release. Because of this concern, the FFA parties evaluated a hypothetical drum release scenario that used worst case, but reasonable, assumptions about what materials could be in a drum at Adak and how that material might travel after being released at the site. The results of the evaluation showed that even with no cover or cap on the site, it was very unlikely that such a release would lead to exceedances of regulatory criteria in Palisades Creek or the nearshore Kuluk Bay environment. This finding also supports the assumption made in the proposed plan that a leachate treatment system is not required.

A consequence of not implementing slope stabilization and a site-wide cap that would serve as an infiltration barrier in the selected alternative is that a portion of the landfill will not be covered. This is the part of the landfill that lies on steep slopes in the ravine leading to the ocean. It is the opinion of the FFA parties that the ravine itself provides considerable physical deterrence to exposures to human receptors. The slopes are very steep, potentially unstable, and would present difficult passage for anyone trespassing onto the site.

The natural access obstacles combined with institutional controls may be sufficient to adequately protect human health; however, they are not viewed by themselves as a significant protection against unacceptable non-human terrestrial exposures. These exposures are possible, but there are no indications that animals inhabiting or frequenting the ravine are imminently at risk. The FFA parties believe that the risk to ecological receptors, based on the current knowledge of the types of animals that inhabit the area and the appearance of the exposed and weathered debris in the ravine, should be minimal from exposure to chemicals. A more rigorous evaluation of the risks posed by the ravine area will, however, be included within the scope of the basewide RI/FS.

The action at Palisades Landfill has not been preceded by a remedial investigation or feasibility study, and as such, is termed an interim remedial action. A comprehensive risk assessment will be performed during the NAF Adak basewide RI/FS, scheduled to begin in October 1996. As part of that RI/FS, the nearshore marine environment near Palisades Landfill will be investigated, and the effects of implementing these actions will be evaluated. At the conclusion of that process, the FFA parties may propose additional activities for the site as part of a final remedial action.

11.1.2 Description of Selected Alternative

The activities to be conducted under the selected alternative (surface water diversion, Palisades Creek rerouting, institutional controls, landfill cover, vegetation, and monitoring) and associated costs are described in the following paragraphs.

Surface Water Control

Controlling surface water will reduce potential erosion to the landfill surface and steep ravine embankment. Also, the potential of water infiltrating the landfill waste will be reduced. Surface water will be controlled as outlined for Alternative 2 and as shown on Figure 11.

Palisades Creek Rerouting

As discussed previously, the rerouting of Palisades Creek will be designed to reduce leaching of wastes and debris located in the creek bed.

In the upland area of the landfill, Palisades Creek presently flows through or under the landfill north of the ravine and along the eastern boundary of the landfill. In order to reroute Palisades Creek in the upland area of the landfill, an open channel will be constructed east of the present Palisades Creek location and outside of the landfill area (Figure 11). The open channel will be constructed in native soil and or rock from near where two streams merge to a point approximately 550 feet downstream. A depression area in the landfill surface has developed where the present Palisades Creek flows through the upland landfill area. After Palisades Creek has been rerouted, the depressed area will be filled with approximately 2,000 cubic yards of fill material to provide surface drainage and prevent the ponding of surface water. Approximately 550 lineal feet of 42-inch, HDPE pipe will be placed in the ravine, beginning at the end of the channel, and discharging into the existing creek bed at the bottom of the ravine. Rock riprap will be placed around the entrance and exit of the pipe to minimize erosion. The pipe will be placed on select gravel material and covered with fill material (Figure 19). The purpose of the fill material around the 42-inch HDPE pipe will be to stabilize the pipe and protect it from becoming crushed or punctured by the surrounding ravine debris. All fill, select gravel, and riprap materials will be processed on or collected from Adak Island.

Institutional Controls

Institutional controls will involve land use restrictions and controls established under the authority of the NAF Adak Commanding Officer. Property transfer for Palisades Landfill will require that a deed restriction be attached. The boundaries of the landfill will be referenced to the survey system and existing monuments on Adak Island. Warning signs will be installed at equally spaced intervals around the perimeter of the landfill to warn the public of its contents. Long-term institutional controls will be addressed as part of the basewide ROD or its post-ROD documents.

Landfill Cover

The landfill cover will minimize human exposure, direct or control run-on or runoff, and protect terrestrial receptors from contact with landfill wastes and debris. Based on a preliminary analysis, an estimated 3-foot-thick landfill cover will protect terrestrial receptors from burrowing and contacting landfill wastes and debris. The landfill cover material will be secured from the nearest acceptable borrow pits somewhere near the landfill or accessible to existing roads. The selection of specific borrow pits and quarries will be part of the engineering and geotechnical evaluation during the design stage. The landfill cover will be constructed on the top, flat section of the landfill and will be limited to depressed areas within the existing landfill cover, areas with exposed landfill debris, and areas where the existing landcover is inadequate to protect terrestrial receptors. The exact design for a cover will be completed after predesign studies and geotechnical testing on the landfill area is complete. Repair efforts will be conducted if erosion degraded the performance of the cap.

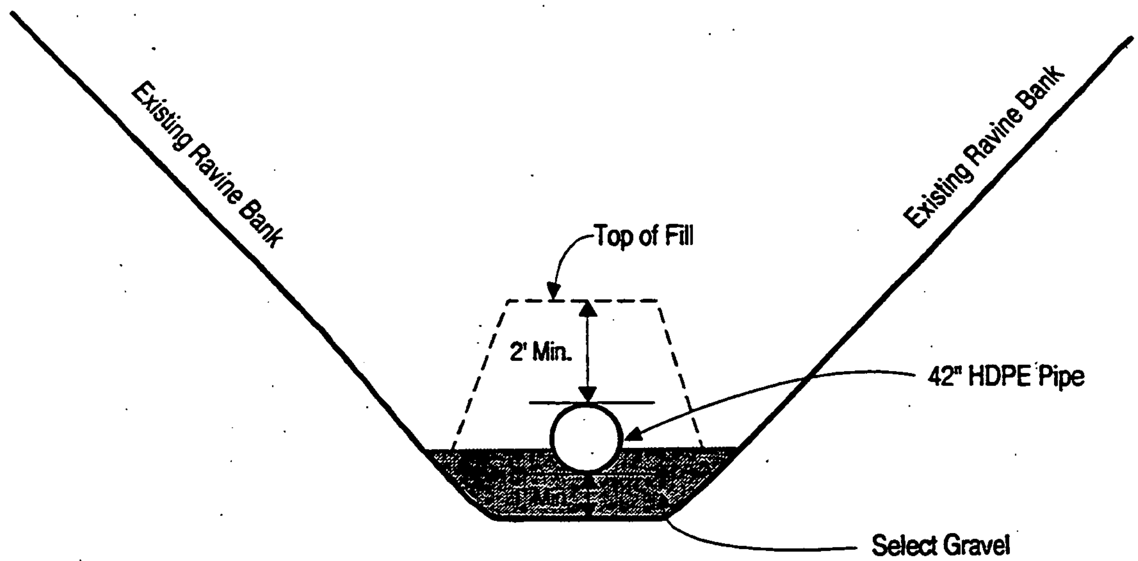

Figure 19
Pipe Bedding, Selected Alternative
Palisades Landfill

Vegetation

After the soil cover has been installed and graded, the disturbed areas will be seeded and measures will be taken to prevent erosion. Erosion control measures may include jute matting, filter fabric fences, and hay/straw bales.

Monitoring Program

It will be necessary to monitor the landfill in order to evaluate the effectiveness of the IRA. Samples will be collected from the mouth of Palisades Creek to provide an indication of water and sediment quality in the nearshore marine environment. The samples will be collected downstream of the 42-inch HDPE pipe and before discharge to Kuluk Bay. The presence of landfill gas will be monitored for at the perimeter of the landfill with the use of a combustible gas meter. The overall physical condition of the landfill will be inspected to determine whether erosion or settlement has occurred that would be detrimental to the landfill or would pose a potential danger to the environment. Repair efforts will be conducted if erosion has degraded the performance of the cap.

For the purpose of estimating costs, it has been assumed that monitoring will be conducted annually for 30 years. Interim remedial action design and/or action documents will establish specific methods, intervals, and action levels for monitoring the landfill before the OU A basewide ROD is issued (scheduled for 1998). The basewide ROD, or its post-ROD documents, will then establish the long-term monitoring requirements for the site.

Cost

The projected capital cost of the selected alternative is $1,987,000, with O&M costs projected at $288,000. The capital and O&M cost estimates for the selected Palisades Landfill interim remedial action are presented in Table 3. The 30-year O&M costs are the present worth of the annual costs at an interest rate of 5 percent. The cost estimates provide an accuracy of +50 percent to -30 percent in accordance with EPA guidelines. The selected alternative will require approximately 18 months to implement. Variations within the projected timeframe depend on the availability of supplies and equipment, completion and approval of work plans, and on-island environmental conditions.

Table 3
Selected Alternative Costs
Palisades Landfill

Element	Capital Cost ($)	30-Year Operation and Maintenance Cost ($)	Total Cost ($)
Mobilization	750,000	0	750,000
Palisades Creek rerouting	172,000	16,000	188,000
Landfill cover	401,000	27,000	428,000
Surface water diversion	10,000	16,000	26,000
Institutional controls	5,000	5,000	10,000
Establishing vegetation	32,000	8,000	40,000
Monitoring	0	216,000	216,000
Subtotal	1,370,000	288,000	1,658,000
Weather conditions[a]	206,000	0	206,000
Miscellaneous unlisted items[b]	137,000	0	137,000
Engineering and management[c]	274,000	0	274,000
Total	1,987,000	288,000	2,275,000

Note:
All costs are 1994 dollars.

[a]Weather conditions - A cost for downtime or reduction in productivity during construction due to inclement weather conditions has been added. The cost is based on 15 percent of the construction subtotal cost.

[b]Miscellaneous unlisted items - The level of detail available for this estimate does not permit establishing costs for every detail in the plan. An additional 10 percent of the construction subtotal cost has been added to cover this item.

[c]Engineering and management - An allowance totaling 20 percent of the construction subtotal cost has been added to include project engineering and management. This allowance is broken down into 5 percent for engineering and geotechnical investigations, 3 percent for administrative and legal costs, 6 percent for engineering design cost, and 6 percent for construction oversight and management.

11.2 METALS LANDFILL

11.2.1 Rationale for the Selected Alternative

Alternative 3 was the preferred alternative identified in the April 1994 proposed plan. A modified version of Alternative 3, site cover, shoreline site removal evaluation, and monitoring, is the selected interim action. This alternative was selected because it achieves RAOs and, among the options evaluated, achieves them most cost-effectively. After soliciting public comment last spring on actions designed to remediate Palisades and Metals Landfills, the FFA parties reconsidered the scope and scale of the April 1994 proposed plan's preferred alternatives. As a result, the parties have determined that the actual selected remedies should be modifications of those previously proposed to the public.

The selected alternative will:

- Perform a site removal evaluation on the shoreline debris in contact with Kuluk Bay, located along the northern section of Metals Landfill. The shoreline debris will be inspected and material that could adversely affect the marine environment will be removed from the shoreline and placed in the landfill. Sediment samples will be taken and the results will be screened against RBSC. If exceedances of RBSC can be linked to the debris present, that debris will be removed from the shoreline and properly disposed. The debris will be evaluated for stability and, if necessary, measures will be taken to prevent further debris from contacting the marine environment.

- Reduce potential erosion to the landfill surface and reduce the potential of water infiltrating the landfill debris by constructing small interceptor swales on the uphill side of the landfill.

- Provide a landfill cover to minimize human exposure, direct or control run-on or runoff, and protect terrestrial receptors from contact with wastes and debris.

- Provide institutional controls to restrict future land use at the landfill, warn the public of the landfill contents, and minimize the potential for activities at or near the surface of the site that could disturb the integrity of the cover. Institutional controls would involve land use restrictions and controls established under the authority of the NAF Adak Commanding Officer.

- Perform groundwater monitoring to detect any releases to the groundwater and Kuluk Bay to avoid impacts to the marine environment.

Very few public comments were received on the interim action proposed plan. Although the comments did not voice unanimous approval for the preferred alternative at the landfill, there appeared to be little opposition to these actions. Commonly this would lead directly to selection and implementation of the preferred alternative. In this case, however, the FFA parties have concluded that certain modifications to the preferred alternative will improve the actual implemented actions. The reasons for these modifications at Metals Landfill are as follows:

- Levels of hazardous substances do not currently appear to be releasing from the site at high concentrations.

- Although Alternative 3 in the proposed plan (the preferred alternative) was designed to be as cost-effective as possible, overall costs were still considerable (potentially as high as $15 plus million). Much of the cost would be incurred by removing debris from the shoreline and in contact with Kuluk Bay and installing a landfill cap that would act as an infiltration barrier. As discussed below, the FFA parties now believe that, based on past sampling at the site and the history of disposal, it is unlikely that an infiltration barrier and complete debris removal from the shoreline of Kuluk Bay may be needed at Metals Landfill.

- Since the signing of the FFCA in November 1990, all but approximately 1 acre of the Metals Landfill is expected to be redesignated as an RCRA nonhazardous SWMU. The remaining 1 acre, which is known to have received hazardous waste, is expected to be treated as a hazardous waste pile. Currently, RCRA Closure Plans are being developed for the hazardous waste pile. The anticipated redesignation of over 90 percent of Metals Landfill allows the FFA parties to focus the IRA more exclusively on potential exposure pathways and associated risk.

In scrutinizing the preferred alternative for Metals Landfill, the FFA parties looked carefully at the nature of the site today, what its potential might be for environmental damage in the future, and what costs/benefits would be incurred by implementing different elements of the alternative. It appeared that significant cost savings could be realized if the following would not be required to protect the marine environment from releases within the landfill: removing all debris from the shoreline of Kuluk Bay and installing an infiltration barrier.

The consequences of not pursuing complete shoreline debris removal and not installing the infiltration barrier are that the marine environment will be exposed to the debris and any leachate generated within the landfill could possibly migrate into the groundwater and Kuluk Bay. The FFA parties believe that the risk to marine receptors, based on the current knowledge of the types of marine animals that inhabit the area and the appearance of the exposed and weathered debris on the shoreline and in contact with Kuluk Bay, should be minimal. These exposures are possible, but there are no indications that animals inhabiting or frequenting the landfill or shoreline debris are imminently at risk. A more rigorous evaluation of the risks posed by the exposed debris on the shoreline and in contact with Kuluk Bay will be included within the scope of the basewide RI/FS.

Based on recent (1992 to 1993) limited groundwater data from groundwater monitoring wells located on the seaward side of Metals Landfill, there are no indications that Metals Landfill is impacting the groundwater to such an extent that receptors in Kuluk Bay will be harmed. Debris and sediment sampling and characterization, and a more rigorous evaluation of the risks posed by groundwater contamination will be included within the scope of the basewide RI/FS.

Since there is the possibility that harmful levels of contaminants continue to exist in Metals Landfill, a presumption that the current contents of the landfill will not pose a future risk to receptors is insufficiently conservative by itself. As part of the implementation of the selected action, a monitoring program and a site removal evaluation will be initiated to ensure that all RAOs are met. The monitoring program will include sampling of groundwater and inspection and maintenance procedures for the covered landfill. Also, the site removal evaluation will include sampling of the shoreline debris and sediments around the shoreline debris and in contact with Kuluk Bay.

Since the preferred alternative was presented in the April 1994 proposed plan, a portion of the Metals Landfill was proposed to be designated a hazardous waste pile under

RCRA. The remainder of the landfill would then be designated a solid waste management unit. Closure plans have been submitted to EPA and it appears that the area designated a hazardous waste pile will be closed under RCRA guidelines. If the RCRA designation of the site does not proceed as expected, a contingent alternative (see Section 11.2.4) will be implemented. Elements contained in the selected remedy therefore will be designed to be consistent with the contingent alternative. If the RCRA redesignation proceeds as expected, community relation efforts will be initiated to update the public on remedial action progress at the landfill. A fact sheet will be issued to confirm the implementation of the selected alternative. If the decision is made to implement the contingent alternative, then the Navy will issue an "Explanation of Significant Differences" to document the changes from the selected alternative.

The action at Metals Landfill has not been preceded by a remedial investigation or feasibility study and, as such, is termed an interim remedial action. A comprehensive risk assessment will be performed during the NAF Adak basewide RI/FS, scheduled to begin in October 1996. As part of that RI/FS, the nearshore marine environment near Metals Landfill will be investigated and the effects of implementing these actions will be evaluated. At the conclusion of that process, the FFA parties may propose additional activities for the site as part of a final remedial action.

11.2.2 Description of the Selected Alternative

The activities to be conducted under the selected alternative (surface water diversion, site removal evaluation, groundwater monitoring, landfill cover, vegetation, institutional controls, and landfill monitoring), and associated costs are described in the following paragraphs.

Surface Water Control

Small interceptor swales will be constructed on the uphill side of the landfill at the base of Monument Hill to collect water flowing off the hill above the landfill and to route the water into Kuluk Bay (Figure 16). A V-shaped channel approximately 1 foot deep will collect and transport the water.

Site Removal Evaluation

The site removal evaluation will be a limited investigation and assessment on the shoreline debris area to determine risks posed by the debris in contact with Kuluk Bay.

The shoreline debris is located in the northern section of the landfill. The evaluation will include a location survey of the debris and characteristics (i.e., erosion patterns, tidal affects, debris, and sediment analysis). The shoreline debris will be inspected and material that could adversely affect the marine environment will be removed from the shoreline and either landfilled or disposed of off site. Sediment samples will be taken and the results will be screened against appropriate marine RBSCs. If exceedances of RBSC can be linked to the debris present, that debris will also be evaluated for removal from the shoreline. The debris will be evaluated for stability and, if necessary to protect human health and the environment, measures will be taken to prevent further debris from contacting the marine environment. These measures may include riprap along the debris in contact with Kuluk Bay or partial or complete debris removal.

Groundwater Monitoring

Groundwater monitoring provides a monitoring system to enable the FFA parties to determine whether future releases of contaminants from the site could pose an unacceptable impact to the marine environment. Monitoring will identify trends in contaminant levels and provide adequate warning for the implementation of engineered groundwater controls if impacts are observed. Five existing monitoring wells have been drilled on site. It is estimated that five additional monitoring wells will be drilled, at a spacing of approximately 200 feet on center, as monitoring points near the eastern perimeter of the site toward Kuluk Bay. It is believed that Monument Hill is a barrier to movement of groundwater from the upland area of the island and that any leachate will be derived principally from percolation through the landfill. The surface of the landfill will be graded to provide drainage to reduce the quantity of water that percolates through the landfill.

Landfill Cover

The landfill cover will minimize human exposure, direct or control run-on or runoff, and protect terrestrial receptors from contact with landfill wastes and debris. Based on a preliminary analysis, an estimated 3-foot-thick landfill cover will protect terrestrial receptors from burrowing and contacting landfill wastes and debris. The landfill cover material will be secured from the nearest acceptable borrow pits somewhere near the landfill or accessible by existing roads. The selection of specific borrow pits and quarries will be part of the engineering and geotechnical evaluation during the design stage. The landfill cover will be limited to depressed areas within the existing landfill cover, areas with exposed landfill debris, and areas where the existing landcover is inadequate to protect terrestrial receptors. The exact design for a cover will be completed after the site removal evaluation, predesign studies and geotechnical testing on the landfill area is complete.

Vegetation

After the soil cover has been installed and graded, the disturbed areas will be seeded and measures will be taken to prevent erosion. Erosion control measures may include jute matting, filter fabric fences, and hay/straw bales.

Institutional Controls

Institutional controls will involve land use restrictions and controls established under the authority of the NAF Adak Commanding Officer. Property transfer for Metals Landfill will require that a deed restriction be attached and that the requirements of CERCLA Section 120(h) be met. The boundaries of the landfill will be referenced to the survey system and existing monuments on Adak Island. Warning signs will be installed at equally spaced intervals around the perimeter of the landfill to warn the public of its contents. Long-term institutional controls will be addressed as part of the basewide ROD or its post-ROD documents.

Landfill Monitoring

It will be necessary to monitor the landfill. The presence of gas in the landfill will be primarily monitored for at the perimeter of the landfill's main section with the use of a combustible gas meter. The overall physical condition of the landfill will be inspected annually to ensure that systems are still performing adequately and to determine whether erosion or settlement has occurred that would be detrimental to the landfill or would pose a potential danger to the environment. Repair efforts will be conducted if erosion degraded the performance of the cap.

To estimate costs, it has been assumed that monitoring will be conducted annually for 30 years. Interim remedial action design and/or action documents will establish specific methods, intervals, and action levels for monitoring the landfill before the OU A basewide ROD is issued (scheduled for 1998). The basewide ROD, or its post-ROD documents, will then establish the long-term monitoring requirements for the site.

Cost

Although riprap for the north section shoreline was not included as an activity under the selected alternative, it has been included as a cost item. It is anticipated that the shoreline debris will probably not require stabilization, but the IRA site removal evaluation will evaluate this option and provide cleanup recommendations prior to the implementation of any excavation or stabilization actions. Since it is expected that only a small amount of the debris will actually require excavation, to be reasonably conservative in the overall cost estimate it has been assumed that riprap stabilization (at a cost of $360,000) will be required at the northern section of the landfill. Also, it has been assumed that no debris removal will be required.

The projected capital cost of the selected alternative is $5,000,000 with O&M costs projected at $521,000. The capital and O&M cost estimates for the Metals Landfill interim remedial action are presented in Table 4. The 30-year O&M costs are the present worth of the annual costs at an interest rate of 5 percent. The cost estimates provide an accuracy of +50 percent to -30 percent in accordance with EPA guidelines. The selected alternative will require approximately 18 to 24 months to implement and will depend on the site removal evaluation results. Variations within the projected timeframe depend on the availability of supplies and equipment and completion of remedial design studies.

11.2.3 Rationale for the Contingent Alternative

Since the preferred alternative was presented in the April 1994 proposed plan, approximately 1 acre of the Metals Landfill is expected to be designated an RCRA hazardous waste pile. The remainder of the landfill would then be designated as an RCRA solid waste management unit. Currently, an RCRA Closure Plan is being developed for the hazardous waste site.

The contingent alternative would be implemented in the unlikely event the RCRA designation does not proceed as expected.

11.2.4 Description of the Contingent Alternative

Most activities conducted under the Metals Landfill contingent alternative (surface water control, site removal evaluation, groundwater monitoring, vegetation, institutional controls, and landfill monitoring) would remain as described in the selected alternative.

Table 4
Selected Alternative Costs
Metals Landfill

Elements	Capital Cost ($)	30-Year Operation and Maintenance Cost ($)	Total Cost ($)
Mobilization	750,000	0	750,000
Site removal evaluation	222,000	0	222,000
Landfill cover	1,890,000	84,000	1,974,000
Groundwater monitoring	100,000	0	100,000
Surface water diversion	20,000	16,000	36,000
Institutional controls	6,000	5,000	11,000
Establishing vegetation	100,000	26,000	126,000
Riprap for north section shoreline	360,000	0	360,000
Monitoring program	0	390,000	390,000
Subtotal	3,448,000	521,000	3,969,000
Weather conditions[a]	517,000	0	517,000
Miscellaneous unlisted items[b]	345,000	0	345,000
Engineering and management[c]	690,000	0	690,000
Total	5,000,000	521,000	5,521,000

Note:
All costs are 1994 dollars.

[a]Weather conditions - A cost for downtime or reduction in productivity during construction due to inclement weather conditions has been added. The cost is based on 15 percent of the construction subtotal cost.

[b]Miscellaneous unlisted items - The level of detail available for this estimate does not permit establishing costs for every detail in the plan. An additional 10 percent of the construction subtotal cost has been added to cover this item.

[c]Engineering and management - An allowance totaling 20 percent of the construction subtotal cost has been added to include project engineering and management. This allowance is broken down into 5 percent for engineering and geotechnical investigations, 3 percent for administrative and legal costs, 6 percent for engineering design cost, and 6 percent for construction oversight and management.

Only the landfill cover and cost elements would change. These changes to the two elements are discussed below.

Landfill Cap

The purpose of the landfill cap is to minimize human exposure, direct or control run-on or runoff, and reduce infiltration from precipitation, thereby minimizing leachate generation. The landfill cap would be installed over part or all of the 17-acre landfill. It is assumed that a geomembrane cap similar to the cross section shown in Figure 14 and as described under Section 9.2.3 will be required to close the landfill under RCRA. If a cap is only installed over part of the landfill, then an estimated 3-foot-thick landfill cover would be placed over the uncapped area(s) (see Section 11.2.2, "Landfill Cover").

It is anticipated that some areas might settle when large objects possibly buried in the landfill collapse. The landfill would be inspected annually as a part of the monitoring program, and repairs would be made to settlements that might rupture the cap. Some erosion might occur until vegetation is established. Repair efforts would be conducted if erosion degraded the performance of the cap.

Cost

For cost estimating purposes, it was assumed that the entire landfill would require a cap. The projected capital cost of the contingent alternative is $8,271,000, with O&M costs projected at $625,000. The capital and O&M cost estimates for the Metals Landfill contingent interim remedial action are presented in Table 5. The 30-year O&M costs are the present worth of annual costs. The cost estimates provide an accuracy of +50 to -30 percent, in accordance with EPA guidelines.

11.3 EVALUATION BY THE NCP'S NINE CRITERIA

The selected and contingent alternatives were evaluated using the nine criteria presented in the NCP for conducting remedial investigations and feasibility studies under CERCLA. The nine criteria are:

- Overall protection of human health and environment
- Compliance with ARARs

Table 5
Contingent Alternative Costs
Metals Landfill

Element	Capital Cost ($)	30-Year Operation and Maintenance Cost ($)	Total Cost ($)
Mobilization	750,000	0	750,000
Site removal evaluation	222,000	0	222,000
Landfill cap	4,146,000	188,000	4,334,000
Groundwater monitoring	100,000	0	100,000
Surface water diversion	20,000	16,000	36,000
Institutional controls	6,000	5,000	11,000
Establishing vegetation	100,000	26,000	126,000
Riprap for north section shoreline	360,000	0	360,000
Monitoring program	0	390,000	390,000
Subtotal	5,704,000	625,000	6,329,000
Weather conditions[a]	856,000	0	856,000
Miscellaneous unlisted items[b]	570,000	0	570,000
Engineering and management[c]	1,141,000	0	1,141,000
Total	8,271,000	625,000	8,896,000

Note:
All costs are 1994 dollars.

[a]Weather conditions - A cost for downtime or reduction in productivity during construction due to inclement weather conditions has been added. The cost is based on 15 percent of the construction subtotal cost.

[b]Miscellaneous unlisted items - The level of detail available for this estimate does not permit establishing costs for every detail in the plan. An additional 10 percent of the construction subtotal cost has been added to cover this item.

[c]Engineering and management - An allowance totaling 20 percent of the construction subtotal cost has been added to include project engineering and management. This allowance is broken down into 5 percent for engineering and geotechnical investigations, 3 percent for administrative and legal costs, 6 percent for engineering design cost, and 6 percent for construction oversight and management.

- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, or volume through treatment
- Short-term effectiveness
- Implementability
- Cost
- State acceptance
- Community acceptance

11.3.1 Palisades Landfill

Overall Protection of Human Health and Environment

The selected alternative will meet all the RAOs identified for this site. The landfill cover will minimize human and ecological exposure to the wastes contained in the landfill. Currently, Palisades Creek flows through the landfill. By rerouting Palisades Creek into an engineered pipe, contact between surface water and landfill waste will be minimized.

Computer modeling has supported the assumption that potential releases from the landfill will not adversely affect the marine environment. Results of the computer modeling can be found in the Technical Memorandum. Monitoring will ensure harmful levels of contaminants will not be present in surface water downgradient of the landfill. If unacceptable levels of contaminants are detected emanating downgradient of the landfill after the IRA is implemented, the FFA parties will evaluate additional actions to address the problem.

Compliance With ARARs

At the time of the proposed plan, the preferred alternative was conceived specifically to meet the relevant and appropriate portions of RCRA 40 CFR 264, landfill closure requirements. Since issuance of the proposed plan, the FFA parties have modified the remedial action objectives for the site. As a consequence, the RCRA capping requirements pertaining to minimizing infiltration are no longer considered relevant and appropriate. The selected alternative will be designed and implemented to attain the current ARARs (see Section 12.2).

Long-Term Effectiveness and Permanence

The selected alternative will be designed for long-term effectiveness and permanence. Rerouting of the creek will be designed to maximize long-term effectiveness of separating surface water from landfill debris. The addition of the landfill cover will effectively and permanently reduce contact with the site surface.

The magnitude of residual risk and the ability of the selected remedy to maintain reliable protection of human health and the environment over time will be reevaluated as part of the findings and conclusions of the basewide RI/FS. Monitoring will be used to confirm the effectiveness of the action. Long-term monitoring requirements for Palisades Landfill will be established under the basewide ROD.

Reduction of Toxicity, Mobility, or Volume Through Treatment

Treatment is not envisioned to be part of the IRA. The selected alternative will not reduce the toxicity or volume of the contaminants. It will reduce the mobility of the contaminants by placing a cover over the site and constructing effective drainage controls to reduce infiltration and minimize leachate generation.

Short-Term Effectiveness

During implementation of these IRAs, the selected alternative will safely contain all landfilled waste, reduce human exposure to wastes and leached contaminants, and reduce the generation and migration of leachate. Appropriate construction techniques will be used to minimize short-term contaminant releases that might affect on-site personnel and the environment during remedial operations.

Implementability

The Navy will be able to implement the selected alternative. Construction activities will incur high costs for mobilizing equipment and personnel to a remote location. It is estimated that the selected alternative will require approximately 18 months to implement. Variations within this projected timeframe will depend on the availability of supplies and equipment, completion and acceptance of work plans, and on-island environmental conditions.

Cost

The projected capital cost of the selected alternative is $1,987,000 with O&M costs projected to be $288,000. This gives a total projected cost for the selected alternative of $2,275,500.

The O&M costs are the present worth of the annual costs over a 30-year period. The cost estimates provide an accuracy of +50 percent to -30 percent in accordance with EPA guidelines.

State Acceptance

ADEC was involved in the preparation of the ROD and supports the selected alternative pursuant to the State cleanup requirements set forth in 18 AAC 75 and AS 40.09.020.

Community Acceptance

Community acceptance was evaluated as part of the first public comment period. In general, the public supported the preferred alternative presented in the April 1994 proposed plan. The selected alternative is considered to be a logical outgrowth of the preferred alternative and information presented in the proposed plan and could have been reasonably anticipated. Because of the changes from the proposed plan's preferred alternative to the ROD's selected alternative, a second comment period was conducted from January 16, 1995, to February 7, 1995. The comment period was initiated through a fact sheet, with no public meetings being conducted during the second comment period. No public comments were received during the second comment period.

11.3.2 Metals Landfill—Selected Alternative

Overall Protection of Human Health and Environment

The selected alternative will meet all the RAOs identified for this site. The landfill cover will minimize human and ecological exposure to the wastes contained in the landfill. By characterizing/stabilizing the shoreline debris, potential for adverse impacts to the environment will be minimized.

Monitoring will ensure harmful levels of contaminants will not be present in the near shore environment. If unacceptable levels of contaminants are detected in water emanating downgradient of the landfill after the IRA is implemented, the FFA parties will evaluate additional actions to address the problem.

Compliance With ARARs

At the time of the proposed plan, the preferred alternative was conceived specifically to meet the relevant and appropriate portions of RCRA 40 CFR 264, landfill closure requirements. At this time it is likely that only a portion of the site will require closure as an RCRA hazardous waste unit. For the remainder of the site, certain RCRA closure requirements will be relevant and appropriate. The selected alternative will be designed and implemented to meet the current ARARs (see Section 12.2).

Long-Term Effectiveness and Permanence

The selected alternative will be designed for long-term effectiveness and permanence. With the characterization and potential stabilization of the shoreline debris, the near shore marine environment will be effectively protected from imminent hazardous releases. By placing a cover over portions or all of the landfill, human and ecological exposure to landfill wastes at the surface will be permanently and effectively prevented.

The magnitude of residual risk and the ability of the selected remedy to maintain reliable protection of human health and the environment over time will be reevaluated as part of the findings and conclusions of the basewide RI/FS. Monitoring will be used to confirm the effectiveness of the action. Long-term monitoring requirements for Metals Landfill will be established under the basewide ROD.

Reduction of Toxicity, Mobility, or Volume Through Treatment

Treatment is not envisioned as part of the IRA. The selected alternative, however, will reduce the toxicity and/or volume of any contaminants detected in the shoreline debris by removal and disposal. It will also reduce the mobility of the contaminants by placing a cover over the site and constructing effective drainage controls to reduce infiltration and minimize leachate generation.

Short-Term Effectiveness

During implementation of the IRAs, the selected alternative will be designed to safely contain all landfilled waste, reduce human exposure to wastes and leached contaminants, and reduce the generation and migration of leachate. Appropriate construction techniques will be used to minimize short-term contaminant releases that might affect on-site personnel and the environment during remedial operations.

Implementability

The Navy will be able to implement the selected alternative. Construction activities will incur high costs for mobilizing equipment and personnel to a remote location. It is estimated that the selected alternative will require approximately 18 months to implement. Variations within this projected timeframe will depend on the availability of supplies and equipment, completion and acceptance of work plans, and on-island environmental conditions.

Cost

The projected capital cost of the selected alternative is $5,000,000 with O&M costs projected to be $521,000. This gives a total projected cost for the selected alternative of $5,521,000.

The O&M costs are the present worth of the annual costs over a 30-year period. The cost estimates provide an accuracy of +50 percent to -30 percent in accordance with EPA guidelines.

State Acceptance

ADEC was involved in the preparation of the ROD and supports the selected alternative pursuant to the State cleanup requirements set forth in 18 AAC 75 and AS 40.09.020.

Community Acceptance

Community acceptance was evaluated as part of the first public comment period. In general, the public supported the preferred alternative presented in the April 1994 proposed plan. Because of the significant changes from the proposed plan's preferred alternative to the ROD's selected alternative, a second comment period was conducted from January 16, 1995, to February 7, 1995. The comment period was initiated through a fact sheet, with no public meetings being conducted during the second comment period. No public comments were received during the second comment period.

11.3.3 Metals Landfill—Contingent Alternative

Overall Protection of Human Health and Environment

The contingent alternative would meet all the RAOs identified for this site. The landfill cap would minimize human and ecological exposure to the wastes contained in the landfill. By characterizing/stabilizing the shoreline debris, potential for adverse impacts to the environment will be minimized.

Monitoring would ensure harmful levels of contaminants would not be present in the near shore environment. If unacceptable levels of contaminants were detected in water emanating downgradient of the landfill, then the FFA parties would evaluate additional actions to address the problem during the basewide RI/FS.

Compliance With ARARs

At the time of the proposed plan, the preferred alternative was conceived specifically to meet the substantive portions of RCRA 40 CFR 264, landfill closure requirements. At this time it is likely that only a portion of the site would require closure as an RCRA hazardous waste unit; however, the contingent alternative would include a cap over part or all of landfill in the event that the RCRA designation does not proceed as expected and the site needs to be closed as a hazardous waste landfill. The contingent alternative would be designed and implemented to meet the ARAR requirements (see Section 12.2).

Long-Term Effectiveness and Permanence

The contingent alternative would be designed for long-term effectiveness and permanence. With the characterization and potential stabilization of the shoreline debris, long-term effectiveness would be obtained for the near shore marine environment. By placing a cap over portions or all of the landfill, a permanent barrier would be placed to minimize human and ecological exposure to landfill wastes.

The magnitude of residual risk and the ability of the contingent remedy to maintain reliable protection of human health and the environment over time would be reevaluated as part of the findings and conclusions of the basewide RI/FS. Monitoring would be used to confirm the effectiveness of the action. Long-term monitoring requirements for Metals Landfill would be established under the basewide ROD.

Reduction of Toxicity, Mobility, or Volume Through Treatment

Treatment is not envisioned as part of the IRA. The contingent alternative, however, will reduce the toxicity and/or volume of any contaminants detected in the shoreline debris by removal and disposal. It will also reduce the mobility of the contaminants by placing a cover over the site and constructing effective drainage controls to reduce infiltration and minimize leachate generation.

Short-Term Effectiveness

During implementation of the IRAs, the contingent alternative would be designed to safely contain all landfilled waste, reduce human exposure to wastes and leached contaminants, and reduce the generation and migration of leachate. Appropriate construction techniques would be used to minimize short-term contaminant releases that may affect on-site personnel and the environment during remedial operations.

Implementability

The Navy would be able to implement the contingent alternative. Construction activities would incur high costs for mobilizing equipment and personnel to a remote location. It is estimated that the selected alternative would require approximately 18 months to implement. Variations within this projected timeframe would depend on the availability of supplies and equipment, completion and acceptance of work plans, and on-island environmental conditions.

Cost

The projected capital cost of the contingent alternative is $8,271,000 with O&M costs projected to be $625,000. This gives a total projected cost for the contingent alternative of $8,896,000.

The O&M costs are the present worth of the annual costs over a 30-year period. The cost estimates provide an accuracy of +50 percent to -30 percent in accordance with EPA guidelines.

State Acceptance

ADEC was involved in the preparation of the ROD and supports the contingency alternative pursuant to the State cleanup requirements set forth in 18 AAC 75 and AS 40.09.020.

Community Acceptance

Community acceptance was evaluated as part of the first public comment period. In general, the public supported the preferred alternative presented in the April 1994 proposed plan. The preferred alternative was similar to the contingent alternative. Both alternatives include an RCRA cap, but the contingent alternative evaluates the shoreline debris prior to any removal activity. Because of the significant changes from the proposed plan's preferred alternative to the ROD's selected alternative, a second comment period was conducted from January 16, 1995, to February 7, 1995. The comment period was initiated through a fact sheet, with no public meetings being conducted during the second comment period. No public comments were received during the second comment period.

12.0 STATUTORY DETERMINATIONS

Under Section 121 of CERCLA, selected remedies must be protective of human health and the environment, comply with ARARs, be cost-effective, and use permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies whose principal element is treatment that significantly and permanently reduces the volume, toxicity, or mobility of hazardous wastes. The selected and contingent alternatives have been chosen so as to be consistent with any envisioned final remedial actions at these two landfills. The following sections discuss how the selected alternative for Palisades Landfill and the selected and contingent alternatives for Metals Landfill meet with these statutory requirements.

12.1 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The selected IRA for Palisades Landfill and the selected and contingent IRAs for Metals Landfill protect human health and the environment by covering areas where wastes and debris have been disposed and by institutionally restricting access to the sites. Monitoring and maintenance activities will be designed to ensure long-term protectiveness.

Installation of the landfill cover will minimize human contact with debris and control run-on or runoff. It will also protect terrestrial receptors from contact with the wastes and debris. Constructing perimeter ditches will reduce potential erosion to the landfill surface and reduce the potential of water infiltrating the landfill debris. A monitoring program will be initiated to inspect and maintain the integrity of the cover and to detect any releases to the nearshore marine environment through surface water and sediment sampling. Implementing institutional controls will restrict future land use at the landfill, warn the public of the landfill contents, and minimize the potential for activities at or near the surface of the site that could disturb the integrity of the cover. Repair efforts would be conducted if erosion degraded the performance of the cover.

Implementation of the IRAs for either landfill will not pose unacceptable short-term risks for site workers or residents. There are currently no existing or planned residential dwellings in the vicinity of the landfills.

12.2 COMPLIANCE WITH ARARS

The selected IRA for Palisades Landfill and the selected and contingent IRAs for Metals Landfill will comply with federal and state ARARs. No waiver of any ARAR is being sought or invoked at this time for any component of the selected remedy.

12.2.1 Palisades Landfill Action-Specific ARARs

The action-specific ARARs for Palisades Landfill are described below.

- 40 C.F.R. part 257 specifies federal requirements for the classification of solid waste disposal facilities and associated practices. This regulation is not applicable, since the wastes were placed in the landfill before 1979. However, there are three substantive requirements of subsections of 40

C.F.R. part 257 that are relevant and appropriate; they are discussed below. Although the three subsections below are relevant and appropriate, ADEC's substantive solid waste requirements contained in 18AAC60.410 will supersede the 40 CFR part 257 citations when more stringent.

Subsection 257.3-3 (Surface Water)

- Land areas that have been used for the disposal of solid wastes may not discharge pollutants into surface waters in violation of the Clean Water Act (NPDES).

- Land areas that have been used for the disposal of solid wastes may not discharge dredge or fill material into surface waters in violation of the Clean Water Act (Section 404).

- Land areas that have been used for the disposal of solid wastes may not cause "non-point" source pollution of surface waters in violation of State water quality management plans (approved pursuant to Section 208 of the Clean Water Act).

Subsection 257.3-6 (Disease)

- For land areas that have been used for the disposal of solid wastes, owners must minimize the on-site population of disease vectors by periodically applying cover material or using other techniques as appropriate so as to protect public health.

Subsection 257.3-8 (Safety)

- The concentration of explosive gases generated by solid waste landfills may not exceed 25 percent of the lower explosive limit (LEL) for gases in structures, and the LEL at the property boundary.

- The owner/operator must not allow uncontrolled public access to the solid waste landfill area if that access could expose the public to health/safety hazards.

- RCRA Subtitle C (40 C.F.R. part 264, subparts F, G, and N) specifies standards for owners and operators of hazardous waste treatment, storage, and disposal facilities. This regulation is not applicable since the wastes were placed in the landfill before 1980. Because waste disposed of would be considered hazardous waste today, substantive requirements of subparts F, G, and N are relevant and appropriate. Subpart F establishes standards for the releases from solid waste management units. Subpart G specifies requirements for the closure and postclosure care of hazardous waste management facilities. Subpart N designates standards for owners and operators that dispose of hazardous waste in landfills.

The federal regulation, RCRA Subtitle D (40 C.F.R. Part 258) specifies standards for owners and operators of municipal solid waste landfills. This regulation is not considered an ARAR for this IRA since the wastes in the landfill were placed before 1991 and the IRA meets certain substantive requirements of Subtitle C, which are more conservative than corresponding requirements in Subtitle D.

- Substantive requirements of the Fish and Wildlife Coordination Act (16 U.S.C. 662 and 663), as per the regulations in 40 C.F.R. part 6.302(g), requires federal agencies involved in actions that will result in the control or structural modification of any natural stream to take additional action to protect fish and wildlife resources that may be affected by the action. Because Palisades Creek will be rerouted, the substantive requirements of these regulations are applicable for the IRA. Under these regulations, the Navy will be required to "ascertain the means and measures necessary to mitigate, prevent, and compensate for project-related losses of wildlife resources and to enhance the resources."

- Several small water areas are located in the central portion of the landfill and appear to be man-made or created due to landfill settlement. These areas will be filled during the IRA. Based on preliminary observations, it appears that the small water areas are not wetlands. During the remedial design stage, a wetlands delineation will be made. If the water areas are classified as wetlands, the substantive requirements of the Clean Water Act (Section 404) will be applicable.

- Substantive State of Alaska Hazardous Waste Management Regulations (18 AAC 62.020) establish applicable requirements for the identification of hazardous wastes. This regulation applies to the identification of potential hazardous waste that may be found during the IRA. The regulation incorporates by reference 40 C.F.R. 261.11 and includes "the additional criterion of acute aquatic toxicity."

- Substantive State of Alaska Solid Waste Management Regulations (18 AAC 60.410) are relevant and appropriate requirements for the closure of a solid waste landfill.

- Alaska Statutes (AS 16.05.840) establish substantive requirements for the protection of fish. Because Palisades Creek will be rerouted, these substantive requirements are applicable to the IRA.

12.2.2 Palisades Landfill Location-Specific ARARs

The location-specific ARARs for Palisades Landfill are described below.

- Substantive requirements of the National Wildlife Refuge System Regulations (16 USC 668dd) are applicable because Adak Island is included in the Alaska Maritime National Wildlife Refuge.

- State of Alaska Coastal Management Regulations (6 AAC 80.130) specify relevant and appropriate substantive requirements for the protection of habitats.

12.2.3 Palisades Landfill Chemical-Specific ARARs

Chemical-specific ARARs for Palisades Landfill are described below.

- Substantive requirements of State of Alaska Solid Waste Management Regulations (18 AAC 60.410(d)(2)(B,C,D)) are relevant and appropriate for the development of chemical parameters involving a long-term monitoring plan for landfill closure.

12.2.4 Metals Landfill Action-Specific ARARs (Selected Alternative)

Action-specific ARARs for Metals Landfill are discussed below.

- Substantive requirements of 40 C.F.R. part 257, subsections 257.3-3, 257.3-6, and 257.3-8 are applicable unless the State is authorized to administer this program, and State's regulations are at least as stringent as those in 40 C.F.R. part 257. Subsections 257.3-3, 257.3-6, and 257.3-8 are as follows:

Subsection 257.3-3 (Surface Water)

- Land areas that have been used for the disposal of solid wastes may not discharge pollutants into surface waters in violation of the Clean Water Act (NPDES).
- Land areas that have been used for the disposal of solid wastes may not discharge dredge or fill material into surface waters in violation of the Clean Water Act (Section 404).
- Land areas that have been used for the disposal of solid wastes may not cause "non-point" source pollution of surface waters in violation of State water quality management plans (approved pursuant to Section 208 of the Clean Water Act).

Subsection 257.3-6 (Disease)

- For land areas that have been used for the disposal of solid wastes, owners must minimize the on-site population of disease vectors by periodically applying cover material or using other techniques as appropriate so as to protect public health.

Subsection 257.3-8 (Safety)

- The concentration of explosive gases generated by solid waste landfills may not exceed 25 percent of the lower explosive limit (LEL) for gases in structures, and the LEL at the property boundary.
- The owner/operator must not allow uncontrolled public access to the solid waste landfill area if that access could expose the public to health/safety hazards.

- RCRA Subtitle C (40 C.F.R. part 264, subparts F, G, and N) specifies standards for owners and operators of hazardous waste treatment, storage, and disposal facilities. This regulation is not applicable since the wastes were placed in the landfill before 1980. Because of the potential of hazardous substances being placed in the landfill, substantive requirements of Subparts F, G, and N are relevant and appropriate. Subpart F establishes standards for the releases from solid waste management units. Subpart G specifies requirements for the closure and postclosure care of hazardous waste management facilities. Subpart N designates standards for owners and operators that dispose of hazardous waste in landfills.

The federal regulation, RCRA Subtitle D (40 C.F.R. Part 258) specifies standards for owners and operators of municipal solid waste landfills. This regulation is not considered an ARAR for this IRA since the wastes in the landfill were placed before 1991 and the IRA meets certain substantive requirements of Subtitle C, which are more conservative than corresponding requirements in Subtitle D.

- Substantive State of Alaska Hazardous Waste Management Regulations (18 AAC 62.020) establish applicable requirements for the identification of hazardous wastes. This regulation applies to the identification of potential hazardous waste that may be found during the IRA. The regulation incorporates by reference 40 C.F.R. 261.11 and includes "the additional criterion of acute aquatic toxicity."

- Substantive State of Alaska Solid Waste Management Regulations (18 AAC 60.410) are relevant and appropriate requirements for the closure of a solid waste landfill.

12.2.5 Metals Landfill Location-Specific ARARs (Selected Alternative)

Location-specific ARARs for Metals Landfill are discussed below.

- The Coastal Zone Management Act (16 U.S.C. 1451 et seq.), as per the regulations in 40 C.F.R. part 6.302(d), specifies that all federal activities in coastal areas must, to the maximum extent possible, be consistent with any "State Coastal Zone Management Programs." The impact of the IRA on the coastal zone is assessed, and if the impacts to recognized off-site areas are significant and a State program is in place, a "consistency determination" would be required as per 15 C.F.R. part 930.

- Substantive requirements of the National Wildlife Refuge System regulations (16 USC 668dd) are applicable because Adak Island is included in the Alaska Maritime National Wildlife Refuge.

- Substantive requirements of the State of Alaska Coastal Management Regulations (6 AAC 80.130) specify relevant and appropriate protection of habitats.

12.2.6 Metals Landfill Chemical-Specific ARARs (Selected Alternative)

- Substantive requirements of State of Alaska Solid Waste Management Regulations (18 AAC 60.410 (d)(2)(B, C, D) are relevant and appropriate for the development of chemical parameters involving a long-term monitoring plan for landfill closure.

12.2.7 Metals Landfill Action-Specific ARARs (Contingent Alternative)

- RCRA Subtitle C (40 C.F.R. part 264, subparts G and N) specifies standards for owners and operators of hazardous waste treatment, storage, and disposal facilities. The substantive requirements of this regulation are applicable since hazardous wastes were placed in the landfill after 1980. Subpart G specifies requirements for the closure and postclosure care of hazardous waste management facilities. Subpart N designates standards for owners and operators that dispose of hazardous waste in landfills.

- Substantive State of Alaska Hazardous Waste Management Regulations (18 AAC 62.020) establish applicable requirements for the identification of hazardous wastes. This regulation applies to the identification of potential hazardous waste that may be found during the IRA. The regulation incorporates by reference 40 C.F.R. 261.11 and includes "the additional criterion of acute aquatic toxicity."

- Substantive State of Alaska Solid Waste Management Regulations (18 AAC 60.410) are relevant and appropriate requirements for the closure of a solid waste landfill.

12.2.8 Metals Landfill Location-Specific ARARs (Contingent Alternative)

Location-specific ARARs for Metals Landfill are discussed below.

- The Coastal Zone Management Act (16 U.S.C. 1451 et seq.), as per the regulations in 40 C.F.R. part 6.302(d), specifies that all federal activities in coastal areas must, to the maximum extent possible, be consistent with any "State Coastal Zone Management Programs." The impact of the IRA on the coastal zone is assessed, and if the impacts to recognized off-site areas are significant and a State program is in place, a "consistency determination" would be required as per 15 C.F.R. part 930.

- Substantive requirements of the National Wildlife Refuge System regulations (16 USC 668dd) is applicable because Adak Island is included in the Alaska Maritime National Wildlife Refuge.

- Substantive requirements of the State of Alaska Coastal Management Regulations (6 AAC 80.130) specify relevant and appropriate protection of habitats.

12.2.9 Metals Landfill Chemical-Specific ARARs (Contingent Alternative)

- Substantive requirements of State of Alaska Solid Waste Management Regulations (18 AAC 60.410 (d)(2)(B, C, D) are relevant and appropriate for the development of chemical parameters involving a long-term monitoring plan for landfill closure.

12.3 COST

The selected alternative for Palisades Landfill, and the selected and contingent alternatives for Metals Landfill will be designed to attain the RAOs. The selected IRA achieves this level of effectiveness while minimizing costs.

12.4 UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES OR RESOURCE RECOVERY TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE

Although the selected IRA for each landfill and the contingent alternative for Metals Landfill has certain features of a permanent solution because of its use of a landfill cover or cap and monitoring programs, this is an interim action and may not provide a final remedy for the landfills. The FFA parties may propose additional activities at the landfills as part of a final remedial action, based on the findings and conclusions of the basewide RI/FS. Any additional activities will be documented in the basewide ROD.

12.5 PREFERENCE FOR TREATMENT AS PRINCIPAL ELEMENT

The selected interim remedial action (and contingent alternative for Metals Landfill) is being undertaken primarily to prevent contact with potential contaminants within the landfills and protect human health and the environment. The IRA does not employ a treatment technology as the principal alternative. At Palisades and Metals Landfill, levels of hazardous substances do not currently appear to be releasing from the site at high concentrations. Based on the nature of the sites today, what its potential might be for environmental damage in the future, and what costs would be incurred by implementing a treatment alternative, an alternative that included treatment was not selected for the IRA, or the contingent alternative. The cost to excavate and treat the wastes at the landfills was prohibitively expensive.

13.0 DOCUMENTATION OF SIGNIFICANT CHANGES

After soliciting public comment last spring on actions designed to remediate Palisades and Metals Landfills, the FFA parties reconsidered the scope and scale of the April 1994 proposed plan's preferred alternatives. As a result, the parties have determined that the actual selected remedies should be modifications of those previously proposed to the public. The modifications have become possible through an anticipated redesignation of the regulatory status of one of the landfills (Metals Landfill), and should significantly enhance the cost-effectiveness of the implemented actions.

The proposed plan identified stream diversion and landfill cap (Alternative 2) and waste removal from surface water and landfill cap (Alternative 3) as the preferred alternative for Palisades and Metals Landfills, respectively. The Navy reviewed all written and verbal comments submitted during the public comment period. All comments and responses to comments are provided in Appendix B, Responsiveness Summary. Very few public comments were received on the interim action proposed plan. Although the comments did not voice unanimous approval for the preferred alternatives at the landfills, there appeared to be little opposition to these actions. Commonly this would lead directly to selection and implementation of the preferred alternatives. In this case, however, the FFA parties have concluded that certain modifications to the preferred alternatives (Alternative 2 for Palisades Landfill and Alternative 3 for Metals Landfill) will improve the actual implemented actions. The reasons for these modifications have been previously discussed in Sections 11.1, "Palisades Landfill," and 11.2, "Metals Landfill." Due to the modifications to the preferred alternatives presented in the proposed plan, the original RAOs were modified to develop the selected alternatives in the ROD.

Based on the modifications, Tables 6 and 7 compare the scope of work or activity differences between the original preferred alternatives as presented in the proposed plan and the selected alternatives presented in Section 11 of this ROD. Only activities that were affected by the modification changes are presented in Tables 6 and 7. Activities that were not affected by the modifications are not presented.

Table 6
Scope of Work Modifications
Palisades Landfill

Original Preferred Alternative Alternative 2	Selected Alternative
Infiltration barrier or landfill cap	Landfill Cover
Leachate collection system	Not included
Slope stabilization	Not included
Leachate monitoring	Stream and sediment monitoring

Table 7
Scope of Work Modifications
Metals Landfill

Original Preferred Alternative Alternative 3	Selected Alternative
Removal of shoreline debris in northern section of landfill	Not included
Cleanup of east section of landfill	Limited to surface debris
Hazardous waste handling	Not anticipated
Infiltration barrier or landfill cap	Landfill cover[a]
Not included	Site removal evaluation of shoreline debris in northern section of landfill

[a]This will remain a landfill cap for the contingent alternative.

14.0 REFERENCES

Environmental Sciences and Engineering (ESE). 1986. *Initial Assessment Study of Naval Air Station, Naval Security Group Activity, and Naval Facility Adak, Adak Island, Alaska.* NEESA 13-103. April 1986.

Tetra Tech. 1989. *Site Inspection Report, Naval Air Station Adak, Adak Island, Alaska.* Vol. 1: Field Report. TC-3603-02.

URS Consultants, Inc. (URS). 1994a. *Groundwater Monitoring Program Data Summary Report, Fourth Sampling Round, Naval Air Station Adak, Adak Island, Alaska.* Prepared for U.S. Navy CLEAN Contract N62474-89-D-9295. Seattle, Washington. April 1994.

———. 1994b. *Technical Memorandum, Palisades and Metals Landfills, Adak Island, Alaska.* Prepared for U.S. Navy CLEAN Contracts N62474-89-D-9295. Seattle, Washington. April 1994.

———. 1993. *Summary of 1990 Investigations, Sites 11, 15, 16, 17, 20, 21A, and 22, Naval Air Station Adak, Adak Island, Alaska.* Prepared for U.S. Navy CLEAN Contracts N62474-89-D-9295. Seattle, Washington. December 1993.

———. 1992. *Site Inspection Final Report, Sites 13, 37, 38, 39, Naval Air Station Adak, Adak, Alaska.* Prepared for U.S. Navy CLEAN Contract N62474-89-D-9295. Seattle, Washington.

APPENDIX A

ADMINISTRATIVE RECORD INDEX

EFA ADMINISTRATIVE RECORD DOCUMENTATION FOR PALISADES AND METALS LANDFILL INTERIM REMEDIAL ACTION

Alaska Department of Environmental Conservation (ADEC). 1995. ADEC Correspondence, re: Draft Record of Decision (ROD) for Interim Remedial Actions at Site 11 (Palisades Landfill) and Site 13 (Metals Landfill), Naval Air Facility (NAF) Adak, Adak Island. January 17, 1995.

———. 1995. ADEC Correspondence, re: Clarification of Applicability or Appropriate and Relevance for Palisades and Metals Landfills for Interim Remedial Action Record of Decision (ROD). January 9, 1995.

———. 1994. ADEC correspondence, re: Review of Draft Interim Remedial Action Record of Decision (ROD), December 13, 1994. November 18, 1994.

Environmental Sciences and Engineering (ESE). 1986. Initial Assessment Study of Naval Air Station, Naval Security Group Activity, and Naval Facility Adak, Adak Island, Alaska. NEESA 13-103. April 1986.

Hild, C.M. 1994. Indigenous People's Council for Marine Mammals. May 28, 1994.

Public Notice. 1995. re: U.S. Navy, U.S. Environmental Protection Agency, and the Alaska Department of Environmental Conservation Hold a Public Comment Period from January 16, 1995, to February 7, 1995. On a modified Proposed Interim Cleanup Action at Naval Air Facility Adak Island, Adak, Alaska. Anchorage Daily News. January 16, 1995.

Public Notice. 1995. re: Proposed Interim Cleanup for Naval Air Facility Adak, Adak Island, Alaska. Eagles Call. January 6, 1995.

Science Applications International Corp. (SAIC). 1991. RCRA Facility Assessment PR/VSI Report, U.S. Naval Complex Adak, Adak Island, Alaska. EPA I.D. No. AK4170024323. March 1991.

Tetra Tech, Inc. 1989. NAS Adak Expanded Site Inspection Program QA/QC Report for Field and Laboratory Support Activities—Volume I: Field and Laboratory Reports. May 1989.

———. 1989. NAS Adak Expanded Site Inspection Program QA/QC Report for Field and Laboratory Support Activities—Volume II: Analytical Data. May 1989.

———. 1989. Site Inspection Report, Naval Air Station Adak, Adak Island, Alaska—Volume I: Field Report. May 1989.

———. 1989. Site Inspection Report, Naval Air Station Adak, Adak Island, Alaska—Volume II: Appendixes. May 1989.

U.S. Environmental Protection Agency (U.S. EPA). 1994. EPA correspondence, re: Draft Record of Decision (ROD) for Interim Remedial Actions at Metals and Palisades Landfills. December 16, 1994.

———. 1995. EPA correspondence, re: Draft Final Record of Decision (ROD) for Interim Remedial Actions at Metals and Palisades Landfills. January 30, 1995.

———. 1990. Federal Facilities Compliance Agreement No. 1090-02-05-60001 for Site 13. November 1990.

———. Notice of Deficiency (NOD). April 1990.

U.S. Environmental Protection Agency/Alaska Department of Environmental Conservation (U.S. EPA/ADEC). Navy Federal Facilities Agreement No. 1092-08-06-120. November 1993.

U.S. Fish and Wildlife Service (USF&W). 1994. USF&W correspondence, re: Review of Record of Decision (ROD) for Naval Air Facility Adak, Site 11 (Palisades Landfill) and Site 13 (Metals Landfill). December 19, 1994.

———. 1995. USF&W Correspondence, re: Draft Final Record of Decision (ROD) for Interim Remedial Actions at Palisades and Metals Landfills. February 16, 1995.

U.S. Navy. 1995. Navy Correspondence, re: Record of Decision (ROD) for Interim Remedial Actions at Site 11 (Palisades Landfill) and Site 13 (Metals Landfill), Naval Air Facility (NAF) Adak, Adak Island. January 17, 1995.

———. 1995. Navy Correspondence, re: Cover Letter for Final Record of Decision (ROD) for Palisades and Metals Landfills, Naval Air Facility Adak, Adak Island, Alaska. February 28, 1995.

———. 1995. Navy Fact Sheet, re: Interim Remedial Actions at Two Landfills, Naval Air Facility (NAF) Adak, Adak Island. January 1995.

———. 1994. Navy e-mail, re: Palisades and Metals Landfills. D.S. Afong. December 22, 1994.

———. 1994. Navy e-mail, re: Meeting on Palisades and Metals Landfills. D.S. Afong. December 22, 1994.

———. 1994. Navy e-mail, re: USF&W Meeting on Palisades and Metals Landfills. D.S. Afong. December 14, 1994.

———. 1994. Navy e-mail, re: Palisades and Metals Landfills Draft ROD. D.S. Afong. November 25, 1994.

———. 1994. Navy correspondence, re: Interim Remedial Actions for Palisades (Site 11) and Metals Landfill (Site 13), Naval Air Facility Adak Island, Alaska. November 18, 1994.

———. 1994. Navy correspondence, re: CLEAN Contract Technical Direction: CTO 154, Palisades and Metals Landfills (Sites 11 and 13) Record of Decision (ROD). August 16, 1994.

———. 1994. Navy e-mail, re: Navy/EPA/ADEC meeting on Palisades and Metals Landfill. D.S. Afong. June 21, 1994.

———. 1994. Navy e-mail, re: Palisades and Metals Landfill. D.S. Afong. July 22, 1994.

———. 1994. Navy correspondence, re: Record of Decision (ROD) for Palisades Landfill and Metals Landfill (Site 13), Naval Air Facility Adak, Adak Island, Alaska. July 12, 1994.

———. 1994. Navy e-mail, re: Followup on Palisades and Metals Landfills Actions. D.S. Afong. August 5, 1994.

URS Consultants, Inc. (URS). 1994. Community Relations Plan, Naval Air Facility Adak, Adak Island, Alaska. Prepared for U.S. Navy CLEAN Contract N62474-89-D-9295. Seattle, Washington. September 30, 1994.

———. 1994. Groundwater Monitoring Program, Data Summary Report, Fourth Sampling Round, Naval Air Station Adak, Adak Island, Alaska. Prepared for U.S. Navy CLEAN Contract N62474-89-D-9295. Seattle, Washington. April 25, 1994.

———. 1994. Proposed Plan and Technical Memorandum—Palisades and Metals Landfills, Naval Air Station Adak, Adak Island, Alaska. Prepared for U.S. Navy CLEAN Contract N62474-89-D-9295. Seattle, Washington. April 1994.

———. 1995. Addendum to the Technical Memorandum—Palisades and Metals Landfills, Naval Air Station Adak, Adak Island, Alaska. Prepared for U.S. Navy CLEAN Contract N62474-89-D-9295. Seattle, Washington. February 1995.

———. 1993. Summary of 1990 Investigations, Sites 11, 15, 16, 17, 20, 21A, and 22. Volume 1 of 2 Appendixes, Naval Air Station Adak, Adak Island, Alaska. Prepared for U.S. Navy CLEAN Contract N62474-89-D-9295. Seattle, Washington. December 21, 1993.

———. 1993. Summary of 1990 Investigations, Sites 11, 15, 16, 17, 20, 21A, and 22. Volume 2 of 2 Appendixes, Naval Air Station Adak, Adak Island, Alaska. Prepared for U.S. Navy CLEAN Contract N62474-89-D-9295. Seattle, Washington. December 21, 1993.

———. 1993. Draft Conceptual Site Model, Operable Unit B, Site 11—Palisades Landfill and Site 13—Metals Landfill, Naval Air Station Adak, Adak Island, Alaska. Prepared for U.S. Navy CLEAN Contract N62474-89-D-9295. Seattle, Washington. July 13, 1993.

———. 1993. Interview Summary Report, Naval Air Station Adak, Adak Island, Alaska. Prepared for U.S. Navy CLEAN Contract N62474-89-D-9295. Seattle, Washington. May 7, 1993.

——. 1992. Sites 13, 37, 38, and 29 Site Inspection Final Report (Revised), Naval Air Station Adak, Adak Island, Alaska. Prepared for U.S. Navy CLEAN Contract N62474-89-D-9295. Seattle, Washington. April 10, 1992.

——. 1990. Remedial Investigation/Feasibility Study Project Plans, Site 11, 17, 20, and 21A, Naval Air Station, Adak Island, Alaska (includes Work Plan, Sampling and Analysis Plan, and Health and Safety Plan). Prepared for U.S. Navy CLEAN Contract N62474-89-D-9295. Seattle, Washington. June 25, 1990.

Warnick, S.J. and K.M. Jezewski. 1994. Navy transcript of Sites 11 and 13 Proposed Plan Meetings at Anchorage and NAS Adak, Adak Island. May 9 and 11, 1994.

APPENDIX B

RESPONSIVENESS SUMMARY

RESPONSIVENESS SUMMARY

OVERVIEW

This responsiveness summary addresses public comments on the proposed plan for the interim remedial actions at NAF Adak, Palisades Landfill (Site 11) and Metals Landfill (Site 13). The public comment period on the proposed plan was held from April 29 to May 29, 1994. Public meetings to present and explain the proposed plan and solicit public comments were held on May 9, 1994, in Anchorage, Alaska, and on May 11, 1994, at NAF Adak, Alaska. Members of the public attended both meetings and seven persons offered 17 oral comments that were responded to at the meetings. During the public comment period, one letter was received offering six comments. A transcript of the proceedings of the public meetings and copies of the letters received are available in the Administrative Record.

Because of the changes from the proposed plan's preferred alternative to the ROD's selected alternative, a second comment period was conducted from January 16, 1995, to February 7, 1995. The comment period was initiated through a fact sheet, with no public meetings being conducted during the second comment period. No public comments were received during the second comment period.

SUMMARY OF COMMENTS ON THE PROPOSED PLAN

Comments received at the public meetings and in letters during the first comment period are summarized and grouped according to similar concerns or questions. In the following paragraphs, the comments and responses are summarized. Although no public comments were received on the ROD's selected alternatives during the second comment period, the comments presented on the proposed plan will also be applied to the selected alternatives, where applicable.

Comment Four comments asked for confirmation that the commenters' reading of the proposed plan or supporting documents was accurate. Three of the comments dealt with possible treatment for leachate and one of the comments dealt with the agencies that are parties to the Federal Facilities Agreement (FFA).

Response The proposed plan's interim remedial actions at both sites do not include a treatment process for leachate. The actions at both sites do include capping to minimize the production of leachate and monitoring to measure contaminant levels against appropriate ambient water quality criteria to determine the effectiveness of the interim remedial actions. At Palisades Landfill the proposed action includes construction of a leachate collection system so that, if needed, a treatment process could be added at a future date without the need to dig into the landfill site a second time. The configuration of Metals Landfill does not provide a similar opportunity to inexpensively provide for future leachate treatment. However, if required in the future, leachate treatment would also not require destruction of elements constructed under the interim remedial action. The technical memorandum supporting document discusses possible Palisades Landfill leachate treatment and estimated costs in Section 4.4.1.2. For cost-estimating purposes, two treatment systems were considered necessary if treatment were required: an ion exchanger would treat inorganic contaminants and an enhanced oxidation and reduction system would treat organic contaminants.

For the ROD's selected alternative at Palisades Landfill, the FFA parties looked carefully at the nature of the site today, what its potential might be for environmental damage in the future, and what costs would be incurred by implementing different elements of the alternative. It appeared that significant cost savings could be realized if, because of the age of the site and the nature of the materials disposed of, a site-wide infiltration barrier (cap) would not be required to protect the marine environment from releases within the landfill.

There is the possibility that harmful levels of contaminants continue to exist in Palisades Landfill; however, a presumption that the current contents of the landfill will not pose a future risk to receptors is insufficiently conservative by itself. For example, there may be a number of petroleum or solvent drums that are present at the site and have yet to release. Because of this concern, the FFA parties evaluated a hypothetical drum release scenario that used worst case, but reasonable, assumptions about what materials could be in a drum at Adak and how that material might travel after being released at the site. The results of the evaluation showed that even with no cover or cap on the site, it was very unlikely that such a release would lead to exceedances of regulatory criteria in Palisades Creek or the nearshore Kuluk Bay environment. This finding supports the assumption that a leachate treatment system is not required.

The agencies that are party to the FFA are the Navy, United States Environmental Protection Agency, and the Alaska Department of Environmental Conservation. In addition, the United States Fish and Wildlife Service participated in discussions leading to the development of the Proposed Plan and ROD.

Comment Four comments recommended minimizing intrusive activities into the landfills. Concern was expressed that the cure might be worse than the problem, that highly intrusive action would hold greater potential for creating problems, and actions now should not create a high possibility that the sites would have to be re-opened in the future.

Response The selection of elements in the proposed plan's alternatives and the evaluation of alternatives in accordance with EPA's nine criteria did consider the topics raised by these comments. In evaluating alternatives under the "short-term effectiveness" criteria, the potential for releases to the environment and exposure of on-site personnel to hazardous substances weighed heavily in favor of alternatives that minimize the need for excavation in the existing landfills. The elements of the proposed plan were selected using EPA guidance for addressing contaminated landfills, *Presumptive Remedy for CERCLA Municipal Landfill Sites*, which identifies containment as the appropriate response action or presumptive remedy. The proposed interim remedial action is consistent with this EPA guidance. Although it is difficult to speculate what future remedial actions might be necessary, implementing stronger containment measures would not require re-opening the sites.

The selected alternatives in the ROD are less intrusive than the preferred alternatives presented in the proposed plan. For Palisades Landfill, the leachate collection system and slope stabilization will not be required under the selected alternative, thereby reducing intrusive activities at the landfill. At Metals Landfill, waste removal from the north section shoreline included in the proposed plans preferred alternative has been eliminated in the ROD's selected alternative.

Comment Three comments raised questions relative to implementation of the IRA: How accurately do the electromagnetic surveys describe the area needing to be capped? How will hazardous chemicals or perhaps chemical weapons be dealt with? How will the potential for release of contamination be controlled?

Response The FFA parties are also concerned with controlling potential contamination releases. In preparation of the proposed plan and ROD, the areas needing to be capped or covered were estimated using the results of previous geophysical surveys, soil logs from borings for investigations and installation of monitoring wells, results of on-site visual examinations, and comparison of 1946 topographic maps with topographic maps produced from 1993 surveys. Although specific techniques were not designed in the proposed plan, the cost estimates include provisions for treating hazardous wastes that may be encountered and for reduced work crew productivity resulting from landfill excavation as compared to simple earthwork excavation. Under the ROD's selected alternatives, landfill excavation will not be conducted. Therefore, cost estimates did not include provisions for treating hazardous wastes that may have been encountered.

In general, all these items will receive more specific attention during future phases of the IRA. Implementation of the IRA under the proposed plan will involve preparation of a remedial design, preparation of a work plan for remedial action, and execution of the remedial action work plan. These phases will include describing more specifically the extent of the landfills; preparing site-specific health and safety plans to be implemented during remedial action; developing design solutions for treating hazardous wastes, if they are encountered; and designing means for controlling and minimizing the potential for release of contamination from the site as a result of remedial actions. Implementation of the IRA under the ROD's selected alternatives will involve all phases included under the proposed plan except developing design solutions for treating hazardous wastes.

Preferred and selected IRA measures that the FFA parties agree upon will be described in documents that will be available in the Adak Information Repository and future Adak fact sheets/mailers.

Comment Four comments were addressed on issues of design and the need to take natural events into account. The potential for waste to come in contact with the environment as a result of earthquakes, tsunami, storm waves, frost heave cracking in a clay cap, and simple rusting was mentioned.

Response The IRA process is being implemented to react to an existing problem. The landfills are obviously located in a vulnerable position. Since the FFA parties have little control over the landfill locations, reasonably designed safeguards will be incorporated to minimize damage caused by natural processes. As the landfills presently exist, the release of contamination to the environment as a result of a natural event is quite possible. At both landfills, waste is presently in contact with either surface or marine waters. Severe storms or earthquakes could cause even more material to come in contact with these waters if the steep slopes at Palisades Landfill and the north section of Metals Landfill should collapse. The uncovered debris at both sites is currently exposed to the oxidizing effects of natural events.

The preparation of the proposed plan did consider how elements of the plan might be affected by natural events. Principally, these considerations are reflected in the cost estimates, as noted in the technical memorandum supporting document. Moving the waste out of water, frequency of maintenance, reinforcement of the Palisades Landfill slope, and the selection of materials were all influenced by the risk of future natural events.

In developing the selected alternatives for Palisades and Metals Landfill, the FFA parties looked carefully at the nature of the site today, what its potential might be for environmental damage in the future, and what costs would be incurred by implementing different elements of the alternative. It appeared that significant cost savings could be realized if, because of the age of the site and the nature of the materials disposed of, the materials in the ravine at Palisades Landfill and the shoreline debris along the north section of Metals Landfill would not be removed. The FFA parties believe that the risk to marine receptors, based on the current knowledge of the types of marine animals that inhabit the area and the appearance of the exposed and weathered debris in the ravine, on the shoreline, and in contact with Kuluk Bay, should be minimal. These exposures are possible, but there are no indications that animals inhabiting or frequenting the landfill or shoreline debris are imminently at risk. A more rigorous evaluation of the risks posed by the exposed debris on the shoreline and in contact with Kuluk Bay will be included within the scope of the basewide RI/FS.

As with the preceding comment, these items will receive more specific attention during future phases of the IRA. Implementation of the IRA will involve preparation of a remedial design, preparation of a work plan for remedial action, and execution of the remedial action work plan. Preparation of the remedial design, in particular, will again focus on the construction elements and materials that best suit the Adak environment.

Comment One comment asked whether the movement of groundwater and leachate in the rock walls of the Palisades ravine had been considered.

Response It is believed that the bedrock of the Palisades ravine is a considerable deterrent to water moving downward after it has exited the bottom of the landfill. From information and observations available at this time, it appears that water infiltrates the landfill, reaches the bedrock surface, and flows towards the existing Palisades Creek streambed. Two observations support this belief. First, stream flow measurements of Palisades Creek, taken above and below the landfill soon after rainfall events, showed a consistent increase in flow from upstream to downstream. This suggests that little surface flow is lost to bedrock infiltration and that surface flow is being recharged as it passes through the landfill. Second, as a part of previous site investigations, the areas of exposed bedrock in ravine were examined in a search for springs or seeps that would indicate movement of groundwater. No seeps were found, indicating that the tightness of the bedrock formation does not allow a significant amount of water movement under the conditions found at Palisades Landfill.

Comment Two comments concerned the monitoring program. One asked how the program would be conducted considering the reduction of personnel on Adak. The second inquired whether it is possible to reduce the 30-year monitoring period and its cost.

Response It is not anticipated that Navy personnel would perform the monitoring work. The preferred and selected alternatives in the proposed plan and

ROD, respectively, does assume that the Navy will continue operations on Adak Island and will be able to provide logistical support, such as electricity. The cost estimate is based upon contract personnel performing this work.

For the purpose of estimating costs for the preferred and selected alternatives, it was assumed that monitoring would be conducted for a 30-year period. Regulations would allow for modification of the monitoring program and/or a reduction in the period of monitoring, provided there is sufficient protection of human health and the environment. Upon completion of the basewide RI/FS and issuance of a ROD, scheduled for 1998, the Navy anticipates establishing one long-term monitoring program for all basewide needs.

Comment Three comments concerned what is known about contamination at the sites. How many samples were taken and what was found? Was the waste dumped in sealed or open containers? What additional information has been gathered since the 1986 site assessment survey?

Response Several investigations have been conducted on the Palisades and Metals Landfills since the 1986 assessment. Data in the supporting documentation at the information repositories show that chemicals have been detected at the sites. It is not known whether waste was dumped in open or closed containers. No other information is available concerning these sites.

Comment One comment expressed concern over past impacts to the marine environment adjacent to Palisades and Metals Landfills.

Response It is unknown whether harmful levels of chemicals have been released into the near-shore marine environment adjacent to the landfills. The immediate objective of the IRA is to limit potential exposure to on-site chemicals and reduce the potential for off-site migration of chemicals. Placing cover material on the landfills and controlling surface water run-on and run-off were identified as actions that would reduce leachate production and the potential for chemical migration from the sites. Tissue samples from marine plants and animals that might come into contact with chemicals potentially released from the sites have not yet been collected under the Navy Installation Restoration Program (IRP). The evaluation of possible impacts to the near-shore marine environment will be addressed in the basewide remedial investigation scheduled to start in the fall of 1996.

Comment One comment expressed concern about investigations at other sites.

Response This proposed plan addresses only those issues concerning Palisades and Metals Landfills. Investigations of other sites on Adak Island are being addressed under different IRP projects.

APPENDIX C

ANALYTICAL RESULTS FROM PREVIOUS INVESTIGATIONS

Data Qualifiers

The following data qualifiers are used on the summary tables. Only those compounds detected at least once during quarterly sampling are listed.

Organic Analysis

- B — Analyte is found in both the associated method blank and in the sample. It indicates possible/probable blank contamination and warns the data user to take appropriate action.
- E — Compounds whose concentration exceed the calibration range of the GC/MS instrument for that specific analysis.
- J — Estimated concentration for tentatively identified compounds (TICs) or when the presence of a compound is quantitated to be less than the Contract Required Quantitation Limit (CRQL) but greater than zero.
- N — Presumptive evidence of a TIC.
- U — Compound was analyzed for but not detected above the reported sample quantitation limit.

Inorganic Analysis: Concentration (C) Qualifiers

- B — Reported value is less than the CRDL but greater than or equal to the Instrument Detection Limit (IDL).
- U — Analyte was not detected above the reported sample detection limit.

Inorganic Analysis: Quality Control (Q) Qualifiers

- E — Reported value is estimated due to the presence of an interference. An explanatory note must be included in the data package narrative.
- N — Spiked sample recovery not within control limits.
- S — Reported value was determined by the Method of Standard Additions (MSA).
- W — Post-digestion spike for Furnace Atomic Absorption analysis is out of control limits.
- * — Duplicate analysis not within control limits.

Table C-1
Detected Chemicals in Different Environmental Media at Palisades Landfill From the 1988 Site Investigation

Analyte	Upgradient		Downgradient		
	Surface Water (µg/L)	Sediment (µg/kg)	Surface Water (µg/L)	Sediment (µg/kg)	Surface Soils (µg/kg)
Volatile Organic Compounds					
	ND	ND	ND	ND	ND
Semivolatile Organic Compounds					
Phenanthrene	10 UJ	170 UJ	R	450 J	160 J
Anthracene	10 UJ	170 UJ	R	340 UJ	190 J
Fluoranthene	10 UJ	170 UJ	R	460 J	340 UJ
Pyrene	R	170 UJ	R	470 J	190 J
Benzo(a)anthracene	R	170 UJ	R	180 J	R
Chrysene	R	170 UJ	R	260 J	140 J
Benzo(k)fluoranthene	10 UJ	R	10 UJ	540 J	R
Benzo(a)pyrene	10 UJ	R	10 UJ	270 J	R
TIC hydrocarbons	ND	1,300 JN	ND	29,100 JN	32,600 JN
PCBs/Pesticides					
Aroclor 1260	1.0 U	200 U	1.0 U	1,500	150 J
Organochlorine pesticides	ND	ND	ND	ND	ND
Metals					
Arsenic	2.0 UJ	9,200	2.0 UJ	25,000	21,200
Cadmium	5.0 U	850	5.0 U	4,100	3,900 J
Chromium	10.0 U	12,200 J	10.0 U	34,100	26,100 J
Copper	25.0 U	27,200	25.0 U	141,000	119,000
Lead	2.0 U	14,400	3.0	291,000	358,000
Nickel	40.0 U	8,900	40.0 U	40,900	28,700 J
Silver	10.0 U	720	10.0 U	2,000	1,800
Zinc	35.0 U	144,000 J	21.0 U	820,000	765,000
Total Petroleum Hydrocarbons					
	ND	NA	ND	NA	NA

Notes:
R - The data were rejected and are unusable.
ND - The analyte was not detected.
NA - The analyte was not analyzed.
Source: Tetra Tech. 1989. *Site Inspection Report, Naval Air Station Adak, Adak Island, Alaska*. Volume 1: *Field Report*. TC-3603-02.

Table C-2
Statistical Summary of Valid Analytical Results for Site 11, Zone 1
1990 Investigation

Parameter	Quantity Analyzed	Percent Frequency of Detection	Quantity Not Detected	Quantity Detected	Minimum Detected Value	Maximum Detected Value
Matrix: Surface Water (µg/L)						
Aluminum	3	1.00E+02		3	4.40E+02	4.10E+03
Barium	3	1.00E+02		3	5.00E+00	1.90E+01
Calcium	3	1.00E+02		3	6.74E+03	1.03E+04
Copper	3	1.00E+02		3	3.00E+00	1.40E+01
Iron	3	1.00E+02		3	4.79E+02	4.72E+03
Magnesium	3	1.00E+02		3	2.09E+03	3.50E+03
Manganese	3	1.00E+02		3	2.30E+01	1.57E+02
Mercury	3	1.00E+02		3	1.00E-01	1.00E-01
Nickel	3	6.67E+01	1	2	1.00E+01	2.00E+01
Potassium	3	1.00E+02		3	5.00E+02	1.10E+03
Sodium	3	1.00E+02		3	8.85E+03	1.09E+04
Vanadium	3	1.00E+02		3	3.00E+00	1.20E+01
Zinc	3	1.00E+02		3	1.80E+01	1.40E+02
Matrix: Sediment (mg/kg)						
Aluminum	3	1.00E+02		3	2.07E+04	3.08E+04
Barium	3	1.00E+02		3	2.89E+01	6.54E+01
Benzo(a)anthracene	3	3.33E+01	2	1	8.50E-02	8.50E-02
Benzo(b)fluoranthene	3	3.33E+01	2	1	5.70E-02	5.70E-02
Benzo(k)fluoranthene	3	3.33E+01	2	1	5.10E-02	5.10E-02
Benzoic acid	3	1.00E+02		3	6.00E-02	2.00E-01
Cadmium	3	3.33E+01	2	1	1.20E+00	1.20E+00
Calcium	3	1.00E+02		3	8.09E+03	1.31E+04
Chromium	3	1.00E+02		3	1.02E+01	1.71E+01
Chrysene	3	3.33E+01	2	1	1.30E-01	1.30E-01
Cobalt	3	1.00E+02		3	6.10E+00	1.34E+01
Copper	3	1.00E+02		3	3.44E+01	5.07E+01
Fluoranthene	3	3.33E+01	2	1	6.00E-01	6.00E-01
Iron	3	1.00E+02		3	2.81E+04	4.83E+04
Lead	3	3.33E+01	2	1	1.90E+01	1.90E+01
Magnesium	3	1.00E+02		3	3.16E+03	1.37E+04

Table C-2 (Continued)
Statistical Summary of Valid Analytical Results for Site 11, Zone 1
1990 Investigation

Parameter	Quantity Analyzed	Percent Frequency of Detection	Quantity Not Detected	Quantity Detected	Minimum Detected Value	Maximum Detected Value
Manganese	3	1.00E+02		3	5.70E+02	1.81E+03
Nickel	3	1.00E+02		3	8.00E+00	2.10E+01
Phenanthrene	3	3.33E+01	2	1	4.40E-01	4.40E-01
Potassium	3	1.00E+02		3	3.87E+02	9.06E+02
Sodium	3	1.00E+02		3	1.12E+03	2.21E+03
Vanadium	3	1.00E+02		3	7.36E+01	1.34E+02
Zinc	3	1.00E+02		3	8.45E+01	1.97E+02
Matrix: Subsurface Soil (mg/kg)						
2-Butanone	5	4.00E+01	3	2	3.20E-02	4.70E-02
Acetone	5	6.00E+01	2	3	2.00E-02	2.60E-01
Aluminum	5	1.00E+02		5	2.42E+04	3.86E+04
Barium	5	1.00E+02		5	2.81E+01	1.12E+02
Benzoic Acid	5	6.00E+01	2	3	4.30E-01	5.60E-01
Cadmium	5	2.00E+01	4	1	8.00E-01	8.00E-01
Calcium	5	1.00E+02		5	5.79E+03	1.08E+04
Carbon Disulfide	5	2.00E+01	4	1	3.10E-03	3.10E-03
Chromium	5	1.00E+02		5	3.90E+00	2.51E+01
Cobalt	5	1.00E+02		5	3.60E+00	1.53E+01
Copper	5	1.00E+02		5	2.39E+01	6.38E+01
Ethylbenzene	5	2.00E+01	4	1	7.00E-04	7.00E-04
Iron	5	1.00E+02		5	1.55E+04	2.93E+04
Lead	5	4.00E+01	3	2	8.00E+00	8.00E+00
Magnesium	5	1.00E+02		5	2.20E+03	1.75E+04
Manganese	5	1.00E+02		5	2.14E+02	9.75E+02
Methylene Chloride	5	6.00E+01	2	3	1.10E-03	3.20E-03
Nickel	5	1.00E+02		5	4.00E+00	2.00E+01
Potassium	5	1.00E+02		5	3.65E+02	1.06E+03
Selenium	5	2.00E+01	4	1	1.10E+01	1.10E+01
Sodium	5	1.00E+02		5	1.20E+03	2.78E+03
Toluene	5	1.00E+02		5	8.00E-04	2.50E-02
Vanadium	5	1.00E+02		5	5.66E+01	9.35E+01

Table C-2 (Continued)
Statistical Summary of Valid Analytical Results for Site 11, Zone 1
1990 Investigation

Parameter	Quantity Analyzed	Percent Frequency of Detection	Quantity Not Detected	Quantity Detected	Minimum Detected Value	Maximum Detected Value
Xylenes	5	8.00E+01	1	4	4.00E-04	5.60E-03
Zinc	5	1.00E+02		5	2.51E+01	9.18E+01
Matrix: Groundwater (µg/L)						
Aluminum	2	1.00E+02		2	5.97E+04	6.27E+05
Barium	2	1.00E+02		2	2.76E+02	2.47E+03
Beryllium	2	1.00E+02		2	1.00E+00	7.00E+00
Cadmium	2	5.00E+01	1	1	2.00E+00	2.00E+00
Calcium	2	1.00E+02		2	3.12E+04	1.34E+05
Chromium	2	1.00E+02		2	1.80E+01	1.94E+02
Cobalt	2	1.00E+02		2	1.70E+01	1.93E+02
Copper	2	1.00E+02		2	9.60E+01	1.04E+03
Iron	2	1.00E+02		2	3.63E+04	4.22E+05
Magnesium	2	1.00E+02		2	2.45E+04	2.08E+05
Manganese	2	1.00E+02		2	1.30E+03	1.30E+04
Mercury	2	5.00E+01	1	1	3.00E-01	3.00E-01
Nickel	2	1.00E+02		2	3.00E+01	2.70E+02
Potassium	2	1.00E+02		2	3.40E+03	1.78E+04
Selenium	2	5.00E+01	1	1	5.00E+01	5.00E+01
Sodium	2	1.00E+02		2	2.25E+04	4.34E+04
Thallium	2	5.00E+01	1	1	8.00E+01	8.00E+01
Vanadium	2	1.00E+02		2	8.50E+01	1.15E+03
Zinc	2	1.00E+02		2	7.50E+01	7.98E+02

Table C-3
Statistical Summary of Valid Analytical Results for Site 11, Zone 2
1990 Investigation

Parameter	Quantity Analyzed	Percent Frequency of Detection	Quantity Not Detected	Quantity Detected	Minimum Detected Value	Maximum Detected Value
Matrix: Surface Water (µg/L)						
Aluminum	3	1.00E+02		3	5.70E+02	7.00E+02
Barium	3	1.00E+02		3	3.00E+00	9.00E+00
Calcium	3	1.00E+02		3	1.52E+03	9.80E+03
Copper	3	1.00E+02		3	1.10E+01	1.30E+01
Iron	3	1.00E+02		3	2.65E+02	1.11E+03
Magnesium	3	1.00E+02		3	8.60E+02	2.95E+03
Manganese	3	1.00E+02		3	1.10E+01	5.00E+01
Mercury	3	1.00E+02		3	1.00E-01	1.00E-01
Nickel	3	1.00E+02		3	2.00E+01	3.00E+01
Potassium	3	1.00E+02		3	6.00E+02	8.00E+02
Sodium	3	1.00E+02		3	6.65E+03	1.07E+04
Vanadium	3	1.00E+02		3	3.00E+00	6.00E+00
Zinc	3	1.00E+02		3	1.30E+02	1.83E+02
Matrix: Sediment (mg/kg)						
Acetone	3	6.67E+01	1	2	1.10E-02	3.40E-02
Aluminum	3	1.00E+02		3	1.62E+04	3.45E+04
Antimony	3	3.33E+01	2	1	1.50E+01	1.50E+01
Barium	3	1.00E+02		3	3.63E+01	1.11E+02
Benzo(a)anthracene	3	3.33E+01	2	1	7.20E-02	7.20E-02
Benzo(b)fluoranthene	3	3.33E+01	2	1	1.40E-01	1.40E-01
Benzoic Acid	3	1.00E+02		3	7.60E-02	1.20E-01
Cadmium	3	6.67E+01	1	2	2.10E+00	2.70E+00
Calcium	3	1.00E+02		3	6.79E+03	2.28E+04
Chromium	3	1.00E+02		3	7.40E+00	3.35E+01
Chrysene	3	3.33E+01	2	1	1.00E-01	1.00E-01
Cobalt	3	1.00E+02		3	1.10E+01	1.55E+01
Copper	3	1.00E+02		3	6.15E+01	5.39E+02
Fluoranthene	3	3.33E+01	2	1	3.40E-01	3.40E-01
Iron	3	1.00E+02		3	3.20E+04	1.23E+05

Table C-3 (Continued)
Statistical Summary of Valid Analytical Results for Site 11, Zone 2
1990 Investigation

Parameter	Quantity Analyzed	Percent Frequency of Detection	Quantity Not Detected	Quantity Detected	Minimum Detected Value	Maximum Detected Value
Lead	3	1.00E+02		3	1.80E+01	2.44E+02
Magnesium	3	1.00E+02		3	6.01E+03	7.50E+03
Manganese	3	1.00E+02		3	6.69E+02	1.79E+03
Mercury	3	3.33E+01	2	1	4.90E-01	4.90E-01
Methylene Chloride	3	3.33E+01	2	1	7.00E-04	7.00E-04
Nickel	3	1.00E+02		3	9.00E+00	9.40E+01
Phenanthrene	3	3.33E+01	2	1	1.50E-01	1.50E-01
Potassium	3	1.00E+02		3	4.73E+02	6.41E+02
Selenium	3	6.67E+01	1	2	2.00E+01	2.50E+01
Sodium	3	1.00E+02		3	1.10E+03	1.15E+03
Thallium	3	6.67E+01	1	2	2.00E+01	2.50E+01
Vanadium	3	1.00E+02		3	4.83E+01	9.47E+01
Zinc	3	1.00E+02		3	8.52E+01	5.80E+02
Matrix: Subsurface Soil (mg/kg)						
2-Butanone	5	6.00E+01	2	3	5.70E-02	1.20E-01
Acetone	5	8.00E+01	1	4	3.10E-02	6.90E-01
Aluminum	5	1.00E+02		5	3.00E+04	6.20E+04
Barium	5	1.00E+02		5	2.61E+01	7.58E+01
Benzoic Acid	5	4.00E+01	3	2	1.10E-01	1.40E-01
Calcium	5	1.00E+02		5	2.74E+03	9.14E+03
Carbon Disulfide	5	2.00E+01	4	1	1.50E-03	1.50E-03
Chromium	5	1.00E+02		5	4.40E+00	2.36E+01
Cobalt	5	1.00E+02		5	3.70E+00	1.00E+01
Copper	5	1.00E+02		5	2.74E+01	7.97E+01
Ethylbenzene	5	4.00E+01	3	2	7.00E-04	4.50E-03
Fluoranthene	5	2.00E+01	4	1	7.00E-02	7.00E-02
Iron	5	1.00E+02		5	1.58E+04	3.69E+04
Lead	5	4.00E+01	3	2	7.00E+00	1.10E+01
Magnesium	5	1.00E+02		5	3.49E+03	9.25E+03
Manganese	5	1.00E+02		5	2.29E+02	5.82E+02

Table C-3 (Continued)
Statistical Summary of Valid Analytical Results for Site 11, Zone 2
1990 Investigation

Parameter	Quantity Analyzed	Percent Frequency of Detection	Quantity Not Detected	Quantity Detected	Minimum Detected Value	Maximum Detected Value
Methylene Chloride	5	4.00E+01	3	2	3.30E-03	9.40E-03
Nickel	5	1.00E+02		5	3.00E+00	1.30E+01
Phenanthrene	5	2.00E+01	4	1	1.80E-01	1.80E-01
Potassium	5	1.00E+02		5	3.20E+02	8.79E+02
Pyrene	5	2.00E+01	4	1	1.00E-01	1.00E-01
Sodium	5	1.00E+02		5	6.86E+02	2.50E+03
Toluene	5	8.00E+01	1	4	2.80E-03	2.10E-02
Vanadium	5	1.00E+02		5	4.91E+01	1.24E+02
Xylenes	5	6.00E+01	2	3	4.90E-03	5.50E-02
Zinc	5	1.00E+02		5	2.24E+01	4.08E+01
Bis(2-ethylhexyl)phthalate	5	8.00E+01	1	4	4.20E-02	1.40E-01
Matrix: Groundwater (µg/L)						
2-Butanone	2	5.00E+01	1	1	3.10E+00	3.10E+00
4-Methylphenol	1	1.00E+02		1	1.00E+00	1.00E+00
Aluminum	2	1.00E+02		2	2.77E+04	2.44E+05
Barium	2	1.00E+02		2	8.60E+01	3.40E+02
Benzene	2	5.00E+01	1	1	5.00E-01	5.00E-01
Beryllium	2	5.00E+01	1	1	3.00E+00	3.00E+00
Calcium	2	1.00E+02		2	2.25E+04	3.92E+04
Chromium	2	1.00E+02		2	5.00E+00	4.60E+01
Cobalt	2	5.00E+01	1	1	1.80E+01	1.80E+01
Copper	2	1.00E+02		2	3.30E+01	3.17E+02
Ethylbenzene	2	5.00E+01	1	1	5.60E+00	5.60E+00
Iron	2	1.00E+02		2	1.60E+05	3.57E+05
Magnesium	2	1.00E+02		2	1.32E+04	2.65E+04
Manganese	2	1.00E+02		2	4.46E+03	6.23E+03
Mercury	2	5.00E+01	1	1	3.00E-01	3.00E-01
Naphthalene	1	1.00E+02		1	1.00E+00	1.00E+00
Nickel	2	5.00E+01	1	1	2.00E+01	2.00E+01
Potassium	2	1.00E+02		2	4.80E+03	7.60E+03

Table C-3 (Continued)
Statistical Summary of Valid Analytical Results for Site 11, Zone 2
1990 Investigation

Parameter	Quantity Analyzed	Percent Frequency of Detection	Quantity Not Detected	Quantity Detected	Minimum Detected Value	Maximum Detected Value
Selenium	2	5.00E+01	1	1	6.00E+01	6.00E+01
Sodium	2	1.00E+02		2	2.93E+04	3.47E+04
Toluene	2	5.00E+01	1	1	1.00E+00	1.00E+00
Vanadium	2	1.00E+02		2	4.50E+01	4.51E+02
Vinyl Chloride	2	5.00E+01	1	1	1.20E+00	1.20E+00
Xylenes	2	1.00E+02		2	1.50E+01	1.60E+01
Zinc	2	1.00E+02		2	2.10E+01	1.94E+02
Bis(2-ethylhexyl)phthalate	1	1.00E+02		1	2.00E+00	2.00E+00

Table C-4
Statistical Summary of Valid Analytical Results for Site 11, Zone 3
1990 Investigation

Parameter	Quantity Analyzed	Percent Frequency of Detection	Quantity Not Detected	Quantity Detected	Minimum Detected Value	Maximum Detected Value
Matrix: Surface Water (µg/L)						
Aluminum	2	1.00E+02		2	4.60E+02	5.10E+02
Barium	2	1.00E+02		2	8.00E+00	8.00E+00
Calcium	2	1.00E+02		2	9.70E+03	9.82E+03
Copper	2	1.00E+02		2	1.10E+01	1.10E+01
Iron	2	1.00E+02		2	6.99E+02	7.47E+02
Magnesium	2	1.00E+02		2	2.88E+03	2.89E+03
Manganese	2	1.00E+02		2	2.90E+01	2.90E+01
Mercury	2	5.00E+01	1	1	1.00E-01	1.00E-01
Nickel	2	1.00E+02		2	1.00E+01	2.00E+01
Potassium	2	1.00E+02		2	8.00E+02	8.00E+02
Sodium	2	1.00E+02		2	1.06E+04	1.08E+04
Vanadium	2	1.00E+02		2	2.00E+00	3.00E+00
Zinc	2	1.00E+02		2	9.20E+01	9.20E+01
Matrix: Sediment (mg/kg)						
Aluminum	6	1.00E+02		6	8.63E+03	2.23E+04
Anthracene	6	1.67E+01	5	1	6.40E-02	6.40E-02
Arsenic	6	1.67E+01	5	1	1.60E+01	1.60E+01
Barium	6	1.00E+02		6	9.50E+00	1.13E+02
Benzo(a)anthracene	6	3.33E+01	4	2	1.60E-01	2.10E-01
Benzo(a)pyrene	6	3.33E+01	4	2	1.10E-01	1.50E-01
Benzo(b)fluoranthene	6	3.33E+01	4	2	2.40E-01	2.70E-01
Benzo(k)fluoranthene	6	3.33E+01	4	2	1.40E-01	2.00E-01
Benzoic Acid	6	5.00E+01	3	3	4.60E-02	1.20E-01
Beryllium	6	1.67E+01	5	1	2.00E-01	2.00E-01
Cadmium	6	1.00E+02		6	5.00E-01	3.80E+00
Calcium	6	1.00E+02		6	5.73E+03	6.78E+04
Chromium	6	1.00E+02		6	8.00E-01	1.03E+02
Chrysene	6	3.33E+01	4	2	2.40E-01	3.30E-01

Table C-4 (Continued)
Statistical Summary of Valid Analytical Results for Site 11, Zone 3
1990 Investigation

Parameter	Quantity Analyzed	Percent Frequency of Detection	Quantity Not Detected	Quantity Detected	Minimum Detected Value	Maximum Detected Value
Cobalt	6	1.00E+02		6	4.00E+00	1.99E+01
Copper	6	1.00E+02		6	1.84E+01	1.05E+02
Fluoranthene	6	3.33E+01	4	2	2.80E-01	3.40E-01
Iron	6	1.00E+02		6	1.27E+04	1.09E+05
Lead	6	8.33E+01	1	5	5.00E+00	5.95E+02
Magnesium	6	1.00E+02		6	6.32E+03	9.21E+03
Manganese	6	1.00E+02		6	4.03E+02	2.19E+03
Mercury	6	1.67E+01	5	1	7.00E-02	7.00E-02
Nickel	6	8.33E+01	1	5	1.10E+01	3.40E+01
Phenanthrene	6	3.33E+01	4	2	2.00E-01	3.00E-01
Potassium	6	1.00E+02		6	3.65E+02	7.88E+02
Selenium	6	1.67E+01	5	1	2.30E+01	2.30E+01
Sodium	6	1.00E+02		6	7.58E+02	1.72E+03
Thallium	5	2.00E+01	4	1	2.20E+01	2.20E+01
Vanadium	6	1.00E+02		6	1.67E+01	6.41E+01
Zinc	6	1.00E+02		6	5.98E+01	8.85E+02
Bis(2-ethylhexyl)phthalate	6	1.67E+01	5	1	1.20E-01	1.20E-01

Table C-5
Maximum Detected Chemical Concentrations From the 1989 SI Report
Metals Landfill

Constituent	Groundwater (µg/L)	Surface Soil (µg/kg)	Subsurface Soils (µg/kg)
Semivolatile Organic Compounds			
Phenanthrene	10 UJ	460 J	170 U
Fluoranthene	10 UJ	748 J	170 U
Pyrene	10 UJ	640 J	170 U
Benzo(a)anthracene	10 UJ	490 J	170 U
Chrysene	10 UJ	520 J	170 U
Benzo(b)fluoranthene	10 UJ	800 J	170 U
Benzo(a)pyrene	10 UJ	450 J	170 U
Indeno(1,2,3-cd)pyrene	10 UJ	300 J	170 U
TIC[a] hydrocarbons	ND	110,000 JN	170 U
TIC[a] unknowns	100 JN	ND	ND
Organochlorine Pesticides			
Delta-BHC	0.073 N	25 U	9.2 UJ
PCBs			
Aroclor 1260	1 U	980	18 U
Metals[b]			
Arsenic	2.0 UJ	16,000 J	8,100
Cadmium	5.0 UJ	1,300 J	450
Chromium	10.0 U	50,000 J	7,200
Copper	25.0 U	91,800	29,500
Lead	3.2 J	99,700	4,400
Nickel	40.0 U	31,200 J	7,500 J
Silver	10.0 U	4,000	800 U
Zinc	364	163,000 J	27,800 J

[a]Tentatively identified compound
[b]Groundwater data shown as dissolved concentrations
Notes:
ND - The constituent was not detected.
Source: Tetra Tech. 1989. *Site Inspection Report, Naval Air Station Adak, Adak Island, Alaska*. Volume 1: *Field Report*. TC-3603-02.

Table C-6
Maximum Detected Chemical Concentrations From the 1992 ESI Report
Metals Landfill

Constituent	Groundwater[a] (µg/L)	Soil (µg/kg)
Volatile Organic Compounds		
Benzene	ND	81 J
2-Butanone	ND	130
Carbon disulfide	ND	26 J
Chloroform	2 J	ND
1,1-Dichloroethane	ND	3 J
cis-1,2-Dichloroethene	1 J	ND
Ethylbenzene	1 J	3,000 J
Toluene	15	2,800 J
1,1,1-Trichloroethane	16	ND
Trichloroethene	67	ND
Xylene	ND	35,000 J
Semivolatile Organic Compounds		
Acenaphthene	ND	630 J
Acenaphthylene	ND	33,000
Acetone	18	400
Anthracene	ND	47,000
Benzo(a)anthracene	ND	41,000
Benzo(b)fluoranthene	ND	34,000
Benzo(k)fluoranthene	ND	16,000 J
Benzo(g,h,i)perylene	ND	13,000
Benzo(a)pyrene	ND	33,000
Benzoic acid	ND	8,400 J
Butylbenzylphthalate	4 J	4,900
Bis(2-ethylhexyl)phthalate	ND	45,000
Bis(2-chloroethyl)ether	12	ND
Chrysene	ND	46,000 J
Dibenzo(a,h)anthracene	ND	5,800
Dibenzofuran	ND	26,000 J
Dimethylphthalate	ND	390 J

Table C-6 (Continued)
Maximum Detected Chemical Concentrations From the 1992 ESI Report
Metals Landfill

Constituent	Groundwater[a] (µg/L)	Soil (µg/kg)
Di-n-butylphthalate	ND	16,000 J
Fluoranthene	ND	95,000
Fluorene	ND	38,000 J
Indeno(1,2,3-cd)pyrene	ND	16,000
Methylene chloride	2 J	6 J
2-Methylnaphthalene	ND	16,000 J
4-Methylphenol	ND	89 J
Naphthalene	ND	41,000
N-Nitrosodiphenylamine	ND	120 J
Phenanthrene	ND	140,000
Phenol	7 J	130 J
Pyrene	ND	110,000
1,2,4-Trichlorobenzene	ND	900 J
Pesticides		
4,4′-DDD	1.8	2.8 J
4,4′-DDE	ND	150 J
4,4′-DDT	ND	65 J
Dieldrin	ND	120 J
Endosulfan sulfate	ND	1.9 J
Endrin	ND	9.6 J
PCBs		
Aroclor 1242	ND	410
Aroclor 1254	ND	3,300
Aroclor 1260	ND	8,800

Table C-6 (Continued)
Maximum Detected Chemical Concentrations From the 1992 ESI Report
Metals Landfill

Constituent	Groundwater[a] (µg/L)	Soil (mg/kg)
Metals		
Aluminum	506,000	21,800
Antimony	ND	863 J
Arsenic	40.5	14.2
Barium	727	261
Beryllium	19.2	0.85
Cadmium	ND	8.7
Chromium	589	60.9
Cobalt	250	14.2
Copper	1,560	1,150
Iron	439,000	42,000
Lead	ND	40,200
Manganese	11,400	1,100
Magnesium	163,000	12,100
Mercury	ND	6.7
Nickel	407	46.3
Potassium	24,500	1,850
Selenium	ND	6.2
Silver	ND	91.6
Sodium	369,000	1,920
Vanadium	1460	82.6
Zinc	ND	1,390

[a]Groundwater data shown as total concentrations
Notes:
ND - The constituent was not detected.
Source: URS Consultants, Inc. 1992. *Site Inspection Final Report, Sites 13, 37, 38, 39, Naval Air Station Adak, Adak, Alaska*. Prepared for U.S. Navy CLEAN Contract N62474-89-D-9295. Seattle, Washington.

Table C-7

Analytical Results for Groundwater at Old Metals Landfill (1992-1993)
Installation: ADAK, Site: 13, Matrix: GW, Units: ug/l, Project: 154
Sorted by Analytical Method, Parameter Name

Report Date: 26-MAY-94

Location Xref 13-1

Method	Parameter Name	Jun-92	DQ	DVQ	Aug-92	DQ	DVQ	Oct-92	DQ	DVQ	Feb-93	DQ	DVQ
418.1	Total Petroleum Hydrocarbons	500	U										
IN-CLP	Aluminum	16400			33600			12000	*		27800	*	
								10400	*				
IN-CLP	Antimony	14	UN		14	U		16	UN		31	UN	
								16	UN				
IN-CLP	Arsenic	7.5	BN		13.3			5.2	BW		9.3	BS	
								4.6	BW				
IN-CLP	Barium	66.4	B		105	B		71.3	B		117	B	
								60.4	B				
IN-CLP	Beryllium	1	U		1	U		1	U		1	U	
								1	U				
IN-CLP	Cadmium	2	U		2	U		2	U		2	U	
								2	U				
IN-CLP	Calcium	47900			58100			56000			58700		
								52900					
IN-CLP	Chromium	12.1			26.2			10.6			25.7		
								12.6					
IN-CLP	Cobalt	6.6	B		13.8	B		4.6	B		12.5	B	
								4	U				
IN-CLP	Copper	62			87.1			51.1	*		109		
								43.4	*				
IN-CLP	Iron	25100			45300			16800	*		37200	*	
								15500	*				
IN-CLP	Lead	9.1			15.7	S		13.9	*		34.3	SN*	
								11.6	*				
IN-CLP	Magnesium	24500			32800			26100			34100		
								25300					
IN-CLP	Manganese	2850			3540			2630	*		3810	N	
								2200	*				
IN-CLP	Mercury	.2	U		.2	U		.2	U*		.33		
								.2	U*				
IN-CLP	Nickel	9.5	B		8	U		15	U		27	U	
								15	U				
IN-CLP	Potassium	7830			8850			7860			8400		
								7740					
IN-CLP	Selenium	4	UW		2	UW		2	U		10	UN	
								2	U				
IN-CLP	Silver	3	U		3	U		2	U		4	UN	
								2	U				
IN-CLP	Sodium	83900			78900			75900			83000		
								73500					
IN-CLP	Thallium	3	UNW		2	UW		3	UWN		2	UWN	
								3	UWN				
IN-CLP	Vanadium	44.6	B		83.8			26	B		70.7		
								24.8	B				
IN-CLP	Zinc	44.3			75			42.5	*		87.5		
								37.3	*				
P/A-CLP	4,4-DDD	.1	U										
P/A-CLP	4,4-DDE	.1	U										
P/A-CLP	4,4-DDT	.1	U										
P/A-CLP	Aldrin	.05	U										
P/A-CLP	Aroclor 1016	1	U										
P/A-CLP	Aroclor 1221	2	U										
P/A-CLP	Aroclor 1232	1	U										
P/A-CLP	Aroclor 1242	1	U										
P/A-CLP	Aroclor 1248	1	U										
P/A-CLP	Aroclor 1254	1	U										
P/A-CLP	Aroclor 1260	1	U										
P/A-CLP	Dieldrin	.1	U										
P/A-CLP	Endosulfan I	.05	U										
P/A-CLP	Endosulfan II	.1	U										
P/A-CLP	Endosulfan sulfate	.1	U										
P/A-CLP	Endrin	.1	U										
P/A-CLP	Endrin aldehyde	.1	U										
P/A-CLP	Endrin ketone	.1	U										
P/A-CLP	Heptachlor	.05	U										
P/A-CLP	Heptachlor epoxide	.05	U										
P/A-CLP	Methoxychlor	.5	U										
P/A-CLP	Toxaphene	1	U										
P/A-CLP	alpha-BHC	.05	U										

Time: 12:31:28

Table C-7 (continued)

Analytical Results for Groundwater at Old Metals Landfill (1992-1993)
Installation: ADAK, Site: 13, Matrix: GW, Units: ug/l, Project: 154
Sorted by Analytical Method, Parameter Name

Report Date: 26-MAY-94

Location Xref 13-1

Method	Parameter Name	Jun-92	DQ	DVQ	Aug-92	DQ	DVQ	Oct-92	DQ	DVQ	Feb-93	DQ	DV
V-CLP	1,1,1-Trichloroethane	10	U		10	U							
V-CLP	1,1,2,2-Tetrachloroethane	10	U		10	U							
					10	U							
V-CLP	1,1,2-Trichloroethane	10	U		10	U							
					10	U							
V-CLP	1,1-Dichloroethane	10	U		10	U							
					10	U							
V-CLP	1,1-Dichloroethene	10	U		10	U							
					10	U							
V-CLP	1,2-Dichloroethane	10	U		10	U							
					10	U							
V-CLP	1,2-Dichloroethene	10	U		10	U							
					10	U							
V-CLP	1,2-Dichloropropane	10	U		10	U							
					10	U							
V-CLP	2-Hexanone	10	U		10	U							
					10	U							
V-CLP	4-Methyl-2-pentanone	10	U		10	U							
					10	U							
V-CLP	Acetone	8	BJ		10	U							
					10	U							
V-CLP	Benzene	1	J		10	U							
					10	U							
V-CLP	Bromodichloromethane	10	U		10	U							
					10	U							
V-CLP	Bromoform	10	U		10	U							
					10	U							
V-CLP	Bromomethane	10	U		10	U							
					10	U							
V-CLP	Carbon disulfide	10	U		10	U							
					10	U							
V-CLP	Carbon tetrachloride	10	U		10	U							
					10	U							
V-CLP	Chlorobenzene	10	U		10	U							
					10	U							
V-CLP	Chloroethane	10	U		10	U							
					10	U							
V-CLP	Chloroform	10	U		10	U							
					10	U							
V-CLP	Chloromethane	10	U		10	U							
					10	U							
V-CLP	Dibromochloromethane	10	U		10	U							
					10	U							
V-CLP	Ethylbenzene	10	U		10	U							
					10	U							
V-CLP	Methyl ethyl ketone	10	U		10	U							
					10	U							
V-CLP	Methylbenzene	10	U		10	U							
					10	U							
V-CLP	Methylene chloride	3	J		32								
					10	U							
V-CLP	Styrene	10	U		10	U							
					10	U							
V-CLP	Tetrachloroethylene	10	U		10	U							
					10	U							
V-CLP	Trichloroethlyene	4	J		2	J							
					3	J							
V-CLP	Vinyl chloride	10	U		10	U							
					10	U							
V-CLP	Xylenes	10	U		10	U							
					10	U							
V-CLP	cis-1,3-Dichloropropene	10	U		10	U							
					10	U							
V-CLP	trans-1,3-Dichloropropene	10	U		10	U							
					10	U							

Time: 12:31:28

Table C-7 (continued)

Analytical Results for Groundwater at Old Metals Landfill (1992-1993)
Installation: ADAK, Site: 13, Matrix: GW, Units: ug/l, Project: 154
Sorted by Analytical Method, Parameter Name

Report Date: 26-MAY-94

Location Xref 13-2

Method	Parameter Name	Jun-92	DQ	DVQ	Aug-92	DQ	DVQ	Oct-92	DQ	DVQ	Feb-93	DQ	DVQ
P/A-CLP	alpha-Chlordane	.05	U										
P/A-CLP	beta-BHC	.05	U										
P/A-CLP	delta-BHC	.05	U										
P/A-CLP	gamma-BHC	.05	U										
P/A-CLP	gamma-Chlordane	.05	U										
SV-CLP	1,2,4-Trichlorobenzene	23			10 10	U U							
SV-CLP	1,2-Dichlorobenzene	10	U		10 10	U U							
SV-CLP	1,3-Dichlorobenzene	10	U		10 10	U U							
SV-CLP	1,4-Dichlorobenzene	22			10 10	U U							
SV-CLP	2,2-oxybis(1-Chloropropane)	10	U		10 10	U U							
SV-CLP	2,4,5-Trichlorophenol	25	U		25 25	U U							
SV-CLP	2,4,6-Trichlorophenol	10	U		10 10	U U							
SV-CLP	2,4-Dichlorophenol	10	U		10 10	U U							
SV-CLP	2,4-Dimethylphenol	10	U		10 10	U U							
SV-CLP	2,4-Dinitrophenol	25	U		25 25	U U							
SV-CLP	2,4-Dinitrotoluene	35			10 10	U U							
SV-CLP	2,6-Dinitrotoluene	10	U		10 10	U U							
SV-CLP	2-Chloronaphthalene	10	U		10 10	U U							
SV-CLP	2-Chlorophenol	49			10 10	U U							
SV-CLP	2-Methylnaphthalene	10	U		10 10	U U							
SV-CLP	2-Nitroaniline	25	U		25 25	U U							
SV-CLP	2-Nitrophenol	10	U		10 10	U U							
SV-CLP	3,3-Dichlorobenzidine	10	U		10 10	U U							
SV-CLP	3-Nitroaniline	25	U		25 25	U U							
SV-CLP	4,6-Dinitro-2-methylphenol	25	U		25 25	U U							
SV-CLP	4-Bromophenyl-phenylether	10	U		10 10	U U							
SV-CLP	4-Chloro-3-methylphenol	58			10 10	U U							
SV-CLP	4-Chloroaniline	10	U		10 10	U U							
SV-CLP	4-Chlorophenyl-phenylether	10	U		10 10	U U							
SV-CLP	4-Nitroaniline	25	U		25 25	U U							
SV-CLP	4-Nitrophenol	59			25 25	U U							
SV-CLP	Acenaphthene	34			10 10	U U							
SV-CLP	Acenaphthylene	10	U		10 10	U U							
SV-CLP	Anthracene	10	U		10 10	U U							
SV-CLP	Benzo(a)anthracene	10	U		10 10	U U							
SV-CLP	Benzo(a)pyrene	10	U		10 10	U U							
SV-CLP	Benzo(b)fluoranthene	10	U		10 10	U U							
SV-CLP	Benzo(g,h,i)perylene	10	U		10	U							

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Table C-7 (continued)

Analytical Results for Groundwater at Old Metals Landfill (1992-1993)
Installation: ADAK, Site: 13, Matrix: GW, Units: ug/l, Project: 154
Sorted by Analytical Method, Parameter Name

Report Date: 26-MAY-94

Location Xref 13-2

Method	Parameter Name	Jun-92	DQ	DVQ	Aug-92	DQ	DVQ	Oct-92	DQ	DVQ	Feb-93	DQ	D\
V-CLP	1,2-Dichloropropane	10	U		10	U							
V-CLP	2-Hexanone	10	U		10	U							
V-CLP	4-Methyl-2-pentanone	10	U		10	U							
V-CLP	Acetone	4	J		10	U							
V-CLP	Benzene	10	U		10	U							
V-CLP	Bromodichloromethane	10	U		10	U							
V-CLP	Bromoform	10	U		10	U							
V-CLP	Bromomethane	10	U		10	U							
V-CLP	Carbon disulfide	10	U		10	U							
V-CLP	Carbon tetrachloride	10	U		10	U							
V-CLP	Chlorobenzene	10	U		10	U							
V-CLP	Chloroethane	10	U		10	U							
V-CLP	Chloroform	10	U		10	U							
V-CLP	Chloromethane	10	U		10	U							
V-CLP	Dibromochloromethane	10	U		10	U							
V-CLP	Ethylbenzene	10	U		10	U							
V-CLP	Methyl ethyl ketone	10	U		10	U							
V-CLP	Methylbenzene	10	U		10	U							
V-CLP	Methylene chloride	10	U		35								
V-CLP	Styrene	10	U		10	U							
V-CLP	Tetrachloroethylene	10	U		10	U							
V-CLP	Trichloroethlyene	4	J		10	U							
V-CLP	Vinyl chloride	10	U		10	U							
V-CLP	Xylenes	10	U		10	U							
V-CLP	cis-1,3-Dichloropropene	10	U		10	U							
V-CLP	trans-1,3-Dichloropropene	10	U		10	U							

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Table C-7 (continued)

Analytical Results for Groundwater at Old Metals Landfill (1992-1993)
Installation: ADAK, Site: 13, Matrix: GW, Units: ug/l, Project: 154
Sorted by Analytical Method, Parameter Name

Report Date: 26-MAY-94

Location Xref 13-3

Method	Parameter Name	Jun-92	DQ	DVQ	Aug-92	DQ	DVQ	Oct-92	DQ	DVQ	Feb-93	DQ	DVQ
SV-CLP	3-Nitroaniline	25	U										
SV-CLP	4,6-Dinitro-2-methylphenol	25	U										
SV-CLP	4-Bromophenyl-phenylether	10	U										
SV-CLP	4-Chloro-3-methylphenol	10	U										
SV-CLP	4-Chloroaniline	10	U										
SV-CLP	4-Chlorophenyl-phenylether	10	U										
SV-CLP	4-Nitroaniline	25	U										
SV-CLP	4-Nitrophenol	25	U										
SV-CLP	Acenaphthene	10	U										
SV-CLP	Acenaphthylene	10	U										
SV-CLP	Anthracene	10	U										
SV-CLP	Benzo(a)anthracene	10	U										
SV-CLP	Benzo(a)pyrene	10	U										
SV-CLP	Benzo(b)fluoranthene	10	U										
SV-CLP	Benzo(g,h,i)perylene	10	U										
SV-CLP	Benzo(k)fluoranthene	10	U										
SV-CLP	Butylbenzylphthalate	10	U										
SV-CLP	Carbazole	10	U										
SV-CLP	Chrysene	10	U										
SV-CLP	Di-n-butylphthalate	10	U										
SV-CLP	Di-n-octylphthalate	10	U										
SV-CLP	Dibenz(a,h)anthracene	10	U										
SV-CLP	Dibenzofuran	10	U										
SV-CLP	Diethylphthalate	10	U										
SV-CLP	Dimethylphthalate	10	U										
SV-CLP	Fluoranthene	10	U										
SV-CLP	Fluorene	10	U										
SV-CLP	Hexachlorobenzene	10	U										
SV-CLP	Hexachlorobutadiene	10	U										
SV-CLP	Hexachlorocyclopentadiene	10	U										
SV-CLP	Hexachloroethane	10	U										
SV-CLP	Indeno(1,2,3-cd)pyrene	10	U										
SV-CLP	Isophorone	10	U										
SV-CLP	N-Nitrosodinpropylamine	10	U										
SV-CLP	N-Nitrosodiphenylamine	10	U										
SV-CLP	Naphthalene	10	U										
SV-CLP	Nitrobenzene	10	U										
SV-CLP	Pentachlorophenol	25	U										
SV-CLP	Phenanthrene	10	U										
SV-CLP	Phenol	10	U										
SV-CLP	Pyrene	10	U										
SV-CLP	bis(2-Chloroethoxy)methane	10	U										
SV-CLP	bis(2-Chloroethyl)ether	10	U										
SV-CLP	bis(2-Ethylhexyl)phthalate	10	U										
SV-CLP	o-cresol	10	U										
SV-CLP	p-cresol	10	U										
V-CLP	1,1,1-Trichloroethane	10	U										
V-CLP	1,1,2,2-Tetrachloroethane	10	U										
V-CLP	1,1,2-Trichloroethane	10	U										
V-CLP	1,1-Dichloroethane	2	J										
V-CLP	1,1-Dichloroethene	10	U										
V-CLP	1,2-Dichloroethane	10	U										
V-CLP	1,2-Dichloroethene	10	U										
V-CLP	1,2-Dichloropropane	10	U										
V-CLP	2-Hexanone	10	U										
V-CLP	4-Methyl-2-pentanone	10	U										
V-CLP	Acetone	10	U										
V-CLP	Benzene	10	U										
V-CLP	Bromodichloromethane	10	U										
V-CLP	Bromoform	10	U										
V-CLP	Bromomethane	10	U										
V-CLP	Carbon disulfide	10	U										
V-CLP	Carbon tetrachloride	10	U										
V-CLP	Chlorobenzene	10	U										
V-CLP	Chloroethane	10	U										
V-CLP	Chloroform	10	U										
V-CLP	Chloromethane	10	U										
V-CLP	Dibromochloromethane	10	U										
V-CLP	Ethylbenzene	10	U										
V-CLP	Methyl ethyl ketone	10	U										

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Table C-7 (continued)

Analytical Results for Groundwater at Old Metals Landfill (1992-1993)
Installation: ADAK, Site: 13, Matrix: GW, Units: ug/l, Project: 154
Sorted by Analytical Method, Parameter Name

Report Date: 26-MAY-94

Location Xref 13-4

Method	Parameter Name	Jun-92	DQ	DVQ	Aug-92	DQ	DVQ	Oct-92	DQ	DVQ	Feb-93	DQ	D
418.1	Total Petroleum Hydrocarbons	500	U										
IN-CLP	Aluminum	14500			6660	*		655	*		5810	*	
IN-CLP	Antimony	14	UN		14	UN		16	UN		31	UN	
IN-CLP	Arsenic	5	BN		3.4	B		2	UW		2.1	B	
IN-CLP	Barium	62.8	B		25.5	B		7	U		24.5	B	
IN-CLP	Beryllium	1	U		1	U		1	U		1	U	
IN-CLP	Cadmium	3.1	B		2	U		2	U		2	U	
IN-CLP	Calcium	45400			16500			12300			23700		
IN-CLP	Chromium	16.1			3.6	B		4	U		6.4	B	
IN-CLP	Cobalt	9.8	B		6	U		4	U		5	U	
IN-CLP	Copper	113			38.5			5.4	B*		36.1		
IN-CLP	Iron	13900			5830	*		584	*		5230	*	
IN-CLP	Lead	27.9			12.7	S		5.6	W*		9.8	N*	
IN-CLP	Magnesium	52300			17200			13500			22000		
IN-CLP	Manganese	2960			1140	*		128	*		780	N	
IN-CLP	Mercury	.28			.2	U		.2	U*		.2	U	
IN-CLP	Nickel	8.5	B		8	U		15	U		27	U	
IN-CLP	Potassium	25600			14600			12300			15500		
IN-CLP	Selenium	4	UW		2	U		2	U		1	UN	
IN-CLP	Silver	7.8	B		3	UN		2	U		4	UN	
IN-CLP	Sodium	456000			278000	E		236000			238000		
IN-CLP	Thallium	3	UNW		2	UWN		3	UWN		2	UWN	
IN-CLP	Vanadium	40.8	B		18.1	B		6	U		18.1	B	
IN-CLP	Zinc	215			93.5			17.6	B*		76.1		
P/A-CLP	4,4-DDD	.1	U										
P/A-CLP	4,4-DDE	.1	U										
P/A-CLP	4,4-DDT	.1	U										
P/A-CLP	Aldrin	.05	U										
P/A-CLP	Aroclor 1016	1	U										
P/A-CLP	Aroclor 1221	2	U										
P/A-CLP	Aroclor 1232	1	U										
P/A-CLP	Aroclor 1242	1	U										
P/A-CLP	Aroclor 1248	1	U										
P/A-CLP	Aroclor 1254	1	U										
P/A-CLP	Aroclor 1260	1	U										
P/A-CLP	Dieldrin	.1	U										
P/A-CLP	Endosulfan I	.05	U										
P/A-CLP	Endosulfan II	.1	U										
P/A-CLP	Endosulfan sulfate	.1	U										
P/A-CLP	Endrin	.1	U										
P/A-CLP	Endrin aldehyde	.1	U										
P/A-CLP	Endrin ketone	.1	U										
P/A-CLP	Heptachlor	.05	U										
P/A-CLP	Heptachlor epoxide	.05	U										
P/A-CLP	Methoxychlor	.5	U										
P/A-CLP	Toxaphene	1	U										
P/A-CLP	alpha-BHC	.05	U										
P/A-CLP	alpha-Chlordane	.05	U										
P/A-CLP	beta-BHC	.05	U										
P/A-CLP	delta-BHC	.05	U										
P/A-CLP	gamma-BHC	.05	U										
P/A-CLP	gamma-Chlordane	.05	U										
SV-CLP	1,2,4-Trichlorobenzene	10	U		10	U							
SV-CLP	1,2-Dichlorobenzene	10	U		10	U							
SV-CLP	1,3-Dichlorobenzene	10	U		10	U							
SV-CLP	1,4-Dichlorobenzene	10	U		10	U							
SV-CLP	2,2-oxybis(1-Chloropropane)	10	U		10	U							
SV-CLP	2,4,5-Trichlorophenol	25	U		25	U							
SV-CLP	2,4,6-Trichlorophenol	10	U		10	U							
SV-CLP	2,4-Dichlorophenol	10	U		10	U							
SV-CLP	2,4-Dimethylphenol	10	U		10	U							
SV-CLP	2,4-Dinitrophenol	25	U		25	U							
SV-CLP	2,4-Dinitrotoluene	10	U		10	U							
SV-CLP	2,6-Dinitrotoluene	10	U		10	U							
SV-CLP	2-Chloronaphthalene	10	U		10	U							
SV-CLP	2-Chlorophenol	10	U		10	U							
SV-CLP	2-Methylnaphthalene	10	U		10	U							
SV-CLP	2-Nitroaniline	25	U		25	U							
SV-CLP	2-Nitrophenol	10	U		10	U							
SV-CLP	3,3-Dichlorobenzidine	10	U		10	U							

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Table C-7 (continued)

Analytical Results for Groundwater at Old Metals Landfill (1992-1993)
Installation: ADAK, Site: 13, Matrix: GW, Units: ug/l, Project: 154
Sorted by Analytical Method, Parameter Name

Report Date: 26-MAY-94

Location Xref 13-4

Method	Parameter Name	Jun-92	DQ	DVQ	Aug-92	DQ	DVQ	Oct-92	DQ	DVQ	Feb-93	DQ	DVQ
V-CLP	Methylbenzene	10	U										
V-CLP	Methylene chloride	10	U										
V-CLP	Styrene	10	U										
V-CLP	Tetrachloroethylene	10	U										
V-CLP	Trichloroethlyene	10	U										
V-CLP	Vinyl chloride	10	U										
V-CLP	Xylenes	10	U										
V-CLP	cis-1,3-Dichloropropene	10	U										
V-CLP	trans-1,3-Dichloropropene	10	U										

Time: 12:31:28

Table C-7 (continued)

Analytical Results for Groundwater at Old Metals Landfill (1992-1993)
Installation: ADAK, Site: 13, Matrix: GW, Units: ug/l, Project: 154
Sorted by Analytical Method, Parameter Name

Report Date: 26-MAY-94

Location Xref 13-5

Method	Parameter Name	Jun-92	DQ	DVQ	Aug-92	DQ	DVQ	Oct-92	DQ	DVQ	Feb-93	DQ
SV-CLP	3-Nitroaniline	25	U									
SV-CLP	4,6-Dinitro-2-methylphenol	25	U									
SV-CLP	4-Bromophenyl-phenylether	10	U									
SV-CLP	4-Chloro-3-methylphenol	10	U									
SV-CLP	4-Chloroaniline	10	U									
SV-CLP	4-Chlorophenyl-phenylether	10	U									
SV-CLP	4-Nitroaniline	25	U									
SV-CLP	4-Nitrophenol	25	U									
SV-CLP	Acenaphthene	10	U									
SV-CLP	Acenaphthylene	10	U									
SV-CLP	Anthracene	10	U									
SV-CLP	Benzo(a)anthracene	10	U									
SV-CLP	Benzo(a)pyrene	10	U									
SV-CLP	Benzo(b)fluoranthene	10	U									
SV-CLP	Benzo(g,h,i)perylene	10	U									
SV-CLP	Benzo(k)fluoranthene	10	U									
SV-CLP	Butylbenzylphthalate	10	U									
SV-CLP	Carbazole	10	U									
SV-CLP	Chrysene	10	U									
SV-CLP	Di-n-butylphthalate	10	U									
SV-CLP	Di-n-octylphthalate	10	U									
SV-CLP	Dibenz(a,h)anthracene	10	U									
SV-CLP	Dibenzofuran	10	U									
SV-CLP	Diethylphthalate	10	U									
SV-CLP	Dimethylphthalate	10	U									
SV-CLP	Fluoranthene	10	U									
SV-CLP	Fluorene	10	U									
SV-CLP	Hexachlorobenzene	10	U									
SV-CLP	Hexachlorobutadiene	10	U									
SV-CLP	Hexachlorocyclopentadiene	10	U									
SV-CLP	Hexachloroethane	10	U									
SV-CLP	Indeno(1,2,3-cd)pyrene	10	U									
SV-CLP	Isophorone	10	U									
SV-CLP	N-Nitrosodinpropylamine	10	U									
SV-CLP	N-Nitrosodiphenylamine	10	U									
SV-CLP	Naphthalene	10	U									
SV-CLP	Nitrobenzene	10	U									
SV-CLP	Pentachlorophenol	25	U									
SV-CLP	Phenanthrene	10	U									
SV-CLP	Phenol	10	U									
SV-CLP	Pyrene	10	U									
SV-CLP	bis(2-Chloroethoxy)methane	10	U									
SV-CLP	bis(2-Chloroethyl)ether	10	U									
SV-CLP	bis(2-Ethylhexyl)phthalate	10	U									
SV-CLP	o-cresol	10	U									
SV-CLP	p-cresol	10	U									
V-CLP	1,1,1-Trichloroethane	10	U									
V-CLP	1,1,2,2-Tetrachloroethane	10	U									
V-CLP	1,1,2-Trichloroethane	10	U									
V-CLP	1,1-Dichloroethane	10	U									
V-CLP	1,1-Dichloroethene	10	U									
V-CLP	1,2-Dichloroethane	10	U									
V-CLP	1,2-Dichloroethene	10	U									
V-CLP	1,2-Dichloropropane	10	U									
V-CLP	2-Hexanone	10	U									
V-CLP	4-Methyl-2-pentanone	10	U									
V-CLP	Acetone	10	U									
V-CLP	Benzene	10	U									
V-CLP	Bromodichloromethane	10	U									
V-CLP	Bromoform	10	U									
V-CLP	Bromomethane	10	U									
V-CLP	Carbon disulfide	10	U									
V-CLP	Carbon tetrachloride	10	U									
V-CLP	Chlorobenzene	10	U									
V-CLP	Chloroethane	10	U									
V-CLP	Chloroform	10	U									
V-CLP	Chloromethane	10	U									
V-CLP	Dibromochloromethane	10	U									
V-CLP	Ethylbenzene	10	U									
V-CLP	Methyl ethyl ketone	10	U									

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