EXECUTIVE SUMMARY

This Proposed Plan presents the remedial alternatives evaluated to address contaminated soil and water at the former Defense Fuel Support Point-Anchorage (DFSP-A) bulk fuel terminal and identifies the preferred cleanup method. The Defense Energy Support Center (DESC), the lead agency, and the Alaska Department of Environmental Conservation (ADEC), the support agency, are requesting public comments on this Proposed Plan. After the public comment period has ended and the information submitted during this period has been reviewed and considered, the DESC and ADEC will select a final remediation method(s).

The remedial alternatives evaluated address the soil, groundwater, and surface water media at DFSP-A. In general, the remedial alternatives were limited to proven technologies for which on-site experience or feasibility testing suggested the methods were practicable and an understanding of the needs of the community as expressed at the DFSP-A restoration advisory board (RAB). For baseline comparison per federal guidance, a no-action alternative for each media was included in the alternatives evaluated. For soil, the alternatives included no-action, intrinsic bioattenuation with monitoring, excavation and treatment of impacted soil exceeding the maximum allowable concentration (MAC) under 18 AAC 75, excavation and treatment of impacted soil to a low-level goal to aggressively shorten the project timeline, and insitu treatment by bioventing or soil vapor extraction to remediate soil exceeding MAC values. For groundwater, the alternatives consisted of no action, monitoring, remediation by air sparging, and remediation by groundwater extraction and aboveground treatment. Per ADEC guidance, the goal of groundwater treatment was to reduce contaminant concentrations to below ten times Table C from 18 AAC 75. The cleanup levels listed in Table C are for use when the groundwater is a drinking water source. A concentration equal to ten times the cleanup levels in Table C can be used when ADEC determines that the groundwater is not suitable as drinking water, which is the case at DFSP-A. Surface water alternatives evaluated were limited to no action and collection/treatment. The goal of surface water remediation was to reduce contaminant concentrations below ADEC criteria in 18 AAC 70.

The remedial alternatives were combined in sets that included one alternative for each media (i.e., soil, groundwater, and surface water). These alternative sets were evaluated using seven criteria specified in the National Contingency Plan. The criteria include protection of human health and the environment, compliance with applicable or relevant and appropriate requirements (ARARs), long-term effectiveness and permanence, reduction in toxicity, mobility, or volume through treatment, short-term effectiveness, implementability and cost.

Out of the Proposed Plan process, DESC has identified a preferred alternative that it believes provides the best value while addressing ADEC and community concerns. DESC's preferred alternative is the excavation and treatment of site soils to an aggressive low-level goal, which achieves ARARs in all site media in the shortest possible timeline. If this alternative is selected as the remedy at DFSP-A, it is DESC's intent to remove the existing tanks and piping so that no site features remain that could delay regulatory approval by ADEC or eventual transfer of responsibility for the site from DESC to the U.S. Army. Pending comments on this Proposed Plan and funding to facilitate removal of the existing tanks and piping, DESC is prepared to implement remedial activities in 2000. A preliminary schedule suggests that site work, including tank and piping removal, could be completed in two field seasons.

TABLE OF CONTENTS

FIGURES

TABLES

ACRONYMS AND ABBREVIATIONS

ADEC	Alaska Department of Environmental Conservation
AFSC	Anchorage Fuel Supply Center
ARAR	applicable or relevant and appropriate requirements
AWWU	Anchorage Water and Wastewater Utility
bgs	below ground surface
BLM	Bureau of Land Management
BTEX	benzene, toluene, ethylbenzene, and total xylenes
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DESC	Defense Energy Support Center
DFA	arctic grade diesel fuel
DFSP-A	Defense Fuel Support Point-Anchorage
DRO	diesel range organics
EAFB	Elmendorf Air Force Base
FTFA	former tidal flats area
GRO	gasoline range organics
HRS	Hazardous Ranking System
JP-4	number four aviation turbine fuel
JP-5	number five aviation turbine fuel
MAC	maximum allowable concentration
MOA	Municipality of Anchorage
MU	management unit
MUR	unleaded regular gasoline
NCP	National Contingency Plan
NPL	National Priority List
PAHs	polyaromatic hydrocarbons
POA	Port of Anchorage
RAB	restoration advisory board
ROD	Record of Decision
SDA	Slope Deposits Area
TAH	Total Aromatic Hydrocarbon
TAqH	Total Aqueous Hydrocarbon
UBA	Upper Bluff Area
mg/Kg	milligrams per kilogram
mg/L	milligrams per liter

1.0 INTRODUCTION

This Proposed Plan presents the remedial alternatives evaluated to address contaminated soil and water at the former Defense Fuel Support Point-Anchorage (DFSP-A) bulk fuel terminal and identifies the preferred cleanup method. The Defense Energy Support Center (DESC), the lead agency, and the Alaska Department of Environmental Conservation (ADEC), the support agency, are requesting public comments on this Proposed Plan. After the public comment period has ended and the information submitted during this period has been reviewed and considered, the DESC and ADEC will select a final remediation method(s).

The alternatives evaluated for DFSP-A were developed based on environmental and engineering studies, experience gained from previous removal actions at the site, and an understanding of the needs of the community as expressed at the DFSP-A restoration advisory board (RAB). The preferred cleanup alternatives for DFSP-A will be finalized after the public has evaluated this information and had the opportunity to express their opinions or provide suggestions as to how best to implement the cleanup. Changes to the preferred alternatives may be made if public comments or additional data show that a change is appropriate. The final selection of cleanup alternatives will be documented in the DFSP-A Record of Decision (ROD). The ROD will contain a Responsiveness Summary that will document DESC's response to the public comments.

This Proposed Plan invites public participation in the cleanup process per ADEC guidance. The plan follows an organization and format provided in Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the federal regulation known as "Superfund". The DFSP-A facility is not a CERCLA site. CERCLA uses the Hazardous Ranking System (HRS) to score individual sites and the sites with the highest HRS scores are placed on the National Priority List (NPL). This site was not ranked by the Environmental Protection Agency.

The Proposed Plan has four objectives:

1. To describe the nature and extent of the contaminated soil and water at the DFSP-A site and to present the cleanup alternatives evaluated;

2. To identify the preferred cleanup alternative(s) and explain the reason for the preference;

3. To provide information on how the public can be involved in choosing the cleanup alternatives presented in this Proposed Plan; and

4. To solicit public review of, and comment on, the cleanup alternatives presented.

The environmental and engineering studies summarized in this Proposed Plan and other site information can be found in the DFSP-A administrative record. DESC and ADEC encourage the public to review the referenced documents to gain a more comprehensive understanding of the site and the associated characterization and cleanup work that have been conducted. The administrative record is available at the following location:

Location: CH2M Hill, Inc.
Address: 301 West Northern Lights Boulevard, Anchorage, Alaska
Phone: 907-278-2551
Hours: 8:00 am to 5:00 pm

You are encouraged to comment on this Proposed Plan and to provide input on the alternatives. Your comments can make a difference when deciding which cleanup alternative will be chosen. **Send your comments to:**

Community Relations Coordinator
Jack Appolloni
Defense Energy Support Center-Anchorage
10-480, 22nd Street, Elmendorf AFB, AK 99506-2500
Phone: 907-552-4650
Email: jappolloni@desc.dla.mil

The comment period begins June 16, 2000 and ends July 17, 2000.

A public meeting will be held on Monday, June 26, 2000 at the Loussac Library, Marston Theater, 3600 Denali Street, Anchorage, AK from 6:00 p.m. to 8:00 p.m.

2.0 SITE BACKGROUND

DFSP-A is located at 1217 Port Road, Anchorage, Alaska within the developed maritime region of the Port of Anchorage (POA) as shown on the vicinity map, Figure 1. DFSP-A is located in the North 1/2 and Southwest 1/4 of Section 7, Township 13 North, Range 3 West, Anchorage (A-8) NW Quadrangle, Seward Meridian and within the Municipality of Anchorage (MOA) Grids 1030, 1031, and 1130. The DFSP-A property encompasses approximately 69 acres and is bordered by Elmendorf Air Force Base (EAFB) to the north and east, Alascom, Inc. to the southeast, Bluff Road and the Government Hill residential community to the south, Chevron USA Products Company to the southwest, and Terminal Road, Signature Flight Support's Anchorage Fuel Supply Center (AFSC), and Tesoro Alaska Petroleum Company to the west and northwest. As with DFSP-A, Chevron, AFSC and Tesoro are bulk fuel storage and distributing facilities.

The DFSP-A property is withdrawn public land, by Public Order, managed by the United States Bureau of Land Management (BLM) and is assigned to the U.S. Army 6th Infantry Division. The facility was operated and maintained by the U.S. Army until October 1989, when DESC

FIGURE 1 INSERTED HERE – PAGE REMOVED

REMOVE PAGE

took over operational responsibilities as a tenant on the property. DFSP-A operated as a bulk fuel storage and distributing facility from 1942 to initial closure in October 1996. A total of 27 releases of arctic grade diesel fuel (DFA), number four aviation turbine fuel (JP-4), number five aviation turbine fuel (JP-5), unleaded regular gasoline (MUR), slop fuel, and transformer fluid were documented at DFSP-A between 1960 and 1989. In addition, several releases of fuel were documented at the Tesoro, Texaco, and Chevron facilities that may have impacted the truck/rail car loading rack area within DFSP-A.

Based on similar contaminants, contaminants sources, geology, and hydrology, the DFSP-A site was divided into five management units (MUs) in an environmental baseline survey prepared by Shannon & Wilson. Based primarily on topography, which is a key factor influencing potential future land use, the DFSP-A site is also subdivided into three functional areas: the Upper Bluff Area (UBA), the Former Tidal Flats Area (FTFA), and the Slope Deposits Area (SDA). A site plan depicting the MUs and functional areas overlaid on the dominant site features (i.e., buildings and fuel storage tanks) is attached as Figure 2.

The DFSP-A functional areas are described below.

UBA: The UBA occupies the generally flat-lying ground at the higher elevations of the site as defined by a bluff line shown on Figure 2. The UBA covers the south portion of MU2 and east portion of MU4. In the Proposed Plan, the forested northeastern portion of MU3 (MU3 Forrest) is included with the UBA although its topography differs from the remainder of the UBA. This is because the MU3 Forest is potentially suitable to recreators. Defining site features for the UBA include two 50,000-barrel fuel tanks (Tanks 20-616 and 20-617) and three large buildings.

FTFA: The FTFA occupies the generally flat-lying ground at the lower elevations of the site as defined by a line shown on Figure 2. The FTFA is in close proximity to the surrounding Chevron, Tesoro, and Signature bulk fuel terminals. A railcar loading rack, a truck loading rack, and an operations building are defining features of the FTFA.

SDA: Excluding the MU3 Forest, the SDA includes the remainder of the DFSP-A property that is best described as sloping topography situated between the UBA and FTFA. Numerous fuel storage tanks (including 50,000 barrel Tanks 20-618 and 20-619), a fuel transfer pumphouse (Building 20-517), a former waste collection area, a reported drum dump area, a tank cleaning sludge dump area, and a former hazardous materials storage area are located within the SDA.

Soils at DFSP-A typically consist of gravelly sand overlying clay. The gravelly sand, which is exposed over most of the site surface, is a relatively pervious soil that was deposited as part of the Naptowne Outwash Formation. The Bootlegger Cove Formation clay is encountered beneath the outwash in borings and excavations that penetrate through the gravelly sand. The clay formation is a relatively impervious soil that forms a competent confining layer beneath the DFSP-A site. Groundwater at the site occurs primarily in two zones: a deep confined aquifer below the Bootlegger Cove Formation and a near-surface unconfined zone perched above the

Bootlegger Cove clay. The movement of perched water generally mimics the surface topography and migration is towards surface drainages that typically discharge into Knik Arm as shown on Figures 1 and 2. At DPSP-A, perched water underlies about two-thirds of the site; with greatest saturated thickness (up to 31 feet) along the eastern portion of the facility. The perched water is not currently used for drinking or domestic purposes. The shallow perched water was determined not suitable for drinking water by the ADEC in a letter from Ms. Eileen Olson on April 21, 1994. Two former buildings on-site, Building 20-504 on the UBA and Building 20-516 on the FTFA, were connected to Anchorage Water and Wastewater Utility (AWWU) services until April 2000. AWWU services are still available on-site and in the site area.

3.0 NATURE AND EXTENT OF CONTAMINATION IN SOIL AND WATER

DESC has studied the subject DFSP-A site to identify the source, type, and extent of contamination at each suspected area. Through a number of projects over a period of about five years, a large number of soil and water samples have been collected and analyzed at chemical laboratories to accomplish these objectives. Soil samples have been collected from various depths to characterize the surface and subsurface soil. Surface water samples were collected from drainage channels to characterize surface water flowing onto or away from the site, while groundwater samples were repeatedly collected from monitoring wells to characterize perched water beneath the site. Monitoring wells are temporary wells constructed specifically to collect groundwater samples for analysis. They are not used for drinking water supply.

Soil and water samples were analyzed for a standard list of potentially hazardous substances and constituents known or suspected to have been associated with site activities. Most of the targeted analytes were not detected or were reported at concentrations below the applicable regulatory criteria. However, some petroleum hydrocarbon constituents were found at concentrations that caused unacceptable human health or ecological risks or were above regulatory criteria. To date, a number of interim removal actions have been accomplished to address contaminated media or to remove tanks and piping in preparation for site closure. The nature and extent of contamination remaining in site soil and water are summarized below.

3.1 SOIL

Soil samples collected from UBA, SDA, and FTFA contained contaminants found in fuels. The contaminants that were considered during evaluation of the cleanup alternatives for the soil are listed in Table 1.

3.2 WATER

Surface water and groundwater samples collected at UBA, SDA, and FTFA locally contained fuel related chemicals. The contaminants that were considered during evaluation of the cleanup alternatives for the surface water and groundwater are listed in Tables 2 and 3, respectively.

FIGURE 1 INSERTED HERE – PAGE REMOVED

REMOVE PAGE

Table 1 – Summary of Soil Contaminants

Source Area	Contaminant of Concern	Shallow (<5 feet bgs)			Deep (>5 feet bgs)			Cleanup Criteria[1] mg/Kg
		Frequency of Detections Detects/Total	Range of Detected Concentrations		Frequency of Detections Detects/Total	Range of Detected Concentrations		
			Minimum mg/Kg	Maximum mg/Kg		Minimum mg/Kg	Maximum mg/Kg	
UBA	GRO	1 / 3	--	0.95	1 / 7	--	2.1	500
	DRO	0 / 5	--	--	0 / 7	--	--	1,000
	Benzene	1 / 3	--	0.006	1 / 7	--	0.005	0.02
	Toluene	2 / 3	0.005	0.02	1 / 7	--	0.008	5.4
	Ethylbenzene	0 / 3	--	--	0 / 7	--	--	5.5
	Xylenes	1 / 3	--	0.032	2 / 7	0.024	0.053	78
SDA	GRO	42 / 68	0.55	5,330	74 / 90	0.75	3,600	500
	DRO	39 / 66	6.9	17,000	61 / 97	8.3	11,000	1,000
	Benzene	13 / 64	0.016	24	22 / 96	0.013	15	0.02
	Toluene	30 / 64	0.003	9.8	37 / 96	0.014	64	5.4
	Ethylbenzene	25 / 64	0.016	64	60 / 96	0.008	22	5.5
	Xylenes	41 / 64	0.023	288	81 / 96	0.006	120	78
FTFA	GRO	7 / 14	1.3	9,800	5 / 13	64	43,000	500
	DRO	11 / 16	10	7,300	6 / 13	10	810,000	1,000
	Benzene	6 / 14	0.046	46	3 / 13	0.21	2,800	0.02
	Toluene	9 / 14	0.041	350	6 / 13	0.19	5,200	5.4
	Ethylbenzene	7 / 14	0.025	120	7 / 13	0.94	6,300	5.5
	Xylenes	7 / 14	0.028	610	8 / 13	4.8	67,000	78

[1] Per guidance from ADEC, soil cleanup criteria are based on maximum allowable concentrations (MAC values) established by 18 AAC 75. The GRO and DRO Cleanup Criteria are based on 18 AAC 75 Method One Category C per guidance from ADEC on June 7, 2000. The BTEX Cleanup Criteria are based on 18 AAC 75.325 and the department's *Guidance on Cleanup Standards Equations and Input Parameters.* The values assume Residential land use and Under 40 inch (annual rain fall) Zone.

Table 2 – Summary of Surface Water Contaminants

Source Area	Compound of Concern	Frequency of Detections/Total [2]	Range of Detected Compounds [2]		Cleanup Criteria[1] mg/L
			Minimum (mg/L)	Maximum (mg/L)	
UBA	TAH	0 / 14	--	--	0.010
	TAqH[3]	2 / 5	0.0024	0.0057	0.015
SDA	TAH	0 / 0	--	--	0.010
	TAqH[3]	0 / 0	--	--	0.015
FTFA	TAH	5 / 10	0.00142	0.0666	0.010
	TAqH[3]	6 / 10	0.00142	0.122	0.015

[1] Per guidance from ADEC, surface water cleanup criteria are based on ADEC's standards for Total Aqueous Hydrocarbons (TAqH) and Total Aromatic Hydrocarbons (TAH) established in 18 AAC 70.

[2] Recognizing the beneficial effects of cleanup activities accomplished to date, the detections and concentrations for surface water were taken from the most recent five water quality monitoring events.

[3]TAqH is defined as the sum of BTEX compounds and the 17 PAHs Acenaphthene, Anthracene, Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Bis(2-ethylhexyl)phthalate, Dibenzo(a,h)anthracene, Di-n-butylphthalate, Diethyl phthalate, Di-n-octyl phthalate, Fluoranthene, Fluorene, Indeno(1,2,3-c,d)pyrene, Naphthalene, and Pyrene

Table 3 – Summary of Groundwater Contaminants

Source Area	Compound of Concern	Frequency of Detections/Total	Range of Detected Compounds[1]		Cleanup Criteria[2] mg/L
			Minimum (mg/L)	Maximum (mg/L)	
UBA	GRO	7 /25	0.16	17.0	13
	DRO	9 / 25	0.34	4.1	15
	Benzene	5 / 25	0.0049	0.0014	0.05
	Toluene	4 / 25	0.0079	4.7	10.0
	Ethylbenzene	7 / 25	0.0020	0.400	7.0
	Xylenes	6 / 25	0.00204	1.300	100.0
SDA	GRO	32 / 47	0.17	4.4	13
	DRO	32 / 47	0.32	29	15
	Benzene	32 / 47	0.000955	0.16	0.05
	Toluene	15 / 47	0.0011	0.170	10.0
	Ethylbenzene	30 / 47	0.0010	0.812	7.0
	Xylenes	30 / 47	0.0011	0.28	100.0
FTFA	GRO	6 / 14	0.28	0.77	13
	DRO	12 / 14	0.81	6.2	15
	Benzene	6 / 14	0.000874	0.165	0.05
	Toluene	1 / 14	0.0020	0.0020	10.0
	Ethylbenzene	6 / 14	0.0015	0.0088	7.0
	Xylenes	7 / 14	0.00219	0.0253	100.0

[1] The detections and concentrations for groundwater were likewise taken from the most recent five water quality monitoring events.
[2] Based on 10 times of the ADEC cleanup standards in 18 AAC 75.

4.0 SUMMARY OF SITE RISKS

A risk assessment was conducted to determine whether chemicals remaining in the environment from past operations at DFSP-A pose an unacceptable risk to human health and the environment. Risks to workers, recreationalists, teachers/students, and ecological receptors were evaluated as well as on site birds, mammals, terrestrial plants, soil invertebrates, and freshwater aquatic and benthic organisms. In addition, potential risks to freshwater and marine aquatic and benthic organisms were considered because of the potential for off-site discharge of chemicals from site drainages.

No unacceptable risks to workers, general recreationalists, or ecological receptors were predicted for the UBA. Otherwise, unacceptable human health risks were limited to potential noncarcinogenic risks predicted for the site worker in the SDA, which are largely related to dermal exposure to diesel range organics (DRO) in perched water. Possible or probable risks unacceptable ecological risks were predicted for all lower trophic level ecological communities evaluated outside of the UBA, including off-site freshwater and marine aquatic and benthic ecological receptors, as a result of off-site contaminant discharge from the two site drainages. Reduction or prevention of off-site discharge of chemicals in sediment, and perhaps surface water, in the drainages is recommended. See the Risk Assessment for further discussion of site risks (Shannon & Wilson, Inc., Risk Assessment, Defense Fuel Support Point – Anchorage, Anchorage, Alaska, January 1999.)

5.0 SUMMARY OF CLEANUP ALTERNATIVES

A number of potential cleanup alternatives were evaluated for the three functional areas, UBA, SDA, and FTFA. These cleanup alternatives are summarized in Table 4 and a detailed discussion of each alternative is presented in the following paragraphs.

Table 4 – Cleanup Alternatives Evaluated for Soil and Water

Impacted Medium	Cleanup Alternatives
Soil	
	Soil Alternative 1 - No Action
	Soil Alternative 2 - Intrinsic Remediation and Institutional Controls
	Soil Alternative 3a - Excavation to MAC[(1)] Values, Treatment, Backfilling, and Institutional Controls
	Soil Alternative 3b - Excavation to low-level goal[(2)], Treatment, Backfilling, and Institutional Controls
	Soil Alternative 4 - Bioventing or Soil Vapor Extraction to MAC Values and Institutional Controls
Groundwater	
	Groundwater Alternative 1 - No Action
	Groundwater Alternative 2 - Water Quality Monitoring and Free Phase Product Removal
	Groundwater Alternative 3 - Water Quality Monitoring, Air Sparging to ARARs[(3)], and Free Phase Product Removal
	Groundwater Alternative 4 - Water Quality Monitoring, Groundwater Extraction and Treatment to ARARs, and Free Phase Product Removal
Surface Water	
	Surface Water Alternative 1 - No Action
	Surface Water Alternative 2 – Water Quality Monitoring and Institutional Controls
	Surface Water Alternative 3 – Surface Water Treatment and Institutional Controls

[1] MAC values refer to Maximum Allowable Concentrations as provided in 18 AAC 75 State of Alaska Department of Environmental Conservation Oil and Hazardous Substances Pollution Control Regulations.

[2] Cleanup to low-level goal as required to remove source area soils that could release contaminants at such concentrations that eventual runoff might exceed surface water quality criteria.

[3] Primary applicable or relevant and appropriate requirement (ARAR) for DFSP-A groundwater (non-potable) is derived from ten times Table C from 18 AAC 75.

Soil cleanup alternatives are described first and followed by a discussion of groundwater and surface water cleanup alternatives. With the exception of the no-action alternatives, the objective of the various alternatives for each media is to achieve the following general cleanup goals:

- Achieve cleanup criteria using remediation methods that are proven with site contaminants and for which site-specific feasibility testing has been conducted;
- Prevent or minimize adverse human-health or ecological risks related to contaminated soil or water;
- Prevent or minimize the movement of contaminants from soil into the water; and
- Prevent or minimize possible off-site contaminant migration.

5.1 CLEANUP ALTERNATIVES FOR SOIL

The soil cleanup alternatives include three basic approaches with corresponding variations in time to achieve cleanup objectives. The longest timeline is associated with no action or intrinsic bioattenuation (Soil Alternatives 1 and 2) wherein no attempt is made to accelerate the soil cleanup over natural processes. The soil alternatives designed to achieve the soil cleanup criteria established by ADEC for DFSP-A (i.e. reduction of soil contaminant concentrations to MAC values under Soil Alternatives 3a or 4) rely on intrinsic bioattenuation to address residual contamination after MAC values are achieved. Refined fate and transport modeling for the site predicts at least 70 years after MAC values are achieved before the site surface water is attenuated below criteria. DESC also chose to consider a more aggressive soil cleanup (Soil Alternative 3b) to achieve the shortest timeline practicable. The soil alternatives and estimated timelines are addressed in greater detail below.

Soil Alternative 1 - No Action

The CERCLA regulations require that the no action alternative be considered when selecting an appropriate cleanup action. This provides a basis of comparison with other considered alternatives. No active remediation is included in the no action alternative. Therefore, there are presumed to be no cleanup costs associated with this alternative. Preliminary modeling results suggest that site contaminant concentrations would likely exceed criteria for in excess of 100 years.

Soil Alternative 2 - Intrinsic Remediation and Institutional Controls

The characterization and feasibility studies conducted at the site have shown that natural biological, chemical, and physical processes will reduce the levels of contaminants in the soil. The combination of these processes is called "intrinsic remediation". Restrictions such as conditional land use, fencing the subject areas, or posting warning signs are called "institutional controls" and would be included as part of this alternative. Because no action is taken to reduce contaminant mass at the site, the timeline for remediation of soil is likely in excess of 100 years.

Soil Alternative 3a - Excavation to MAC Values, Treatment, Backfilling, and Institutional Controls

In this alternative, soil with contaminant concentrations exceeding the MAC values, summarized in Table 1, would be excavated and treated on site or off site. Following the on-site or off-site soil treatment, the contaminant free soil (or imported clean soil) can be used to backfill site excavations and regrade the site as appropriate. This alternative would also include the land use restrictions described in Soil Alternative 2. Contaminant fate and transport modeling suggest that the timeline for intrinsic remediation to reduce site contaminant loading to the point at which leachate should no longer exceed criteria in groundwater or surface water is approximately 70 years. It is assumed that approximately 5 additional years would be needed to flush the remaining contaminants out of the site groundwater and surface water and collect two years data showing these media are below criteria before site closure is approved by ADEC.

Soil Alternative 3b - Excavation to low-level goal, Treatment, Backfilling, and Institutional Controls

This alternative is the same as Soil Alternative 3a except for the amount of soil to be excavated and treated. Additional soil would be excavated and remediated to reduce the soil contaminant concentrations to a low-level goal, 18 AAC Method One Category C per guidance from ADEC on June 7, 2000, at which the remaining contaminant mass would likely be insufficient to cause groundwater or surface water contaminant concentrations to exceed criteria. Reduction of the contaminant concentrations in soil would shorten the time required to cleanup the surface water and groundwater at the subject site. As in Soil Alternative 3a, the remediated soil or imported clean soil would be used as backfill as needed for site restoration and short-term land use restrictions may be needed until ADEC approves site closure. Assuming the excavation could be completed in one year, and that potentially two years would be required to flush contaminants from the site groundwater and that monitoring for two additional years will show the site to be clean, the timeline to site closure is estimated to be five years.

Soil Alternative 4 - Bioventing or Soil Vapor Extraction to MAC Values and Institutional Controls

Soil Alternative 4 consists of insitu remediation of impacted soil by bioventing or soil vapor extraction and institutional controls to prevent inappropriate exposure of humans to site contaminants. Feasibility testing at DFSP-A has shown that the bioventing and soil vapor extraction technologies are viable alternatives for enhancing insitu bioremediation of petroleum hydrocarbon impacted soils. Since the extent of the remediation systems is similar for the two technologies, the estimated costs are also similar. Therefore, the technologies can be considered together under Soil Alternative 4. In practice, if this alternative was selected for site cleanup, the actual system installed would likely employ both the bioventing and soil vapor extraction approaches in a combined system tailored to actual site conditions.

Bioventing is the process of aerating the subsurface soil to stimulate insitu biological activity and enhance bioremediation. To implement bioventing, atmospheric air is blown at a relatively low rate into the subsurface soil through a series of wells and/or horizontal piping. Naturally occurring bacteria already present in the site's subsurface soil consume the petroleum hydrocarbons (the contaminants) as a source of food. Enhancing the oxygen content of the pore vapors in the unsaturated soil column allows these bacteria to significantly increase the rate at which they consume the contaminants, thereby reducing the time for cleanup as compared to passive intrinsic bioremediation. With bioventing, the active oxygen supply will continue until contaminant concentrations are reduced to MAC values. It is estimated that this could be accomplished in about five years.

Soil vapor extraction incorporates a system designed to remove volatile hydrocarbons from the subsurface soil by vacuum applied at the specially designed and installed wellhead. Volatiles from soil vapor extraction can be concentrated and discharged at a single point, the discharge stack, and treated if necessary based on contaminant concentrations. As with bioventing, soil vapor extraction would require vertical and/or horizontal piping to be installed within the contaminated soil. Also akin to bioventing, vapor extraction would continue until soil contaminant concentrations are reduced to MAC values. It is estimated that this could be accomplished in about five years. Soil vapor extraction must be installed in the unsaturated soil (vadose zone) if the groundwater is being remediated using air sparging. In this case, (as discussed in the Groundwater Alternative 3) volatilized petroleum hydrocarbon constituents are removed from the vadose zone by vapor extraction.

During and after the bioventing or soil vapor extraction treatment, this alternative would also include the institutional controls. The timeline to reduce soil contaminant concentrations to achieve groundwater and surface water criteria would require approximately 70 years following source reduction to MAC values. Approximately 5 additional years follow for site flushing and 5 years for monitoring to document that groundwater and surface water are clean. Therefore the timeline for Alternative 4 is estimated to be about 80 years.

5.2 CLEANUP ALTERNATIVES FOR GROUNDWATER

The groundwater cleanup alternatives likewise include three basic approaches; no action, monitoring without remediating groundwater contamination, or monitoring while performing active remediation using air sparging or pump-and-treat systems. It is assumed that a groundwater remediation system, once started, continues for the life of the corresponding soil alternative used to address contamination in the site soil. It is also assumed that free product removal will be necessary if a petroleum hydrocarbon is found floating on site groundwater, although the only area of known free product (beneath former Tank 20-624) has already been addressed with an interim removal action. Beyond these assumptions, the groundwater alternatives are addressed in greater detail below.

Groundwater Alternative 1 - No Action

As with soil and surface water, the no action alternative must be considered as a basis of comparison with other cleanup alternatives. No monitoring is included in the no action alternative.

Groundwater Alternative 2 - Water Quality Monitoring and Free Phase Product Removal

This alternative includes sampling and analysis of groundwater. Sampling results would be used to monitor contaminant concentrations in the groundwater to evaluate the potential dispersion of the DFSP-A contaminant plume(s). This alternative also calls for removal of petroleum hydrocarbon product that may be found as a separate layer on top of the groundwater. The existing monitoring wells would be utilized to monitor for free product and free product could also be encountered in excavations or other incidental site work accomplished to cleanup soil or to install soil remediation systems. If necessary, free product would likely be addressed by direct removal or installation of an oil collection gallery.

Groundwater Alternative 3 - Water Quality Monitoring, Air Sparging to ARARs, and Free Phase Product Removal

This method, typically designed in conjunction with soil vapor extraction as described in Soil Alternative 4, involves injection of air into the saturated zone below the groundwater table to volatilize hydrocarbon constituents dissolved in the groundwater and absorbed to the soil. The air is typically injected through a system of blowers feeding air through piping extending horizontally from environmental sheds to vertical air injection wells. An equivalent system of vertical vents and horizontal piping extracts the volatilized hydrocarbon constituents from the unsaturated or vadose zone soils for treatment in the environmental shed to prevent dispersion of the contaminants into the atmosphere. Air injection also increases groundwater dissolved oxygen levels, which enhances biodegradation. Once the groundwater contaminant concentrations are reduced below ARARs, the air sparging process could be discontinued, although it has been assumed this would not occur until source area soil contaminants were depleted. As in Groundwater Alternative 2, groundwater monitoring and free phase product removal would be performed in this alternative.

Groundwater Alternative 4 - Water Quality Monitoring, Groundwater Extraction and Treatment to Applicable ARARs, and Free Phase Product Removal

This alternative consists of extraction and treatment of groundwater containing contaminants in excess of ARARs. To accomplish this, a series of water pumping wells or groundwater collection galleries would be installed and groundwater would be pumped via horizontal piping to treatment systems in environmental sheds on the ground surface. The treated water would then be pumped back into infiltration galleries to leach back into the groundwater aquifer or the treated water could be discharged into the city sewer upon approval. The objective of this groundwater treatment method is to reduce the groundwater contaminant concentrations to below

ARARs after which the extraction/treatment process could discontinue, although it has been assumed this would not occur until source area soil contaminants were depleted. Groundwater monitoring and free phase product removal would also be performed as part of this alternative.

5.3 CLEANUP ALTERNATIVES FOR SURFACE WATER

The surface water cleanup alternatives are limited to two basic approaches including no action and active remediation using a pump-and-treat system. It is assumed that a surface water remediation system, once started, continues for the life of the corresponding soil alternative used to address contamination in the site soil. Beyond this assumption, the surface water alternatives are addressed in greater detail below.

Surface Water Alternative 1 - No Action

As with soil and groundwater, the no action alternative must be considered as a basis of comparison with other cleanup alternatives.

Surface Water Alternative 2 – Water Quality Monitoring and Institutional Controls

This alternative includes sampling and analysis of surface water. Sampling results would be used to evaluate whether contaminant concentration exceed ARARs in surface waters at the DFSP-A boundaries. This alternative would also include institutional controls.

Surface Water Alternative 3 - Water Treatment and Institutional Controls

This alternative addresses the quality of surface water near the compliance points where the water discharges off the DFSP-A site into MOA storm drains. In general, the surface waters are channeled in shallow ditches. Surface water Alternative 3 takes advantage of these channels. Weirs would be constructed across the channels and slightly upstream from the compliance points at surface locations SS4 to the north and SS14 to the west. A sump would be situated on the upstream side of the weir and the quality of surface water reaching the sump would be monitored three times per year, when the monitoring wells are sampled, for site contaminants. If or when contaminants are above surface water ARARs, the water would be pumped through a treatment system to remove the contaminants before discharging to the downstream side of the weir. Institutional controls, consisting largely of fencing and signage, may be needed to address potential site worker exposure to contaminants in untreated surface water.

6.0 EVALUATION OF CLEANUP ALTERNATIVES

In accordance with regulatory guidance, cleanup alternatives for the contaminated media should be evaluated using the seven remedial alternative evaluation criteria found in the National Contingency Plan (NCP). The seven criteria are listed and defined in Table 5.

Table 5 – Remedial Alternative Evaluation Criteria

Evaluation Criterion	Definition
Protection of human health and the environment	Protection of both human health and the environment through the elimination, reduction, or control of the contaminated soil or water.
Compliance with ARARs	Complies with applicable or relevant and appropriate requirements (ARARs) such as laws and government regulations. The selected alternative must meet ARARs.
Long-term effectiveness and permanence	Protection of human health and the environment after the cleanup objectives have been met, including adequacy and reliability of controls.
Reduction in toxicity, mobility, or volume through treatment	Treatment to reduce toxicity, mobility, and/or the volume of the contaminated soil or water.
Short-term effectiveness	Short-term effectiveness considers the effects of the alternative during construction and implementation until remedial objectives have been achieved.
Implementability	Implementability addresses the technical and administrative feasibility of applying an alternative. The availability of materials and labor, the difficulty of working with site features, and impacts upon ongoing operations are considered.
Cost	Rough Order of Magnitude costs were estimated for combinations of alternatives as shown in Table 6.

To facilitate evaluation for DFSP-A, the media-specific alternatives presented above were combined into alternative sets (See Table 6) that include one alternative for each media and range from no action with a low cost but corresponding long timeline to very aggressive treatment at substantial cost to attain a short timeline. The alternative sets are evaluated against the seven criteria in the discussion following Table 6. In addition to the seven listed criteria, the public is given an opportunity to review and comment on the Proposed Plan. Final selection of the cleanup alternatives will consider community acceptance as indicated by comments received during the Public Comment period.

Table 6 – Combinations of Cleanup Alternatives, Estimated Costs, and Timelines

Alt. Set No.	Soil Alternatives: No Action	Soil Alternatives: Intrinsic Remediation	Soil Alternatives: Excavation to MAC Values	Soil Alternatives: Excavation to Low-Level Goal	Soil Alternatives: Biovent to MAC Values	Groundwater Alternatives: No Action	Groundwater Alternatives: Monitoring	Groundwater Alternatives: Air Sparging	Groundwater Alternatives: Pump & Treat	Surface Water: No Action	Surface Water: Monitoring	Surface Water: Water Treatment	Estimated Cleanup Costs (Thousands of $): Capital	Estimated Cleanup Costs (Thousands of $): Annual	Estimated Cleanup Costs (Thousands of $): Present Worth[3]	Estimated Timeline[2] (years)
A	**X**					**X**				**X**			$0	$0	$0	100+
B		**X**					**X**				**X**		$230	$60	$2,000	100+
C		**X**						**X**				**X**	$2,100	$430	$13,500	100+
D		**X**							**X**			**X**	$2,900	$400	$15,100	100+
E			**X**				**X**				**X**		$380	$60	$1,900	75
F			**X**					**X**				**X**	$2,300	$430	$13,300	75
G			**X**						**X**			**X**	$3,000	$400	$14,900	75
H				**X**			**X**				**X**		$3,660[4]	$60	$3,900[4]	5
I					**X**		**X**				**X**		$520	$140	$2,400	80
J					**X**			**X**				**X**	$2,400	$500	$13,800	80
K					**X**				**X**			**X**	$3,200	$480	$15,400	80

Combined Cleanup Alternatives[1]

[1] See Table 4 for description of each alternative.

[2] Estimated timeline is driven by the time needed to cleanup source area soils followed by "flushing" of site groundwater, and finally attenuation of contaminants in surface water.

[3] Present worth is based on 4 percent inflation and 8 percent interest through the lifetime of each alternative.

[4] Ultimate cleanup uncertain without removal of remaining tanks and piping. Estimated cost to remove tanks and piping and contaminated soil that might reasonably be associated with these site features is about $2,800k. This cost has been included in the listed estimate.

Evaluation of Alternative Set A

Alternative Set A consists of the no-action alternatives for soil, groundwater, and surface water. Set A is not protective of human health and the environment as the DFSP-A risk assessment identified unacceptable risk levels associated with present conditions for groundwater and surface water. Set A is not in compliance with ARARs although contaminant concentrations could naturally attenuate below ARARs in excess of 100 years from the present time. The long-term effectiveness of Set A is negligible because there is no attempt to obtain cleanup goals. Set A achieves no reduction in toxicity, mobility, or volume of contaminants or contaminated media. It is difficult to apply short-term effectiveness to Set A, because there is no goal to attain remedial objectives. Set A is easily implementable because no action is needed. Since it is limited to the cost of site work associated with implementing the corrective action, the estimated present cost of Set A is $0.

Evaluation of Alternative Set B

Alternative Set B consists of intrinsic remediation to address soil contamination, institutional controls to address human health risks, and water quality monitoring to track contaminant trends in site groundwater and surface water. Set B is protective of human health but potential ecological risks identified in the DFSP-A risk assessment are not addressed. Set B is not initially in compliance with ARARs (i.e., does not attain MAC values as requested by ADEC and does not address groundwater or surface water above ARARs) although contaminant concentrations should naturally bioattenuate below ARARs in excess of 100 years from the present time. In the long-term, Set B would be effective and permanent because no risks would remain and no controls would be necessary. Set B uses the natural ability for oil-degrading microbes to consume petroleum hydrocarbons to reduce the toxicity, mobility, and volume of contaminants in DFSP-A soil. However, because the timeline for soil cleanup is inordinately long, site contamination could be mobilized by groundwater and dispersed off site in surface water. Set B does not provide for corrective action in these media. The short-term effectiveness of Set B is limited. The community and workers are protected by institutional controls, but environmental impacts remain and contaminants are released off site over a very lengthy timeline. Because the only site work needed to “construct” Set B is to install fencing, Set B is easily implementable. The estimated cost of fence building plus monitoring for 100 years is about $2,000,000..

Evaluation of Alternative Set C

Alternative Set C consists of intrinsic remediation to address soil contamination, institutional controls to address human health risks, water quality monitoring to track contaminant trends in site groundwater and surface water, treatment of groundwater contaminants above ARARs with air-sparging systems, and treatment of surface water above ARARs before discharging the water off-site. Set C is protective of human health and the environment. Set C eventually attains compliance with ARARs although ADEC has requested corrective action to reduce soil contaminant concentrations below MAC values. In the long-term, Set C would be effective and permanent because no risks or contaminant residuals would remain and no controls would be necessary. In the long term, Set C reduces the toxicity, mobility, and volume of contaminants in DFSP-A soil while using active systems to treat contaminants in site groundwater and surface water. Although Set C has a very lengthy timeline, the community and workers are protected and the remediation systems prevent dispersion of contaminants to the environment. Therefore, Set C has good short-term effectiveness. Compared to Set B, Set C is implementable but with greater difficulty associated with installing groundwater and surface water treatment systems. The estimated cost to construct, operate, and monitor Set C for 100 years is about $13,500,000. The State may not accept Set C because soil ARARs are not initially attained.

Evaluation of Alternative Set D

Alternative Set D consists of intrinsic remediation to address soil contamination, institutional controls to address human health risks, water quality monitoring to track contaminant trends in site groundwater and surface water, treatment of groundwater contaminants above ARARs with groundwater extraction/treatment systems, and treatment of surface water above ARARs before discharging the water off site. Set D is protective of human health and the environment. Set D eventually attains compliance with ARARs although ADEC has requested corrective action to reduce soil contaminant concentrations below MAC values. In the long-term, Set D would be effective and permanent because no risks or contaminant residuals would remain and no controls would be necessary. Set D reduces the toxicity, mobility, and volume of contaminants in soil while using active systems to treat contaminants in site groundwater and surface water. Although Set D has a very lengthy timeline, the community and workers are protected and the remediation systems prevent dispersion of contaminants to the environment. Therefore, Set D has good short-term effectiveness. Regarding implementability, Set D is comparable to Set C with some difficulty associated with installing groundwater and surface water treatment systems. The estimated cost to construct, operate, and monitor Set D for 100 years is about $15,100,000.

Evaluation of Alternative Set E

Alternative Set E consists of excavation and treatment of site soils exceeding ARARs, institutional controls to address human health risks, and water quality monitoring to track contaminant trends in site groundwater and surface water. Set E is protective of human health but potential ecological risks identified in the DFSP-A risk assessment are not addressed until surface water contaminant concentrations attenuate near the end of the alternative's timeline. Set E rapidly attains compliance with soil ARARs (likely accomplished in two field seasons) but modeling suggests that surface water ARARs might not be attained for an additional 70 years. The long-term effectiveness of Set E would be high and the remedy would be permanent because no risks or contaminant residuals would remain and no controls would be necessary. Set E rapidly reduces the toxicity, mobility, and volume of contaminants in soil above MAC values and then relies on natural biological processes to further remediate soil until groundwater and surface water are clean. However, because the timeline for soil cleanup is long, contamination leached from site soil could be mobilized by groundwater and dispersed off-site in surface water. Set E does not provide for corrective action in these media. The short-term effectiveness of Set E is limited. The community and workers are protected by institutional controls, but environmental impacts remain and contaminants may be released off-site over a lengthy timeline. Several interim removal actions at DFSP-A have included excavation and treatment of contaminated soil. Based on this experience, Set E is easily implementable. The estimated cost of excavating and treating soil above MAC values followed by fencing and monitoring for 75 years is about $1,900,000. This does not include any tank or piping remedial actions.

Evaluation of Alternative Set F

Alternative Set F consists of excavation and treatment of site soils exceeding ARARs, institutional controls to address human health risks, water quality monitoring to track contaminant trends in site groundwater and surface water, treatment of groundwater contaminants above ARARs with air-sparging systems, and treatment of surface water above ARARs before discharging the water off-site. Set F is protective of human health and the environment. Set F rapidly attains compliance with soil and surface water ARARs (likely accomplished in two field seasons). Groundwater ARARs are likely attained within about 5 years but the groundwater and surface water treatment systems must be operated until the site soils no longer contain sufficient contaminant mass to recontaminate the waters. The long-term effectiveness of Set F would be high and the remedy would be permanent because no risks or contaminant residuals would remain and no controls would be necessary. Set F rapidly reduces the toxicity, mobility, and volume of contaminants in soil above MAC values and then relies on natural biological processes to further remediate soil until groundwater and surface water are clean without active treatment. The short-term effectiveness of Set F is high and systems or controls are in place to protect the community, site workers, and the environment. Several interim removal actions at DFSP-A have included excavation and treatment of contaminated soil and feasibility tests have shown that air sparging is practicable. Based on this experience, Set F is implementable. The estimated cost of implementing Set F is about $13,300,000.

Evaluation of Alternative Set G

Alternative Set G consists of excavation and treatment of site soils exceeding ARARs, institutional controls to address human health risks, water quality monitoring to track contaminant trends in site groundwater and surface water, treatment of groundwater contaminants above ARARs with groundwater extraction/treatment systems, and treatment of surface water above ARARs before discharging the water off-site. Set G is protective of human health and the environment. Set G rapidly attains compliance with soil and surface water ARARs (likely accomplished in two field seasons). Groundwater ARARs are likely attained within about 5 years but the groundwater and surface water treatment systems must be operated until the site soils no longer contain sufficient contaminant mass to recontaminate the waters. After the remedial objectives are attained, the long-term effectiveness of Set G would be high and the remedy would be permanent because no risks or contaminant residuals would remain and no controls would be necessary. Set G rapidly reduces the toxicity, mobility, and volume of contaminants in soil above MAC values and then relies on natural biological processes to further remediate soil until groundwater and surface water are clean without active treatment. The short-term effectiveness of Set G is high and systems or controls are in place to protect the community, site workers, and the environment. Several interim removal actions at DFSP-A have included excavation and treatment of contaminated soil and feasibility tests have shown that extraction of water is practicable if costly. Based on this experience, Set G is implementable. The estimated cost of implementing Set G is about $14,900,000.

Evaluation of Alternative Set H

Alternative Set H consists of excavation and treatment of site soils to an aggressive low-level goal, institutional controls to address human health risks, and water quality monitoring to track contaminant trends in site groundwater and surface water. The low-level cleanup goal is designed to remediate source area soils so aggressively that the soil no longer contains sufficient contaminant mass to leach contaminants into site waters at concentrations in excess of groundwater or surface water ARARs. It is believed that "chasing" contamination from known impacted areas could lead to decommissioning some of the remaining tanks and piping where soil contaminant concentrations do not exceed ARARs. Set H is protective of human health and the environment. Set H rapidly attains compliance with ARARs in soil, groundwater, and surface water. The long-term effectiveness of Set H would be high and the remedy would be permanent because no risks or contaminant residuals would remain and no controls would be necessary after closure is obtained from ADEC. Set H rapidly reduces the toxicity, mobility, and volume of contaminants in soil, groundwater, and surface water. The short-term effectiveness of Set H is moderate; engineering controls can be applied to reduce dust generated by site work and a traffic plan can be developed to minimize road noise and congestion. However, it is possible that with extensive excavations on site exposing contaminated soils, the nearby Government Hill community could experience dust, noise, and objectionable fuel odors. Several interim removal actions at DFSP-A have included demolition of tanks or piping and excavation and treatment of contaminated soil. Based on this experience, the site work required to complete Set H is extensive but easily implementable. The estimated cost of excavating and treating known impacted soil to below the low-level goal required by Set H is about $1,100,000. However, excavations to achieve this goal are likely to encounter existing tanks and/or piping where soil contamination is presently unknown (perhaps because of sparse data). Removal of existing tanks and piping adds an estimated $2,800,000 to the cost of Set H for a total present worth of about $3,900,000.

Evaluation of Alternative Set I

Alternative Set I consists of insitu remediation by bioventing or soil vapor extraction to address soil contamination, institutional controls to address human health risks, and water quality monitoring to track contaminant trends in site groundwater and surface water. Set I is protective of human health but potential ecological risks identified in the DFSP-A risk assessment are not addressed until surface water contaminant concentrations attenuate near the end of the alternative's timeline. Set I achieves compliance with soil ARARs in approximately five years, but modeling suggests that surface water ARARs might not be attained for an additional 70 years. The long-term effectiveness of Set I would be high and the remedy would be permanent because no risks or contaminant residuals would remain and no controls would be necessary. Set

I reduces the toxicity, mobility, and volume of contaminants in soil above MAC values and then relies on natural biological processes to further remediate soil until groundwater and surface water are clean. However, because the timeline for soil cleanup is long, contamination leached from site soil could be mobilized by groundwater and dispersed off-site in surface water. Set I does not provide for corrective action in these media. The short-term effectiveness of Set I is limited. The community and workers are protected by institutional controls, but environmental impacts remain and contaminants may be released off-site over a lengthy timeline. Feasibility testing at DFSP-A have included bioventing and soil vapor extraction. Based on this experience, Set I is implementable. The estimated cost of implementing Set I is about $2,400,000.

Evaluation of Alternative Set J

Alternative Set J consists of insitu remediation by bioventing or soil vapor extraction to address soils exceeding ARARs, institutional controls to address human health risks, water quality monitoring to track contaminant trends in site groundwater and surface water, treatment of groundwater contaminants above ARARs with air-sparging systems, and treatment of surface water above ARARs before discharging the water off-site. Set J is protective of human health and the environment. Set J attains compliance with soil and groundwater ARARs in about five years and surface water ARARs in about one year. However, the groundwater and surface water treatment systems must be operated until the site soils no longer contain sufficient contaminant mass to recontaminate the waters. The long-term effectiveness of Set J would be high and the remedy would be permanent because no risks or contaminant residuals would remain and no controls would be necessary. Set J rapidly reduces the toxicity, mobility, and volume of contaminants in soil above MAC values and then relies on natural biological processes to further remediate soil until groundwater and surface water are clean without active treatment. The short-term effectiveness of Set J is high and systems or controls are in place to protect the community, site workers, and the environment. Feasibility tests at DFSP-A have shown that bioventing, soil vapor extraction, and air sparging is practicable. Based on this experience, Set J is implementable. The estimated cost of implementing Set J is about $13,800,000.

Evaluation of Alternative Set K

Alternative Set K consists of insitu remediation by bioventing or soil vapor extraction to address soils exceeding ARARs, institutional controls to address human health risks, water quality monitoring to track contaminant trends in site groundwater and surface water, treatment of groundwater contaminants above ARARs with groundwater extraction/treatment systems, and treatment of surface water above ARARs before discharging the water off-site. Set K is protective of human health and the environment. Set K attains compliance with soil groundwater ARARs in about five years and surface water ARARs in about one year. However, the groundwater and surface water treatment systems must be operated until the site soils no longer contain sufficient contaminant mass to recontaminate the waters. After the remedial objectives are attained, the long-term effectiveness of Set K would be high and the remedy would be permanent because no risks or contaminant residuals would remain and no controls would be necessary. Set K rapidly reduces the toxicity, mobility, and volume of contaminants in soil above MAC values and then relies on natural biological processes to further remediate soil until groundwater and surface water are clean without active treatment. The short-term effectiveness of Set K is high and systems or controls are in place to protect the community, site workers, and the environment. Feasibility tests at DFSP-A have shown bioventing and soil vapor extraction is feasible and that extraction of water is practicable if costly. Based on this experience, Set K is implementable. The estimated cost of implementing Set K is about $15,400,000.

7.0 SUMMARY AND CONCLUSIONS

The DFSP-A facility is a former bulk fuel terminal that no longer benefits DESC, the U.S. Army, or the BLM. It is DESC's desire to address environmental issues at the site to the satisfaction of the ADEC and community, and further to prepare the site for transfer of site management back to the U.S. Army. This Proposed Plan summarizes the environmental status of the site and evaluates several alternatives that may be used to cleanup contaminated soil, groundwater, and surface water that exceed ARARs. The alternatives vary in the degree to which they satisfy the evaluation criteria listed in Table 5. Out of the proposed plan process, DESC has identified a preferred alternative that it believes provides the best value while addressing ADEC and community concerns. ADEC has been involved with the development of cleanup alternatives for the facility and concurs with the preferred alternative. DESC's preferred alternative is Set H, which achieves ARARs in all site media in the shortest possible timeline through excavation and treatment of site soils to an aggressive low-level goal. If Set H is selected as the remedy at DFSP-A, it is DESC's intent to remove the existing tanks and piping so that no site features remain that could delay regulatory approval by ADEC or eventual transfer of responsibility for the site from DESC to the U.S. Army. Pending comments on this Proposed Plan and funding to facilitate removal of the existing tanks and piping, DESC is prepared to implement Set H in 2000. A preliminary schedule suggests that site work, including tank and piping removal, could be completed in two extensive field seasons.