ENVIRONMENTAL CONTAMINANTS OF CONCERN

Contaminants of concern at Fort Randall include fuels, fuel additives, pesticides, metals, and solvents. Table 2 summarizes those contaminants and their components and includes contaminants found in soils, sediments, and groundwater. Specific cleanup levels are included in Tables 3, 4, and 5.

TABLE 2: TYPES OF CONTAMINANTS FOUND

Type of Contaminant	Analytical Grouping	Specific Analyte	Comments
Petroleum Hydrocarbons (Fuels)	Total Petroleum Hydrocarbon Fractions	Gasoline-Range Organics	Grouping of light fuel components, such as gasoline
		Diesel-Range Organics	Grouping of mid-weight fuel components, such as diesel fuel
		Residual Range Organics	Grouping of heavy fuel components, such as lubricating oil
	BTEX	Benzene Toluene Ethylbenzene Xylenes	Volatile fuel components
	Polynuclear Aromatic Hydrocarbons	2-Methylnaphthalene Anthracene Benzo[a]anthracene Benzo[a]pyrene Benzo[b]fluoranthene Benzo[g,h,i]perylene Benzo[k]fluoranthene Dibenzo[a,h]anthracene Fluorene Indeno[1,2,3-c,d]pyrene Naphthalene Phenanthrene Pyrene	Semivolatile fuel compounds marked by connected benzene rings
	Other Fuel Components	1,2,4-Trimethylbenzene 1,3,5-Trimethylbenzene	Miscellaneous fuel components
Fuel Additives	-	1,2-dibromoethane	Used to keep lead in leaded gasoline
		1,2-dichloroethane	
Pesticides	Pesticides	Beta-BHC (b-HCH)	A common pesticide
Metals	Metals	Lead	Added to leaded fuels
Solvents	Volatile Organic Compounds	Trichloroethene	A common degreaser

***Petroleum Hydrocarbons**: a group of chemicals commonly found in fuel products. These include gasoline-range organics , diesel-range organics, and residual-range organics. Compounds such as benzene, toluene, ethylbenzene, and xylenes (BTEX). which are found in gasoline, are included in this group of chemicals.*

Contaminated Soils

Contaminants of concern in soil at Fort Randall include petroleum hydrocarbons, fuel additives, pesticides, metals, and solvents. Petroleum hydrocarbons, a pesticide (beta-BHC), and a fuel additive (1,2-dibromoethane) are present at the Drum Disposal Area. Diesel-range organics are present at the Beach Seep Area. Asphalt (containing polycyclic aromatic hydrocarbons or PAHs), diesel-range organics, and residual-range organ-

ics are present at the Asphalt Seeps. Petroleum hydrocarbons are present at the Stapp Creek and the East-West Runway. Table 3 lists soil contaminants of concern, the maximum concentration at which they were detected, and proposed cleanup levels (in blue).

Investigations conducted at the Asphalt Seeps might not have fully defined the contaminants present there because drum contents are unknown; additional contaminants of concern might be identified at that site in the future.

TABLE 3: SOIL CONTAMINANTS OF CONCERN

Site	Contaminant	Maximum Detected Concentration	Regulatory Limit by Exposure Pathway			Cumulative Risk Level	Source of Regulatory Limit
			Ingestion	Inhalation	Migration to Groundwater		
Drum Disposal Area	Diesel-Range Organics	39,000	10,100	12,500	**524**	-	Method 3
	Gasoline-Range Organics	5,700	1,400	1,400	**578**	-	
	Benzene	11	151	9.9	**0.0228**	7.5	
	Ethylbenzene	24	10,100	155	**9.15**	-	
	Toluene	50	20,300	278	**8.01**	-	
	Xylenes	400	203,000	-	**129**	-	
	Beta-BHC (b-HCH)	0.0487	4.61	61.4	**0.0176**	-	
	2-Methylnaphthalene	154	2030	-	**86.6**	-	
	1,2,4-Trimethylbenzene	99	5,070	133	192	**25.2**	
	1,3,5-Trimethylbenzene	140	5,070	52.8	46.9	**35.5**	
	1,2-Dibromoethane	0.017	0.0977	1.35	**0.000173**	-	
Beach Seep Area	Diesel-Range Organics	31,400	10,100	12,500	**524**	-	Method 3
Asphalt Seeps	Diesel-Range Organics	20,600	10,100	12,500	**5690**	-	Method 3
	Residual-Range Organics	51,300	**10,100**	22,000	22,000	-	
Stapp Creek	Diesel-Range Organics	361	10250	12,500	**250**	-	Method 2
	Benzo[a]anthracene	16.6	11	-	**6**	-	
	Benzo[a]pyrene	14.4	**1**	-	3	-	
	Benzo[b]fluoranthene and Benzo[k]fluoranthene	27.4	**11**	-	20	-	
	Dibenzo[a,h]anthracene	1.81	**1**	-	6	-	
East-West Runway	Gasoline-Range Organics	1,200	1,400	1,400	**300**	-	Method 2
	Diesel-Range Organics	21,500	10,250	12,500	**250**	-	
	Dibenzo[a,h]anthracene	1.05	**1**	-	6	-	
	Benzene	95	150	9	**0.02**	-	
	Ethylbenzene	370	10,000	89	**5.5**	-	
	Toluene	42	20,300	180	**5.4**	-	

Notes:
All Values are in milligrams/kilogram (mg/kg)
Blue text represents the proposed cleanup level

Contaminated Sediments

Fuel-related contamination in beach sediments at the Beach Seep Area extends approximately 250 feet along the shoreline, 35 feet towards the beach bluff, and approximately 1.5 to 2 feet below ground surface. The State of Alaska has not established cleanup standards for sediments. Therefore, ecological benchmarks have been used as screening criteria for sediment contamination. Marine sediment data collected from the inter-tidal zone of the Beach Seep Area were compared to National Oceanic and Atmospheric Administration (NOAA) sediment quality guidelines established for marine sediments and similar sources, such as Oak Ridge National Laboratory. Table 4 lists contaminant concentrations detected above ecologically based screening benchmarks. (These values should not be considered cleanup standards but represent the lowest concentration at which ecological impacts are considered possible.) All of these compounds are fuel-related.

***Sediment**: loose particles of sand or mud that are transported from their place of origin by moving water and deposited in unconsolidated layers.*

TABLE 4: SEDIMENT CONTAMINANTS OF CONCERN

Site	Contaminant	Maximum Detected Value	Minimum Ecological Screening Criteria
Beach Seep Area	Toluene	13.4	0.05
	2-Methylnaphthalene	17,300	0.07
	Anthracene	2,260	0.0853
	Benzo[a]pyrene	125	0.43
	Benzo[b]fluoranthene and Benzo[k]fluoranthene	260	0.027
	Benzo[g,h,i]perylene	51.8	0.29
	Fluorene	4,840	0.019
	Indeno[1,2,3-c,d]pyrene	72.6	0.078
	Naphthalene	3,840	0.16
	Phenanthrene	15,300	0.24
	Pyrene	3,390	0.665

Notes:
All values are in milligrams per kilogram (mg/kg).
Sources for ecological screening criteria include:

- NOAA sediment quality guidelines (http://response.restoration.noaa.gov/cpr/sediment/squirt/squirt.html)
- Oak Ridge National Laboratory. 1997. *Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Sediment-Associated Biota*
- Long, E.R., D. MacDonald, S. Smith, and F. Calder. 1995. "Incidence of Adverse Biological Effects Within Ranges of Chemical Concentrations in Marine and Estuarine Sediments." *Environmental Management.* Volume 19, No. 1

Liquid Diesel Fuel Contamination

Pure petroleum contaminants are generally referred to as light non-aqueous phase liquids (LNAPL) because they are lighter than water and will not readily mix with water. This LNAPL contamination is present at the Drum Disposal Area and Beach Seep Area. A portion of this contamination consists of mobile contamination floating on the groundwater surface; this contamination generally is referred to as free product (see Figure 3). The remainder of the LNAPL contamination is trapped as immobile droplets beneath the water table or as semi-mobile contamination above the LNAPL layer. The lateral extent of free product contamination changes over time as the water table rises and falls.

***Free Product**: petroleum floating on the groundwater surface.*

Groundwater Contamination

Contaminants of concern in groundwater include petroleum hydrocarbons at the Drum Disposal Area and Beach Seep Area, and residual-range organics and lead at the Asphalt Seeps (see Table 5). In addition, a solvent (trichloroethene), two fuel additives, and lead are present in groundwater at the Drum Disposal Area. The two fuel additives are: 1,2-dibromoethane and 1,2-dichloroethane (both are additives to leaded gasoline used to keep lead in suspension). The fuel additive 1,2-dibromoethane also is present in groundwater beneath the Beach Seep Area.

TABLE 5: GROUNDWATER CONTAMINANTS OF CONCERN

Site	Analyte	Units	Maximum Detected Value	Cleanup Level	Source of Cleanup Level
Drum Disposal Area	Diesel-Range Organics	mg/L	15.1	1.5	18 AAC 75
	Gasoline-Range Organics	mg/L	6.37	1.3	18 AAC 75
	Residual-Range Organics	mg/L	1.16	1.1	18 AAC 75
	1,2-Dibromoethane	µg/L	10	0.05	Tech Memo 01-007
	1,2-Dichloroethane	µg/L	12.5	5	18 AAC 75
	Benzene	µg/L	1,150	5	18 AAC 75
	Naphthalene	µg/L	216	700	18 AAC 75
	Toluene	µg/L	1,390	1,000	18 AAC 75
	Trichloroethene	µg/L	5.43	5	18 AAC 75
	Xylenes	µg/L	705	10,000	18 AAC 75
	Benzo[b]fluoranthene	µg/L	0.157*	1	18 AAC 75
	Benzo[k]fluoranthene	µg/L	0.157*	10	18 AAC 75
	Phenanthrene	µg/L	7.57	11,000	Tech Memo 01-007
	Lead	mg/L	0.0087	0.015	18 AAC 75
Beach Seep Area	Diesel-Range Organics	mg/L	58.3	1.5	18 AAC 75
	Residual-Range Organics	mg/L	1.14	1.1	18 AAC 75
	Benzene	µg/L	90	5	18 AAC 75
	Naphthalene	µg/L	90	700	18 AAC 75
	1,2-Dibromoethane	µg/L	5.4	0.05	18 AAC 75
	Total Aromatic Hydrocarbons	µg/L	115.87	10	18 AAC 70
	Total Aqueous Hydrocarbons	µg/L	225	15	18 AAC 70
Asphalt Seeps	Residual-Range Organics	mg/L	3.46	1.1	18 AAC 75
	Lead	mg/L	0.0214	0.015	18 AAC 75

*Previous analyses measured benzo[b]fluoranthene and benzo[k]fluoranthene as one analyte

Liquids in Tanks

Two underground storage tanks (UST) remain at Fort Randall: one (UST-1) in the East-West Runway area and another (UST-26) in the Stapp Creek area. Both tanks contain water with dissolved petroleum hydrocarbon contamination. UST-26 also contains dissolved lead. Although the sample from UST-1 was not analyzed for lead, based on the concentration of gasoline-range organics and the history of the site, it is likely that the concentration of lead in that tank also exceeds ADEC standards (18 AAC 75.345).

Buried Drums

During a geophysical survey at the Asphalt Seeps, two trenches of buried drums and a bury pit containing some drums were detected. It is estimated that as many as 8,500 drums could be buried at the site.

***Geophysical Survey**: an investigative technique using radar and magnetic technologies to identify objects underground.*

RISK SCREENING AND CLEANUP LEVELS

The overall cleanup objectives are to restore each site to a level that is protective of human health and the environment, and to comply with Applicable or Relevant and Appropriate Requirements.

To assess the risks that each site could pose to human health and the environment, contaminant concentrations were measured using analytical methods and compared to appropriate cleanup levels or other quantitative criteria. Potential exposure pathways considered in this analysis included:

- The use of groundwater as drinking water
- The inhalation of contaminants located in soil at depths of 15 feet or less
- The ingestion of soil located at depths of 15 feet or less

- The potential for soil contaminants to migrate to the underlying groundwater
- The impacts that contaminants could pose to the marine environment at the Beach Seep Area
- The impacts that contaminants could pose to human health or the freshwater environment at Stapp Creek and Lake Burns

Alaska Department of Environmental Conservation (ADEC): *the state agency responsible for protecting public health, safety, and the environment from adverse effects of environmental contamination.*

The Alaska Department of Environmental Conservation (ADEC) standards published in 18 AAC 75*, Oil and Other Hazardous Substances Pollution Control, govern the cleanup of sites contaminated with oil or other hazardous substances. These regulations address the selection or development of cleanup levels for contaminated soil and groundwater to protect human health and the environment. The proposed cleanup levels address both short-term (acute) and long-term (cancer) risks associated with the sites. The ADEC concurs with the USAED on the actions proposed in this Proposed Plan.

United States Army Engineer District, Alaska (USAED)*: the federal agency responsible for sites discussed in this Proposed Plan.*

ADEC regulations provide four methods for determining soil cleanup levels:

- Method One is a standard table for soils contaminated only with petroleum products (gasoline-range organics, diesel-range organics, residual-range organics, benzene, toluene, ethylbenzene, and xylenes)
- Method Two is a standard table for soils contaminated with petroleum products or other chemicals
- Method Three allows for modification of Method Two values based on site-specific soil and aquifer data
- Method Four is a risk assessment

Methods One and Four were not used in the development of this Proposed Plan. Method Two cleanup levels are taken directly from the values listed in 18 AAC 75 and apply to the cleanup of Stapp Creek, the East-West Runway, and the Collapsed Wooden Building.

Method Three cleanup levels have been developed for Cold Bay's Drum Disposal Area, Beach Seep Area, and Asphalt Seeps. In developing Method Three cleanup levels, the only parameter that was changed from the default values listed in ADEC regulations was the fraction of the soil composed of organic carbon. Contaminants tend to accumulate on the surface of organic carbon, reducing their mobility. In other words, the higher the carbon concentration, the slower the migration of contaminants to groundwater. Approximately 0.21 percent of the soil at the Drum Disposal Area and Beach Seep Area is organic; approximately 2.3 percent of the soil at the Asphalt Seeps is organic. Although the Method Three cleanup levels apply to upland soils at the Beach Seep Area, they do not apply to the sediments along the beach, which contain much lower levels of organic carbon and are in contact with surface waters.

**A copy of 18 AAC 75 can be found at the Information Repository (see page 27) or via ADEC's web site at http://www.state.ak.us/dec/spar/csp/regs.htm*

ADEC regulations require that the potential cumulative risk for all contaminants at a site be evaluated. Cumulative risk calculations assess the potential impacts that contaminants could pose through multiple exposure pathways. For instance, a contaminant

in soil may pose a risk if the soil is ingested directly and additional risk if the contaminant migrates to the underlying groundwater and the groundwater is used as a source of drinking water. At the Drum Disposal Area, the cumulative risk potentially posed by contaminants at the alternative cleanup levels was above ADEC standards. This necessitated lowering the proposed cleanup levels for two contaminants of concern (1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene) in order to reduce cumulative risk to ADEC standards.

For groundwater, the cleanup levels used are the concentrations listed in Table C of the ADEC standards (18 AAC 75).

FEASIBILITY STUDY

As outlined in the National Contingency Plan, the objective of a feasibility study is to develop and evaluate cleanup alternatives so that an appropriate remedy can be selected. Preferred alternatives for the Cold Bay sites were selected based on criteria established by the U.S. Environmental Protection Agency and formally evaluated in the *Final Cold Bay Feasibility Study*. The criteria used in this evaluation are organized into two groups: threshold criteria and balancing criteria.

The threshold criteria, overall protection of human health and the environment and compliance with applicable or relevant and appropriate requirements, must be met for the candidate alternative to be selected. There are five balancing criteria, which are used to assess the alternatives that meet the threshold criteria. The balancing criteria are long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost. Evaluation results for these two groups of criteria are provided for each site in the following site-specific details.

A third group of criteria, modifying criteria, are not considered until after completion of the public comment period. The two modifying criteria, state acceptance and community acceptance, may prompt USAED to modify aspects of the preferred alternative or to decide that another alternative is more appropriate. This Proposed Plan solicits public review and comment on the alternatives described and solicits community and state input on the selected remedies. The criteria used in selecting remedies for each of the sites are summarized below.

Threshold Criteria

- Overall protection of human health and the environment: Will the alternative protect human health and plant and animal life on and near the area? The chosen cleanup plan must meet this criterion.
- Compliance with applicable or relevant and appropriate requirements: Does the alternative meet all pertinent federal and more stringent state environmental statutes, regulations, and requirements? The chosen cleanup plan must meet this criterion.

Balancing Criteria

- Long-term effectiveness and permanence: How reliable will the alternative be at long-term protection of human health and the environment? Is the contamination likely to present a potential risk again?
- Reduction of toxicity, mobility, and volume through treatment: Does the alternative incorporate treatment to reduce the harmful effects of the contaminants, their ability to spread, and the amount of contaminated material present?
- Short-term effectiveness: How soon will risks be adequately reduced? Are there short-term hazards to workers, the community, or the environment that could occur during the cleanup process?
- Implementability: Is the alternative technically and administratively feasible? Are the goods and services needed to implement the alternative readily available?
- Costs presented in this Proposed Plan are estimates of the capital cost and the present value of the long-term operation and maintenance of the alternative.

Modifying Criteria

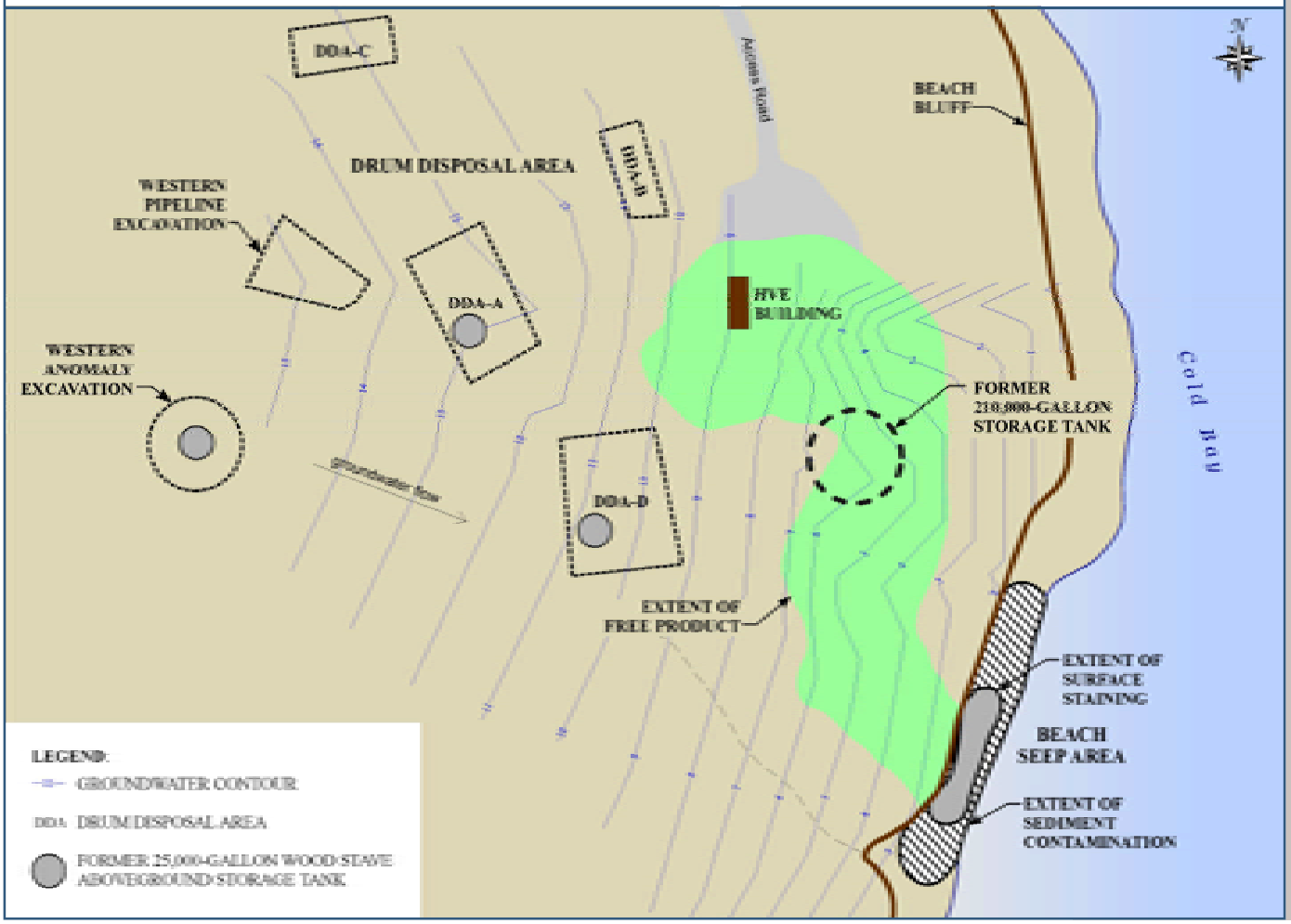
- State acceptance: Do state environmental agencies agree with the recommendations? What are their preferences and concerns?
- Community acceptance: What suggestions or modifications do residents of the community offer during the comment period? What are their preferences and concerns?

SITE-SPECIFIC DETAILS

DRUM DISPOSAL AREA AND BEACH SEEP AREA SOILS

During World War II, the Drum Disposal Area was used to store large quantities of 55-gallon drums and bulk quantities of fuel. The fuel distribution system originally included three 25,000-gallon wooden tanks. These tanks received diesel fuel by pipeline from the Cold Bay dock for distribution to two truck fill stations. The wood stave tanks later were abandoned in place, and a 210,000-gallon aboveground storage tank replaced them for diesel fuel storage. At some point, probably shortly after the end of World War II, many of the stored drums were buried in the Drum Disposal Area. The local community may have continued to use the fuel storage and distribution system until the late 1970s (information per the Site Cleanup and Investigation Report for the Cold Bay FAA Station, 1996 available in the information repository). The fuel distribution tanks and system and the buried drums were the primary sources of contamination at the Drum Disposal Area and Beach Seep Area.

FIGURE 3: DRUM DISPOSAL AND BEACH SEEP AREAS



Previous Environmental Investigations and Cleanup Actions

Cleanup activities for soils at the Drum Disposal Area and Beach Seep Area began in 1985. Early work included removing the 210,000-gallon diesel aboveground storage tank and demolishing adjacent structures.

- In 1998, 2,138 drums were removed from three drum disposal areas (DDA-A, DDA-B, and DDA-C). Approximately 3,000 cubic yards of contaminated soil were removed and stockpiled.
- In 1999, a geophysical survey was conducted, and 129 drums were removed from DDA-D and disposed of. Approximately 1,340 cubic yards of contaminated soil were removed and stockpiled. Approximately 140 feet of 4-inch diameter steel pipe were removed and disposed of.
- In 2000, 4,950 cubic yards of stockpiled soil were thermally treated. Over 2,000 crushed drums and associated scrap metal were recycled.
- In 2001, all remaining, stockpiled, contaminated soil was thermally treated. Treated soil was returned to its original location. The site was then graded and seeded.
- In 2002, a remedial investigation was conducted to define the extent of soil contamination remaining at the site.

Photo: *Field crews collecting soil samples at the Beach Seep Area. Photo taken looking toward the north with Cold Bay Dock in the background. Soil in the area is visibly stained. The extent of contamination appears to coincide with a zone in which almost no vegetation is present.*

Future remedial actions need to take into account that most of the diesel fuel contamination at the site is bound to the soil. This contamination will continue to contribute to groundwater contamination (and possibly to the free product layer) unless additional cleanup actions are taken.