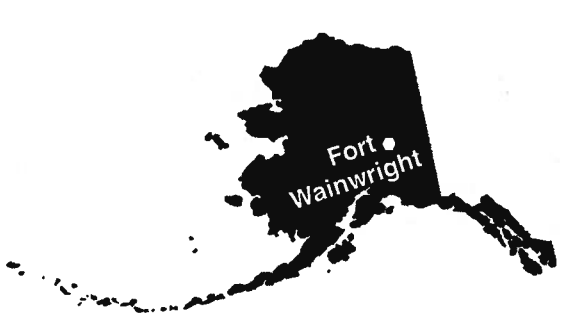
Fort Wainwright Army Base



Environmental Justice at Alaska Military Superfund Sites
Fact Sheet

Location:

Fort Wainwright is located within the Tanana and Tanacross Native language groups region at the eastern border of Fairbanks. Both the Chena and Tanana Rivers run through Fort Wainwright. The Native villages of Minto and Nenana are within 50 miles of the military base, Rampart and Manley Hot Springs are within 100 miles, and all are downstream of the Chena or Tanana Rivers or their tributaries.

Primary Contaminants:

- **Petroleum, Oils and Lubricants** (POLs): benzene, toluene, ethylbenzene, xylene (these four are also referred to BTEX, as a group), diesel fuels, gasoline, ethylene dibromide (a highly toxic substance that was banned from agricultural use in 1987, but was also used as a solvent and an anti-knock ingredient in gas) and other solvents
- **Volatile Organic Chemicals**: (VOCs): benzene, trichloroethane (TCE), vinyl chloride, methylene chloride, 1,2-dichloroethane, 1,1,2-trichloroethane, 1,1,2,2-tetra-chloroethane (PCA)
- **Semi-Volatile Organic Chemicals:** (SVOCs): naphthalene, di-n-butylphthalate, polyaromatic hydrocarbons
- **Persistent Organic Pollutants** (POPs): PCBs, dioxin, pesticides* (including DDT, DDD, dieldrin, aldrin, heptachlor, lindane, 1,2-dibromethane or EDB)
- **Heavy Metals**: arsenic, chromium, lead, manganese, mercury
- **Others:** isopropylbenzene, trimethylbenzene, bis(1-ethylhexyl)phthalate, cis-1,2-dichloroethene

Note: The categories used here are those used by the Environmental Protection Agency for Superfund sites. Other methods of categorizing do exist. See www.epa.gov/reg3hwmd/bfs/regional/analytical. Chemicals listed as "Others" were those not found on the EPA's list.

History:

Fort Wainwright is located within the traditional lands of a number of Interior tribes from the Tanana and Tanacross language groups; these lands are also held within the Doyon Regional Corporation. Both the Chena and Tanana Rivers run through Fort Wainwright. The Native villages of Minto and Nenana are within 50 miles of the military base, Rampart and Manley Hot Springs are within 100 miles, and all are downstream of the Chena or Tanana Rivers or their tributaries.

Originally established in 1938 as a cold weather testing station, Ladd Airfield was officially designated in 1939. During World War II, the site served as crew-transfer point in the U.S./Soviet Union Lend-Lease Program. After the war, it continued to be an active Air Force base and a supply and maintenance facility for Nike Hercules missile sites, experimental research stations in the Arctic Ocean, and the remote Distant Early Warning radar sites (the DEW line). In 1961, all operations at the base were transferred to the Army, and it was officially designated as Fort Wainwright.

The Fort now occupies 918,000-acres. Current activities include training infantry, defense and deployment capabilities, and equipment testing under Arctic conditions. In addition, it also supports a number of industrial

* With the exception of lindane and EDB, the other pesticides listed here are so toxic they are targeted for international phase-out in the Stockholm Convention on Persistent Organic Pollutants, commonly referred to as the POPs Treaty. For more information about POPs, go to www.ipen.org.

activities that have played a role in the historical contamination of the site. These include the operation, maintenance, and repair of heavy military transport and defense machinery and weaponry, power generation, and drinking water production, treatment, and distribution. The issue of drinking water production and protection are particularly important for Superfund activities at Fort Wainwright, as the Chena River is used for drinking water for both the post and the city of Fairbanks - under questionable conditions. Proximity of the Chena River to many of the contaminated source areas puts drinking water sources at high risk for contamination from chemicals of concern.

Geography & Geology:

Although Fort Wainwright encompasses over 900,000 acres, the majority of sites under Superfund are all within the cantonment area, which covers approximately 4,500 acres immediately east of Fairbanks. Remaining lands are range and military maneuver areas. The Chena River flows through the cantonment area and into the Tanana River, which flows generally westward until it meets the Yukon River.

The main drinking water source for the fort and the city of Fairbanks is the alluvium of the Tanana basin. Alluvium is a geological term that describes layers of silt, soil, gravel, and other materials that are deposited by running water, and that act as the aquifer, or groundwater, that is used as a source of drinking water. The Tanana basin ranges in depth from a few feet to at least 300 feet thick in the cantonment area. The relationship between the groundwater and the rivers that flow through and around the cantonment areas are important to understand in terms of the implications of its contamination. The surface soil at Fort Wainwright is described as being "generally less than five feet thick."[1] Permafrost in this area is uneven and discontinuous throughout the basin. In two of the critical contaminant source areas for Operable Unit 5, "much of the native vegetation has been removed near the military facilities south of the Chena River, and the land surface has been extensively reshaped. Permafrost has degraded here to the extent that no significant amount remains in the WQFS or EQFS" (two of the contaminated sites).[2]

Because groundwater is not held in place by the permafrost, it is free to flow in warmer weather. Spilled and dumped contaminants are able to percolate through soils into the groundwater, moving freely between the river and groundwater table. Unimpeded by permafrost, groundwater, at several points, flows directly into the Chena River from the fort. Due to this direct flow, a large percentage of soil and groundwater contaminants are likely to end up in the Chena River, the water supply for thousands of people. Approximately 15,000 people alone live and work at Fort Wainwright and obtain drinking water from wells that are in close proximity to contaminated source areas. Once theses contaminants enter the Chena, they will eventually enter the Tanana River, with even more far-reaching implications.

Records of Decision (ROD) fail to note the potential impact to downstream communities, especially with regard to the status of Native Alaska villages and traditional hunting and fishing grounds.

Contamination Background:

Fort Wainwright was formally placed on the National Priorities List for Superfund remediation in August 1990. It was divided into five separate operable units, each with its own remedial investigation, feasibility studies, risk assessments, and records of decision. Operable Unit 5 (OU5) is a comprehensive assessment of the entire area. According to the OU5 ROD, the intent of OU5 was to address "potential cumulative human health or ecological risks that may become evident from the aggregate of source areas and areas not otherwise resolved in previous OUs."

The Army maintains primary responsibility for conducting remedial activities at Ft. Wainwright, but the EPA and the State are supposed to work jointly in planning and decision-making. Missing in this group are any tribal governments, which should have been included from the onset, and certainly post-1994 when President Clinton's Executive Order outlining environmental justice guidelines for federal agencies. See *Overview of Key Issues* for a complete discussion of environmental justice as it pertains to Alaska's military Superfund sites.

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* Words in **bold** signify terms used in the world of Superfund. For a comprehensive discussion of Sueprfund law and how it works, please see the accompanying document, *An Overview of Key Issues at Alaska Military Superfund Sites.*

The first five-year review of remediation activities was completed in September 2001. It was determined by the three involved agencies that all treatment systems and institutional controls are functioning as intended and that the selected remedies for the five project areas remain protective of human health and the environment. However, in September 2002, the Army released a document entitled, *Explanation of Significant Differences*, which outlined gross underestimates of contamination in the OU3 ROD versus levels that were actually found. Because the source of contamination was not different, neither new risk assessments nor a new ROD were determined necessary.

Sources of Contamination:

Operable Unit 1

OU-1 was initially comprised of a total of twenty-two potential contaminated sites, or source areas, to be investigated for remediation. Only four source areas were eventually recommended for further action.

801 Drum Burial Site: The site is an otherwise undeveloped area on the west bank of the Chena River approximately one tenth of a mile from the 801 military housing area. The entire area including soil, subsurface soil, and groundwater was contaminated with petroleum-based compounds such as diesel-range organics and gasoline-range organics; pesticides including DDT, DDD, dieldrin, aldrin, heptachlor, and lindane; various chemicals including volatile organic chemicals; toluene; xylenes; vinyl chloride; methylene chloride; naphthalene; di-n-butylphthalate; cis-1,2-dichloroethane; trichloroethane; arsenic; various metals; and solvents.

Cleanup objectives focus on remediation of the soil and groundwater at the site alone. Downstream contamination is not considered within the purview of any cleanup action related to Superfund, regardless of whether the contamination originated with site activities. One of the reasons cited is the problem of attribution, that is, how much of any contamination downstream is actually related to the original source area, and how much was contributed by additional sources along the way?[3]

Because of these self-imposed constraints, objectives at the site are first, to ensure that groundwater meets federal and state standards, and second, to minimize potential migration of the contaminated groundwater to the Chena River and down gradient drinking water wells. These objectives will not return the water to a pristine state, but will limit the amount of contamination that is allowed to remain. The third objective regarding groundwater is to "[e]stablish and maintain institutional controls to ensure that the groundwater will not be used until federal and state MCLs [maximum contaminant levels] are attained." [4]

While institutional controls may be effective in preventing or limiting access to the site by humans for the duration of military occupation of the area, this is not the only concern. Due to area hydrogeology, the water table is very shallow in some areas adjacent the Chena River. During warmer months there is significant potential for interchanges between the groundwater and surface waters. Secondly, the site is in a flood plain. Because it is a designated "500-year flood plain" the assumption is that flooding represents little danger. Nevertheless, only one significant flood could bring contaminated groundwater to the surface where it could recontaminate surface soils or volatilize contaminants. The institutional controls described in the record of decision would hardly prevent these events.

Cleanup remedies chosen include excavation of soil and drums to remove the source of the contamination, and monitoring to assure that the contamination has been contained. Contaminated soil and drums were reburied in a hazardous waste facility. Removing them from Fort Wainwright remediates contamination at the 801 sites, but until the soil, the drums, and their contents are permanently disposed of through environmentally acceptable destruction technologies, they will continue to pose a potential danger to the environment and public health. On-site destruction by environmentally sound, non-incineration technologies is the more appropriate method of cleanup.

Natural attenuation, institutional controls, and long-term groundwater monitoring with the *possibility* of soil vapor extraction and air sparging are the additional cleanup remedies. The agencies believe that natural attenuation is sufficient to restore groundwater to levels of contamination acceptable to state and federal regulations. Long-term monitoring is to assure natural attenuation is working. If it does not control the contaminant plume after three consecutive testing events over a 20-year period, or if the contaminant plume appears to be migrating away from the site, the treatment contingency would be implemented. This alternative does not treat the contaminated

groundwater other than under the circumstances described above*

Buildings 1599 and 2077: Building 1599, located one-tenth of a mile south of the Chena River, was historically used for automobile and heavy equipment maintenance, and dispensing diesel and gasoline. Prior to 1973 it was also used for pesticide mixing and storage. It was intentionally destroyed in 1984. The remedial investigation focused on surface soil contamination; diesel-range organics, gasoline-range organics, dioxins, and pesticides were found in the surface soil both adjacent to and south of the former building. Based on the risk assessment for the dioxin and pesticides, it was determined that no further action was necessary at this site under CERCLA requirements. Petroleum contamination, on the other hand, exceeded the State's acceptable levels, which resulted in a Two Party Agreement. The Army's cleanup response includes institutional controls (land and groundwater use restrictions) and "annotation in the Fort Wainwright Master Plan to ensure proper handling and management of the soil at this source area."[5]

Building 2077, also known as *Hangars 7 and 8*, was built in 1958, and a paint booth added in 1973. The building is currently used for aircraft maintenance and paint shop operations. Site activities included storage of barrels containing spent solvents, used oil and contaminated fuels. Dumping and/or burning waste of paint chips outside the building may also have occurred. Since 1989 the barrels have been removed and the soil beneath them excavated for disposal. Soil contamination ten feet deep was found during the remedial investigation, and included diesel-range organics, gasoline-range organics, benzene, toluene, ethylbenzene, and total xylenes. Benzene and petroleum contamination were also found in groundwater wells at the site. Again, based on the human health risk assessments for the non-petroleum contaminants, the site was determined to require no further action under CERCLA, but was referred to the Two Party Agreement because of the petroleum levels.

No Further Action Sites: Twenty-seven sites were recommended for no further action. After reviewing the rationale for each site, the site of most concern to the authors is discussed below.

Blair Lakes Drum Site – This site is located in the Tanana Flats Training Area, approximately 35 miles to the southeast of the main fort cantonment area. There are two lakes in the area, plus a gas runway and a taxiway for aircraft, with "lowland and upland areas" surrounding it. In 1986, halogenated organics, ketones, benzene derivatives, and alkanes were found in 25 drum samples, and cyanide and metals were detected in sediment samples from surface waters. In 1987, a removal action was done at the site that removed all structures and miscellaneous debris. In 1993 diesel-range organics and DDT were found at various sites, but the majority of the samples were within what the EPA considers "risk-based concentrations," that is, in concentrations not considered high enough to exceed acceptable risk. [6]

An ecological evaluation finds no significant risk to fish, wildlife or the ecosystem. However, the assessment fails to take into account the geographic relationship of the area to Alaska Native villages or allotments. It does not address whether species used by subsistence fishers and hunters were included in the risk analysis, nor whether the range of such species might bring them into proximity to the contaminated areas. This is of particular concern with regard to the pesticide DDT. Without these considerations, it is impossible for the agencies to fulfill their environmental justice mandates.

Operable Unit 2

Eight sites were initially identified. The final decision on six of these areas was that no further action was required. Two sites, described below, required remediation under CERCLA.

The DRMO Yard: This site encompasses approximately 25 acres and includes seven buildings. Both groundwater and surface water from the site drain into the Chena River, approximately one mile away, through a drainage ditch and a "riprapped conveyance that parallels the west boundary of the DRMO Yard and connects the Chena and

* After leaving Fort Wainwright, the Chena River flows through Fairbanks, passing at least one non-military Superfund site along the way, and receiving run-off from various non-point sources as well as permitted discharges. Even if the stream and its sediments were tested as part of the Superfund process (they are not), how would it be possible to know how much came from the Fort Wainwright sources? This is the argument given by the EPA for limiting the scope of the cleanup to the source areas at Fort Wainwright itself. The question remains: who will be responsible for assessing and remediating the impacts of the contamination on downstream users from upstream sources?

Tanana Rivers."[7] Although only 200 feet from the DRMO Yard is another Superfund site (Arctic Surplus), because it is a private facility it is not at all addressed under the Fort Wainwright Superfund. Any issues related to cumulative impacts were essentially ignored.

The remedy chosen consists of soil vapor extraction, groundwater air sparging, natural attenuation and groundwater monitoring/evaluation. The engineering treatments seem appropriate to treat the volatile organic chemicals identified, as long as the soil vapor extraction and air sparging emissions are closely monitored to assure that the contaminants are actually destroyed and not simply transferred from the water and soil to the air. However, this remedy includes a no action component for the benzene-contaminated soil hotspots. The rationale in the ROD is: "[a]fter evaluation of the potential risks and appropriate cleanup standards and comparison with the nine CERCLA criteria, it was determined that action is not required."[8] No further explanation is offered.

The expected length of time for volatile-organic-chemicals-contaminated soil and groundwater to be remediated after the treatment is completed is fifty years, with monitoring continuing for an estimated fifteen years. Again, this approach fails to incorporate an adequate environmental justice analysis in the investigations and remedies. Regrettably, this failure exists for all records of decision at Fort Wainwright.

Building 1168 Leach Well: The Leach Well is located 1,800 feet west of the Chena River. Floor drains in the building are thought to have received spilled oil and lubricants, fuels, solvents, and engine coolants that contaminated subsurface soil and then groundwater. The main contaminants of concern in both the soil and the groundwater are trichloroethylene and benzene, both of which are above state and federal maximum contaminant levels. Petroleum hydrocarbons, ethylbenzene, xylenes and other aromatic and chlorinated volatile organic chemicals as well as inorganic elements were also found in this area.

The remedy chosen for this site includes in-place treatment of soils and groundwater by soil vapor extraction and air sparging, followed by groundwater monitoring and institutional controls. Because this remedy will actually eliminate or destroy the contaminants of concern through treatment, rather than attenuation, this appears to be one of the better decisions.

Operable Unit 3

Operable Unit 3 is located within the Chena River floodplain. It consists of three broadly defined source areas, all of which were involved in petroleum fuels storage or transfer in underground (USTs) and aboveground storage tanks (ASTs), and through pipelines such as the Canadian Oil Line and the Fairbanks-Haines Pipeline. The primary contaminants are petroleum fuels and petroleum constituents that have seeped into the groundwater over large areas. Only one portion of the original Fairbanks-Haines pipeline is still active; it is the Fairbanks-Eielson Pipeline that connects Eielson Air Force Base with the Mapco refinery in North Pole.

Birch Hill Tank Farm Source Area: This large tank farm is located in the northeast corner of Wainwright, on the northwest bank of the Chena River. Included in this area were a total of twenty steel storage tanks, both under and above ground, three buildings, the Canadian Oil Line pipeline and Valve Pit A.

Railcar Off-Loading Facility Source Area (ROLF): This facility was built in 1939. It is connected to the tank farm by a pipeline, and is located south of the tank farm with the Chena River to the north and west of it. The facility is no longer in use; and the fuel in under ground storage tanks was removed in 1990.

Milepost Source Areas: This source area is divided into several sub-areas based on milepost locations along the Fairbanks-Eielson Pipeline where spills have been either reported or detected. At least 40 ruptures occurred. All of the contamination addressed in this source area is related to fuel spills at different points along the pipelines.

Major contaminants in the soil, subsurface soil, and most markedly in the groundwater throughout OU-3 include benzene, toluene, ethylbenzene, 1,2-dichloroethane, total xylenes, isopropylbenzene, trimethylbenzene, lead, and ethylene dibromide, a highly toxic substance banned from agricultural use in 1987, but was used as a solvent and an anti-knock ingredient in gas.[9]

The record of decision (ROD) indicated low levels of petroleum were believed to be contaminating groundwater discharged into the Chena River from the railcar off-loading facility area and Valve Pit A. However, the Army's 2002 document, *Explanation of Significant Differences (ESD)*, shows gross underestimates. As outlined

in the ESD, throughout OU3 contamination levels are actually 3-4 times greater than in the ROD, though at the Birch Hill Tank Farm levels are up to *5,000 times greater*. Due to the nature of the "complex fractured bedrock", the ESD states that contamination levels can only be estimated; historical records document the transfer of millions of gallons of petroleum product.

The ESD also demonstrates that contaminants at the base of the hill at the Milepost source areas are not decreasing from the selected remedy (bioremediation) as expected, due to level ground and, mostly, to permafrost in the soils. Additional monitoring will be added in the spring of 2003 for groundwater flows, contaminant levels, and flow levels for different times of the year. A different remedial action may be needed, as which time the Army intends to either amend the ROD or develop a new Explanation of Significant Differences. Despite these differences from the earlier ROD, the Army believes a new ROD is not warranted because source areas remain the same.

However, the authors believe a new ROD is necessary for a number of reasons. First, and foremost, investigation of the Birch Hill site did not begin until after the ROD. According to the ESD, "At the time of the RI [remedial investigation], no wells or deep borings were installed on Birch Hill; thus, free product within the bedrock aquifer was missed. Post ROD activities, which identified the free product, have led to the addition of a sub-area known as the Birch Hill Product Recovery System." This site should undergo a remedial investigation/feasibility study under CERCLA.

Second, given that an investigation of Birch Hill (part of the Birch Hill Tank Farm site) was not conducted prior to the ROD, risk assessments for the ROD contain insufficient data from which decisions for remediation were made and the public had insufficient information from which to make informed comment. Third, according the ESD, fractured bedrock in the subsurface "makes it difficult to estimate the volume of free product." The best the Army can do is refer to historical records, which indicate the Farm handled millions of gallons of fuel. Yet, "high concentrations of DCA and EDB in the Birch Hill bedrock aquifer is believed to be the major source of groundwater contamination in the alluvial aquifer."[10] As discussed before, the Tanana alluvium is the main source of drinking water for the city of Fairbanks and the fort itself.

Several contaminated areas border Fairbanks and/or have residential developments nearby. A military residential area on the base lies within one-fourth mile of one source area, and two Fairbanks churches have drinking water wells approximately one-fourth-mile down gradient from the tank farm source area. Although ecological receptors of concern to Alaska Natives may exist, the record of decision failed to take these concerns into account, because they are outside of the boundaries of the fort. The risk assessment documents fail to report data about ecological receptors in these and other down gradient areas that are outside of the boundaries of the post itself, even when acknowledged recipients of historical contamination exist.

While these populations were taken into consideration, the risk assessment documents fail to include data about ecological receptors down gradient, even though these lands may be of importance to wildlife taken for subsistence uses. With levels of contamination up to 5,000 times greater than stated in the ROD, these risk assessments are certainly inadequate.

In the ROD, the same remedies were chosen for all areas in OU-3: soil vapor extraction and air sparging in permafrost-free areas to meet Safe Drinking Water Act levels, and natural attenuation to meet Alaska Water Quality Standards. The time frame for remediation, based on the assumption that land uses in the affected areas will not change, was set at no more than 30 years to achieve cleanup. Also according to the ROD, long-term monitoring was a component of the remedies, with the qualification if, during implementation, it become apparent that "contaminant levels cease to decline and are remaining constant at levels higher than the remediation goal," a re-evaluation of the process could occur. The ESD document describes enhancement and significant expansion of these treatment systems, including off-gas treatment of soil vapor exhaust, *ex situ* treatment of soils (treatment of soils after they've been removed), and underground piping to enhance biodegradation through the introduction oxygen

In the ESD, two off-Post wells still show levels of contamination; annual testing show fluctuations above and below MCL, rather than a steady decrease. The Army continues to provide water to these two churches. A product recovery system has been added in addition to expanding the area that soil vapor extraction and air sparging is conducted.

Contamination at the Railcar Off-loading facility was also underestimated in the ROD. Remedial methods are similar to those above, except that a thermal/catalytic oxidizer is also being used for off-gas treatment.

Unfortunately, the ESD did not use its opportunity to further investigate impacts downstream from these sites. Clearly, with the extent of contamination greater than originally thought, potential impacts to downstream

communities and their fishing and/or hunting grounds is also that much greater. Yet, nowhere in the document is this discussed. Again, the Army has failed to meet environmental justice mandates by this omission.

Operable Unit 4

Operable Unit 4 consists of three clearly defined source areas: the Landfill, the Coal Storage Yard, and the Fire Training Pits.

Landfill Source Area: This is the main landfill serving Fort Wainwright. Originally a 60-acre site, the active portion now consists of approximately 40 acres north of the Chena River at the base of Birch Hill. The remaining 20 acres, including a large trench area, are across a main road to the south. Use of the site as a landfill began in the early 1950s.

Activities included waste burning in addition to dump and covering operations. There is a high probability that burning activities resulted in hazardous air emissions that led to air deposition of contaminants into nearby waterways and sediments – sites where dioxin and furans have been identified. According to the record of decision,[11] trenching and burning activities at the Landfill ended sometime in the 1960's, at which time the wastes remaining at the site were spread, compacted by bulldozer, and covered with coal ash.

Wastes disposed at this site during the '50s included human waste; household refuse; waste petroleum, oils, and lubricants; hazardous waste including solvents; pesticides; asbestos; construction debris; and inert munitions. Investigations revealed drums and debris from other dumpsites on the Fort, remnants of buildings that had been demolished, excavated materials from the Glass Park Tar Site, various pesticide cans, asbestos and vehicular paint waste.

The major contaminants identified in the remedial investigation were benzene, bis(1-ethylhexyl)phthalate, TCE, 1,1,2-trichloroethane, 1,1,2,2-tetra-chloroethane (PCA), and cis-1,2-dichloroethene in the groundwater under the Landfill and in the down gradient southwest thaw channel that intersects the Chena River. Concentrations indicated there was a contaminant source within the Landfill area itself, as opposed to the chemicals leaching from elsewhere. Contaminants exceeded both the federal drinking water maximum contaminant levels and the risk-based screening concentrations of EPA. Exceedance of only one of these criteria usually sufficient for remediation, but in practice the maximum contaminant levels seem to be the measure that drives cleanup decisions.

Lead and chromium also exceeded both these governmental levels, yet the agencies decided because contaminants were below background levels no action was required. Several additional petroleum contaminants, including high concentrations of lead that were also found in one area were believed to be the result of a spill. The area was covered permanently in 1995 with eight feet of materials, and this was considered to eliminate of the exposure pathway for the lead.

The main concern is contamination of groundwater at contaminant levels that are considered to pose a risk to down gradient groundwater users.

The remediation alternative is described as "a phased approach involving capping of the soils in the older, inactive portion of the Landfill, natural attenuation of groundwater; groundwater monitoring/evaluation; and institutional controls. Phase 2, if necessary, would involve evaluation and implementation of an active groundwater treatment system."[12] The choice of this alternative is a classic example of how cost considerations can drive remediation decisions. Although this initially costs almost six times less than the technological treatment of groundwater (alternative 5), the expected length of time to reach some semblance of "clean" groundwater is seven times greater.

The decision to choose capping as a method of remediation is particularly surprising, given that capping is not a permanent treatment, and will eventually need to be remediated itself. Moreover, capping is susceptible to rupture, especially under conditions of regular weather-related contractions and expansions. Animal activity can also challenge the integrity of the cap over time. (A major "advantage" to capping is that the site will probably not need attention again until after the current decision-makers have retired.)

The decision to rely on natural attenuation and institutional controls is not acceptable for a site that has been described as a significant threat to down gradient water quality because of the nature of the thaw channel exposure pathways. The assurance that technologies will be used eventually (should natural attenuation prove to be ineffective after monitoring) is a hollow promise given that the proposed Phase 2 calls only "for *evaluation of implementation* [emphasis added] of an active groundwater treatment system."[13] How long would the public have to wait before there was an actual decision to act? The greater problem is this entire approach is a reactive

strategy; it is the antithesis of the prevention and permanent remediation that Superfund was intended to ensure. This alternative offers action only after *further damage* from the site has been determined. Natural attenuation and institutional controls should not be considered protective in any way.

The Coal Storage Yard: This site is located approximately 12,000 feet north of the Tanana River and approximately 4,000 feet south of the Chena River. It is the storage area for the Fort's coal-fired cogeneration power plant, the sole source of heat and electricity for all of Fort Wainwright. The coal is stored directly on the ground, and from the 1960's through 1993 was sprayed regularly with waste petroleum fuel products such as diesel, fuel oil, solvents, and lubricants from tanks, railroad cars, and drums in order to increase the BTU value.

The remediation alternative chosen is a combination of on-site technologies to treat both soil and groundwater, with ongoing monitoring and evaluation to assure the efficacy of the procedures, and institutional controls to prevent access to the site during treatment. The expected length of time until soil and groundwater would reach cleanup goals was estimated at approximately nine years. The advantage of these technologies is that the treatment is also expected to be permanent once the sources of contamination are removed.

Operable Unit 5

OU-5 addresses source areas deferred from previous operable units, source areas not resolved in earlier operable units and three new areas identified in OU-5. Deferred from earlier investigations are the Open Burning/Open Detonation Area (OB/OD), the Former Explosive Ordnance Disposal Range (Blair Lakes Impact Area), and the Motor Pool Buildings.

The ordnance disposal range and the motor pool buildings were eventually designated as "no further action" sites under CERCLA and, for undetermined reasons not discussed further in the ROD. The OB/OD was evaluated separately from the new areas. The three new areas are the West Section, Former Quartermaster's Fueling System (WQFS); East Section, Former Quartermaster's Fueling System (EQFS); and Remedial Area 1A. The first two are among the most contaminated sites at Fort Wainwright.

Remedial Area 1A: The major contaminant is lead, which was detected in the surface soil at levels above EPA guidance for industrial cleanup levels. The risk assessment discusses the inability to address lead exposure because it is not considered a carcinogen and because exposure to lead is measured by blood-lead levels rather than based on an average daily intake. However, there is also no threshold below which exposure to lead is considered safe.

The area is located in the upper northwest corner of the post, and it is unclear how great a magnitude of fugitive dust from the site would reach either the Chena River or residential areas.

Institutional controls, monitored for 30 years, are the chosen remedy for lead contamination at this site even though the ROD admits that Alternative 4, removing the soil, would provide the greatest protection of human health and the environment, and a permanent solution. This is based on the assumption that area land use will continue to be restricted, as it is currently. While clearly more expensive, Alternative 4 would constitute permanent remediation, which would be appropriate regardless of what land use or changed circumstances occur in the future. But it is also clear, from the willingness of all parties to accept a lesser solution, that permanent protection is not necessarily what drives the decisions at these sites. The petroleum-contaminated soil will be cleaned up separately under Two-Party Agreement requirements, including removal of tanks on the site.

Quartermaster Site: The two quartermaster sites include numerous buildings and fueling system components (such as pipes, pipelines, and aboveground and underground fuel and oil storage tanks), resulting in a complex mixture of amounts and types of contamination.

East Section: Many of these buildings were used for vehicle maintenance activities, fuels testing, offices, storage, and communication facilities. Storage included an array of oils and fuels, PCB transformers, pesticides, varieties of other waste products, and chemicals from testing kits, paints, and solvents. Evidence of drainage pipes leading directly into the Chena River was also found.[14]

In a 1994 investigation of the North Airfield area of east section, plumes of free-product, benzene, 1,1,1,-trichloroethane, TCE, cis-1,2-DCE, diesel and gasoline range organics were all discovered in the groundwater. Other contaminants found at the site include low levels of pesticides, including aldrin, as well as total xylenes, toluene, ethylbenzene, and petroleum hydrocarbons.

West Section: The primary activity here was supplying fuel for vehicles and aircraft. Historically, the site included at least one building and numerous aboveground and underground fuel storage tanks, as well as both buried and exposed piping and pipelines. Several major leaks and spills were documented in this source area, many of which leaked into the Chena River at different points. Also documented are out-falls for sewer lines that emptied into the Chena. Several events where fuel oil spills were burned-off are documented, including one instance in which a spill on river ice was set on fire.[15] Contaminants include pesticides and dioxins in the soil, gasoline range organics, benzene, gasoline, free-product, chlorinated solvents, fuel constituents including xylenes, naphthalene, and lead.

According to the Five-Year Review, a new contaminant of concern, EDB, was identified. EDB (1,2-dibromethane) is a highly toxic fungicide also used as a petroleum additive. Unlike earlier selected remedies, the one selected here is a more active system, which included removal of the free liquid product from groundwater, air sparging, soil heating, and oxidation release (which helps prevent transfer of the contaminant from soils and water to the air.[16]

Open Burning/Open Detonation (OB/OD): The pad is within an active small-arms impact range on the post. It is located approximately 1,000 feet north of the Tanana River and 1,500 south of the flood control dike. The area was apparently used by the Army beginning in the mid-1960s through sometime in the 1980s, but operating records are no longer available for the site. It was reportedly used for disposing of unexploded ordinances (UXO) and dud ordnance, unused propellants (e.g., black powder, a toluene-based substance), and other hazardous materials. After extensive investigation using record searches, historical aerial photography and interviews with individuals with institutional knowledge of ordnance activities on the post, it was determined that this site is the only historically active and identifiable ordnance disposal area at the post.

Field investigation and sampling revealed the significant contaminant to be diesel range organics, present at very low levels. An organosulfur compound, p-chlorophenyl methyl sulfoxide, was also found in three (of eight) samples, and is believed to be a degradation product of the herbicide Planevin. Several metals were found in levels less than or equal to background levels; barium, chromium, and lead did exceed background levels but were below acceptable risks in soil.[17]

As a result of the low levels of the contaminants found, and because the "OB/OD area is within an active range, where human access is extremely restrictive"[18], no further actions beyond institutional controls were determined necessary for this site.

The risk assessment for OU5 contains serious flaws. Populations of concern are discussed only in terms of current and future. The current population is limited to "facility workers," while future populations include "facility workers, construction workers, and military and nonmilitary residents."[19] The assessment fails to include populations beyond the post itself; communities downstream of contaminated sites on the Chena or Tanana are left out of the discussion. Several questions arise from this assessment.

According the ROD, "(C)hemicals detected at concentrations below the risk-based screening concentrations were eliminated from the source-area risk assessments."[20] This may, at first, sound reasonable, however it fails to address two important risk factors. One: for chemicals such as dioxin, and many other carcinogens, there is no agreed-upon threshold exposure. In other words, anything above zero is considered a risk. Two: the classic quantitative risk approach used here does not address situations where multiple chemicals may interact with each other or with background contaminants. The total amount of all chemicals at a site may add up to an aggregate of several parts per million of contaminants of known toxicity. There is no adequate risk assessment method to determine what the long-term risk will be if people are exposed to multiple contaminants on a chronic basis.

In addition, the post-wide assessment is notable for its uncertainty, hedging and qualifying comments abound throughout the document. Contaminants and risk indices are first reported and in the next sentence described as being either greatly overestimated and therefore unstable, or possibly underestimated and therefore uncertain. In some instances, if the data necessary to include a particular chemical in the risk assessment equation is not available, that chemical is simply left out. Nowhere is this problem more evident than in the post wide human health risk assessment. The reported risks are significant; for example the excess lifetime cancer risk to a hunter from eating moose is 5 in 10,000. It's unlikely that the EPA's "reasonable-maximum-exposure scenario" (RME) is based on a subsistence diet. The non-cancer hazard index for moose meat ingestion for the RME was 5.2 (anything over 1.0 is considered an "unacceptable" risk).

For each of the high risks calculated, there are several uncertainties presented to demonstrate that these risks are extremely conservative and probably greatly overestimated as a result. These risk assessments may be confusing to the average person trying to grasp if there are truly concerns from these contaminants. On the one hand, the EPA invests large amounts of time and resources into determining a risk value and the source of that risk. On the other hand, once the assessment has been made, the agency emphasizes how uncertain the results may be, casting into question the usefulness of the risk product and doubt as to whether or not a risk is actually present. What does this translate to for persons who may live in the area or downstream, who come into daily contact with these contaminants, or who may rely on certain wildlife species for important contributions to their diet?

The ecological risk assessment is fraught with the same inconsistencies. For example, the risk characterization finds first that the muskrat has a hazard index of 1.9 to 3.1 based on exposure to surface water and sediment in the Chena River. However, the end of the paragraph draws the conclusion that due to the uncertainties this hazard figure is "unlikely to be significant at the population level".[21] Several paragraphs later, the ROD reports a hazard index for the northern goshawk of 1.3 from dioxin/furans and DDT, and in the area south of the Chena River, an index of 225 for the red fox, primarily from dioxin.

North of the Chena River the index for the red fox is 62, 99% related to lead exposure. Again, these figures are immediately questioned by emphasizing the high degree of uncertainty in their determination. In the case of the lead contamination, this qualification of the true risk is offered: "the potential for adverse effects to the red fox population is not considered to be significant because of existing fencing, unsuitable habitat in the areas considered, and uncertainty in risk estimates resulting from necessary conservative assumptions."[22] Reading this risk assessment, one comes away questioning the value of all this effort, as virtually every elevated risk is explained away as being due to an overly conservative approach fraught with uncertainty. Even if the risk is elevated, the source of that risk is not related to the source areas identified as part of the Superfund process but to accepted background levels that will therefore not be remediated.

This is a key point that requires further consideration. For the first time in all of the operable units for Fort Wainwright, contaminants such as dioxin/ furans, mercury, and pesticides such as DDT and dieldrin show up as significant factors in the risk analyses. Persistent organic pollutants such as DDT and its metabolites, PCBs, dieldrin, and dioxins/furans, several volatile and semi-volatile organic chemicals, and a number of heavy metals were also identified in the sediments and waters of at least one segment of the Chena River, and some segments, notably Segment D, were particularly contaminated.

In the *Postwide Risk Assessment* the presence of these chemicals is attributed to the common use of chlorinated pesticides "several decades ago . . . to control mosquitoes through both widespread aerial and local application." It concludes that "regional background concentrations of these chemicals [DDT and its metabolites DDD and DDE, and dioxin] may pose potentially significant risks even without any contribution from specific source areas"[23] The ROD recommends identification of "Fort Wainwright-specific background levels of DDT and its metabolites DDD and DDE to help distinguish source area-related risks from regional background risks."[24] The same recommendation was made with regard to dioxin. Although recommendations are made, there is no clarification of what is actually to be done.

Unfortunately, institutional controls are a major component of all the remedies chosen in OU-5.

Conclusions:

Not surprisingly, the Five Year Review, released in September 2001, found that all remediation methods at the five operable units on Fort Wainwright were protective of human health and the environment. In it, the additional contamination discovered at Birch Hill in OU3 is considered a minimal issue even though contamination levels in some source areas were as much as 5,000 times greater than the record of decision indicated.

As stated earlier, the Army should conduct a new CERCLA Remedial Investigation for OU3 given the extent and volume of contamination at the Birch Hill site, and the lack of remedy at the Milepost site. The Army acknowledges the difficulty of estimating actual levels given that the bedrock is of a complex fractured type. The potential for contamination to the drinking water supply for the city of Fairbanks and the base itself, and the potential for seepage into the Chena River, ought to trigger a review that includes a new risk assessment.

Aggregate contamination to the aquifer from operational units 1-3 from petroleum-based products and the

known health consequences from these chemicals is a primary concern. Eight years after cleanup has begun, the Army continues to provide water to two local churches. Although contamination levels in their wells have declined somewhat, it continues to spike rather than show a continued decrease.

Although institutional controls are used far too often, where remediation is the chosen alternative, the Army has used active systems for cleanup, rather than natural attenuation, as many of the other military Superfund sites have done. They are to be commended for doing so.

Fort Wainwright personnel did not adequately address environmental justice in the CERCLA process, as noted earlier by the authors and by inference to a report from the Tanana Chiefs Conference. Should a new CERCLA review for OU3 be undertaken, it would provide the Army the opportunity to fulfill its environmental justice mandates by including local tribes from the onset, on a government-to-government basis.

Finally, the authors suggest the Army be as open as the Navy with the Adak Superfund site in making documents easily accessible to the general public via the Internet. (See www.adakupdate.com.) Although some RAB notes are available (www.usarak.army.mil/DPW/Environmental), they are sporadically posted, and do not provide the detail as do other investigative and decision documents.

A glossary of terms and laws, commonly found contaminants, and a comprehensive discussion of environmental justice issues can be found in the accompanying document, *Overview of Key Issues at Alaska Military Superfund Sites.*

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Limited information is available online at:
http://www.state.ak.us/dec/dspar/csites/dod/rabs.htm

Sites where Fort Wainwright Superfund documents are located:

Directorate of Public Works (Administrative Records)
Building 3023
Fort Wainwright, Alaska 99703
(907) 353-9886

Noel Wien Library (Selected Documents)
1215 Cowles Street
Fairbanks, Alaska 99701
(907) 459-1020

Footnotes:

[1] *Revised Areawide Community Relations Plan Fort Wainwright, Fairbanks, Alaska, October 1997*, U.S. EPA, Region 10.

[2] Ibid

[3] Community relations plan, op cit.

[4] Fort Wainwright No Further Action Site Summaries, Final, August, 1995

[5] Ibid

[6] Ibid

[7] Community relations plan, op cit

[8] Fort Wainwright ROD OU-2

[9] OU-3 ROD

[10] *Ft. Wainwright OU3 Explanation of Significant Differences*, September 2002

[11] U.S. EPA Record of Decision, Operable Unit 4, Fort Wainwright, Fairbanks, Alaska, 1996

[12] Ibid

[13] Ibid

[14] *Revised Areawide Community Relations Plan Fort Wainwright,* Fairbanks, *Alaska, October 1997*, U.S. EPA, Region 10.

[15] Fort Wainwright Community Relations Plan 1997

[16] Fort Wainwright Five-Year Review, September 2001

[17] OU-5 ROD

[18] Ibid

[19] Ibid

[20] Ibid

[21] Ibid

[22] Ibid

[23] Ibid

[24] Ibid

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