

**RECORD OF DECISION
SITES 1 AND 11
OPERABLE UNIT 8 (OU 8)**

**NAVAL WEAPONS STATION EARLE
Colts Neck, New Jersey**



Engineering Field Activity Northeast
Naval Facilities Engineering Command
Contract No. N62467-94-D-0888
Contract Task Order 843

September 2004



TETRA TECHNUS, INC.

**RECORD OF DECISION
NAVAL WEAPONS STATION EARLE
OPERABLE UNIT 8**

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**RECORD OF DECISION
NAVAL WEAPONS STATION EARLE
OPERABLE UNIT 8 (SITE 1 and SITE 11)**

PART I - DECLARATION

I. SITE NAME AND LOCATION

Naval Weapons Station Earle
Colts Neck, Monmouth County, New Jersey
ID Number: NJ0170022172

II. STATEMENT OF BASIS AND PURPOSE

This Record of Decision (ROD) presents the remedial action alternative selected for Site 1 at Operable Unit 8 (OU 8) to address groundwater contaminated with metals (including arsenic) at the Naval Weapons Station (NWS) Earle Site, located in Colts Neck, New Jersey. OU 8 consists of Site 1 (Ordnance Demilitarization Site), and Site 11 (Contract Ordnance Disposal Area). No further action is necessary for Site 11 for protection of human health and the environment.

This remedial action decision is in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 as amended (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision document explains the factual and legal basis for selecting the remedial action and is based on the Administrative Record for OU 8. Remedial Investigation/Feasibility Studies (RI/FS) reports and other information used in the remedy selection process are part of the Administrative Record file for OU 8, which is available at the Monmouth County Library, Eastern Branch, Route 35, Shrewsbury, New Jersey.

The New Jersey Department of Environmental Protection (NJDEP) has commented on the selected remedy and concurs, and their comments have been incorporated into this ROD. A review of the public response to the Proposed Plan is included in the Responsiveness Summary (Part III) of this decision document.

III. ASSESSMENT OF THE SITE

Pursuant to duly delegated authority, I hereby determine, pursuant to Section 106 of CERCLA, 42 U.S.C. § 9606, that actual or threatened releases of hazardous substances from Site 1, OU 8, as discussed in Section VI (Summary of Site Risks) of this ROD, if not addressed by implementing the remedial action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

IV. DESCRIPTION OF THE SELECTED REMEDY

The Department of the Navy (Navy) and the United States Environmental Protection Agency (USEPA), in consultation with NJDEP, have selected the following remedy for OU 8, Site 1. The remedy addresses groundwater contamination, including arsenic, by instituting land use controls (LUCs). An NJDEP groundwater Classification Exception Area (CEA) will be implemented to prohibit human exposure to groundwater. The NJDEP CEA program was developed to preclude use of contaminated groundwater at waste sites in New Jersey. The CEA program provides mechanisms to prohibit groundwater use for a limited period of time and to monitor for reduction in contaminant concentrations resulting from natural processes until unrestricted use resumes. In addition to the prohibition of the use of groundwater beneath Site 1, as required by NJDEP, the selected remedy includes a stipulation for the Navy to include a notice to future land owners in the Base Master Plan stating that arsenic has been detected at a concentration above the NJDEP residential direct contact cleanup criteria in subsurface soil at the Site 1 property (even though there is no excessive human health or ecological risk associated with arsenic from Site 1 soils identified in the site-specific risk assessment). The selected remedy for Site 1 consists of the following major components:

- LUCs will be implemented by the Navy according to Department of Defense (DoD) guidelines as set forth in the DoD document titled "Principles and Procedures for Specifying, Monitoring and Enforcement of Land Use Controls and Other Post-ROD Actions" as agreed between USEPA and the DoD. Access restrictions will be attached to the Station Master Plan to limit future uses of the site to prevent direct contact with contaminated groundwater. The Navy is responsible for maintaining the integrity of any current or future remedial or monitoring system such as monitoring wells. Use of the aquifer beneath the site for purposes other than environmental monitoring and testing without Navy approval will be prohibited, until groundwater is found to meet Federal Maximum Contaminant Levels (MCL's) and New Jersey groundwater standards. Land Use controls will be maintained until the concentrations of hazardous substances in the soil and groundwater are at such levels to allow for unrestricted use and exposure. A Classification Exception Area pursuant to N.J.A.C. 7:9-6 will be established to provide the state official notice that the constituent standards will not be met for a

specified duration anticipated not to exceed 10 years (The State of New Jersey uses this wording to imply that open-ended exemptions to GWQS will not be approved.) and to ensure that use of groundwater in the affected area is prohibited.

- Long-term periodic groundwater monitoring will be conducted to assess contaminant status and potential threats to human health and the environment. Since contaminant levels will remain above human-health based standards, site conditions and risks will be reviewed every 5 years.
- A notification will be added to the Base Master Plan stating that arsenic has been detected at a concentration above the NJDEP residential direct contact cleanup criteria in subsurface soil at the Site 1 property.

The remedial action objective (RAO) for restoration of groundwater at Site 1 will not be immediately achieved. Groundwater use restrictions will prevent potential human exposure to metals in groundwater until groundwater restoration is achieved. Implementation of the CEA according to New Jersey regulatory guidelines and long-term periodic monitoring will determine when the RAO for groundwater at Site 1 is achieved.

No CERCLA action is necessary for Site 11. No future monitoring is necessary to ensure protection of human health and the environment.

V. STATUTORY DETERMINATION

The selected remedy for Site 1 is protective of human health and the environment and is cost effective. The Navy and USEPA believe that the selected remedy will comply with all federal and state requirements. A temporary exemption (CEA) from these requirements will be obtained until the GWQS and MCL's are achieved. Other ARARs, such as the Endangered Species Act of 1973 (16 USC 1531 et seq.); and New Jersey Freshwater Wetlands Protection Act Rules (N.J.A.C. 7:7A) may be applicable and have been considered in the preparation of this ROD.

The selected remedy utilizes a permanent solution to the maximum extent practicable.

Because this remedy will result in hazardous substances remaining in Site 1 groundwater at concentrations above health-based levels, a review by the Navy, USEPA, and NJDEP will be conducted within 5 years after initiation of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

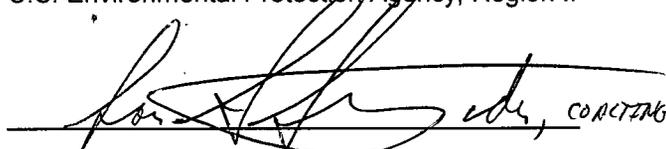
No remedial action is necessary to ensure protection of human health and the environment at Site 11.

AUTHORIZING SIGNATURES:



George Pavlou
Director, Emergency Remedial and Response Division
U.S. Environmental Protection Agency, Region II

January 19, 2005
Date



W. J. Robertson
Captain, U.S. Navy
Commanding Officer
Naval Weapons Station Earle

30 SEP 04
Date

**RECORD OF DECISION
NAVAL WEAPONS STATION EARLE
OPERABLE UNIT 8
SITE 1 AND SITE 11**

PART II - DECISION SUMMARY

I. SITE NAME, LOCATION, AND DESCRIPTION

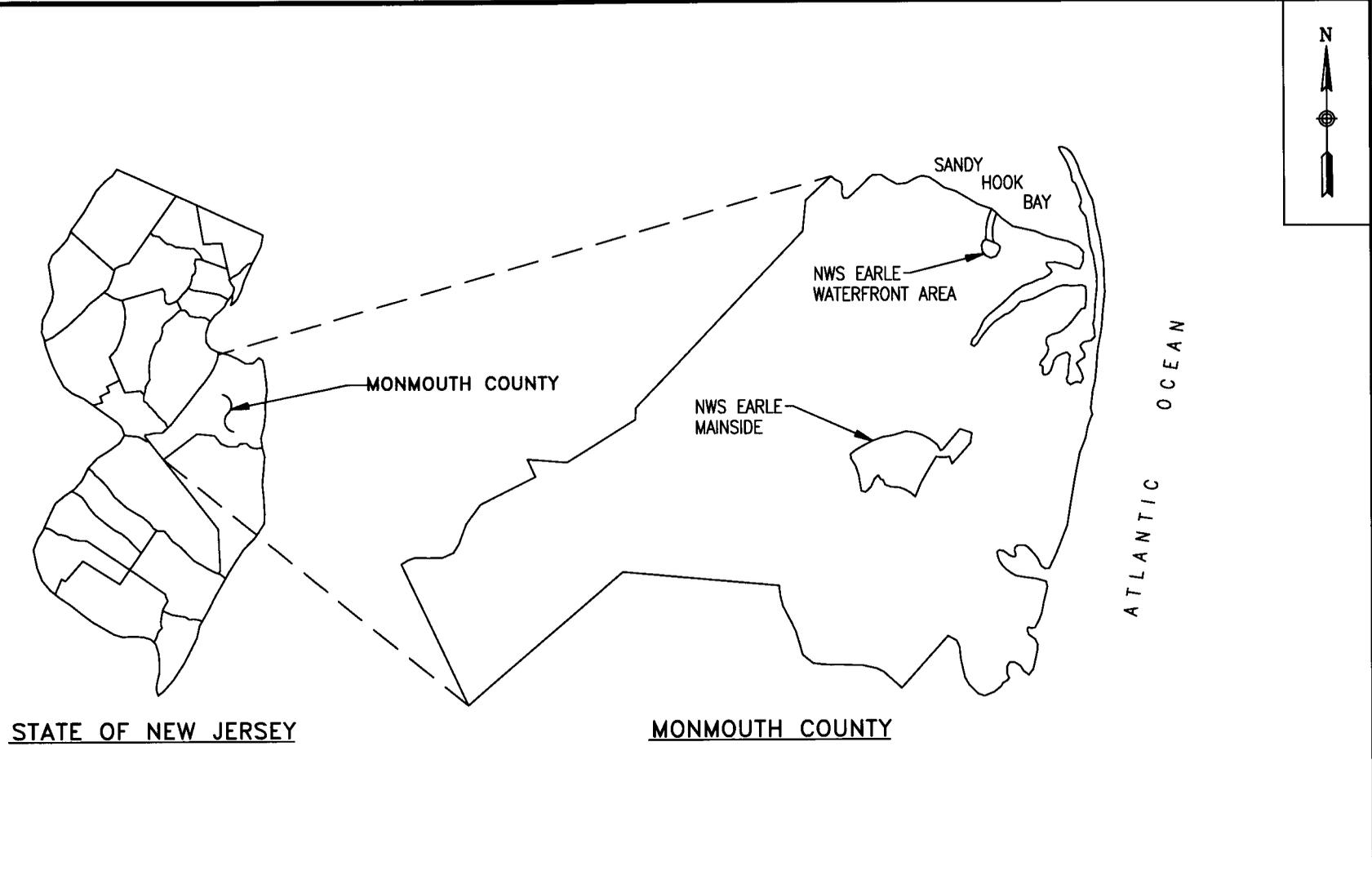
A. General

NWS Earle is located in Monmouth County, New Jersey, approximately 47 miles south of New York City. The station consists of two areas, the 10,248-acre Main Base (Mainside area), located inland, and the 706-acre Waterfront area (Figure 1). The two areas are connected by a Navy-controlled right-of-way. The facility was commissioned in 1943, and its primary mission is to supply ammunition to the naval fleet. An estimated 2,500 people either work or live at the NWS Earle station.

The Mainside area is located approximately 10 miles inland from the Atlantic Ocean in Colts Neck, Howell and Wall Townships, and Tinton Falls Borough. The combined population of these municipalities is approximately 100,000 people. The surrounding area includes agricultural land, vacant land, and low-density housing. The Mainside area consists of a large, undeveloped portion associated with ordnance operations, production, and storage; this portion is encumbered by explosive safety quantity distance arcs. Other land use in the Mainside area consists of residences, offices, workshops, warehouses, recreational space, open space, and undeveloped land. The Waterfront area is located adjacent to Sandy Hook Bay in Middletown Township, which has a population of approximately 68,200 people. The Mainside and Waterfront areas are connected by a narrow strip of land that serves as a government-controlled right-of-way containing a road and railroad.

Operable Unit 8 (OU 8) consists of Site 1 (an open field that was used for burning ordnance material) and Site 11 (an open area that was used for burning/detonation of obsolete ordnance material and subsequently for occasional firefighting training exercises), located in the Mainside area (Figure 2). A brief description of each site follows.

11-2



STATE OF NEW JERSEY

MONMOUTH COUNTY

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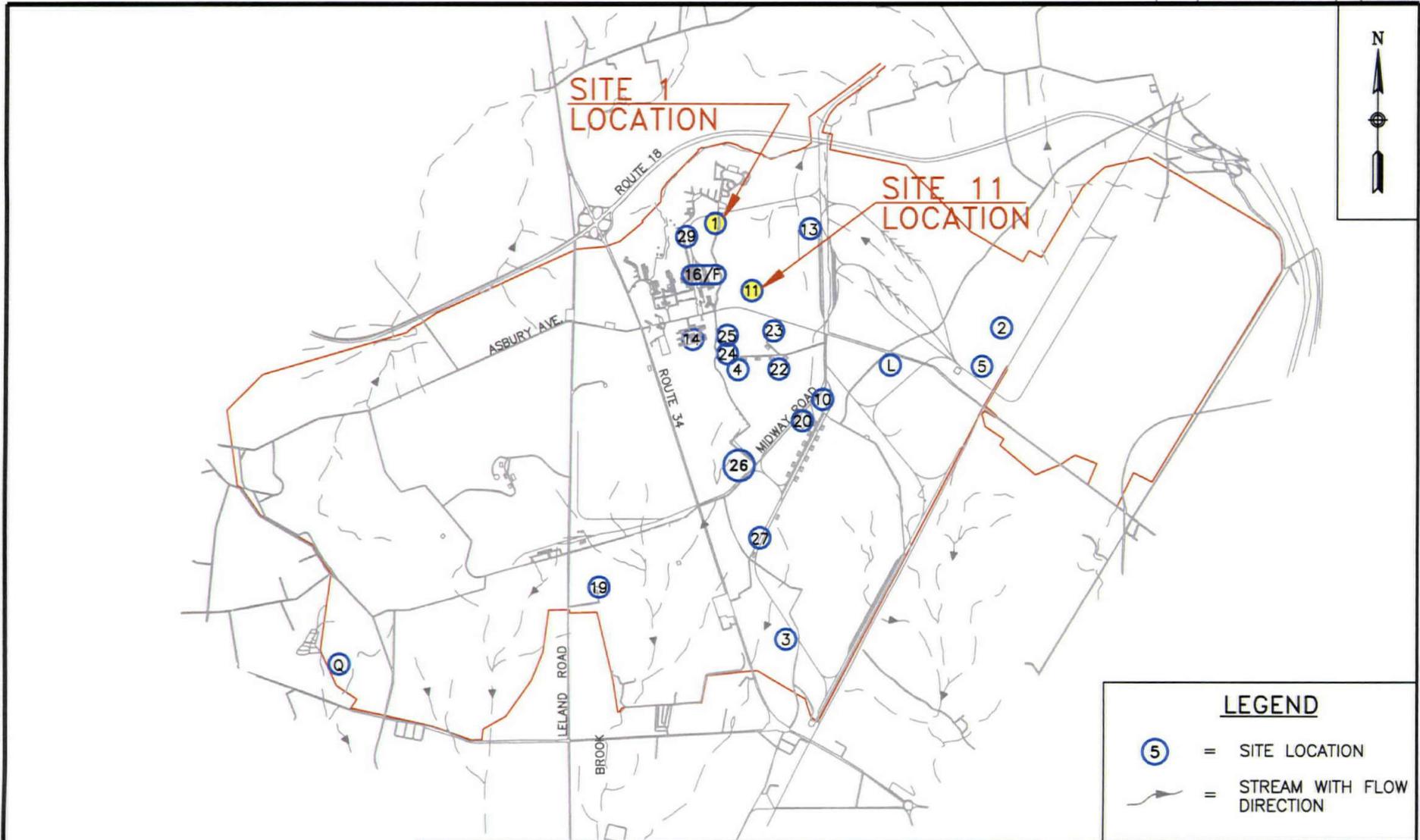


REGIONAL SITE MAP
NAVAL WEAPONS STATION EARLE
 COLTS NECK, NEW JERSEY

CONTRACT # - CTO # 2128 - 1220		
FILE NUMBER:	MKB	PHL
2128CM01		
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FIGURE 1		

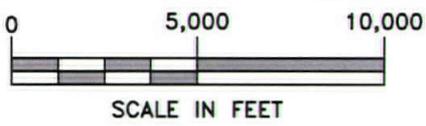
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11-3



LEGEND

- 5 = SITE LOCATION
- = STREAM WITH FLOW DIRECTION



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OU-8 LOCATION
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY

CONTRACT # - CTO #	
2128 - 1220	
FILE NUMBER:	
2128CP01 MKB PHL	
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FIGURE 2	

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B. OU 8 Sites

Site 1 - Ordnance Demilitarization Site

Site 1 is a 6-acre open field that was used for burning ordnance material between 1943 and 1975. During site abandonment, the area was plowed, and a layer of diesel-soaked hay was burned on site to remove any residual from the burning/detonation of ordnance. This procedure was carried out three times. For several years during the early 1990s, a United States Army communications station and tower were located near the center of the site. The site is currently cleared of all structures.

Site 11 - Contract Ordnance Disposal Area

Site 11 is a 2-acre site that was used for burning/detonation of obsolete ordnance material for several years (dates unknown). Obsolete ordnance could include munitions with an expired shelf life or unknown munitions such as explosives recovered from a public place or munitions captured abroad and transported to the U.S. for study and eventual disposal. Typically, disposal of ordnance or munitions consists of detonation or burning the unwanted material above ground or in a trench. No explosives remain after the disposal process. The site was occasionally used from 1974 to 1977 for firefighting training exercises. Training activities took place in two unlined pits, approximately 20 feet long. During firefighting training, reject vehicles were soaked with fuel or oil and ignited and then extinguished. Unburned fuel and waste oil used for ignition were allowed to evaporate or soak into the soil. It has been estimated that 50 gallons of oil per year may have been lost in this manner. Site activities were discontinued approximately 30 years ago. Currently, there is scant evidence remaining that fuel/oil was ever deposited in this way.

II. SITE HISTORY AND ENFORCEMENT ACTIVITY

Potential hazardous substance releases at NWS Earle were addressed in an Initial Assessment Study (IAS) in 1982, a Site Inspection Study (SI) in 1986, and a Phase I Remedial Investigation (RI) in 1993. These were preliminary investigations to determine the number of sources, compile histories of waste-handling and disposal practices at the sites, and acquire data on the types of contaminants present and potential human health and/or environmental receptors.

In 1990, NWS Earle was placed on the National Priorities List (NPL), which is a list of sites where uncontrolled hazardous substance releases may potentially present serious threats to human health and the environment. The sites at NWS Earle were then addressed by Phase II RI activities to determine the nature and extent of contamination at these sites. The Phase II RI was initiated in 1995 and completed in July 1996.

The Phase II activities at OU-8 included the installation and sampling of groundwater monitoring wells, and sampling of surface soil and subsurface soil.

Results from the final RI report, including human health and ecological risk assessment, were used as the basis for performing a feasibility study (FS) of potential remedial alternatives. Based on the alternatives development from the FS, the Navy and USEPA, in consultation with NJDEP, prepared the Proposed Remedial Action Plan (Proposed Plan). The Proposed Plan is the basis for the selected remedial alternatives presented in this ROD. The RI, FS, Proposed Plan, and community input are discussed in this ROD.

III. HIGHLIGHTS OF COMMUNITY PARTICIPATION

The documents that the Navy and USEPA used to develop, evaluate, and select a remedial alternative for OU 8 have been maintained in the official Administrative Record repository at the Monmouth County Library (Eastern Branch), Route 35, Shrewsbury, New Jersey.

The Feasibility Study Report, Proposed Plan, and other documents related to OU 8 were released to the public in November 21, 2003. The notice of availability of these documents was published in the Asbury Park Press on November 26, 27, and 28, 2003. A public comment period was held from November 21, 2003 to December 22, 2003.

A public meeting was held during the public comment period on December 10, 2003. At this meeting, representatives from the Navy, EPA and NJDEP were available to answer questions about OU 8 and the remedial alternatives under consideration. The results of the public comment period are presented in the Responsiveness Summary, which is included in Part III of this ROD.

IV. SCOPE AND ROLE OF RESPONSE ACTION FOR OPERABLE UNIT 8

The Department of the Navy completed an RI, FS, and Proposed Plan for OU 8, addressing contamination associated with Site 1 and Site 11 at NWS Earle. These studies showed that groundwater at Site 1 (Ordnance Demilitarization Site) has metals contamination. The selected remedial action to address groundwater contamination at Site 1 is described in this document. Site 11 does not require a remedial action.

V. SUMMARY OF SITE CHARACTERISTICS

A. General

NWS Earle is located in the coastal lowlands of Monmouth County, New Jersey, within the Atlantic Coastal Plain Physiographic Province. The Mainside area, which includes OU 8, lies in the outer Coastal Plain, approximately 10 miles inland from the Atlantic Ocean. The Mainside area is relatively flat, with elevations ranging from approximately 100 to 300 feet above mean sea level (MSL). The most significant topographic relief within the Mainside area is Hominy Hills, a northeast-southwest-trending group of low hills located near the center of the Station. The New Jersey Coastal Plain is a seaward-dipping wedge of unconsolidated Cretaceous to Quaternary sediments that were deposited on a pre-Cretaceous basement-bedrock complex. The Coastal Plain sediments are primarily composed of clay, silt, sand, and gravel and were deposited in continental, coastal, and marine environments. The sediments generally strike northeast-southwest and dip to the southeast at a rate of 10 to 60 feet per mile. The approximate thickness of these sediments beneath NWS Earle is 900 feet. The pre-Cretaceous complex consists mainly of PreCambrian and lower Paleozoic crystalline rocks and metamorphic schists and gneisses. The Cretaceous to Miocene Coastal Plain Formations are either exposed at the surface or subcrop in a banded pattern that roughly parallels the shoreline. The outcrop pattern is caused by the erosion truncation of the dipping sedimentary wedge. Where these formations are not exposed, they are covered by essentially flat-lying post-Miocene surficial deposits.

The rivers and streams draining NWS Earle ultimately discharge to the Atlantic Ocean, which are approximately 9 or 10 miles east of the Mainside area. The headwaters and drainage basins of three major Coastal Plain rivers (Swimming, Manasquan, and Shark) originate on the Mainside area. The northern half of the Mainside is in the drainage basin of the Swimming River, and tributaries include Mine Brook, Hockhockson Brook, and Pine Brook. The southwestern portion of the Mainside drains to the Manasquan River via either Marsh Bog Brook or Mingamahone Brook. The southeastern corner of the Mainside drains to the Shark River. Both the Swimming River and the Shark River supply water to reservoirs used for public water supplies.

Groundwater classification areas were established in New Jersey under NJDEP Water Technical Programs Groundwater Quality Standards in New Jersey Administrative Code N.J.A.C. 7:9-6. The Mainside area is located in the Class II-A: Groundwater Supporting Potable Water Supply area. Class II-A includes those areas where groundwater is an existing source of potable water with conventional water supply treatment or is a potential source of potable water. In this part of New Jersey, in general, the deeper aquifers are used for public water supplies and the shallower aquifers may be used for private home owner well domestic supplies.

The OU 8 sites are situated in the recharge area of the Vincentown aquifer system. The Vincentown aquifer system is developed in the sands and calcarenites of the Vincentown Formation within its outcrop area and extends for approximately 8 to 10 miles downdip. The Vincentown aquifer was reported in previous investigations as being used extensively for residential wells in the Mainside area. This aquifer is underlain by confining beds of the Hornerstown and Tinton Sands.

All facilities located in the Mainside Administration area are connected to a public water supply (New Jersey American Water Company). Water for the public supply network comes from surface water intakes, reservoirs, and deep wells. No public water supply wells or surface water intakes are located on the NWS Earle facility. A combination of private wells and public water supply from the New Jersey American Water Company serves businesses and residences in areas surrounding the Mainside facilities. There are water supply wells on the weapons station, but none are down gradient of Site 1. The nearest private or public well down gradient off-Base is more than a mile away. Site 11 is about one mile from the Base boundary to the north. Site 1 is about half of a mile from the Base boundary, but there are no known wells within 1 mile downgradient. Figures 3-6 and 3-7 (provided by Monmouth County Health Department) of the Phase II RI report show the locations of known wells. Based on existing groundwater conditions, no public or private wells are currently threatened by metals in groundwater at Site 1.

There is a rich diversity of ecological systems and habitats at NWS Earle. Knieskern's beaked-rush (*Rynchospora knieskernii*), a sedge species on the federal endangered list, has been seen on the station, and some species on the New Jersey endangered list, such as the swamp pink (*Helonias bullata*), may be present. An osprey has visited Mainside and may nest in another area at NWS Earle. The Mingamahone Brook supports bog turtles downstream of the Mainside area and provides an appropriate habitat for them at the Mainside area.

B. Surface Water Hydrology

Site 1 is bordered by Macassar Road to the east, a railroad spur to the north, and an 8- to 10-foot-high berm to the west and south. No drainage swales or streams are located on the site.

Site 11 is a fan-shaped open area surrounded by woods and wetlands on all sides. An undeveloped dirt road off the transmission line right-of-way accesses the site. The topography of the site slopes gradually downwards to the northwest by approximately 10 feet in elevation over a horizontal distance of 400 feet. Most of the site is characterized as wetlands. An endangered plant, Knieskern's beaked-rush, has been observed on this site.

C. Geology

Regional mapping indicates that Site 1 is within the outcrop area of the Vincentown Formation. The Vincentown Formation ranges between 10 and 130 feet in thickness and the soil borings are no more than 16 feet deep. The lithology of the sediments encountered in the on-site borings generally agrees with the published description of the Vincentown Formation. In general, the borings encountered alternating beds of yellowish-brown, micaceous, silty, fine- to medium-grained sand and light olive brown, glauconitic, silty sand and sand. Trace amounts of clay and gravel are present in the upper two feet of some of the borings and possibly represent the plow zone.

Regional mapping indicates that Site 11 is also within the outcrop area of the Vincentown Formation. The upper colluvium has a maximum thickness of 10 feet, the Vincentown Formation ranges between 10 and 130 feet in thickness, and the soil borings are no more than 25 feet deep. The lithology of the sediments encountered in the on-site borings generally agrees with the published description of the upper colluvium and the Vincentown Formation. In general, the borings encountered gray and black silt and white sand (possibly representative of the upper colluvium), and brownish-yellow, olive, glauconitic, fine- to medium-grained sand (probably representative of the Vincentown Formation).

D. Hydrogeology

Groundwater in the Vincentown aquifer beneath Site 1 occurs under unconfined conditions. The direction of shallow groundwater flow in the aquifer is toward the east-northeast. There does not appear to be a significant seasonal variation in groundwater flow direction. The hydraulic conductivities calculated at two monitoring well locations are $6.06E-4$ cm/sec (1.71 ft/day) and $1.29E-3$ cm/sec (3.66 ft/day).

Groundwater in the upper colluvium and Vincentown aquifer beneath Site 11 occurs under unconfined conditions and the geologic units are interpreted to be hydraulically interconnected. The direction of shallow groundwater flow in the aquifer is toward the northeast. There does not appear to be a significant seasonal variation in groundwater flow direction. The hydraulic conductivities calculated for a monitoring well screened in the Vincentown Formation, and another monitoring well screened in the upper colluvium and Vincentown Formation are $3.56E-4$ cm/sec (1.01 ft/day) and $8.64E-4$ cm/sec (2.45 ft/day), respectively.

E. Nature and Extent of Contamination

1. Background Media Samples

In order to determine the background level of chemicals present in and around NWS Earle, the Navy collected samples from media at locations on the Station that were selected on the expectation that past or present operations have not impacted the media at these locations. The field team collected samples of surface soil, subsurface soil, sediment, surface water, and groundwater from areas throughout the station. A total of four background samples were collected for each of the five media, except at two locations where surface water and sediment media were not present. The samples were collected in areas hydraulically upgradient and, where possible, upwind of station areas where industrial operations or other potential sources of contaminant accumulation in site media may have occurred.

In order to compare site-related metals concentrations found in groundwater during RI sampling to facility-wide naturally occurring (background) groundwater concentrations, it was necessary to choose additional facility monitoring wells deemed to have been installed in "background" locations upgradient of RI sites. The Navy proposed a list of existing monitoring wells to be used. After EPA and NJDEP comment and revision, a list of additional monitoring wells to be used for background statistical comparisons was agreed to. The RI report and the FS for OU 8 show the chosen background and upgradient wells grouped by interpreted aquifer. Formations were grouped according to similarity and intimate association of certain geologic units found across NWS Earle. The results of the background sampling were used for comparison with analytical results obtained from the sampling activities at the RI sites.

2. AS and SI Results

The IAS in 1983, consisting of a document search and employee interviews but no site media sampling or analysis, concluded minimal potential impact from Site 1 activities on the surrounding environment and human receptors based on the finding that the explosives burned were composed mostly of smokeless powder which is essentially nitrocellulose. It was reasoned that unburned residue or combustion products from nitrocellulose are relatively insoluble and thus pose limited hazard through percolation to the groundwater. Based on the nature of the propellants burned at Site 1, and the conclusion that they would not pose a potential threat to public health or the environment, Site 1 was not recommended for a confirmation study (actual site environmental media sampling) at that time. The Navy did not agree with the IAS recommendations. Subsequent remedial investigations were planned in cooperation with the EPA and NJDEP and carried out by the Navy.

At Site 11, the IAS in 1983 consisting of a document search, interviews, and on-site observations concluded minimal impact on the surrounding environment and human receptors. Site 11 was not recommended for a

confirmation study of actual site environmental media sampling because of the small quantity of waste materials believed to be available for migration. The Navy did not agree with the IAS recommendations. Subsequent remedial investigations were planned in cooperation with the EPA and NJDEP and carried out by the Navy.

3. Phase I Site Investigation and RI/FS Results

SI and RI/FS activities (Phase I RI activities) were conducted by the Navy and Roy F. Weston, Inc. (Weston) in 1993 at NWS Earle. Weston reported their findings in two documents, SI and RI/FS. Site 1 was reported in the SI and Site 11 was reported in the RI/FS. Field investigations were performed during the SI and RI/FS at Site 11 but were only reported in the RI/FS.

Site 1:

At Site 1, sixteen surface soil (0 to 1.5 feet) were obtained. Eight of those samples were collected from the 0 to 0.5 feet (surface soil) interval. Four of the surface soil samples were analyzed in the laboratory for TAL metals. Arsenic was detected at concentrations ranging from 2.1 mg/kg to a maximum of 4.0 mg/kg in soil samples (surface and subsurface soil samples) analyzed for TAL metals at Site 1 in the Phase I RI. Other significant compounds detected in the entire soil sample set were cadmium (up to 2.2 ppm), chromium (up to 65.7 ppm), mercury (up to 0.96 ppm), and lead (up to 179 ppm). Nitrite (0.32 ppm) was detected in one sample. Nitrate (up to 2.6 ppm) was detected in soil samples. Explosive-constituent compounds were found at very low levels in one surface soil sample. TPH concentrations ranged from non-detectable to 450 ppm.

Three monitoring wells were installed and groundwater samples were collected and submitted for Target Compound List (TCL) volatile organic compounds (VOC), TCL semi-volatile organic compounds (SVOC), and explosive-constituent compound analysis. Elevated levels of the following TCL VOCs were found in MW1-01: acetone (up to 7 ppb) and 1,1-dichloroethylene (up to 80 ppb). Elevated levels of the TAL inorganics such as chromium (up to 538 ppb), lead (up to 12.5 ppb), and iron (up to 76,000 ppb) were detected generally in all three monitoring wells. Explosive-constituent compounds RDX (up to 8.98 ppb), 2,4-DNT (up to 0.82 ppb), and nitrite - nitrate combined (up to 1.4 ppm) were detected in two wells.

Site 11:

At Site 11, four soil borings were drilled and three monitoring wells were installed and sampled at the site perimeter during the SI. Eight total soil samples (from 0.5 to 1.5 feet) were collected from the site during the 1993 RI/FS. Soil and groundwater samples were analyzed for explosive-constituent compounds, TPH, and nitrite/nitrate. Analytical results indicated that no explosive-constituent compounds were present in soil or groundwater. Two soil samples obtained from the center of the site had TPH concentrations of 640 mg/kg

and 290 mg/kg but the remaining 6 samples showed low or non detectable levels of TPH. Two monitoring wells were installed during the RI/FS. All SI and RI/FS monitoring wells were sampled and analyzed for TCL volatiles, SVOCs, TAL metals/CN, pesticides/PCBs, and explosive-constituents. One semivolatile, bis(2-ethylhexyl)phthalate was found at estimated concentrations below the method detection limit ranging from 1J ug/L to 3J ug/L (J indicates an estimated laboratory result) in the groundwater. Three volatiles (common laboratory artifacts), acetone (up to 87,000 ug/L), chloroform (up to 6 ug/L in the upgradient well) and methylene chloride (up to 58 ug/L) were detected in well samples. Two of the volatile compounds, acetone and methylene chloride were also detected in quality control blank samples. Metals including lead (up to 77 ug/L) and chromium (up to 1,580 ug/L) were detected in site wells. The RI/FS groundwater results indicated that no pesticides, PCBs, or explosive-constituents were detected at the site. These RI/FS groundwater samples were collected after the SI field activities in 1993.

4. Phase II Remedial Investigation

Summary of Phase II RI Activities at Site 1:

At Site 1, the Navy conducted Phase II RI activities in 1995; the final report included a human health risk assessment and an ecological risk assessment that were performed for 27 sites at NWS Earle, including the sites in OU 8. Based on comparable findings from the 1983 IAS and the 1993 Phase I activities, surface soil was not sampled during the Phase II RI. Activities performed during this investigation of Site 1 are summarized below.

- Sampling and analysis of groundwater samples from eight hydropunch locations.
- Sampling and analysis of subsurface soil samples from 10 soil borings.
- Drilling and installation of two shallow permanent monitoring wells (depths ranged 14 to 15 feet deep).
- Sampling and analysis of groundwater from the wells.
- Measurement of static-water levels in the monitoring wells.
- Execution of slug tests (a field test that estimates the hydraulic properties of aquifers) in two of the monitoring wells.

The horizontal locations and vertical elevations of the hydropunch sample locations, soil borings, newly installed monitoring wells, and selected existing wells, were established by survey.

Summary of Phase II RI Activities at Site 11:

Between July and October 1995, the Navy conducted the following field investigation activities at Site 11:

- Sampling and analysis of groundwater from the five existing monitoring wells.
- Measurement of static-water levels in the monitoring wells.

Due to the presence of the threatened plant species (beaked-rush) on the site, disturbance of surface soils is not desirable. Surface soil/subsurface soil samples taken during previous investigations (from 6 to 18 inches) provided sufficient information on the nature and extent of soil contamination at the site to determine no soil remediation would be appropriate with the presence of the threatened plant. No runoff of contaminants from the site is expected to occur, nor any groundwater to surface water discharge. The nature and extent of contamination in Site 11 surface soils could have been further defined, but subsequent data would be of little practical use. Hence, no additional soil samples were considered needed in the Phase II RI at Site 11.

Summary of Phase II RI Results for Site 1:

Samples locations for Site 1 are shown on Figure 3. Tables 1 through 3 compare the results of samples collected from Site 1 to background samples. Figure 4 shows sample locations and concentrations of chemicals in the site

media that exceed applicable or relevant and appropriate requirements (ARARs) and other guidance to be considered (TBCs) that were used as screening levels.

Subsurface Soil Results Summary

Twenty site-related subsurface soil samples were collected at Site 1. Table 1 presents the occurrence and distribution of inorganic chemicals detected in site-related subsurface soil samples and compares them to background concentrations.

Concentrations of most metals in site-related subsurface soil samples were similar to the ranges associated with background samples. Certain metals were detected at concentrations slightly greater than the range associated with background samples: antimony, 5.1 mg/kg in sample 01 SB 10-02; arsenic, 27.8 mg/kg in sample 01 SB 03-00; and silver, 2.2 mg/kg in 01 SB 07-00.

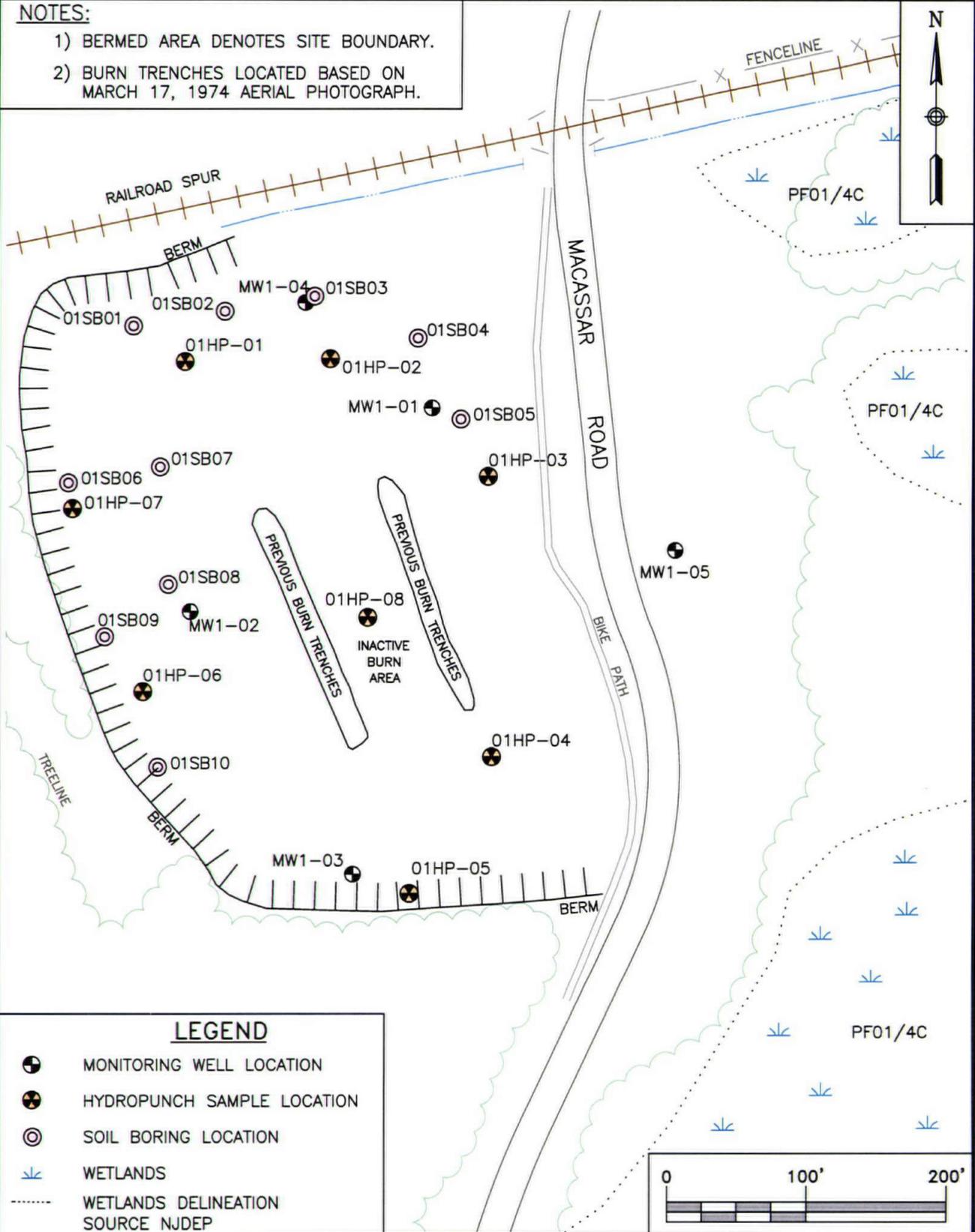
Explosive-constituent compounds were analyzed in 20 subsurface soil samples. Nitrocellulose was detected at a depth of two feet in sample location 01 SB 02-02 at a concentration of 77,000 ug/kg. This compound was detected in one background subsurface soil sample. No other explosive compounds were detected at Site 11. Table 1A presents the occurrence and distribution of explosive chemicals detected in site-related subsurface soil samples.

The miscellaneous parameters analyzed at Site 1 consisted of nitrate, nitrite, and TPH. TPH levels found in the background samples ranged from 9.0 mg/kg to 660 mg/kg, which is three times greater than the upper range reported for site-related samples (120 mg/kg to 240 mg/kg). In addition, nitrate levels were less than 0.7 mg/kg in all samples, which is within the range found in background samples and less than one-third of

2128/1220/2128CP03.DWG 05/19/04 MKB

NOTES:

- 1) BERMED AREA DENOTES SITE BOUNDARY.
- 2) BURN TRENCHES LOCATED BASED ON MARCH 17, 1974 AERIAL PHOTOGRAPH.



LEGEND

- ⊕ MONITORING WELL LOCATION
- ⊗ HYDROPUNCH SAMPLE LOCATION
- ⊙ SOIL BORING LOCATION
- ↘ WETLANDS
- WETLANDS DELINEATION SOURCE NJDEP



TETRA TECH NUS, INC.

**SAMPLE LOCATIONS
SITE 1 - ORDNANCE DEMILITARIZATION SITE
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY**

SCALE AS NOTED	
FILE:	2128CP03
LDL	PHL
REV	DATE
	05/19/04
FIGURE NUMBER	
FIGURE 3	

TABLE 1
SITE 1 - OCCURRENCE AND DISTRIBUTION OF INORGANICS IN SURFACE SOILS
NWS EARLE, COLTS NECK, NEW JERSEY
(mg/kg)

SUBSTANCE	BACKGROUND			SITE-RELATED				
	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	2 X AVERAGE CONCENTRATION	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	AVERAGE CONCENTRATION	MEAN > 2 X BKGD?	REPRESENTATIVE CONCENTRATION
ALUMINUM	8 / 8	675 - 5310	5370.00	20 / 20	897 - 5180	2556.31	NO	3487.33
ANTIMONY*	NOT DETECTED	-	-	2 / 20	1.3 - 5.1	0.00	YES	3.64
ARSENIC*	8 / 8	1.35 - 14.4	13.29	20 / 20	2 - 27.8	5.81	NO	12.20
BARIUM*	8 / 8	0.92 - 31	17.92	20 / 20	1.8 - 121	3.72	NO	31.13
BERYLLIUM*	2 / 8	0.12 - 0.28	0.28	10 / 20	0.16 - 0.61	0.25	NO	0.26
CADMIUM*	1 / 8	0.57	0.58	5 / 20	0.1 - 0.61	0.35	NO	0.31
CALCIUM	8 / 8	28.6 - 799	577.55	20 / 20	30.1 - 1710	299.60	NO	312.96
CHROMIUM*	8 / 8	4.7 - 59.5	54.73	20 / 20	28.4 - 84.6	71.08	YES	63.02
COBALT	4 / 8	0.75 - 5	2.77	4 / 20	0.19 - 1.1	0.34	NO	0.65
COPPER*	8 / 8	0.97 - 8.6	8.66	16 / 20	0.68 - 57.6	3.26	NO	12.82
IRON	8 / 8	3745 - 62500	40871.25	20 / 20	2590 - 18500	9410.47	NO	13481.13
LEAD*	8 / 8	1.4 - 39.4	24.33	20 / 20	1.3 - 62.85	8.39	NO	18.26
MAGNESIUM	8 / 8	18.5 - 619	504.05	20 / 20	121 - 1130	348.20	NO	609.14
MANGANESE	8 / 8	2.6 - 214	92.51	16 / 20	0.53 - 23.3	4.24	NO	5.58
MERCURY*	8 / 8	0.03 - 0.17	0.13	18 / 20	0.025 - 0.2	0.02	NO	0.06
NICKEL	4 / 8	1.8 - 7.2	4.75	5 / 20	0.54 - 1.9	1.13	NO	1.07
POTASSIUM	7 / 8	95 - 792	793.35	20 / 20	214 - 2930	899.52	YES	1690.40
SELENIUM	2 / 8	0.57 - 0.93	0.79	3 / 20	0.56 - 0.61	0.52	NO	0.36
SILVER*	2 / 8	0.37 - 0.67	0.51	4 / 20	0.14 - 2.2	0.25	NO	0.74
SODIUM	8 / 8	17.5 - 94.8	79.35	10 / 20	11.3 - 115	61.72	NO	96.42
THALLIUM	4 / 8	0.7 - 1.9	1.38	7 / 20	0.7 - 1.2	0.64	NO	0.63
VANADIUM	8 / 8	11.05 - 64	64.71	20 / 20	5 - 50.4	40.86	NO	38.09
ZINC*	6 / 8	1.1 - 50.7	31.35	8 / 20	4.7 - 129	6.49	NO	27.14

Note:

* - Selected as a COPC

TABLE 1A
SITE 1 - OCCURRENCE AND DISTRIBUTION OF EXPLOSIVES IN SUBSURFACE SOIL
NWS EARLE, COLTS NECK, NEW JERSEY

Substance	Site-Related Data				
	Frequency of Detection	Range of Positive Detection		Mean of All Data	Location of Maximum
		Min.	Max.		
Nitrocellulose	1/20	77000	- 77000	12200	01SB02-02

Notes:

Units are ug/kg.

Number of sample results excludes rejected data or blank-qualified data. Duplicates are consolidated into one result.

Mean of all data includes positive detections and non-detected results. Detection limits are divided by two.

Frequency of detection refers to number of times compound was detected among all samples versus total number of samples.

Number of samples may vary based on the number of usable results.

TABLE 2
SITE 1 - OCCURRENCE AND DISTRIBUTION OF INORGANICS IN GROUNDWATER
NWS EARLE, COLTS NECK, NEW JERSEY
(ug/L)

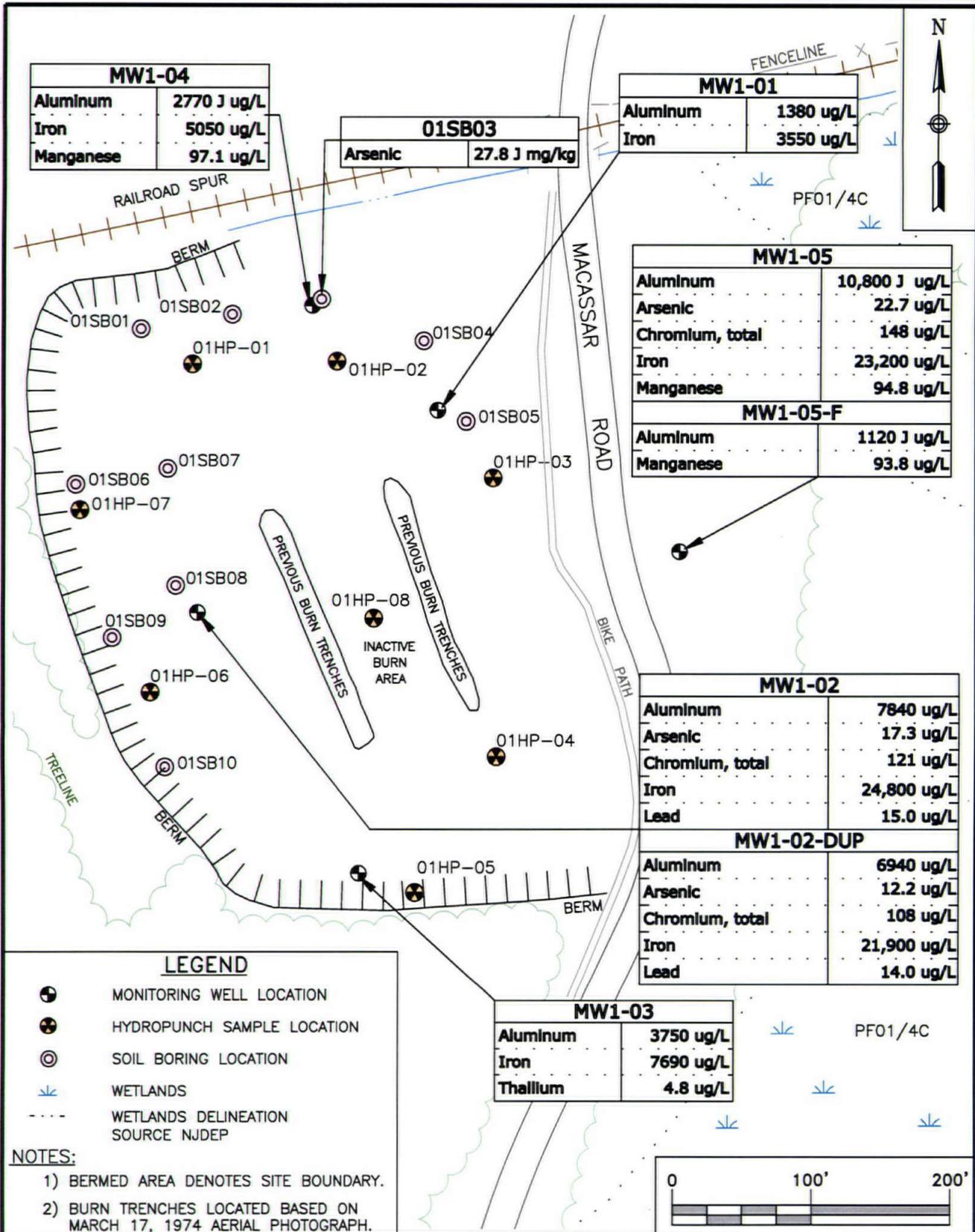
SUBSTANCE	BACKGROUND			SITE-RELATED				
	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	2 X AVERAGE CONCENTRATION	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	AVERAGE CONCENTRATION	MEAN > 2 X BKGD?	REPRESENTATIVE CONCENTRATION
ALUMINUM*	11 / 11	287 - 7870	5097.82	5 / 5	1380 - 10800	5218.00	YES	10800
ARSENIC*	1 / 11	5.8 - 5.8	4.05	3 / 5	5.8 - 22.7	9.31	YES	22.7
BARIUM*	11 / 11	2.6 - 518	229.60	5 / 5	50.1 - 853	489.52	YES	853
BERYLLIUM*	4 / 11	0.21 - 1.6	0.49	4 / 5	0.21 - 0.85	0.375	NO	0.85
CADMIUM*	5 / 11	0.6 - 1.9	1.21	5 / 5	1.5 - 3.3	2.53	YES	3.3
CALCIUM	11 / 11	506 - 17200	8306.55	5 / 5	1210 - 5450	3085	NO	5450
CHROMIUM*	NOT DETECTED	-	-	5 / 5	19.6 - 148	72	YES	148
COBALT	6 / 11	0.7 - 10.1	4.06	5 / 5	0.7 - 3.4	1.95	NO	3.4
COPPER*	9 / 11	0.79 - 13.5	6.53	5 / 5	1.8 - 75.45	25.93	YES	75.45
IRON*	11 / 11	153 - 7690	4197.09	5 / 5	3550 - 23350	12568	YES	23350
LEAD*	3 / 11	2.1 - 3	2.44	4 / 5	4.7 - 14.5	6.59	YES	14.5
MAGNESIUM	11 / 11	273 - 27400	8449.64	5 / 5	1060 - 2690	1859	NO	2690
MANGANESE	11 / 11	3.3 - 65	46.18	5 / 5	24.2 - 97.1	55.16	YES	90.85
MERCURY*	11 / 11	0.005 - 0.12	0.12	5 / 5	0.082 - 0.28	0.1424	YES	0.22
NICKEL*	10 / 11	0.81 - 25.5	11.98	3 / 5	2.3 - 4.6	2.01	NO	4.6
POTASSIUM	11 / 11	350 - 3245	2810.55	5 / 5	2180 - 10700	5056	YES	10700
SILVER*	NOT DETECTED	-	-	1 / 5	1.2	0.616	YES	1.09
SODIUM	11 / 11	1850 - 11650	8449.09	5 / 5	1850 - 29500	10335	YES	29500
THALLIUM*	3 / 11	4 - 5.1	5.15	1 / 5	4.8	2.4	NO	4.42
VANADIUM*	10 / 11	0.69 - 42.25	16.48	5 / 5	8.2 - 58.4	30.39	YES	58.4
ZINC*	9 / 6	3.7 - 348	178.61	5 / 5	131 - 1020	631.4	YES	1020

Note:

* - Selected as a COPC

TABLE 3
SITE 1 - OCCURRENCE AND DISTRIBUTION OF ORGANICS IN GROUNDWATER
NWS EARLE, COLTS NECK, NEW JERSEY
(ug/L)

SUBSTANCE	BACKGROUND			SITE-RELATED		
	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	REPRESENTATIVE CONCENTRATION	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	REPRESENTATIVE CONCENTRATION
CHLOROFORM	NOT DETECTED	-	-	1 / 5	3	3
GAMMA-BHC (LINDANE)	NOT DETECTED	-	-	1 / 5	0.001	0.001
METHYLENE CHLORIDE	NOT DETECTED	-	-	1 / 5	0	1



**CONCENTRATIONS ABOVE SCREENING LEVELS
SITE 1 - ORDNANCE DEMILITARIZATION SITE
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY**

SCALE AS NOTED	
FILE: 2128KP01.dwg	MKB PHL
REV	DATE
	05/19/04
FIGURE NUMBER	
FIGURE 4	

the maximum nitrate level reported in soil sampled during the previous 1992 investigation. Therefore, nitrate and TPH results do not demonstrate subsurface soil impacts related to past ordnance burning activities.

Groundwater Results Summary

Five site-related groundwater samples (01 GW 01 through 01 GW 05) were collected at Site 1. Tables 2 and 3 present the occurrence and distribution of inorganic and organic chemicals, respectively, detected in site-related groundwater samples compared to background.

Three unfiltered monitoring well samples, 01 GW 02, 01 GW 03, and 01 GW 05, exhibited elevated levels of several metals. Unfiltered monitoring well samples 01 GW 02 and 01 GW 05 exhibited the highest concentrations of aluminum, arsenic, cadmium, chromium, iron, lead, and zinc. Thallium was detected in 01 GW 03 but was not detected in background groundwater samples. Cadmium and zinc did not have elevated concentrations in background samples. The turbidity values prior to sampling for background samples were between 4 to 90 NTU. The turbidity values just prior to sampling were 440 NTU for 01 GW 02, 112 NTU for 01 GW 03, and 336 NTU for 01 GW 05. Sample 01 GW 05 required filtering in the field, despite the use of micro-flow purge techniques to minimize suspended solids. Filtered sample results from the same location did not exhibit elevated levels of any metals except cadmium (3.0 ug/L) and zinc (182 ug/L). Chloroform (3 ug/L), gamma-BHC (0.001 ug/L), and methylene chloride (1 ug/L) were each detected in one site-related groundwater sample collected at Site 1. None of these compounds were detected in background groundwater samples.

Explosive-constituent compounds or their degradation by-products were detected in two groundwater samples. 01 GW 01 contained low levels of 2-amino-4,6-dinitrotoluene, and 01 GW 02 contained levels of 2,4-dinitrotoluene and RDX.

The following landfill parameters were analyzed in the Site 1 groundwater samples: biochemical oxygen demand (BOD), chemical oxygen demand (COD), nitrate, and total organic carbon (TOC). In addition, samples were analyzed for TPH. Nitrate levels in site-related groundwater samples were within a range from 0.28 mg/L to 1.5 mg/L, which is less than the upper range detected in background samples and consistent with results of the 1992 sampling investigation. Therefore, nitrate results do not demonstrate groundwater impacts from past ordnance burning activities. No TPH was detected in background groundwater samples above the detection limit of 0.30 mg/L.

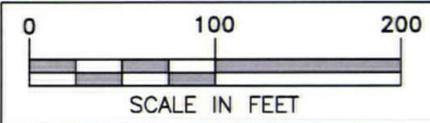
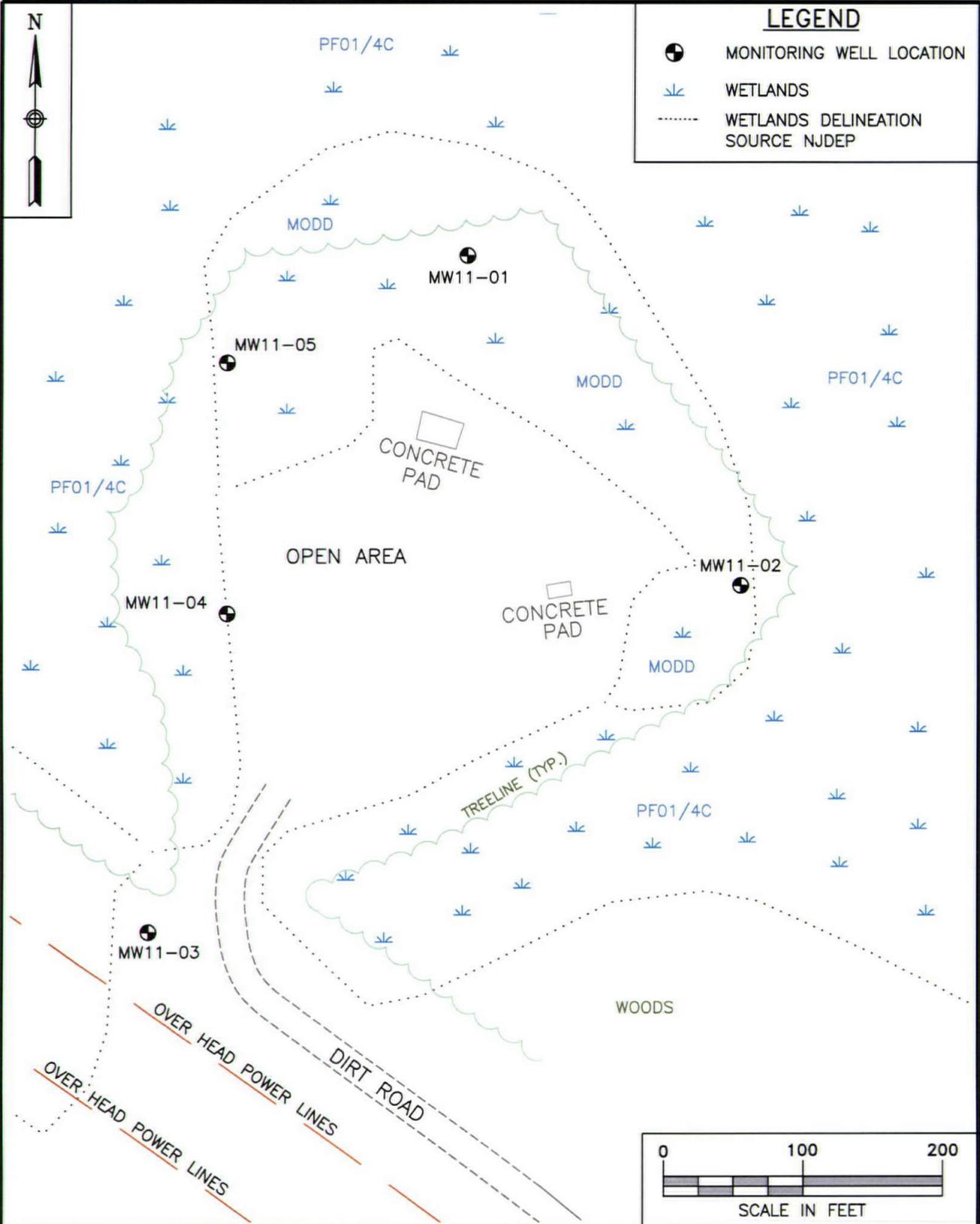
Summary of Phase II RI Results for Site 11:

Samples locations for Site 11 are shown on Figure 5. Tables 4 and 5 compare the results of the site samples to background samples. Figure 6 shows sample locations and concentrations of chemicals in the site media that exceed ARARs and TBCs that were used as screening levels.



LEGEND

- MONITORING WELL LOCATION
- WETLANDS
- WETLANDS DELINEATION SOURCE NJDEP



SAMPLE LOCATIONS
SITE 11 - CONTRACT ORDNANCE DISPOSAL AREA
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY

SCALE AS NOTED	
FILE: 2128CP02.dwg MKB PHL	
REV	DATE 05/19/04
FIGURE NUMBER FIGURE 5	

TABLE 4
SITE 11 - OCCURRENCE AND DISTRIBUTION OF INORGANICS IN GROUNDWATER
NWS EARLE, COLTS NECK, NEW JERSEY
(ug/L)

SUBSTANCE	BACKGROUND			SITE-RELATED				
	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	2 X AVERAGE CONCENTRATION	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	AVERAGE CONCENTRATION	MEAN > 2 X BKGD?	REPRESENTATIVE CONCENTRATION
ALUMINUM*	11 / 11	287 - 7870	5097.82	5 / 5	177 - 3010	1913.40	NO	3010
BARIIUM*	11 / 11	2.6 - 518	229.60	5 / 5	27.4 - 518	131.68	NO	337.63
CADMIUM*	5 / 11	0.6 - 1.9	1.21	5 / 5	0.57 - 0.62	0.43	NO	0.62
CALCIUM	11 / 11	506 - 17200	8306.55	5 / 5	274 - 2090	999.60	NO	2090
CHROMIUM	NOT DETECTED	-	-	5 / 5	4.4 - 31	21.34	YES	31.00
COBALT	6 / 11	0.7 - 10.1	4.06	5 / 5	0.63 - 1.8	1.03	NO	1.73
COPPER*	9 / 11	0.79 - 13.5	6.53	5 / 5	0.85 - 13.5	3.57	NO	13.50
IRON	11 / 11	153 - 7690	4197.09	5 / 5	166 - 4310	2793.20	NO	4310
LEAD*	3 / 11	2.1 - 3	2.44	1 / 5	3	1.20	NO	3.00
MAGNESIUM	11 / 11	273 - 27400	8449.64	5 / 5	811 - 2240	1394.20	NO	2240
MANGANESE	11 / 11	3.3 - 65	46.18	5 / 5	5.1 - 18	12.24	NO	18.00
MERCURY*	11 / 11	0.005 - 0.12	0.12	5 / 5	0.013 - 0.12	0.09	NO	0.12
NICKEL	10 / 11	0.81 - 25.5	11.98	3 / 5	1 - 4.7	2.38	NO	4.70
POTASSIUM	11 / 11	350 - 3245	2810.55	5 / 5	1140 - 2160	1578.00	NO	2064.66
SODIUM	11 / 11	1850 - 11650	8449.09	5 / 5	2200 - 3530	2938.00	NO	3530
VANADIUM	10 / 11	0.69 - 42.25	16.48	4 / 5	1.4 - 13.5	7.84	NO	13.50
ZINC*	6 / 9	3.7 - 348	178.61	1 / 5	348	70.27	NO	218.29

Note:

* - Selected as a COPC

TABLE 5
SITE 11 - OCCURRENCE AND DISTRIBUTION OF ORGANICS IN GROUNDWATER
NWS EARLE, COLTS NECK, NEW JERSEY
(ug/L)

SUBSTANCE	BACKGROUND			SITE-RELATED		
	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	REPRESENTATIVE CONCENTRATION	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	REPRESENTATIVE CONCENTRATION
CHLOROFORM	NOT DETECTED	-	-	3 / 5	1 - 3	3



LEGEND

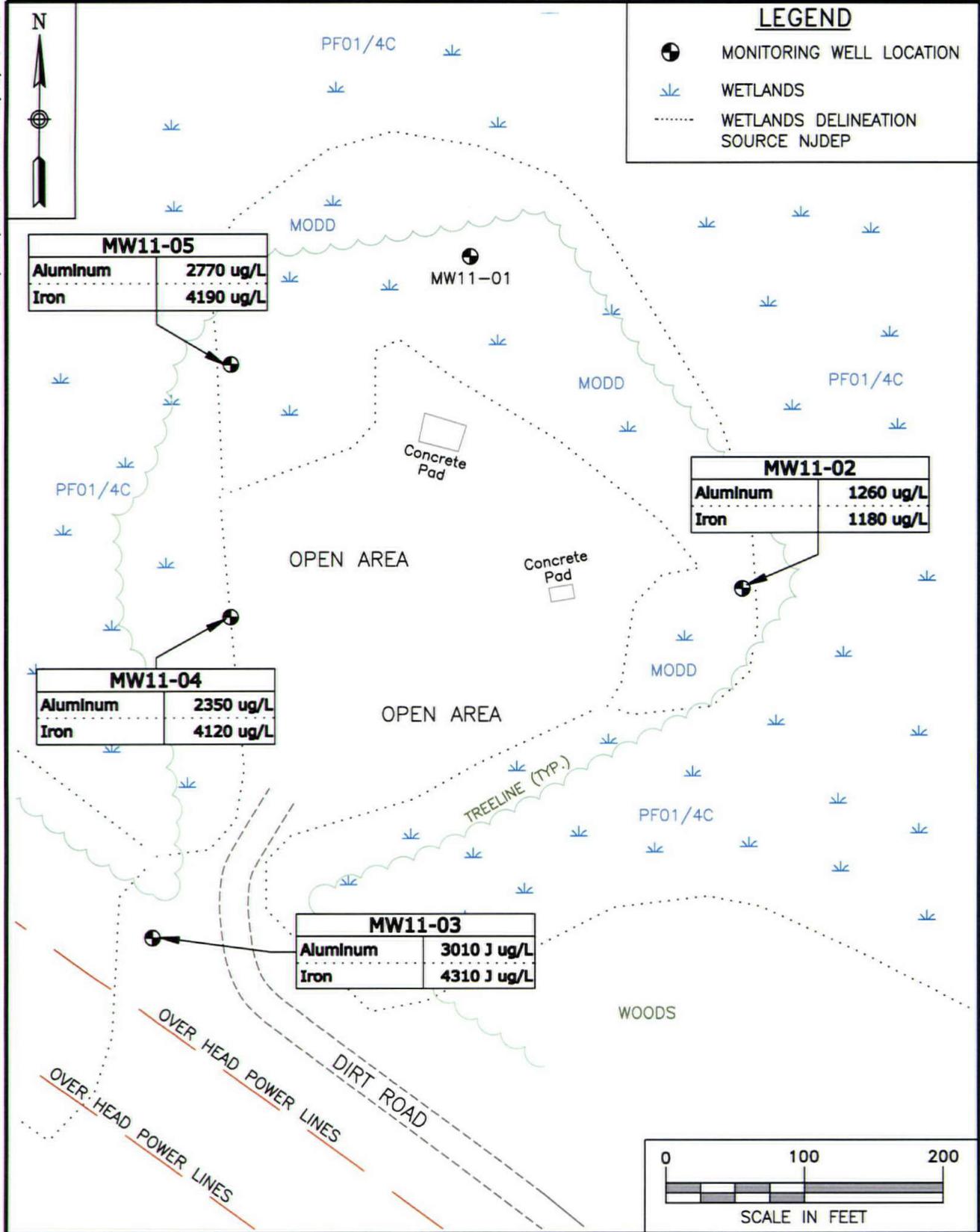
- MONITORING WELL LOCATION
- WETLANDS
- WETLANDS DELINEATION SOURCE NJDEP

MW11-05	
Aluminum	2770 ug/L
Iron	4190 ug/L

MW11-04	
Aluminum	2350 ug/L
Iron	4120 ug/L

MW11-03	
Aluminum	3010 J ug/L
Iron	4310 J ug/L

MW11-02	
Aluminum	1260 ug/L
Iron	1180 ug/L



CONCENTRATIONS ABOVE SCREENING LEVELS
 SITE 11 - CONTRACT ORDNANCE DISPOSAL AREA
 NAVAL WEAPONS STATION EARLE
 COLTS NECK, NEW JERSEY

SCALE AS NOTED	
FILE: 2128KP02.dwg	
LDL PHL	
REV	DATE
	05/19/04
FIGURE NUMBER	
FIGURE 6	

Groundwater Results Summary

Five groundwater samples (11 GW 01 through 11 GW 05) were collected at Site 11. Tables 4 and 5 present the occurrence and distribution of inorganic and organic chemicals, respectively, in site-related groundwater samples and compare them to background. Concentrations of most metals in site-related groundwater samples were similar to background ranges. Sample 11 GW 03 exhibited concentrations greater than background for aluminum (3,010 ug/L), barium (518 ug/L), and zinc (348 ug/L) and sample 11 GW 05 indicated aluminum (2,770 ug/L) at a level greater than background. Chloroform was detected at low levels in groundwater samples 11 GW 01 (3.0 ug/L), 11 GW 03 (2.0 ug/L), and 11 GW 04 (1.0 ug/L) collected at Site 11. This compound was not detected in background groundwater samples.

Summary of Findings - Site 1

Concentrations of most metals in site-related subsurface soil samples, with the exception of arsenic were similar to the ranges associated with background samples. One arsenic subsurface soil sample concentration (27.8 mg/kg) exceeded the NJDEP residential direct contact cleanup criterion for arsenic (20 mg/kg). These arsenic levels were used in the risk assessment. Nitrocellulose was detected at one subsurface sample location and one background sample; however explosives are not expected to be found in background samples at NWS Earle. The nitrocellulose found in the background sample is inexplicable. The occurrence of nitrocellulose in one soil sample at 77,000 ug/kg is not believed to represent a significant impact on site conditions.

Monitoring well samples exhibited concentrations of metals in excess of Groundwater Quality Standards (GWQS) and Maximum Contaminant Levels (MCLs). Chloroform and methylene chloride were each detected in one site-related groundwater sample collected at Site 1 although they were not detected in background groundwater samples.

Summary of Findings - Site 11

Concentrations of most metals in site-related groundwater samples were similar to background ranges.

VI. SUMMARY OF SITE RISKS

As part of the Phase II RI, a human health risk assessment and an ecological risk assessment were performed for OU 8. A four-step process was applied to assess site-related human health risks for a reasonable maximum exposure scenario consisting of the following: Hazard Identification, Exposure Assessment, Toxicity Assessment, and Risk Characterization. Hazard Identification identifies the contaminants of concern at the site based on several factors such as toxicity, frequency of occurrence, and

concentration. Exposure Assessment estimates the magnitude of actual and/or potential human exposures, the frequency and duration of these exposures, and the pathways (e.g., ingesting contaminated well water) by which humans are potentially exposed. Toxicity Assessment determines the types of adverse health effects associated with chemical exposures and the relationship between the magnitude of exposure (dose) and severity of adverse effects (response). Risk Characterization summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative assessment of site-related risks.

A. Human Health Risks

The human health risk assessment estimated the potential risks to human health posed by exposure to contaminated groundwater, surface water and sediment, and surface and subsurface soils at the sites. To assess these risks, the exposure scenarios listed below were assumed:

- Ingestion of groundwater as a drinking water source.
- Inhalation of contaminants in groundwater (i.e., volatile compounds emitted during showering).
- Dermal exposure to contaminants in groundwater (i.e., showering, hand washing, bathing).
- Dermal contact with contaminated soils.
- Inhalation or incidental ingestion of contaminants in soil (e.g., fugitive dusts).

Following EPA risk assessment guidance; these scenarios were applied to various site use categories, including future industrial, residential, and recreational receptors. Land use will be controlled by agreement between the DOD and EPA until all potential risks are eliminated to a level permitting unrestricted use.

Potential human health risks were categorized as carcinogenic or noncarcinogenic. A hypothetical carcinogenic risk increase from exposure should ideally fall below a risk range of $1E-6$ (an increase of one case of cancer for one million people exposed) to $1E-4$ (an increase of one case of cancer per 10,000 people exposed).

Noncarcinogenic risks were estimated using Hazard Indices (HI), where an HI exceeding one is considered an unacceptable health risk.

In addition, results were compared to applicable federal and/or state standards such as federal MCLs for drinking water, NJDEP GWQS, or other published lists of reference values.

A baseline human health risk assessment was conducted for Site 1 and Site 11 at OU 8. Results of this assessment are discussed in the following sections.

Site 1:

The results of the Site 1 baseline human health risk assessment concluded that reasonable maximum exposure (RME) cancer risks estimated for future residents exposed to subsurface soil and consuming groundwater from beneath the site ($5.6E-04$) exceeds the upper end of the target maximum acceptable risk range. The estimated human health risk for the future industrial (subsurface soil and groundwater) exposure scenario ($1.4E-04$) was also exceeds the target maximum acceptable risk range. Arsenic (via ingestion of groundwater) was by far the greatest contributor to the estimated human health risks for the future residential and future industrial exposure scenarios at $5.1E-04$ and $1.2E-04$, respectively. Based on the EPCs calculated for the arsenic in surface and sub-surface soil, the estimated risks do not exceed the risk range for both cancer and non-cancer health effects based on the results of the screening level assessment described above. The screening level assessment does not identify any exceedances of the residential screening criteria. Only RME risk assessment results were used for decision making.

RME estimates for non-carcinogenic HIs associated with future industrial (subsurface soil and groundwater) and future residential (subsurface soil and groundwater) exposure scenarios exceeded 1.0, the cutoff point below which adverse non-carcinogenic effects are not expected to occur. Arsenic (maximum concentration 22.7 ug/L), chromium (maximum concentration 148 ug/L), and iron (maximum concentration 23,350 ug/L), all via ingestion of groundwater, were the principal compounds of concern in Site 1 groundwater that contributed to the estimated HI greater than the EPA guidance for these exposure scenarios. The RME estimates of non-cancer risk from exposure to groundwater for the future industrial receptor are probably overly conservative because associated central tendency non-cancer HIs are less than 1.0. The HI for residential exposure to groundwater is 6.4. The estimated future residential child risk was driven by ingestion and dermal contact with iron in groundwater, which would target the digestive system and liver.

Lead groundwater concentrations at the site were below the EPA action level for public water supplies and lead soil concentrations were below EPA guidelines. These lead concentrations are not expected to be associated with significant increases in blood-lead levels based on the results of the IEUBK Lead Model (v. 0.99).

Site 11:

The potential receptors considered for this site were future industrial and residential receptors exposed to groundwater. The cancer risks associated with the future residential exposure scenario was approximately $3E-06$; near the lower end of the acceptable target risk range. The non-carcinogenic HIs associated with the future industrial and future residential exposure scenarios were below 1.0; the cutoff point below which adverse effects are not expected to occur.

Lead concentrations at the site were below the EPA action level for public water supplies and are not expected to be associated with significant increases in blood-lead levels based on the results of the IEUBK Lead Model (v. 0.99).

B. Ecological Risks

Site 1:

Site 1 contains limited terrestrial habitat, mainly scattered grass, brush, and some small trees. The site is probably utilized by small mammals, but receptor use is not extensive. Upland habitats around the site provide excellent terrestrial habitat. Runoff of contaminants to the upland areas is inhibited by the berm that surrounds portions of the site, and by the lack of drainage ditches or other surface water on the site. Also, groundwater is not expected to discharge to surface water on or near the site. NJDEP Geographic Information System data originally indicated the presence of wetlands east of the site. However, ground-truthing of the site revealed that no wetlands were present in these areas. No wetland hydrology, hydric soils, or aquatic plants were identified. The nearest wetlands downgradient from Site 1 are estimated to be approximately 1,500 feet to the northeast.

In site surface soils, hazard quotient (HQ) values for final compounds of potential concern (COPCs) were indicative of low potential risk, with the exception of chromium and mercury. Nonetheless, chromium was detected in concentrations comparable to background, and mercury was only detected in three of 12 samples. HQ values for terrestrial plants were indicative of low potential risk, with the exception of aluminum, chromium, and vanadium, but all three of these inorganics were detected below or comparable to background. In addition, these inorganics were not detected in roughly one-half of the samples. Some metals and explosives were detected at slightly elevated levels in groundwater and some metals were present at slightly elevated levels in subsurface soil samples taken as part of the 1995 RI effort. However, no surface water is present near the site, so groundwater discharge to surface water is not expected to be relevant for Site 1. The closest surface water body is a branch of Hockhockson Brook 1/2 mile to the west.

In summary, Site 1 contains limited terrestrial habitat due to the previous burning activities, which removed the existing natural organic matter. No migration pathways exist at the site that could carry contaminants to the higher quality upland areas that border the site or contribute contaminants to the Hockhockson Brook Watershed. Some metals, such as aluminum (HQ = 5.0), chromium (HQ = 164), copper (HQ = 2.72), mercury (HQ = 9.6), and vanadium (HQ = 2.15), are present in surface soil indicative of moderate potential risks to terrestrial receptors, but almost all of these compounds were detected at concentrations comparable to background. Surface soil samples taken as part of the 1993 SI were sufficient to characterize potential ecological risks and, therefore, further study based on ecological risk should not be necessary.

If unaltered, succession should continue to progress at the site, and subsequent receptor use should increase. Remediation, such as soil removal, based on potential risks would disrupt succession at the site. Any potential risks caused by inorganics at this site should dissipate due to natural effects like dilution over time. For these reasons, remediation at Site 1 based on ecological concerns is considered undesirable.

Site 11:

Site 11 and the surrounding area contain extensive wetland and upland habitat. Most of the site is classified as a wetland, and contains grasses and some small trees. Nearby wooded areas, primarily south and southeast of the site, provide excellent upland habitats that are expected to attract most upland wildlife species found on the installation. The federally threatened Knieskern's beaked-rush, a grasslike plant, has been identified on Site 11. Runoff from the site is minimal since the topography results in perched water on the site. Groundwater to surface water discharge is precluded by the absence of surface water near the site.

Six surface/subsurface soil samples were taken around the site from 6 to 18 inches below ground surface during 1993 RI/FS activities. Data from these samples indicated that no explosives were present in site soils but that some low levels of petroleum hydrocarbons were present. Groundwater samples taken during the RI/FS indicated the presence of some slightly elevated concentrations of VOCs and metals. Groundwater samples taken during 1995 RI activities contained slightly elevated levels of some metals and chloroform.

The 1993 RI/FS report concluded that due to the presence of the threatened plant species on the site, future disturbance of surface soils is not desirable. Soil samples taken from 0 to 6 inches may provide a limited amount of additional information on the nature and extent of soil contamination at the site, but data from additional soil samples would also be of limited use since no soil remediation would be appropriate with the presence of the threatened plant. Based on the findings of the groundwater investigation, the RI/FS report concluded that impacts to site soils were negligible and that the petroleum hydrocarbons detected in soils are expected to degrade over time. No runoff of contaminants from the site is expected to occur, nor any groundwater to surface water discharge. For these reasons, the nature and extent of contamination in Site 11 surface soils could be further defined, but subsequent data would be of little practical use. Hence, further study or remediation based on ecological concerns at Site 11 is considered unwarranted. However, monitoring of the status of the Knieskern's beaked-rush on the site should be considered, and is actually underway as a responsibility of the NWS Earle staff ecologist.

Summary of Risks for OU 8 Sites:

The risk assessment for Site 1 indicated the presence of potential unacceptable risks to future residential or industrial worker receptors from exposure to groundwater at the site. No other media pose potential unacceptable risks to human receptors at this site. Anticipated land use is unrestricted with the stipulation placed in the Base Master Plan that groundwater use must be avoided.

The risk assessment for Site 11 indicated that the contaminants are at concentrations that are low enough to not cause potential unacceptable risks to human health. Site 11 and the surrounding area contain extensive wetland and excellent upland habitat for ecological purposes. Moreover, the Knieskern's beaked-rush, a grass like plant, which is on the federal list of threatened plants, has been identified on Site 11. Therefore there are potential benefits of allowing the site to remain undisturbed by any remedial action on soil or groundwater.

VII. REMEDIAL ACTION OBJECTIVES (RAOs)

The overall remedial action objective for Site 1 is to protect human health and the environment. The RAO for human health is to prevent potential human exposure to metals in groundwater until groundwater is restored to comply with MCLs and NJ GWQSs. A Remedial Design (RD) for LUCs will be prepared to ensure groundwater beneath Site 1 is not used, other than for environmental monitoring and testing, without Navy approval. Figure 7 has the estimated CEA limits.

VIII. DESCRIPTION OF REMEDIAL ACTION ALTERNATIVES

Summaries of the remedial alternatives developed for Site 1 are presented in the following sections. Table 6 presents the considered remedial alternatives and the results of preliminary screening.

1. Alternative 1: No Action

The no-action alternative is required by the NCP to be used as a baseline to which other alternatives may be compared. No remedial actions would be taken to protect human health or the environment.

This alternative does not prevent potential receptors from being exposed to groundwater contaminated at levels that exceed MCLs or NJ GWQSs. This alternative does not monitor for attainment of MCLs or NJ GWQSs over time.

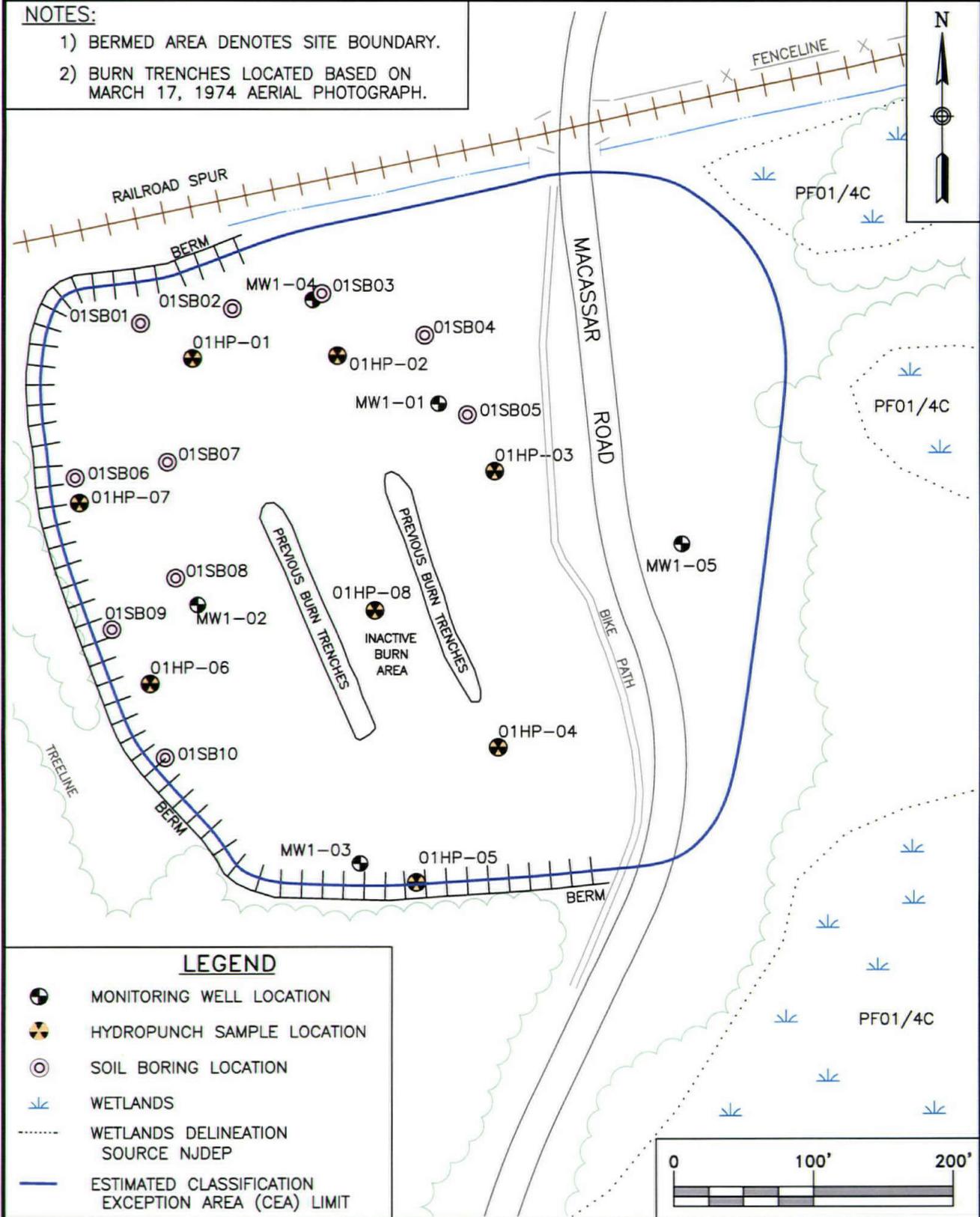
2. Alternative 2: Limited Action (Long-Term Monitoring)

Alternative 2 does not include active remediation of groundwater. However, groundwater contamination is expected to gradually decrease resulting from naturally-occurring chemical and physical processes. Additional monitoring wells will be installed for long-term annual monitoring and five-year reviews to assess contaminant status and potential threats to human health and the environment.

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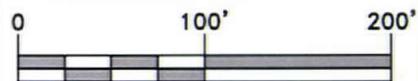
NOTES:

- 1) BERMED AREA DENOTES SITE BOUNDARY.
- 2) BURN TRENCHES LOCATED BASED ON MARCH 17, 1974 AERIAL PHOTOGRAPH.



LEGEND

- MONITORING WELL LOCATION
- HYDROPUNCH SAMPLE LOCATION
- SOIL BORING LOCATION
- WETLANDS
- WETLANDS DELINEATION SOURCE NJDEP
- ESTIMATED CLASSIFICATION EXCEPTION AREA (CEA) LIMIT



**ESTIMATED CLASSIFICATION EXCEPTION AREA LIMIT
SITE 1 – ORDNANCE DEMILITARIZATION SITE
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY**

SCALE AS NOTED	
FILE: 2128CP03	MKB PHL
REV	DATE 05/19/04
FIGURE NUMBER FIGURE 7	

TABLE 6
SITE 1 - SCREENING OF REMEDIAL ALTERNATIVES
OU-8 FEASIBILITY STUDY
NWS EARLE, COLTS NECK, NEW JERSEY

	ALTERNATIVE	EFFECTIVENESS	IMPLEMENTABILITY	COST	COMMENTS
1	No Action	Provides no additional protection of human health or the environment.	Readily implementable. No technical or administrative difficulties.	Capital: none O&M: low	<u>Retained</u> as baseline alternative in accordance with NCP.
2	Limited Action (Long-Term Monitoring including 5-year reviews)	Provides some protection of human health through annual monitoring assessment of contaminant status.	Readily implementable. No technical or administrative difficulties.	Capital: low O&M: low	Relative to Alt. 1 provides additional human health protectiveness through ongoing site groundwater monitoring. <u>Retained</u> .
3	Limited Action (Long-Term Monitoring and Institutional Controls, including 5-year reviews)	Protects human health through annual monitoring assessment of contaminant status and establishment of CEA; groundwater use would be restricted. No reduction of toxicity or volume of contaminants.	Readily implementable. No technical or administrative difficulties. Personnel and materials necessary to implement alternative are widely available.	Capital: moderate O&M: moderate	Relative to Alt. 2 prevents exposure to groundwater contaminants. <u>Retained</u> .

The key components of this alternative are summarized as follows:

- Long-term monitoring of groundwater
- Ecological Assessment of the beaked-rush
- Five-year reviews to assess contaminant status and evaluation

This alternative does not prevent potential receptors from being exposed to groundwater contaminated at levels that exceed MCLs or NJ GWQS. However, under this alternative, the groundwater contaminants would be monitored for attainment of MCLs and NJ GWQS over time, thereby indicating when beneficial reuse of groundwater may be possible.

3. Alternative 3: Limited Action Institutional Controls and Long-Term Monitoring)

Alternative 3 relies on institutional controls to limit exposure to the contaminated groundwater at the site. This alternative does not include any active remediation of groundwater. However, groundwater contamination is expected to gradually decrease resulting from naturally-occurring chemical and physical processes. Additional monitoring wells will be installed for long-term annual monitoring and five-year reviews to assess contaminant status and potential threats to human health and the environment. The key components of this alternative are summarized as follows:

- Institutional Controls
- Long-term monitoring of groundwater
- Ecological Assessment of the beaked-rush
- Five-year reviews to assess contaminant status and evaluation

This alternative would prevent potential receptors from being exposed to groundwater contaminated at levels that exceed MCLs and NJ GWQS. Also, under this alternative, the groundwater contaminants would be monitored for attainment of MCLs and NJ GWQS over time, thereby indicating when beneficial reuse of groundwater may be possible.

Land use restrictions would be incorporated into the Base Master Plan to restrict the future use of Site 1 groundwater until natural processes have reduced contaminant concentrations (including arsenic) to acceptable levels. Use of untreated Site 1 groundwater for drinking water would be prohibited. Because site groundwater does not meet MCLs or NJ GWQS, a CEA pursuant to N.J.A.C. 7:9-6 would be established. The CEA would provide the state official notice that the constituent standards will not be met for a specified duration and ensure that use of groundwater in the affected area is suspended until standards are achieved.

Long-term, periodic monitoring would be conducted to assess the ongoing effectiveness of institutional controls to contain potential threats to human health and the environment. Since wastes would be left in place, site conditions and risks would be reviewed every 5 years. A notification will be added to the Base Master Plan stating that arsenic has been detected at a concentration above the NJDEP residential direct contact cleanup criteria in subsurface soil at the Site 1 property.

IX. COMPARATIVE ANALYSIS OF ALTERNATIVES

The remedial action alternatives described in Section VIII were evaluated using the following criteria, established by the NCP:

Threshold Criteria: Statutory requirements that each alternative must satisfy in order to be eligible for selection.

1. Overall protection of human health and the environment - draws on the assessments conducted under other evaluation criteria and considers how the alternative addresses site risks through treatment, engineering, or institutional controls.
2. Compliance with ARARs - evaluates the ability of an alternative to meet ARARs established through federal and state statutes and/or provides the basis for invoking a waiver.

Primary Balancing Criteria: Technical criteria upon which the detailed analysis is primarily based.

3. Long-term effectiveness and permanence - evaluates the ability of an alternative to provide long-term protection of human health and the environment and the magnitude of residual risk posed by untreated wastes or treatment residuals.
4. Reduction of mobility, toxicity, or volume through treatment - evaluates an alternative's ability to reduce risks through treatment technology.
5. Short-term effectiveness - addresses the cleanup timeframe and any adverse impacts posed by the alternative during the construction and implementation phase, until cleanup goals are achieved.
6. Implementability - evaluates technical feasibility, administrative feasibility, and availability of services and the material required to implement the alternative.
7. Cost - includes an evaluation of capital costs and annual operation and maintenance (O&M) costs.

Modifying Criteria: Criteria considered throughout the development of the preferred remedial alternative and formally assessed after the public comment period, which may modify the preferred alternative.

8. Agency acceptance - indicates EPA's and the state's response to the alternatives in terms of technical and administrative issues and concerns.
9. Community acceptance - evaluates the issues and concerns the public may have regarding the alternatives.

The remedial alternatives were compared to one another based on the nine selection criteria, to identify differences among the alternatives and discuss how site contaminant threats are addressed.

Based on the initial screening of remedial alternatives, Alternatives 1, 2, and 3 were retained for further consideration. A detailed review of Alternatives 1, 2, and 3 is included in this section and summarized in Table 7.

1. Overall Protection of Human Health and the Environment

Alternative 1 would not be protective of human health because no measures would be taken to prevent potential exposure to the contaminated groundwater at Site 1. Alternative 2 would be similar to Alternative 1 in this respect; however, under Alternative 2, monitoring would indicate when natural processes have resulted in the groundwater contaminant levels to achieve human health standards. Alternative 3 would be protective of human health because measures would be taken to prevent human exposure to the contaminated groundwater until monitoring indicates natural processes have resulted in the groundwater contaminant levels within GWQS.

2. Compliance With ARARs

Alternative 1 would not comply with federal MCLs and New Jersey's N.J.A.C. 7:9-61 for GWQS. Alternatives 2 and 3 would eventually comply with federal MCLs and NJ GWQS, however only Alternative 3 would be in compliance with ARARs because a temporary exemption (CEA) from these requirements will be obtained until the GWQS are achieved.

TABLE 7
SITE 1 - COMPARATIVE ANALYSIS OF REMEDIAL ACTION ALTERNATIVES
OU-8 ROD
NWS EARLE, COLTS NECK, NEW JERSEY

CRITERION:	ALTERNATIVE 1: NO ACTION	ALTERNATIVE 2: LIMITED ACTION (LONG-TERM MONITORING)	ALTERNATIVE 3: LIMITED ACTION (LONG-TERM MONITORING AND INSTITUTIONAL CONTROLS)
OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT			
Prevent Human Exposure to Metals in Groundwater	No action would be taken to prevent human exposure to contaminated groundwater. Non-carcinogenic risks exceeding EPA's target risk range would remain. No institutional controls would be implemented to prohibit use of untreated groundwater.	Same as Alternative 1. In time, a gradual reduction of contaminants in groundwater due to continued dissipation/dilution would occur.	Institutional controls would minimize potential exposure to groundwater by prohibiting access. In time, a gradual reduction of contaminants in groundwater due to continued dissipation/dilution would occur. CEA would preclude use of groundwater for human consumption until MCLs and GWQS are met.
Minimize Contaminant Migration	No actions would be taken to reduce infiltration of surface water or precipitation to groundwater.	Same as Alternative 1.	Same as Alternative 1.
COMPLIANCE WITH ARARs			
Chemical-Specific ARARs	Would not comply with state groundwater quality standards.	Same as Alternative 1. Groundwater contaminant concentrations would initially exceed state GWQS. Over time, GWQS would be achieved by dissipation/dilution.	Same as Alternative 2. Groundwater contaminant concentrations would initially exceed MCLs and GWQS. Over time, remediation goals would be achieved by dissipation/dilution. A CEA would be established to provide the state official notification that standards would not be met for a specified duration.
Location-Specific ARARs	Not applicable.	Not applicable.	Not applicable.
Action-Specific ARARs	Not applicable.	Not applicable.	Not applicable.

TABLE 7
SITE 1 - COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES
0U-8 ROD
NWS EARLE, COLTS NECK, NEW JERSEY
PAGE 2 OF 4

CRITERION:	ALTERNATIVE 1: NO ACTION	ALTERNATIVE 2: LIMITED ACTION (LONG-TERM MONITORING)	ALTERNATIVE 3: LIMITED ACTION (LONG-TERM MONITORING AND INSTITUTIONAL CONTROLS)
LONG-TERM EFFECTIVENESS AND PERMANENCE			
Magnitude of Residual Risk	Existing (HI greater than 1) non-carcinogenic risk from exposure to site groundwater would remain.	Same as Alternative 1. Existing risks would remain. Over time, concentrations of metals in groundwater downgradient of the site would be expected to decrease as a result of natural influences.	Same as Alternative 2. Existing risks would remain. Institutional controls would preclude use of groundwater. Over time, concentrations of metals in groundwater downgradient of the site would be expected to decrease as a result of natural influences.
Adequacy and Reliability of Controls	No new controls would be implemented. Existing site features provide limited controls.	Same as Alternative 1.	If implemented and enforced, the CEA could prevent use of contaminated groundwater.
Need for 5-Year Review	Not applicable.	Review would be required since soil and groundwater contaminants would be left in place.	Same as Alternative 2.
REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT			
Reduction of Toxicity, Mobility, or Volume Through Treatment	No reduction, since no treatment would be employed.	Same as Alternative 1.	Same as Alternative 1.
SHORT-TERM EFFECTIVENESS			
Community Protection	No risk to community is anticipated.	No significant risk to community anticipated.	Same as Alternative 2.
Worker Protection	Not applicable.	No risk to workers is anticipated if proper PPE is used during long-term monitoring.	Same as Alternative 2.
Environmental Impacts	Minimal adverse impacts to the environment are anticipated.	Same as Alternative 1.	Same as Alternative 1.
Time Until Action is Complete	Not applicable.	Not applicable.	Approximately 12 months to institute CEA.

TABLE 7
SITE 1 - COMPARATIVE ANALYSES OF REMEDIAL ALTERNATIVES
OU-8 ROD
NWS EARLE, COLTS NECK, NEW JERSEY
PAGE 3 OF 4

CRITERION:	ALTERNATIVE 1: NO ACTION	ALTERNATIVE 2: LIMITED ACTION (LONG-TERM MONITORING)	ALTERNATIVE 3: LIMITED ACTION (LONG-TERM MONITORING AND INSTITUTIONAL CONTROLS)
IMPLEMENTABILITY			
Ability to Construct and Operate	No construction or operation would be involved.	No difficulties are anticipated. Well installation is a readily implementable technology.	Same as Alternative 2.
Ease of Doing More Action if Needed	Additional actions would be easily implemented if required.	Additional actions, such as establishment of a CEA, would be easily implemented if required.	Additional actions would be easily implemented if required.
Ability to Monitor Effectiveness	No monitoring would be involved.	Monitoring would provide assessment of potential exposures, contaminant presence, migration, or changes in site conditions.	Same as Alternative 2.
Ability to Obtain Approvals and Coordinate with Other Agencies	No coordination would be required.	Coordination for 5-year reviews may be required and would be obtainable.	Same as Alternative 2. Coordination with the state would be required to establish a CEA and would be obtainable.
Availability of Treatment, Storage Capacities, and Disposal Services	None required.	Same as Alternative 1.	Same as Alternative 1.
Availability of Equipment, Specialists, and Materials	None required.	Equipment and personnel are available to perform long-term monitoring and 5-year reviews.	Same as Alternative 2.
Availability of Technology	None required.	None required.	None required.

TABLE 7
SITE 1 - COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES
OU-8 ROD
NWS EARLE, COLTS NECK, NEW JERSEY
PAGE 4 OF 4

CRITERION:	ALTERNATIVE 1: NO ACTION	ALTERNATIVE 2: LIMITED ACTION (LONG-TERM MONITORING)	ALTERNATIVE 3: LIMITED ACTION (LONG-TERM MONITORING AND INSTITUTIONAL CONTROLS)
COST			
Capital Cost	\$0	\$15,900	\$41,900
First-Year Annual O&M Cost	\$0	\$8,050	\$8,050
Five-Year Reviews	\$0	\$15,500	\$15,500
Present Worth Cost*	\$0	\$149,200	\$175,200

* Present-worth cost is based on discount rate of 7 %.

3. Long-Term Effectiveness and Permanence

Potential future users of site groundwater may be at risk under Alternatives 1 and 2 because of the lack of institutional controls that would prohibit use of untreated contaminated groundwater.

Alternative 3 would mitigate risks due to ingestion of site groundwater by implementing institutional controls to prohibit use of untreated, contaminated groundwater. Therefore, Alternative 3 offers a more effective remedy for the long term.

4. Reduction of Toxicity, Mobility, or Volume through Treatment

Because none of the alternatives includes treatment, they would not reduce the toxicity, mobility, or volume through treatment.

5. Short-Term Effectiveness

Alternatives 1 and 2 would not be effective in the short term. The remedial action objective will be attained within 12 months after implementation of Alternative 3 because potential human receptors would be protected from exposure to contaminated groundwater. Therefore, Alternative 3 would be most effective in the short-term.

6. Implementability

All of the alternatives are easily implementable. Alternative 3 requires an additional component requiring implementation of institutional controls compared to Alternative 2.

7. Cost

The present-worth cost associated with each alternative is provided below for comparison. Alternative 1, no action, would be the least expensive to implement and Alternative 3 would be the most expensive to implement.

Alternative 1	\$0
Alternative 2	\$149,000
Alternative 3	\$ 175,000

8. Agency Acceptance

NJDEP has had the opportunity to review and comment on all the documents in the Administrative Record and has had the opportunity to comment on the draft ROD. Comments received from the NJDEP have been incorporated into the ROD.

9. Community Acceptance

The community has had the opportunity to review and comment on documents in the Administrative Record, to participate in regularly scheduled Restoration Advisory Board (RAB) meetings convened to encourage community involvement, and attend a public meeting held on December 10, 2003, to provide the community an opportunity to learn about the Proposed Plan. The community has not indicated objections to the alternative selected in this ROD. Part III, Responsiveness Summary, of this ROD presents an overview of community involvement and input to the selected alternative.

X. THE SELECTED REMEDY

The Navy, with USEPA and NJDEP, has selected Alternative 3 as its preferred remedy for Site 1. Alternative 3 relies on institutional controls to prevent use of groundwater until natural processes restore the groundwater to comply with MCLs and GWQS levels. Alternative 3 provides assurance to the regulatory agencies and the community that groundwater use by potential human receptors would be prevented by implementation of institutional controls until groundwater is restored.

Although the risk assessment process has determined there is no excess risk above acceptable guidelines to humans or the environment, a notification added to the Base Master Plan will inform future interested parties that arsenic has been detected in one subsurface soil sample at a concentration above the NJDEP residential direct contact cleanup criteria. Since the concentration of arsenic does not require limits on the use of the land, no LUC is required for site soils.

The selected remedy for Site 1 is as follows:

- Institutional Controls - LUCs will be established by the Navy to prevent human exposure to the contaminated groundwater. The Navy is responsible for maintaining the integrity of any current or future remedial or monitoring system such as monitoring wells. A remedial Design (RD) for land use controls (LUCs) will be prepared by the Navy and amended to the NWS

Earle Master Plan. The Navy will be responsible for implementing, inspecting, reporting, and enforcing the LUCs described in this ROD in accordance with the approved RD for LUCs. Although the Navy retains ultimate responsibility for the performance of these obligations, the Navy may arrange, by contract or otherwise, for another party(ies) to carry them out. Land Use controls will be maintained until the concentration of hazardous substances in the soil and groundwater are at such levels to allow for unrestricted use and exposure. Because site groundwater does not meet MCLs or New Jersey groundwater quality standards, a temporary exemption (CEA) pursuant to N.J.A.C 7:9-6 would be established to provide the state official notice that the constituent standards will not be met for a specified duration anticipated not to exceed 10 years and to ensure that use of groundwater in the affected area is suspended until standards are achieved.

- Long-Term Monitoring - One new downgradient well would be installed. The groundwater would be sampled periodically to monitor the migration of contaminants from the site and the potential impacts to downgradient areas. Background well data would be used for comparison to evaluate site contaminant status. The collected data would be evaluated during the 5-year review period.
- Five-Year Reviews - Because contaminants remain on the site, a review of site conditions and risks would be conducted every five years, as required by CERCLA. The reviews would consist of evaluation of analytical and hydrogeologic data and assessing whether contaminant migration has increased and whether human or biological receptors or groundwater resources are at risk.

For the purpose of costing, it is assumed that groundwater samples would be collected from the one new monitoring well, along with four existing monitoring wells, and the samples would be analyzed for metals. Only metals were selected for analysis because they contribute by far the greatest fraction of the estimated unacceptable risk. The sampling results would be evaluated to assess whether there have been changes in contaminant status and to determine whether additional response actions are warranted.

XI. STATUTORY DETERMINATIONS

The remedy selected for OU 8, Alternative 3, satisfies the remedy selection requirements of CERCLA and the NCP. The remedy is expected to be protective of human health and the environment, complies with ARARs, and is cost effective. The following sections discuss how the selected remedial action addresses these statutory requirements.

A. Protection of Human Health and the Environment

The selected remedy will be protective of human health and the environment. The human health risk assessment concluded that site groundwater poses carcinogenic and non-carcinogenic risks exceeding USEPA's guideline risk limits under future residential and future industrial exposure to groundwater scenarios. Establishment of the site as a groundwater CEA will provide interim protection by prohibiting use of the aquifer until MCLs and GWQS are achieved.

The long-term periodic monitoring program will allow the responsible agencies to monitor the quality of groundwater leaving the site, assess potential impacts to downgradient receptors, and determine whether additional remedial actions are necessary.

The Navy is responsible for implementing, inspecting, reporting, and enforcing the LUCs described in this ROD in accordance with the approved RD for LUCs. Although the Navy retains ultimate responsibility for the performance of these obligations, the Navy may arrange, by contract or otherwise, for another party(ies) to carry them out. Should any LUC remedy fail, the Navy will ensure that appropriate actions are taken to reestablish the remedy's protectiveness and may initiate legal action to either compel action by a third party(ies) and/or to recover the Navy's costs for remedying any discovered LUC violation(s).

B. Compliance With and Attainment of ARARs

The selected remedy for OU 8 will comply with all applicable or relevant and appropriate chemical-specific, and location-specific ARARs.

1. Chemical-Specific ARARs

Potential federal and state chemical-specific ARARs are listed in Tables 8 and 9, respectively. Implementation of the selected remedy would comply with all ARARs identified in Tables 8 and 9. The selected remedy does not include active treatment of groundwater, therefore, initially the remedy will not meet MCLs or the constituent concentrations specified in the New Jersey GWQS [N.J.A.C. 7:9-6]. However, the selected remedy includes a provision to seek a temporary exemption (CEA) from these requirements until the MCLs and GWQS are achieved by natural processes. The CEA will be established to provide the state official notice that the constituent standards will not be met for a duration not to exceed 10 years and to ensure that consumption of the untreated groundwater is prohibited.

TABLE 8
POTENTIAL FEDERAL CHEMICAL-SPECIFIC ARARs AND TBCs
OU 8 RECORD OF DECISION
NAVAL WEAPON STATION EARLE, COLTS NECK, NEW JERSEY

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE ROD
Safe Drinking Water Act (SDWA) - Maximum Contaminant Levels (MCLs) (40 CFR 141.11-141.16)	Applicable	MCLs have been promulgated for a number of common organic and inorganic contaminants to regulate the concentration of contaminants in public drinking water supply systems. MCLs may be relevant and appropriate for groundwater because the aquifer beneath the site is a potential drinking water supply.	MCLs may be used to establish clean-up levels for the portion of the aquifer underlying the OU-8 sites. MCLs can be used to derive potential soil clean-up levels.

**TABLE 9
 POTENTIAL STATE CHEMICAL-SPECIFIC ARARs AND TBCs
 OU 8 RECORD OF DECISION
 NAVAL WEAPON STATION EARLE, COLTS NECK, NEW JERSEY**

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE ROD
New Jersey Ground Water Quality Standards (GWQS) (N.J.A.C. 7:9-6)	Applicable	This regulation establishes the rules to protect ambient groundwater quality through establishing groundwater protection and clean-up standards and setting numerical criteria limits for discharges to groundwater. The Groundwater Quality Criteria (GWQC) (N.J.A.C. 7:9-6.7) are the maximum allowable pollutant concentrations in groundwater that are protective of human health. This regulation also prohibits the discharges to groundwater that subsequently discharges to surface water that do not comply with the Surface Water Quality Standards (SWQS).	Because contaminated groundwater is present underneath Site 1 in excess of GWQS, these regulations will be considered in determining groundwater action levels. Application for Classification Exception Area (CEA) will be required during the term of proposed remediation. The CEA procedure ensures that designated groundwater uses at remediation sites are suspended for the term of the CEA.
New Jersey Safe Drinking Water Act (N.J.A.C. 7:10)	Potentially Relevant and Appropriate	<p>These regulations were promulgated to assure the provision of safe drinking water to consumers in public community water systems. Maximum Contaminant Levels (MCLs) (N.J.A.C. 7:10-16) have been established to regulate the concentration of organic and metal contaminants in water supplies.</p> <p>MCLs may be relevant and appropriate for groundwater because the aquifer beneath the site is a potential drinking water supply.</p>	MCLs may be used to establish clean-up levels for groundwater underlying the OU-8 sites. MCLs can be used to derive potential soil clean-up levels.

2. Location-Specific ARARs

Potential federal and state location-specific ARARs are listed in Tables 10 and 11, respectively. The selected remedy will easily comply with these ARARs.

3. Action-Specific ARARs

Potential federal and state action-specific ARARs are listed in Table 12 and 13.

C. Cost-Effectiveness

The Navy and USEPA have determined that the selected remedy for OU 8 is cost effective in that it mitigates the risks posed by the site-related contaminants, meets all other requirements of CERCLA, and affords overall effectiveness proportionate to the cost. The estimated costs for the selected remedy for OU 8 are summarized below.

The capital costs for the selected remedy, Alternative 3, total \$ 41,900. The annual O&M costs are \$8,050, and 5-year reviews cost \$15,500 per event. Over a 30-year period, the net present-worth cost is \$175,000 (assuming a seven percent discount rate).

D. Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

The Navy and USEPA have determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner at OU 8.

E. Preference for Treatment as a Principal Element

The Navy and USEPA have determined that active remediation is not necessary at this site because the risks posed to potential receptors do not constitute principal threats. Therefore, the preference for treatment is not truly applicable.

XII. DOCUMENTATION OF SIGNIFICANT CHANGES

No significant changes from the Proposed Plan appear in this ROD.

TABLE 10
POTENTIAL FEDERAL LOCATION-SPECIFIC ARARs AND TBCs
OU 8 RECORD OF DECISION
NAVAL WEAPON STATION EARLE, COLTS NECK, NEW JERSEY

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE ROD
Endangered Species Act of 1973 (16 USC 1531 et seq); (50 CFR Part 200)	Potentially Applicable, if present	Actions shall be taken to conserve endangered or threatened species or to protect critical habitats. Consultation with the Department of the Interior is required.	The RI determined that there were sensitive habitats at the OU-8 sites, including an endangered plant species present at Site 11 (Knieskern's beaked-rush).

**TABLE 11
 POTENTIAL STATE LOCATION-SPECIFIC ARARs AND TBCs
 OU 8 RECORD OF DECISION
 NAVAL WEAPON STATION EARLE, COLTS NECK, NEW JERSEY**

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE ROD
New Jersey Freshwater Wetlands Protection Act Rules (N.J.A.C. 7:7A)	Potentially Applicable	Regulate activities that result in the disturbance in and around freshwater wetland areas including removing or dredging wetland soils, disturbing the water level or water table, driving piles, placing obstructions, destroying plant life, and discharging dredged or fill materials into open water.	Remedial alternatives have been developed to avoid activities that would be detrimental to the wetlands located at and adjacent to Site 11.

**TABLE 12
 POTENTIAL FEDERAL ACTION-SPECIFIC ARARs AND TBCs
 OU 8 RECORD OF DECISION
 NAVAL WEAPON STATION EARLE, COLTS NECK, NEW JERSEY**

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE ROD
Resource Conservation and Recovery Act (RCRA) - Hazardous Waste Generator and Transporter Requirements (40 CFR parts 262 and 263)	Potentially Applicable	These regulations establish the responsibilities of generators and transporters of hazardous waste in the handling, transportation, and management of waste. The regulations specify the packaging, labeling, recordkeeping, and manifest requirements.	Activities performed in connection with off-site transport of hazardous wastes will comply with the requirements of these regulations.

TABLE 13
POTENTIAL STATE ACTION-SPECIFIC ARARs AND TBCs
OU 8 RECORD OF DECISION
NAVAL WEAPON STATION EARLE, COLTS NECK, NEW JERSEY

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	COMMENTS
New Jersey Labeling, Records, and Transportation Requirements (N.J.A.C. 7:26-7)	Potentially Applicable	These regulations establish the responsibilities of generators and transporters of hazardous waste in the handling, transportation, and management of waste. The regulations specify the packaging, labeling, recordkeeping, and manifest requirements.	Activities performed in connection with off-site transport of hazardous wastes will comply with the requirements of these regulations.

**RECORD OF DECISION
NAVAL WEAPONS STATION EARLE
OPERABLE UNIT 8**

PART III - RESPONSIVENESS SUMMARY

The purpose of this Responsiveness Summary is to review public response to the Proposed Plan for OU 8. It also documents the consideration of comments during the decision-making process and provides answers to any comments raised during the public comment period.

The Responsiveness Summary for OU 8 is divided into the following sections:

- **Overview** - This section briefly describes the remedial alternative recommended in the Proposed Plan and any impacts on the Proposed Plan due to public comment.
- **Background on Community Involvement** - This section describes community relations activities conducted with respect to the area of concern.
- **Summary of Major Questions and Comments** - This section summarizes verbal and written comments received during the public meeting and the public comment period.

I. OVERVIEW

This Responsiveness Summary addresses public response to the Proposed Plan. The Proposed Plan and other supporting information are maintained for public review in the Administrative Record file for OU 8, which is maintained at the Monmouth County Library (Eastern Branch) in Shrewsbury, New Jersey.

II. BACKGROUND ON COMMUNITY INVOLVEMENT

This section provides a brief history of community participation in the investigation and interim remedial planning activities conducted for OU 8. Throughout the investigation period, USEPA and NJDEP reviewed work plans and reports and provided comments and recommendations, which were incorporated into appropriate documents. A Technical Review Committee (TRC), consisting of representatives from the Navy, USEPA, the NJDEP, the Monmouth County Health Department, and other agencies and local groups surrounding NWS Earle, was formed. The TRC later was transformed into the Restoration Advisory Board (RAB) to include community members, as well as the original officials from the TRC. The RAB has been

holding periodic meetings to maintain open lines of communication with the community and to inform all parties of current activities.

On November 26, 27, and 28, 2003, a newspaper notification inviting public comment on the Proposed Plan appeared in the Asbury Park Press. The newspaper public notice summarized the Proposed Plan and the preferred alternative. The announcement also identified the time and location of the public meeting and specified a public comment period as well as the address to which written comments could be sent. Public comments were accepted from November 21, 2003 to December 22, 2003. The newspaper notification identified the Monmouth County Library - Eastern Branch, Route 35, Shrewsbury, New Jersey as the location of the Administrative Record.

The public meeting was held on December 10, 2003 at 7:00 PM at the Colts Neck Library Meeting Room, 1 Winthrop Road, Colts Neck, New Jersey. At this meeting, representatives from the Navy, USEPA and NJDEP were available to answer questions concerning OU 8 and the preferred alternative. The attendance list for the December 10, 2003 public meeting is included in Appendix B.

III. SUMMARY OF MAJOR QUESTIONS AND COMMENTS

A. Written Comments

During the public comment period from November 21, 2003 to December 22, 2003, no written comments were received from the public pertaining to OU 8. No new comments were received from NJDEP or USEPA.

B. Public Meeting Comments

Questions or comments concerning OU 8 received from the public at the December 10, 2003 public meeting are presented with the government response in Appendix C.

APPENDIX A

TERMS USED IN THE RECORD OF DECISION

Appendix A
TERMS USED IN THE RECORD OF DECISION

Applicable or Relevant and Appropriate Requirements (ARARs): The federal and state requirements with which a selected remedy must comply. These requirements may vary among sites and remedial activities.

Administrative Record: An official compilation of site-related documents, data, reports, and other information that are considered important to the status of and decisions made relative to a Superfund site. The public has access to this material.

Carcinogenic: A type of risk resulting from exposure to chemicals that may cause cancer in one or more organs.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): A federal law passed in 1980 and modified in 1986 by the Superfund Amendments and Reauthorization Act (SARA). The Act created a trust fund, known as Superfund, to investigate and clean up abandoned or uncontrolled hazardous substance facilities.

Feasibility Study (FS): Report identifying and evaluating alternatives for addressing the contamination present at a site or group of sites.

Groundwater Quality Standards (GWQS): New Jersey-promulgated groundwater quality requirements, N.J.A.C. 7:9-6.

Hazard Index (HI): The sum of chemical-specific Hazard Quotients. A Hazard Index of greater than 1 is associated with an increased level of concern about adverse non-cancer health effects.

Hazard Quotient (HQ): A comparison of the level of exposure to a substance in contact with the body per unit time to a chemical-specific Reference Dose to evaluate potential non-cancer health effects. Exceedence of a Hazard Quotient of 1 is associated with an increased level of concern about adverse non-cancer health effects.

Initial Assessment Study (IAS): Preliminary investigation usually consisting of review of available data and information on a site, interviews, and a non-sampling site visit to observe areas of potential waste disposal and migration pathways.

Maximum Contaminant Level (MCL): USEPA-published (promulgated as law) maximum concentration level for compounds found in water in a public water supply system.

Noncarcinogenic: A type of risk resulting from the exposure to chemicals that may cause systemic human health effects.

National Contingency Plan (NCP): The basis for the nationwide environmental restoration program known as Superfund; administered by USEPA under the direction of the U.S. Congress.

National Priorities List (NPL): USEPA's list of the nation's top-priority hazardous substance disposal facilities that may be eligible to receive federal money for response under CERCLA.

Record of Decision (ROD): A legal document that describes the remedy selected for a Superfund facility, why the remedial actions were chosen and others not, how much they are expected to cost, and how the public responded.

Reference Dose (RD): An estimate with an uncertainty spanning an order of magnitude or greater of a daily exposure level for the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of deleterious effects during a portion of a lifetime.

Remedial Action Objective (RAO): An objective selected in the FS against which all potential remedial actions are judged.

Remedial Investigation (RI): Study that determines the nature and extent of contamination at a site.

Site Inspection (SI): Sampling investigation with the goal of identifying potential sources of contamination, types of contaminants, and potential migration of contaminants. The SI is conducted prior to the RI.

Semivolatile Organic Compounds (SVOCs): Organic chemicals [e.g., phthalates or polycyclic aromatic hydrocarbons (PAHs)] that do not readily evaporate under atmospheric conditions.

Target Compound List/Target Analyte List (TCL/TAL): List of routine organic compounds (TCL) or metals (TAL) included in the USEPA Contract Laboratory Program.

Total Petroleum Hydrocarbons (TPH): Analysis that indicates the presence of fuel-related organic chemicals

Volatile Organic Compounds (VOCs): Organic liquids [e.g., vinyl chloride or trichloroethene (TCE)] that readily evaporate under atmospheric conditions.

APPENDIX B
LIST OF ATTENDEES
PUBLIC MEETING HELD ON DECEMBER 10, 2003

**NAVAL WEAPONS STATION EARLE
PUBLIC MEETING TO PRESENT THE PROPOSED REMEDIATION
PLAN FOR SITES 1 AND 11 (OU-8)
December 10, 2003**

NAME	AFFILIATION	E-MAIL	PHONE
Russ Turner	Tetra Tech	turnerr@ttnus.com	610-491-9688
Michele DiGeambeardino	EFANE - RPM	digeambeardinomx@efane.navfac.navy.mil	610-595-0567 x117
Bob Marcolina	NJDEP-BCM		732-262-7631
Chris Kerlish	EA Engineering	ckerlish@eaest.com	732-404-9370
CDR. Steven Steuer	NWS Earle	ssteuer@earle.navy.mil	732-866-2879
John Mayerski	RAB (Colts Neck)		732-462-9608
Mary Lanko	Howell Resident		732-462-2199
Gus Hermani	NWS Earle		732-866-2624
Nancy Eldridge	NWS Earle		732-866-2171
Larry Burg	NWS Earle	lburg@earle.navy.mil	732-866-2621

APPENDIX C
RESPONSE TO QUESTIONS AND COMMENTS
PUBLIC MEETING HELD ON DECEMBER 10, 2003

RESPONSIVENESS SUMMARY
OU 8 ROD (Site 1 and Site 11)
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY
(December 10, 2003 Public Meeting)

I. Reply to Comments on the OU 8 Proposed Plan

1. Mr. Burg asked if the classification exception area has been determined already.

Response: Mr. Turner replied that no, it has not. The CEA would be described on an actual surveyed map to be prepared for the purpose. At this point this is just a proposed alternative that can change. Based on comments from the public or any other stakeholder, in consultation with the EPA and NJDEP, the Navy could change the recommended alternative.