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RECORD OF DECISION
OPERABLE UNIT 6 (OU 6)
Sites 3 and 10

NAVAL WEAPONS STATION EARLE
Colts Neck, New Jersey

Naval Facilities Engineering Command
Mid-Atlantic

Contract Number N62472-03-D-0057
Contract Task Order 033

August 2006

TETRA TECH NUS, INC.

RECORD OF DECISION
NAVAL WEAPONS STATION EARLE
OPERABLE UNIT 6

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RECORD OF DECISION
NAVAL WEAPONS STATION EARLE
OPERABLE UNIT 6 (SITES 3 AND 10)

PART I - DECLARATION

I. SITE NAME AND LOCATION

Naval Weapons Station Earle
Colts Neck, Monmouth County, New Jersey
ID Number: NJ0170022172
Operable Unit 6 - Landfill Southwest of "F" Group (Site 3) and Scrap Metal Landfill (Site 10)

II. STATEMENT OF BASIS AND PURPOSE

This Record of Decision (ROD) presents the remedial action alternative selected for Operable Unit 6 (OU 6) to address soil and groundwater contamination at the Naval Weapons Station (NWS) Earle Site, located in Colts Neck, New Jersey. OU 6 includes the landfill southwest of “F” group (Site 3) and the scrap metal landfill (Site 10), that have been grouped together as OU 6 based on their similar potential effect on human and/or environmental receptors.

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 6. 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 6, 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. NJDEP 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. The state concurrence letter is included in Appendix A. Terms used in the ROD are presented in Appendix B.

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 OU 6, 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 (EPA), in consultation with NJDEP, have selected the following remedies for OU 6, Sites 3 and 10. The remedies address cover/capping of each landfill, institutional controls, and long-term groundwater monitoring. The selected remedies for Sites 3 and 10 include the following major components:

SITE 3:

1. Limited removal of protruding landfill contents, additional soil cover, grading, and vegetation will be placed over the former landfill to reduce infiltration, promote drainage, limit erosion, and preclude potential contact with the landfill contents.

2. Land use controls (LUCs) will be implemented by the Navy according to the document entitled "Principles and Procedures for Specifying, Monitoring and Enforcement of Land Use Controls and other Post-ROD actions" as agreed between EPA and the Department of Defense (DoD). A Remedial Design (RD) for LUCs will be incorporated into the Base Master Plan to limit future uses of the site to prevent disturbance of the landfill cover system or direct contact with contaminated media such as landfill contents and groundwater use. Activities to be prohibited will include digging into or disturbing the landfill cover or contents of the landfill, residential development on the site, and use of untreated groundwater from the aquifer beneath the site for purposes other than environmental monitoring and testing without Navy approval until groundwater is found to meet the New Jersey groundwater quality standards (GWQS) and EPA Safe Drinking Water Act (SDWA) maximum contaminant levels (MCLs). A Classification Exception Area (CEA) pursuant to New Jersey Administrative Code (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 and to ensure that use of the groundwater in the affected area is prohibited until two consecutive sampling events result in no groundwater contaminant concentrations in excess of GWQS. The Navy is responsible for implementing, maintaining, reporting on, and enforcing the land use controls described in the ROD in accordance with the RD for LUC. 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.

The LUC objectives are:

a) Maintain the integrity of any current or future remedial or monitoring system such as monitoring wells, fencing, signage and the landfill cover;
b) Except for environmental monitoring, prevent access or use of untreated groundwater until cleanup levels are met;
c) Prohibit the development and use of property for residential housing, elementary and secondary schools, child care facilities and playgrounds; and
d) Prohibit excessive vehicular traffic and digging into or disturbing the landfill cover or contents of the landfill.

These objectives will be implemented through mechanisms, such as the RD for LUC amended to the Base Master Plan, fencing and signage at the landfill cover, 30 years of operations and maintenance (O&M) and annual status reporting for the cover, establishment of the NJDEP-compliant CEA and conduct of a site review every five years.

3. A cable-type fence with locking gates and appropriate warning signs will be erected around the landfill to limit access to the site, to preclude excessive vehicular traffic, to restrict human contact with contaminated landfill materials, and to protect the integrity of the soil cover.

4. Long-term periodic groundwater monitoring will be conducted to assess contaminant status and potential threats to human health and the environment. Since wastes will be left in place, site conditions and risks will be reviewed every five years.

Site 10:

1. Grading of the landfill area, combined with placement of an engineered Resource Conservation and Recovery Act (RCRA)-type cap system, will prevent potential human and animal contact with landfill materials and reduce infiltration of surface water. The RCRA-type cap system would be installed over all former landfill areas. An initial one-year period of cap O&M and annual status reporting by the contractor installing the cap will be extended to 30 years as the responsibility of the Navy.

2. LUCs will be implemented by the Navy according to the document entitled, “Principals and Procedures for Specifying, Monitoring and Enforcement of Land Use Controls and other Post-ROD actions” as agreed between EPA and the DoD. A RD for LUCs will be incorporated into the Base Master Plan to limit future uses of the site to prevent disturbance of the landfill cap or direct

contact with contaminated media, such as landfill contents and groundwater. Activities to be prohibited will include digging into or disturbing the landfill cap or contents of the landfill, residential development on the site, and use of untreated groundwater from the aquifer beneath the site for purposes other than environmental monitoring and testing without Navy approval until groundwater is found to meet GWQS and MCLs. A CEA 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 and to ensure that use of groundwater in the affected area is prohibited until two consecutive sampling events result in no groundwater contaminant concentrations in excess of GWQS. The Navy is responsible for implementing, maintaining, reporting on, and enforcing the land use controls described in the ROD in accordance with the RD for LUC. 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.

The LUC objectives are:

a) Maintain the integrity of any current or future remedial or monitoring system such as monitoring wells, fencing, signage and the landfill cap;
b) Except for environmental monitoring, prevent access or use of untreated groundwater until cleanup levels are met;
c) Prohibit the development and use of property for residential housing, elementary and secondary schools, child care facilities and playgrounds; and
d) Prohibit excessive vehicular traffic and digging into or disturbing the landfill cover or contents of the landfill.

These objectives will be implemented through mechanisms, such as the RD for LUC amended to the Base Master Plan, fencing and signage at the landfill cap, 30 years of O&M and annual status reporting for the cap, establishment of the NJDEP-compliant CEA and conduct of a site review every five years.

3. A cable-type fence with locking gates and appropriate warning signs will be erected around the landfill cap to limit access to the site, to preclude excessive vehicular traffic, to restrict potential human contact with contaminated landfill materials, and to protect the integrity of the cover system.
4. Long-term periodic groundwater monitoring will be conducted to assess contaminant status and potential threats to human health and the environment. Since wastes will be left in place, site conditions and risks will be reviewed every five years.

Although the remedial action objective (RAO) for groundwater protection at Site 3 (prevention of potential human exposure to metals in groundwater) will not be immediately achieved, risks will be reduced in relation to background by the reduction of infiltration and continued monitoring to evaluate

contaminant trends. Implementation of the CEA according to New Jersey regulatory guidelines and long-term periodic monitoring and analysis will determine when the RAO for groundwater at Site 3 is achieved. Implementation of a CEA at Site 10 combined with periodic monitoring will determine when NJDEP GWQSs are attained. All other RAO's for protection of human health and the environment will be achieved upon implementation of the remedy selected for Sites 3 and 10.

V. STATUTORY DETERMINATION

The selected remedy is protective of human health and the environment and is cost effective. The Navy and EPA believe that the selected remedy will comply with all federal and state requirements that are legally applicable or relevant and appropriate to the remedial action. The selected remedy utilizes a permanent solution to the maximum extent practicable.

Because this remedy will result in hazardous substances remaining on site above health-based levels, a review by the Navy, EPA, and NJDEP will be conducted within five years after initiation of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

John S. Frisco

for George Pavlou
Division Director ERRD
U.S. Environmental Protection Agency, Region II

8/15/06
Date

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

2 AUG 06
Date

RECORD OF DECISION
NAVAL WEAPONS STATION EARLE
OPERABLE UNIT 6 (SITES 3 AND 10)

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, located on the Sandy Hook Bay (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 NWS Earle.

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.

OU 6 consists of two former landfills located in the Mainside area: the landfill southwest of “F” group (Site 3) and the scrap metal landfill (Site 10) (Figure 2). Site 3 is located in Howell Township and Site 10 is located in Colts Neck Township. The OU 6 sites were grouped together based on similarities of potential for contaminants to migrate to human and/or environmental receptors. A brief description of each of these sites follows.

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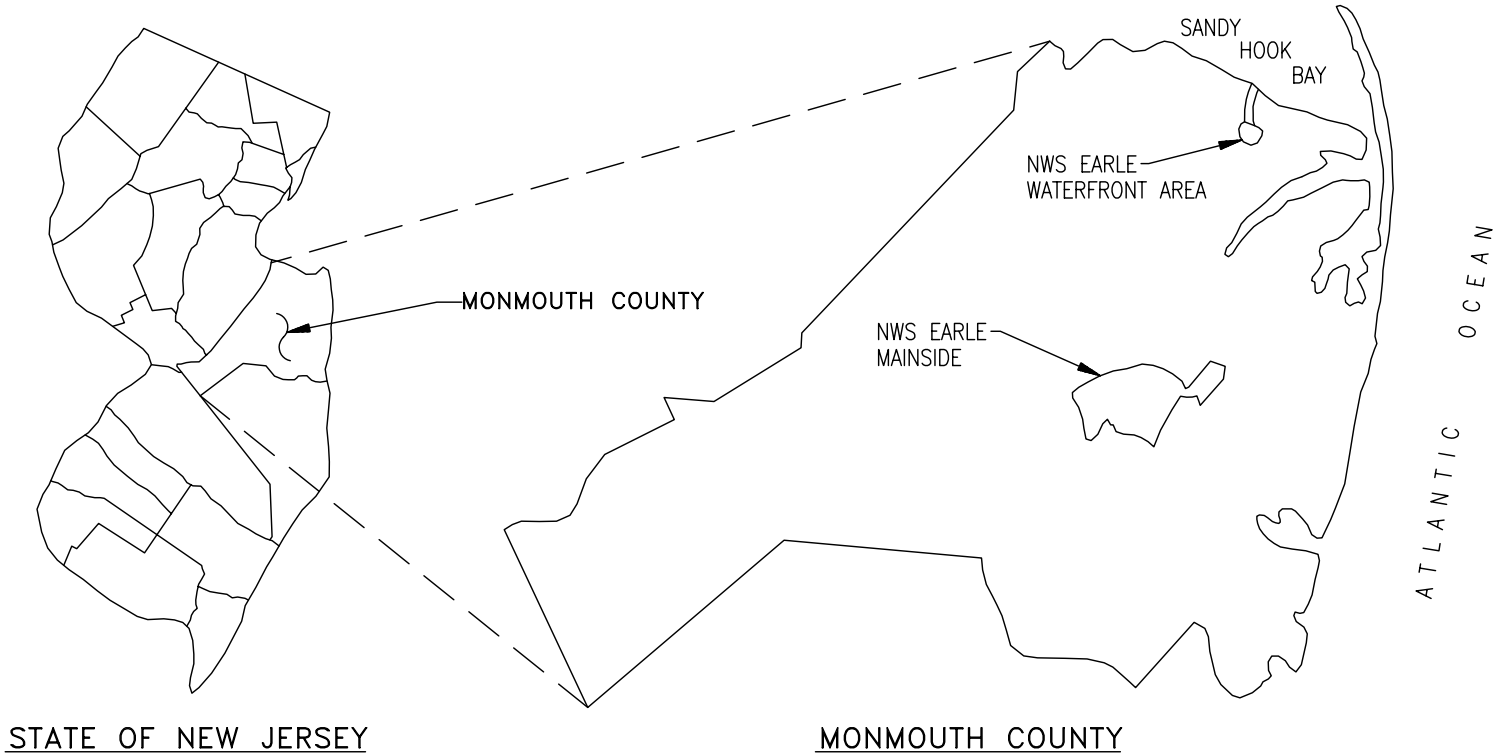

DRAWN BY MKB DATE 08/10/04	Tetra Tech NUS, Inc.	REGIONAL SITE MAP NAVAL WEAPONS STATION EARLE COLTS NECK, NEW JERSEY	CONTRACT NO. 2128 CTO NO. 843
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REVISED BY DATE			APPROVED BY DATE
SCALE NOT TO SCALE			DRAWING NO. FIGURE 1 REV.

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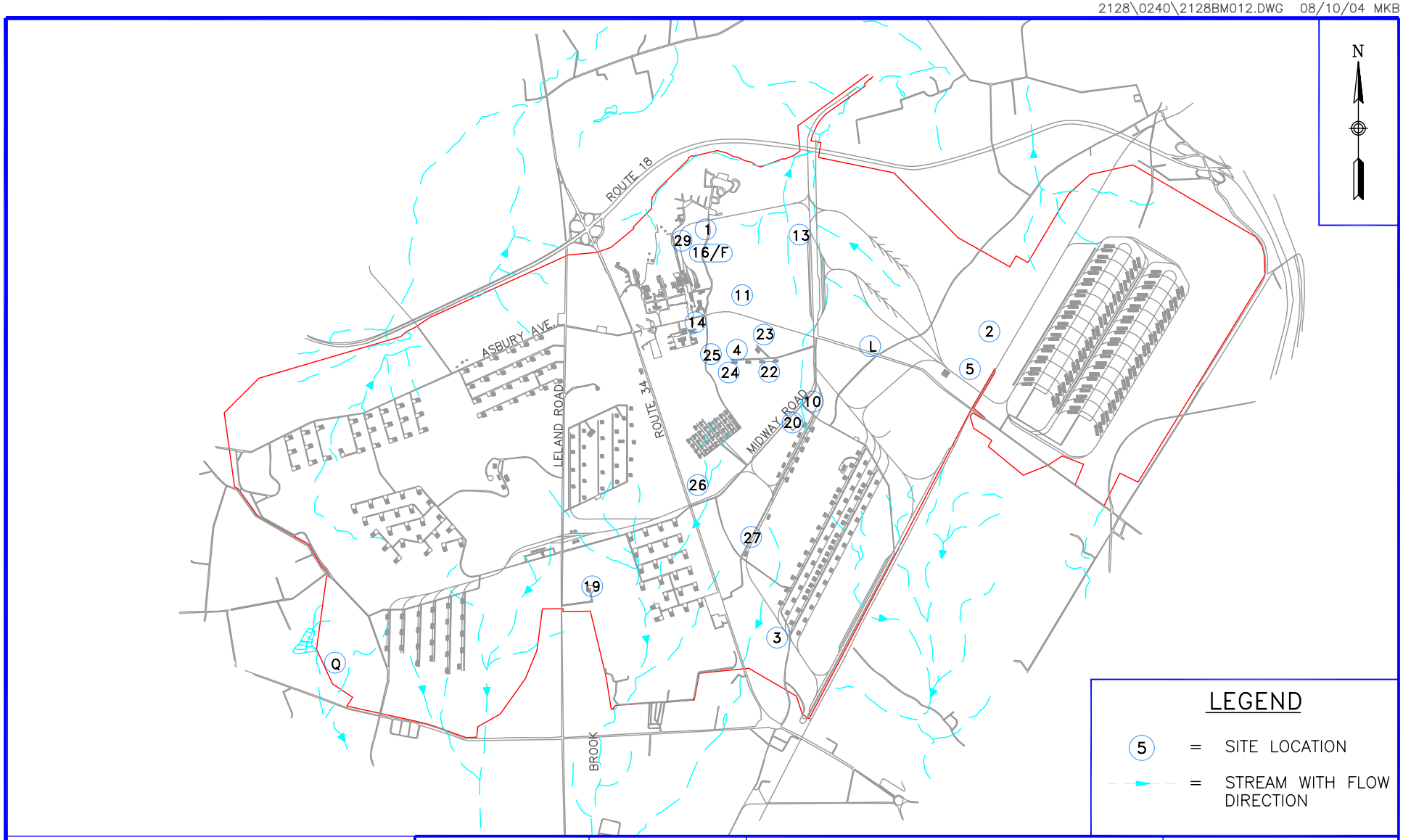

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REVISED BY	DATE		
SCALE NOT TO SCALE			

CONTRACT NO. 2128	CTO NO. 843
OWNER NO. OU 6	
APPROVED BY	DATE
DRAWING NO. FIGURE 2	REV.

B. Site 3: Landfill Southwest of "F" Group

The landfill southwest of "F" group (Figure 3) is a 5-acre site that was used from 1960 to 1968 for the disposal of domestic and industrial wastes. Typical thickness of fill material ranges from about 2 to 4 feet. Industrial wastes reportedly disposed at Site 3 consisted of paints and paint thinners, solvents, varnishes, shellac, acids, alcohols, caustics, pesticide containers and rinse water, wood, and small amounts of asbestos. A thin layer of sandy soil was placed to cover the landfill contents.

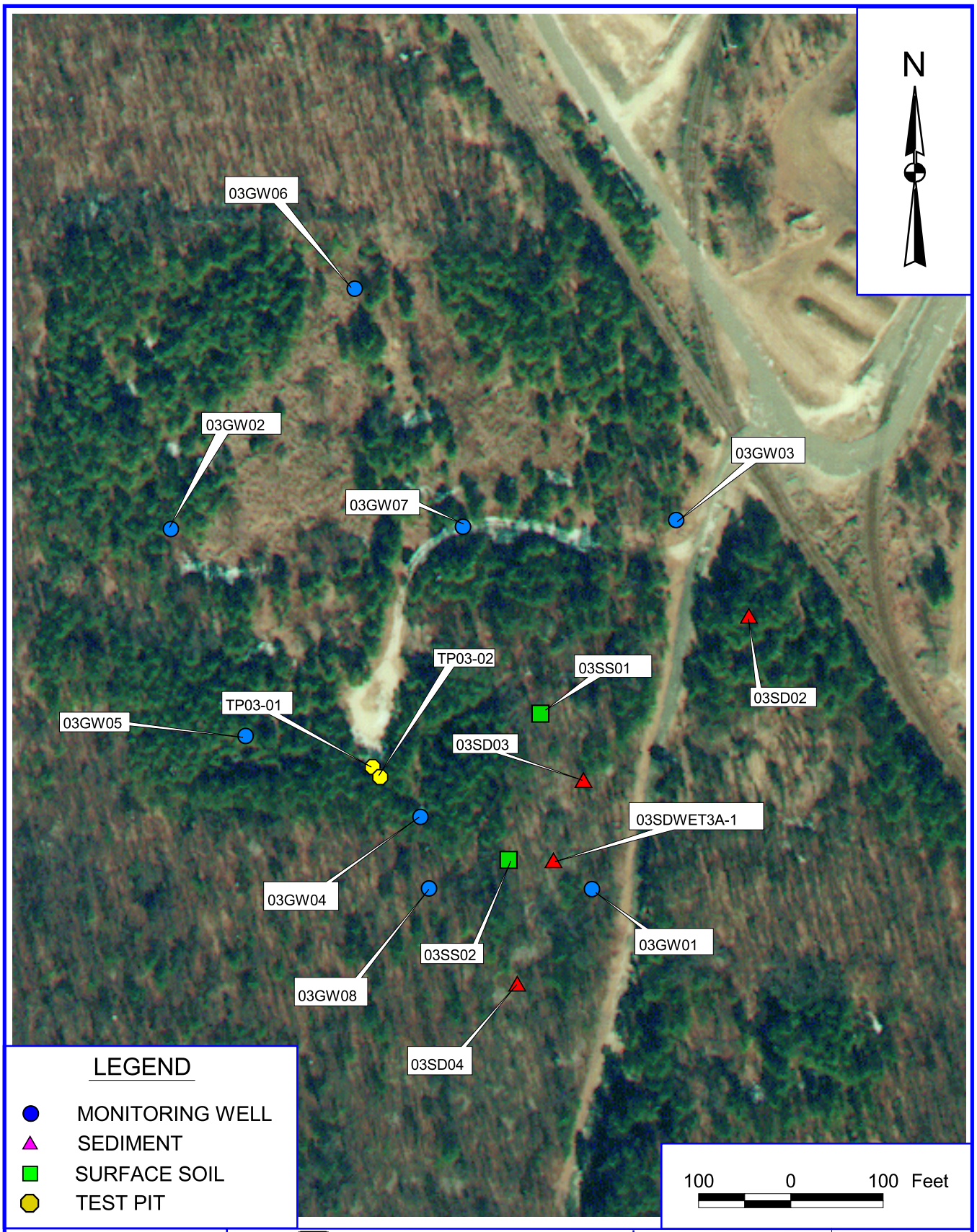
C. Site 10: Scrap Metal Landfill

The scrap metal landfill (Figure 4) is a 2-acre site that was used from 1953 to 1965 for the disposal of demilitarized munitions and spent munitions cases. There is no known evidence that any live ammunition is interred at the site. Only certified-inert (i.e., no energetic potential remaining) materials were reported to have been disposed here. An estimated 65,000 cubic yards, which includes cover material, were disposed at the site. The disposed material consisted primarily of aluminum and steel containers. Spent grit and paint chips from the ammunition re-work operations were also buried. The landfill was primarily covered with a very thin covering of sandy soil.

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. The RI investigation at Sites 3 and 10 included the installation and sampling of monitoring wells, collection of soil, surface water, and sediment samples, and excavation of test pits to observe wastes and sample subsurface soils.

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. Activities included installation and sampling of groundwater monitoring wells, surface water and sediment sampling, and surface and subsurface soil sampling.



DRAWN BY MKB	DATE 08/11/04	Tetra Tech NUS, Inc.	CONTRACT NO. 2128 / CTO NO. 843 / OWNER NO. OU 6
CHECKED BY RJT	DATE	SAMPLE LOCATIONS SITE 3 - LANDFILL SOUTHWEST OF "F" GROUP NAVAL WEAPONS STATION EARLE COLTS NECK, NEW JERSEY	PROJECT FILE: 2128-0240.apr LAYOUT: SITE 3 SAMPLE LOCATIONS
COST/SCHEDULE-AREA			APROVED BY / DATE
SCALE AS NOTED			DRAWING No. FIGURE 3 / REV

LEGEND

- = MONITORING WELL LOCATION
- = APPROXIMATE LANDFILL BOUNDARY
- = DLG STREAM COVERAGE SOURCE: USGS RESTON, VA

DRAWN BY MKB	DATE 08/11/04	Tetra Tech NUS, Inc.	CONTRACT NO. 2128 / CTO NO. 843 / OWNER NO. OU 6
CHECKED BY RET	DATE	SAMPLE LOCATIONS SITE 10 SCRAP METAL LANDFILL NAVAL WEAPONS STATION EARLE COLTS NECK, NEW JERSEY	PROJECT FILE: 2128-0240.apr LAYOUT: SITE 10 SAMPLE LOCATIONS
COST/SCHEDULE-AREA			APROVED BY / DATE
SCALE AS NOTED			DRAWING No. FIGURE 4 / REV

The Phase II RI was initiated in 1995 and completed in July 1996, when the final RI Report was released. An addendum remedial investigation, consisting of additional surface soil samples from the southeastern face of the Site 3 landfill and sediment samples from the drainage pathway southeast of Site 3 were obtained in 1996 to determine if the landfill could be the source of contamination seen in one sediment sample taken from the wetlands area south of Site 3 previously.

Results from the final RI and Addendum 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 feasibility study, the Navy and EPA, 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.

There is a substantial gap between the public comment period (April 23, 2001 to May 23, 2001) for the Proposed Plan and submission of the final ROD (June 2005) due to policy negotiations between DoD and EPA regarding the approach to ensuring implementation of land use controls.

III. HIGHLIGHTS OF COMMUNITY PARTICIPATION

The documents that the Navy and EPA used to develop, evaluate, and select a remedial alternative for OU 6 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 6 were released to the public in September 2000. The notice of availability of these documents was published in the Asbury Park Press on May 5, 6, and 7, 2001. A public comment period was held from April 23, 2001 to May 23, 2001.

A public meeting was held during the public comment period on May 10, 2001. At this meeting, representatives from the Navy and EPA were available to answer questions about OU 6 and the remedial alternatives under consideration. The results of the public comment period are included in the Responsiveness Summary, which is included in Part III of this ROD.

IV. SCOPE AND ROLE OF RESPONSE ACTION FOR OPERABLE UNIT 5

The Navy completed an RI, FS, and Proposed Plan for OU 6, addressing contamination associated with Sites 3 and 10 at NWS Earle. These studies showed that groundwater and/or soils in the areas of the former landfills had been contaminated with metals and some organic compounds such as semivolatile

compounds and pesticides. The final remedial action to address site contamination at each landfill is described in this document.

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 6, 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. 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 is approximately 9 or 10 miles east of the Mainside area. There are six different watersheds that originate on 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 under NJDEP Water Technical Programs Groundwater Quality Standards in 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 often used for public water supplies and the shallower aquifers may be used for private home owner well domestic supplies.

OU 6 is situated in the recharge area of the Kirkwood-Cohansey aquifer system. The Kirkwood-Cohansey aquifer system is a source of water in Monmouth County and is composed of the generally unconfined sediments of the Cohansey Sand and Kirkwood Formation. The Kirkwood-Cohansey aquifer system has been reported in previous investigations as being used for residential wells in the Mainside area. Along the coast, this aquifer system is underlain by thick diatomaceous clay beds of the Kirkwood Formation.

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 a number of private wells located within a 1-mile radius of NWS Earle and several within the NWS Earle boundaries. Although the majority of the off-Base wells are used for potable supplies, none is near enough to either OU 6 site to possibly be impacted. On-Base wells (located at remote building locations) are not used for potable water supply.

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

1. Site 3

Site 3 is characterized as an open area surrounded by woodlands. The site is moderately vegetated with grasses and scrub pines. There are several scarred areas with no vegetation in the northeastern portion of the site. The ground surface is relatively flat, with ground elevations varying between 115 and 125 feet above mean sea level (MSL). Wetlands are located southeast of the site. Groundwater flow is generally to the southeast toward the wetland, based on groundwater-level measurements.

2. Site 10

Site 10 is an open area surrounded by wetlands. The site is accessed via a dirt road from the south and is bordered by railroad tracks to the southeast, a wetland to the north, and a drainage ditch to the east. The site is vegetated with grasses and pines, except for the access road and an open area (vehicle turn-around area) in the middle where no vegetation exists. The ground surface is relatively flat, with an average elevation approximately 110 feet above MSL. The groundwater flow direction is to the northwest, north, and northeast based on measured groundwater levels.

C. Geology

1. Site 3

Regional mapping places Site 3 within the outcrop area of the Kirkwood Formation. The Kirkwood Formation ranges between 60 and 100 feet in thickness. The lithology of the sediments encountered in the on-site borings generally agrees with the published description of the Kirkwood and Vincentown Formations. In general, the borings encountered white and yellowish-brown, very fine- to fine-grained sand with minor silt and clay layers, dark gray silt and clay (probably representative of the Kirkwood Formation) and glauconitic, medium- to coarse-grained sand (probably representative of the Vincentown Formation).

Based upon the boring log descriptions, wells MW3-02 through MW3-07 penetrated the Kirkwood Formation and well MW3-01 penetrated the Kirkwood and Vincentown Formations.

2. Site 10

Regional mapping places Site 10 within the outcrop area of the Kirkwood Formation; upper colluvium may be present at the site. The Kirkwood Formation ranges between 60 and 100 feet in thickness. The upper colluvium has a maximum thickness of 10 feet. The lithology of the soils encountered in the on-site borings generally agrees with the published descriptions of the upper colluvium and the Kirkwood and Vincentown Formations. The on-site borings were no greater than 27.5 feet deep.

Based upon the boring log descriptions, wells MW10-05 and MW10-07 penetrated the upper colluvium, Kirkwood Formation, and Vincentown Formation, and wells MW10-01 through MW10-04 and MW10-06 penetrated the Kirkwood and Vincentown Formations.

D. Hydrogeology

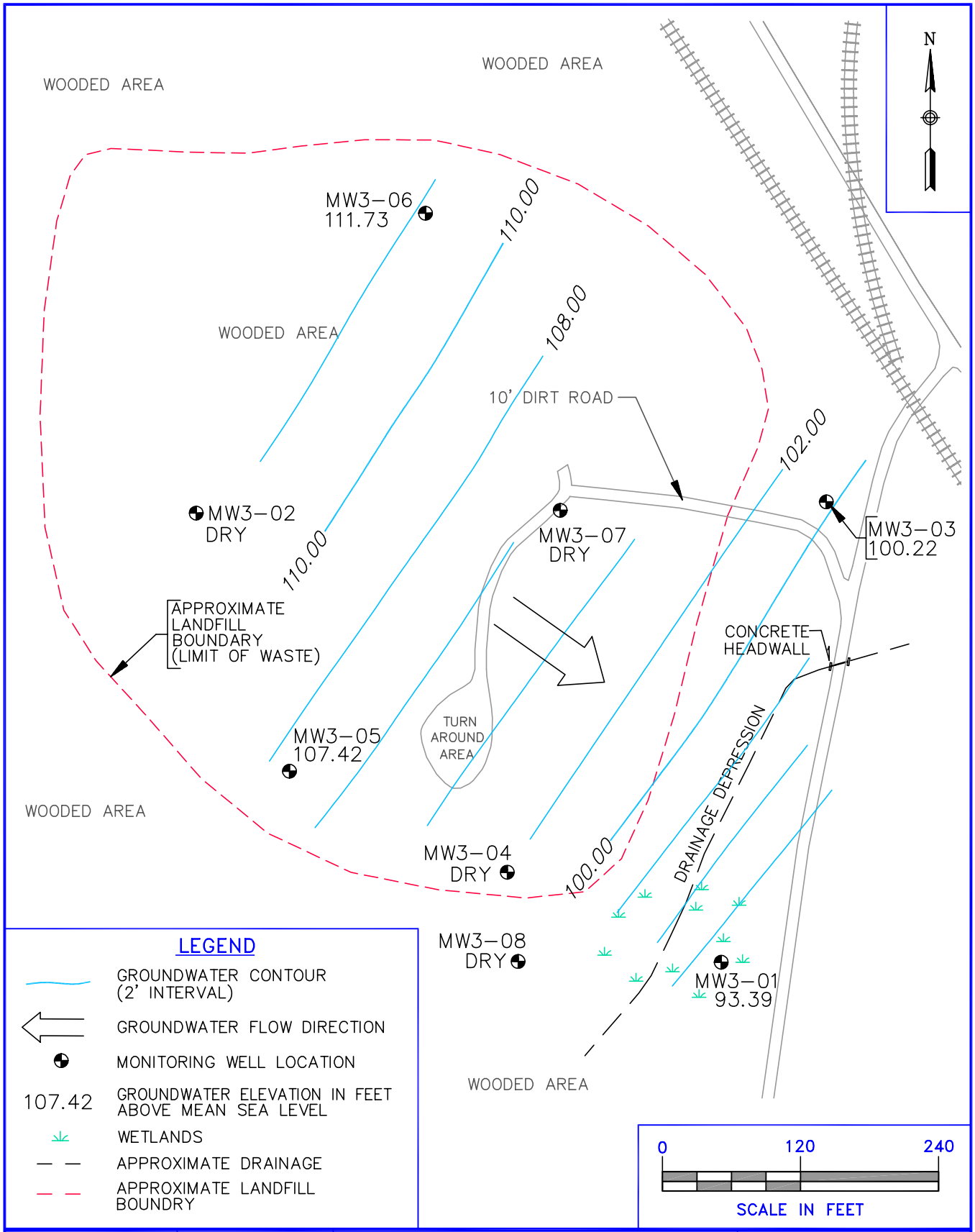
1. Site 3

Groundwater in the Kirkwood and Vincentown aquifer beneath the site occurs under unconfined conditions, and the formations are interpreted to be hydraulically connected. Static-water-level measurements and water-table elevations were recorded in August and October 1995. A groundwater contour map is presented in Figure 5. The direction of shallow groundwater flow in the aquifer, as indicated by the August groundwater elevations, is toward the southeast. An adequate representative sample of water levels could not be obtained in October because most of the wells were dry. There appears to be a significant seasonal variation in groundwater flow direction. The hydraulic conductivities calculated for MW3-03 and MW3-06, both of which are screened in the Kirkwood Formation, are 7.16 x 10^{-4} cm/sec (2.03 ft/day) and 5.50 x 10^{-4} cm/sec (1.56 ft/day), respectively.

2. Site 10

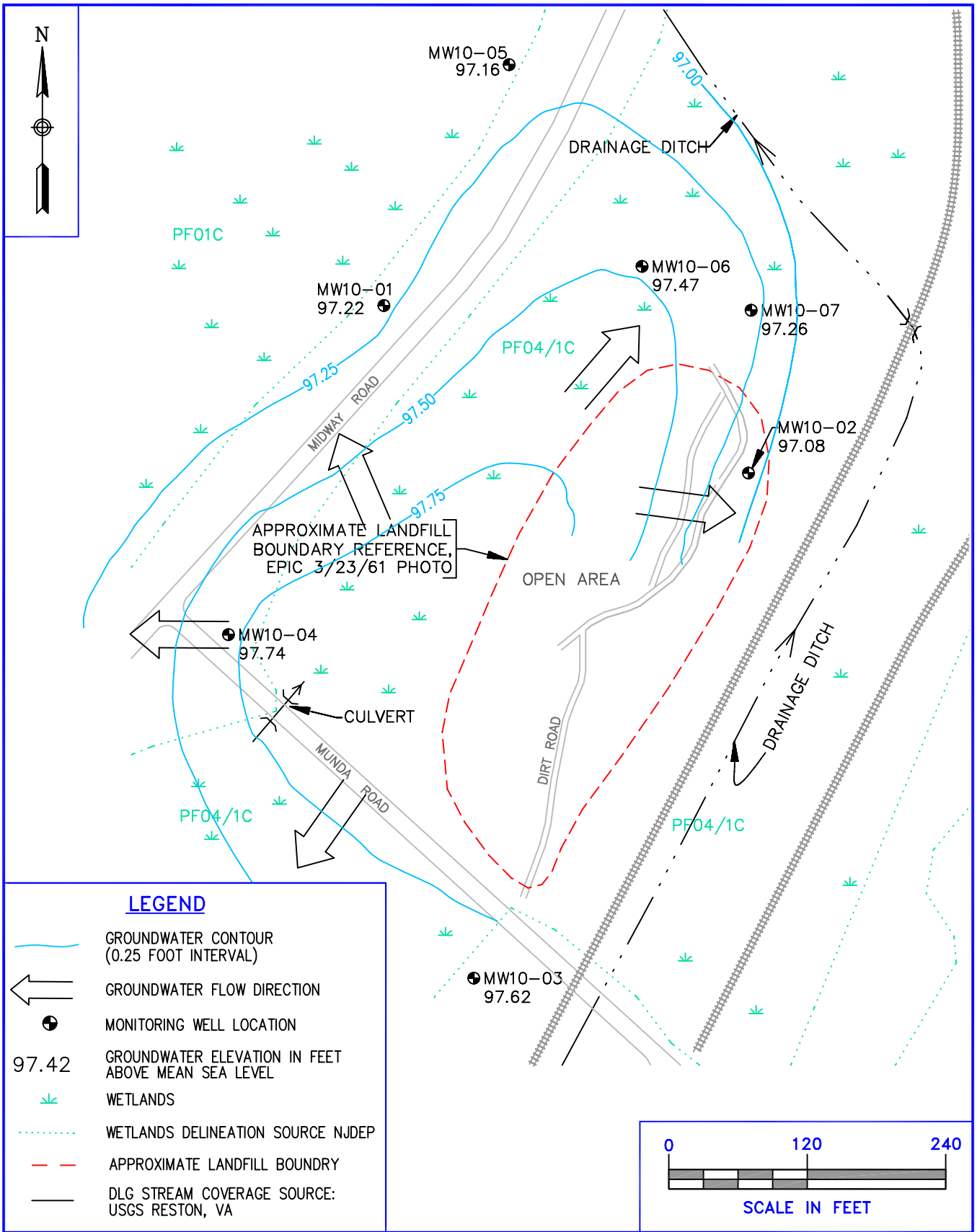
Groundwater in the upper colluvium, Kirkwood and Vincentown aquifer beneath the site occurs under unconfined conditions, and the formations are interpreted to be hydraulically interconnected. Groundwater contour maps are presented in Figure 6 (August 1995) and Figure 7 (October 1995). The direction of shallow groundwater flow in the aquifer is toward the northwest, north, and northeast. There does not appear to be a significant seasonal variation in groundwater flow direction. The hydraulic conductivities calculated for MW10-04 (Kirkwood and Vincentown Formation), MW10-05 (upper colluvium, Kirkwood Formation, and Vincentown Formation), and MW10-07 (upper colluvium, Kirkwood Formation, and Vincentown Formation) are 2.54 x 10^{-4} cm/sec (0.72 ft/day), 6.99 x 10^{-4} cm/sec (1.98 ft/day), and 1.75 x 10^{-3} cm/sec (4.97 ft/day), respectively.

2128\0240\2128CM04.DWG 08/10/04 MKB



DRAWN BY MKB DATE 08/10/04	Tetra Tech NUS, Inc.	GROUNDWATER CONTOUR MAP AUGUST 7, 1995 SITE 3 – LANDFILL SOUTHWEST OF "F" GROUP NAVAL WEAPONS STATION EARLE COLTS NECK, NEW JERSEY	CONTRACT NO. 2128 CTO NO. 843
CHECKED BY DATE			OWNER NO. OU 6
REVISED BY DATE			APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. FIGURE 5 REV.

2128\0240\2128CM06.DWG 08/10/04 MKB



LEGEND

- GROUNDWATER CONTOUR (0.25 FOOT INTERVAL)
- GROUNDWATER FLOW DIRECTION
- MONITORING WELL LOCATION
- 97.42 GROUNDWATER ELEVATION IN FEET ABOVE MEAN SEA LEVEL
- WETLANDS
- WETLANDS DELINEATION SOURCE NJDEP
- APPROXIMATE LANDFILL BOUNDRY
- DLG STREAM COVERAGE SOURCE: USGS RESTON, VA

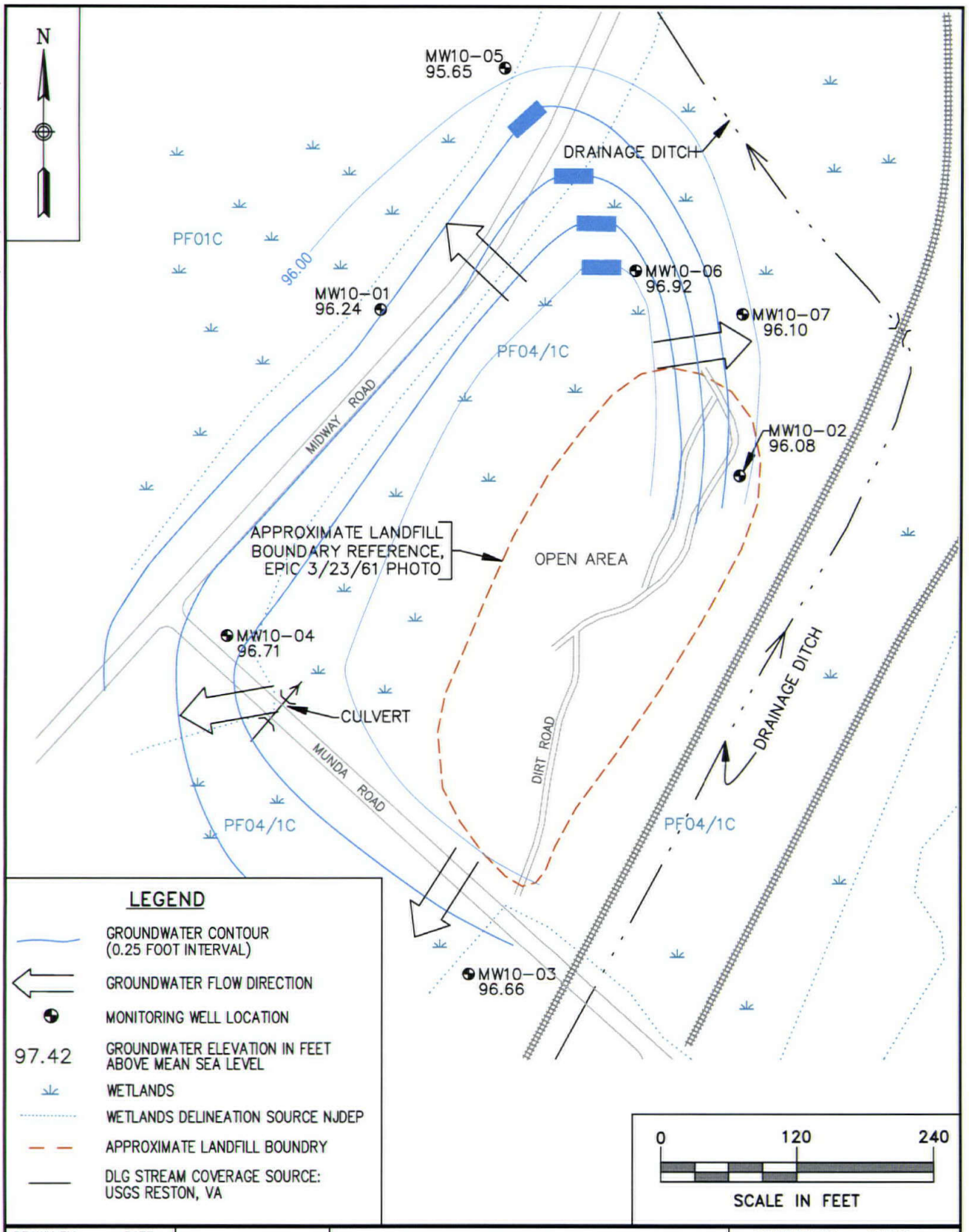
0 120 240

SCALE IN FEET

DRAWN BY MKB	DATE 08/10/04	Tetra Tech NUS, Inc.	GROUNDWATER CONTOUR MAP AUGUST 7, 1995 SITE 10 SCRAP METAL LANDFILL NAVAL WEAPONS STATION EARLE COLTS NECK, NEW JERSEY
CHECKED BY	DATE		
REVISED BY	DATE		
SCALE AS NOTED			

CONTRACT NO. 2128	CTO NO. 843
OWNER NO. OU 6	
APPROVED BY	DATE
DRAWING NO. FIGURE 6	REV.

2128\0240\2128CM08.DWG 08/10/04 MKB



DRAWN BY MKB DATE 08/10/04	Tetra Tech NUS, Inc.	GROUNDWATER CONTOUR MAP OCTOBER 17, 1995 SITE 10 SCRAP METAL LANDFILL NAVAL WEAPONS STATION EARLE COLTS NECK, NEW JERSEY	CONTRACT NO. 2128 CTO NO. 843
CHECKED BY DATE			OWNER NO. OU 6
REVISED BY DATE			APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. FIGURE 7 REV.

E. Nature and Extent of Contamination

1. Site 3

a. IAS and SI Results

The 1983 IAS consisted of interviews and on-site observations. Based on the potential for groundwater impacts to the Kirkwood Aquifer, the site was recommended for further investigation.

A confirmation study in 1986 (now known as a site investigation) included the installation and sampling of three monitoring wells, MW3-01 through MW3-03. Groundwater samples were found to have a relatively low pH, but no compounds were found at concentrations above regulatory limits at that time. No other Site 3 media were sampled in the confirmation study.

b. Phase I Remedial Investigation

The Navy conducted Phase I RI activities in 1993 at NWS Earle. During the RI/FS, seven test pits were excavated to obtain a physical description of the waste materials and surrounding soils, and four additional monitoring wells were installed at Site 3 to monitor groundwater quality. Two representative samples of soil in contact with the waste were taken from the test pits to obtain a representative characterization of the status of soils in the area.

Based on visual inspection of test pit excavations, the landfill contains typical municipal waste. The two soil samples collected from the test pits were analyzed for Target Compound List (TCL) organics and Target Analyte List (TAL) inorganics and total petroleum hydrocarbons (TPH). Three semivolatile compounds, fluoranthene, pyrene, and bis(2-ethylhexyl) phthalate, were detected at concentrations below the method detection limit. Barium was detected at a concentration of 1,320 mg/kg, TPH was detected at a concentration of 110 mg/kg, and trace levels of pesticides were encountered in one sample. Barium was the only compound detected at a concentration above NJDEP Residential Soil Cleanup Criteria (700 mg/kg). It should also be noted that the duplicate sample (in reference to the high barium concentration sample) had a concentration of only 307 mg/kg of barium. The 1993 RI analytical data did not meet validation criteria and was only used quantitatively in the risk assessment.

Groundwater from all seven wells was collected and analyzed for full TCL/TAL analytes. Later rounds of groundwater samples were analyzed for volatile organic compounds (VOCs), drinking water metals, and inorganic landfill indicator parameters at a limited number of wells.

In groundwater samples, an elevated level of arsenic (0.37 ppm) was found in one downgradient well MW3-01. This high level of arsenic in groundwater was not reproduced in later sampling events. The elevated reading was obtained from an unfiltered sample. While turbidity was not recorded during the first sampling round, analysis of a highly turbid sample could yield artificially high levels of metals due to suspended solids. Given the low recovery from wells at this site and the fine silty sand in the subsurface soils, it is reasonable to assume the high reading for arsenic in the first sampling round could have been due to a turbid sample. Turbidity readings from subsequent sampling rounds at Site 3 were as high as 1240 turbidity units versus the primary drinking water standard of 1-5 turbidity units. Since subsequent sampling events in all media (including groundwater) at Site 3 encountered arsenic at levels near or below the corresponding background arsenic concentration for that medium, this high arsenic reading was not used for the risk assessment calculations. Sediment was the only media where background concentrations for arsenic exceeded the regulatory levels.

Elevated levels of VOCs and semivolatile organic compounds (SVOCs) were found in some wells, particularly monitoring well MW3-04 with acetone (970 ug/L) and xylene (470 ug/L). Wells MW3-04 and MW3-05 had low levels of several pesticide compounds.

Monitoring wells downgradient of the landfill contained higher levels of the landfill indicator parameters [chemical oxygen demand (COD) (235 to 1,960 mg/l), and sulfate (64.9 to 74.6 mg/l)] than were found in the upgradient well (COD, 96.8 mg/l; sulfate, 14.3). Subsequent analysis in the final RI Report concluded that, although this former landfill has some impact on shallow groundwater quality, the water percolating through the landfill is not indicative of a concentrated leachate that would be in itself an ecological or human health risk.

c. Phase II Remedial Investigation

Between May and October 1995, the Navy conducted the following field investigation activities:

- Soil gas survey and analysis at 25 locations.
- Excavation of two test pits.
- Drilling and installation of one shallow permanent monitoring well.
- Sampling and analysis of groundwater from monitoring wells.
- Measurement of static water levels in monitoring wells.
- Sampling and analysis of one surface soil in the wetlands southeast of the landfill (03SDWET3A-1).

Tables 1 through 5 compare the results of background samples to samples collected at Site 3.

Concentrations of most metals in site-related sediment samples were similar to the range associated with background samples. Antimony was found in sediment sample (03SDWET3A-1) at a low concentration (1.3 mg/kg) near the instrument detection limit but was not detected in the background samples. Polycyclic aromatic hydrocarbons (PAHs), including benz(a)anthracene, benzo(a)pyrene, chrysene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, fluoranthene, fluorene, and pyrene, were detected in 03SDWET3A-1 at concentrations two to three times above background concentrations. 4-4'-DDT was detected in sediment samples at concentrations ranging from 3 to 4 ug/kg; however, background concentrations as high as 19 ug/kg were detected. Alpha-BHC and heptachlor epoxide were detected in sample 03SDWET3A-1 at 0.082 ug/kg and 2.2 ug/kg, respectively. With the exception of beryllium, the site-related samples also showed the presence of all the metals found in background, in addition to arsenic and thallium. The highest concentrations of metals in Site 3 groundwater samples were detected in the sample collected at 03 GW 01. This well and one other (03 GW 03) required sample filtering in the field. The filtered sample from the downgradient location, 03 GW 01, exhibited fairly high aluminum levels (5,520 ug/L) and also displayed concentrations greater than background ranges for antimony and cadmium. Other metals, such as iron, zinc, and barium, were present at considerably lower levels in the filtered sample. Arsenic was present in the unfiltered sample at the slightly elevated level of 0.0151 ppm in the unfiltered sample but at only 0.0045 ppm in the filtered sample. Sample 03 GW 05, collected from a well cross-gradient from the landfill, displayed an elevated level of manganese, and sample 03 GW 06 (an upgradient location) exhibited thallium at a low level. VOCs detected above the GWQS in MW3-04 in 1991 could not be replicated. Neither MW3-04 nor the newly installed MW3-08 yielded sufficient water to obtain a sample. While a soil gas survey in the vicinity of MW3-04 showed some evidence of volatile organics, subsequent test pitting, targeted toward the highest soil gas readings, did not find any significant source of these contaminants. 2-Butanone (5 ug/L) and gamma-chlordane (0.0081 ug/L) were each detected in one groundwater sample collected at Site 3. Neither of these compounds was detected in background groundwater samples.

Figure 8 shows sample locations and concentrations of compounds that exceed Applicable or Relevant and Appropriate Requirements (ARARs) and other guidance to be considered (TBC).

TABLE 1
OCCURRENCE AND DISTRIBUTION OF INORGANICS IN SURFACE SOILS AT SITE 3
NWS EARLE, COLTS NECK, NEW JERSEY
(mg/kg)

SUBSTANCE	BACKGROUND***				SITE-RELATED					
	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	UTL**	2 X AVERAGE CONCENTRATION	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	AVERAGE CONCENTRATION	MEAN > 2 X BKGD	MEAN > BACK UTL	REPRESENTATIVE CONCENTRATION
ALUMINUM	4 / 4	1710 - 5310	4.6E+9	6153	2 / 2	319 - 339.5	329.25	NO	NO	339.50
ANTIMONY*	NOT DETECTED	-	-	-	1 / 2	0.45 - 0.48	0.34	YES	-	0.48
ARSENIC*	4 / 4	1.35 - 14.4	9.6E+2	13.43	1 / 2	1.3 - 1.3	0.83	NO	NO	1.30
BARIUM	4 / 4	1.85 - 31	3.6E+3	22.53	2 / 2	4 - 5.95	4.98	NO	NO	5.95
CADMIUM	1 / 4	0.3975 - 0.3975	6.7E-2	0.58	1 / 2	0.0905 - 0.0905	0.06	NO	NO	0.09
CALCIUM	4 / 4	40.1 - 519	2.3E+7	551.80	2 / 2	42 - 71	56.50	NO	NO	71.00
COBALT	2 / 4	0.75 - 5	1.0E+1	3.15	2 / 2	0.36 - 0.64	0.50	NO	NO	0.64
COPPER	4 / 4	0.97 - 8.4	4.5E+2	10.06	2 / 2	1.7 - 5.7	3.70	NO	NO	5.70
IRON	4 / 4	3745 - 62500	3.0E+12	52403	2 / 2	457 - 773.5	615.25	NO	NO	773.50
LEAD	4 / 4	1.8 - 39.4	2.1E+4	37.30	2 / 2	10.9 - 27.05	18.98	NO	NO	27.05
MANGANESE	4 / 4	3.45 - 214	4.3E+2	128.33	2 / 2	5.85 - 7.8	6.83	NO	NO	7.80
NICKEL	2 / 4	1.8 - 7.2	6.2E+1	5.18	2 / 2	0.39 - 1.25	0.82	NO	NO	1.25
POTASSIUM	4 / 4	95 - 792	5.9E+7	912.50	2 / 2	64.1 - 86.65	75.38	NO	NO	86.65
SILVER	2 / 4	0.37 - 0.67	2.3E-1	0.69	2 / 2	0.17 - 0.205	0.19	NO	NO	0.21
VANADIUM	4 / 4	11.05 - 64	5.0E+4	70.13	2 / 2	4.2 - 4.85	4.53	NO	NO	4.85
ZINC	3 / 4	0.665 - 27.6	6.1E+3	22.58	2 / 2	2.3 - 6.55	4.43	NO	NO	6.55

* - Selected as a COPC

** - Upper Tolerance Limit = UTL is the concentration that is estimated to contain a designated portion (95%) of all possible sample measurements.

*** - Background samples are as follows: BGSB0100, BGSB0200 (AND A DUPLICATE, DUP-4), BGSB0300, BGSB0400.

TABLE 2
OCCURRENCE AND DISTRIBUTION OF INORGANICS IN SEDIMENT AT SITE 3
NWS EARLE, COLTS NECK, NEW JERSEY
(mg/kg)

SUBSTANCE	BACKGROUND***				SITE-RELATED					
	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	UTL**	2 X AVERAGE CONCENTRATION	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	AVERAGE CONCENTRATION	MEAN > 2 X BKGD	MEAN > BACK UTL	REPRESENTATIVE CONCENTRATION
ALUMINUM	6 / 6	839 - 3940	8.1E+7	5460	4 / 4	615 - 9870	4896	NO	NO	9870
ANTIMONY*	NOT DETECTED	-	-	-	1 / 4	1.3 - 1.3	0.50	YES	-	1.13
ARSENIC*	5 / 6	2.4 - 9.9	2.9E+2	11.23	3 / 4	1.1 - 11	4.69	NO	NO	11.00
BARIUM	6 / 6	3.2 - 15.8	2.9E+2	16.80	4 / 4	2.6 - 60.8	23.00	YES	NO	60.80
BERYLLIUM	4 / 6	0.34 - 0.57	3.3E-1	0.72	2 / 4	0.26 - 0.47	0.20	NO	NO	0.47
CADMIUM	2 / 6	0.44 - 0.46	1.1E+0	0.93	3 / 4	0.083 - 2.1	0.57	NO	NO	1.77
CALCIUM	6 / 6	179 - 518	6.7E+5	690.83	3 / 3	59.2 - 2570	957.07	YES	NO	2570
CHROMIUM	6 / 6	4.3 - 56	2.6E+3	40.42	2 / 2	22.1 - 24.3	23.20	NO	NO	24.30
COBALT	4 / 6	0.51 - 2.1	6.4E+0	2.85	4 / 4	0.43 - 2.3	1.05	NO	NO	2.30
COPPER	6 / 6	1 - 13	1.9E+1	9.08	4 / 4	1.6 - 24.3	8.55	NO	NO	24.30
IRON	6 / 6	228 - 21400	7.2E+9	23589	4 / 4	613 - 21200	9663	NO	NO	21200
LEAD	6 / 6	4 - 34.3	4.8E+1	21.07	4 / 4	6.5 - 89.1	29.43	YES	NO	76.44
MAGNESIUM	6 / 6	60.7 - 880	2.0E+6	809.90	2 / 4	545 - 1400	507.34	NO	NO	1400
MANGANESE	6 / 6	3.9 - 63.1	8.9E+1	36.22	4 / 4	5.2 - 59.5	28.38	NO	NO	59.50
MERCURY*	1 / 6	0.068 - 0.068	8.5E-3	0.09	1 / 4	0.26 - 0.26	0.12	YES	YES	0.23
NICKEL	5 / 6	1.6 -- 6	3.4E+1	6.90	4 / 4	0.67 - 9.5	3.78	NO	NO	9.50
POTASSIUM	5 / 6	86.1 - 2900	1.4E+7	1892	4 / 4	85.5 - 2640	824.38	NO	NO	2258
SILVER	2 / 6	0.1125 - 0.15	2.8E+0	1.13	3 / 4	0.16 - 0.44	0.22	NO	NO	0.44
SODIUM	4 / 6	26.6 - 2280	2.9E+3	876.80	2 / 4	85.3 - 226	120.83	NO	NO	203.65
VANADIUM	6 / 6	5.9 - 42.7	2.1E+3	39.42	4 / 4	2.6 - 31.7	18.08	NO	NO	31.70
ZINC	6 / 6	12.5 - 34.7	1.5E+3	41.23	3 / 3	5.1 - 10.4	7.43	NO	NO	10.40

* - Selected as a COPC

** - Upper Tolerance Limit = UTL is the concentration that is estimated to contain a designated portion (95%) of all possible sample measurements.

*** - Background samples are as follows: BGSD01,BGSD02,BGSD04 through BGSD07.

TABLE 3
OCCURRENCE AND DISTRIBUTION OF ORGANICS IN SEDIMENT AT SITE 3
NWS EARLE, COLTS NECK, NEW JERSEY
(ug/kg)

SUBSTANCE	BACKGROUND**			SITE-RELATED		
	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	REPRESENTATIVE CONCENTRATION	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	REPRESENTATIVE CONCENTRATION
4,4'-DDT*	1 / 6	19 - 19	10.61	2 / 4	3 - 4	4
ALPHA-BHC*	NOT DETECTED	-	-	1 / 4	0.082 - 0.082	0.082
ALPHA-CHLORDANE*	NOT DETECTED	-	-	1 / 4	2.1 - 2.1	2.1
HEPTACHLOR EPOXIDE*	NOT DETECTED	-	-	1 / 4	2.2 - 2.2	2.2
2-METHYLNAPHTHALENE*	NOT DETECTED	-	-	1 / 4	140 - 140	140
ACENAPHTHENE*	NOT DETECTED	-	-	1 / 4	52 - 52	52
ACENAPHTHYLENE	NOT DETECTED	-	-	1 / 4	130 - 130	130
ANTHRACENE*	NOT DETECTED	-	-	1 / 4	140 - 140	140
BENZO(A)ANTHRACENE*	3 / 6	85 - 590	560	3 / 4	68 - 1300	1117
BENZO(A)PYRENE*	3 / 6	110 - 590	393.60	3 / 4	81 - 4100	1200
BENZO(B)FLUORANTHENE*	3 / 6	150 - 490	346.54	3 / 4	110 - 2000	1704
BENZO(G,H,I)PERYLENE*	3 / 6	51 - 380	380	1 / 4	1000 - 1000	874.24
BENZO(K)FLUORANTHENE*	3 / 6	63 - 470	470	1 / 4	50 - 50	50
BIS(2-ETHYLHEXYL)PHTHALATE*	NOT DETECTED	-	-	1 / 4	82 - 82	82
BUTLBENZYLPHTHALATE*	NOT DETECTED	-	-	1 / 4	64 - 64	64
CARBAZOLE*	NOT DETECTED	-	-	1 / 4	70 - 70	70
CHRYSENE*	3 / 6	130 - 940	577.87	3 / 4	130 - 1800	1538
DIBENZ(A,H)ANTHRACENE*	NOT DETECTED	-	-	1 / 4	240 - 240	240
FLUORANTHENE	3 / 6	240 - 1800	1024	3 / 4	160 - 2200	1876
FLOURENE*	1 / 6	190 - 190	190	1 / 4	260 - 260	260
INDENO (1,2,3-CD)PYRENE*	3 / 6	55 - 310	310	1 / 4	880 - 880	773.69
NAPHTHALENE*	NOT DETECTED	-	-	1 / 4	130 - 130	130
PHENANTHRENE*	3 / 6	110 - 1900	1052	3 / 4	180 - 2400	2047
PYRENE*	3 / 6	200 - 1900	1077	3 / 4	190 - 3400	2886

* - Selected as a COPC.

** - Background samples are as follows: BGSD01,BGSD02,BGSD04 through BGSD07.

TABLE 4
OCCURRENCE AND DISTRIBUTION OF INORGANICS IN GROUNDWATER AT SITE 3
NWS EARLE, COLTS NECK, NEW JERSEY
(ug/L)

	BACKGROUND***				SITE-RELATED					
SUBSTANCE	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	UTL**	2 X AVERAGE CONCENTRATION	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	AVERAGE CONCENTRATION	MEAN > 2 X BKGD	MEAN > BACK UTL	REPRESENTATIVE CONCENTRATION
ALUMINUM	11 / 11	287 - 7870	9.6E+6	5098	4 / 4	268 - 7930	2286	NO	NO	6715
ARSENIC*	1 / 11	5.8 - 5.8	6.6E+0	4.05	1 / 4	15.1 - 15.1	5.01	YES	NO	15.10
BARIUM	11 / 11	2.6 - 518	5.8E+2	229.60	4 / 4	2.6 - 689	187.45	NO	NO	581.36
CADMIUM*	5 / 11	0.6 - 1.9	2.3E+0	1.21	3 / 4	2.3 - 11.7	5.17	YES	YES	11.70
CALCIUM	11 / 11	506 - 17200	1.7E+4	8307	4 / 4	3920 - 7260	5515	NO	NO	7260
CHROMIUM*	NOT DETECTED	-	-	-	3 / 4	1.3 - 9.8	3.25	YES	-	8.41
COBALT	6 / 11	0.7 - 10.1	9.6E+0	4.06	2 / 4	4.4 - 8.4	3.35	NO	NO	8.40
COPPER	9 / 11	0.79 - 13.5	1.4E+1	6.53	4 / 4	0.79 - 16.3	4.80	NO	NO	13.82
IRON	11 / 11	153 - 7690	8.5E+3	4197	4 / 4	440 - 26000	7090	YES	NO	21927
LEAD	3 / 11	2.1 - 3	3.1E+0	2.44	1 / 4	5.1 - 5.1	1.84	NO	NO	5.10
MAGNESIUM	11 / 11	273 - 27400	2.3E+4	8450	4 / 4	603 - 3240	1803	NO	NO	3240
MANGANESE	11 / 11	3.3 - 65	1.2E+3	46.18	4 / 4	4.4 - 534	147.68	YES	NO	451.42
MERCURY	11 / 11	0.005 - 0.12	2.0E-1	0.12	4 / 4	0.008 - 0.12	0.06	NO	NO	0.12
NICKEL	10 / 11	0.81 - 25.5	2.6E+1	11.98	4 / 4	1.1 - 22.7	9.23	NO	NO	22.70
POTASSIUM	11 / 11	350 - 3245	2.5E+6	2811	4 / 4	309 - 2270	1019	NO	NO	2270
SODIUM	11 / 11	1850 - 11650	1.3E+4	8449	4 / 4	3490 - 7460	4878	NO	NO	7460
THALLIUM	3 / 11	4 - 5.1	1.1E+1	5.15	1 / 4	4 - 4	2.35	NO	NO	4.00
VANADIUM	10 / 11	0.69 - 42.25	4.0E+1	16.48	2 / 4	0.69 - 11.3	3.15	NO	NO	9.55
ZINC	6 / 9	3.7 - 348	4.4E+2	178.61	3 / 4	109 - 623	247.95	YES	NO	623.00

* - Selected as a COPC

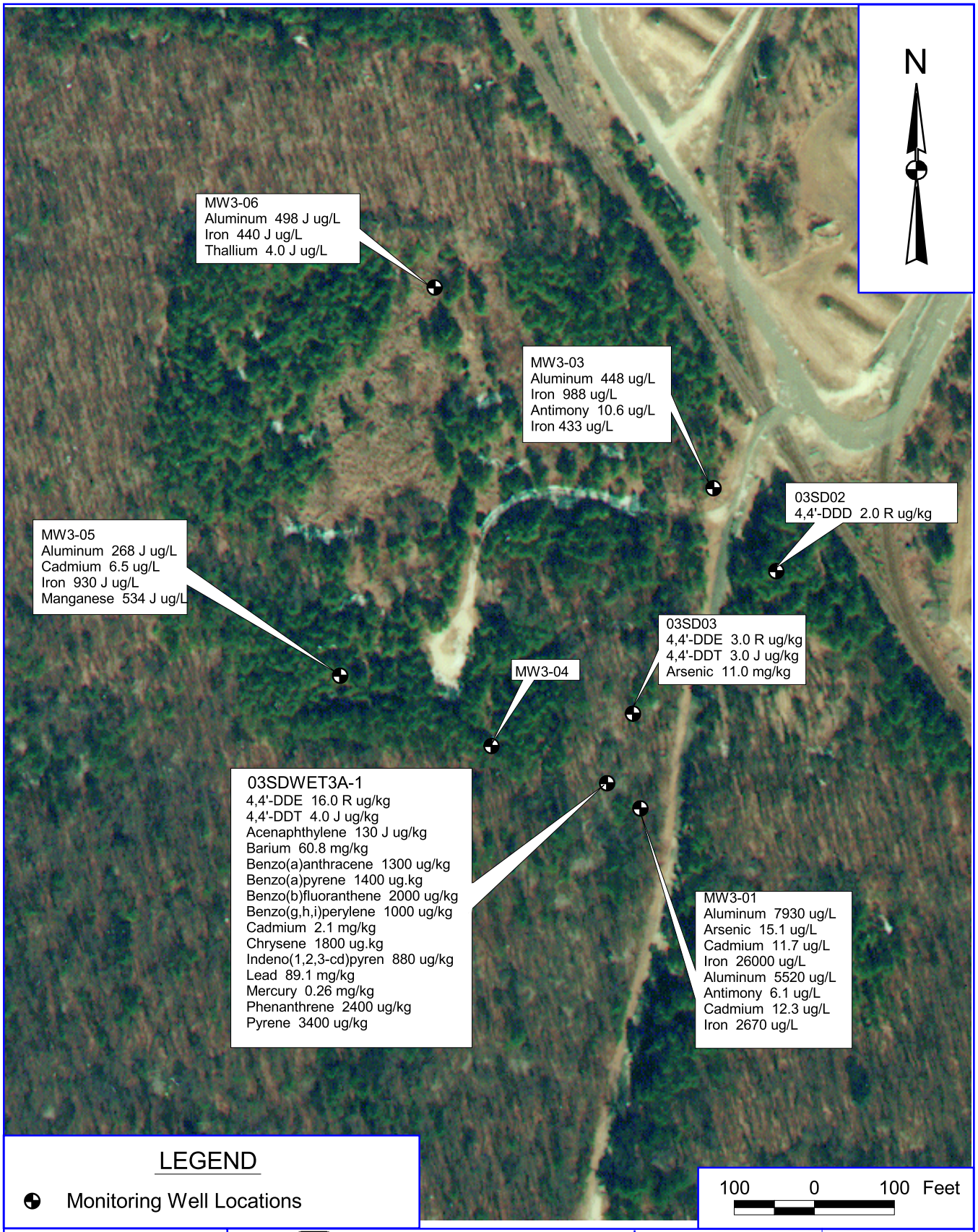
** - Upper Tolerance Limit

TABLE 5
OCCURRENCE AND DISTRIBUTION OF ORGANICS IN GROUNDWATER AT SITE 3
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
2-BUTANON *	NOT DETECTED	-	-	1 / 4	5 - 5	5
GAMMA-CHLORDANE*	NOT DETECTED	-	-	1 / 4	0.0081 - 0.0081	0.0081

* - Selected as a COPC.

** - Background samples are as follows: MW4-04, BGMW-02, BGMW-01, MW26-03, MW3-06, MW5-02, MW5-03, MW19-01, MW1-03, MW5-08, MW11-03.



DRAWN BY MKB	DATE 08/11/04	Tetra Tech NUS, Inc.	CONTRACT NO. 2128 / CTO NO. 843	OWNER NO. OU 6
CHECKED BY RJT	DATE	CONCENTRATIONS ABOVE SCREENING LEVELS SITE 3 - LANDFILL SOUTHWEST OF "F" GROUP NAVAL WEAPONS STATION EARLE COLTS NECK, NEW JERSEY	PROJECT FILE: 2128-0240.apr LAYOUT: SITE 3 CONCENTRATIONS	
COST/SCHEDULE-AREA			APROVED BY	DATE
SCALE AS NOTED			DRAWING No. FIGURE 8	REV

2. Site 10

a. IAS and SI Results

An IAS in 1983 consisting of a document search, interviews, and on-site observations concluded that materials present in the landfill were inert or not leaching due to the moderate range of pH values in the environment. Erosion of the very thin cover material was noted, along with the exposed corroded shell casings.

During the 1993 SI, three monitoring wells were installed, and surface water and groundwater samples were analyzed. Methylene chloride (possible laboratory artifact) was detected at MW10-01, MW10-02, and MW10-03. One metal and one semivolatile compound were detected in surface water samples.

b. Phase I Remedial Investigation

During the 1993 RI, four test pits were excavated and four monitoring wells were installed. One sample from Test Pit 1 was analyzed for TCL/TAL analytes and TPH. Waste was encountered in two of the four test pits. A layer of decomposed natural organic material (i.e., leaf, root, and organic silty matter) was encountered in all four test pits at a level between 3.5 and 5.5 feet. The waste consisted of metallic debris, such as rusted shell casings, at a level of 0 to 2 feet below the landfill surface. The cover material was thin to nonexistent. No sustained organic vapor readings were detected in any of the test pits. Two organics (possibly laboratory contaminants) and a low level of TPH were detected. Groundwater samples were collected from all seven wells and analyzed for TCL/TAL analytes, VOCs, drinking water metals, and landfill parameters. Elevated levels of metals were detected in several wells. Results of landfill parameters showed no distinction between downgradient wells and the upgradient wells. VOCs were detected, although these compounds are consistent with contamination by common laboratory artifacts. Additionally, three surface water and sediment samples were collected and analyzed for TCL/TAL analytes. The sediment samples were also analyzed for TPH and VOCs. Low levels of SVOCs and inorganics were detected in the sediment samples. It was considered likely that the SVOCs were associated with runoff from the adjacent railroad bed. Several VOCs typically associated with laboratory contaminants were detected in surface water samples. Metals concentrations were relatively low, and no polychlorinated biphenyl (PCB) or pesticide compounds were detected. For the surface water samples, low levels of VOCs and metals were detected.

Phase I RI data is generally suspect because of possible field and/or laboratory deficiencies. Data quality deficiencies could potentially have arisen as the result of insufficient quality control measures taken to avoid contaminating the field-collected sample with equipment decontamination solutions or

solvents either in the field, or in the laboratory. Therefore, Phase I data was used for planning Phase II RI field efforts but was not used in the calculation of site risks.

c. Phase II Remedial Investigation

Seven site-related groundwater samples (10 GW 01 through 10 GW 07) were collected at Site 10. Table 6 compares the results of background groundwater sample inorganic compound concentrations to samples collected at Site 10. Figure 9 shows sample locations and concentrations of compounds that exceed ARARs and TBCs.

Inorganics

Concentrations of most metals in Site 10 groundwater were within the range of background results; arsenic (4.7 ug/L in 10 GW 05), silver (1.5 ug/L in 10 GW 05), and thallium (3.7 ug/L in 10GW 04) were found in addition to the metals found in background samples. Iron was detected at an elevated concentration in 10 GW 04 (16,000 mg/L).

Organics

Sampling for organics was not conducted during the Phase II Remedial Investigation. While organics, primarily acetone, were detected in several samples during the Phase I RI, it was also found in the equipment and trip blanks. Acetone was used in both the field and laboratory equipment decontamination processes. Since all the test pits found only metallic debris (consistent with the reported use of the site), the organics found in Phase I were attributed to poor laboratory or field decontamination procedures.

Miscellaneous Parameters

Miscellaneous parameter analyses of seven groundwater samples at Site 10 consisted of ammonia, biochemical oxygen demand (BOD), COD, chlorides, nitrates, sulfates, total organic carbon (TOC), phosphates, and turbidity. The landfill is on a topographically high area; therefore, all monitoring wells are hydraulically downgradient of the landfill. TOC concentrations were greater than background levels, except in MW10-02. Ammonium and COD levels were above background levels in MW10-05, MW10-06, and MW10-07. Concentrations of sulfate exceeding background levels were detected in MW10-01 and MW10-07. BOD concentrations above background were detected in MW10-04 and MW10-05. Maximum detected concentrations were generally consistent between the RI activities over the years. Indicator parameter results are below the range associated with concentrated landfill leachate.

In summary, results of investigations at Site 10 indicate that aluminum, iron and manganese were found at concentrations above the corresponding GWQS.

TABLE 6
OCCURRENCE AND DISTRIBUTION OF INORGANICS IN GROUNDWATER AT SITE 10
NWS EARLE, COLTS NECK, NEW JERSEY
(ug/L)

SUBSTANCE	BACKGROUND			SITE-RELATED				
	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	2 X AVERAGE CONCENTATION	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	2 X AVERAGE CONCENTATION	MEAN > 2 X BKGD?	REPRESENTATIVE CONCENTRATION
ALUMINUM*	11 - 11	287 - 7870	5097.82	7 / 7	195 – 5820	2165.00	NO	5820.00
ARSENIC	1 - 11	5.8 - 5.8	4.05	1 / 7	4.7	2.09	NO	2.99
BARIUM	11 - 11	2.6 - 518	229.60	7 / 7	2 - 75.6	40.75	NO	75.60
BERYLLIUM	4 - 11	0.21 - 1.6	0.49	6 / 7	0.14 - 1.8	0.49	NO	0.93
CADMIUM	5 - 11	0.6 - 1.9	1.21	3 / 7	0.45 - 0.85	0.36	NO	0.55
CALCIUM	11 - 11	506 - 17200	8306.55	7 / 7	1100 – 6945	2745.00	NO	5938.13
CHROMIUM	ND	-	-	7 / 7	3.2 - 22.8	8.889	YES	13.75
COBOLT	6 - 11	0.7 - 10.1	4.06	7 / 7	2.1 – 5	3.16	NO	4.11
COPPER*	9 - 11	0.79 - 13.5	6.53	1 / 7	6.7	1.29	NO	5.85
IRON*	11 - 11	153 - 7690	4197.09	7 / 7	186 – 16600	3258.43	NO	7676.42
LEAD*	3 - 11	2.1 - 3	2.44	2 / 7	2.1 - 2.55	1.20	NO	2.15
MAGNESIUM	11 - 11	273 - 27400	8449.64	7 / 7	380 – 3285	1796.43	NO	3285.00
MANGANESE	11 - 11	3.3 - 65	46.18	7 / 7	2.9 – 144	39.37	NO	74.58
MERCURY*	11 - 11	0.005 - 0.12	0.12	7 / 7	0.084 - 0.11	0.10	NO	0.11
NICKEL	10 - 11	0.81 - 25.5	11.98	7 / 7	1.6 - 9.35	5.68	NO	9.35
POTASSIUM	11 - 11	350 - 3245	2810.55	7 / 7	574 – 6950	2283.00	NO	3939.99
SILVER	ND	-	-	1 / 7	1.5	0.62	YES	0.93
SODIUM	11 - 11	1850 - 11650	8449.09	7 / 7	2150 – 30800	10730.00	YES	17566.96
THALLIUM*	3 - 11	4 - 5.1	5.15	1 / 7	3.7	2.07	NO	2.61
VANDIUM	10 - 11	0.69 - 42.25	16.48	7 / 7	0.71 – 15	5.02	NO	15.00

Note: Selected COPCs are indicated in boldface type.
* - Indicated COPCs eliminated based on amended risk assessment
ND - Indicated Not Detected

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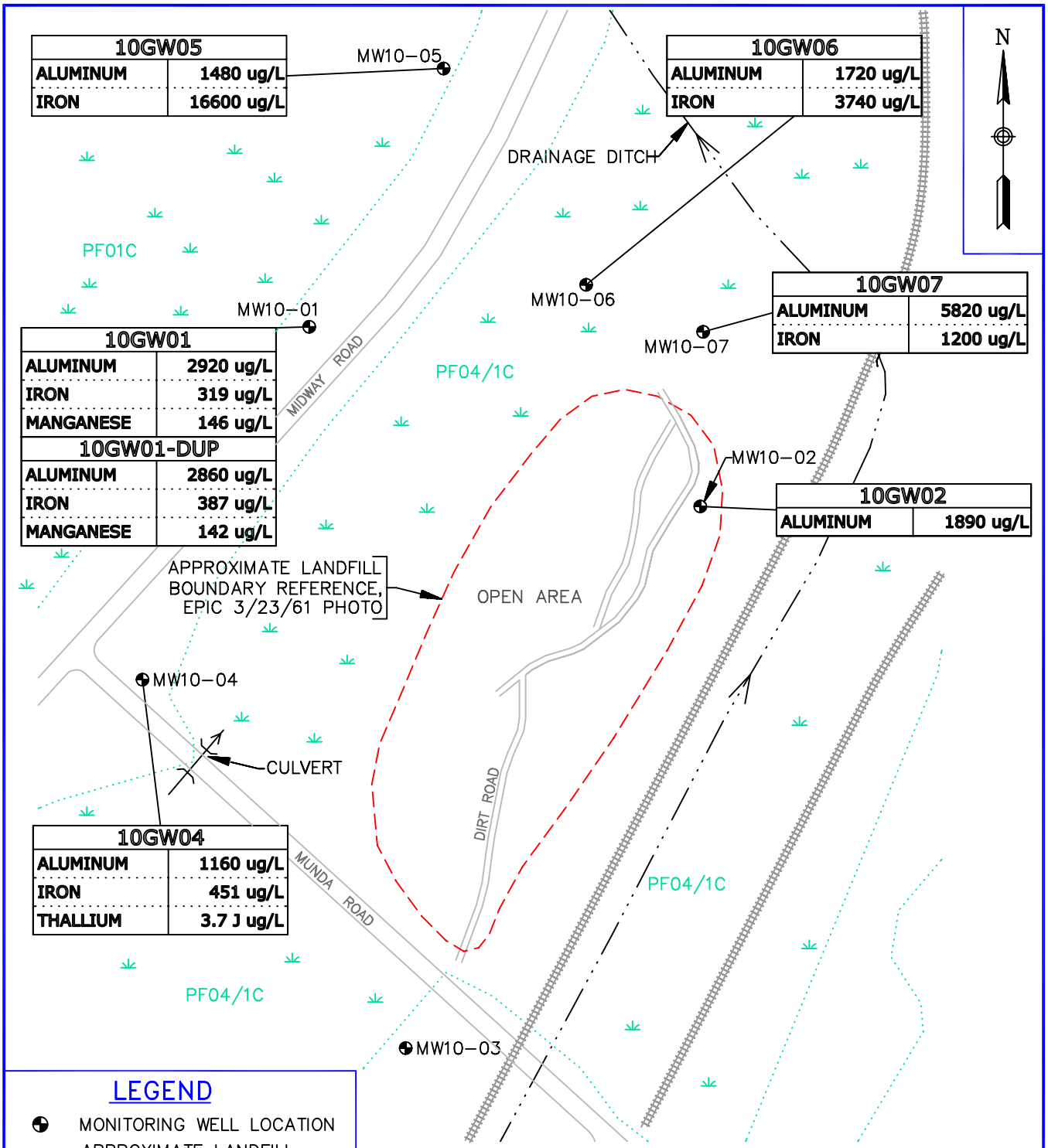

LEGEND

- MONITORING WELL LOCATION
- APPROXIMATE LANDFILL BOUNDRY
- WETLANDS
- WETLANDS DELINEATION SOURCE NJDEP
- DLG STREAM COVERAGE SOURCE: USGS RESTON, VA

0 120 240

SCALE IN FEET

DRAWN BY MKB	DATE 08/10/04	CONCENTRATIONS ABOVE SCREENING LEVELS SITE 10 SCRAP METAL LANDFILL NAVAL WEAPONS STATION EARLE COLTS NECK, NEW JERSEY	CONTRACT NO. 2128 / CTO NO. 843
CHECKED BY	DATE		OWNER NO. OU 6
REVISED BY	DATE	Tetra Tech NUS, Inc.	APPROVED BY / DATE
SCALE AS NOTED			DRAWING NO. FIGURE 9 / REV.

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 6. A four-step process was used for assessing site-related human health risks for a reasonable maximum exposure scenario: 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 affects 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 from contaminated soils.
- Inhalation or incidental ingestion of contaminants in soil (e.g., fugitive dusts).
- Incidental ingestion of surface water and sediment.
- Dermal contact with contaminated surface water or sediment.

Following EPA risk assessment guidance, these scenarios were applied to various site use categories, including future industrial, residential, and recreational receptors although reasonably anticipated land use would be limited to the future maintenance worker to periodically cut the grass and inspect the fencing and landfill cover/cap integrity. NWS Earle is not expected to be included in Base closure or realignment in the foreseeable future, so the only anticipated land use at this time will be maintenance of the cover/cap and fencing to protect the landfill cap.

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 1×10^{-6} (an increase of

one case of cancer for one million people exposed) to 1 x 10^{-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 MCLs for drinking water, GWQS, or other published lists of reference values.

A baseline human health risk assessment was conducted for the OU 6 site. Results of this assessment are discussed in the following paragraphs.

1. <u>Site 3</u>

The potential receptors considered for this site were future industrial, residential, and recreational receptors. The reasonable maximum exposure (RME) scenario cancer risks associated with future residential and future industrial exposure scenarios did not exceed the upper end of the conservative EPA guidance target risk range.

The RME estimates for noncarcinogenic HIs associated with future residential (groundwater) exposure scenario exceeded 1.0, the cutoff point below which adverse noncarcinogenic effects are not expected to occur. Arsenic is the chemical of potential concern (COPC) that exceeded 1.0 for this exposure scenario. In addition, central tendency exposure (CTE) scenario risk estimates for future residential exposure to groundwater yielded an HI greater than 1.0; the affected target organ is the skin.

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

2. <u>Site 10</u>

Groundwater was sampled at Site 10. The potential receptors considered for this site were future industrial and residential receptors of groundwater. The cancer risk associated with the future residential (groundwater) exposure scenario was approximately 7 x 10^{-5}, within the conservative EPA guideline target acceptable risk range. The cancer risk associated with the future industrial (groundwater) exposure scenario was within the mid-range of the target acceptable risk range. The noncarcinogenic HIs associated with the future industrial and future residential (groundwater) exposure scenarios were below 1.0, the cutoff point below which adverse effects are not expected to occur. Lead groundwater

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).

Human health risk assessment calculations did not include data from field sampling prior to the 1995 RI. Therefore, only groundwater scenarios were considered in the risk assessment for Site 10. Conclusions from previous investigations indicated that Site 10 surface water or sediment pathways were not contributing a significant human health risk to potential receptors. One surface soil sample collected from a test pit showed high metals concentrations (Weston, 1993). Site 10 was a disposal area for shell casings and exposed corroded shell casings were observed during the field investigations. It should be noted that samples collected from surface soil would almost certainly show high metals concentrations due to the demilitarized metal shell casings interred near the surface.

B. Ecological Risks

The ecological risk assessment estimates the risk posed to ecological receptors, such as aquatic and terrestrial biota, from contamination at the NWS Earle sites. A summary of the results of the ecological risk assessment for the OU 6 site is presented below.

1. Site 3

Site 3 is a former landfill that received a variety of wastes in the 1960s. The former landfill area is covered with brush and small trees, although a few bare areas with exposed debris are present. A small forested wetland is located directly southeast of the former landfill, and runoff from most of the landfill flows toward the wetland.

Some metals and several PAHs were detected in wetland sediments during 1995 RI sampling activities. Most of these contaminants exceeded screening values used in the 1995 RI ecological risk assessment and were, therefore, retained as compounds of concern (COCs). The COCs were either not detected or were detected at relatively low concentrations in groundwater, suggesting that contaminants may be migrating from the former landfill to the wetlands via overland runoff/erosion. In landfill surface soil samples collected at the landfill toe, concentrations of contaminants that were sediment COCs were relatively low. Concentrations of these COCs were also relatively low in 1995 RI groundwater samples.

The assessment endpoint chosen for Site 3 was the protection of individuals inhabiting the wetland area. For the reasons discussed above, the RI concluded that impacts to the wetlands appear to be minor and potential ecological risks to wetland receptors appear to be insignificant. Therefore, no

remedial action based on potential risks to ecological receptors or additional ecological study is recommended at Site 3.

2. Site 10

Site 10 is a relatively small upland area consisting of grasses and small pines, with an open area in the middle. The open area mostly consists of the dirt road that leads into the site and areas of exposed debris where soils have eroded. A railroad bed is located 50 feet southeast of the landfill. A drainage ditch is located adjacent to the railroad tracks. The ditch runs northeastward along the eastern side of the tracks and bends and flows to the northwest approximately 300 feet northeast of the site. The ditch converges with a branch of Hockhockson Brook about 500 feet northwest of the site, so the site is located within the Hockhockson Brook Watershed. Site 10 is mostly surrounded by forested wetlands that are primarily dominated by red maple. The ditch provides limited aquatic habitat, and the surrounding upland and wetland areas provide excellent habitat, primarily for terrestrial receptors. Several species of mammals, such as white-tailed deer, red fox, and gray fox, are expected to utilize these areas, as are most avian species that inhabit forested areas on the base. No sensitive habitats, other than the wetlands, and no threatened or endangered species are known to occur in the area.

The area is surrounded by a forested wetland and some upland areas that contain no surface water. These areas are probably utilized by a variety of wildlife found on the base. Runoff from the site is to the east to a drainage ditch that connects with a branch of Hockhockson Brook northwest of the site. Groundwater flow at the site is generally northward, making groundwater to surface water discharge to the drainage ditch possible. Aquatic migration pathways and exposure routes are the main concern for Site 10.

No contaminants were detected in surface water that was not found at comparable concentrations in blanks. In sediments, only antimony exceeds the most conservative ecotox thresholds (ET), but antimony's Hazard Quotient (HQ) value was indicative of low potential risk. Aluminum and vanadium were conservatively retained as final COPCs in sediments since no ETs were available, but both were present at concentrations lower than in the upstream sample.

Some elevated levels of metals were found in 1993 RI/FS groundwater samples, including lead, chromium, arsenic, and cadmium. In 1995 RI groundwater samples, no organics were detected and most metals were within the range of background values. No metals detected in groundwater were present at elevated levels in drainage ditch sediments, suggesting the absence of groundwater discharge. In addition, the low levels of organics in drainage ditch sediments are more likely attributable to the railroad bed than the landfill.

For these reasons, potential risks to ecological receptors at Site 10 and contaminant contributions to the Hockhockson Brook Watershed appear insignificant, and further study or remediation at the site based on ecological concerns is considered unwarranted. However, since cover material has eroded heavily, an additional cover could be placed on the landfill to prevent any further erosion and runoff and may expedite ecological succession and increase vegetation cover on the landfill.

VII. REMEDIAL ACTION OBJECTIVES (RAOs)

The overall objective for the remedy at OU 6 Sites 3 and 10 is to protect human health and the environment.

The RAO at Site 3 to protect human health is to prevent human exposure to landfilled material and to metal contamination in groundwater in the area immediately downgradient of the former landfill. The RD for LUCs includes restrictions to prohibit digging into or disturbing the cover system or contents of the landfill, residential development at the site, or use of groundwater from beneath the site, other than for environmental monitoring and testing without Navy approval. The RAO for protection of the environment is to prevent potential contact with landfill contents and minimize contaminant migration into the adjacent wetlands.

The RAO at Site 10 to protect human health is to prevent human exposure to landfilled material. The RD for LUCs includes restrictions to prohibit digging into or disturbing the cover system or contents of the landfill, residential development at the site, or use of groundwater from beneath the site, other than for environmental monitoring and testing without Navy approval. The RAO for protection of the environment is to prevent potential contact with landfill contents.

VIII. DESCRIPTION OF REMEDIAL ACTION ALTERNATIVES

The purpose of the alternative development and screening process is to assemble an appropriate range of possible remedial options to achieve the RAOs identified for the sites. In this process, technically feasible technologies are combined to form remedial alternatives that provide varying levels of risk reduction that comply with federal (EPA) and state (NJDEP) guidelines for site remediation.

Engineering technologies capable of eliminating the unacceptable risks associated with exposure to landfill contents or to groundwater were identified, and those alternatives determined to best meet RAOs after screening were evaluated in detail. Tables 7 and 8 present the considered alternatives and the results of preliminary screening.

TABLE 7
SITE 3 - SCREENING OF REMEDIAL ALTERNATIVES
OU-6 FEASIBILITY STUDY
NWS EARLE, COLTS NECK, NEW JERSEY

	ALTERNATIVE	EFFECTIVENESS	IMPLEMENTABILITY	COST	COMMENTS
1	No Action: (long-term monitoring, 5-year reviews)	Provides no additional protection of human health or the environment. Does not reduce potential for human exposure to landfill or groundwater contaminants. Does not reduce contaminant migration in the environment. No reduction in toxicity, mobility, or volume of contaminants.	Readily implementable. No technical or administrative difficulties.	Capital: none O&M: low	Retained as baseline alternative in accordance with NCP.
2	Limited Action (Cover, grading, institutional controls, access restrictions, long-term monitoring and 5-year reviews)	Provides some protection of human health through covering, fencing, and institutional controls. Restricted groundwater use. No reduction in toxicity, mobility, or volume of contaminants.	Readily implementable. No technical or administrative difficulties.	Capital: low O&M: low	Relative to Alt. 1, provides additional human health protectiveness. Retained.
3	Capping, Institutional Controls, and Long-Term Monitoring	Protects human health and the environment. Capping contaminated landfill materials prevents direct contact exposure and minimizes contaminant migration to the environment. 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	Groundwater contaminants would decrease gradually over time at a rate faster than Alternative 2. Retained.

TABLE 8
SITE 10 - SCREENING OF REMEDIAL ALTERNATIVES
OU-6 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. Does not reduce potential for human exposure to landfill materials. Does not reduce contaminant migration in the environment. No reduction in toxicity, mobility, or volume of contaminants.	Readily implementable. No technical or administrative difficulties.	Capital: none O&M: none	Retained as baseline alternative in accordance with NCP. Retained.
2	Limited Action (Institutional controls and access restrictions)	Provides little added protection of human health through fencing and institutional controls. Does not reduce contaminant migration to the environment. No reduction in toxicity, mobility, or volume of contaminants.	Readily implementable. No technical or administrative difficulties.	Capital: low O&M: low	Relative to Alt. 1, provides minimal additional protectiveness for additional cost. Eliminated.
3	Covering and Institutional Controls	Protects human health and the environment. Covering landfill materials prevents direct contact exposure. 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	Retained.

A. Detailed Summary of Alternatives

Summaries of the remedial alternatives developed for OU 6 Sites 3 and 10 are presented in the following sections.

1. Site 3 Remedial Alternatives

a. 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. The purpose of this alternative is to evaluate the overall human health and environmental protection provided by the site in its present state. No measures would be implemented to remove or contain the suspected contaminant source (the landfill), to prevent potential human exposure to site groundwater, or to mitigate contaminant migration in the environment. Periodic reviews of site conditions, typically every five years, and long-term monitoring of groundwater would be conducted under this alternative.

b. Alternative 2: Limited Action

This alternative was developed as an option that relies on access restrictions and institutional controls to limit exposure to contaminants. This alternative does not employ treatment or containment to address site contamination.

Alternative 2 relies on containment and institutional controls to achieve RAOs. After limited removal of protruding landfill materials, scarred or bare areas would receive additional soil cover, regrading, and revegetation to prevent potential human and animal contact with contaminants in the landfill materials. The perimeter of the landfill would be fenced and warning signs would be posted to limit access to the covered area.

Access restrictions would be placed to limit future uses of the site that may result in disturbance of the soil cover or direct contact with contaminated media. Future construction in or over the area would be prohibited unless effective measures were taken to ensure an equal level of protection provided by the soil cover could be maintained during and after construction. A CEA pursuant to N.J.A.C 7:9-6 would be established to prohibit the use of untreated groundwater as drinking water. NJDEP administers the CEA program to ensure that groundwater that temporarily does not meet GWQS guidelines is not inadvertently used for a potable water source. Long-term, periodic monitoring and five-year reviews would assess contaminant status and potential threats to human health and the environment.

c. Alternative 3: Capping, Institutional Controls, and Long-Term Monitoring

Alternative 3 relies on containment and institutional controls to achieve RAOs. A low-permeability cover system would be used to prevent potential human and animal contact with contaminants in the landfill materials, limit contaminant leaching to groundwater, and minimize contaminant migration via surface runoff and erosion. The perimeter of the landfill would be fenced and warning signs would be posted to limit access to the covered area. Access restrictions would be placed to limit future uses of the site that may result in disturbance of the soil cover or direct contact with contaminated media and to prohibit the use of untreated groundwater as drinking water. Over time, as a result of reduced leaching of contaminants from the landfill, groundwater contamination is expected to gradually decrease by chemical and physical mechanisms. A CEA pursuant to N.J.A.C 7:9-6 would be established to prohibit the use of untreated groundwater as drinking water. Long-term, periodic monitoring and five-year reviews would assess contaminant status and potential threats to human health and the environment.

2. Site 10 Remedial Alternatives

a. Alternative 1: No Action

The no-action alternative was developed as a baseline to which other alternatives may be compared, as required by the NCP. No remedial actions would be taken to protect human health or the environment. The purpose of this alternative is to evaluate the overall human health and environmental protection provided by the site in its present state. No measures would be implemented to remove or contain the suspected contaminant source (the landfill), to prevent potential human exposure to site groundwater, or to mitigate contaminant migration in the environment.

b. Alternative 2: Limited Action

Alternative 2, Limited Action, consisting of institutional controls and access restrictions, provides little additional protectiveness to human health and the environment through fencing and institutional controls. This alternative would not impede the migration of landfill contents to the environment. This alternative was not retained.

c. Alternative 3: Capping, Institutional Controls, and Long-Term Monitoring

Alternative 3 relies on containment and institutional controls to achieve RAOs. A cover system would be installed over the area of former active landfill operations to prevent potential human and animal

contact with the landfill contents, reduce contaminant leaching to groundwater, and minimize contaminant migration via surface runoff and erosion. Active treatment is not employed to address site contamination. Over time, the contaminants in groundwater will likely gradually decrease naturally through physical, biological, and chemical processes. Contaminant concentrations in groundwater will also decrease as a result of reduced infiltration of precipitation through contaminated landfill materials.

Under Alternative 3, an engineered low-permeability cover system that meets RCRA criteria for municipal solid waste landfills (40 CFR 258.60), the New Jersey regulations for closure of nonhazardous solid waste specified in N.J.A.C. 7:26-2A, and guidance provided in the NJDEP, Bureau of Landfill and Recycling Management, Division of Solid and Hazardous Waste's "Technical Manual for Sanitary Landfill Permits and Approvals" will be installed. The cover system, consisting of a base layer (to provide puncture protection for the barrier layer above), a low permeability membrane barrier layer (minimum 30 mil HDPE membrane or equivalent clay layer), a drainage layer to prevent the accumulation of water above the low permeability layer, and a vegetated top layer of soil to protect the underlying layers from mechanical damage would be installed to prevent potential human and animal contact with landfill materials. The cover system would limit contaminant leaching to groundwater and minimize contaminant migration via surface runoff and erosion. The cover system would be installed over the former landfill area of the site. Drainage and top layers would have a minimum combined thickness of 24-inches. Access restrictions, including fencing, would be enacted to limit future uses of the site that may result in disturbance of the cover or direct contact with contaminated media.

After construction of the cover and installation of the fencing elements of Alternative 3, access restrictions would significantly limit the future activities that could result in intrusion into and possible damage of the cover and accidental exposure to the landfill wastes. Restricted activities would include excavation, excessive vehicular traffic, and use of untreated groundwater for drinking water. An initial one-year period of cap O&M and annual status reporting by the contractor installing the cover system will be extended for 30 years as the responsibility of the Navy.

Land use restrictions and controls would be incorporated into the Base Master Plan to restrict the future use of Site 10 groundwater until natural processes have reduced contaminant concentrations to acceptable levels. Use of untreated Site 10 groundwater for drinking water would be prohibited. Because site groundwater does not meet 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 groundwater monitoring would be conducted to assess contaminant status and potential threats to human health and the environment. Since wastes would be left in place, site conditions and risks would be reviewed every five years.

Note: Details of this proposed alternative vary slightly from the Alternative 3 presented in the FS (vegetative cover system versus a proposed asphalt cap); however, the overall protection of human health and the environment remains equivalent.

IX. SUMMARY AND 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 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.

A. Site 3

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 9.

1. <u>Overall Protection of Human Health and the Environment</u>

Because no actions are conducted, Alternative 1 would not reduce human health or ecological risk and would not reduce contaminant migration to the environment. Because no actions would be taken under Alternative 1 to contain contaminants or prevent deterioration of the landfill surface, health risks and adverse impacts to the environment would be expected to remain the same or increase over time.

Alternative 2 is protective of human health and the environment. The institutional controls would reduce human health risks posed by contact with landfill contents and would provide assurance that untreated contaminated groundwater is not used as a potable water source in the future. This would significantly reduce the human health risks by eliminating potential exposure to contaminated groundwater.

Alternative 3 is most protective of human health and the environment. The soil cover system would reduce human health and ecological risks posed by contact with landfill contents and would reduce

TABLE 9
SITE 3 - COMPARATIVE ANALYSIS OF REMEDIAL ACTION ALTERNATIVES
0U 6 FEASIBILITY STUDY
NWS EARLE, COLTS NECK, NEW JERSEY

CRITERION:	ALTERNATIVE 1: NO ACTION	ALTERNATIVE 2: LIMITED ACTION, COVER, GRADING, INSTITUTIONAL CONTROLS, AND LONG-TERM MONITORING	ALTERNATIVE 3: CAPPING, INSTITUTIONAL CONTROLS, AND LONG-TERM MONITORING
OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT			
Prevent Human Exposure to Contaminated Soils and Landfilled Materials	No action would be taken to prevent human exposure to contaminated soils and landfilled materials. Existing risks would remain. Continued deterioration of the landfill surface would expose more contaminated soils and landfilled materials and result in increased direct exposure risks.	Fencing with warning signs would reduce the potential for direct contact with contaminated soils and landfilled materials. Limited removal of protruding landfill contents, additional soil cover, and revegetation of scarred areas would inhibit contact with landfill contents.	Cover system would prevent direct contact with contaminated soils and landfilled materials.
Prevent Human Exposure to Metal Contaminants 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 actions would be taken to reduce contaminant leaching to groundwater. No institutional controls would be implemented to prohibit use of untreated groundwater.	Institutional controls would minimize potential exposure to site groundwater by prohibiting its use. In time, a gradual reduction of contaminants in groundwater due to decreased infiltration and continued dissipation/dilution would occur.	Institutional controls would minimize potential exposure to site groundwater by prohibiting its use. The cover system would reduce leaching of contaminants to groundwater. In time, contaminant concentrations would decrease due to dissipation and dilution.
Minimize Contaminant Migration	No actions would be taken to reduce contaminant leaching to groundwater. Contaminants would continue to leach into groundwater and migrate.	Additional soil cover, grading and revegetation would help to reduce migration of contaminants by surface water and wind erosion and would reduce contaminant leaching to groundwater. However, contaminants may continue to leach into groundwater and migrate.	A cover system would reduce leaching of contaminants to groundwater and would reduce migration of contaminants to the environment by surface water and wind erosion.

TABLE 9
SITE 3 - COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES
0U 6 FEASIBILITY STUDY
NWS EARLE, COLTS NECK, NEW JERSEY
PAGE 2 OF 5

CRITERION:	ALTERNATIVE 1: NO ACTION	ALTERNATIVE 2: LIMITED ACTION, COVER, GRADING, INSTITUTIONAL CONTROLS, AND LONG-TERM MONITORING	ALTERNATIVE 3: CAPPING, INSTITUTIONAL CONTROLS, AND LONG-TERM MONITORING
COMPLIANCE WITH ARARs			
Chemical-Specific ARARs	Would not comply with GWQS.	Groundwater contaminant concentrations would initially exceed GWQS; over time, GWQS 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.	Groundwater contaminant concentrations would initially exceed GWQS; over time, GWQS 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	Would comply with federal and state ARARs for wetlands, floodplains, and other sensitive receptors.	Would comply with federal and state ARARs for wetlands, floodplains, and other sensitive receptors.
Action-Specific ARARs	Would not comply with federal or state ARARs for post-closure maintenance of municipal landfills.	Would not comply with federal or state ARARs for post-closure maintenance of municipal landfills.	Would comply with federal and state ARARs for closure and post-closure of municipal landfills.
LONG-TERM EFFECTIVENESS AND PERMANENCE			
Magnitude of Residual Risk	Existing (HI greater than 1) non-carcinogenic risk from exposure to site groundwater would remain. Increased direct contact risk would be anticipated over time as landfill surface deteriorates.	Existing risks would remain. Institutional controls would preclude use of groundwater. Over time, assuming reduced infiltration and no new waste disposal in the former landfill, concentrations of metals in groundwater downgradient of the site would be expected to decrease.	Existing risks would remain. Institutional controls would preclude use of groundwater in the vicinity. Over time, assuming reduced infiltration and no new waste disposal in the former landfill, concentrations of metals downgradient of the site would be expected to decrease.

TABLE 9
SITE 3 - COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES
0U 6 FEASIBILITY STUDY
NWS EARLE, COLTS NECK, NEW JERSEY

CRITERION:	ALTERNATIVE 1: NO ACTION	ALTERNATIVE 2: LIMITED ACTION, COVER, GRADING, INSTITUTIONAL CONTROLS, AND LONG-TERM MONITORING	ALTERNATIVE 3: CAPPING, INSTITUTIONAL CONTROLS, AND LONG-TERM MONITORING
Adequacy and Reliability of Controls	No new controls would be implemented. Existing site features provide limited controls.	If implemented and enforced, institutional controls could prevent damage to the cover, intrusion into contaminated materials, and use of contaminated groundwater.	If properly maintained, the cap system would be reliable for preventing exposure and reducing contaminant migration to the environment. If implemented and enforced, institutional controls could prevent damage to the cap, intrusion into contaminated materials, and use of contaminated groundwater.
Need for 5-Year Review	Review would be required since soil and groundwater contaminants would be left in place.	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. Engineering controls would be used during implementation to mitigate risks.	No significant risk to community is anticipated. Engineering controls would be used during implementation to mitigate risks.
Worker Protection	No risk to workers is anticipated if proper personal protective equipment (PPE) is used during long-term monitoring.	No risk to workers is anticipated if proper PPE is used during fence installation and long-term monitoring.	No significant risk to workers is anticipated if proper PPE is used during remediation and long-term monitoring.
Environmental Impacts	No adverse impacts to the environment are anticipated.	No adverse impacts to the environment are anticipated.	No significant impacts to the environment are anticipated. Engineering controls would be used during implementation to mitigate risks.
Time Until Action is Complete	Not applicable	Approximately one-year to cover and grade the landfill and to institute CEA.	Approximately 1.5 years to install the cap and institute CEA.

TABLE 9
SITE 3 - COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES
0U 6 FEASIBILITY STUDY
NWS EARLE, COLTS NECK, NEW JERSEY

CRITERION:	ALTERNATIVE 1: NO ACTION	ALTERNATIVE 2: LIMITED ACTION, COVER, GRADING, INSTITUTIONAL CONTROLS, AND LONG-TERM MONITORING	ALTERNATIVE 3: CAPPING, INSTITUTIONAL CONTROLS, AND LONG-TERM MONITORING
IMPLEMENTABILITY			
Ability to Construct and Operate	No construction or operation would be involved.	No difficulties are anticipated. Fencing, limited removal/off-station disposal, soil cover placement, grading, and revegetation are readily implementable technologies.	No difficulties are anticipated. Capping is a readily implementable technology.
Ease of Doing More Action if Needed	Additional actions would be easily implemented if required.	Additional actions would be easily implemented if required.	If additional actions are warranted, the cover system may need to be opened to access contaminated materials.
Ability to Monitor Effectiveness	Monitoring would provide assessment of potential exposures, contaminant presence, migration, or changes in site conditions.	Same as Alternative 1	Same as Alternative 1
Ability to Obtain Approvals and Coordinate with Other Agencies	Coordination for 5-year reviews may be required and would be obtainable.	Coordination for 5-year reviews may be required and would be obtainable. Coordination with the state would be required to establish a CEA and would be obtainable.	Coordination for 5-year reviews may be required and would be obtainable. Coordination with the state would be required to establish a CEA and would be obtainable.
Availability of Equipment, Specialists, and Materials	Personnel and equipment would be available for implementation of long-term monitoring and 5- year reviews.	Equipment and personnel are available to install fencing and perform long-term maintenance, monitoring, and 5-year reviews.	Equipment and personnel are available to construct cap and perform long-term maintenance, monitoring, and 5-year reviews.
Availability of Technology	Not required	Common construction techniques and materials would be required for construction.	Common construction techniques and materials would be required for cap construction.

TABLE 9
SITE 3 - COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES
0U 6 FEASIBILITY STUDY
NWS EARLE, COLTS NECK, NEW JERSEY
PAGE 5 OF 5

CRITERION:	ALTERNATIVE 1: NO ACTION	ALTERNATIVE 2: LIMITED ACTION, COVER, GRADING, INSTITUTIONAL CONTROLS, AND LONG-TERM MONITORING	ALTERNATIVE 3: CAPPING, INSTITUTIONAL CONTROLS, AND LONG-TERM MONITORING
COST			
Capital Cost	$41,400	$627,600	$4,962,100
First-Year Annual O&M Cost	$17,500	$17,500	$20,400
Five-Year Reviews	$15,500	$15,500	$15,500
Present Worth Cost*	$291,000	$878,000	$5,249,000

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

infiltration through landfill materials and leaching of contaminants to groundwater, thereby reducing contaminant migration into the environment. Routine maintenance of the landfill cover would ensure its long-term protectiveness. Institutional controls would provide assurance that untreated contaminated groundwater is not used as a potable water source in the future.

2. Compliance with ARARs

Because Alternative 1 does not include any remedial actions, it would not comply with state and federal ARARs pertaining to post-closure of municipal landfills [40 CFR 258.60 and 258.61 and N.J.A.C. 7:26-2A.9]. Alternative 2 would comply with some of these requirements. Alternative 3 would comply with these requirements since a cover system would be installed and a long-term maintenance and repair program would be implemented.

All three alternatives would comply with federal and state long-term monitoring requirements through periodic monitoring and evaluation of groundwater, surface water, and sediments.

Alternative 1 would not comply with state ARARs for attainment of GWQS (N.J.A.C. 7:9-61). Alternatives 2 and 3 would comply by seeking a temporary exemption (CEA) from these requirements until the GWQS are achieved.

3. Long-Term Effectiveness and Permanence

Alternatives 2 and 3 offer substantial long-term protection of human health and the environment. Under Alternative 1, risks would remain the same or increase over time as the landfill surface erodes because no additional actions would be taken to contain wastes and limit deterioration of the landfill surface. Potential future users of site groundwater may be at risk under Alternative 1 because it lacks institutional controls that would prohibit use of untreated contaminated groundwater.

Alternative 2 would reduce human risks due to ingestion of site groundwater by reducing the potential for exposure. Long-term risks due to ingestion of site groundwater would be reduced by implementation of institutional controls to prohibit use of untreated, contaminated groundwater. Regrading and revegetation would slightly reduce infiltration of rainwater through the fill material.

Alternative 3 would reduce human and ecological risks due to direct exposure to landfill contents by eliminating the potential for exposure. Long-term risks due to ingestion of site groundwater would be mitigated by significantly reducing contaminant leaching into groundwater and by implementing institutional controls to prohibit use of untreated contaminated groundwater.

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

Because none of the alternatives include treatment, they would not reduce the toxicity, mobility, or volume through treatment. Alternative 3 would reduce the mobility of landfill contaminants by significantly reducing precipitation infiltration.

5. Short-Term Effectiveness

The short-term effectiveness of the three alternatives would be similar since the use of appropriate engineering controls and PPE is expected to minimize adverse impacts to station residents and personnel, the local community, and workers during implementation.

Long-term monitoring, which would provide little opportunity for short-term impact, is the only on-site action proposed under Alternative 1.

Alternatives 2 and 3 would present a greater opportunity for short-term impact due to soil grading and installation of fencing. Alternative 3 would present an even greater opportunity for short-term impact due to installation of the soil cover system.

Impacts to the environment are not anticipated under Alternative 1 since minimal activities would be conducted. Impacts to the environment would be minimized under Alternative 2 and 3 by use of erosion and stormwater control measures during site work.

Alternative 1 would not achieve any of the RAOs. Alternative 2 would achieve some of the RAOs within approximately one-year, which would be the time to perform limited removal of protruding landfill contents, place, grade, and revegetate additional soil cover, install the fencing, and implement the CEA. Alternative 3 would achieve all RAOs within approximately 1.5 years, which would be the time to design and install the proposed cover and to implement the CEA.

6. Implementability

Alternative 1 is the most easily implemented since the only activities proposed are long-term monitoring and 5-year reviews. Alternative 2 would be more difficult to implement since it would involve removal of protruding landfill contents, placement, grading, and revegetation of additional soil cover, installation of fencing, and implementation of the CEA; however, no difficulties are anticipated, since common installation techniques are required and materials are available from several vendors. Alternative 3 would be most difficult to implement since it involves the construction of an enhanced

cover system over several acres of land; however, no difficulties are anticipated, since common construction techniques are required and cover materials are available from several vendors.

CEA implementation issues under Alternatives 2 and 3, such as submission of CEA documentation and periodic CEA reporting to regulatory agencies are not expected to present any difficulty since the Navy has significant experience complying with these requirements at other NWS Earle Installation Restoration (IR) program and underground storage tank sites.

If additional actions are warranted, they could be easily implemented under Alternatives 1 and 2. Additional actions could be implemented under Alternative 3; however, opening the cover system would be required to access landfill contents.

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	$291,000
Alternative 2	$878,000
Alternative 3	$ 5,249,000

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 to provide the community an opportunity to learn about the Proposed Plan. The community has not indicated objections to the alternatives selected in this ROD. Part III, Responsiveness Summary, of this ROD presents an overview of community involvement and input to the selected alternative.

B. Site 10

Based on the initial screening of remedial alternatives, Alternatives 1 and 3 were retained for further consideration. A detailed review of Alternatives 1 and 3 is included in this section and summarized in Table 10.

1. Overall Protection of Human Health and the Environment

Only Alternative 3 would be protective of human health and the environment. Because no actions are conducted, Alternative 1 would not reduce human health or ecological risk and would not reduce contaminant migration to the environment. Health risks and adverse impacts to the environment are expected to remain the same or increase over time.

Alternative 3 is most protective of human health and the environment. The cover system would reduce human health and ecological risks posed by contact with landfill contents and impacted sediments or surface soil. The cover system would reduce infiltration through landfill materials and leaching of contaminants to groundwater, thereby reducing contaminant migration into the environment. Routine maintenance of the landfill cover system would ensure its long-term protectiveness. Institutional controls would provide assurance that untreated contaminated groundwater is not used as a potable water source in the future.

2. Compliance with ARARs

Because Alternative 1 does not include any remedial actions, it would not comply with state and federal ARARs pertaining to post-closure of municipal or demolition debris landfills (40 CFR 258.60 and 258.61 and N.J.A.C. 7:26-2A.9).

Alternative 3 would comply with these requirements since a vegetative cover system would be installed and a long-term maintenance and repair program would be implemented, consistent with what would typically be required for a demolition debris landfill.

3. Long-Term Effectiveness and Permanence

Alternative 3 is the only alternative that offers long-term protection of human health and the environment. Because no additional actions would be taken under Alternative 1 to contain wastes and limit deterioration of the landfill surface, risks would increase over time as the landfill surface erodes.

TABLE 10
SITE 10- COMPARATIVE ANALYSIS OF REMEDIAL ACTION ALTERNATIVES
0U 6 FEASIBILITY STUDY
NWS EARLE, COLTS NECK, NEW JERSEY

CRITERION:	ALTERNATIVE 1: NO ACTION	ALTERNATIVE 3: CAPPING, INSTITUTIONAL CONTROLS, AND NATURAL ATTENUATION
OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT		
Prevent Human Exposure to Landfill Materials	No action would be taken to prevent human exposure to landfilled materials. Existing risks would remain. Continued deterioration of the landfill surface, particularly the edge of the landfill, would expose more landfilled materials and result in increased direct exposure risks.	New cover system over the landfill would prevent direct contact with contaminated materials. Risks would be reduced by installing the new low-permeability cover and maintaining the new cover.
COMPLIANCE WITH ARARs		
Location-Specific ARARs	No action would be taken that would impact wetlands or other sensitive receptors. Site 10 is not in a 100-year flood plain.	This alternative would comply with federal and state ARARs for wetlands, floodplains, and other sensitive receptors.
Action-Specific ARARs	This alternative would not comply with federal or state ARARs for post-closure maintenance of municipal landfills.	This alternative would comply with federal and state ARARs for closure and post-closure of construction/demolition debris landfills.
LONG-TERM EFFECTIVENESS AND PERMANENCE		
Magnitude of Residual Risk	Increased risk would be anticipated over time as landfill surface deteriorates, especially along edge of landfill.	Installation of the new cover, maintenance of the new cover, and implementation of access restrictions to prevent intrusion into landfilled materials would reduce direct exposure risks.
Adequacy and Reliability of Controls	No new controls would be implemented. Existing site features provide limited controls.	If properly maintained, the cover system would be reliable for preventing exposure and reducing contaminant migration to the environment. If implemented and enforced, institutional controls could prevent damage to the cover, and intrusion into landfilled materials.
Need for 5-Year Review	Review would be required since soil and groundwater contaminants would be left in place.	Same as Alternative 1.

TABLE 10
SITE 10 COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES
OU 6 FEASIBILITY STUDY
NWS EARLE, COLTS NECK, NEW JERSEY
PAGE 2 OF 3

CRITERION:	ALTERNATIVE 1: NO ACTION	ALTERNATIVE 3: CAPPING, INSTITUTIONAL CONTROLS, AND NATURAL ATTENUATION
SHORT-TERM EFFECTIVENESS		
Community Protection	No risk to community is anticipated.	No significant risk to community is anticipated. Engineering controls would be used during implementation to mitigate risks.
Worker Protection	No risk to workers is anticipated.	No significant risk to workers is anticipated if proper PPE is used during cover construction.
Environmental Impacts	No adverse impacts to the environment are anticipated.	No significant impacts to the environment are anticipated. Engineering controls would be used during implementation to mitigate risks.
Time Until Action is Complete	Not applicable.	Approximately 1.5 years to install the cap and institute CEA.
IMPLEMENTABILITY		
Ability to Construct and Operate	No construction or operation is involved.	No difficulties are anticipated. Low permeability cover system is a readily implementable technology.
Ease of Doing More Action if Needed	Additional actions would be easily implemented if required.	If additional actions are warranted in the landfill, the cover system may need to be opened to access landfilled materials within.
Ability to Obtain Approvals and Coordinate with Other Agencies	Not applicable	Coordination with the state would be required to establish a CEA and would be obtainable.
Availability of Equipment, Specialists, and Materials	Not applicable	Ample availability of equipment and personnel to construct cover system and perform long-term maintenance.
Availability of Technology	Not required	Common construction techniques and materials required for landfill cover system construction.

TABLE 10
SITE 10 COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES
OU 6 FEASIBILITY STUDY
NWS EARLE, COLTS NECK, NEW JERSEY
PAGE 3 OF 3

CRITERION:	ALTERNATIVE 1: NO ACTION	ALTERNATIVE 3: CAPPING, INSTITUTIONAL CONTROLS, AND NATURAL ATTENUATION
COST		
Capital Cost	$0	$1,072,000
First-Year Annual O&M Cost	$0	$20,000
Five -Year Review	$0	$15,000
Present Worth Cost*	$0	$1,347,000

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

Potential future users of the site may be at risk under Alternative 1 because it lacks features to limit contact with landfill contents. Alternative 3 would reduce human and ecological risks due to direct exposure to landfill contents by eliminating the potential for exposure. Long-term risks due to ingestion of site groundwater would decrease by reducing contaminant leaching into groundwater.

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

Because neither of the alternatives includes treatment, neither would reduce the toxicity, mobility, or volume through treatment. Alternative 3 would reduce the mobility of landfill contaminants by reducing precipitation infiltration into the landfill and protecting against surface transport of landfill contents.

5. Short-Term Effectiveness

The short-term effectiveness of the two alternatives would be similar since the use of appropriate engineering controls and PPE is expected to minimize adverse impacts to station residents and personnel, the local community, and workers during implementation. There is no on-site action proposed under Alternative 1. Alternative 3 would present a greater opportunity for short-term impact due to site preparation, grading, and construction of the cover system.

Impacts to the environment are not anticipated under Alternative 1 since no activities would be implemented. Implementation of erosion and stormwater control measures during vegetative cover construction under Alternative 3 would minimize impacts to the environment.

Alternative 1 would not achieve any of the RAOs. Alternative 3 will prevent exposure to the landfill contents within approximately one-year once the vegetative cover is installed and the CEA is implemented. The risk of exposure due to ingestion of site groundwater will not be completely eliminated until cleanup levels (i.e., MCLs) are reached by dispersion. Once the vegetative cover is in place, however, precipitation infiltration into the landfill and the subsequent leaching of landfill materials into the groundwater will be minimized. Implementation of the CEA will formally prohibit groundwater usage until monitoring determines that cleanup levels have been reached.

6. Implementability

Each of the alternatives could be implemented. Alternative 1 is easily implemented since no activities are proposed. Alternative 3 would be more difficult to implement since it involves the construction of a vegetative cover system over several acres of land; however, no difficulties are anticipated, because vegetative covers are a commonly applied technology involving conventional construction methods and

cover materials are available from several vendors.

If additional actions are warranted, they could be easily implemented under Alternative 1. Under Alternative 3, additional actions could be easily implemented; however, the cover system would have to be opened to access landfill contents.

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 3	$1,347,000

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 NJDEP have been incorporated into this 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 RAB meetings convened to encourage community involvement, and to attend a public meeting held to provide the community with an opportunity to learn about the Proposed Plan. The community has not indicated objections to the alternatives 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

A. Site 3

The Navy, with EPA and NJDEP, has selected Alternative 2 - Limited Action, Cover, Grading, Institutional Controls, and Long-Term Monitoring - as its preferred alternative. The range of

technologies in Alternative 2 is appropriate for the protection of human health and the environment at this remote former landfill.

Alternative 2 relies on containment, access restrictions, and institutional controls to limit exposures to site risks.

The site has not been used for many years and is moderately vegetated with grasses and pine trees. Any exposed debris and the remnants of a former skeet range will be removed and additional soil cover material will be placed to grade the site to encourage runoff. Clearing and grubbing of the vegetative growth may be necessary in parts of the site to prepare for soil cover placement. Where possible, the additional cover and grading will be placed around the existing trees.

Grading of the landfill area will be completed without removal of healthy trees where possible. Compaction of the soils and landfill materials will be performed as needed. The appropriate slopes for the cover (to facilitate drainage) will be determined as part of the soil cover system design. The final surface slope of landfill soil cover should have a slope of between three percent (3V:1OOH) and five percent (5V:1OOH) to ensure slope stability, control erosion, and allow compaction, seeding, and vegetation of the cover materials. The final slope will also promote precipitation runoff while inhibiting erosion or infiltration.

A cable-type fence with appropriate warning signs will be erected around the landfill to limit access to the site, to preclude excessive vehicular traffic, to restrict human contact with contaminated landfill materials, and to protect the integrity of the soil cover. Figure 10 presents a plan view of the Alternative 2 conceptual design. Figure 11 presents a cross-section view of the cover system conceptual design.

Long-term periodic groundwater monitoring will be conducted to assess contaminant status and potential threats to human health and the environment. Since wastes will be left in place, site conditions and risks will be reviewed every five years.

Under Alternative 2, access restrictions will be enacted to limit future use of the landfill property. Restrictions will be placed on future activities that could result in increased human exposure to contaminated landfill materials or increased erosion and contaminant migration. Restricted activities will include excavation, excessive vehicular traffic (off-road vehicles and dirt bikes), and use of untreated groundwater for drinking water.

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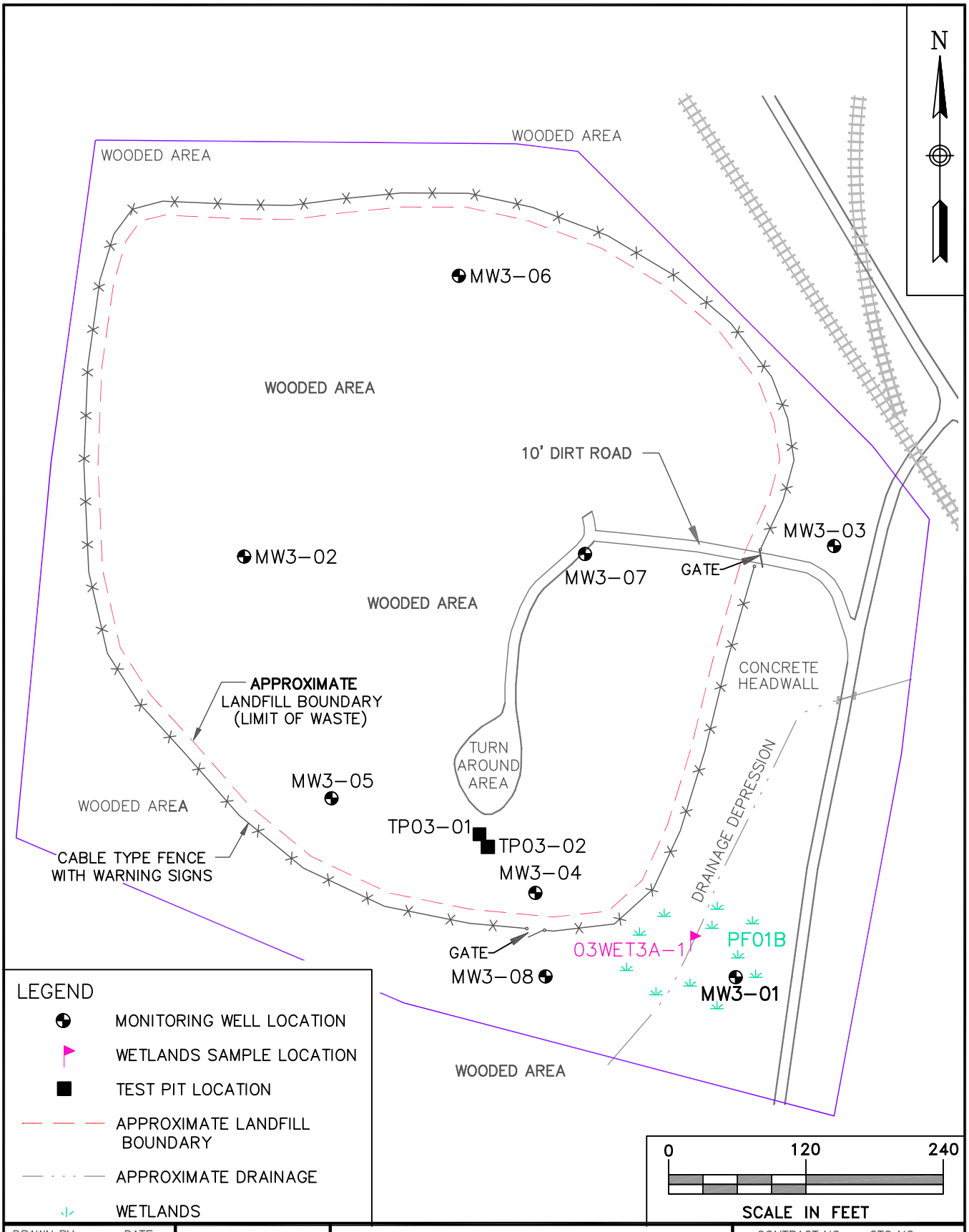

DRAWN BY MKB DATE 08/10/04	Tetra Tech NUS, Inc.	ALTERNATIVE 2 SITE 3 – LANDFILL SOUTHWEST OF "F" GROUP NAVAL WEAPONS STATION EARLE COLTS NECK, NEW JERSEY	CONTRACT NO. 2128 CTO NO. 843
CHECKED BY DATE			OWNER NO. OU 6
REVISED BY DATE			APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. FIGURE 10 REV.

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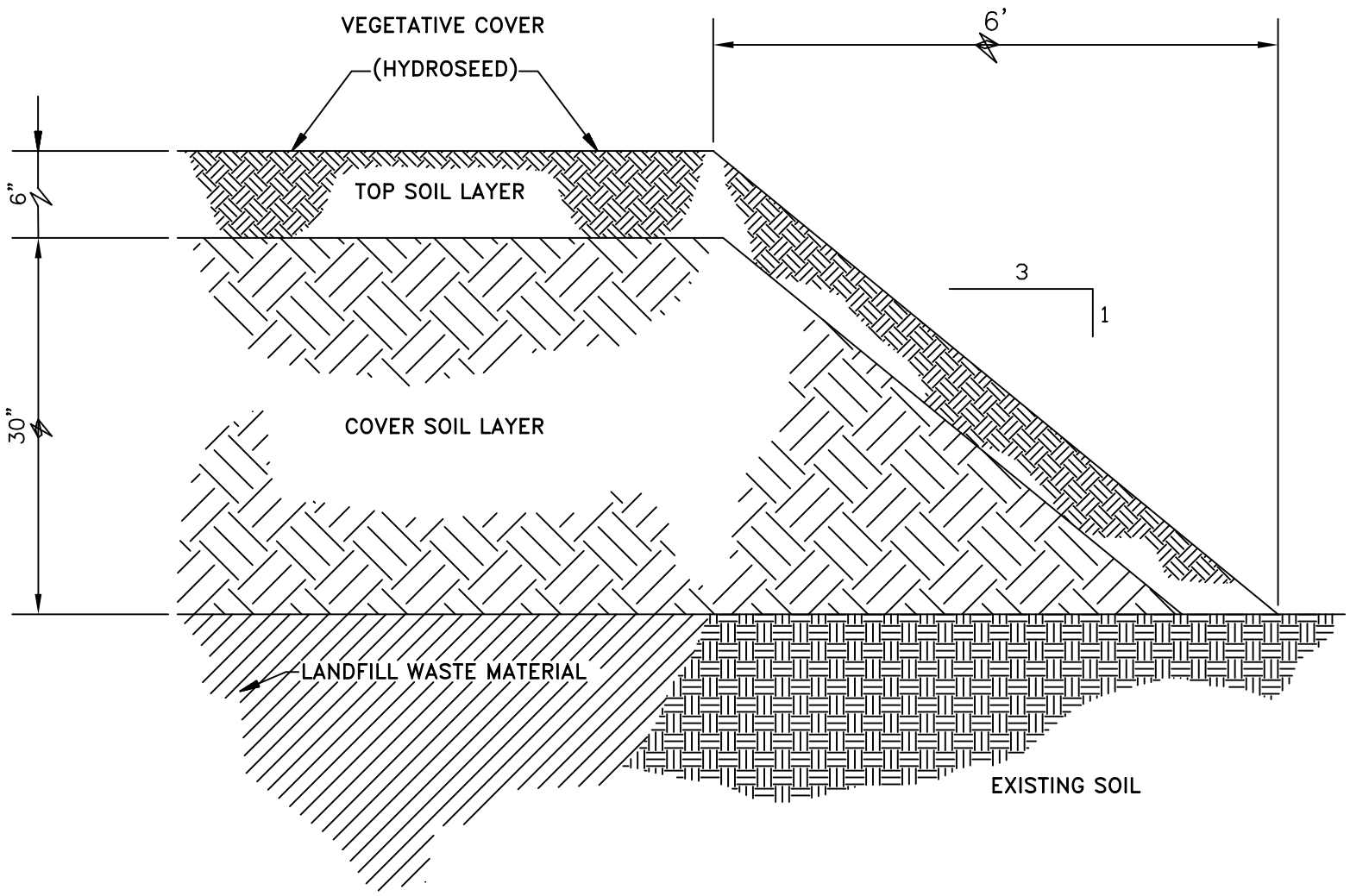

DRAWN BY MKB DATE 08/10/04	Tetra Tech NUS, Inc.	CONCEPTUAL COVER SYSTEM DESIGN – ALTERNATIVE 2 SITE 3 – LANDFILL SOUTHWEST OF "F" GROUP NAVAL WEAPONS STATION EARLE COLTS NECK, NEW JERSEY	CONTRACT NO. 2128 CTO NO. 843
CHECKED BY DATE			OWNER NO. OU 6
REVISED BY DATE			APPROVED BY DATE
SCALE NONE			DRAWING NO. FIGURE 11 REV.

The Navy has prepared a RD for LUCs containing the LUC implementation actions that has been submitted to the EPA for review and concurrence. The final RD for LUC at OU 6 that includes incorporation of EPA comments has been submitted to EPA concurrently with the final ROD. After construction of the cover, land use control restrictions would prohibit digging into or disturbing the existing cover or contents of the landfill, prohibit residential development on the site, prohibit use of the aquifer groundwater beneath the site other than for environmental monitoring and testing until the groundwater meets GWQS. Figure 10 shows the area of the proposed cap and fence. The area proposed for the LUCs will include the area within the fence protecting the cap (Figure 12). The RD for LUCs will be amended to the NWS Earle Master Plan. The Navy will be responsible for maintaining LUCs and monitoring site status.

The Navy is responsible for implementing, maintaining, reporting on, and enforcing the land use controls. 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.

The LUC objectives are:

a) Maintain the integrity of any current or future remedial or monitoring system such as monitoring wells, fencing, signage and the landfill cover;
b) Except for environmental monitoring, prevent access or use of untreated groundwater until cleanup levels are met;
c) Prohibit the development and use of property for residential housing, elementary and secondary schools, child care facilities and playgrounds; and
d) Prohibit excessive vehicular traffic and digging into or disturbing the landfill cover or contents of the landfill.

These objectives will be implemented through mechanisms, such as the RD for LUC amended to the Base Master Plan, fencing and signage at the landfill cap, 30 years of O&M and annual status reporting for the cap, establishment of the NJDEP-compliant CEA and conduct of a site review every five years.

Because site groundwater does not meet GWQS, a CEA pursuant to N.J.A.C 7:9-6 will be established to provide the state with official notice that the constituent standards will not be met for a specified duration and to ensure that use of groundwater in the affected area is prohibited (Figure 12). Refer to the RD for LUC implementation actions, since these details may need to be adjusted periodically based on site conditions and other factors.

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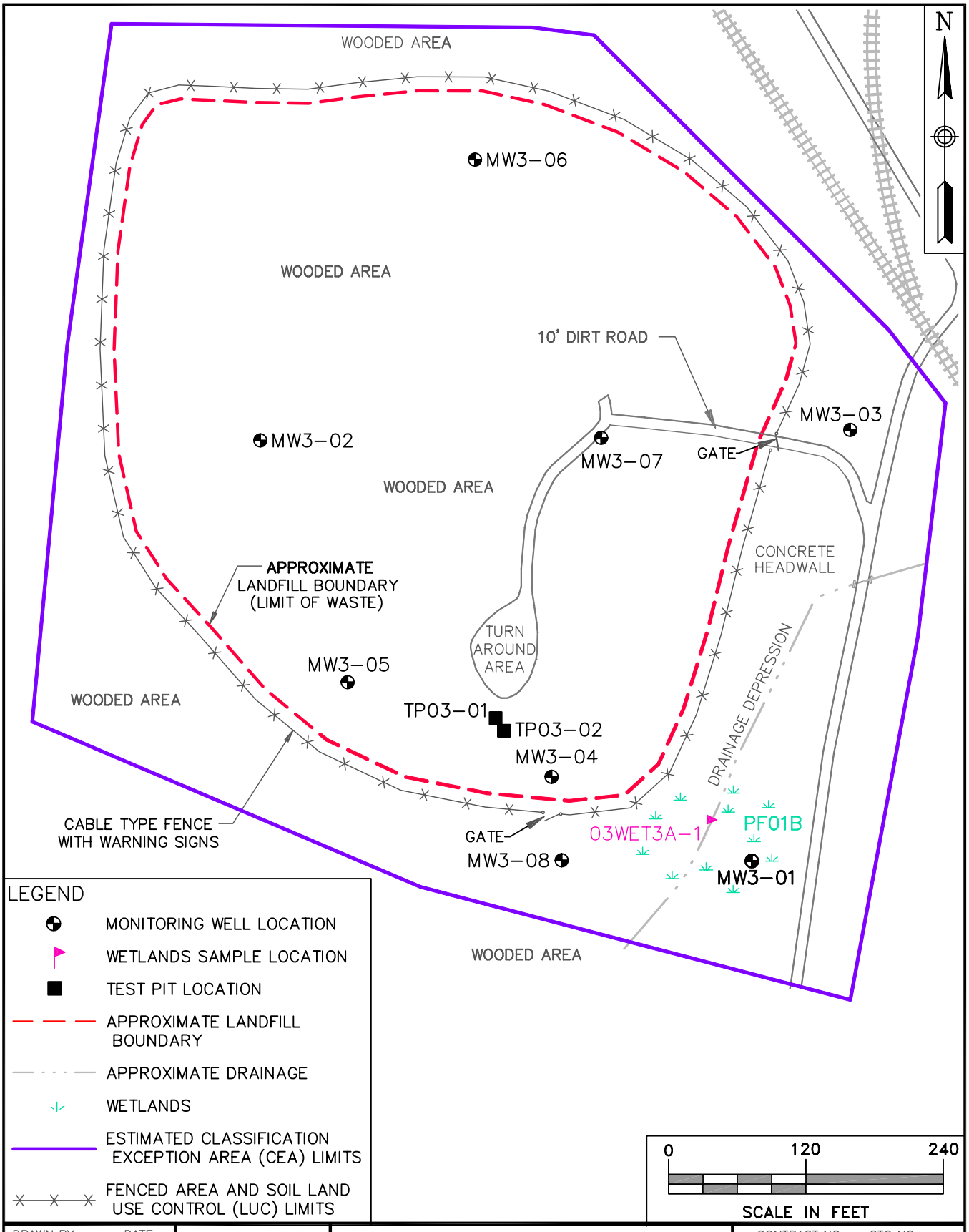


DRAWN BY MKB DATE 06/14/05	Tetra Tech NUS, Inc.	ALTERNATIVE 2 SITE 3 – LANDFILL SOUTHWEST OF "F" GROUP NAVAL WEAPONS STATION EARLE COLTS NECK, NEW JERSEY	CONTRACT NO. 2128 CTO NO. 843
CHECKED BY DATE			OWNER NO. OU 6
REVISED BY DATE			APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. FIGURE 12 REV.

B. Site 10

The Navy, with EPA and NJDEP, has selected Alternative 3 - Capping and Institutional Controls - as its selection of the preferred alternative. The range of technologies included in Alternative 3 offer the maximum of protection to human health and the environment of all the alternatives, and is appropriate for the protection of human health and the environment at this former waste-metals disposal area. Significant groundwater contamination has not been found, and although technically not required, the Navy chose to implement a more protective low-permeability cover at Site 10 for the following reasons:

Site 10 is in close proximity to extensive wetlands and a stream. It is also bordered by an active rail line. The proposed cover system can be installed without impact to the wetlands or stream or encroachment onto the rail line. A soil cover would need to extend further beyond the filled area to be effective and would have some impact on one or more of these features.

The military nature of the landfilled materials at site 10 warrants a higher level of protection. While all evidence suggests only inert demilitarized items were placed in this landfill, a more conservative remedy is justified.

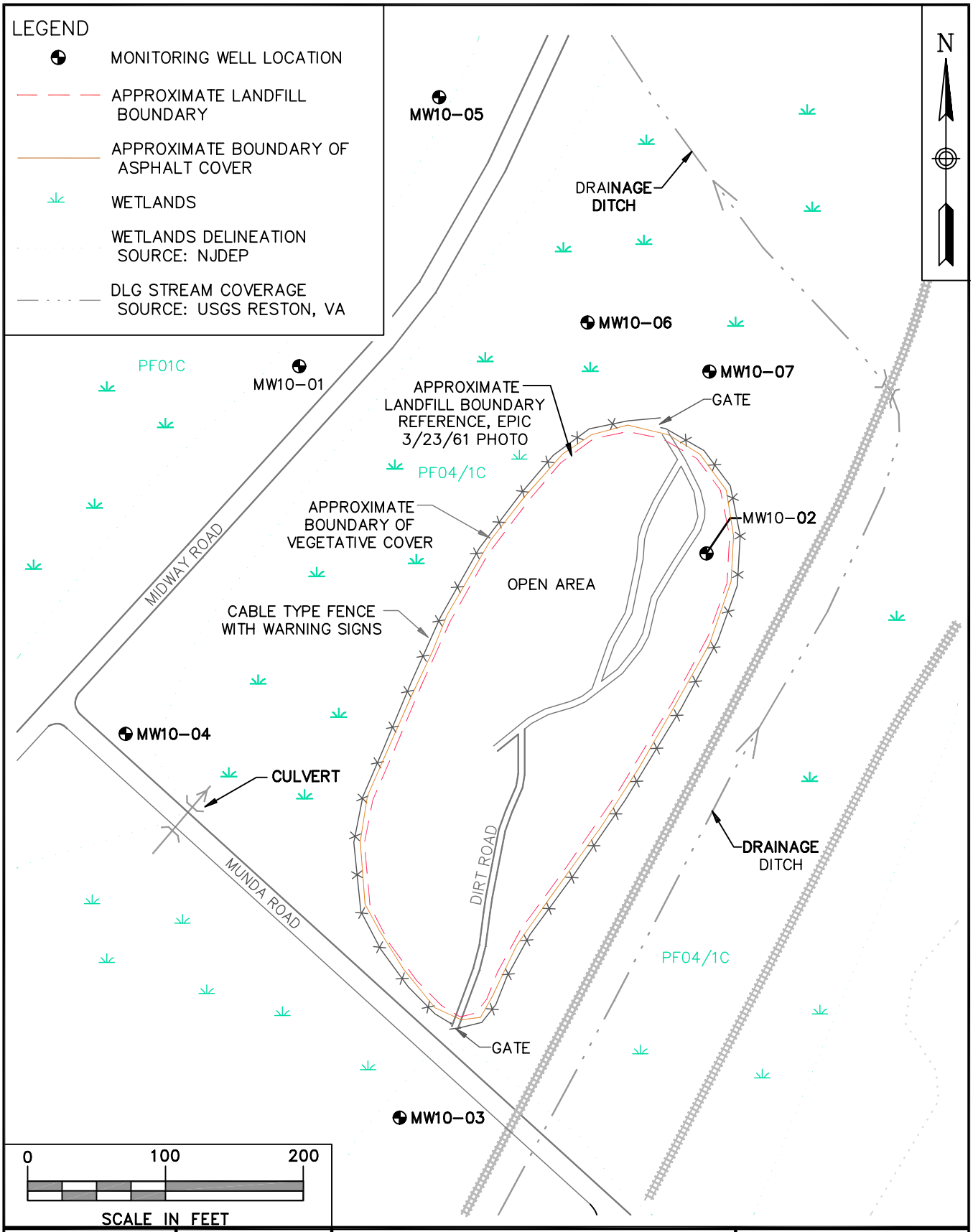
The incremental cost difference for the low-permeability cover versus a soil cover at a site this small (2 acres) is relatively small for the increased level of protection achieved.

A vegetative cover would be placed over an impermeable landfill cap over the entire former landfill area. Figure 13 shows a plan view of the preferred alternative landfill cap. Alternative 3 relies on containment and institutional controls to limit exposure to landfill contents. Grading of the landfill area, combined with placement of a low-permeability vegetative cover system, will prevent potential human and animal contact with landfill materials and reduce infiltration of precipitation through the landfill contents. Access restrictions will be enacted to limit future uses of the site that may result in disturbance of the cover or direct contact with landfill materials. Figure 14 presents a cross sectional view of the conceptual design of the cover.

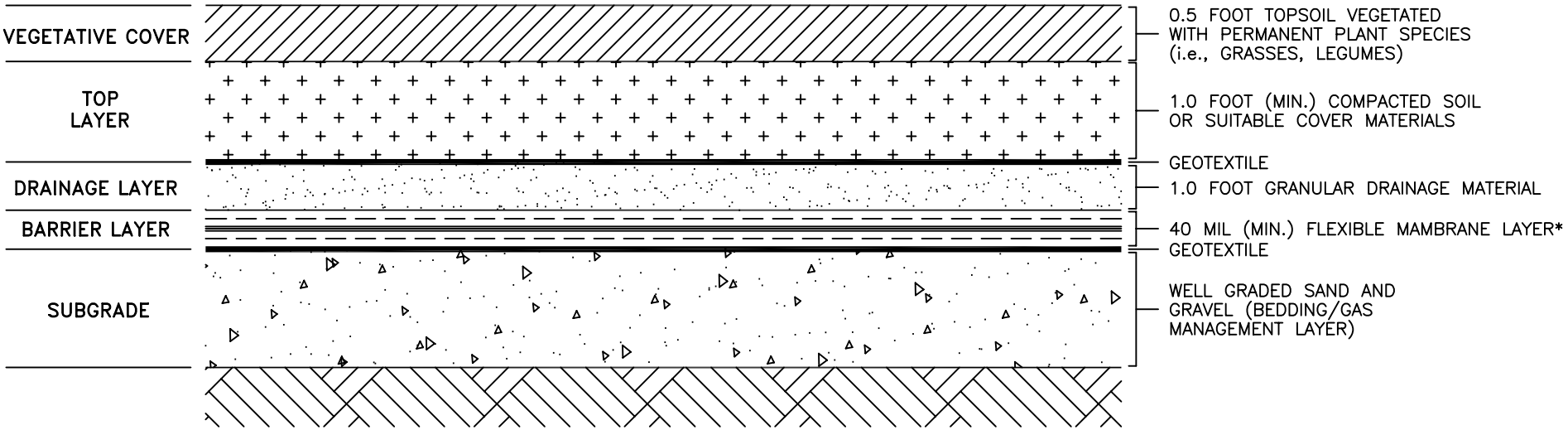
A topographic survey of the site will be performed to collect accurate elevation and contour data for use in the cover system design.

The site has not been used for many years and is moderately vegetated with grasses and pine trees. Clearing and grubbing of the vegetative growth will be necessary to prepare the site for soil covering and grading. Temporary silt fences or staked hay bales will be required to minimize erosion effects while the site is covered and graded.

2128\0240\2128CM07.DWG 03/03/05 DA



DRAWN BY MKB DATE 11/03/04	Tetra Tech NUS, Inc.	ALTERNATIVE 3 SITE 10 – LANDFILL SOUTHWEST OF "F" GROUP NAVAL WEAPONS STATION EARLE COLTS NECK, NEW JERSEY	CONTRACT NO. 2128 CTO NO. 843
CHECKED BY DATE			OWNER NO. OU 6
REVISED BY DATE			APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. FIGURE 13 REV.



LANDFILL MATERIALS AND SOILS

* MAY SUBSTITUTE ONE FOOT OF CLAY OR EQUAL WITH MAX. PERMEABILITY OF 1.0E-07 CM/SEC

CROSS-SECTIONAL VIEW

NOTE:

NOT FOR DESIGN.

DRAWN BY MKB	DATE 03/07/05	Tetra Tech NUS, Inc.	CONCEPTUAL COVER SYSTEM DESIGN SITE 10 – ALTERNATIVE 3 NAVAL WEAPONS STATION EARLE COLTS NECK, NEW JERSEY
CHECKED BY	DATE		
REVISED BY	DATE		
SCALE NOT TO SCALE			

CONTRACT NO. 2128	CTO NO. 843
OWNER NO. OU 6	
APPROVED BY	DATE
DRAWING NO. FIGURE 14	REV.

Compaction of the soils and landfill materials will be performed as needed. The appropriate slopes for the soil cover (to facilitate drainage) will be determined as part of the cover system design.

The graded and vegetated cover system will be designed to prevent human and animal exposures to landfill material and to prevent migration of contaminants by wind and surface runoff.

A cable-type fence with appropriate warning signs will be erected around the landfill to limit access to the site, to preclude excessive vehicular traffic, to restrict human contact with contaminated landfill materials, and to protect the integrity of the cover.

The Navy has prepared a RD for LUCs containing the LUC implementation actions that have been submitted to the EPA for review and concurrence. The final RD for LUC at OU 6 that includes incorporation of EPA comments has been submitted to EPA concurrently with the final ROD. After construction of the cover, land use control restrictions would prohibit digging into or disturbing the existing cover or contents of the landfill, prohibit residential development on the site, and prohibit use of the untreated groundwater aquifer beneath the site other than for environmental monitoring and testing until the groundwater meets GWQS. Figure 15 shows the area of the proposed cap and fence. The area proposed for the LUCs will include the area within the fence. Restricted activities would include excavation, excessive vehicular traffic, and use of untreated groundwater for drinking water. The RD for LUCs will be amended to the NWS Earle Master Plan. The Navy will be responsible for maintaining LUCs and monitoring site status.

The Navy is responsible for implementing, maintaining, reporting on, and enforcing the land use controls. 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.

The LUC objectives are:

a) Maintain the integrity of any current or future remedial or monitoring system such as monitoring wells, fencing, signage and the landfill cap;
b) Except for environmental monitoring, prevent access or use of untreated groundwater until cleanup levels are met;
c) Prohibit the development and use of property for residential housing, elementary and secondary schools, child care facilities and playgrounds; and
d) Prohibit excessive vehicular traffic and digging into or disturbing the landfill cover or contents of the landfill.

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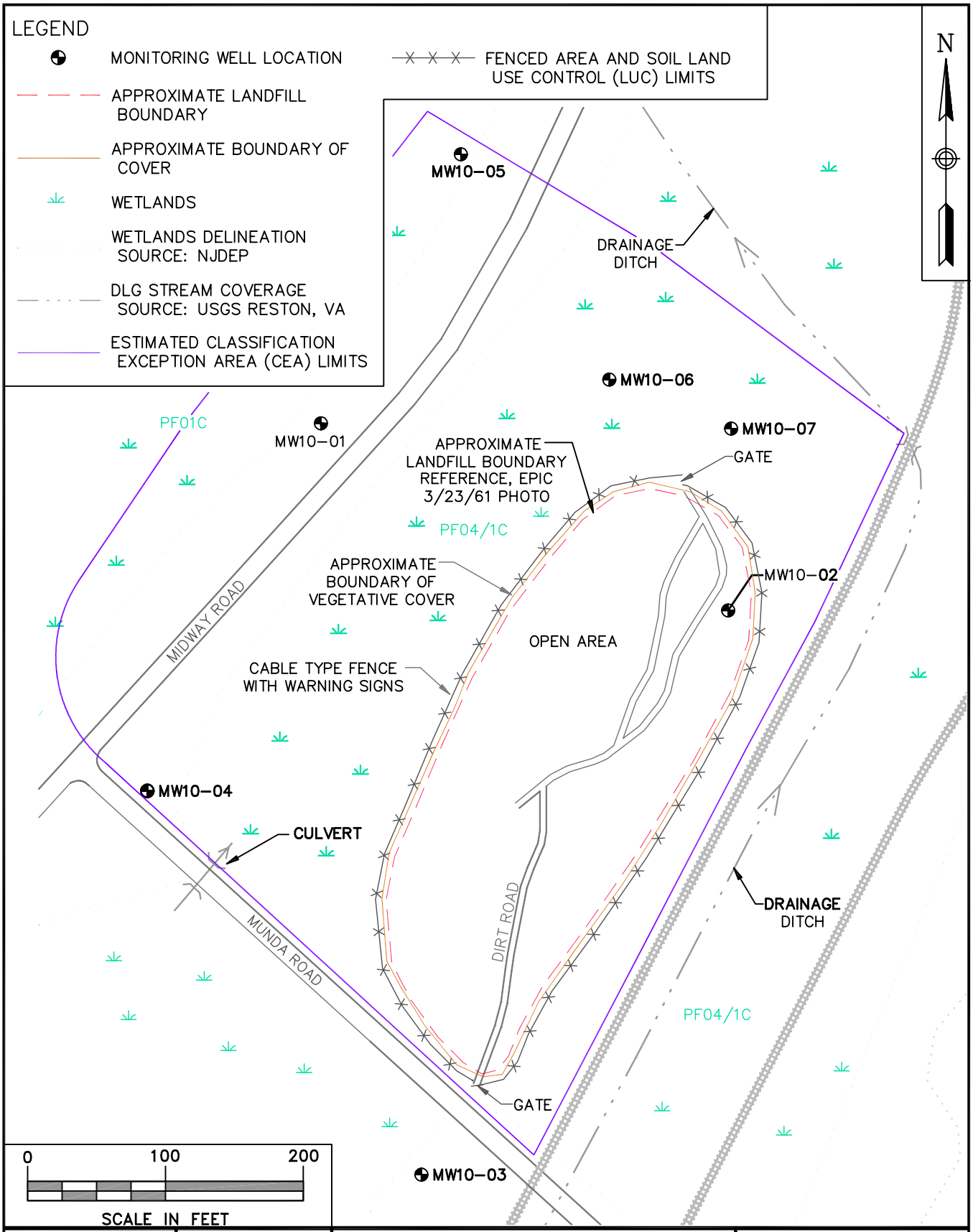

DRAWN BY MKB DATE 05/16/05	Tetra Tech NUS, Inc.	ESTIMATED SOIL AND GROUNDWATER LAND USE CONTROL LIMITS SITE 10 – LANDFILL SOUTHWEST OF "F" GROUP NAVAL WEAPONS STATION EARLE COLTS NECK, NEW JERSEY	CONTRACT NO. 2128 CTO NO. 843
CHECKED BY DATE			OWNER NO. OU 6
REVISED BY DATE			APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. FIGURE 15 REV.

These objectives will be implemented through mechanisms, such as the RD for LUC amended to the Base Master Plan, fencing and signage at the landfill cap, 30 years of O&M and annual status reporting for the cap, establishment of the NJDEP-compliant CEA and conduct of a site review every five years.

Because site groundwater does not meet GWQS, a CEA pursuant to N.J.A.C 7:9-6 would be established (Figure 15). The CEA would provide the state official notice that the constituent standards will not be met for a specified duration and to ensure that use of groundwater in the affected area is suspended until standards are achieved.

Long-term periodic monitoring would be conducted to assess contaminant status and potential threats to human health and the environment. In addition to the existing wells, sentinel wells would be installed north of the site pursuant to CEA guidelines. Since wastes would be left in place, site conditions and risks would be reviewed every five years. Refer to the RD for LUC implementation actions, since these details may need to be adjusted periodically based on site conditions and other factors.

XI. STATUTORY DETERMINATIONS

The remedy selected for OU 6 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

1. Site 3

Alternative 2 will provide overall protection of human health and the environment by preventing direct exposure to contaminated landfill materials, reducing contaminant migration from the landfill into the environment, and instituting restrictions on use of site groundwater.

Although the potential health risks from direct exposure to landfill contaminants were not quantified in the RI, it is conservatively assumed that direct exposure to landfilled materials may pose health risks to humans and animals. These risks will be reduced by installation of access restrictions and warning signs. The additional soil cover and vegetation will also limit contaminant migration to the environment by surface runoff and wind erosion.

Alternative 2 will reduce the risks posed by future use of site groundwater. The human health risk assessment concluded that site groundwater poses non-carcinogenic risks exceeding EPA's target risk range under a future residential exposure to groundwater scenario. Placing additional soil cover and grading to promote runoff will reduce infiltration of precipitation into the landfill, thereby reducing contaminant leaching from the landfill materials to the underlying groundwater and facilitating natural attenuation of groundwater contamination. Reducing leaching of contaminants from the landfill into the underlying groundwater will eventually result in a decrease of groundwater contaminant concentrations to acceptable levels (GWQS), reducing the long-term risk posed by future use of site groundwater. Implementation of access restrictions and establishment of the site as a groundwater CEA will provide interim protection by prohibiting use of the aquifer until GWQS are achieved.

Fencing/warning signs and access restrictions will provide additional long-term protection by limiting access to the covered area and restricting activities that could damage or intrude into the cover and contaminated media.

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

Use of engineering controls to minimize generation of fugitive dusts and vapors and proper use of PPE by site workers will effectively minimize short-term risks to the local community and workers posed by implementation of this alternative.

The Navy has prepared a RD for LUCs containing the LUC implementation actions that has been submitted to the EPA for review and concurrence.

The Navy is responsible for implementing, inspecting, reporting, and enforcing the LUCs described in this ROD in accordance with the LUC Remedial Design. 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).

2. Site 10

Alternative 3 will provide overall protection of human health and the environment by preventing direct exposure to contaminated landfill materials, reducing contaminant migration from the landfill into the environment, and instituting restrictions on use of site groundwater.

Although the potential health risks from direct exposure to landfill contaminants were not quantified in the RI, it is conservatively assumed that direct exposure to landfilled materials may pose health risks to humans and animals. Direct exposure risks will be reduced by installation of an enhanced vegetative cover system over the entire landfill. Because the properly maintained cover system will effectively eliminate the direct exposure pathway, the direct contact risks will be eliminated by implementation of Alternative 3. The cover system will also prevent further erosion of the landfill surface and preclude contaminant migration to the environment by surface runoff or wind erosion.

Alternative 3 will protect against future use of site groundwater. The human health risk assessment concluded that site groundwater does not pose carcinogenic or non-carcinogenic risks exceeding EPA's target risk range, but regulators desire to further ensure protectiveness against groundwater use. Capping the landfill with a low-permeability cover system will reduce infiltration of precipitation into the landfill, thereby adding an additional measure of protection against leaching of landfill contents into groundwater. Implementation of access restrictions and establishment of the site as a groundwater CEA will provide interim protection by prohibiting use of the aquifer until GWQS and MCLs are confirmed.

Access restrictions will also provide additional long-term protection by limiting access to the capped area and restricting activities that could damage or intrude into the cover system and landfill contents.

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

Use of engineering controls to minimize generation of fugitive dusts and vapors and proper use of PPE by site workers will effectively minimize short-term risks to the local community and workers posed by implementation of this alternative.

The Navy has prepared a RD for LUCs containing the LUC implementation actions that has been submitted to the EPA for review and concurrence.

The Navy is responsible for implementing, inspecting, reporting, and enforcing the LUCs described in this ROD in accordance with the LUC RD. 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 6 will comply with all applicable or relevant and appropriate chemical-specific, location-specific, and action-specific ARARs. The following discussion provides a synopsis of the detailed evaluation of the remedial alternatives in the FS for Sites 3 and 10 (OU 6) (Tetra Tech NUS, September 2000).

1. Chemical-Specific ARARs

Federal and state chemical specific ARARs presented in the FS included MCLs and GWQS.

a. Site 3

Because Alternative 2 does not include active treatment of groundwater, initially the groundwater beneath Site 3 will not meet the constituent concentrations specified in the GWQS [N.J.A.C. 7:9-6].

However, additional cover and grading of the landfill proposed under Alternative 2 will reduce migration of contaminants into groundwater, facilitating natural attenuation of contaminants and ultimately resulting in attainment of MCLs and GWQS. Alternative 2 includes a provision to seek a temporary exemption (CEA) from these requirements until the GWQS are achieved through natural attenuation. The CEA will be established to provide the state official notice that the constituent standards will not be met for a limited duration and to ensure that consumption of the untreated groundwater is prohibited.

b. Site 10

Because Alternative 3 does not include active treatment of groundwater, initially the groundwater beneath Site 10 will not meet the constituent concentrations specified in the GWQS [N.J.A.C. 7:9-6].

Installation of an engineered cap over the landfill proposed under Alternative 3 will reduce migration of contaminants into groundwater, facilitating natural attenuation of contaminants and ultimately resulting in attainment of MCLs and GWQS. Alternative 3 includes a provision to seek a temporary exemption (CEA) from these requirements until the GWQS are achieved through natural attenuation. The CEA will be established to provide the state official notice that the constituent standards will not be met for a limited duration and to ensure that consumption of the untreated groundwater is prohibited.

2. Location-Specific ARARs

The potential effects of the proposed remediation on wetlands, floodplains, water bodies, and other sensitive receptors will be identified during the design of Alternative 2 (Site 3) and Alternative 3 (Site 10), and all necessary measures will be taken to comply with the location-specific federal and state ARARs identified in the FS. It is expected that remedial design for both sites will easily comply with these ARARs.

3. Action-Specific ARARs

a. Site 3

The addition of soil and grading of the improved landfill cover and long-term monitoring and maintenance plan proposed under Alternative 2 will comply with federal and state municipal landfill closure and post-closure regulations [40 CFR 258.60 & 258.61 and N.J.A.C. 7:26-2A.9].

b. Site 10

The low-permeability landfill cap and long-term monitoring and maintenance plan proposed under Alternative 3 will comply with federal and state municipal landfill closure and post-closure regulations [40 CFR 258.60 & 258.61 and N.J.A.C. 7:26-2A.9].

4. To Be Considered (TBC) Standards

Office of Solid Waste and Emergency Response (OSWER) Directive 9355.0-62FS “Application of the CERCLA Municipal Landfill Presumptive Remedy to Military Landfills” (April 1996) and OSWER Directive 9355.0-49FS “Presumptive Remedy for CERCLA Municipal Landfill Sites” (September 1993) were considered during the development of remedial alternatives for OU 6.

C. Cost-Effectiveness

The Navy and EPA have determined that the selected remedy for OU 6 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 6 are summarized below.

1. Site 3

The capital costs for Alternative 2 total $627,600. The average annual O&M costs are $17,500, and five-year reviews cost $15,500 per event. Over a 30-year period, the net present-worth cost is $878,000 (at a seven percent discount rate).

2. Site 10

The capital costs for Alternative 3 total $1,072,000. The average annual O&M costs are $20,000, and five-year reviews cost $15,000 per event. Over a 30-year period, the net present-worth cost is $1,347,000 (at a seven percent discount rate).

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

The Navy and EPA 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 6.

E. Preference for Treatment as a Principal Element

The Navy and EPA 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 6.

XII. DOCUMENTATION OF SIGNIFICANT CHANGES

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

RECORD OF DECISION
NAVAL WEAPONS STATION EARLE
OPERABLE UNIT 6 (SITES 3 AND 10)

PART III - RESPONSIVENESS SUMMARY

The purpose of this Responsiveness Summary is to review public response to the Proposed Plan for OU 6. 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 6 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 6, 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 6. Throughout the investigation period, EPA 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, EPA, 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 May 5, 6, and 7, 2001, a newspaper notification inviting public comment on the Proposed Plan appeared in the Asbury Park Press. The 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 April 23, 2001 to May 23, 2001. 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 May 10, 2001 from 7:30 p.m. to 9:00 p.m. at the Howell Township Municipal Building, main meeting room, 251 Preventorium Road, Howell, New Jersey. At this meeting, representatives from the Navy and EPA were available to answer questions concerning OU 6 and the preferred alternatives. The complete attendance list is included in Appendix C.

III. SUMMARY OF MAJOR QUESTIONS AND COMMENTS

A. Written Comments

During the public comment period from April 23 to May 23, 2001, no written comments were received from the public pertaining to OU 6. No new comments were received from NJDEP or EPA.

B. Public Meeting Comments

Questions or comments concerning OU 6 received from the public at the May 10, 2001 public meeting are presented with the government responsiveness summary in Appendix D.

APPENDIX A

NJDEP's CONCURRENCE LETTER

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05.01.00.0021

State of New Jersey

Department of Environmental Protection

ALD T. DIFRANCESCO
Acting Governor

Robert C. Shinn, Jr.
Commissioner

Captain Claude B. Shaw
Captain, U.S Navy
Commanding Officer
Naval Weapons Station Earle
Headquarters Building, C-1
201 Highway 34 South
Colts Neck, NJ 07722

SEP 12 2001

William J. Muszynski, P.E., Acting Regional Administrator
U.S Environmental Protection Agency - Region II
290 Broadway
New York, NY 10007

Dear Captain Shaw and Mr. Muszynski:

Re: Draft Record of Decision
Operable Unit 6 (Sites 3 and 10)
Naval Weapons Station Earle
Colts Neck Twp., Monmouth Co.

The New Jersey Department of Environmental Protection (Department) has reviewed the Record of Decision (ROD) for Operable Unit 6 (Sites 3 and 10), prepared by Tetra Tech NUS, Inc., on behalf of Naval Weapons Earle, dated July 2001.

The Department concurs with the Navy's and EPA's chosen remedial alternative for these Sites as follows:

Site 3: Capping with Institutional Controls and Long Term Monitoring. This includes a soil cap with proper grade for drainage purposes and to inhibit water infiltration. Institutional controls include property use restrictions, fencing and warning signs. Long Term Groundwater monitoring will be in place to assess effectiveness of landfill cap installation.

Site 10: Capping with Institutional Controls and Long Term Monitoring: This includes a capping system with an impermeable layer to minimize exposure of landfill contaminants to the environment and to prevent water infiltration. Institutional controls include property use restrictions, fencing and warning signs. Long Term Groundwater monitoring will be in place to assess of landfill cap installation.

New Jersey appreciates the importance of the Record of Decision in the cleanup process and will continue to take all reasonable steps to ensure that the State's commitment in this area are met.

Sincerely,

Susan B. Boyle, Assistant Commissioner
Site Remediation Program

c: Jessica Mollin, EPA
Greg Goepfert, NWS Earle
Lester Jargowsky, Monmouth Co. Health Dept.
John Kolicius, Naval Facilities Engineering Command
Bruce Venner, Chief

APPENDIX B

TERMS USED IN THE RECORD OF DECISION

Appendix B

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.

Land Disposal Restrictions (LDRs): A set of EPA-prescribed limit concentrations with associated treatment standards regulating disposal in landfills.

Maximum Contaminant Level (MCL): EPA-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 EPA under the direction of the U.S. Congress.

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

Presumptive Remedy: Preferred technologies for common categories of sites based on historical patterns of remedy selection and EPA's scientific and engineering evaluation of performance data on technology implementation. Presumptive remedies ensure the consistent selection of remedial actions.

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.

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 generally 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 EPA Contract Laboratory Program.

APPENDIX C

ATTENDANCE LIST

MAY 10, 2001

PUBLIC MEETING

ATTENDANCE LIST
MAY 10, 2001
RESTORATION ADVISORY BOARD MEETING

NAME	ORGANIZATION
Stanley Marsiniak	Howell Township Environmental Commission
Michael Hammer	Howell Township Environmental Commission
Steve Taylor	Manasquan Watershed Management Group
Don Smith	Vice-Chair, Howell Township Environmental Commission
Janet Coakley	Chairman, Howell Township Environmental Commission
Steven Meyer	Board of Adjustment, Howell Township
Carl Meyer	Community
Merwin Kinkade	RAB Member
Lester Jargowsky	Monmouth County Health Department
Mary Lanko	RAB Member
Carol Reed	Community
Nancy Eldridge	NWS Earle, Public Affairs Officer
Gus Hermanni	NWS Earle, Environmental Director
Captain Shaw	NWS Earle, Commanding Officer
Greg Goepfert	NWS Earle
Lt. Ian Wexler	NWS Earle, Base Attorney
Jessica Mollin	EPA
Bob Marcolina	NJDEP
Mike Heffron	Foster Wheeler Environmental Corp., Consultant
John Kolicius	Navy, Remedial Project Manager
Russ Turner	Tetra Tech NUS, Consultant

APPENDIX D

RESPONSE TO QUESTIONS AND COMMENTS FROM THE PUBLIC MEETING HELD ON MAY 10, 2001

RESPONSIVENESS SUMMARY
OU 6 ROD (Sites 3 and 10)
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY

II. Reply to Comments on the Site 3 Proposed Plan

1. *Comment from Mr. Michael Hammer, Howell Township Environmental Commission: How big is the landfill area and how deep is it? Is there a water table in the area of the contaminants?*

Response: The entire area of the Site 3 former landfill site is approximately 5 acres. Typical thickness of fill material ranges from about 2 to 4 feet.

Measurements of groundwater level obtained from Site 3 monitoring wells indicate that the water table is below the contents of the landfill. The water table has not been observed to rise into the waste placed at Site 3.

2. *Comment from Mr. Stanley Marsiniak, Howell Township Environmental Commission: Does the stream (water from the Site 3 area) travel to different watersheds? When you look at it, it appears to be the headwaters. I would like to see more about different watersheds going in different directions, not only into the Manasquan.*

Response: There are six different watersheds that originate on the Mainside Area. Surface water leaving the Site 3 area enters the Manasquan watershed only.

As part of the remedial investigation finished in 1995, the Navy looked at all the watersheds on the base, and at the sites that would potentially be impacting that watershed. The Navy performed sampling and analysis of surface water and sediments at every stream leaving the Base. No impact to surface water was found in any stream at the fence line leaving the Base.

In addition, where there was potential for contaminant transport via surface water from any site, samples were obtained upstream and downstream of the site. The results of sampling of sediments or surface waters were evaluated for each site. At Site 3, the site-specific human health risk assessment concluded there is no present or future scenario with carcinogenic risk above the target acceptable range (1.0 E-04 to 1.0 E-06) associated with the site media that were investigated. Noncarcinogenic risks were below 1 (the level below which no adverse non-cancer risk is anticipated) for the drainage area sediment (there was no surface water) exposure scenario.

II. Reply to Comments on the Site 10 Proposed Plan

3. *Comment from Mr. Steve Taylor, Manasquan Watershed Management Group: Which way does groundwater flow at this site? Which wells are downgradient of the others (on the slide)?*

Response: Groundwater flow is generally toward the north and northeast toward the Hockhockson watershed.

4. *Comment from Mr. Michael Hammer, Howell Township Environmental Commission: Who sets the standard for your decision? Is it NJDEP, EPA, Navy or other U.S. Government body? Is this a public hearing? Are these the most serious sites?*

Response: The process being followed is part of the Superfund program administered by EPA. The Navy is the lead government agency, but EPA Region II, with assistance from NJDEP, makes

comments and helps shape the effort. In addition, the public is invited to participate through the Department of Defense (DoD) restoration advisory board (RAB) initiative.

This public meeting is being held to invite general public input into the process of selecting a remedy for OU-6, Sites 3 and 10. After all public and regulatory agency concerns are addressed; the Naval Weapons Station Earle Commanding Officer and the EPA Region II Administrator will sign a Record of Decision (ROD), which will include an explanation of the remedy for the sites.

Sites 3 and 10 are not the most serious sites in the Installation Restoration (IR) Program at NWS Earle. Various other sites are in the process of remediation or have completed remediation. Sites 4 and 5 (OU-1) were considered the most critical sites on the base. Remediation at Sites 4 and 5 was completed several years ago. Those two sites were capped and are now in a long-term monitoring status. Working with EPA and the state, the Navy establishes a hierarchy of what sites can be processed at what time.

5. *Comment from Mr. Don Smith and Janet Coakley, Howell Township Environmental Commission: How extensive was the investigation as to what metals were buried in the Site 10 landfill? Was mercury tested? Were compounds other than metals in groundwater investigated?*

Response: An analysis for metals in the landfill (the landfill contents) was not performed. Direct observation confirmed facility records indicating that spent metal munitions casings were interred here. The concern was to determine if the metals were migrating from the waste site in groundwater or other media. A complete suite of regulated metals, including mercury, as well as organic compounds (such as solvents and pesticides), were investigated during earlier studies. The Proposed Plan addresses metals only because these compounds are the only chemicals of potential concern.

6. *Comment from Mr. Steven Meyer, Board of Adjustment Howell Township: Considering the size of the site, would it be feasible to remove the contaminants, or is it something where you can remove the shell casings and eliminate the problem, or have all the contaminants already leached from them? Would (removal) and possible metals recycling off site be cheaper than the long term monitoring?*

Response: The metals appear to be stable where they are. No real indication that significant metal leachate can be entering the groundwater has been observed. The Navy feels that, with the addition of an impermeable layer, the remedy will be that much more protective of groundwater. To remove the soil and metals from the entire landfill for disposal or processing would be expensive. Additionally, due to the military nature of these items, some on-site demilitarization may be required before off-site disposal could be considered. Partial or complete removal options were considered in the Feasibility Study but were not selected for the preferred remedy because of the high cost, as well as the potential for public resistance.

7. *Comment from Mr. Stanley Marsiniak, Howell Township Environmental Commission: What happens with ammunition coming for demilitarization today? What happens to other materials offloaded from ships?*

Response: The United States Army has been assigned as the DoD lead agency for disposal of all conventional ammunition. Any conventional ordnance goes back to the Army for final disposition. The Army has contracts in the U.S. and overseas to demilitarize ordnance and properly deal with the by-products.

Other ship-generated wastes materials received at NWS Earle are disposed at appropriate off-site facilities through appropriately licensed disposal contractors.

8. *Comment from Mr. Merwin Kinkade, RAB Member: It may be worthwhile to point out that the technique the Navy is proposing here is not new and is widely used and accepted. Landfill cover systems have been used on other operable unit remedies on Base.*

Response: There are two other IR sites, Sites 4 and 5 (OU-1), on NWS Earle where this technology has been applied to approximately nine and one half acres of former landfill.

9. *Comment from Mr. Steve Taylor, Manasquan Watershed Management Group: How were the landfills originally formed? Were there excavations that were filled and covered, or were natural depressions filled and soil placed on top? When will the final decision be made to accept (or revise) these proposed alternatives?*

Response: It appears that, in both cases, no initial excavation was made. It appears that materials were dumped into natural depressions or ravines. Soil was later placed on top, and the landfill was extended over some time period in this way.

The open comment period for the Proposed Plan extends to May 23. The Navy invites written comment in the period. A copy of the Proposed Plan is available in the Library or can be obtained at this meeting from Greg Goepfert. The next step will be to prepare the responsiveness summary and meet with EPA to decide if all concerns have been adequately addressed. We expect the process to take approximately 30 to 45 days.

With that schedule in mind, the Navy is hopeful that construction of the remedy can begin as early as the end of August. Funding has been assured for this work.

10. *Comment from Mr. Michael Hammer, Howell Township Environmental Commission: How were these sites picked, from the 29 sites at NWS Earle? Are these the only sites that were picked so far?*

Response: The sites were identified back in 1983 after an extensive study was performed. Twenty-nine sites were identified this way. Since that time, about five additional sites have been found to require further study. The total number of sites identified then is about 35. Of those sites, the Navy has put in place remedial actions or completed remedial action on about 62 percent of the sites. About 20 of the sites have been completed.

In general, the worst sites were processed first, but some sites of concern, namely Site 13, which is a former industrial-type landfill, remain. By the end of this year, the Navy hopes to be about three-quarters through the program.

The bulk of the investigative stage was completed in 1995. Investigations are underway now for any sites identified later than 1995.

11. *Comment from Mr. Lester Jargowsky, Monmouth County Health Department, and Mr. Merwin Kinkade, RAB Member: Suggested that a hand vote of RAB members present be taken in support of the Proposed Plan for OU-6 as defined in the report presented.*

Moved that the RAB accept and support the proposed alternatives for Sites 3 and 10. (All RAB members present concurred, none abstained from voting. That the motion was carried was noted in the meeting minutes for the record).

Response: No response.