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NORTHNAVFACENGCOM 4335/3 (Rev. 6/80)

CONTROL NO. 62

CONTRACT NO.	DELIVERY ORDER #	ACTIVITY LOCATION
N62472-94-D-0398	0034	Naval Weapons Station (NWS) @ Earle, Colts Neck, NJ

PROJECT TITLE:
VARIOUS REMOVAL ACTIONS

FROM:	DATE
Foster Wheeler Environmental Corp. Program QC Manager: Mark Miller	July 8, 1999
TO:	DATE
W FAUSTMAN (2 COPIES + ORIGINAL)	July 8, 1999

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FOR COMMANDING OFFICER, NORTHERN DIVISION NAVAL FACILITIES ENGINEERING COMMAND — DATE

ITEM NO.	SUBMITTAL DESCRIPTION	PREPARED/ SUBMITTED BY	APPROVED	DISAPPROVED	REMARKS
86	SD-18, Records; Final Action Memorandum & EE/CA for Site 12	M. Miller			
87	SD-18, Records; Final Work Plan for Site 12	M. Miller			

FINAL WORK PLAN
SOIL EXCAVATION AT SITE 12, FORMER BATTERY STORAGE AREA

NAVAL WEAPONS STATION – EARLE

Issued:

July 8, 1999

Prepared for:

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REMEDIAL ACTION CONTRACT N62472-94-D-0398
DELIVERY ORDER NO. 0034

Revision	Date	Prepared By:	Approved By:	Pages Affected
1	July 8, 1999	C. Joblon	M. Heffron, P.G. J. Gorgol, P.E.	All

DRAFT WORK PLAN
SOIL EXCAVATION AT SITE 12,
FORMER BATTERY STORAGE AREA
NAVAL WEAPONS STATION - EARLE
COLTS NECK, NEW JERSEY

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APPENDICES

Appendix A; RI and RI Addendum Summary

1.0 INTRODUCTION

Foster Wheeler Environmental Corporation (Foster Wheeler Environmental) has been contracted by the Northern Division, Naval Facilities Engineering Command (Navy) to perform the work outlined in this Work Plan at Site 12 - Former Battery Storage Area, at the Naval Weapons Station (NWS) Earle located in Colts Neck, NJ. This Work Plan is being submitted to satisfy the pre-construction submittal requirements included in paragraph 1.2.1, Pre- and Post-Construction Documentation of the Statement of Services for Delivery Order No. 0034 under Remedial Action Contract No. N62472-94-D-0398.

1.1 PROJECT OBJECTIVES

The project objectives are: excavation, removal, and disposal of contaminated soils, sample collection to demonstrate that New Jersey Department of Environmental Protection (NJDEP) Residential Clean-Up Standards have been met, and restoration of the site after excavation. Removal of the impacted soils will minimize the potential migration/mobilization of the contaminants to surface water, groundwater, and soils at the site. All work will be completed in accordance with all applicable federal, state, and local regulations.

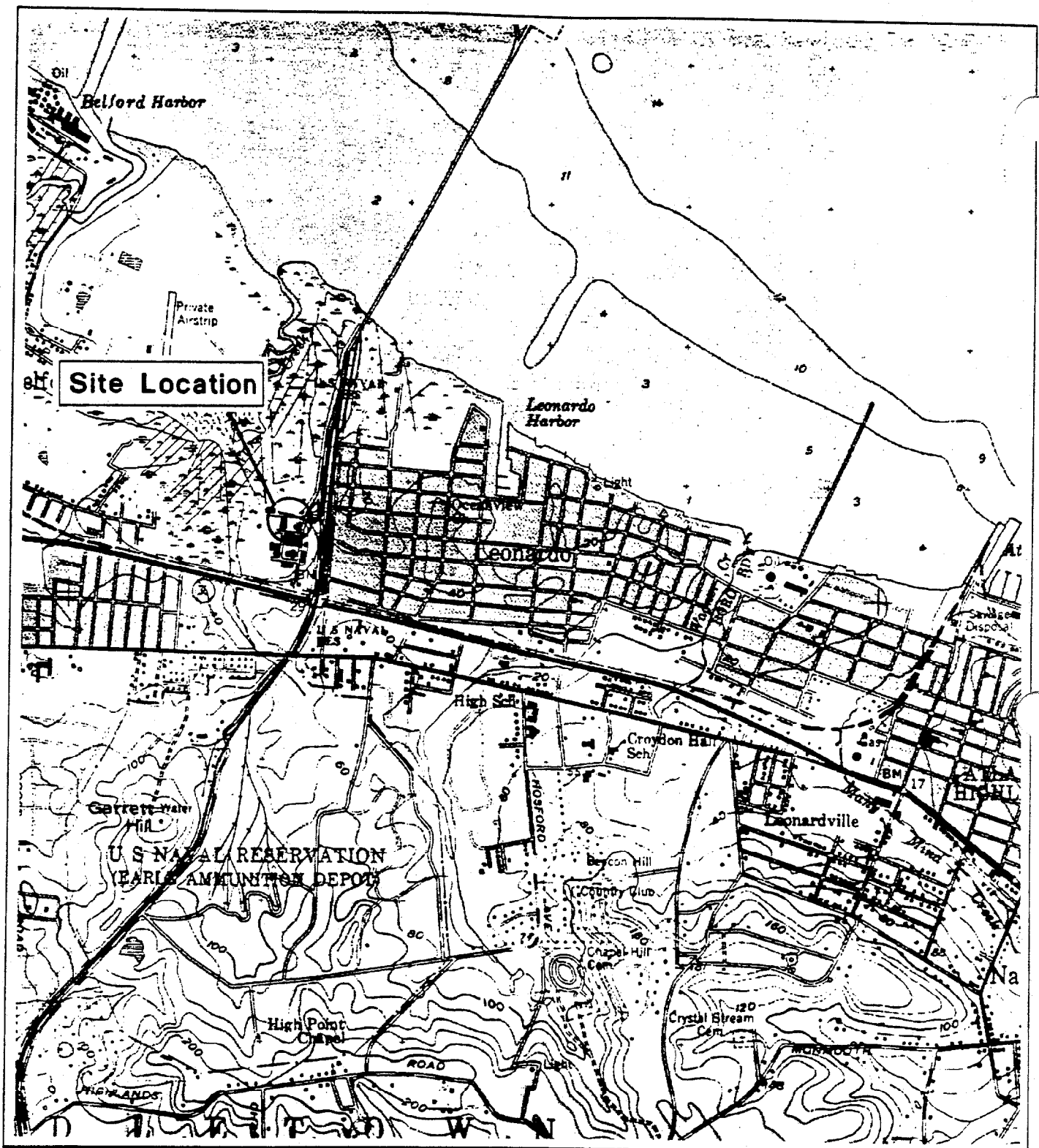
The Health and Safety Plan previously submitted for Site 19 shall be used for this effort since this was a similar removal action of soils contaminated with metals and semi-volatile organics.

2.0 PROJECT LOCATION AND DESCRIPTION

Naval Weapons Station Earle (NWS-Earle) is located in Monmouth County in east-central New Jersey as presented on Figure 2-1, Site Location Map. The base consists of a Mainside area and a Water Front area occupying a total of approximately 11,134 acres. The Mainside of the base is located approximately 10 miles inland from the Atlantic Ocean. The Mainside and the Waterfront areas of the base are linked by a narrow tract of land that serves as a right-of-way for a government road and railroad line.

NWS Earle is responsible for furnishing ammunition to the naval fleet, and coordinates all port services and logistical support for home-ported and visiting ships. The base also conducts safety inspections, supervises ammunition loading for the United States Coast Guard, and provides marine fire fighting capability and standby tug services.

Site 12 is located at the Waterfront area of the NWS-Earle Base. The Waterfront consists of an ammunition depot and associated piers for loading and servicing the naval fleet. Site 12 is located adjacent to the loading dock north of Building R-10. Site 12 – Former Battery Storage Area is shown as Figure 2-2. Based on the existing data, the area to be excavated is located between the loading dock, on the north side of Building R-10, and



0 2000 4000 FT

QUADRANGLE LOCATION

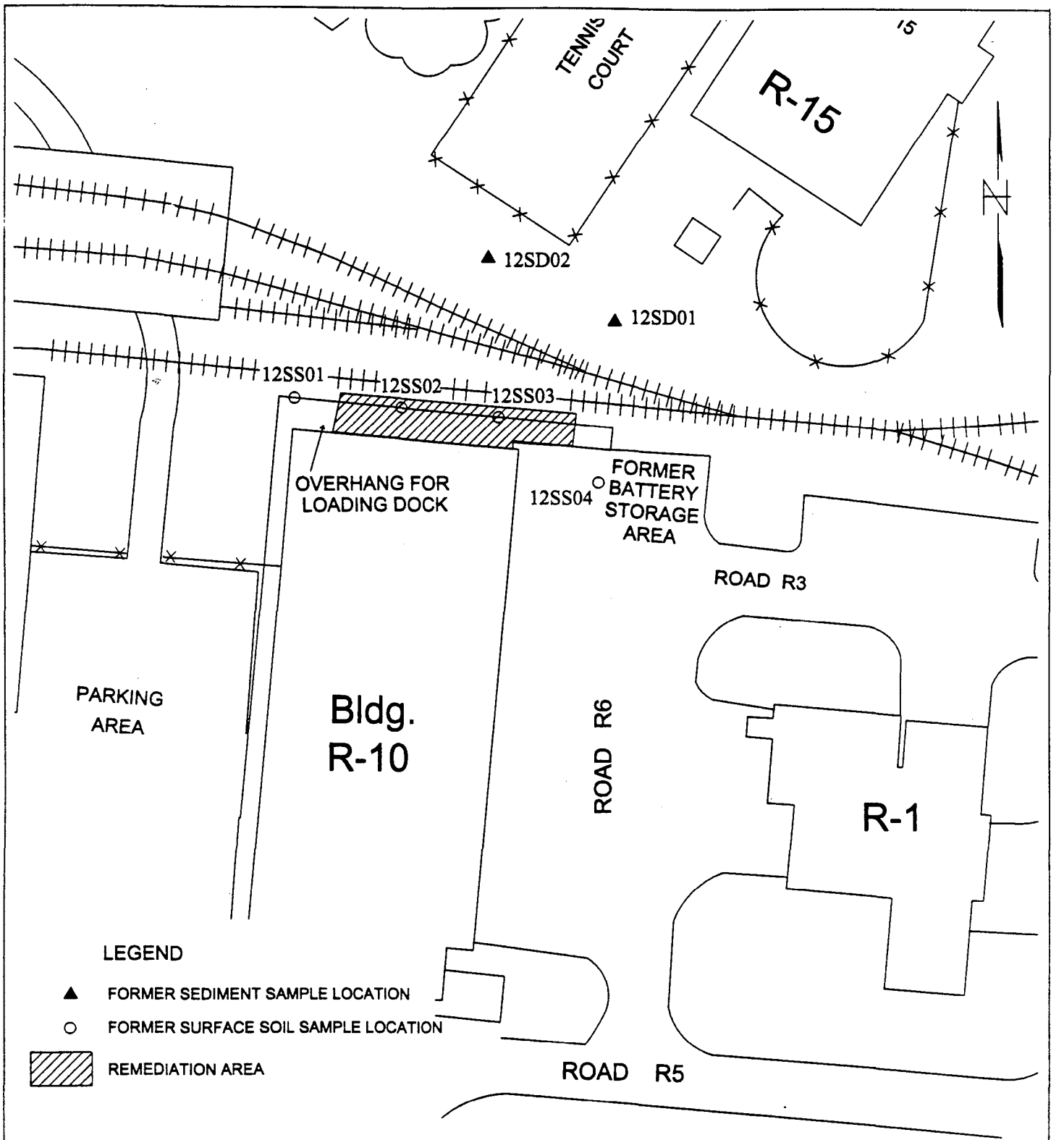
Source: U.S.G.S. Topographic Maps (7.5 Minute)
Sandy Hook, NJ Quadrangle

NWS – Earle
Colts Neck, N.J.

Figure 2-1
Site 12

FOSTER WHEELER ENVIRONMENTAL CORPORATION

earle\siteloc.dwg



Source: Brown & Root Environmental, RI Report.

U.S. Navy RAC
NWS – Earle

Figure 2–2
Site 12 Battery Storage Area

FOSTER WHEELER ENVIRONMENTAL CORPORATION

navyrac\earle\site 12

the railroad tracks. It is also possible that soils to the north of the Former Battery Storage Area will require excavation.

Site 12 was used as a temporary staging area for forklift batteries. Some of the batteries were apparently drained of their electrolyte onto the site. The storage area encompassed an area of approximately 10,000 square feet. The area has not been used for battery storage for some time. There is no visible source of contamination, such as staining or stressed vegetation.

Brown and Root Environmental conducted a Remedial Investigation of the Site 12 in 1995. Surface soils were obtained between the loading dock, on the northern side of Building R-10, and the railroad tracks. The soil samples were collected from 0 to six-inches below grade. The three soil samples were analyzed for target compound list (TCL) volatile organic compounds (VOCs), TCL semivolatile compounds (SVOCs), TCL pesticides/PCBs, and target analyte list (TAL) metals. The laboratory analyses of the surface soils revealed concentrations of SVOCs and inorganics above the NJDEP Residential Direct Contact Cleanup Criteria. Table 2-1 summarizes the contaminants of concern that were detected at concentrations greater than the NJDEP Residential Clean-Up Criteria.

Brown and Root Environmental conducted additional sampling at Site 12, and submitted an Addendum to the RI. The additional sampling included the collection of an additional soil sample (12SS04) to the west of surface soil sample 12SS03 in order to delineate the western extent of contamination. Soil borings were also advance during the additional field work in order to obtain soil sample for laboratory analyses to delineate the vertical extent of the contamination. Four soil borings were advanced to a depth of approximately 3 feet below grade at surface soil sample locations. The four subsurface soil samples were analyzed for (TAL) metals. The laboratory analyses of the subsurface soil samples revealed that the concentrations of metals at 3 feet below grade were below all NJDEP Residential Clean-Up Criteria. Appendix A contains a summary of all the analytical data collected for the RI, and the Addendum to the RI.

2.1 SITE CONDITIONS

Local topography at Site 12 is relatively flat, approximately 13 feet above sea level. Much of Site 12 is paved with asphalt, however, the area of concern is covered with minimal vegetation, and is not paved.

2.1.1 Site Geology

NWS-Earle is situated in the Coastal Plain Physiographic Province of New Jersey. The Coastal Plain consists of a series of seaward-dipping unconsolidated sediments of Cretaceous through Quaternary Age, deposited atop pre-Cretaceous bedrock. The Coastal Plain sediments were deposited in continental, coastal, and marine depositional environments, and consist of numerous sequences of sand and gravel, silt, and clay. These deposits generally strike northeast-southwest, and dip to the southeast at 10 to 60 feet per mile. The Coastal

TABLE 2-1 CONCENTRATIONS OF SOIL SAMPLES GREATER THAN NJDEP RESIDENTIAL CLEANUP CRITERIA

	Soil Sample 12SS01	Soil Sample 12SS02	Soil Sample 12SS03	Soil Sample 12SS03	Soil Sample 12SS04	NJDEP Residential Clean-Up Criteria
SEMIVOLATILES						
Benzo(a)pyrene	250 ug/kg	1,100 ug/kg	1,700 ug/kg	2,800 ug/kg	N/A	660 ug/kg
Benzo(a)fluoranthene	610 ug/kg	4,600 ug/kg	8,700 ug/kg	12,000 ug/kg	N/A	900 ug/kg
Benzo(a)anthracene	210 ug/kg	1,600 ug/kg	2,300 ug/kg	5,500 ug/kg	N/A	900 ug/kg
INORGANICS						
Lead	68.6 mg/kg	1,130 mg/kg	978 mg/kg	1,070 mg/kg	12.6 mg/kg	400 mg/kg
Zinc*	214 mg/kg	835 mg/kg	1,500 mg/kg	1,570 mg/kg	54.7 mg/kg	1,500 mg/kg

Shaded concentrations are greater than or equal to the NJDEP Residential Cleanup Criteria.
*Zinc data was rejected during data validation, but is expected to be present.

Plain section is nearly 900 feet thick beneath NWS-Earle (Brown & Root, Draft Remedial Investigation Report, March 1996).

Regional mapping places Site 12 within the outcrop area of the Englishtown Formation. The Englishtown Formation ranges between 35 and 150 feet in thickness, and consists mainly of tan and gray fine to medium grained quartz sand with localized clay beds. The presence of the Englishtown Formation beneath Site 12 has not been confirmed because soil characterization has not been performed at the site. However, the sediments encountered in borings at nearby Sites 6, 15, and 17 generally exhibit soil characteristics that agree with the published description of the Englishtown Formation. Sites 6, 15, and 17 are located within 1,000 feet of Site 12 to the northeast, south-southeast, and south-southwest, respectively. Soil borings in these sites revealed fill material, sand, silty sand, and clayey sand (Brown & Root, Draft Remedial Investigation Report, March 1996).

2.1.2 Groundwater

Shallow groundwater is expected at Site 12, as occurs within most areas of the naval base.

3.0 SCOPE OF WORK

The tasks included in this scope of work are described below in greater detail.

3.1 TASK 1 - PROJECT PLANNING/MANAGEMENT

Project Planning/Management activities include the preparation of pre-construction submittals, coordinating utility requirements, mobilization to the site, and providing home office support functions during the estimated period of performance. The subtasks involved in Project Planning/Management are described below.

3.1.1 Subtask 1A - Pre-Construction Submittals

Foster Wheeler Environmental will prepare and submit the following pre-construction documents to the Navy:

Work Plan
The Work Plan presents Foster Wheeler Environmental's approach to executing the project, including the site description, statement of work, engineering data, transportation and disposal information, and sampling and analytical requirements.

Health and Safety Plan (HASP)
The approved Health and Safety Plan (HASP) for the Site 19 Remediation shall be used for the Site 12 Remedial Action. The Site 19 remedial action involved the excavation and removal of soils contaminated with semi-volatile organics and metals, almost identical to Site 12. The HASP includes Foster Wheeler Environmental's approach to providing for the health

and safety of its employees during the project. The Activity Hazard Analysis and Action Levels for this effort shall be submitted as an Addendum to the Site 19 HASP.

3.1.2 Subtask 1B - Mobilization

Mobilization will consist of contacting appropriate Navy personnel at NWS Earle to arrange for contractor passes and to coordinate support requirements for the excavation work. A utility survey shall be conducted to determine all utility lines in the work area. A thorough survey of above ground utilities and structures will be conducted prior to work. Subsurface utilities shall be located by NWS-Earle Public Works personnel. A dig permit shall be obtained prior to any excavation work.

3.1.3 Subtask 1C - Home Office Support

Foster Wheeler Environmental's Langhorne, Pennsylvania office will provide home office support for the duration of the project. Home office support includes the preparation of the monthly progress reports, financial and technical reports.

3.2 TASK 2 - PERMIT AND REPORT PREPARATION/SUBMISSION

3.2.1 Subtask 2A- Dig Permit

Foster Wheeler Environmental shall contact the NWS-Earle Public Works Department to obtain a dig permit and have all utilities marked-out prior to excavation activities. Foster Wheeler will also contact the New Jersey Dig Safe to clear additional utilities.

3.2.2 Subtask 2B-Preparation of Closure Report

Foster Wheeler Environmental shall prepare a report detailing the actions performed at Site 12, and any subsequent findings or changes based on the field work. This report will be submitted to the Navy.

3.3 TASK 3- PRE-EXCAVATION SOIL SAMPLING

Objectives

The objective of soil sampling prior to excavation is to characterize the waste for off-site transportation and disposal. Based on laboratory analyses, the soil may contain concentrations of TAL metals, and some semi-volatile organic compounds, above the NJDEP Residential Clean-Up Criteria.

Sampling Locations, Equipment and Procedures

Waste characterization samples shall also be collected from the anticipated excavation area, between former soil sample locations 12SS01 and 12SS04. The soil samples shall be

collected from 0 to 2.5 feet below grade. Waste characterization samples at Site 12 will be selected for every 20 cubic yards of excavated material for the first 100 cubic yards, then for every 100 cubic yards of material thereafter. Since waste characterization sampling will take place before the actual excavation, the number of samples will be based upon estimates of the quantity of material to be excavated. Once the locations have been selected, a laborer in level D protection using clean, dedicated sampling gloves will collect the waste characterization samples from 0-2.5 feet with a decontaminated steel hand auger.

Procedures for sampling are as follows:

1. Using a clean steel hand auger, core down from 0-2.5 feet at sample location. Transfer soil, with as few rocks and vegetative material as possible, from auger head into the sample bottle.
2. Cap the sample bottle immediately. Wipe excess residue from the sides of the bottleware.
3. Affix labels to the sample jar(s), and complete chain-of-custody and other required sample data forms. Protect samples against extreme temperature changes and breakage by placing them in sample coolers stored in a protected area.

Sample Analysis

The waste characteristics samples shall be collected from previously chosen locations and laboratory analyzed for total petroleum hydrocarbons (TPH), total organic halogens (TOX), polychlorinated biphenyls (PCBs), ignitability, corrosivity, reactivity, moisture content, RCRA metals (including Cu, Ni, Zn), and full TCLP. The laboratory analyses are dictated by the analytical requirements of the recycling and disposal facilities. Based on previous analytical data of soil samples, the soils will probably be classified as non-hazardous, therefore the excavated soils shall be sent to a soil recycling facility, but the laboratory analyses must verify the non-hazardous classification of the soils.

The Sampling and Analysis Plan in Section 4 details the sample collection methodology and the laboratory analyses.

3.4 TASK 4 - REMOVAL OF CONTAMINATED SOIL

The contaminated soil from Site 12 shall be excavated with a Case 580 backhoe, or equivalent. Since the waste characterization samples are to be obtained prior to the excavation activities, the soil can be loaded directly into trucks for off-site disposal. The trucks shall be backed down the paved area to the east of Building R-10. The soil loading area shall be covered with plastic. The trucks shall be loaded on the asphalt area covered with plastic. The plastic-lined loading area shall be kept free of soils in order to prevent truck tires from coming in contact with contaminated soils.

The area north of Building R-10 shall be excavated to a depth of approximately 2 to 3 feet below grade, between the loading dock, and the railroad tracks. The anticipated area of excavation is delineated to the east by former soil sample location 12SS01 and to the west by former soil sample location 12SS04. Soils that exhibit any staining, odors, or indicate the presence of volatile organics on air monitoring equipment will be removed from the excavation and transported off-site.

Hay bales shall be installed in order to control erosion and prevent the migration of sediments off-site during the excavation and back-filling operations. The hay bales shall be set a minimum of four inches in the soil. The barriers shall be constructed in such a manner as to prevent water from bypassing the ends of the barriers. The hay bales shall be removed after the site is stabilized such that erosion control is no longer needed.

The area will be inspected, and the work zone will be cordoned off to prevent accidental access to the work zone. A decontamination pad will be created for both equipment and personnel. The decontamination pad will be located within the work zone, near to the point of entry/exit. All miscellaneous waste and waste water will be stored on site and disposed of properly as described in Section 6.0 of this Work Plan. Excavated soils and other wastes are not anticipated to be hazardous.

3.5 TASK 5 - POST EXCAVATION SAMPLE COLLECTION

Post-excavation samples will be collected from the walls and bottom of the excavation to demonstrate that the NJDEP Residential Clean-Up Standards have been met.

Objectives

The objective of confirmation sampling after the excavation activity is to determine if all of the contaminated material has been removed from the site before back-filling takes place.

Sampling Locations, Equipment and Procedures

Based on NJDEP Final Regulations, one confirmatory sample will be taken from the top of each side-wall for every 30 linear feet of side-wall and one sample will be taken from the excavation bottom for every 900 square feet of bottom area. If possible, these samples should be taken from areas of visible staining or with a strong odor. The samples will be collected by a laborer in level D modified protection, using dedicated clean sampling gloves, a clean steel trowel and bowl. Wide-mouthed sample bottles will be used.

Procedures for sampling are as follows:

1. Using a clean steel trowel and bowl, dig into side-wall (or excavation floor) at sample location. Transfer soil, with as few rocks and organic material as possible, into the sample bottle.

2. Cap the sample bottle immediately. Wipe excess residue from the sides of the bottleware.
3. Affix labels to the sample jar(s), and complete chain-of-custody and other required sample data forms. Protect samples against extreme temperature changes and breakage by placing them in sample coolers stored in a protected area.

Sample Analysis

Each sediment/soil sample will be collected and analyzed for TCL semi-volatile organics and TAL metals as described in Table 4-1.

3.5.1 Field Blank Sampling

Objectives

The objective of field blank sampling is to ensure that the proper quality assurance and quality control procedures were used during the collection of the confirmatory soil samples.

Sampling Locations, Equipment and Procedures

One water sample shall be collected for the field blank.

Procedures for sampling are as follows:

1. Deionized water shall be poured over the decontaminated soil collection device, such as a hand auger, with the water being collected in a decontaminated stainless steel bowl under the sampling device. The water should be transferred from the stainless steel bowl to the appropriate sample container.
2. Cap the sample bottle immediately. Wipe excess residue from the sides of the bottleware.
3. Affix labels to the sample jar(s), and complete chain-of-custody and other required sample data forms. Protect samples against extreme temperature changes and breakage by placing them in sample coolers stored in a protected area.

Sample Analysis

Each water sample will be collected and analyzed for TCL semi-volatiles and TAL metals as described in Table 4-1.

3.6 TASK 6- EQUIPMENT DECONTAMINATION

The excavator bucket, and any other equipment that comes into contact with contaminated soils, shall be decontaminated with a pressure washer. The decon water shall be collected, containerized in 55 gallon drums, analyzed, and disposed off-site.

3.7 TASK 7- BACKFILL OF EXCAVATION

The excavated area shall be back-filled and graded to match the surrounding grade following Navy review of confirmatory sample analysis and determination of soil analyses meeting the NJDEP Residential Clean-Up Criteria. The excavated area shall be back-filled with certified-clean common fill or sand and compacted with a hand-operated, plate type, vibratory or other suitable hand tampering device.

4.0 FIELD SAMPLING AND ANALYSIS PLAN

4.1 INTRODUCTION

Foster Wheeler Environmental Corporation (FWENC) is submitting this Sampling and Analysis Plan (SAP) for excavation and disposal of contaminated soil at Site 12 at the Naval Weapons Station (NWS) Earle Waterfront located in Leonardo, NJ. The samples are being collected for waste characterization and post-excavation confirmatory samples. The analytical results will be reviewed by the Navy to confirm that the remediated site meets NJDEP Residential Clean-Up Criteria prior to backfill of the excavations. This work is being performed under Delivery Order No. 0034 to Navy Contract N62472-94-D-0398

The SAP presents the procedures to be followed during excavation and sampling of the Site 12-Former Battery Storage Area. The SAP specifically addresses the following areas:

- Analytical Requirements
- Responsibilities of Site Personnel
- Sample Analytical Program
- Sample Packing and Shipping
- Documentation
- Field Sampling Program
- Quality Assurance/Quality Control
- Procedures for Field Changes and Corrective Actions

Site-specific Standard Operating Procedures have been included (Section 3.0) to describe the sampling procedures. Any modifications necessary to these SOPs due to field conditions or other unforeseen situations shall be recorded in the site logbook, documented on the

appropriate Change Request Forms (CRF) by site personnel, and approved by the Senior Project Engineer/Manager (See Section 8.5).

4.2 PERSONNEL RESPONSIBILITIES

The project team will include the following personnel:

The Senior Project Engineer/Manager (SPEM) has final responsibility for the development of the SAP and management of the project team.

The Project Superintendent (PS) is responsible for assuring that proper collection, packaging, preservation, and shipping of samples is performed in accordance with the SAP. In addition, the PS is responsible for coordinating with the subcontracted laboratory during sample analysis and for reviewing the analytical data received from the laboratory.

The Site Health and Safety Officer (SHSO) is responsible for the safety of all site personnel as detailed in the site-specific Health and Safety Plan (HASP), presented under separate cover.

The Laboratory Subcontractor is responsible for supplying all services, equipment, and material required to perform the analysis of the environmental samples. The laboratory subcontractors are responsible for following all specified methodology protocols, including quality assurance/quality control (QA/QC) requirements. In addition, the laboratory subcontractors are responsible for the proper disposal, including all associated costs, of the environmental samples upon completion of the analytical work.

4.3 FIELD SAMPLING ACTIVITIES

This section addresses the field investigation activities, including:

- Sample Tracking System
- Sample Analytical Requirements
- Sample Packaging and Shipping
- Sample Documentation

4.3.1 Sample Tracking System

The objective of the sample identification system is to provide a framework for developing sample numbers that are unique to that sample and convey information regarding sample type that will enable data users to easily identify sample locations. The sample designation is established in order to integrate the data into the Navy's Geographical Information System (GIS).

The first two number of the sample tracking system shall refer to this site specific location, which in our case is Site 12. All soil sample identifiers shall begin with the number 12. For example 12SS01 would refer to Site 12 soil sample one. In order to identify the specific sample, the date and round shall be appended to the sample name. 12SS01-99-1 would refer to Site 12, soil sample number 1, taken from the first round in 1999. A "D" would be added to the sample nomenclature to indicate a duplicate sample. For the purposes of this sampling effort, the following characters shall be assigned to identify the various matrices:

WC = Waste characterization SS = Soil sample
WW = Wastewater (decon fluids)

For example, 12WC01-99-1 would be waste characterization number 1, collected at Site 12 during the first round of sampling in 1999.

A cumulative sampling master log will be maintained as the field program progresses. The samples taken will be referenced to each sampling location in the site logbook.

All location information for the samples will be recorded in the field sampling logbook (Section 8.6.1).

4.3.2 Sample Analytical Requirements

Table 4-1 specifies location, number of samples, matrix, laboratory analyses, and rationale for each sample type. Specific procedures governing sample preservation are presented below. Reagents required for sample preservation will be added to the sample containers by the laboratory prior to their shipment to the field or added in the field. In general, aqueous samples of low concentration organics (or soil samples of low or medium concentration organics) are cooled to 4°C. Medium and high hazard aqueous or high hazard soil samples are not preserved. Low concentration aqueous samples for TPH are acidified with H_2SO_4, while medium concentration and high hazard aqueous metal samples are not preserved. Soil samples for metals are not preserved.

Preservatives will be added to the sample bottleware by the subcontracted laboratory prior to shipment to the site. These reagents should be reagent (AR) grade and should be diluted to the required concentration with double-distilled, deionized water.

4.3.3 Sample Packaging and Shipping

The objective of the sample packaging and shipping requirements are to maintain sample integrity from the time a sample is collected until it is received at the analytical laboratory. Chain-of-custody (COC) forms, sample labels, custody seals, and other sample documents will be completed to maintain sample integrity. Specific procedures for packaging and shipping of environmental samples are presented below. These procedures were obtained from the NJDEP Field Sampling Procedures Manual.

TABLE 4-1
NAVAL WEAPONS STATION-EARLE
DELIVERY ORDER 0034
SAMPLING AND ANALYSIS REQUIREMENTS

Media	*Analyses*	*Frequency*	*Quantity*	*Method*	*Rationale*
Soil	Full TCLP, TPH, TOX, PCBs, ignitability, corrosivity, reactive cyanide, reactive sulfide, moisture content, RCRA metals (including Cu, Ni, Zn)	Waste characterization sample: one sample from the area of the highest concentrations of contaminants.	1	TPH:EPA 413 TOX: SW846 Method 3540A/9020A PCBs-SW846, 8080 Ign: SW-846 Method 1020 Corr: SW846 Method 1110 React: SW846 Chapter 7 TAL metals-EPA SW846 Full TCLP SW846 1311with applicable. methods following.	Analytical results used for waste characterization for selection of material transporter and disposal facility.
Soil	Semi-volatile TCLP, Metals TCLP, and TAL metals	Waste characterization samples: one sample for every 20 yds^3 for first 100 yds^3 of excavated material, one sample for every 100 yds^3 thereafter.	9	TAL metals-EPA SW846 Full TCLP SW846 1311with applicable. methods following.	Analytical results used for waste characterization for selection of material transporter and disposal facility.
Soil	TCL semi-volatile organics TAL metals	Confirmatory soil samples from every 30 linear feet of sidewall and every 900 square feet of base.	18*	TCL semi-volatiles SW846, 8270 TAL metals SW846, 6010/7000	Analytical results used to insure site meets NJDEP direct contact non-residential standards prior to backfilling operations.
Field Blank	TCL semi-volatile organics TAL metals	One per sampling episode.	1	TCL semi-volatiles SW846, 8270 TAL metals SW846, 6010/7000	To ensure proper quality assurance/quality control during sampling operations.
Decon Water	TCL semi-volatile organics TAL metals	One sample for all decon water generated.	1	TCL semi-volatiles SW846, 8270 TAL metals SW846, 6010/7000	Analytical results used for waste characterization for off-site transportation and disposal of decon water generated at the site.

* Quantities includes duplicate quality assurance samples

4.3.3.1 Environmental Samples

Low-concentration samples will meet the volume limits for the limited quantity packaging exceptions under 49CFR173 and should be packaged for shipment as follows:

1. A sample label is attached to the sample bottle. The label should be taped over with clear packing tape to preserve legibility.

2. A picnic cooler (such as a Coleman or other sturdy cooler) is typically used as a shipping container. In preparation for shipping samples, the drain plug is taped shut from the inside and outside, and a large plastic bag is used as a liner for the cooler. Approximately 1 inch of packing material, such as asbestos-free vermiculite, perlite, or styrofoam beads, is placed in the bottom of the liner. The cooler containing methanol-preserved volatile soil samples must have the following markings on the cooler: Limited Quantity, This End Up. Each sample shall not contain more than one (1) liter of methanol or one (1) gallon of fumic acid, and the total weight of the cooler and packaging materials must not exceed 64 pounds.

3. The sample bottles are placed in the lined picnic cooler. Cardboard separators, and/or additional packing material, should be placed between the bottles to prevent breakage during shipping.

4. Aqueous samples for low or medium-level analysis must be shipped cooled to 4°C with ice. No ice is used in shipping high-level aqueous samples, or soil samples, or dioxin samples. Ice is not required in shipping soil samples, but may be utilized at the option of the sampler. All cyanide samples, however, must be shipped cooled to 4°C.

5. The lined cooler is filled with packing material (such as asbestos-free vermiculite, perlite, or styrofoam beads), and the large inner liner is taped shut. Sufficient packing materials should be used to prevent sample containers from making contact during shipment.

6. The paperwork being shipped to the laboratory is placed inside a plastic bag. The base is sealed and taped to the inside of the cooler lid. A copy of the COC form should be included in the paperwork sent to the laboratory. The last block on the COC form should indicate the overnight carrier and airbill number. The airbill must be filled out before the samples are handed over to the carrier. The laboratory should be notified if the shipper suspects that the sample contains any substance for which the laboratory personnel should take safety precautions.

7. The cooler is taped shut with strapping tape (filament-type).

8. At least two signed custody seals are placed on the cooler, one on the front and one on the back.

9. The name and address of the shipper and consignee are placed on the exterior of the container in addition to the shipping papers. Commercial address labels may be used.
   - The DOT Proper Shipping Names and UN# are placed on the outside of the cooler:
     For methanol preserved samples: Methanol, PG II, UN1230, or
     Flammable Liquid, NOS (Methanol),
     PG II, UN1230
- The words "Limited Quantity" are written on the cooler adjacent to the Proper Shipping Name and UN#. A DOT Hazard Class Label is not required for limited quantity samples.
  - Markings indicating "This End Up" with upward pointing arrows are placed on two (2) sides of the container. Commercially printed labels shall be used

10. The cooler is handled over to the overnight carrier. A Dangerous Goods airbill is necessary for shipping environmental samples if preserved with methanol or acid. A standard airbill can be used to ship the samples if there are no preservatives.

11. Arrow symbols indicating "This Way Up" should be placed on the cooler in addition to the marking and labels described above.

12. Restricted-article/Dangerous Goods airbills are used for shipment indicating the following:

    - Number of packages or number of coolers.

    - Proper shipping name and packaging group. If unknown, use FLAMMABLE SOLID, N.O.S. or FLAMMABLE LIQUID, N.O.S.

    - Hazard Class; if unknown, use flammable solid or flammable liquid.

    - Words "Limited Quantity" if inner containers meet the volume limits for limited quantities under 49CFR173.

    - Identification number; if unknown, use UN1325 (for flammable solids) or UN1993 (for flammable liquids).

    - Net quantity per package or amount of substance in each cooler.

    - Radioactive materials section (leave blank).

    - Passenger or cargo aircraft (cross off the nonapplicable). Up to 25 pounds of flammable solid per cooler can be shipped on a passenger or cargo aircraft. Up to 1 quart of flammable liquid per cooler can be shipped on a passenger aircraft, and up to 10 gallons of flammable liquids per cooler can be shipped on a cargo aircraft. Use Hazardous Materials Table (49CFR172.101) column (9) to verify quantity restrictions for other Proper Shipping Names.

- Name and title of shipper (printed).
- An emergency telephone number at which the shipper can be reached within 24-48 hours.
- Emergency Response Guide Number
- Shipper's signature.

NOTE: The penalties for improper shipment of hazardous materials are severe. A fine of $25,000 and five years imprisonment can be imposed for each violation.

4.3.3.2 Hazardous Samples

Medium- and high-concentration samples are defined as hazardous and must be packaged as follows:

1. A sample label is attached to the sample bottle. The label should be taped over with clear packaging tape to preserve legibility.
2. Each sample bottle is placed in a plastic bag, and the bag is sealed. For medium-concentration water samples, each VOA vial is wrapped in a paper towel, and the two vials are placed in one bag. As much air as possible is squeezed from the bags before sealing.
3. Each bottle is placed in a separate paint can, the paint can is filled with vermiculite, and the lid is fixed to the can. The lid must be sealed with metal clips, or with filament or evidence tape; if clips are used, the manufacturer normally recommend six clips.
4. Arrows are placed on the can to indicate which end is up.
5. The outside of each can must contain the proper DOT shipping name and identification number for the sample. The information may be placed on stickers or printed legibly. If the nature of the sample is known, 49 CFR 171-177 is consulted to determine the proper labeling and packaging requirements. A liquid sample of an uncertain nature is shipped as a flammable liquid with shipping name "FLAMMABLE LIQUID, N.O.S." and the identification number "UN1993." A solid sample of uncertain nature is shipped as a flammable solid with the shipping name "FLAMMABLE SOLID, N.O.S." and the identification number "UN1325."

6. The cans are placed upright in a cooler lined with a plastic garbage-type bag, with the drain plug taped shut inside and out. Asbestos-free vermiculite, perlite, or styrofoam is placed in the bottom of the cooler. Two sizes of paint cans are used: half-gallon and gallon. The half-gallon paint cans may be stored on top of each other; however, one-gallon cans are too high to stack. The cooler is filled with packing material and the plastic liner is taped shut.

7. The paperwork going to the laboratory is placed inside a sealable plastic bag and taped to the inside of the cooler lid. A copy of the COC form must be included in the paperwork sent to the laboratory. The sampler keeps one copy of the COC form. The laboratory should be notified if the sample is suspected of containing any substance for which laboratory personnel should take safety precautions.

8. The cooler is closed and sealed with strapping tape. At least two custody seals are placed on the outside of the cooler (one on the front and one on the back).

9. The following markings are placed on top of the cooler:

    - Proper shipping name (49 CFR 172.301)
    - DOT identification number (49 CFR 172.301)
    - Shipper's or consignee's name and address (49 CFR 172.306)
    - "This End Up", with upward pointing arrows, legibly written if shipment contains liquid hazardous materials (49 CFR 172.312). Commercial labels shall be used.

10. The following labels are required on top of the cooler (49 CFR 172.406e):

    - Appropriate hazard class label (placed next to the proper shipping name)
    - "Cargo Aircraft Only" (if applicable as identified in 49 CFR 172.101)

11. Arrow symbols indicating "This Way Up" should be placed on the cooler in addition to the marking and labels described above.

12. Restricted-article/Dangerous Goods airbills are used for shipment indicating the following:

    - Number of packages or number of coolers.

    - Proper shipping name and packaging group. If unknown, use FLAMMABLE SOLID, N.O.S. or FLAMMABLE LIQUID, N.O.S.

    - Hazard Class; if unknown, use flammable solid or flammable liquid.

    - Words "Limited Quantity" if inner containers meet the volume limits for limited quantities under 49CFR173.

- Identification number; if unknown, use UN1325 (for flammable solids) or UN1993 (for flammable liquids).

- Net quantity per package or amount of substance in each cooler.

- Radioactive materials section (leave blank).

- Passenger or cargo aircraft (cross off the nonapplicable). Up to 25 pounds of flammable solid per cooler can be shipped on a passenger or cargo aircraft. Up to 1 quart of flammable liquid per cooler can be shipped on a passenger aircraft, and up to 10 gallons of flammable liquids per cooler can be shipped on a cargo aircraft). Use Hazardous Materials Table (49CFR172.101) column (9) to verify quantity restrictions for other Proper Shipping Names.

- Name and title of shipper (printed).

- An emergency telephone number at which the shipper can be reached within 24-48 hours.

- Emergency Response Guide Number

- Shipper's signature.

NOTE: The penalties for improper shipment of hazardous materials are severe. A fine of $25,000 and five years imprisonment can be imposed for each violation.

4.3.4 Sample Documentation

The following documentation is associated with sample collection and transfer:

- Field Logbooks
- Site Logbooks
- Master Sample Log
- Sample Label
- Chain-of-Custody Form
- Custody Seals
- Shipping Airbill.

5.0 HEALTH AND SAFETY REQUIREMENTS

The approved Health and Safety Plan (HASP) for the Site 19 Remediation shall be used for the Site 12 Remedial Action. The Site 19 remedial action involved the excavation and removal of soils contaminated with semi-volatile organics and metals, almost identical to Site 12. As required by paragraph 1.2.1, Pre- and Post-Construction documentation, the HASP includes organizational information, a potential hazards assessment, protective equipment requirements, air monitoring, site controls and protective zones, medical surveillance procedures, emergency response and spill control measures, and training requirements.

6.0 WASTE REMOVAL/REGULATORY COMPLIANCE

This section addresses how the waste generated during excavation of contaminated soils will be handled on site and disposed of off site. All wastes generated by these activities will be disposed of based on the waste characterization of the contaminated soils. The wastes are anticipated to be non-hazardous. These wastes include contaminated soil, decontamination water, miscellaneous debris, and PPE. Foster Wheeler Environmental shall provide completed waste manifests and/or bills of lading and transport documentation to the Navy for review and signature.

Foster Wheeler Environmental shall subcontract for waste transport and disposal (T&D) services. The T&D subcontractor shall be competitively procured from firms with which Foster Wheeler Environmental has pre-placed basic ordering agreements. This assures the Navy that hazardous and/or solid wastes will be sent to an EPA/NJDEP-approved facility. All disposal facility transporters used to dispose of the Navy's wastes will be evaluated for regulatory compliance and approved for use in accordance with Foster Wheeler Corporation Regulatory Compliance Procedures. Approved facilities and transporters will be submitted to the Navy for final approval.

All non-hazardous solid wastes generated on-site will be disposed of or recycled in accordance with all applicable Federal and State Laws.

7.0 PROJECT MANAGEMENT

The project management team shall be responsible for all technical and administrative aspects of the remediation project.

7.1 PROJECT SCHEDULE

The project schedule is provided as Figure 7-1.

7.2 PROJECT STAFFING PLAN

The organization chart for this project is provided in Figure 7-2.

7.3 MEETINGS

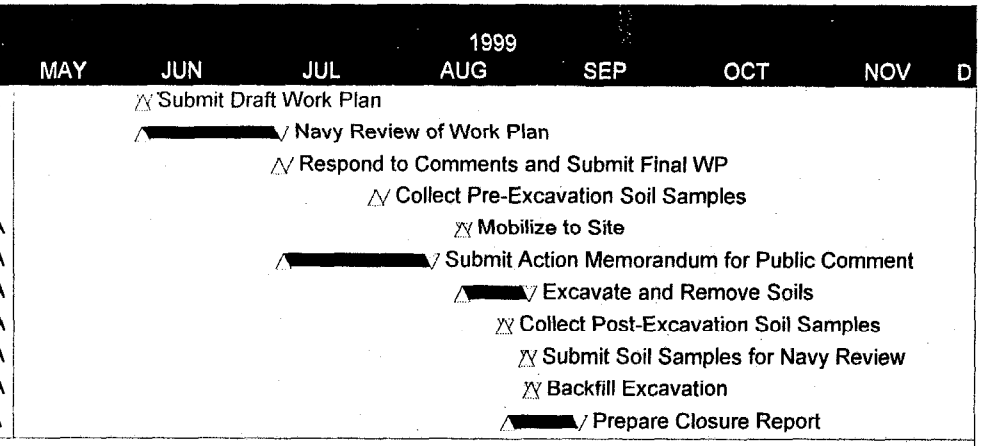
7.3.1 Pre-Construction Meeting

Prior to mobilization, the Project Superintendent shall conduct a pre-construction meeting in the ROICC office. The date and time of the pre-construction meeting shall be approved by the ROICC and the NTR.

7.3.2 Daily Safety Meetings

Prior to the starting work, a daily safety meeting will be conducted by the Foster Wheeler Environmental Health and Safety Officer. All of the day's planned activities will be

Act ID	Description	Orig Dur	Rem Dur	Early Start	Early Finish
1000	Submit Draft Work Plan	1d	0	07JUN99 A	07JUN99 A
1040	Navy Review of Work Plan	1d	0	07JUN99 A	07JUL99 A
1050	Respond to Comments and Submit Final	1d	0	07JUL99 A	08JUL99 A
1070	Collect Pre-Excavation Soil Samples	1d	0	28JUL99 A	29JUL99 A
1080	Mobilize to Site	1d	0	16AUG99 A	16AUG99 A
1090	Submit Action Memorandum for Public	1d	0	08JUL99 A	09AUG99 A
1180	Excavate and Remove Soils	1d	0	16AUG99 A	30AUG99 A
1190	Collect Post-Excavation Soil Samples	1d	0	25AUG99 A	25AUG99 A
1200	Submit Soil Samples for Navy Review	1d	0	30AUG99 A	30AUG99 A
1210	Backfill Excavation	1d	0	31AUG99 A	31AUG99 A
1220	Prepare Closure Report	1d	0	26AUG99 A	10SEP99 A

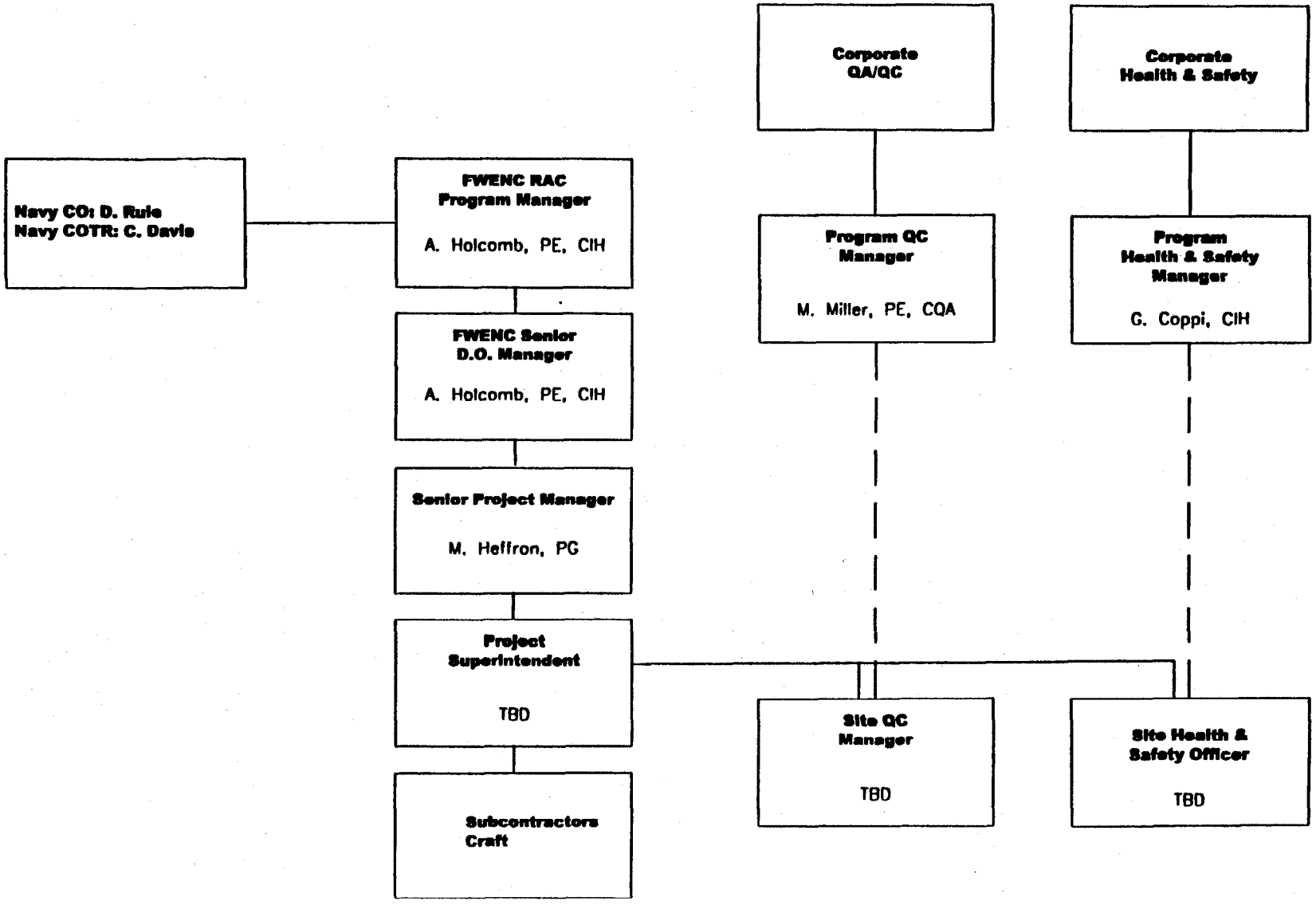


- Early start point
- Early finish point
- Early bar
- Late finish point
- Total float bar
- Progress bar
- Critical bar
- Summary bar
- Progress point
- Critical point
- Summary point
- Start milestone point
- Finish milestone point

FIGURE 7-1
NWS-EARLE
SITE 12
SCHEDULE OF ACTIVITIES

Date	Revision	Checked	Approved
06AUG99	0	M.H.	
08JUL99	1	M.H.	

Figure 7-2
Navy / FWENC Organization Chart



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reviewed with particular attention focused on PPE and risk. All personnel are required to attend the meeting.

8.0 QUALITY ASSURANCE/QUALITY CONTROL

This Quality Assurance/Quality Control (QA/QC) section describes the organization, inspections, tests, procedures, and documentation necessary to produce a completed project which complies with the governing regulations and the technical statement of work.

8.1 ORGANIZATION AND RESPONSIBILITIES

The project team will include the following personnel:

The Senior Project Engineer/Manager (SPEM) has final responsibility for the development of the Work Plan and management of the project team.

The Project Superintendent (PS) is responsible for assuring that all the work is conducted in accordance with the Work Plan. In addition, the PS is responsible for coordinating with the subcontractors for execution of all of the on-site work.

The Site Health and Safety Officer (SHSO) is responsible for the safety of all site personnel, as detailed in the site-specific Health and Safety Plan (HASP), presented under separate cover.

Foster Wheeler Environmental will direct and maintain responsibility for the overall QA/QC requirements. Subcontractors shall be used for laboratory analyses, and waste removal.

8.2 PROBLEM OR WORK DEFICIENCY MEETINGS

If a major problem or deficiency occurs or is likely to occur, a special meeting to address related issues will be held. The meeting may be attended by the SPEM, Navy Representative(s) and others, as required. Meetings may be conducted at NWS Earle, at the Navy Lester office, or by teleconference. The purpose of the meeting will be to define and resolve potential problems or work deficiencies in the following manner:

- Define and discuss the problem or deficiency
- Review alternative solutions, including their effects on schedule and budget
- Implement plan to resolve the problem or deficiency

8.3 SUBMITTALS

The Quality Control Manager is responsible for maintaining the submittal register and reviewing and certifying that submittals are in compliance with the contract requirements.

All submittals will be accompanied by a transmittal form, which will identify the submittal and provide a unique tracking number.

8.4 TESTS AND INSPECTIONS

Foster Wheeler Environmental will perform preparatory, initial, and follow-up inspections.

8.5 CHANGES

If circumstances develop during the project that make it necessary or advisable to revise the Work Plan in order to accomplish project objectives, a Change Request Form (CRF) will be forwarded to the Navy for approval. Events such as a change in the site conditions or system performance may result in a CRF. Changes may be discussed with the Navy Design Manager telephonically and followed up with a CRF to avoid negative impacts on the project budget. A typical CRF used to document field changes is provided as Figure 8-1.

8.6 DOCUMENTATION

Documentation of operations, record keeping, photographic evidence of work performed, and any engineering or analytical results will be provided to the Navy in the Closure Report for the excavation, disposal, and site restoration activities.

8.6.1 Operations Record keeping

All field inspection and testing activities will be documented in a project logbook. The project logbook will be maintained in accordance with the relevant Foster Wheeler Guidelines. The Project Manager will maintain records of quality control operations and activities for subcontractors and suppliers.

8.6.2 Photographic Documentation

Still 35mm color photographs will be taken as needed to record work progress. At a minimum, photographs will be taken of the existing conditions before work begins, and during the excavation, backfilling, and site restoration activities. Photograph location, date and description of the activity recorded will be entered in a photo documentation log. The photographs and log will be submitted with the Closure Report.

FIGURE 8-1

Page ____ of ____

Foster Wheeler Environmental Corporation
Change Request Form

Section 1 thru 4 to be filled out by Foster Wheeler, Section 5 to be filled out by Navy

PROJECT: NWS-Earle: Site 12	OFS.No. 1284 0034	Change Request Form: CRF- 001 Rev. 0

To: B. Faustman Dept. NorthDiv. Location: _____ Date:

Re: ☐ Drawing No. _____ Title _____

☐ Spec. No. _____ Title _____

☐ Other Work Plan

1. DESCRIPTION (*Items involved, submit sketch if applicable*)

2. REASONS FOR CHANGE (*If from disposition of nonconformance report, list report number*):

3. RECOMMENDED DISPOSITION

☐ Technical Direction (Minor Scope Shift-<10%/50k) [COTR/NR approval required]

☐ Technical Direction (Major Scope shift->10%/50k) [CO approval required]

☐ ROM Estimate _____

☐ Cost Growth

☐ Out of Scope(Minor-<10%/50k) [CO approval required]

☐ Out of Scope (Major->10%/50k) [CO approval required]

☐ Schedule Impact _____

See attached Breakdown

Initiator Signature:

4. Resident Engineer (Signature)	Date	Project Superintendent Concurrence (Signature)	Date

5. Disposition

☐ Approved per recommended disposition

☐ Not approved (give reason)

☐ Approved with modification(s) [describe below]

Project Manager (*Signature*)	Date	ROICC Approval (*Signature*)	Date
Contracting Officer Technical Representative Approval (*Signature*)(as required)		Contracting Officer Approval (*Signature*)	Date

Engineer signs and transmits to Resident Engineer with copies to:

_____ Project Manager

_____ Project Superintendent

Others as Required _____

File: _____

p:\shared\forms\fcrform.doc

6.0 SITE 12: BATTERY STORAGE AREA

6.1 SITE BACKGROUND AND PHYSICAL SETTING

The battery storage area is a paved area next to the loading dock east of Building R-10. This area was used as a temporary staging area for forklift batteries being sent off site to be reclaimed. The storage area occupied various portions of the paved area at different times but was generally limited to approximately 7,500 to 10,000 square feet at the northern end of the paved area adjacent to Building R-10. As reported in the 1993 SI, batteries have not been stored at the site for several years. It is unknown if a release to the environment occurred at the site in the past. No source of visible contamination, such as batteries, other residues, stressed vegetation, or surface soil staining, is present at the site. Infiltration is limited by an asphalt parking lot that covers the site. Surface runoff is directed to a stormwater collection basin that discharges through a concrete culvert to a drainage swale and eventually to a marsh north of the site. An underground storage tank was located in this general area, but it has been removed. Figure 6-1 is a map of the site.

6.2 PREVIOUS INVESTIGATIONS

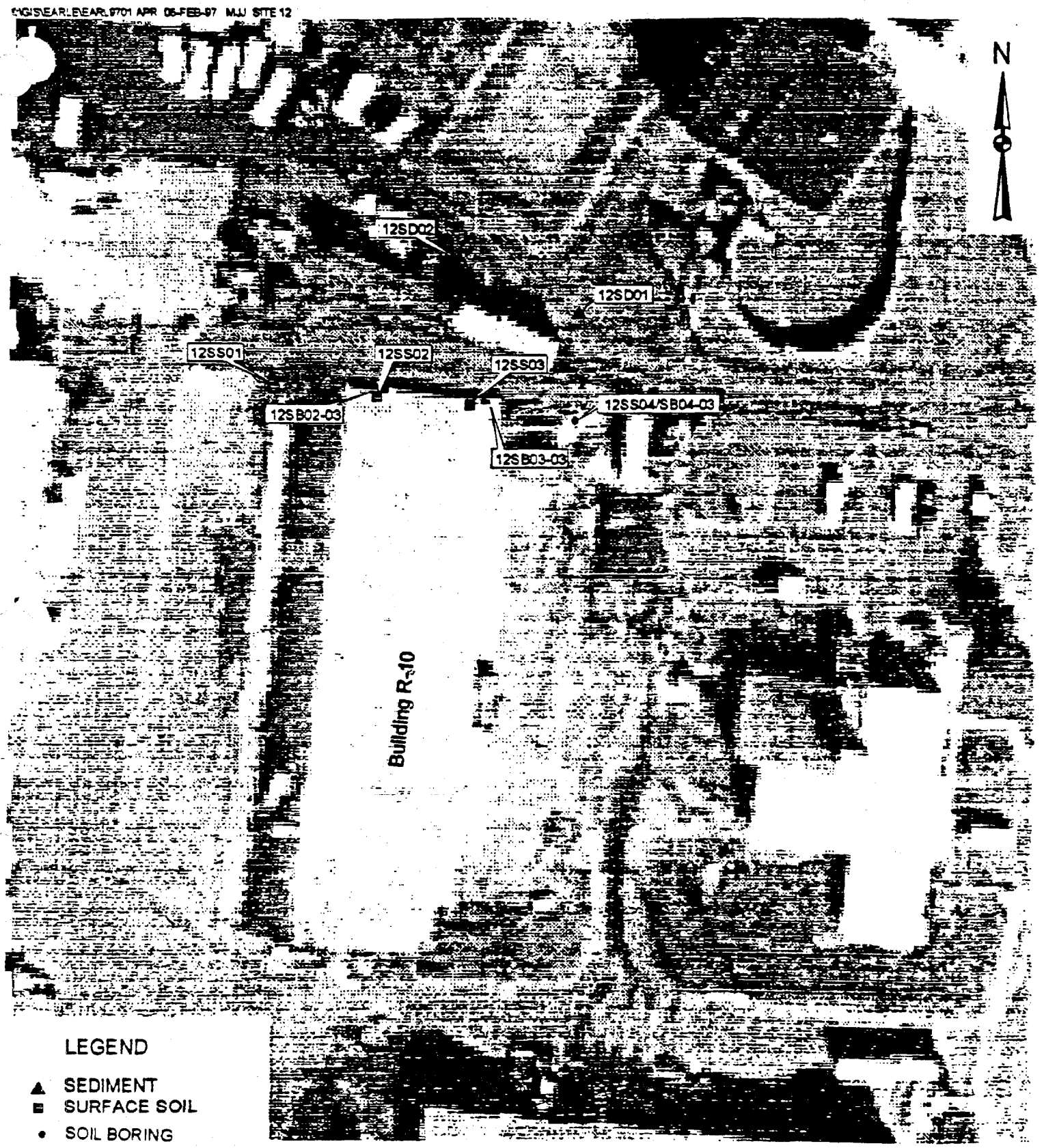
6.2.1 IAS and SI

IAS

The 1983 IAS consisted of interviews and on-site inspection. The site was not recommended for a confirmation study based on the belief that any acids spilled would be buffered when they drained into the salt marsh.

SI

During the 1993 SI, one surface water sample and one sediment sample were collected from the downstream side of the stormwater culvert outflow. No surface water or sediment was present at the upgradient portion of the drainage culvert at the time these samples were taken. The sediment sample was analyzed for VOCs, SVOCs, pesticides, PCBs, metals, and cyanide. The surface water sample was analyzed for VOCs, metals, and cyanide. Sample analysis indicated that SVOCs, VOCs, pesticides, and metals were present in the sediment sample taken at the site. Metals were detected in the surface water sample. Cyanide was not detected in either sample.



SAMPLE LOCATIONS
SITE 12 - BATTERY STORAGE AREA

50 0 50 100 Feet

FIGURE 6-1

Brown & Root Environmental

An underground storage tank, R-10, installed at the northeastern corner of Building R-10, was located approximately adjacent to the former battery storage area. The UST was removed in 1994. Visual contamination of the soil was not observed during the tank removal. Upon removal, the tank and associated piping were examined and found in good condition, free of holes, with minor rust and pitting. Four confirmation soil samples were obtained from the excavation sidewalls, and two samples were taken from the excavated soils. The excavation sidewall samples were analyzed for TPH, and all were found to contain a concentration less than the method detection limit of 56 to 61 mg/kg. The two soil pile samples showed TPH of 460 mg/kg and 520 mg/kg. The soil was disposed as nonhazardous.

6.2.2 1995 RI

In August 1995, B&R Environmental collected three surface soil samples from the northern end of Building 10 between the loading dock and southern side of the railroad tracks. In addition, two sediment samples were obtained from an area north of the railroad tracks and south of the tennis court. Samples from the battery storage area were not obtained because the asphalt cover would preclude impacts from spilled battery electrolyte solution. Instead, the samples were collected from low-lying areas where runoff may flow and collect. Figure 6-1 shows the sampling locations.

6.2.3 Summary of Conclusions

Elevated levels of metals, particularly lead, were detected in surface soil samples. PAHs, which are believed to originate from the railroad bed, were also detected. Sediment samples also showed elevated levels of metals, PAHs, and pesticides.

6.2.4 Data Gaps (Objectives of RI Addendum Field Investigation)

The RI Addendum field investigation was designed to provide further data on the areal and vertical extent of metals contamination.

6.3 RI ADDENDUM FIELD INVESTIGATION

On October 29, 1996, B&R Environmental conducted the following field investigation activities at Site 12:

- Sampling and analysis of surface soil (Section 6.3.1)
- Sampling and analysis of subsurface soil (Section 6.3.2)

B&R Environmental surveyed to establish the horizontal locations and vertical elevations of the surface and subsurface soil sample locations.

6.3.1 Surface Soil Sampling

One surface soil sample (12 SS 04), as specified by the RI Addendum work plan, was collected near the northeastern corner of the loading dock, approximately 40 feet east of 1995 RI sample 12 SS 03 (Figure 6-1). B&R Environmental collected this sample with a stainless-steel trowel and transferred the soil directly into the sampling container. Samples were submitted to IEA Laboratories and analyzed for TAL metals and TOC.

6.3.2 Subsurface Soil Sampling

Three subsurface soil samples (12 SB 02 through 12 SB 04), as specified in the RI Addendum work plan, were collected at Site 12. These samples were obtained at corresponding surface soil sample locations 12 SS 02 and 12 SS 03 from the 1995 RI sampling and 12 SS 04 (Figure 6-1). Samples were collected by advancing a hand bucket auger, supplemented with a rock bar to remove larger materials, to the desired sampling depth of 3 to 3.5 feet. The sample was removed from the auger bucket by stainless-steel trowel and transferred directly into the sample container. Samples were submitted to IEA Laboratories for TAL metals and TOC analysis.

6.4 SITE CHARACTERISTICS

6.4.1 Geology

Regional mapping places Site 12 within the outcrop area of the Englishtown Formation. The Englishtown Formation ranges between 35 and 150 feet in thickness and consists of tan and gray, fine- to medium-grained quartz sand with local clay beds. The presence of the Englishtown Formation beneath the site cannot be confirmed because no soil borings were drilled at the site. However, the lithology of the sediments encountered in borings at Sites 6, 15, and 17 generally agrees with the published description of the Englishtown Formation. Site 6 is located about 600 feet northeast, Site 15 is located about 1,000 feet south-southeast, and Site 17 is located about 700 feet south-southwest of Site 12. In general, the borings at these sites encountered fill material and sand, silty sand, and clayey sand.

6.4.2 Hydrogeology

Groundwater conditions beneath the site cannot be confirmed because no wells were installed at the site. However, groundwater in the Englishtown aquifer beneath Sites 6 and 17, and presumably Site 12, occurs under unconfined conditions. The direction of shallow groundwater flow in the aquifer beneath Site 6, as indicated by both the August and October 1995 groundwater elevation measurements, is toward the north and northwest. The direction of groundwater flow in the aquifer beneath Site 17, as indicated by both the August and October groundwater contour maps for Site 17, is toward the northwest.

6.5 NATURE AND EXTENT OF CONTAMINATION

This section evaluates the occurrence and distribution of contaminants detected from the 1995 RI and RI Addendum field investigations. Surface soil, subsurface soil, and sediment sample analysis results were compared to NWS Earle site-wide background samples as presented in Section 2.4.1.

6.5.1 Surface Soils

Three surface soil samples were collected at Site 12 (12 SS 01 through 12 SS 03) in 1995. An additional surface soil sample (12 SS 04), analyzed for TAL metals, was collected during the 1996 RI Addendum field activities (Figure 6-1). Tables 6-1 and 6-2 present the occurrence and distribution of inorganic and organic chemicals in site-related samples and compare them to background. Table 6-3 presents a comparison of detected compounds to ARARs and TBCs. Figure 6-2 shows sample locations and concentrations of compounds that exceed ARARs and TBCs.

6.5.1.1 Inorganics

Elevated concentrations of certain metals, notably lead and zinc, were seen in surface soil samples. The highest concentrations of these metals in Site 12 surface soil samples were generally present in samples 12 SS 02 and 12 SS 03; however, elevated levels of metals were also detected in sample 12 SS 04. Metals present at concentrations greater than background in surface soil samples include the following: aluminum (up to 10,900 mg/kg), barium (up to 189 mg/kg), beryllium (up to 0.85 mg/kg), cadmium (up to 8.7 mg/kg), copper (up to 339 mg/kg), lead (up to 1,130 mg/kg), magnesium (up to 10,400 mg/kg), manganese (up to 373 mg/kg), mercury (up to 0.87 mg/kg), vanadium (up to 259 mg/kg), and zinc (up to 1,570 mg/kg R). Note that zinc results for the 1995 samples were qualified rejected (R), based upon data validation; however, zinc is believed to be present in these samples. The presence of zinc was confirmed in sample 12 SS 04 at a level approximately twice that of background. Antimony (up to 71.5 mg/kg) was detected in all site-related samples but was not present in background samples.

TABLE 6-1
OCCURRENCE AND DISTRIBUTION OF INORGANICS IN SURFACE SOIL AT SITE 12
NWS EARLE, COLTS NECK, NEW JERSEY
(mg/kg)

	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	4 / 4	1710 - 5310	4.6E+09	5310	4 / 4	3530 - 7825	6646	YES	NO	10900
ANTIMONY *	NOT DETECTED	-	-	-	4 / 4	0.76 - 71.5	19.20	YES	-	60.27
ARSENIC *	4 / 4	1.35 - 14.4	9.6E+02	14.40	4 / 4	5.1 - 10.7	9.88	NO	NO	10.7
BARIUM	4 / 4	1.85 - 31	3.6E+03	31.00	4 / 4	28.7 - 188.5	111.08	YES	NO	188.5
BERYLLIUM*	1 / 4	0.28 - 0.28	1.6E-01	0.28	4 / 4	0.05 - 0.47	0.42	YES	YES	0.85
CADMIUM *	1 / 4	0.3975 - 0.3975	6.7E-02	0.40	3 / 4	1.4 - 8.25	3.42	YES	YES	8.25
CALCIUM	4 / 4	40.1 - 519	2.3E+07	519.00	3 / 3	1610 - 23550	15520	YES	NO	23550
CHROMIUM	4 / 4	7.8 - 59.5	6.8E+04	59.50	4 / 4	39.6 - 96.3	54.88	NO	NO	96.3
COBALT	2 / 4	0.75 - 5	1.0E+01	4.27	4 / 4	3.1 - 7.9	4.68	YES	NO	7.9
COPPER	4 / 4	0.97 - 8.4	4.5E+02	8.40	4 / 4	23.2 - 282.5	94.25	YES	NO	282.5
IRON	4 / 4	3745 - 62500	3.0E+12	62500	4 / 4	17500 - 37450	25988	NO	NO	37450
LEAD	4 / 4	1.8 - 39.4	2.1E+04	39.40	4 / 4	68.6 - 1130	558.80	YES	NO	1130
MAGNESIUM	4 / 4	71.7 - 619	1.5E+07	619.00	4 / 4	413 - 6825	2765	YES	NO	6825
MANGANESE	4 / 4	3.45 - 214	4.3E+02	182.62	4 / 4	133 - 334	169.48	NO	NO	334
MERCURY *	4 / 4	0.035 - 0.17	8.1E-03	0.17	3 / 4	0.395 - 0.87	0.44	YES	YES	0.87
NICKEL	2 / 4	1.8 - 7.2	6.2E+01	7.20	4 / 4	6.8 - 49.9	18.63	YES	NO	43.30
POTASSIUM	4 / 4	95 - 792	5.9E+07	792.00	4 / 4	649 - 851.5	1688	YES	NO	4530
SILVER *	2 / 4	0.37 - 0.67	2.3E-01	0.67	2 / 4	1.1 - 1.7	0.74	YES	YES	1.7
SODIUM	4 / 4	17.5 - 86.2	5.8E+04	86.20	3 / 4	76.3 - 685	250.95	YES	NO	595.17
THALLIUM	2 / 4	0.5025 - 1.9	4.0E+00	1.68	1 / 4	2.1 - 2.1	0.62	NO	NO	1.15
VANADIUM	4 / 4	11.05 - 64	5.0E+04	64.00	4 / 4	18 - 252	82.58	YES	NO	216.07
ZINC	3 / 4	0.665 - 27.6	6.1E+03	27.60	1 / 1	54.7 - 54.7	54.70	YES	NO	54.7

* - 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 6-2
OCCURRENCE AND DISTRIBUTION OF ORGANICS IN SURFACE SOIL AT SITE 12
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'-DDD *	NOT DETECTED	-	-	1 / 2	19 - 19	19
4,4'-DDE *	2 / 4	16 - 330	277.86	1 / 2	29 29	29
4,4'-DDT *	2 / 4	43 - 420	355.71	3 / 3	460 235.3	460
ALDRIN *	NOT DETECTED	-	-	1 / 3	2 - 2	2
ALPHA-CHLORDANE *	NOT DETECTED	-	-	2 / 3	9.05 - 6.88	9.05
ENDRIN ALDEHYDE *	NOT DETECTED		-	2 3	60 42.5	60
GAMMA-CHLORDANE *	NOT DETECTED	-	-	3 / 3	14 - 9.27	14
2-METHYLNAPHTHALENE *	NOT DETECTED	-	-	2 / 3	170 160	170
ACENAPHTHENE *	NOT DETECTED	-	-	2 / 3	64 - 58.5	64
ACENAPHTHYLENE *	NOT DETECTED	-	-	2 / 3	135 - 122.5	135
ANTHRACENE *	NOT DETECTED	-	-	3 / 3	945 - 446.3	945
BENZ(A)ANTHRACENE *	NOT DETECTED	-	-	3 / 3	3900 - 1903	3900
BENZO(A)PYRENE *	NOT DETECTED	-	-	3 / 3	2250 - 1200	2250
BENZO(B)FLUORANTHENE *	NOT DETECTED	-	-	3 / 3	10350 - 5187	10350
BENZO(G,H,I)PERYLENE *	NOT DETECTED	-	-	3 / 3	2300 - 1600	2300
BIS(2-ETHYLHEXYL)PHTHALATE *	NOT DETECTED		-	3 / 3	1220 756	1220
BUTYLBENZYLPHTHALATE *	1 / 4	220 - 220	220	1 / 3	130 - 130	130
CARBAZOLE *	NOT DETECTED	-	-	3 / 3	980 - 542	980
CHRYSENE *	NOT DETECTED	-	-	3 / 3	8200 - 3773	8200
DI-N-BUTYLPHTHALATE *	2 / 4	45 - 48	48	2 / 3	110 - 105	110
DIBENZ(A,H)ANTHRACENE *	NOT DETECTED	-	-	3 / 3	540 - 300	540
DIBENZOFURAN *	NOT DETECTED	-	-	2 / 3	63 - 55.5	63
FLUORANTHENE *	2 / 4	40 - 84	84	3 / 3	13300 - 6073	13300
FLUORENE *	NOT DETECTED	-	-	2 / 3	94 - 90.5	94
INDENO(1,2,3-CD)PYRENE *	NOT DETECTED	-	-	3 / 3	2500 - 1380	2500
NAPHTHALENE *	NOT DETECTED	-	-	2 / 3	130 - 106.5	130
PHENANTHRENE *	NOT DETECTED	-	-	3 / 3	1900 - 1147	1900
PYRENE *	1 / 4	46 46	46	3 / 3	15500 - 7293	15500
TETRACHLOROETHENE *	NOT DETECTED	-	-	1 / 3	3 3	3

* - Selected as a COPC

TABLE 6-3a

COMPARISON OF SUBSURFACE SOIL ANALYTICAL DATA TO ARARS AND TBCs - SITE 12

NWS EARLE, COLTS NECK, NEW JERSEY

SAMPLE NUMBER:	12SB02-03	12SB03-03	12SB04-03	---	---	---	ARARS & TBCs		
LOCATION:	12SB02	12SB03	12SB04	---	---	---	NJDEP Soil Residential Direct Contact Cleanup Criteria	NJDEP Soil Non-Residential Direct Contact Cleanup Criteria	NJDEP Soil Impact to Groundwater Cleanup Criteria
DATA SOURCE:	1996 RI	1996 RI	1996 RI						
SAMPLE DATE:	10/29/96	10/29/96	10/29/96						
INORGANICS	mg/kg	mg/kg	mg/kg				mg/kg	mg/kg	mg/kg
aluminum	12400	1670	10900				-	-	-
antimony	0.82	0.40 U	0.40 U				14.0	340	-
arsenic	16.5	0.92	13.1				20.0	20.0	-
barium	32.5	5.0	30.7				700	47000	-
beryllium	1.1 E	0.11	0.87				1.00	1.00	-
calcium	410	220	6940 R				-	-	-
chromium, total	45.2	6.2 R	35.1				-	500	-
cobalt	2.7	0.79	3.5				-	-	-
copper	9.2 J	2.2	5.5 J				600	600	-
iron	40700	2040	32200				-	-	-
lead	30.1	12.7	17.7				400	600	-
magnesium	2720	114	2120				-	-	-
manganese	35.2 J	11.3 J	111 J				-	-	-
nickel	5.8	1.1	6.8				250	2400	-
potassium	8320	159	5450				-	-	-
silver	0.12 U	0.15	0.12 U				110	4100	-
sodium	240	153 U	155 U				-	-	-
vanadium	38.0	6.8	36.7				370	7100	-
zinc	43.8	8.3	30.6				1500	1500	-

TABLE 6-3a
COMPARISON OF SUBSURFACE SOIL ANALYTICAL DATA TO ARARS AND TBCS - SITE 12
NWS EARLE, COLTS NECK, NEW JERSEY

Footnotes to sample results:

U - Compound or element was not detected. Value is the detection limit (inorganics) or quantitation limit (organics).

UJ - Not detected. Detection limit or quantitation limit shown is considered estimated due to exceedance of data validation quality control criteria.

No Value - Constituent was not analyzed for in this sample.

UR - Nondetected result is considered rejected based on exceedance of data validation quality control criteria.

J - Value is estimated because concentration is below the quantitation limit or because of exceedance of data validation quality control criteria.

R - Positive result is considered rejected based on exceedance of data validation quality control criteria.

N - Compound is considered to be tentatively identified based on exceedance of QC criteria for compound identification.

E - Result exceeds one or more of the selected ARARs.

Footnotes to soil criteria:

- - No standard is available for this chemical in this classification.

TABLE 6-3b

COMPARISON OF SUBSURFACE SOIL MISCELLANEOUS PARAMETERS DATA TO ARARS AND TBCs - SITE 12

NWS EARLE, COLTS NECK, NEW JERSEY

SAMPLE NUMBER:		12SB02-03	12SB03-03	12SB04-03	---	---	ARARS & TBCs		
LOCATION:		12SB02	12SB03	12SB04	---	---	NJDEP Soil Residential Direct Contact Cleanup Criteria	NJDEP Soil Non-Residential Direct Contact Cleanup Criteria	NJDEP Soil Impact to Groundwater Cleanup Criteria
DATA SOURCE:		1996 RI	1996 RI	1996 RI					
SAMPLE DATE:		10/29/96	10/29/96	10/29/96					
MISCELLANEOUS									
% solids	%	79.9	84.7	83.9			-	-	-
total organic carbon	mg/kg	4820	2740	2640			-	-	-

Footnotes to sample results:

U - Compound or element was not detected. Value is the detection limit (inorganics) or quantitation limit (organics).

UJ - Not detected. Detection limit or quantitation limit shown is considered estimated due to exceedance of data validation quality control criteria.

No Value - Constituent was not analyzed for in this sample.

UR - Nondetected result is considered rejected based on exceedance of data validation quality control criteria.

J - Value is estimated because concentration is below the quantitation limit or because of exceedance of data validation quality control criteria.

R - Positive result is considered rejected based on exceedance of data validation quality control criteria.

N - Compound is considered to be tentatively identified based on exceedance of QC criteria for compound identification.

E - Result exceeds one or more of the selected ARARs.

Footnotes to soil criteria:

- - No standard is available for this chemical in this classification.

@ - Value is New Jersey guideline for maximum total concentration of all organic compounds in soil (including VOCs, SVOCs, and TPH).

TABLE 6-3c

COMPARISON OF SEDIMENT ANALYTICAL DATA TO ARARS AND TBCs - SITE 12

NWS EARLE, COLTS NECK, NEW JERSEY

SAMPLE NUMBER:	12SD01 08/07/95	12SD02 08/07/95	12SD02-DUP	---	---	---	---	SELECTED ARARS
LOCATION:	12SD01	12SD02	12SD02	---	---	---	---	Sediment Ecological Toxicity Threshold Values
DATA SOURCE:	1995 RI	1995 RI	1995 RI					
SAMPLE DATE:	08/07/95	08/07/95	08/07/95					
INORGANICS	mg/kg	mg/kg	mg/kg					mg/kg
aluminum	7890	5850	4590					-
arsenic	9.8 E	14.4 E	12.4 E					8.20 L
barium	51.0 E	31.5	28.2					40.0 B
beryllium	0.66	0.72	0.43					-
calcium	4670	10900	7200					-
chromium, total	26.7	28.8	30.5					81.0 L
cobalt	1.9	2.4	1.5					50.0 T
copper	25.6	19.6	28.9					34.0 L
iron	39000	27100	23600					-
lead	67.0 E	45.0	106 E					47.0 L
magnesium	2880	3520	1360					-
manganese	127	120	103					460 O
mercury	0.012 J	0.045 J	0.026 J					0.150 L
nickel	4.0	6.0	4.9					21.0 L
potassium	2360	2150	1210					-
sodium	119	147	103					-
vanadium	23.6	31.9	29.8					-
zinc	34.1	59.2	65.8					150 L
SEMIVOLATILES	ug/kg	ug/kg	ug/kg					ug/kg
2-methylnaphthalene	360 U	53.0 J	50.0 J					330 F
benzo(a)anthracene	250 J	460 E	340 E J					330 F
benzo(a)pyrene	320 J	540 E	430 J					430 L
benzo(b)fluoranthene	520 E	890 E	790 E J					330 F
benzo(g,h,i)perylene	240 J	400 E J	310 J					330 F
benzo(k)fluoranthene	180 J	340 E J	250 J					330 F
bis(2-ethylhexyl)phthalate	67.0 J	80.0 J	110 J					890000000 S
chrysene	280 J	580 E	460 E					330 F
dibenz(a,h)anthracene	60.0 J	97.0 J	62.0 J					330 F

TABLE 6-3c

COMPARISON OF SEDIMENT ANALYTICAL DATA TO ARARS AND TBCs - SITE 12

NWS EARLE, COLTS NECK, NEW JERSEY

SAMPLE NUMBER:	12SD01 08/07/95		12SD02 08/07/95		12SD02-DUP		---	---	---	---	SELECTED ARARS	
LOCATION:	12SD01		12SD02		12SD02		---	---	---	---	Sediment Ecological Toxicity Threshold Values	
DATA SOURCE:	1995 RI		1995 RI		1995 RI							
SAMPLE DATE:	08/07/95		08/07/95		08/07/95							
SEMIVOLATILES	ug/kg		ug/kg		ug/kg						ug/kg	
fluoranthene	350	J	680		500						2900	Q
Indeno(1,2,3-cd)pyrene	240	J	410	E	320	J					330	F
naphthalene	360	U	51.0	J	47.0	J					480	P
phenanthrene	110	J	210	J	180	J					850	Q
pyrene	310	J	600		490						660	L
PESTICIDES	ug/kg		ug/kg		ug/kg						ug/kg	
4,4'-DDD	3.6	E R	5.3	E JN	5.5	E JN					1.60	L
4,4'-DDE	11.0	E	19.0	E	18.0	E					2.20	L
4,4'-DDT	35.0	E	35.0	E	35.0	E					1.60	L
alpha-BHC	1.9	U	0.19	J	2.0	U					3.70	S
alpha-chlordane	1.0	J	1.2	J	1.2	J					7.00	O
gamma-BHC (Lindane)	1.9	U	0.070	R	2.0	U					-	
gamma-chlordane	0.54	J	0.79	J	1.0	J					7.00	O
heptachlor epoxide	1.9	U	2.0	U	0.57	JN					5.00	O

Footnotes to sample results:

U - Compound or element was not detected. Value is the detection limit (inorganics) or quantitation limit (organics).

UJ - Not detected. Detection limit or quantitation limit shown is considered estimated due to exceedance of data validation quality control criteria.

No Value - Constituent was not analyzed for in this sample.

UR - Nondetected result is considered rejected based on exceedance of data validation quality control criteria.

J - Value is estimated because concentration is below the quantitation limit or because of exceedance of data validation quality control criteria.

R - Positive result is considered rejected based on exceedance of data validation quality control criteria.

N - Compound is considered to be tentatively identified based on exceedance of QC criteria for compound identification.

E - Result exceeds one or more of the selected ARARs.

Footnotes to sediment ecological toxicity criteria:

- - No standard is available for this chemical in this classification.

B - Source: Baudo, R., J. Geisy and H. Muntau. eds. 1990. Sediments: Chemistry and Toxicity of In-Place Pollutants. Lewis Publishers, Inc. Ann Arbor, MI.

F - Source: USEPA. 1994c. Draft Region IV Waste Management Division Sediment Screeing Values for Hazardous Waste Sites. 2/16/94 Revision.

L - Effects Range-Low. Source: Long E.R., D.D. MacDonald, S.L. Smith, and F.D. Calder. 1995. Incidence of Adverse Biological Effects within Ranges of Chemical Concentrations in Marine and Estuarine Sediments. Environmental Management. 19:81-97.

M - Effects Range-Low. Source: Long, E. R. and L. G. Morgan. 1991. The Potential for Biological Effects of Sediment-Sorbed Contaminants Tested in the National Status and Trends Program. NOAA Technical Memorandum NOS OMA 52, National Oceanic and Atmospheric Administration, Seattle, WA.

O - Ontario screening level. Source: Ontario Ministry of the Environment (OME). 1992. Guidelines for the Protection and Management of the Aquatic Sediment Quality in Ontario. Log 92-2309-067, PIBS 1962.

P - Sediment quality benchmark using equipartition. Source: USEPA. 1996. ECO Update. Volume 3: Number 2. EPA 540/F-95/038.

Q - Sediment quality criterion. Source: USEPA. 1996. ECO Update. Volume 3: Number 2. EPA 540/F-95/038.

S - Sediment screening benchmark. Source: Suter, G. W., and J. B. Mabrey. 1994. Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota. Oak Ridge National Laboratory, Oak Ridge, TN.

T - Threshold for soils. Source: Direction des Substances Dangereuses. 1988. Contaminated Sites Rehabilitation Policy. Gouvernement du Quebec. Ministere de L'Environment. Sainte-Foy, Quebec, Canada. In: R.L. Siegrist. 1989. International Review of Approaches for Establishing Cleanup Goals for Hazardos Waste Contaminated Land. Institute for Georesearch and Pollution Research. Norway.

W - Screening value for wet soil. Source: Will, M.E., and G.W. Suter. 1994. Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Terrestrial Plants: 1994 Revision. Oak Ridge National Laboratory.

TABLE 6-3d

COMPARISON OF SURFACE SOIL ANALYTICAL DATA TO ARARS AND TBCs - SITE 12

NWS EARLE, COLTS NECK, NEW JERSEY

SAMPLE NUMBER:	12SS01 08/05/95	12SS02 08/05/95	12SS03 08/05/95	12SS03-DUP	12SS04 10/29/96	---	ARARS & TBCs		
LOCATION:	12SS01	12SS02	12SS03	12SS03	12SS04	---	NJDEP Soil Residential Direct Contact Cleanup Criteria	NJDEP Soil Non-Residential Direct Contact Cleanup Criteria	NJDEP Soil Impact to Groundwater Cleanup Criteria
DATA SOURCE:	1995 RI	1995 RI	1995 RI	1995 RI	1996 RI				
SAMPLE DATE:	08/05/95	08/05/95	08/05/95	08/05/95	10/29/96				
INORGANICS	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg		mg/kg	mg/kg	mg/kg
aluminum	3530	4330	7980	7670	10900		-	-	-
antimony	0.76	71.5 E	3.6	4.4	0.52		14.0	340	-
arsenic	10.7	5.1	6.6	7.8	16.5		20.0	20.0	-
barium	28.7	187	188	189	40.1		700	47000	-
beryllium	0.47	0.050	0.37	0.23	0.85		1.00	1.00	-
cadmium	1.4 E	4.0 E	7.8 E	8.7 E	0.051 U		1.00	100	-
calcium	1610	21400	20000	27100	2600 R		-	-	-
chromium, total	53.3 J	39.6 J	85.6 J	107 J	30.3		-	500	-
cobalt	4.6	3.1	7.5	8.3	3.1		-	-	-
copper	23.2	66.9	226	339	4.4		600	600	-
iron	20300	17500	34600	40300	28700		-	-	-
lead	68.6	1130 E	978 E	1070 E	12.6		400	600	-
magnesium	413	1950 J	3250 J	10400 J	1870		-	-	-
manganese	133	140	295	373	70.9 J		-	-	-
mercury	0.42	0.87	0.42	0.37	0.12 U		14.0	270	-
nickel	6.8	11.4	49.1	50.7	6.4		250	2400	-
potassium	649	723	893	810	4530		-	-	-
silver	0.21 U	1.7	1.1	1.1	0.12 U		110	4100	-
sodium	76.3	167	200	1170	151 U		-	-	-
thallium	0.82 U	0.86 U	2.1 E	1.0 U	0.72 UJ		2.00	2.00	-
vanadium	18.0	19.2	245	259	41.1		370	7100	-
zinc	214 R	835 R	1500 R	1570 E R	54.7		1500	1500	-
SEMIVOLATILES	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg		ug/kg	ug/kg	ug/kg
2-methylnaphthalene	170 J	150 J	460 U	460 U	n/a		-	-	-
acenaphthene	380 U	64 0 J	57.0 J	49.0 J	n/a		3400000	10000000	100000
acenaphthylene	380 U	110 J	140 J	130 J	n/a		-	-	-
anthracene	44.0 J	350 J	490	1400	n/a		10000000	10000000	100000
benzo(a)anthracene	210 J	1600 E J	2300 E J	5500 E J	n/a		900	4000	500000

TABLE 6-3d

COMPARISON OF SURFACE SOIL ANALYTICAL DATA TO ARARS AND TBCs - SITE 12

NWS EARLE, COLTS NECK, NEW JERSEY

SAMPLE NUMBER:	12SS01 08/05/95		12SS02 08/05/95		12SS03 08/05/95		12SS03-DUP		12SS04 10/29/96		---	ARARS & TBCs		
LOCATION:	12SS01		12SS02		12SS03		12SS03		12SS04		---	NJDEP Soil Residential Direct Contact Cleanup Criteria	NJDEP Soil Non-Residential Direct Contact Cleanup Criteria	NJDEP Soil Impact to Groundwater Cleanup Criteria
DATA SOURCE:	1995 RI		1995 RI		1995 RI		1995 RI		1996 RI					
SAMPLE DATE:	08/05/95		08/05/95		08/05/95		08/05/95		10/29/96					
SEMIVOLATILES	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg			ug/kg	ug/kg	ug/kg
benzo(a)pyrene	250	J	1100	E J	1700	E J	2800	E J	n/a			660	660	100000
benzo(b)fluoranthene	610		4600	E J	8700	E J	12000	E J	n/a			900	4000	50000
benzo(g,h,i)perylene	800		1700	J	2200	J	2400	J	n/a			-	-	-
bis(2-ethylhexyl)phthalate	87.0	J	960	J	1700	J	740	J	n/a			49000	210000	100000
butylbenzylphthalate	380	U	410	UJ	150	J	110	J	n/a			1100000	10000000	100000
carbazole	45.0	J	600		1100		860		n/a			-	-	-
chrysene	320	J	2800	J	6400	J	10000	E J	n/a			9000	40000	500000
di-n-butylphthalate	380	U	100	J	70.0	J	150	J	n/a			5700000	10000000	100000
dibenz(a,h)anthracene	59.0	J	300	J	490	J	590	J	n/a			660	660	100000
dibenzofuran	380	U	63.0	J	48.0	J	460	U	n/a			-	-	-
fluoranthene	320	J	4600		9600		17000		n/a			2300000	10000000	100000
fluorene	380	U	94.0	J	80.0	J	94.0	J	n/a			2300000	10000000	100000
indeno(1,2,3-cd)pyrene	340	J	1300	E J	2300	E J	2700	E J	n/a			900	4000	500000
naphthalene	83.0	J	130	J	460	U	460	U	n/a			230000	4200000	100000
phenanthrene	140	J	1400		1900		1900		n/a			-	-	-
pyrene	380	J	6000	J	12000	J	19000	J	n/a			1700000	10000000	100000
VOLATILES	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg			ug/kg	ug/kg	ug/kg
tetrachloroethene	3.0	J	12.0	UJ	14.0	UJ	14.0	U	n/a			4000	6000	1000
PESTICIDES	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg			ug/kg	ug/kg	ug/kg
4,4'-DDD	19.0	JN	23.0	R	4.6	U	8.0	U	n/a			3000	12000	50000
4,4'-DDE	3.9	U	29.0	J	7.6	R	14.0	R	n/a			2000	9000	50000
4,4'-DDT	51.0		460		190	J	200	JN	n/a			2000	9000	500000
aldrin	2.0	U	2.1	U	2.0	J	0.89	R	n/a			40.0	170	50000
alpha-BHC	2.0	U	0.17	R	0.26	R	0.23	R	n/a			-	-	-
alpha-chlordane	2.0	U	4.7	JN	7.1		11.0		n/a			-	-	-
endosulfan sulfate	3.8	U	4.1	U	4.6	U	27.0	R	n/a			340000	6200000	50000
endrin aldehyde	3.9	U	25.0		46.0	J	74.0	JN	n/a			-	-	-
gamma-BHC (Lindane)	0.072	R	0.067	R	2.4	U	2.4	U	n/a			520	2200	50000

TABLE 6-3d

COMPARISON OF SURFACE SOIL ANALYTICAL DATA TO ARARS AND TBCs - SITE 12

NWS EARLE, COLTS NECK, NEW JERSEY

SAMPLE NUMBER:	12SS01 08/05/95		12SS02 08/05/95		12SS03 08/05/95		12SS03-DUP		12SS04 10/29/96		---	ARARS & TBCs		
LOCATION:	12SS01		12SS02		12SS03		12SS03		12SS04		---	NJDEP Soil Residential Direct Contact Cleanup Criteria	NJDEP Soil Non-Residential Direct Contact Cleanup Criteria	NJDEP Soil Impact to Groundwater Cleanup Criteria
DATA SOURCE:	1995 RI		1995 RI		1995 RI		1995 RI		1996 RI					
SAMPLE DATE:	08/05/95		08/05/95		08/05/95		08/05/95		10/29/96					
PESTICIDES	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg			ug/kg	ug/kg	ug/
gamma-chlordane	1.8	J	12.0	JN	14.0	J	22.0	R	n/a			-	-	-
heptachlor	2.0	U	0.40	R	0.62	R	0.43	R	n/a			150	650	50000
heptachlor epoxide	0.60	R	2.5	R	2.4	U	2.4	U	n/a			-	-	-
methoxychlor	8.4	R	21.0	U	24.0	U	24.0	U	n/a			280000	5200000	50000

Footnotes to sample results:

U - Compound or element was not detected. Value is the detection limit (inorganics) or quantitation limit (organics).

UJ - Not detected. Detection limit or quantitation limit shown is considered estimated due to exceedance of data validation quality control criteria.

No Value - Constituent was not analyzed for in this sample.

UR - Nondetected result is considered rejected based on exceedance of data validation quality control criteria.

J - Value is estimated because concentration is below the quantitation limit or because of exceedance of data validation quality control criteria.

R - Positive result is considered rejected based on exceedance of data validation quality control criteria.

N - Compound is considered to be tentatively identified based on exceedance of QC criteria for compound identification.

E - Result exceeds one or more of the selected ARARs.

Footnotes to soil criteria:

- - No standard is available for this chemical in this classification.

TABLE 6-3e

COMPARISON OF SURFACE SOIL MISCELLANEOUS PARAMETERS DATA TO ARARS AND TBCs - SITE 12

NWS EARLE, COLTS NECK, NEW JERSEY

SAMPLE NUMBER:		12SS04 10/29/96	---	---	---	---	ARARS & TBCs		
LOCATION:		12SS04	---	---	---	---	NJDEP Soil Residential Direct Contact Cleanup Criteria	NJDEP Soil Non-Residential Direct Contact Cleanup Criteria	NJDEP Soil Impact to Groundwater Cleanup Criteria
DATA SOURCE:		1996 RI							
SAMPLE DATE:		10/29/96							
MISCELLANEOUS									
% solids	%	85.8					-	-	-
total organic carbon	mg/kg	4250					-	-	-

Footnotes to sample results:

U - Compound or element was not detected. Value is the detection limit (inorganics) or quantitation limit (organics).

UJ - Not detected. Detection limit or quantitation limit shown is considered estimated due to exceedance of data validation quality control criteria.

No Value - Constituent was not analyzed for in this sample.

UR - Nondetected result is considered rejected based on exceedance of data validation quality control criteria.

J - Value is estimated because concentration is below the quantitation limit or because of exceedance of data validation quality control criteria.

R - Positive result is considered rejected based on exceedance of data validation quality control criteria.

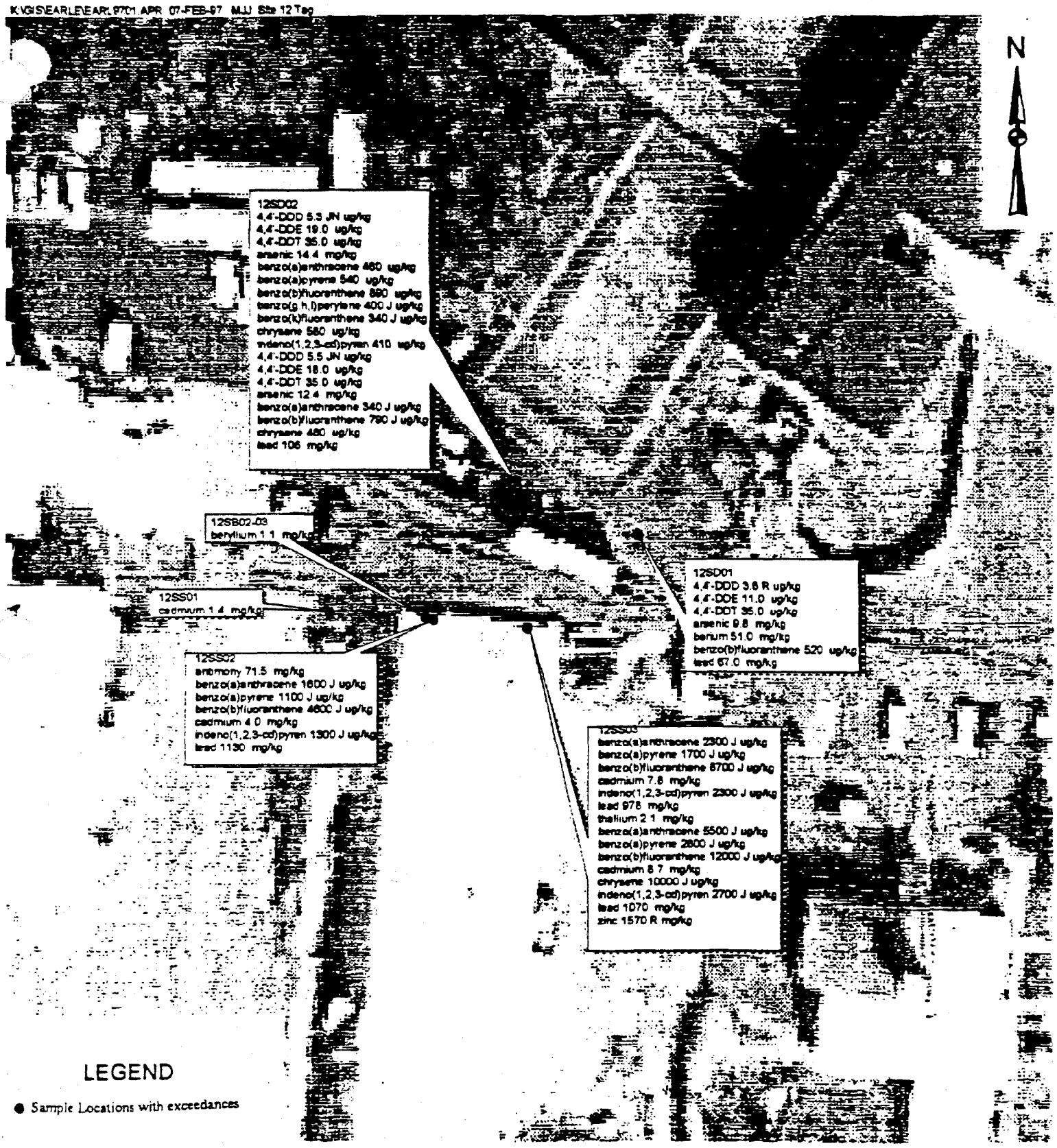
N - Compound is considered to be tentatively identified based on exceedance of QC criteria for compound identification.

E - Result exceeds one or more of the selected ARARs.

Footnotes to soil criteria:

- - No standard is available for this chemical in this classification.

@ - Value is New Jersey guideline for maximum total concentration of all organic compounds in soil (including VOCs, SVOCs, and TPH).



CONCENTRATIONS ABOVE SCREENING LEVELS
SITE 12 - BATTERY STORAGE AREA

50 0 50 100 Feet

FIGURE 6-2

Brown & Root Environmental

6.5.1.2 Organics

PAHs were present at levels greater than background in surface soils, with the highest levels occurring in sample 12 SS 03. Benz(a)anthracene, benzo(a)pyrene, carbazole, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenzofuran, indeno(1,2,3-cd)pyrene, fluoranthene, fluorene, naphthalene, and pyrene were detected in site-related surface soil samples at levels ranging from 44 ug/kg to 15,500 ug/kg. Many of these compounds are typically associated with treated lumber such as could be found on the adjacent railroad track.

4,4'-DDT (43 ug/kg to 420 ug/kg) and 4,4'-DDE (16 ug/kg to 330 ug/kg) were each detected in two background surface soil samples. These pesticides were detected at similar levels in site-related surface soil samples, with concentrations ranging from 51 ug/kg to 460 ug/kg for 4,4'-DDT and at 29 ug/kg for 4,4'-DDE. Other pesticides, including 4,4'-DDD (19 ug/kg), aldrin (2 ug/kg), alpha-chlordane (4.7 ug/kg to 9.05 ug/kg), and gamma-chlordane (1.8 ug/kg to 14 ug/kg), were also detected in surface soil samples collected at Site 12. PCE was detected in one site-related surface soil sample (12 SS 01) at a concentration of 3 ug/kg

6.5.1.3 Miscellaneous Parameters

Samples collected in 1996 were analyzed for TOC but did not show levels above background.

6.5.2 Subsurface Soil

Three subsurface soil samples (12 SB 02-03, 12 SB 03-03, and 12 SB 04-03) were collected and analyzed for TAL metals during the RI Addendum field activities. These samples were obtained from depths of approximately 3 feet below the ground surface. Table 6-4 presents the occurrence and distribution of inorganic chemicals in site-related samples and compare them to background. Table 6-3 presents a comparison of detected compounds to ARARs and TBCs. Figure 6-2 shows sample locations and concentrations of compounds that exceed ARARs and TBCs.

6.5.2.1 Inorganics

Subsurface soils collected from a depth of approximately 3 feet below the ground surface generally contained metals in the range of subsurface soil background samples. Those metals exceeding background concentrations were at sample locations 12 SB 02-03 and 12 SB 04-03 and included aluminum (up to 12,400 mg/kg), beryllium (up to 1.1 mg/kg), and magnesium (up to 2,720 mg/kg). Antimony (0.82 mg/kg) was also detected in 12 SB 02-03 but was not detected in background samples.

TABLE 6-4

OCCURRENCE AND DISTRIBUTION OF INORGANICS IN SUBSURFACE SOILS AT SITE 12

NWS EARLE, COLTS NECK, NEW JERSEY

(mg/kg)

	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	8 / 8	675 - 5310	2.1E+07	5310	3 / 3	1670 - 12400	8323	YES	NO	12400
ANTIMONY *	NOT DETECTED	-	4.3E+00	-	1 / 3	0.82 - 0.82	0.41	YES	-	0.82
ARSENIC *	8 / 8	1.35 - 14.4	1.5E+02	14.40	3 / 3	0.92 - 16.5	10.17	NO	NO	16.5
BARIUM	8 / 8	0.92 - 31	3.8E+01	15.81	3 / 3	5 - 32.5	22.73	YES	NO	32.5
BERYLLIUM *	2 / 8	0.12 0.28	8.8E-02	0.28	3 3	0.11 1.1	0.69	YES	YES	1.1
CALCIUM	8 / 8	28.6 - 799	3.6E+05	799.00	2 / 2	220 - 410	315.00	NO	NO	410
CHROMIUM	8 / 8	4.7 59.5	2.5E+03	59.50	2 2	35.1 45.2	40.15	NO	NO	45.2
COBALT	4 / 8	0.75 - 5	6.1E+00	2.50	3 / 3	0.79 - 3.5	2.33	NO	NO	3.5
COPPER	8 / 8	0.97 - 8.6	1.6E+01	6.62	3 / 3	2.2 - 9.2	5.63	NO	NO	9.2
IRON	8 / 8	3745 - 62500	1.5E+09	62500	3 / 3	2040 - 40700	24980	NO	NO	40700
LEAD	8 / 8	1.4 - 39.4	5.5E+02	39.40	3 / 3	12.7 - 30.1	20.17	NO	NO	30.1
MAGNESIUM	8 / 8	18.5 619	2.9E+05	619.00	3 3	114 2720	1651	YES	NO	2720
MANGANESE	8 / 8	2.6 - 214	2.4E+02	93.90	3 / 3	11.3 - 111	52.50	NO	NO	111
NICKEL	4 / 8	1.8 - 7.2	9.7E+00	4.02	3 / 3	1.1 - 6.8	4.57	YES	NO	6.8
POTASSIUM	7 / 8	95 - 792	8.1E+05	792.00	3 / 3	159 - 8320	4643	YES	NO	8320
SILVER	2 / 8	0.37 - 0.67	8.8E-01	0.38	1 / 3	0.15 - 0.15	0.09	NO	NO	0.15
SODIUM	8 / 8	17.5 94.8	1.4E+02	60.94	1 3	240 240	131.33	YES	NO	240
VANADIUM	8 / 8	11.05 - 64	2.8E+03	61.59	3 / 3	6.8 - 38	27.17	NO	NO	38
ZINC	6 / 8	0.665 - 50.7	1.2E+03	50.70	3 / 3	8.3 - 43.8	27.67	NO	NO	43.8

* - 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, BGSB0105, BGSB0205, BGSB0305, BGSB0405

6.5.2.2 Miscellaneous Parameters

Samples collected in 1996 were analyzed for TOC but did not show levels above background.

6.5.3 Sediment

Two sediment samples were collected at Site 12: 12 SED 01 and 12 SED 02 (Figure 6-1). Tables 6-5 and 6-6 present the occurrence and distribution of inorganic and organic chemicals in site-related samples and compare them to background. Table 6-3 presents a comparison of detected compounds to ARARs and TBCs. Figure 6-2 shows sample locations and concentrations of compounds that exceed ARARs and TBCs.

6.5.3.1 Inorganics

The two site-related sediment samples revealed barium, iron, and manganese at levels greater than background. Arsenic, lead, and zinc were also detected at levels similar to or slightly greater than the upper range observed in background samples.

6.5.3.2 Organics

PAHs including benz(a)anthracene, benzo(a)pyrene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, fluoranthene, and fluorene were detected in background sediment samples at a range from 140 ug/kg to 1,800 ug/kg. Similar levels of PAHs were detected in sediment samples collected at Site 12. Bis(2-ethylhexyl) phthalate (280 ug/kg to 520 ug/kg) was detected in two site-related sediment samples but was not detected in background samples.

4,4'-DDT (43 ug/kg to 420 ug/kg), 4,4'-DDD (4.9 ug/kg to 21 ug/kg), 4,4'-DDE (16 ug/kg to 330 ug/kg), endosulfan I (0.45 ug/kg), and endrin ketone (1.6 ug/kg) were detected in background sediment samples. These pesticides were detected in site-related sediment samples collected at Site 12 at levels ranging from 11 ug/kg to 19 ug/kg for 4,4'-DDE, 240 ug/kg to 410 ug/kg for endosulfan I, at 35 ug/kg for 4,4'-DDT, 5.5 ug/kg for 4,4'-DDD, and 49 ug/kg for endrin ketone. Alpha-BHC (0.19 ug/kg) and alpha-chlordane (1 ug/kg to 1.2 ug/kg) were also detected in sediment samples collected at Site 12.

TABLE 6-5

OCCURRENCE AND DISTRIBUTION OF INORGANICS IN SEDIMENT AT SITE 12

NWS EARLE, COLTS NECK, NEW JERSEY

(mg/kg)

	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?	REPRESENT. CONCENTRA
ALUMINUM	6 / 6	839 - 3940	8.1E+07	5460	2 / 2	5220 - 7690	6455	YES	NO	7690
ARSENIC *	5 / 6	2.4 - 9.9	2.9E+02	11.23	2 / 2	9.8 - 13.4	11.60	YES	NO	13.40
BARIUM	6 / 6	3.2 - 15.8	2.9E+02	16.80	2 / 2	29.85 - 51	40.43	YES	NO	51.00
BERYLLIUM	4 / 6	0.34 0.57	3.3E-01	0.72	2 / 2	0.575 - 0.66	0.62	NO	YES	0.66
CALCIUM	6 / 6	179 - 518	6.7E+05	690.83	2 / 2	4670 - 9050	6860	YES	NO	050
CHROMIUM	6 / 6	4.3 - 56	2.6E+03	40.42	2 / 2	26.7 - 29.65	28.18	NO	NO	29.65
COBALT	4 / 6	0.51 2.1	6.4E+00	2.85	2 / 2	1.9 - 1.95	1.93	NO	NO	1.95
COPPER *	6 / 6	1 - 13	1.9E+01	9.08	2 / 2	24.25 - 25.6	24.93	YES	YES	25.60
IRON	6 / 6	228 - 21400	7.2E+09	23589	2 / 2	25350 - 39000	32175	YES	NO	3900
LEAD *	6 / 6	4 - 34.3	4.8E+01	21.07	2 / 2	67 - 75.5	71.25	YES	YES	75.50
MAGNESIUM	6 / 6	60.7 - 880	2.0E+06	809.90	2 / 2	2440 - 2880	2660	YES	NO	2880
MANGANESE *	6 / 6	3.9 - 63.1	8.9E+01	36.22	2 / 2	111.5 - 127	119.25	YES	YES	127.0
MERCURY	1 / 6	0.068 0.068	8.5E-03	0.09	2 / 2	0.012 - 0.0355	0.02	NO	YES	0.04
NICKEL	5 / 6	1.6 - 6	3.4E+01	6.90	2 / 2	4 - 5.45	4.73	NO	NO	5.45
POTASSIUM	5 / 6	86.1 - 2900	1.4E+07	1892	2 / 2	1680 - 2360	2020	YES	NO	2360
SODIUM	4 / 6	26.6 - 2280	2.9E+03	876.80	2 / 2	119 - 125	122.00	NO	NO	125.0
VANADIUM	6 / 6	5.9 - 42.7	2.1E+03	39.42	2 / 2	23.6 - 30.85	27.23	NO	NO	30.85
ZINC	6 / 6	12.5 - 34.7	1.5E+03	41.23	2 / 2	34.1 - 62.5	48.30	YES	NO	62.5

* - 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 6-6
OCCURRENCE AND DISTRIBUTION OF ORGANICS IN SEDIMENT AT SITE 12
NWS EARLE, COLTS NECK, NEW JERSEY
(ug/kg)

	BACKGROUND			SITE-RELATED				
SUBSTANCE	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	2 X Average Concentration	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	Average Concentration	Mean > 2 X Bkgd.?	REPRESENTATIVE CONCENTRATION
2-METHYLNAPHTHALENE *	NOT DETECTED	-	-	1 / 2	51.5	115.75	NO	51.5
BENZO(A)ANTHRACENE *	3 / 6	85 - 560	560.00	2 / 2	250 - 460	355	NO	460
BENZO(A)PYRENE *	3 / 6	110 - 590	393.60	2 / 2	320 - 540	430	YES	540
BENZO(B)FLUORANTHENE *	3 / 6	150 490	346.54	2 / 2	520 - 890	705	YES	890
BENZO(G,H,I)PERYLENE *	3 / 6	51 - 380	380.00	2 / 2	240 - 355	297.5	NO	355
BENZO(K)FLUORANTHENE *	3 / 6	63 - 470	470.00	2 / 2	180 - 295	237.5	NO	295
BIS(2-ETHYLHEXYL)PHTHALATE *	NOT DETECTED	-	-	2 / 2	67 - 95	81	NO	95
CHRYSENE *	3 / 6	130 - 940	577.87	2 / 2	280 - 520	400	NO	570
DIBENZ(A,H)ANTHRACENE *	NOT DETECTED	-	-	2 / 2	60 - 79.5	69.75	NO	79.5
FLUORANTHENE *	3 / 6	240 - 1800	1024	2 / 2	350 - 590	470	NO	590
INDENO(1,2,3-CD)PYRENE *	3 / 6	55 - 310	310.00	2 / 2	240 - 410	325	YES	410
NAPHTHALENE *	NOT DETECTED	-	-	1 / 2	49	114.5	NO	49
PHENANTHRENE *	3 / 6	110 - 1900	1052	2 / 2	110 - 195	152.5	NO	195
PYRENE *	3 / 6	200 - 1900	1077	2 / 2	310 - 545	427.5	NO	545
4,4'-DDD *	2 / 6	4.9 - 21	11.98	1 / 1	6.3	5.3	NO	5.3
4,4'-DDE *	1 / 6	1.7 - 1.7	1.70	2 / 2	11 - 19	15	YES	19
4,4'-DDT *	1 / 6	19 19	10.64	2 / 2	35 - 35	35	YES	35
ALPHA-BHC *	NOT DETECTED	-	-	1 / 2	0.19	0.57	NO	0.19
ALPHA-CHLORDANE *	NOT DETECTED	-	-	2 / 2	1 - 1.2	1.1	NO	1.2
GAMMA-CHLORDANE *	1 / 6	0.095 - 0.095	0.10	2 / 2	0.54 - 0.79	0.665	YES	0.79

* - Selected as a COPC

6.6 CONTAMINANT FATE AND TRANSPORT

The behavior of contaminants in the environment at Site 12 is described in this subsection. Various chemicals detected and their transport potential in the environment are discussed in Section 6.6.1. Persistence of detected chemicals in the environment is discussed in Section 6.6.2. Section 6.6.3 presents a brief discussion of contaminant trends.

6.6.1 Detected Chemicals and Transport Potential

Analytical results for the media sampled at Site 12 indicate the presence of lead, zinc, and other metals in surface soil, with lower levels of metals present in sediment and subsurface soil samples. PAHs and pesticides were detected at levels greater than background in surface soil and, to a lesser degree, in sediments at Site 12. PCE was detected at a trace level in one surface soil and PCBs were detected at low levels in sediment but were not detected in surface soil. The physical transport data for the detected contaminants are presented in Table 2-8. Additional discussion with respect to chemical and physical properties, contaminant persistence, and contaminant migration pathways is presented in Section 2.3.

The former battery storage area occupied portions of a paved area adjacent to Building R-10. Infiltration is limited by an asphalt parking lot that covers the site. With the exception of PCE, contaminants detected in the surface soil and sediments at Site 12 have low potential for impacts to groundwater. The detected PAHs and pesticides exhibit low solubility and are strongly bound to soil. Inorganic compounds also have a strong tendency to adsorb onto soil/sediment particles, a factor that greatly reduces their mobility. However, processes that transport surface soil particles, such as fugitive dust emissions and erosional transport via surface water pathways, can lead to migration of contaminated media. Surface water runoff at the site is directed to a stormwater collection basin, which discharges water through a concrete culvert, to a drainage swale, and eventually to the marsh area north of the site.

Lead, the major component of the forklift batteries stored at Site 12, was found at concentrations similar to background levels in sediments but at a higher level than background in surface soil. Lead and other metals can migrate by erosional effects of wind or surface water. The potential for lead in the soil to enter the groundwater or surface water exists and would be increased if the pH of surface soils were to decrease. Subsurface soils do not indicate the presence of lead at levels exceeding background; therefore, the potential for migration to groundwater is expected to be low.

The lead contribution at the site may be partially due to leachable lead from the railroad bed ballast; however, based on leachability testing of the ballast material, the lead contribution from the ballast is minimal (see Section 11.3.2).

PCE, which was detected in one surface soil sample, is considered volatile, soluble, and mobile in groundwater. PCE will readily leach from soils and migrate in the subsurface through groundwater transport and soil vapor migration. Volatilization from surface soils is a significant fate process.

6.6.2 Contaminant Persistence

For the classes of detected chemicals, environmental persistence varies widely. Transformation of a chemical to its degradation by-product(s) can be the result of numerous processes including biotransformation and uptake, photolysis, acid- or base-catalyzed reaction, or hydrolysis. The by-product chemical(s) may or may not be significantly different toxicologically or different from a physical transport perspective. If the transformational process is known or suspected, product chemicals can be predicted and extent of transformation can be determined from chemical reaction rate data. Other transformational processes may be identified empirically from analytical data.

Although most chemicals are resistant to chemical change because of their stability and/or lack of reaction sites, many of the more mobile species are subjected to at least limited transformation. Because of more frequent contact with reactive dissolved species and catalysts when compared to unsaturated conditions, the contaminants found in saturated media (groundwater, saturated zone soils, surface water, and sediment) are most likely to be transformed in the environment. Higher molecular weight contaminants tend to be less mobile and less prone to chemical transformation. PAHs can be biodegraded but the rate of degradation is slower for the higher molecular weight compounds.

PCE, which was detected at a trace level in one surface soil, is considered to have low persistence due to its high volatility and solubility. In addition, PCE in the subsurface can be slowly degraded by microorganisms to simpler chlorinated ethenes.

6.6.3 Observed Chemical Contaminant Trends

The detected surface soil contamination indicates elevated levels of several organics and metals. A potential for groundwater contamination with lead also cannot be ruled out, since groundwater quality was not determined during this or previous investigations; however, subsurface soils do not appear to be adversely impacted by lead contamination. The potential for leaching to groundwater would be controlled by factors such as the chemical form of lead, soil cation exchange capacity, soil pH, and the buffering capacity of subsurface soil. Since the site was a temporary storage area rather than a battery reclaiming area, it is unlikely that groundwater pH would be affected. Subsurface soil samples do not indicate significant contamination by metals because levels are generally within the background range.

Organic contaminants in surface soil and sediment fall into three classes: PAHs (which are considered relatively immobile), pesticides (which have varying degrees of mobility), and volatiles (which are considered mobile). Of these classes, the detected levels of PAHs are the highest, although the overall potential for PAH migration impacts is lowest. PAH levels in site-related surface soils were notably greater than levels in background in surface soil samples. Levels of PAHs in site-related sediment samples were within a range similar to background sediment samples.

The significance of a single detection of PCE at levels below quantitation limits is unclear since VOCs were not detected elsewhere in site-related samples and are not related to known previous site activities. Based upon the limited detection, it is safe to conclude that there is not widespread potential for groundwater contamination with PCE resulting from this site.

6.6.4 Conclusions

The principal concern is metals and organics in surface soils in a small area in the vicinity of the north end of Building R-10 near the loading dock and railroad tracks. Some degree of migration of surface soil could occur through windblown particulates or through runoff and erosional dispersion; however, the greatest concern is from compounds near the surface that could be accidentally ingested via direct contact with soil. With the exception of PCE, which is of questionable origin, compounds detected in the surface soil and sediments at Site 12 have low potential for impacts to groundwater. Samples collected along the surface water drainage pathway do not indicate significant migration of lead through erosional soil transport.

The significance of a single detection of PCE at trace levels in surface soil cannot be determined. The presence of this chemical might be attributable to a spill or off-site source.

6.7 BASELINE RISK ASSESSMENT

This section presents the results of the baseline risk assessment for Site 12. The risk assessment was performed using the approach outlined in Section 2.4. Tables 6-7 through 6-9 provide the selected COPCs and representative concentrations of inorganics and organics in site-related surface soil, subsurface soil (inorganics only), and sediment, respectively. COPCs and representative concentrations were selected as described in Sections 2.4.1.1, 2.4.1.2, and 2.4.1.3. Exposure pathways, potential receptors, uncertainties, and conclusions are included.

The risk assessment only identifies exposure and risks, not acceptable levels of these parameters. The results of this risk assessment are used for input into the risk management process, where clean-up goals and remediation procedures are identified for a site.

6.7.1 Risk Characterization

The results of the risk assessment are presented in the risk characterization and are discussed on a receptor-specific basis. The identified potential receptors have been evaluated on the basis of current land use (industrial employee) and hypothetical future land use (industrial employees, residential receptors, and recreational receptors).

6.7.1.1 Current Industrial Employee

Surface Soil Exposure

RME

The estimated total cancer risks for the current industrial employee for exposure to COPCs in surface soil at Site 12 are 2.1E-05 (ingestion) and 4.3E-05 (dermal contact). The total surface soil cancer risk is within the 10^{-4} to 10^{-6} target acceptable risk range often used by EPA to determine the need for action at CERCLA/RCRA sites or formulate standards and criteria (ARARs). The principal COPCs contributing to the surface soil cancer risk are arsenic (ingestion, 41 percent of the cancer risk for this pathway; dermal contact, 100 percent of the cancer risk for this pathway), benzo(a)pyrene (ingestion, 27 percent of the cancer risk for this pathway), and benzo(b)fluoranthene (ingestion, 12 percent of the cancer risk for this pathway).

The estimated noncarcinogenic HIs for the current industrial employee assuming exposure to COPCs in surface soil at Site 12 is less than 1.0 for the ingestion, dermal contact, and inhalation exposure pathways. Adverse noncarcinogenic effects are not expected when the HI is less than 1.0.

Estimated RME carcinogenic risks and noncarcinogenic HQs are presented for current industrial receptors exposed to surface soil at Site 12 in Tables 6-10 and 6-11, respectively.

TABLE 6-7
REPRESENTATIVE CONCENTRATIONS OF SELECTED COPCS
SURFACE SOIL - SITE 12
NWS EARLE, COLTS NECK, NEW JERSEY

CHEMICAL OF CONCERN	REPRESENTATIVE CONCENTRATION (mg/kg)
ANTIMONY	60.26
ARSENIC	10.7
BERYLLIUM	0.85
CADMIUM	8.25
MERCURY	0.87
SILVER	1.7
4,4'-DDD*	19
4,4'-DDE*	29
4,4'-DDT*	460
2-METHYLNAPHTHALENE	170
ACENAPHTHENE*	64
ACENAPHTHYLENE*	135
ALDRIN*	2
ALPHA-CHLORDANE*	9.05
ANTHRACENE*	945
BENZ(A)ANTHRACENE*	3900
BENZO(A)PYRENE*	2250
BENZO(B)FLUORANTHENE*	10350
BENZO(G,H,I)PERYLENE*	2300
BIS(2-ETHYLHEXYL)PHTHALATE*	1220
BUTYLBENZYLPHTHALATE*	130
CARBAZOLE*	980
CHRYSENE*	8200
DI-N-BUTYLPHTHALATE*	110
DIBENZ(A,H)ANTHRACENE*	540
DIBENZOFURAN*	63
ENDRIN ALDEHYDE	60
FLUORANTHENE*	13300
FLUORENE*	94
GAMMA-CHLORDANE*	14
INDENO(1,2,3-CD)PYRENE*	2500
NAPHTHALENE*	130
PHENANTHRENE*	1900
PYRENE*	15500
TETRACHLOROETHENE*	3

* = UNITS FOR ORGANIC CHEMICALS ARE IN ug/kg

TABLE 6-8
REPRESENTATIVE CONCENTRATIONS OF SELECTED COPCS
SUBSURFACE SOIL - SITE 12
NWS EARLE, COLTS NECK, NEW JERSEY

CHEMICAL OF CONCERN	REPRESENTATIVE CONCENTRATION (mg/kg)
ANTIMONY	0.82
ARSENIC	16.5
BERYLLIUM	1.1

TABLE 6-9
REPRESENTATIVE CONCENTRATIONS OF SELECTED COPCS
SEDIMENT - SITE 12
NWS EARLE, COLTS NECK, NEW JERSEY

CHEMICAL OF CONCERN	REPRESENTATIVE CONCENTRATION (mg/kg)
ARSENIC	13.4
COPPER	25.6
LEAD	75.5
MANGANESE	127
2-METHYLNAPHTHALENE*	51.5
4,4'-DDD*	5.3
4,4'-DDE*	19
4,4'-DDT*	35
ALPHA-BHC*	0.19
ALPHA-CHLORDANE*	1.2
BENZO(A)ANTHRACENE*	460
BENZO(A)PYRENE*	540
BENZO(B)FLUORANTHENE*	890
BENZO(G,H,I)PERYLENE*	355
BENZO(K)FLUORANTHENE*	295
BIS(2-ETHYLHEXYL)PHTHALATE*	95
CHRYSENE*	520
DIBENZ(A,H)ANTHRACENE*	79.5
FLUORANTHENE*	590
INDENO(1,2,3-CD)PYRENE	40
NAPHTHALENE	49
PHENANTHRENE	195
PYRENE	545

* = UNITS FOR ORGANIC CHEMICALS ARE IN ug/kg

TABLE 6-10
RME CARCINOGENIC RISK TO CURRENT INDUSTRIAL RECEPTORS - SITE 12
SURFACE SOIL
NWS EARLE, COLTS NECK, NEW JERSEY

SUBSTANCE	SURFACE SOIL INGESTION	SURFACE SOIL DERMAL CONTACT	INHALATION OF COPCS IN FUGITIVE DUST
2-METHYLNAPHTHALENE	N/A	N/A	N/A
4,4'-DDD	1.59E-09	N/A	N/A
4,4'-DDE	3.4E-09	N/A	N/A
4,4'-DDT	5.47E-08	N/A	N/A
ACENAPHTHENE	N/A	N/A	N/A
ACENAPHTHYLENE	N/A	N/A	N/A
ALDRIN	1.19E-08	N/A	N/A
ALPHA-CHLORDANE	4.1E-09	N/A	N/A
ANTHRACENE	N/A	N/A	N/A
BENZO(A)ANTHRACENE	9.9E-07	N/A	N/A
BENZO(A)PYRENE	5.7E-06	N/A	N/A
BENZO(B)FLUORANTHENE	2.6E-06	N/A	N/A
BENZO(G,H,I)PERYLENE	N/A	N/A	N/A
BIS(2-ETHYLHEXYL)PHTHALATE	5.97E-09	N/A	N/A
BUTYLBENZYLPHTHALATE	N/A	N/A	N/A
CARBAZOLE	6.8E-09	N/A	N/A
CHRYSENE	2.09E-08	N/A	N/A
DI-N-BUTYLPHTHALATE	N/A	N/A	N/A
DIBENZ(A,H)ANTHRACENE	1.38E-06	N/A	N/A
DIBENZOFURAN	N/A	N/A	N/A
ENDRIN ALDEHYDE	N/A	N/A	N/A
FLUORANTHENE	N/A	N/A	N/A
FLUORENE	N/A	N/A	N/A
GAMMA-CHLORDANE	6.36E-09	N/A	N/A
INDENO(1,2,3-CD)PYRENE	6.38E-07	N/A	N/A
NAPHTHALENE	N/A	N/A	N/A
PHENANTHRENE	N/A	N/A	N/A
PYRENE	N/A	N/A	N/A
TETRACHLOROETHENE	5.5E-11	N/A	N/A
ANTIMONY	N/A	N/A	N/A
ARSENIC	8.65E-06	4.32E-05	N/A
BERYLLIUM	1.28E-06	N/A	N/A
CADMIUM	N/A	N/A	N/A
MERCURY	N/A	N/A	N/A
SILVER	N/A	N/A	N/A
TOTAL RISK	2.1E-05	4.3E-05	N/A

N/A = NOTAPPLICABLE, NO TOXICITY VALUE OR ABSORPTION FACTOR HAS BEEN ESTABLISHED FOR THIS CHEMICAL

SURFACE SOIL
NWS EARLE, COLTS NECK, NEW JERSEY

SUBSTANCE	SURFACE SOIL INGESTION	SURFACE SOIL DERMAL CONTACT	INHALATION OF COPCS IN FUGITIVE DUST
2-METHYLNAPHTHALENE	N/A	N/A	N/A
4,4'-DDD	N/A	N/A	N/A
4,4'-DDE	N/A	N/A	N/A
4,4'-DDT	9.00E-04	N/A	N/A
ACENAPHTHENE	1.4E-06	N/A	N/A
ACENAPHTHYLENE	N/A	N/A	N/A
ALDRIN	6.2E-05	N/A	N/A
ALPHA-CHLORDANE	1.5E-04	N/A	N/A
ANTHRACENE	3.1E-06	N/A	N/A
BENZO(A)ANTHRACENE	N/A	N/A	N/A
BENZO(A)PYRENE	N/A	N/A	N/A
BENZO(B)FLUORANTHENE	N/A	N/A	N/A
BENZO(G,H,I)PERYLENE	N/A	N/A	N/A
BIS(2-ETHYLHEXYL)PHTHALATE	6.0E-05	N/A	N/A
BUTYLBENZYLPHTHALATE	1.6E-02	N/A	N/A
CARBAZOLE	N/A	N/A	N/A
CHRYSENE	N/A	N/A	N/A
DI-N-BUTYLPHTHALATE	1.1E-06	N/A	N/A
DIBENZ(A,H)ANTHRACENE	N/A	N/A	N/A
DIBENZOFURAN	1.5E-05	N/A	N/A
ENDRIN ALDEHYDE	2.0E-04	N/A	N/A
FLUORANTHENE	3.3E-04	N/A	N/A
FLUORENE	2.3E-06	N/A	N/A
GAMMA-CHLORDANE	2.3E-04	N/A	N/A
INDENO(1,2,3-CD)PYRENE	N/A	N/A	N/A
NAPHTHALENE	3.2E-06	N/A	N/A
PHENANTHRENE	N/A	N/A	N/A
PYRENE	5.1E-04	N/A	N/A
TETRACHLOROETHENE	2.9E-07	N/A	N/A
ANTIMONY	1.5E-01	N/A	N/A
ARSENIC	5.4E-02	2.69E-01	N/A
BERYLLIUM	1.7E-04	N/A	N/A
CADMIUM	1.61E-02	2.52E-03	8.26E-12
MERCURY	2.84E-03	N/A	8.96E-13
SILVER	3.3E-04	N/A	N/A

N/A = NOTAPPLICABLE, NO TOXICITY VALUE OR ABSORPTION FACTOR HAS BEEN ESTABLISHED FOR THIS CHEMICAL

CTE

No CTE analysis is required for surface soil exposure.

6.7.1.2 Future Industrial Employee

Subsurface Soil Exposure

RME

The estimated total cancer risks for the future industrial employee for exposure to COPCs in subsurface soil (assuming subsurface soils become future surface soils) at Site 12 are 1.0E-05 (ingestion) and 4.3E-05 (dermal contact). The total subsurface soil cancer risk is within the 10^{-4} to 10^{-6} target acceptable risk range often used by EPA to determine the need for action at CERCLA/RCRA sites or to formulate standards and criteria (ARARs). The principal COPC contributing to the subsurface soil cancer risk is arsenic (ingestion, 99 percent of the cancer risk for this pathway; and dermal contact, 100 percent of the cancer risk for this pathway).

The estimated noncarcinogenic HIs for the future industrial employee assuming exposure to COPCs in subsurface soil (assuming subsurface soil becomes future surface soil) at Site 12 are less than 1.0 for the ingestion and dermal contact. Adverse noncarcinogenic effects are not expected because the sum of these HIs is below 1.0.

Estimated RME carcinogenic risks and noncarcinogenic HQs are presented for future industrial receptors exposed to subsurface soil at Site 12 in Tables 6-12 and 6-13, respectively.

CTE

No CTE analysis is required for subsurface soil exposure.

TABLE 6-12
RME CARCINOGENIC RISK TO FUTURE INDUSTRIAL RECEPTORS - SITE 12
SUBSURFACE SOIL
NWS EARLE, COLTS NECK, NEW JERSEY

SUBSTANCE	SUBSURFACE SOIL INGESTION	SUBSURFACE SOIL DERMAL CONTACT	INHALATION OF COPCS IN FUGITIVE DUST
ANTIMONY	N/A	N/A	N/A
ARSENIC	8.7E-06	4.3E-05	N/A
BERYLLIUM	1.7E-06	N/A	N/A
TOTAL RISK	1.0E-05	4.3E-05	N/A

N/A = NOT APPLICABLE, NO TOXICITY VALUE HAS BEEN ESTABLISHED FOR THIS CHEMICAL

TABLE 6-13
RME NONCARCINOGENIC HQS, FUTURE INDUSTRIAL RECEPTORS - SITE 12
SUBSURFACE SOIL
NWS EARLE, COLTS NECK, NEW JERSEY

SUBSTANCE	SUBSURFACE SOIL INGESTION	SUBSURFACE SOIL DERMAL CONTACT	INHALATION OF COPCS IN FUGITIVE DUST
ANTIMONY	2.0E-03	N/A	N/A
ARSENIC	5.4E-02	2.7E-01	N/A
BERYLLIUM	2.2E-04	N/A	N/A

N/A = NOT APPLICABLE, NO TOXICITY VALUE HAS BEEN ESTABLISHED FOR THIS CHEMICAL

6.7.1.3 Future Residential Receptor

Surface Soil Exposure

RME

The estimated total cancer risks for the future residential receptor for exposure to COPCs in surface soil at Site 12 are 9.5E-05 (ingestion), 1.0E-04 (dermal contact), and 5.1E-14 (inhalation of COPCs in fugitive dust). The total surface soil cancer risk is at the upper bound of the 10^{-4} to 10^{-6} target acceptable risk range often used by EPA to determine the need for action at CERCLA/RCRA sites or formulate standards and criteria(ARARs). The principal COPCs contributing to the surface soil cancer risk are arsenic (ingestion, 41 percent of the cancer risk for this pathway; dermal contact, 100 percent of the cancer risk for this pathway), benzo(a)pyrene (ingestion, 27 percent of the cancer risk for this pathway), and benzo(b)fluoranthene (ingestion, 12 percent of the cancer risk for this pathway).

The estimated noncarcinogenic HIs for the future residential receptor assuming exposure to COPCs in surface soil at Site 12 exceeded 1.0 for the ingestion exposure pathways. For surface soil ingestion by the future residential receptor, the target organ, corresponding HI, and principal COPC is cardiovascular effects (1.9 - antimony). Adverse noncarcinogenic effects cannot be ruled out when the HI is greater than 1.0.

Estimated RME carcinogenic risks and noncarcinogenic HQs are presented for future receptors exposed to surface soil at Site 12 in Tables 6-14 and 6-15, respectively.

CTE

The estimated total cancer risks for the future residential receptor for exposure to COPCs in surface soil at Site 12 are 1.5E-05 (ingestion), 5.9E-05 (dermal contact), and 1.3E-14 (inhalation of COPCs in fugitive dust). The total surface soil cancer risk is within the 10^{-4} to 10^{-6} target acceptable risk range often used by EPA to determine the need for action at CERCLA/RCRA sites or formulate standards and criteria (ARARs). The principal COPCs contributing to the surface soil cancer risk are arsenic (ingestion, 41 percent of the cancer risk for this pathway; dermal contact, 100 percent of the cancer risk for this pathway), benzo(a)pyrene (ingestion, 27 percent of the cancer risk for this pathway), and benzo(b)fluoranthene (ingestion, 12 percent of the cancer risk for this pathway).

TABLE 6-14
RME CARCINOGENIC RISK TO FUTURE RESIDENTIAL RECEPTORS - SITE 12
SURFACE SOIL
NWS EARLE, COLTS NECK, NEW JERSEY

SUBSTANCE	SURFACE SOIL INGESTION - LIFETIME	SURFACE SOIL DERMAL CONTACT - LIFETIME	INHALATION OF COPCS IN FUGITIVE DUST - LIFETIME
2-METHYLNAPHTHALENE	N/A	N/A	N/A
4,4'-DDD	7.40E-09	N/A	N/A
4,4'-DDE	1.54E-08	N/A	N/A
4,4'-DDT	2.45E-07	N/A	N/A
ACENAPHTHENE	N/A	N/A	N/A
ACENAPHTHYLENE	N/A	N/A	N/A
ALDRIN	5.23E-08	N/A	N/A
ALPHA-CHLORDANE	1.84E-08	N/A	N/A
ANTHRACENE	N/A	N/A	N/A
BENZO(A)ANTHRACENE	4.46E-06	N/A	N/A
BENZO(A)PYRENE	2.57E-05	N/A	9.0E-15
BENZO(B)FLUORANTHENE	1.18E-05	N/A	N/A
BENZO(G,H,I)PERYLENE	N/A	N/A	N/A
BIS(2-ETHYLHEXYL)PHTHALATE	2.67E-08	N/A	N/A
BUTYLBENZYLPHTHALATE	N/A	N/A	N/A
CARBAZOLE	3.07E-08	N/A	N/A
CHRYSENE	9.37E-08	N/A	N/A
DI-N-BUTYLPHTHALATE	N/A	N/A	N/A
DIBENZ(A,H)ANTHRACENE	6.17E-06	N/A	N/A
DIBENZOFURAN	N/A	N/A	N/A
ENDRIN ALDEHYDE	N/A	N/A	N/A
FLUORANTHENE	N/A	N/A	N/A
FLUORENE	N/A	N/A	N/A
GAMMA-CHLORDANE	2.6E-08	N/A	N/A
INDENO(1,2,3-CD)PYRENE	2.86E-06	N/A	N/A
NAPHTHALENE	N/A	N/A	N/A
PHENANTHRENE	N/A	N/A	N/A
PYRENE	N/A	N/A	N/A
TETRACHLOROETHENE	2.44E-10	N/A	N/A
ANTIMONY	N/A	N/A	N/A
ARSENIC	3.9E-05	9.96E-05	4.2E-14
BERYLLIUM	5.27E-06	N/A	N/A
CADMIUM	N/A	N/A	N/A
MERCURY	N/A	N/A	N/A
SILVER	N/A	N/A	N/A
TOTAL RISK	9.5E-05	1.0E-04	5.1E-14

N/A = NOTAPPLICABLE, NO TOXICITY VALUE OR ABSORPTION FACTOR HAS BEEN ESTABLISHED FOR THIS CHEMICAL

TABLE 6-15

RME NONCARCINOGENIC HOS, FUTURE RESIDENTIAL RECEPTORS - SITE 12

SURFACE SOIL

NWS EARLE, COLTS NECK, NEW JERSEY

		GROUNDWATER INGESTION BY TARGET ORGAN										
SUBSTANCE	SURFACE SOIL INGESTION - CHILD	CARDIO-VASCULAR SYSTEM	SKIN	KIDNEY	LIVER	DIGESTIVE SYSTEM	CENTRAL NERVOUS SYSTEM	SKELETAL MUSCLE	REPRO-DUCTIVE SYSTEM	THYROID	SURFACE SOIL DERMAL CONTACT - CHILD	INHALATION OF COPCS IN FUGITIVE DUST - CHILD
2-METHYLNAPHTHALENE	N/A										N/A	N/A
4,4'-DDD	N/A										N/A	N/A
4,4'-DDE	N/A										N/A	N/A
4,4'-DDT	1.18E-02				1.2E-02						N/A	N/A
ACENAPHTHENE	1.4E-05			1.4E-05	1.4E-05						N/A	N/A
ACENAPHTHYLENE	N/A										N/A	N/A
ALDRIN	8.52E-04				8.5E-04		8.5E-04		8.5E-04		N/A	N/A
ALPHA-CHLORDANE	1.93E-03				1.9E-03		1.9E-03		1.9E-03		N/A	N/A
ANTHRACENE	4.0E-05										N/A	N/A
BENZO(A)ANTHRACENE	N/A										N/A	N/A
BENZO(A)PYRENE	N/A										N/A	N/A
BENZO(B)FLUORANTHENE	N/A										N/A	N/A
BENZO(G,H,I)PERYLENE	N/A										N/A	N/A
BIS(2-ETHYLHEXYL)PHTHALATE	7.40E-04				7.4E-04				7.4E-04		N/A	N/A
BUTYLBENZYLPHTHALATE	8.3E-08										N/A	1.2E-10
CARBAZOLE	N/A										N/A	N/A
CHRYSENE	N/A										N/A	N/A
DI-N-BUTYLPHTHALATE	1.4E-05								1.4E-05		N/A	2.1E-10
DIBENZ(A,H)ANTHRACENE	N/A										N/A	N/A
DIBENZOFURAN	2.0E-04										N/A	N/A
ENDRIN ALDEHYDE	2.6E-03										N/A	N/A
FLUORANTHENE	4.25E-03	4.3E-03		4.3E-03	4.3E-03						N/A	N/A
FLUORENE	3.0E-05	3.0E-05					3.0E-05				N/A	N/A
GAMMA-CHLORDANE	2.98E-03				3.0E-03		3.0E-03		3.0E-03		N/A	N/A
INDENO(1,2,3-CD)PYRENE	N/A										N/A	N/A
NAPHTHALENE	4.2E-05	4.2E-05		4.2E-05							N/A	N/A
PHENANTHRENE	N/A										N/A	N/A
PYRENE	6.61E-03			6.6E-03							N/A	N/A
TETRACHLOROETHENE	3.8E-08				3.8E-08						N/A	N/A
ANTIMONY	1.93E+00	1.9E+00									N/A	N/A
ARSENIC	7.03E-01		7.0E-01								1.1E+00	N/A
BERYLLIUM	2.17E-03	2.2E-03				2.2E-03		2.2E-03	2.2E-03		N/A	N/A
CADMIUM	2.11E-01			2.1E-01							1.0E-02	2.5E-10
MERCURY	3.71E-02			3.7E-02			3.7E-02		3.7E-02		N/A	3.6E-11
SILVER	4.4E-03		4.4E-03								N/A	N/A
	HI BY TARGET ORGAN	1.9E+00	7.1E-01	2.6E-01	2.3E-02	2.2E-03	4.3E-02	2.2E-03	4.6E-02			

N/A = NOT APPLICABLE, NO TOXICITY VALUE HAS BEEN ESTABLISHED FOR THIS CHEMICAL

The estimated noncarcinogenic HIs for the future residential receptor assuming exposure to COPCs in surface soil at Site 12 exceeded 1.0 for the ingestion, dermal contact and inhalation exposure pathways. However, the HIs divided into their respective target organs are all less than 1.0. Adverse noncarcinogenic effects are not expected when the HIs (based on target organs) are less than 1.0.

Estimated CTE carcinogenic risks and noncarcinogenic HQs are presented for future receptors exposed to surface soil at Site 12 in Tables 6-16 and 6-17, respectively.

Subsurface Soil Exposure

RME

The estimated total cancer risks for the future residential receptor for exposure to COPCs in subsurface soil (assuming subsurface soils become future surface soils) at Site 12 are 4.6E-05 (ingestion), 1.0E-04 (dermal contact), and 4.2E-14 (inhalation of COPCs in fugitive dust). The total subsurface soil cancer risk is at the upper bound of the 10^{-4} to 10^{-6} target acceptable risk range often used by EPA to determine the need for action at CERCLA/RCRA sites or to formulate standards and criteria (ARARs). The principal COPCs contributing to the subsurface soil cancer risk are arsenic (ingestion, 85 percent of the cancer risk for this pathway; and dermal contact, 100 percent of the cancer risk for this pathway) and beryllium (ingestion, 15 percent of the cancer risk for this pathway).

The estimated noncarcinogenic HIs for the future residential receptor assuming exposure to COPCs in subsurface soil (assuming subsurface soil becomes future surface soil) at Site 12 is greater than 1.0 for the dermal contact exposure pathway. For surface soil ingestion by the future residential receptor, the target organ, corresponding HI, and principal COPC is skin (1.1 - arsenic). The estimated noncarcinogenic HIs for the future residential receptor for the ingestion exposure pathway is less than 1.0. Adverse noncarcinogenic effects cannot be ruled out when the HI is greater than 1.0.

Estimated CTE carcinogenic risks and noncarcinogenic HQs are presented for future residential receptors exposed to subsurface soil at Site 12 in Tables 6-18 and 6-19, respectively.

TABLE 6-16
CENTRAL TENDENCY CARCINOGENIC RISK TO FUTURE RESIDENTIAL RECEPTORS - SITE 12
SURFACE SOIL
NWS EARLE, COLTS NECK, NEW JERSEY

SUBSTANCE	SURFACE SOIL INGESTION - LIFETIME	SURFACE SOIL DERMAL CONTACT - LIFETIME	INHALATION OF COPCS IN FUGITIVE DUST - LIFETIME
2-METHYLNAPHTHALENE	N/A	N/A	N/A
4,4'-DDD	1.2E-09	N/A	N/A
4,4'-DDE	2.5E-09	N/A	N/A
4,4'-DDT	3.9E-08	N/A	N/A
ACENAPHTHENE	N/A	N/A	N/A
ACENAPHTHYLENE	N/A	N/A	N/A
ALDRIN	8.5E-09	N/A	N/A
ALPHA-CHLORDANE	3.0E-09	N/A	N/A
ANTHRACENE	N/A	N/A	N/A
BENZO(A)ANTHRACENE	7.2E-07	N/A	N/A
BENZO(A)PYRENE	4.1E-06	N/A	N/A
BENZO(B)FLUORANTHENE	1.9E-06	N/A	N/A
BENZO(G,H,I)PERYLENE	N/A	N/A	N/A
BIS(2-ETHYLHEXYL)PHTHALATE	4.3E-09	N/A	N/A
BUTYLBENZYLPHTHALATE	N/A	N/A	N/A
CARBAZOLE	4.9E-09	N/A	N/A
CHRYSENE	1.5E-08	N/A	N/A
DI-N-BUTYLPHTHALATE	N/A	N/A	N/A
DIBENZ(A,H)ANTHRACENE	9.9E-07	N/A	N/A
DIBENZOFURAN	N/A	N/A	N/A
ENDRIN ALDEHYDE	N/A	N/A	N/A
FLUORANTHENE	N/A	N/A	N/A
FLUORENE	N/A	N/A	N/A
GAMMA-CHLORDANE	4.6E-09	N/A	N/A
INDENO(1,2,3-CD)PYRENE	4.6E-07	N/A	N/A
NAPHTHALENE	N/A	N/A	N/A
PHENANTHRENE	N/A	N/A	N/A
PYRENE	N/A	N/A	N/A
TETRACHLOROETHENE	3.9E-11	N/A	N/A
ANTIMONY	N/A	N/A	N/A
ARSENIC	6.2E-06	5.9E-05	1.3E-14
BERYLLIUM	9.2E-07	N/A	N/A
CADMIUM	N/A	N/A	N/A
MERCURY	N/A	N/A	N/A
SILVER	N/A	N/A	N/A
TOTAL RISK	1.5E-05	5.9E-05	1.3E-14

N/A = NOT APPLICABLE, NO TOXICITY VALUE OR ABSORPTION FACTOR HAS BEEN ESTABLISHED FOR THIS CHEMICAL

TABLE 6-17
CENTRAL TENDENCY NONCARCINOGENIC HQS, FUTURE RESIDENTIAL RECEPTORS - SITE 12
SURFACE SOIL
NWS EARLE, COLTS NECK, NEW JERSEY

SUBSTANCE	SURFACE SOIL INGESTION - CHILD	SURFACE SOIL DERMAL CONTACT - CHILD	INHALATION OF COPCS IN FUGITIVE DUST - CHILD
2-METHYLNAPHTHALENE	N/A	N/A	N/A
4,4'-DDD	N/A	N/A	N/A
4,4'-DDE	N/A	N/A	N/A
4,4'-DDT	5.9E-03	N/A	N/A
ACENAPHTHENE	6.8E-06	N/A	N/A
ACENAPHTHYLENE	N/A	N/A	N/A
ALDRIN	4.3E-04	N/A	N/A
ALPHA-CHLORDANE	9.6E-04	N/A	N/A
ANTHRACENE	2.0E-05	N/A	N/A
BENZO(A)ANTHRACENE	N/A	N/A	N/A
BENZO(A)PYRENE	N/A	N/A	N/A
BENZO(B)FLUORANTHENE	N/A	N/A	N/A
BENZO(G,H,I)PERYLENE	N/A	N/A	N/A
BIS(2-ETHYLHEXYL)PHTHALATE	3.9E-04	N/A	N/A
BUTYLBENZYLPHTHALATE	4.2E-06	N/A	N/A
CARBAZOLE	N/A	N/A	N/A
CHRYSENE	N/A	N/A	N/A
DI-N-BUTYLPHTHALATE	7.3E-06	N/A	N/A
DIBENZ(A,H)ANTHRACENE	N/A	N/A	N/A
DIBENZOFURAN	1.0E-04	N/A	N/A
ENDRIN ALDEHYDE	1.3E-03	N/A	N/A
FLUORANTHENE	2.1E-03	N/A	N/A
FLUORENE	1.5E-05	N/A	N/A
GAMMA-CHLORDANE	1.5E-03	N/A	N/A
INDENO(1,2,3-CD)PYRENE	N/A	N/A	N/A
NAPHTHALENE	2.1E-05	N/A	N/A
PHENANTHRENE	N/A	N/A	N/A
PYRENE	3.3E-03	N/A	N/A
TETRACHLOROETHENE	1.9E-06	N/A	N/A
ANTIMONY	9.6E-01	N/A	N/A
ARSENIC	3.5E-01	5.4E-01	N/A
BERYLLIUM	1.1E-03	N/A	N/A
CADMIUM	1.1E-01	3.0E-02	1.6E-10
MERCURY	1.9E-02	N/A	1.8E-11
SILVER	2.2E-03	N/A	N/A

N/A = NOT APPLICABLE, NO TOXICITY VALUE HAS BEEN ESTABLISHED FOR THIS CHEMICAL

TABLE 6-18
RME CARCINOGENIC RISK TO FUTURE RESIDENTIAL RECEPTORS - SITE 12
SUBSURFACE SOIL
NWS EARLE, COLTS NECK, NEW JERSEY

SUBSTANCE	SUBSURFACE SOIL INGESTION - LIFETIME	SUBSURFACE SOIL DERMAL CONTACT - LIFETIME	INHALATION OF COPCS IN FUGITIVE DUST - LIFETIME
ANTIMONY	N/A	N/A	N/A
ARSENIC	3.9E-05	1.0E-04	4.2E-14
BERYLLIUM	7.4E-06	N/A	N/A
TOTAL RISK	4.6E-05	1.0E-04	4.2E-14

N/A = NOT APPLICABLE, NO TOXICITY VALUE HAS BEEN ESTABLISHED FOR THIS CHEMICAL

TABLE 6-19
RME NONCARCINOGENIC HQS, FUTURE RESIDENTIAL CHILD RECEPTORS - SITE 12
SUBSURFACE SOIL
NWS EARLE, COLTS NECK, NEW JERSEY

SUBSTANCE	SUBSURFACE SOIL INGESTION - CHILD	SUBSURFACE SOIL DERMAL CONTACT - CHILD	INHALATION OF COPCS IN FUGITIVE DUST - CHILD
ANTIMONY	2.6E-02	N/A	N/A
ARSENIC	7.0E-01	1.1E+00	N/A
BERYLLIUM	2.8E-03	N/A	N/A

N/A = NOT APPLICABLE, NO TOXICITY VALUE HAS BEEN ESTABLISHED FOR THIS CHEMICAL

CTE

The estimated total cancer risks for the future residential receptor for exposure to COPCs in subsurface soil (assuming subsurface soils become future surface soils) at Site 12 are 7.40E-06 (ingestion), 5.9E-05 (dermal contact), and 1.3E-14 (inhalation of COPCs in fugitive dust). The total subsurface soil cancer risk is within the 10^{-4} to 10^{-6} target acceptable risk range often used by EPA to determine the need for action at CERCLA/RCRA sites or to formulate standards and criteria (ARARs). The principal COPCs contributing to the subsurface soil cancer risk are arsenic (ingestion, 85 percent of the cancer risk for this pathway; and dermal contact, 100 percent of the cancer risk for this pathway) and beryllium (ingestion, 15 percent of the cancer risk for this pathway).

The estimated noncarcinogenic HIs for the future residential receptor assuming exposure to COPCs in subsurface soil (assuming subsurface soil becomes future surface soil) at Site 12 are less than 1.0 for the ingestion, dermal contact and inhalation exposure pathways. Adverse noncarcinogenic effects are not expected because the sum of these HIs is below 1.0.

Estimated CTE carcinogenic risks are presented for future residential receptors exposed to subsurface soil at Site 12 in Tables 6-20 and 6-21.

6.7.1.4 Future Recreational Receptor

The estimated total RME cancer risks for the future recreational child assuming exposure to COPCs in sediment during wading at Site 12 are 2.8E-07 (ingestion) and 2.8E-08 (dermal contact). This sediment cancer risk is below the 10^{-4} to 10^{-6} target acceptable risk range.

The estimated RME HIs for the future recreational child, assuming exposure to COPCs in sediment during wading, are less than 1.0 for ingestion and dermal contact exposure pathways. Adverse noncarcinogenic effects are not expected when the HIs are below 1.0.

Estimated RME carcinogenic risks and noncarcinogenic HQs are presented for future recreational receptors exposed to sediment at Site 12 in Tables 6-22 and 6-23, respectively.

TABLE 6-20
CENTRAL TENDENCY CARCINOGENIC RISK TO FUTURE RESIDENTIAL RECEPTORS - SITE 12
SUBSURFACE SOIL
NWS EARLE, COLTS NECK, NEW JERSEY

SUBSTANCE	SUBSURFACE SOIL INGESTION - LIFETIME	SUBSURFACE SOIL DERMAL CONTACT - LIFETIME	INHALATION OF COPCS IN FUGITIVE DUST - LIFETIME
ANTIMONY	N/A	N/A	N/A
ARSENIC	6.2E-06	5.9E-05	1.3E-14
BERYLLIUM	1.2E-06	N/A	N/A
TOTAL RISK	7.4E-06	5.9E-05	1.3E-14

N/A = NOT APPLICABLE, NO TOXICITY VALUE HAS BEEN ESTABLISHED FOR THIS CHEMICAL

TABLE 6-21

CENTRAL TENDENCY NONCARCINOGENIC HQS, FUTURE RESIDENTIAL CHILD RECEPTORS - SITE 12

SUBSURFACE SOIL

NWS EARLE, COLTS NECK, NEW JERSEY

SUBSTANCE	SUBSURFACE SOIL INGESTION - CHILD	SUBSURFACE SOIL DERMAL CONTACT - CHILD	INHALATION OF COPCS IN FUGITIVE DUST - CHILD
ANTIMONY	1.3E-02	N/A	N/A
ARSENIC	3.5E-01	5.4E-01	N/A
BERYLLIUM	1.4E-03	N/A	N/A

N/A = NOT APPLICABLE, NO TOXICITY VALUE HAS BEEN ESTABLISHED FOR THIS CHEMICAL

TABLE 6-22
RME CARCINOGENIC RISK, WADING, FUTURE RECREATIONAL RECEPTORS - SITE 12
SEDIMENT
NWS EARLE, COLTS NECK, NEW JERSEY

SUBSTANCE	SEDIMENT INGESTION	SEDIMENT DERMAL CONTACT
4,4'-DDD	1.4E-11	N/A
4,4'-DDE	7.1E-11	N/A
4,4'-DDT	1.3E-10	N/A
ALPHA-CHLORDANE	1.7E-11	N/A
2-METHYLNAPHTHALENE	N/A	N/A
BENZO(A)ANTHRACENE	3.7E-09	N/A
BENZO(A)PYRENE	4.3E-08	N/A
BENZO(B)FLUORANTHENE	7.1E-09	N/A
BENZO(G,H,I)PERYLENE	N/A	N/A
BENZO(K)FLUORANTHENE	2.4E-10	N/A
BIS(2-ETHYLHEXYL)PHTHALATE	1.5E-11	N/A
CHRYSENE	4.2E-11	N/A
DIBENZ(A,H)ANTHRACENE	6.4E-09	N/A
FLUORANTHENE	N/A	N/A
GAMMA-CHLORDANE	1.1E-11	N/A
INDENO(1,2,3-CD)PYRENE	3.3E-09	N/A
NAPHTHALENE	N/A	N/A
PHENANTHRENE	N/A	N/A
PYRENE	N/A	N/A
ALPHA-BHC	1.3E-11	N/A
ARSENIC	2.2E-07	2.8E-08
COPPER	N/A	N/A
LEAD	N/A	N/A
MANGANESE	N/A	N/A
TOTAL RISK	2.8E-07	2.8E-08

N/A = NOT APPLICABLE, NO TOXICITY VALUE OR ABSORBANCE FACTOR HAS BEEN ESTABLISHED FOR THIS CHEMICAL

TABLE 6-23
RME NONCARCINOGENIC HQS, WADING, FUTURE RECREATIONAL RECEPTORS - SITE 12
SEDIMENT
NWS EARLE, COLTS NECK, NEW JERSEY

SUBSTANCE	SEDIMENT INGESTION	SEDIMENT DERMAL CONTACT
4,4'-DDD	NA	NA
4,4'-DDE	NA	NA
4,4'-DDT	8.9E-06	NA
ALPHA-CHLORDANE	2.6E-06	NA
2-METHYLNAPHTHALENE	NA	NA
BENZO(A)ANTHRACENE	NA	NA
BENZO(A)PYRENE	NA	NA
BENZO(B)FLUORANTHENE	NA	NA
BENZO(G,H,I)PERYLENE	NA	NA
BENZO(K)FLUORANTHENE	NA	NA
BIS(2-ETHYLHEXYL)PHTHALATE	6.1E-07	NA
CHRYSENE	NA	NA
DIBENZ(A,H)ANTHRACENE	NA	NA
FLUORANTHENE	1.9E-06	NA
GAMMA-CHLORDANE	1.7E-06	NA
INDENO(1,2,3-CD)PYRENE	NA	NA
NAPHTHALENE	1.6E-07	NA
PHENANTHRENE	NA	NA
PYRENE	2.3E-06	NA
ALPHA-BHC	NA	NA
ARSENIC	5.7E-03	7.1E-04
COPPER	2.2E-03	N/A
LEAD	NA	NA
MANGANESE	3.2E-03	NA

N/A = NOT APPLICABLE, NO TOXICITY VALUE OR ABSORBANCE FACTOR HAS BEEN ESTABLISHED FOR THIS CHEMICAL

6.7.2 Conclusions

Surface soil, subsurface soil, and sediment were sampled at Site 12. The potential receptors considered for this site were current industrial and future industrial, residential, and recreational receptors.

The RME cancer risk associated with the future residential (surface and subsurface soil) exposure scenario is at the upper end of the target acceptable risk range. Arsenic (via ingestion of and dermal contact with surface soil and subsurface soil), benzo(a)pyrene (via ingestion of surface soil), and benzo(b)fluoranthene (via ingestion of surface soil) were the major COPCs that contributed to the cancer risk for these exposure scenarios. The RME noncarcinogenic HIs associated with the future residential (surface and subsurface soil) exposure scenarios exceeded 1.0, the cutoff point below which adverse effects are not expected to occur. Antimony (via ingestion of surface soil) and arsenic (via ingestion of subsurface soil) were the principal COPCs that contributed to the HI exceeding 1.0 for these exposure scenarios.

The CTE cancer risk associated with the future residential (surface and subsurface soil) exposure scenario is at the upper bound of the 10^{-4} to 10^{-6} target acceptable risk range. Arsenic (via ingestion of and dermal contact with surface soil and subsurface soil), benzo(a)pyrene (via ingestion of surface soil), and benzo(b)fluoranthene (via ingestion of surface soil) were the major COPCs that contributed to the cancer risk for these exposure scenarios. The CTE noncarcinogenic HIs associated with the future residential (surface and subsurface soil) exposure scenarios exceeded 1.0, the cutoff point below which adverse effects are not expected to occur. Antimony (via ingestion of surface soil) was the principal COPC that contributed to the HI exceeding 1.0 for these exposure scenarios.

Risk characterization results (total cancer risks and total noncarcinogenic HIs) are presented for all potential receptors at Site 12 in Table 6-24 for surface and subsurface soil and sediment. Table 6-25 presents the relevant central tendency risk estimates associated with potential receptors for surface and subsurface soil and sediment. The estimated RME cancer risk for the future residential receptor is at the upper end of the target acceptable risk range, based mainly on ingestion of surface and subsurface soil. The estimated CTE cancer risk for the future residential receptor is also at the upper end of the target acceptable risk range, based mainly on ingestion of surface and subsurface soil. The estimated RME noncancer HI for the future residential receptor exceeds 1.0, based mainly on ingestion of surface and subsurface soil. The estimated CTE cancer risk for the future residential receptor exceeds 1.0, based mainly on ingestion of surface soil.

TABLE 6-24
SUMMARY OF RME ESTIMATED CANCER RISKS AND NONCARCINOGENIC HAZARD INDICIES - SITE 12
NWS EARLE, COLTS NECK, NEW JERSEY

Medium	Exposure Routes	Estimated Incremental Cancer Risk				Estimated Hazard Index**				
		Current Industrial Employee	Future Industrial Employee	Future Lifetime Resident	Future Recreational Child	Current Industrial Employee	Future Industrial Employee	Future Resident		Future Recreational Child
								Child	Adult	
Surface Soil	Incidental Ingestion	2.1E-05	N/A	9.5E-05	N/A	2.4E-01	N/A	1.9E+00@	N/A	N/A
	Dermal Contact	4.3E-05	N/A	1.0E-04	N/A	2.2E-01	N/A	1.1E+00@	N/A	N/A
	Inhalation of Fugitive Dust	N/A	N/A	5.1E-14	N/A	9.6E-12	N/A	6.2E-10	N/A	N/A
Subsurface Soil	Incidental Ingestion	N/A	1.0E-05	4.6E-05	N/A	N/A	5.6E-02	7.3E-01	N/A	N/A
	Dermal Contact	N/A	4.3E-05	1.0E-04	N/A	N/A	2.7E-01	1.1E+00@	N/A	N/A
	Inhalation of Fugitive Dust	N/A	N/A	4.2E-14	N/A	N/A	N/A	N/A	N/A	N/A
Sediment	Incidental Ingestion	N/A	N/A	N/A	2.8E-07	N/A	N/A	N/A	N/A	1.1E-02
	Dermal Contact	N/A	N/A	N/A	2.8E-08	N/A	N/A	N/A	N/A	7.1E-04
Groundwater	Ingestion	N/A	N/S	N/S	N/A	N/A	N/S	N/S	N/A	N/A
	Dermal Contact	N/A	N/S	N/S	N/A	N/A	N/S	N/S	N/A	N/A
	Inhalation of Volatiles*	N/A	N/S	N/S	N/A	N/A	N/S	N/S	N/S	N/A
Surface Water	Incidental Ingestion	N/A	N/A	N/A	N/S	N/A	N/A	N/A	N/A	N/S
	Dermal Contact	N/A	N/A	N/A	N/S	N/A	N/A	N/A	N/A	N/S
TOTAL		6.4E-05	5.3E-05	3.4E-04	3.1E-07	4.6E-01	3.3E-01	4.8E+00	-	1.2E-02

N/A = Not applicable because this media is not associated with this potential receptor
N/S = Not sampled
* = During Showering, Adult Residents Only
** = Hazard Indicies (i.e., summation of hazard quotients) are used only for comparison purposes and do not reflect actual additive noncarcinogenic effects
@ - Result is the maximum of the His among the affected target organs from the amended risk assessment.

TABLE 6-25
SUMMARY OF CENTRAL TENDENCY CANCER RISKS AND NONCARCINOGENIC HAZARD INDICIES - SITE 12
NWS EARLE, COLTS NECK, NEW JERSEY

Medium	Exposure Routes	Estimated Incremental Cancer Risk				Estimated Hazard Index**				
		Current Industrial Employee	Future Industrial Employee	Future Lifetime Resident	Future Recreational Child	Current Industrial Employee	Future Industrial Employee	Future Resident		Future Recreational Child
								Child	Adult	
Surface Soil	Incidental Ingestion	N/R	N/A	1.5E-05	N/A	N/R	N/A	1.5E+00	N/A	N/A
	Dermal Contact	N/R	N/A	5.9E-05	N/A	N/R	N/A	5.6E-01	N/A	N/A
	Inhalation of Fugitive Dust	N/R	N/A	1.3E-14	N/A	N/R	N/A	1.8E-10	N/A	N/A
Subsurface Soil	Incidental Ingestion	N/A	N/R	7.4E-06	N/A	N/A	N/R	3.7E-01	N/A	N/A
	Dermal Contact	N/A	N/R	5.9E-05	N/A	N/A	N/R	5.4E-01	N/A	N/A
	Inhalation of Fugitive Dust	N/A	N/R	1.3E-14	N/A	N/A	N/R	N/A	N/A	N/A
Sediment	Incidental Ingestion	N/A	N/A	N/A	N/R	N/A	N/A	N/A	N/A	N/R
	Dermal Contact	N/A	N/A	N/A	N/R	N/A	N/A	N/A	N/A	N/R
Groundwater	Ingestion	N/A	N/S	N/S	N/A	N/A	N/S	N/S	N/A	N/A
	Dermal Contact	N/A	N/S	N/S	N/A	N/A	N/S	N/S	N/A	N/A
	Inhalation of Volatiles*	N/A	N/S	N/S	N/A	N/A	N/S	N/S	N/S	N/A
Surface Water	Incidental Ingestion	N/A	N/A	N/A	N/S	N/A	N/A	N/A	N/A	N/S
	Dermal Contact	N/A	N/A	N/A	N/S	N/A	N/A	N/A	N/A	N/S
TOTAL		-	-	1.4E-04	-	-	-	2.9E+00	-	-

N/A = Not applicable because this media is not associated with this potential receptor
N/R = Central Tendency calculation not required
N/S = Not sampled
* = During Showering, Adult Residents Only
** = Hazard Indicies (i.e., summation of hazard quotients) are used only for comparison purposes and do not reflect actual additive noncarcinogenic effects
@ - Result is the maximum of the His among the affected target organs from the amended risk assessment.

Arsenic ranged from 5.1 mg/kg to 16.5 mg/kg in surface soil samples; these levels would cause the risk to be in the target acceptable risk range of 10^{-4} to 10^{-6}. Benzo(a)pyrene ranged from 250 ug/kg to 2,250 ug/kg; these levels would cause the risk to be within the target risk range of 10^{-4} to 10^{-6}. Benzo(b)fluoranthene levels ranged from 610 ug/kg to 10,350 ug/kg; these levels, except the minimum of 610 ug/kg, would cause the risk range to be within the target acceptable risk range of 10^{-4} to 10^{-6}. Antimony and arsenic were detected in one of four samples each at a concentration of 71.5 mg/kg and 16.5 mg/kg, respectively. These two values were the drivers for the noncarcinogenic risks found above EPA's risk assessment acceptable risk range. However, considering the uncertainties inherent to the risk assessment calculations, arsenic levels may be within background concentrations for surface soil.

6.8 EVALUATION SUMMARY

Despite relatively high concentrations of lead in surface soils at Site 12, lead was not chosen as a COPC because the 95 percent UTL calculated from the station-wide background sample set was higher than the site-related concentrations. The consequence of this unrealistically high UTL comparison was that lead was not used to calculate human health risks.

However, the Navy intends to remove surface soils in the vicinity of Site 12 based on the RI delineation of lead concentrations. Alternative benchmark criteria for lead in soil such as 400 ppm (OSWER directive 9355.4-12) or 600 ppm (NJDEP Non-Residential Direct Contact Soil Cleanup Criteria) are available and will be used in the feasibility study (FS) to determine the appropriate clean-up standard and the approximate limits of soil removal.

It is possible that metals leaching from railroad bed ballast material may contribute to the levels of inorganics present at Site 12.