ACTION MEMORANDUM
ENGINEERING EVALUATION/COST ANALYSIS

SITE 12 – BATTERY STORAGE AREA

NAVAL WEAPONS STATION - EARLE
COLTS NECK, NEW JERSEY

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Upon review and approval, the following article shall be published in the Asbury Park Press.

UNITED STATES
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY

This announces that an Action Memorandum, Engineering Evaluation and Cost Analysis (EE/CA) for the excavation and removal of impacted soils at the Naval Weapons Station Earle Site 12 under the Navy's Installation Restoration Program has been drafted. The Northern Division of the Naval Facilities Engineering Command, the lead agency for the site remedial activity, has recommended the removal of soils impacted by the battery storage area to minimize the potential for exposure to and migration of metals, and semi-volatile organic compounds. The remedial action involves the excavation, transportation, and off site disposal of approximately 500 cubic yards of soils contaminated with metals and semi-volatile organics. Post excavation sampling will be used to evaluate the effectiveness of the remedial action. Naval Weapons Station Earle will consider written and verbal comments on the proposed actions before final selection of the remedial action and the issuance of a Decision Document reflecting this choice. Written comments must be postmarked **August 10, 1999.**

The Action Memorandum and EE/CA for this site may be reviewed at the repository listed below:

Monmouth County Library
Eastern Branch
Government Repository
Route 35
Shrewsbury, New Jersey 07701

Written comments on the proposed actions should be sent to:

Commanding Officer
Attn: Code 043
Naval Weapons Station Earle
Colts Neck, New Jersey 07722-5014

ACTION MEMORANDUM
NAVAL WEAPONS STATION-EARLE
SITE 12 BATTERY STORAGE AREA

I. PURPOSE

The purpose of the Action Memorandum is to request and document approval of the proposed removal and disposal action described herein for Site 12 - Battery Storage Area at the Naval Weapons Station Earle (NAVWPNSTA Earle), located in Monmouth County, New Jersey. A contractor who has specific environmental cleanup experience will conduct the removal and disposal work.

II. SITE CONDITIONS AND BACKGROUND

A. Site description

1. Site 12 Evaluation

Site 12 is a former battery storage area located in the Waterfront area of the NAVWPNSTA Earle. 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 was used as a temporary staging area for forklift batteries. The storage area encompassed an area of approximately 10,000 square feet. The area has not been in use for battery storage for some time. There is no visible source of contamination, such as staining or stressed vegetation.

Based on the existing analytical data, soils to the north of the former loading dock contain concentrations of metals and semi-volatile organics above the New Jersey Department of Environmental Protection's (NJDEP) Residential Clean-Up Criteria.

The objective of the remedial action is to excavate and dispose of soils that have been impacted by the former battery storage area. Removal of the impacted soils will minimize the potential hazards associated with direct contact and the migration/mobilization of the contaminants to surface water and groundwater.

2. Physical Location

Site 12 is located at the Waterfront area of the NWS-Earle Base in Leonardo, New Jersey. 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. 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 the railroad tracks. It is also possible that soils to the north of the Former Battery Storage Area will require excavation. Appendix B contains a Site Location Map.

3. Site Characteristics

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.

4. Release or Threatened Release into the Environment of a Hazardous Substance, or Pollutant, or Contaminant

The main contaminants detected at the site are metals (arsenic, barium, lead, zinc), semi-volatile organics, PCBs, pesticides, and PCE. Lead, zinc, and several semi-volatile organics were detected in soil samples above the NJDEP Residential Direct Contact Soil Cleanup Criteria. Appendix A contains the analytical data from the Remedial Investigation. Several semi-volatile organics and pesticides, and metals (arsenic, barium, and lead) were detected in sediment samples above the Sediment Ecological Toxicity Threshold Values. Other contaminants detected in soil and sediment samples (PCBs and PCE) were at levels higher than background but did not exceed the applicable criteria. With the exception of PCE, the site contaminants have a low potential to impact groundwater. However, transport of the contaminants by surface water runoff and dust emissions is likely. Surface water runoff at the site is caught in a storm water collection basin. This basin discharges water through a concrete culvert to a drainage swale, which eventually empties into the marsh area north of the site.

5. National Priority List (NPL) Status

NAVWPNSTA Earle (Colts Neck, New Jersey) was listed as an "NPL" site in August 1990. A Federal Facilities Agreement between the Department of the Navy and the United States Environmental Protection Agency (USEPA), Region II was finalized in February 1991. In accordance with Navy policy to include the members of the public in decisions concerning site clean up decisions, NAVWPNSTA Earle established a "Restoration Advisory Board" (RAB). The RAB is comprised of community members, representatives of the USEPA, New Jersey Department of Environmental Protection (NJDEP), and the Navy. The RAB was officially formed in February 1995, and meets regularly after normal business hours to allow the working public an opportunity to participate in site-specific discussions. Prior to RAB formation, a Technical Review Committee (TRC) met during normal business hours; representatives

of local municipalities and regulatory agencies attended TRC meetings. This proposed action at Site 12 has been discussed with the NAVWPNSTA Earle RAB.

The proposed excavation and removal of soils at Site 12 in a non-time critical removal action as defined in the National Contingency Plan (NCP).

6. Maps, Pictures, and Other Graphic Representations

Maps of the site are included in Appendix B of this Action Memorandum.

B. Other Actions Addressing Site 12

1. Previous Actions

In 1993, a site investigation was performed near Site 12, downstream of the culvert flow. Analytical data from a soil and surface sample indicated the presence of contamination.

Brown and Root performed a Remedial Investigation in August 1995. Sample data indicated contamination of soils and sediments. A Final Remedial Investigation (RI) Report was prepared by Brown and Root in July 1996, and a Final RI Addendum Report was prepared in January 1998. This Action Memorandum is based on the findings of the RI and RI Addendum Reports.

2. Current Action

No current action other than this Action Memorandum.

C. State and Local Authorities' Rule

1. State and Local Actions

The site is located on the NWS-Earle base, which is secured and requires a pass for entry. The pass can only be obtained from the NAVWPNSTA Earle Security office.

2. Potential for Continued State/Local Response

The Navy will lead the response under cooperative agreement with the USEPA. The potential for any continued State/Local response in unlikely.

III. THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES

A. Threats to Public Health or Welfare

Lead, zinc, and several semi-volatile organics were detected in soil samples above the NJDEP Residential Direct Contact Soil Cleanup Criteria. Several semi-volatile organics and pesticides, and metals (arsenic, barium, and lead) were detected in sediment samples above the Sediment Ecological Toxicity Threshold Values. Other contaminants detected in soil and sediment samples (PCBs and PCE) were at levels higher than background but did not exceed the applicable criteria. A risk based assessment provided to the Navy from Brown and Root Environmental summarized that "excess human health risks based on future hypothetical scenarios (such as future lifetime resident) can be avoided simply by avoiding implementation of the scenario (e.g., restrict future land use or groundwater use)." The sites are located in a secure government use area and are not accessible to the general public.

The remedial action proposed in this Action Memorandum should reduce or eliminate the risks associated with the Site 12 contamination, and may remove or reduce land use restrictions. Post-remedial sample collection will determine the effectiveness of the remedial action.

B. Threats to the Environment

Direct contact of contaminated soils/sediments and surface water runoff mobilizing the contaminants is the main threat to human health and the environment.

The remedial action proposed in this Action Memorandum will reduce or eliminate potential adverse effects of the Site 12 contaminants on human health and ecological receptors, such as animals, vegetation, and wetlands in the area.

IV. ENDANGERMENT DETERMINATION

Actual or threatened releases of pollutants and contaminants from Site 12, if not addressed by implementing the response action selected for this Action Memorandum, may present an imminent and substantial endangerment to public health, or welfare, or the environment.

V. PROPOSED ACTION AND ESTIMATED COSTS

A. Proposed Actions

1. Proposed Action Description

The impacted soils at Site 12 will be excavated with a Case 580 backhoe, or equivalent. The soils will be direct loaded into dump trucks for transportation and off site disposal. Given the limited size of the impacted area, it is expected that this remedial action will be the most effective alternative to remove the contamination, and therefore the risks associated with the contamination. In accordance with the Resource Conservation and Recovery Act, the soils to be excavated will be subject to the Toxicity Characteristic Leachate Procedure (TCLP) for analysis of chemical compounds. The soils will be tested prior to excavation to ensure that the soils are characterized and disposed of at the proper waste facility in accordance with all applicable regulations. After the removal is complete, post-excavation soil samples will be collected from the soils remaining place to evaluate the effectiveness of the remedial action. All post-excavation soil samples and backfilling activities will be performed in accordance with the Technical Regulations for Site Remediation (N.J.A.C. 7:26E).

2. Contribution to Remedial Performance

No further action may be required based on the proposed removal action. Post-excavation sampling results will be compared to the NJDEP Residential Direct Contact Soil Cleanup Criteria to determine the need for additional action. Sample data that indicates levels of contaminants below the Residential Cleanup Criteria will demonstrate that the remedial action was effective. With NJDEP approval, no further action may be necessary.

3. Description of Alternative Technologies

Alternative technologies have been considered for Site 12. It has been determined that the proposed action of removal and off site disposal is the most effective and least expensive option.

4. Engineering Evaluation/Cost Analysis (EE/CA)

An Engineering Evaluation/Cost Analysis has been prepared and is included as Appendix C. It contains a detailed discussion of alternatives considered before selection the remedial action outlined in this Action Memorandum.

5. Applicable or Relevant and Appropriate Requirements (ARARs)

The New Jersey Residential Direct Contact Soil Cleanup Standards will be used as cleanup criteria for this remedial action.

6. Project Schedule

This project will begin on August 9, 1999 and be completed by August 30,1999.

C. Estimated Costs

The estimated cost of the remedial action is approximately $73,152. A detailed cost estimate is provided in the EE/CA.

VI. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

Although the contaminants in the soils are relatively immobile, a delay in action would increase potential migration/mobilization of these compounds. Weather impacts would continue to disturb the area and increase surface water runoff and dust emissions that could mobilize the contaminants. This could increase the area impacted by the contaminants, and therefore, the risks associated with the contaminants. A delay or no action at this time would eventually increase the costs of an inevitable cleanup.

V. OUTSTANDING POLICY ISSUES

There are no outstanding policy issues that have been discussed or addressed.

VI. ENFORCEMENT

This remedial action will be performed properly and in accordance with this Action Memorandum, and all applicable federal, state, and local regulations.

VII. RECOMMENDATION

This decision document represents the selected removal action for Site 12, Former Battery Storage Area, at Naval Weapons Station Earle, Colts Neck, Monmouth County, New Jersey. It was developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, and not inconsistent with the National Contingency Plan. This decision is based on the administrative record for Site 12.

APPENDIX A

ANALYTICAL RESULTS

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

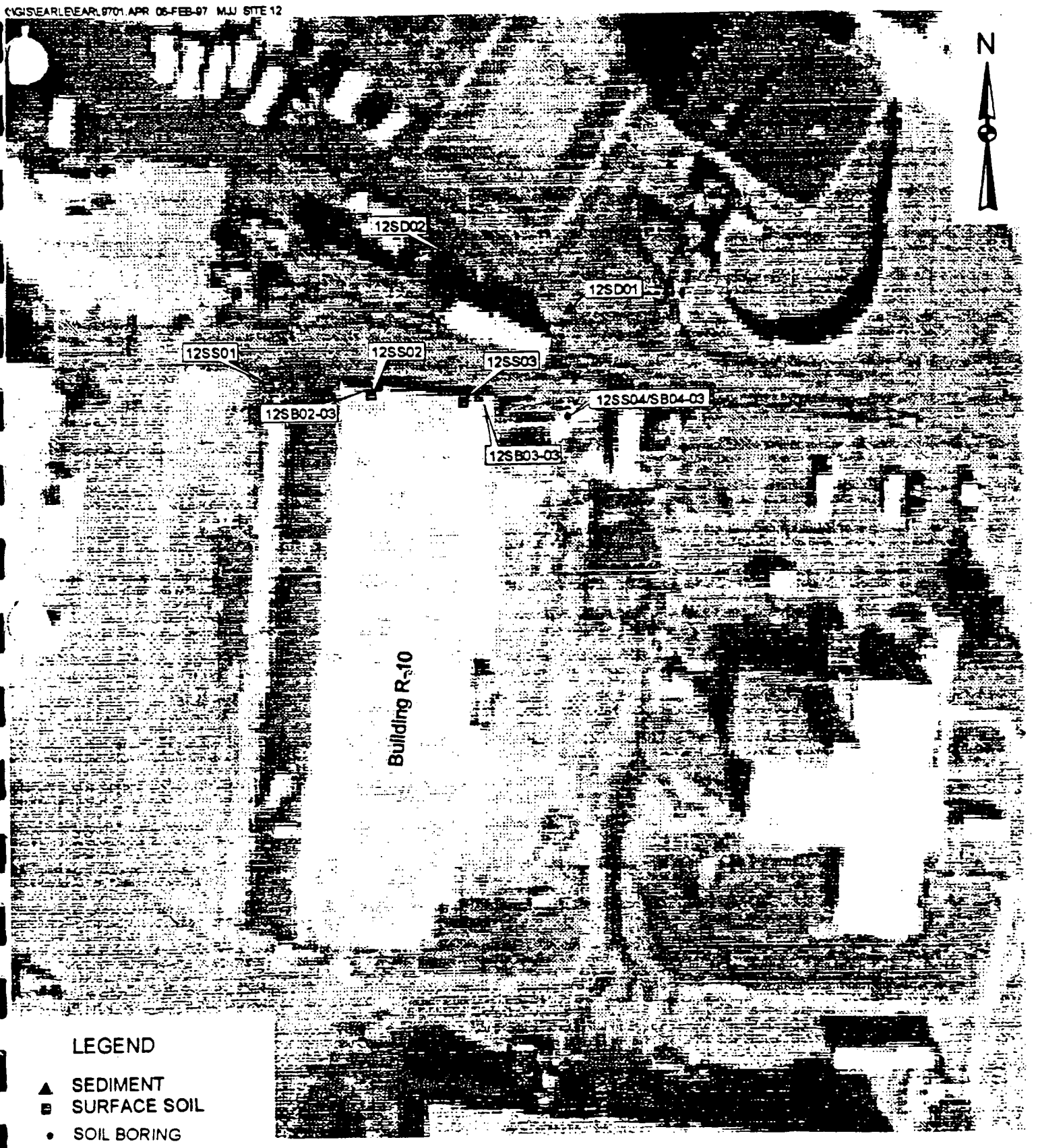
6.2.1 IAS and SI

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

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)

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 6-2
OCCURRENCE AND DISTRIBUTION OF RGANICS 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 CONCENTRATI N
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

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.

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.

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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					
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
ph nanthrene	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

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	-
ars nic	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	-
magn sium	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					
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 poxide	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

TABLE 6-3e

02/04/97

DRAFT

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					-	-	-

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 F INORGANICS IN SUBSURFACE S ILS 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 C NCENTRATION
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	27.57	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

TABLE 6-5

OCCURRENCE AND DISTRIBUTION F 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?	REPRESENTA 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	39000
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	127.00
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	88.1 - 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	125.00
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	62.50

* - 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

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).

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.

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 6-9
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

RME NONCARCINOGENIC HQS, CURRENT INDUSTRIAL RECEPTOR
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	2.69E-01	N/A
ARSENIC	5.4E-02	N/A	N/A
BERYLLIUM	1.7E-04	2.52E-03	8.26E-12
CADMIUM	1.61E-02	N/A	8.96E-13
MERCURY	2.84E-03	N/A	N/A
SILVER	3.3E-04	N/A	N/A

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

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

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 6-15

RME NONCARCINOGENIC HOS, FUTURE RESIDENTIAL RECEPT RS - 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 F 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-06										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-06				3.8E-06						N/A	N/A
ANTIMONY	1.93E+00	1.9E+00									1.1E+00	N/A
ARSENIC	7.03E-01		7.0E-01								N/A	N/A
BERYLLIUM	2.17E-03	2.2E-03				2.2E-03		2.2E-03	2.2E-03		1.0E-02	2.5E-10
CADMIUM	2.11E-01			2.1E-01							N/A	3.6E-11
MERCURY	3.71E-02			3.7E-02			3.7E-02		3.7E-02		N/A	N/A
SILVER	4.4E-03		4.4E-03									
	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 T XICITY VALUE HAS BEEN ESTABLISHED FOR THIS CHEMICAL

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TABLE 6-16

CENTRAL TENDENCY CARCINOGENIC RISK TO FUTURE RESIDENT 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 6-18
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

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 6-21

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 6-23
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

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 Recreati nal 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.

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

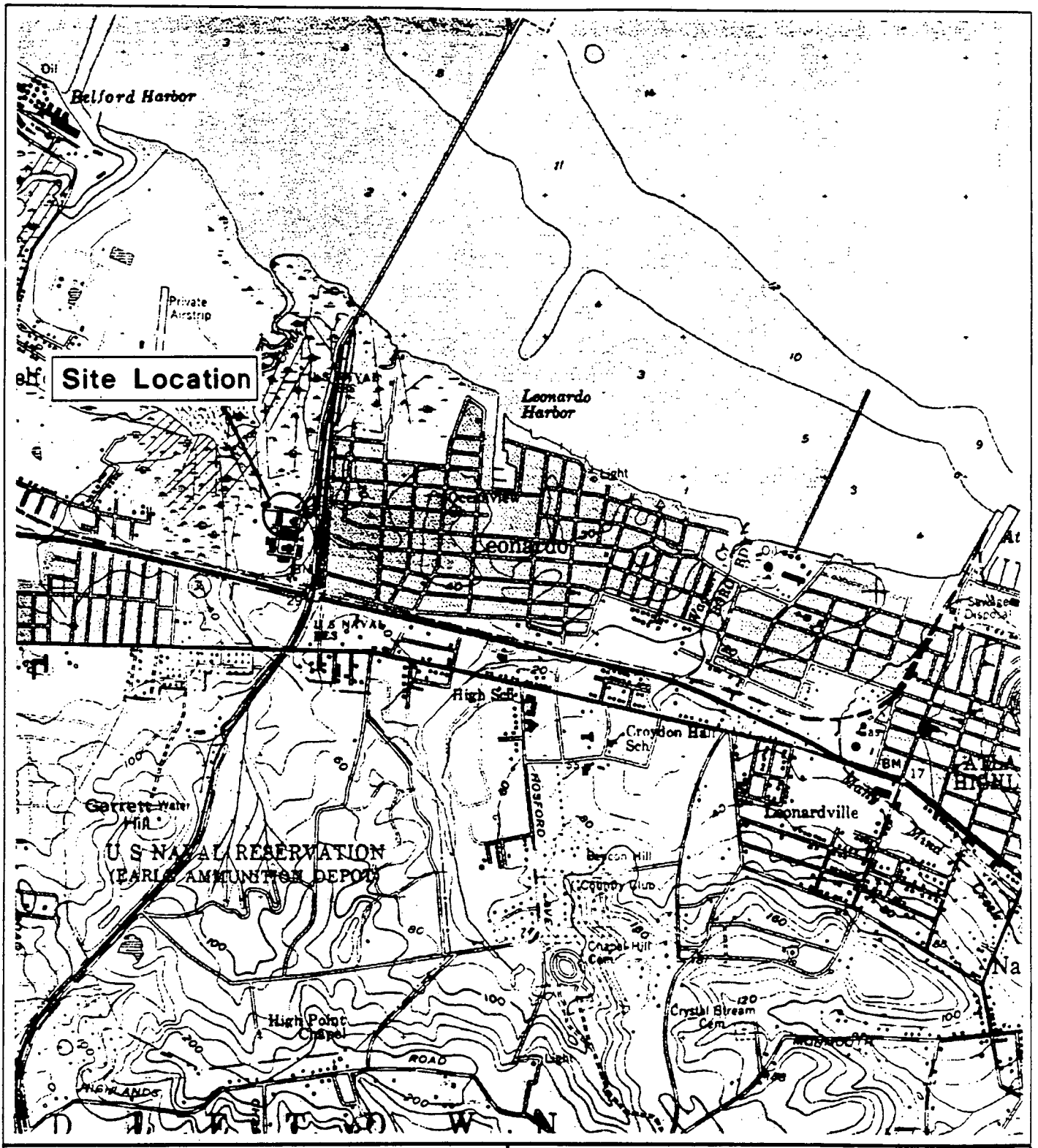
Despite relatively high concentrations of lead in surface soils at Site 12, lead was not chosen as a COPC because the 95 percent UTL calculated from the station-wide background sample set was higher than the site-related concentrations. The consequence of this unrealistically high UTL comparison was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

APPENDIX B

MAPS/FIGURES



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

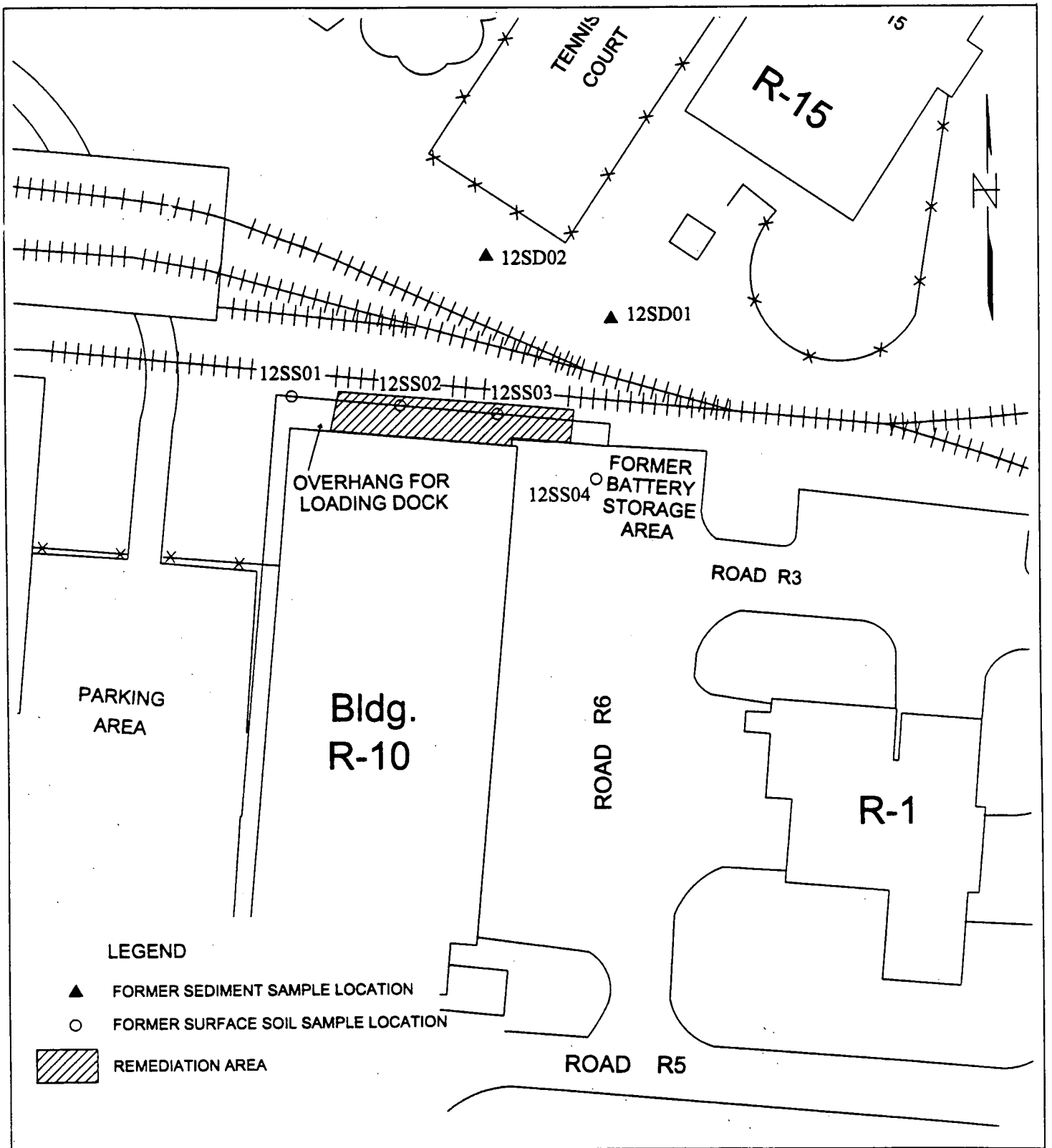
NWS – Earle

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

SAMPLE LOCATIONS
SITE 12 - BATTERY STORAGE AREA

50 0 50 100 Feet

FIGURE 6-1

Brown & Root Environmental

APPENDIX C

ENGINEERING EVALUATION/COST ANALYSIS

ENGINEERING EVALUATION/COST ANALYSIS

SITE 12, FORMER BATTERY STORAGE AREA
NAVAL WEAPONS STATION EARLE

INSTALLATION RESTORATION SITE 12

Prepared by: Foster Wheeler Environmental Corporation
July 1999

1.0 **EXECUTIVE SUMMARY**

An Engineering Evaluation/Cost Analysis (EE/CA) is a comparative analysis of remedial options for a National Priority List (NPL) site. The EE/CA enables the development, evaluation, and selection of alternatives that will provide an effective interim remedy which is consistent with anticipated final remediation goals.

Naval Weapons Station Earle (NAVWPNSTA Earle), Site 12 was a former battery storage area. The analytical results of soil samples collected from the soils and sediments in Site 12 revealed concentrations of metals (lead, zinc) and semi-volatile organics in the soils above the NJDEP Direct Contact Soil Clean-Up Criteria.

The objective of the remedial action is to remove the impacted soils and dispose of them at an appropriate disposal facility. The remedial action will serve to minimize the potential for contaminant migration/mobilization via surface water runoff, ground water infiltration, as well as any impacts from direct contact with the soils. This action is consistent with Navy Policy to close small storage areas in an environmentally acceptable manner.

The site is currently located in a secured area. There is no near term or long term plan to convert this area to residential use; the current military-unique land use in the area of the site is expected to prevail.

This EE/AC has been prepared to provide documentation in the NAVWPNSTA Earle administrative record for the remedial action selection at Site 12. Following a 30-day public comment period, a responsiveness summary will be prepared to address any concerns that may arise.

2.0 **SITE CHARACTERIZATION AND BACKGROUND**

2.1 SITE 12 DESCPITION AND BACKGROUND

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 was used as a temporary staging area for forklift batteries. Batteries were also reportedly drained of their electrolyte on site. The storage area encompassed an area of approximately 10,000 square feet. The area has not been in use for battery storage for some time.

The laboratory analyses of soil samples collected during a Remedial Investigation (RI) determined that the soils had concentrations of some metals and semi-volatile organic compounds above the New Jersey Environmental Protection (NJDEP) Residential Direct Contact Clean-Up Criteria.

2.2 PREVIOUS REMEDIAL ACTIONS

There have been no known removal actions at the site.

2.3 SOURCE, NATURE AND EXTENT OF CONTAMINATION

The Final RI Report prepared for the Navy by Brown and Root Environmental, dated July 1996, and the RI Addendum Report dated January 1998, indicated the presence of metals (arsenic, barium, lead, zinc), semi-volatile organics, PCBs, pesticides, and PCE. Lead, zinc, and several semi-volatile organics were detected in soil samples above the NJDEP Residential Direct Contact Soil Cleanup Criteria. Several semi-volatile organics, pesticides, and metals (arsenic, barium, and lead) were detected in sediment samples above the Sediment Ecological Toxicity Threshold Values. Other contaminants detected in soil and sediment samples (PCBs and PCE) were at levels higher than background but did not exceed the applicable criteria. The entire area of former battery storage was approximately 10,000 square feet.

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 the railroad tracks. It is also possible that soils to the north of the Former Battery Storage Area will require excavation. The actual extent of contamination will be further delineated as part of the removal action.

2.4 ANALYTICAL DATA

In August 1993, Brown and Root Environmental (Navy contracted consultant) conducted a RI of Site 12. Four surface soil samples were collected from the unpaved area at the northern end of Building R-10 near the loading dock. The samples were from surface to six inches below surface. Three sediment samples were collected from 0 to 6 inches below ground surface down gradient of the site. Each sample was analyzed for Target Compound List Volatile Organic Compounds (TCL VOCs), TCL Semi-Volatile Organic Compounds (SVOCs), TCL pesticides/PCBs, and Target Analyte List (TAL) metals.

In October 1996, 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. Three 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.

2.5 SITE RISK ASSESSMENT

Actual or threatened releases of pollutants or contaminants from Site 12, if not addressed by implementing a remedial action, may present an imminent and substantial endangerment to public health, or welfare, or the environment.

3.0 **IDENTIFICATION OF REMOVAL ACTION OBJECTIVES**

3.1 STATUTORY LIMITS IN REMOVAL ACTIONS

Removal actions are generally limited by statute to a maximum cost of two million dollars and a maximum duration of 12 months, except as provided for under two types of exemptions available (emergency and consistency). The 12-month time limit and two million dollar statutory limit is governed by applicable portions of CERCLA Section 104 (b) (1). As described in this report, the proposed removal action is to incur costs of less than two million dollars and occur within a time period less than 12 months.

3.2 DETERMINATION OF REMOVAL SCOPE

The scope of work for Site 12 will include delineation of impacted soils, the excavation, transportation, and off site disposal of the contaminated soils, and the restoration of the site to appropriate conditions. Confirmation sample collection and analysis will be conducted to demonstrate the effectiveness of the removal action. The soils shall be excavated to ensure that the concentrations of TAL metals and TCL semi-volatile organics were remediated to concentrations below the NJDEP Residential Direct Contact Clean-Up Criteria.

3.3 DETERMINATION OF REMOVAL SCHEDULE

The planned removal action will occur from August 9, 1999 through August 30, 1999. Analytical results will be available August 31, 1999. The post-remedial report will be submitted September 10 , 1999.

4.0 **IDENTIFICATION OF REMEDIAL ACTION ALTERNATIVES**

4.1 NO ACTION

No action is not a technology, but it is an option. This option entails taking no remedial measures. No action does not include future monitoring or future migration assessment. This option is generally considered as a baseline for comparison to other remedial actions.

Initial Screening

Although analytical results do not indicate that the site presents any immediate threat, the lack of action to remove the contaminated soils would not decrease the potential for migration/mobilization of contaminants via surface water runoff or ground water infiltration. Also, the risk of direct contact with contaminants by receptors still exists.

4.2 INSTITUTIONAL CONTROLS

Institutional controls and containment is a group of options that would slow or stop the contaminant exposure to receptors, and in some cases, the environment. These options include land use restrictions, capping with various materials, and containment via stabilization and solidification.

4.2.1 Land Use Restrictions

Land use restriction is the official limiting of access to the site, either by Naval instruction, or local code. Site 12 is within a Naval installation that presently has limited public access. Additionally, the site is within a secure area which has additional personnel restrictions.

Initial Screening

Land use restriction would provide limited protection and assessment of future land use and property ownership and control can not be firmly established. Even under limited access, the contaminants may be transported via erosion/depositional and infiltration processes.

4.2.2 Capping

Capping would consist of the construction of a cap over Site 12 using one of the available capping methods, such as asphalt, concrete, clay, bentonite, or synthetic membranes, to provide a low permeability cover.

Initial Screening

The geographic setting of this site does not lend itself to capping within reasonable constraints. Capping would not eliminate the migration of contaminants below the cap. The inability of using this technology to meet the remediation goal removes it from further consideration.

4.2.3 In-Situ Containment by Stabilization/Solidification

In solidification, a reagent is added to transform the contaminated soil into a solid like material. In stabilization, a reagent is added to transform the material so that the

hazardous constituents are in a less mobile form. When both solidification and stabilization are performed, the handling and physical characteristics of the waste are improved. The surface area of the waste mass across which the transfer of loss of contaminants can occur is decreased. Also, the solubility of the hazardous constituent is limited.

Initial Screening

Although this option is technically feasible and may be effective in binding the contaminants in place, leaching of contaminants may not be prevented. Therefore, this option has been eliminated from further consideration.

4.3 EXCAVATION AND OFF SITE DISPOSAL OF SOILS

Implementation of this alternative assures the removal of the potential contaminant source and is a common cost effective remedial alternative. The impacted soils will be excavated, transported, and disposed of off site at an appropriate disposal facility. Post-excavation sample collection will ensure that the removal action was effective. Upon receipt of the analytical results, concentrations will be compared to the NJDEP Residential Direct Contact Soil Cleanup Criteria. If the sample concentrations are below the cleanup criteria, the excavated areas will be backfilled with certified clean fill material covered with stone or topsoil, re-graded, and if appropriate, seeded. If the concentrations exceed the NJDEP Residential Direct Contact Soil Cleanup Criteria, the removal of soils will continue until clean conditions are achieved, and confirmed by sample analysis.

Initial Screening

This option will provide for an effective remedy to remove the source of contamination, and thereby, reduce or remove the risks associated with the contamination. The total potential volume of soil to be excavated, transported, and disposed of is approximately 500 cubic yards.

5.0 **COMPARARTIVE ANALYSIS OF REMEDIAL ACTION ALTERNATIVES**

Based on the initial screening of alternatives, the most effective alternative is described in Section 4.3. Exhibit 1 is the cost estimate for the total effort. The estimate incorporates the assumption that the soils will not fail the TCLP test, thereby soils will be disposed of off site as non-hazardous. The estimate also assumes that the post-excavation sample concentrations will be below the NJDEP Soil Cleanup Criteria, thereby limiting the volume of soil excavated, transported, and disposed. This is the only alternative which effectively removes the source. It is proposed that one round of post-excavation sample collection will demonstrate cleanup effectiveness, therefore, the need for future monitoring or analysis of the sites will be eliminated.

Contractor personnel will excavate the contaminated soils. The soils will be directly loaded into trucks for transport and disposal. Post-excavation sample collection will be performed by contractor personnel; soils will subject to analysis for metals and semi-volatile organics, and excavated areas will be restored by contractor personnel.

6.0 RECOMMENDED REMEDIAL ACTION ALTERNATIVE

The alternative described in Section 4.3 is the recommended alternative. The recommended alternative provides excellent protection to human health and the environment by removing the sources of contamination which pose a potential risk to receptors.

The New Jersey Residential Direct Contact Soil Cleanup Criteria will be used as the cleanup standard for this removal action.

EXHIBIT 1

Remedial Action Cost Estimate

Cleanup of Site 12
Installation Restoration Program
Naval Weapons Station Earle

April 1999

Remediation Labor	
Preparation, Planning, Procurement, Documentation	$6,000
Site Labor	$14,000
Subtotal Remediation Labor	$20,000
Equipment/Supplies and Materials/Laboratory Cost	$24,652
Transportation/Disposal	$28,500
Total Job	$73,152