

EXECUTIVE SUMMARY

This report presents the methodology and results of the Feasibility Study (FS) conducted to address contamination in soil, sediment, surface water, and groundwater at Sites 31 and 101 at Picatinny, Rockaway Township, New Jersey. Groundwater contamination at the sites is currently being addressed as part of the Mid-Valley Groundwater Remedial Investigation/Feasibility Study (RI/FS); however, the focus of the Mid-Valley investigation is limited to explosive and volatile organic compound (VOC) contamination in groundwater. All available groundwater data for Sites 31 and 101 were incorporated into this FS; although remedial alternatives (RAs) were not developed for VOCs and explosives as they will be addressed in the forthcoming Mid-Valley Groundwater RI/FS. Shaw Environmental, Inc. (Shaw) was tasked by the United States Army Corps of Engineers (USACE), Baltimore District, to conduct this FS under the Total Environmental Restoration Contract (TERC), Contract Number DACA31-95-D-0083, Task Order 17. The scope of this FS is the evaluation of alternatives for remediation of surface soil, subsurface soil, sediment, and groundwater at Sites 31 and 101. As further explained in this FS, the preferred RAs are to be selected based on the best balance between the selection criteria for remediation of contamination at these sites.

Sites 31 and 101 are located within the "mid-valley" portion of the installation. Site 31, the former Defense Reutilization Marketing Office (DRMO), is located along 11th Avenue, south of the intersection of Sixth Street and Reilly Road. The former DRMO had been used as a storage yard for the disposal, salvage, and sale of excess materials, including used batteries, potential polychlorinated biphenyl (PCB)-containing transformers, vehicles, motors, generators, and materials used in the manufacture of explosives, pyrotechnics, and munitions. Site 31 includes Buildings 314, and 314B through 314E. During the 1930s, the site was used as a burning ground. Site 101 is located immediately northeast of Site 31, between 11th Avenue and Green Pond Brook (GPB), and encompasses former Building 311 (former gas station) and Building 319 (Safety, Surety, and Environmental Office). The former gas station was constructed in 1941 and closed in 1993. Building 319 was originally built in 1909, and used as a storehouse for sodium nitrate. Destroyed in the 1926 explosion at Picatinny, Building 319 was subsequently rebuilt to its current construction. Building 319 has reportedly been utilized in the production of explosives, as a vehicle dispatcher's office, for storage of automobile tires, and potentially as a horse stable area. GPB is located along the southeast boundary of both sites. It is suspected that debris from the 1926 explosion and destruction of the original Building 319 was used as fill material to cover marshlands adjacent to GPB.

Several previous environmental investigations have been conducted at Sites 31 and 101, and GPB and include: the Phase I Remedial Investigation (RI) conducted by Dames and Moore, the Additional Investigation Sites RI and the Green Pond and Bear Swamp Brooks Focused Feasibility Study (GP/BSB FFS) conducted by IT Corporation, and the Phase I 2A/3A RI conducted by Shaw. Additionally, groundwater and surface water samples have been collected at Sites 31 and 101 in support of the Mid-Valley Groundwater RI/FS.

This FS was drafted using the results from the environmental investigations mentioned above. As a result, the analytical data from these investigations were merged into one database, and then sorted by media type. The analytical results indicated:

- Twenty constituents [eight polynuclear aromatic hydrocarbons (PAHs), three PCBs, one dioxin, and eight metals] exceeded surface soil levels of concern (LOCs).
- Twelve constituents exceeded their LOCs in subsurface soil; six PAHs, one PCB, one explosive compound, and four metals.
- Forty-one constituents were detected above sediment LOC values. Exceedances included eleven PAHs, thirteen pesticides, four PCBs, two dioxins/furans, and eleven metals. Sediment samples were collected from GPB and its floodplain.
- Six surface water constituents exceeded LOCs. Exceedances included: one VOC; one semi-volatile organic compound (SVOC), one pesticide; and three metals.
- Sixteen groundwater constituents exceeded LOCs, including one VOC, one SVOC, four explosives, and ten metals.

A baseline human health risk assessment (HHRA) and ecological risk assessment (ERA) were conducted by Dames and Moore during the Phase I RI (1998). Estimated risks and hazards were calculated in the HHRA receptor populations including industrial research workers, construction/excavation workers, and on-site youth visitor (Site 101). Based on the HHRA results, non-carcinogenic hazards at Site 31 exceeded the hazard index (HI) criterion of 1 for industrial research workers with an HI of 3.1. The majority of the risk was due to Aroclor 1254 in site surface soil. Noncarcinogenic hazards at Site 101 exceeded the HI criterion for construction/excavation workers with an HI of 6.2. The elevated hazards in total soil were almost exclusively a result of exposure to manganese; however, a review of the assumptions used in the HHRA showed that the manganese hazard was overestimated. A revised HI of 0.1 was calculated in Section 2.5.1 based on a revised exposure point concentration, dust loading factor and exposure frequency. The reevaluation concluded that manganese is not a hazard driver at the site.

Carcinogenic risks at Site 101 fell within the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) target risk range of $1\text{E-}04$ to $1\text{E-}06$ for all three receptor populations, ranging from $4.0\text{E-}06$ for the on-site youth visitor to $1.1\text{E-}05$ for the industrial research worker. The carcinogenic risk at Site 31 exceeded the NCP range at $8.2\text{E-}4$ for the industrial research worker, but fell within the NCP range for the construction/excavation worker at $2.3\text{E-}05$. The majority of the risk was due to surface soil concentrations of Aroclors 1260, 1248, and 1254; benzo(a)pyrene; arsenic; and 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) toxicity equivalence, which is a measure of the combined toxicity resulting from a wide range of dioxin and furan compounds expressed as an equivalent TCDD concentration. All risks and hazards were calculated based on the evaluation of reasonable maximum exposure (RME). The estimated total central tendency (CT) cancer risk and HI for the industrial research worker at Site 31, were $5.9\text{E-}05$ and 0.23, respectively.

Results of the ecological risk assessment found elevated earthworm mortality in site soil, and modeled risk to woodcock, veery, and the barred owl. However, the modeled risks were deemed extremely conservative given the size of the potential habitat relative to the home range of the species. Therefore, no unacceptable risk to ecological receptors was identified based on the ERA.

Remedial action objectives (RAOs) were developed for Sites 31 and 101. The RAOs have been developed in such a way that attainment of the goals will result in the protection of human health, ecological receptors, and the environment. The RAOs for Sites 31 and 101 are: prevent exposure to media impacted by contaminants of concern (COCs) above site cleanup levels (SCLs) by human and ecological receptors, protect uncontaminated media from impact by COCs above SCLs, and prevent impact to groundwater by COCs above SCLs.

In this FS, a list of COCs were developed for each media type based on the results of the human health and ecological risk assessments, as well as the Applicable or Relevant and Appropriate Requirements (ARARs) and To-Be-Considered (TBC) guidance. COCs that contributed to the majority of site-specific human health or ecological risk were determined to Risk-Driver COCs. COCs that only exceeded New Jersey Department of Environmental Protection (NJDEP) site cleanup criteria (SCC) were determined to be Non-Risk Driver COCs. SCLs were developed for surface soil, subsurface soil, sediment, and groundwater constituents that were considered as Risk-Driver COCs, based on relevant HHRA and ERA results, ARARs, and TBC guidance. SCLs for Non-Risk Driver COCs were set at the NJDEP SCC.

Based on the list of COCs and RAOs, areas of attainment (AA) were identified at Sites 31 and 101. Remedial goals should be achieved throughout the AAs. Nine AAs were identified for surface and subsurface soil at Sites 31 and 101, two AAs were identified for sediment in and around GPB, and three AAs were identified for groundwater.

In order to address the soil and sediment contamination identified at Sites 31 and 101, RAs were established for each media type. Three sets of RAs have been identified to encompass soil, sediment, and groundwater contamination within each site and GPB. The following RAs have been developed for soil contamination within Sites 31 and 101.

Alternative S-1: No action;

Alternative S-2: Implementation of land-use and access restrictions and institutional controls (ICs);

- Alternative S-3: Excavation and off-site disposal of soil with PCB concentrations greater than 50 milligrams per kilogram (mg/kg), and continued implementation of land-use and access restrictions and ICs;
- Alternative S-4: Excavation and disposal of soil with lead concentrations above SCLs, and continued implementation of land-use and access restrictions and ICs;
- Alternative S-5: Excavation of soil with concentrations of COCs that exceed SCLs with off-site disposal and continued implementation of land-use and access restrictions and ICs;
- Alternative S-6: Excavation of soil with concentrations of COCs that exceed SCLs and stabilization of the fraction exceeding hazardous waste characterization limits with off-site disposal and continued implementation of land-use and access restrictions and ICs;
- Alternative S-7: Installation of an improved asphalt cap and continued implementation of land-use and access restrictions and ICs.

The following RAs have been developed to address sediment contamination within GPB (adjacent to Sites 31 and 101).

- Alternative D-1: No action;
- Alternative D-2: Continued implementation of land-use and access restrictions and ICs;
- Alternative D-3: Long-term chemical and biological monitoring and continued implementation of land-use and access restrictions and ICs;
- Alternative D-4: Excavation of sediments with concentrations of COCs that exceed SCLs with off-site disposal, and continued implementation of land-use and access restrictions and ICs.

The following RAs have been developed to address groundwater remediation within Sites 31 and 101.

- Alternative G-1: No action;
- Alternative G-2: Continued implementation of land use and access restrictions and ICs;
- Alternative G-3: Long-term chemical monitoring and continued implementation of land-use and access restrictions and ICs;

The soil, sediment and groundwater alternatives were screened against seven of the nine NCP criteria, in which each RA must be assessed. The acceptability or performance of each alternative against the criteria is evaluated individually so that relative strengths and weaknesses may be identified. The detailed criteria are: protection of human health and the environment, compliance with ARARs, long-term effectiveness and permanence, reduction of toxicity, mobility, or volume through treatment, short-term effectiveness, implementability, and cost. The final two criteria, State and community acceptance, are "modifying criteria" which are evaluated at later stages of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) process. The costs for each alternative are provided in **Table ES-1**.

Table ES-1
Cost Summary for Soil, Sediment, and Groundwater Remedial Alternatives, Sites 31 and 101
Picatinny, New Jersey

Remedial Alternative	Description	Capital Cost	Discounted O&M ⁽¹⁾	Total Present Worth	Duration (Construction and O&M)
CONTINUED IMPLEMENTATION OF LAND USE AND ACCESS RESTRICTIONS AND ICs FOR SOIL AND SEDIMENT AT SITES 31 AND 101 ⁽²⁾		\$32,200.00	\$108,574.33	\$140,774.33	30 years
Soil					
Alternative S-1	NO ACTION	\$0.00	\$0.00	\$0.00	None
Alternative S-2	CONTINUED IMPLEMENTATION OF LAND USE AND ACCESS RESTRICTIONS AND INSTITUTIONAL CONTROLS (ICs)	\$32,200.00	\$108,574.33	\$140,774.33	30 years
Alternative S-3	EXCAVATION OF PCB "HOT SPOTS" (>50 mg/kg) WITH OFF-SITE DISPOSAL	\$1,043,474.66		\$1,043,474.66	4 months (30 years ICs)
Alternative S-3B	EXCAVATION OF PCB "HOT SPOTS" (>100 mg/kg) WITH OFF-SITE DISPOSAL	\$804,295.03		\$804,295.03	4 months (30 years ICs)
Alternative S-4	EXCAVATION OF LEAD CONTAMINATED SOIL ABOVE SCLs WITH OFF-SITE DISPOSAL	\$2,779,178.71		\$2,779,178.71	5 months (30 years ICs)
Alternative S-4B	EXCAVATION OF LEAD CONTAMINATED SOIL ADJACENT TO GREEN POND BROOK WITH OFF-SITE DISPOSAL	\$771,025.46		\$771,025.46	2 months (30 years ICs)
Alternative S-5	EXCAVATION OF SOIL WITH COC CONCENTRATIONS ABOVE SCLs WITH OFF-SITE DISPOSAL	\$9,477,505.16		\$9,477,505.16	9 months (30 years ICs)
Alternative S-6	EXCAVATION OF SOIL WITH COC CONCENTRATIONS ABOVE SCLs AND STABILIZATION OF EXCAVATED MEDIA	\$11,087,887.87		\$11,087,887.87	11 months (30 years ICs)
Alternative S-7	INSTALLATION OF AN IMPROVED ASPHALT CAP	\$2,037,548.95	\$113,381.14	\$2,150,930.09	7 months (30 years ICs)
Sediment					
Alternative D-1	NO ACTION	\$0.00	\$0.00	\$0.00	None
Alternative D-2	CONTINUED IMPLEMENTATION OF LAND USE AND ACCESS RESTRICTIONS AND INSTITUTIONAL CONTROLS (ICs)	\$32,200.00	\$108,574.33	\$140,774.33	30 years
Alternative D-3	LONG TERM CHEMICAL AND BIOLOGICAL MONITORING OF SEDIMENT AND SURFACE WATER	\$36,800.00	\$89,517.43	\$126,317.43	3 days per sampling event, 30 years (ICs)
Alternative D-4	DREDGING OF SEDIMENT WITH COC CONCENTRATIONS ABOVE SCLs AND OFF-SITE DISPOSAL	\$344,921.91		\$344,921.91	4 weeks, 30 years (ICs)
Groundwater					
Alternative G-1	NO ACTION	\$0.00	\$0.00	\$0.00	None
Alternative G-2	CONTINUED IMPLEMENTATION OF LAND USE AND ACCESS RESTRICTIONS AND INSTITUTIONAL CONTROLS (ICs)	\$32,200.00	\$108,574.33	\$140,774.33	30 years
Alternative G-3	LONG TERM CHEMICAL MONITORING OF GROUNDWATER	\$54,000.00	\$165,006.33	\$219,006.33	3 days per sampling event, 30 years (ICs)

⁽¹⁾ Present worth O&M with discount rate of 7%.

⁽²⁾ Continued implementation of land use and access restrictions is evaluated as a remedial alternative; however, since SCLs are based on a non-residential use scenario costs for ICs must be added to the remaining remedial alternatives with the exception of the No Action alternative