



**INTERNATIONAL  
TECHNOLOGY  
CORPORATION**

**CONCLUSIONS AND RECOMMENDATIONS FOR THE CONTAMINATION EVALUATION  
AT THE FORMER PLUM BROOK ORDNANCE WORKS  
SANDUSKY, OHIO**

Prepared for:

Department of the Army  
Nashville District, Corps of Engineers  
Nashville, Tennessee

and

Huntsville Division, Corps of Engineers  
Huntsville, Alabama

DERP Project No. G05OH001800

Prepared by:

IT Corporation  
Knoxville, Tennessee

January 1991

Regional Office

312 Directors Drive • Knoxville, Tennessee 37923 • 615-6



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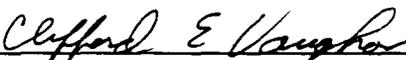
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## 1.0 INTRODUCTION

This document is provided under separate cover to the "Engineering Report for the Contamination Evaluation at the Former Plum Brook Ordnance Works, Sandusky, Ohio" (IT Corporation, 1990) to document the conclusions and recommendations of whether chemical contamination exists at the site, possibly caused by the U.S. Department of Defense (DOD) related activities. The conclusions and recommendations are supported by the results and findings from the field investigation and from the results of laboratory analyses of soil, surface water, and groundwater samples. It is necessary to reference the above document for project objectives, general site information, site investigation procedures, analytical results, and other data.

## 2.0 EXECUTIVE SUMMARY

The U.S. Army is conducting a contamination evaluation at previously owned DOD properties under the Defense Environmental Restoration Program (DERP). This evaluation addresses possible chemical contamination, which includes contamination of the groundwater, surface water, and soils caused by DOD activities at the former Plum Brook Ordnance Works (Plum Brook) site in Sandusky, Ohio.

IT Corporation (IT) conducted the contamination evaluation at the former Plum Brook site under Contract DACA87-87-D-0089, Delivery Order 004 for the U.S. Army Corps of Engineers (COE), Engineering Management Support Branch, Nashville, Tennessee. The objective of this project was to conduct a preliminary investigation to confirm or deny the presence or absence of residual chemical contamination (if any) from operational activities conducted at the site during DOD control.

The scope of the contamination evaluation included a records review and evaluation, visual site inspection, preparation and completion of project work plans, completion of various field investigation activities, and the evaluation of analytical results from samples collected during the field investigation. The field investigation activities included: installing groundwater monitoring wells; drilling soil/subsoil borings; collecting soil, surface water, and groundwater samples for geotechnical or chemical analysis; and conducting a hydraulic conductivity test.

Four groundwater monitoring wells were drilled and installed at the Plum Brook site to intercept groundwater influenced by percolation from the red water retention ponds, to monitor quality of groundwater that is migrating toward the site boundary, and to provide a background control. Twenty-one soil samples were collected for chemical analysis from specific areas targeted as potential areas for contamination associated with the operation, maintenance, and deactivation of the site. One upgradient soil boring sample (SB-19), located at the southern extreme of the property, was collected to determine the natural "background" concentration of compounds at the site. Additional soil samples were collected for geotechnical analysis.

Soil and water samples collected for chemical analyses were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds, nitro-aromatic explosive compounds, nitrates, sulfates, pH, and metals. Soil samples collected for geotechnical analyses were tested for moisture content, Atterberg limits, and grain size distribution (grain size plus hydrometer analyses). All samples (except split samples) were analyzed at the IT Analytical Services (ITAS) laboratory in Knoxville, Tennessee. A

sample analysis quality assurance (QA) program was administered by COE using its Missouri River Division laboratory in Omaha, Nebraska.

Results from field investigations and analytical testing indicate that there are no soil or groundwater contamination from VOCs. There is some soil and groundwater contamination from semivolatile organic compounds at Waste Disposal Area 1. Nitro-aromatic explosive compounds are present in the soil at Waste Disposal Area 1 and at the Scheid Road Burning Ground. Elevated metals (sodium and/or manganese) are present in soils at Waste Disposal Areas 1 and 2, and chromium is present in the groundwater at Waste Disposal Area 2. At the downgradient site edge location, sulfates and nitrates are also present at elevated levels at Waste Disposal Areas 1 and 2. Surface water samples were free of contamination with the exception of small amounts of butyl benzyl phthalate, some metals, and nitrate in isolated samples. The Hazard Ranking System (HRS) score for this site is 0.0 because there are no target users of impacted groundwater or surface water within 3 miles of the site.

The borings and monitoring wells that IT drilled, installed, and sampled have confirmed the presence of localized contamination. Results of this study suggest additional sampling at Waste Disposal Areas 1 and 2. Additional soil, sediment, and groundwater samples should be collected to determine the vertical and horizontal extent of contamination at the specified areas. In addition, a preliminary hazard evaluation and sensitive receptor analysis should be performed at the site to determine if immediate remedial action should be taken.

### 3.0 CONCLUSIONS AND RECOMMENDATIONS

The objectives of this project were to confirm or deny whether chemical contamination is present at the site, which may be related to DOD activities, and to provide some quantification of this. Four groundwater monitoring wells and 18 shallow soil borings were installed and sampled in accordance with the final work plan for the site. In addition, surface water samples were collected. Samples collected were analyzed for the following chemicals/ constituents: VOCs, semivolatile organic compounds, nitro-aromatic explosive compounds, metals, nitrate, sulfate, and pH.

The following conclusions are apparent from field investigations and observations and from results of the laboratory analyses of soil, groundwater, and surface water samples:

- Analytical results of volatile and semivolatile analyses of soils indicate the presence of acetone that may have resulted from contamination due to decontamination procedures and/or may be laboratory contaminants. Toluene detected in SB-19 represents restricted minor soil contamination. Significant concentrations of dinitrotoluene were detected and represent soil contamination related to past disposal practices at Waste Disposal Area 1.
- Analytical results of nitro-aromatic explosive compounds indicate minor soil contamination at the Scheid Road Burning Ground and more extensive soil contamination at the two waste disposal areas.
- Analytical results of sulfate and nitrate analyses indicate elevated concentrations of these parameters at both waste disposal areas and represent soil contamination from past activities at the facility.
- Analytical results of volatile and semivolatile analyses of groundwater samples indicate the presence of acetone in MW-01 and DNT in MW-02. These concentrations represent contamination resulting from past activities at the facility.
- Analytical results of metals analyses of groundwater samples indicate that chromium is present above its maximum contaminant limit (MCL) in MW-02 and MW-06, which represents contamination from past activities at the facility. MW-02 lies directly north (in direct line with groundwater flow) of a Red Water retention basin. MW-06 is directly north of Waste Disposal Area No. 1 and north of the main operations area of the former ordnance production areas.
- Analytical results of sulfate and nitrate analyses of groundwater indicate the presence of sulfate above its secondary maximum contaminant limit (SMCL) in MW-02, which is representative of minor contamination due to past activities at the facility. MW-02 lies in Waste Disposal Area No. 2, presently a red water retention basin with a dead, nonactive pond. This reflects disposal of explosive manufacturing wastes that will contain sulfate and nitrate compounds.
- Analytical results of surface water analyses indicate that no significant contamination by volatile, semivolatile, nitro-aromatic explosive compounds, metals, or sulfate compounds is

present at the site. Nitrate was detected slightly above its MCL in SW-01 and represents minor surface water contamination probably from Waste Disposal Area 1.

A summary of contaminants found in various media at various locations on the site is shown in Table 3-1. The analytical results of this investigation confirm the presence of residue or contamination by nitro-aromatic explosive compounds in soils, groundwater, and surface water of the Plum Brook former ordnance works. The disposal of explosive manufacturing wastes containing nitrites, sulfates, and nitro-aromatic explosive compounds will impact all media investigated at the site. The most likely, in fact the only reasonable, explanation for the presence of the compounds found in soils, groundwater, and surface water is the result of disposal activities at the site during and following its operation as an ordnance production facility.

In light of the analytical results of environmental samples and conclusions drawn from these data, the following recommendations are made:

- Place two additional 2-inch-diameter monitoring wells at Waste Disposal Area 1 to determine local groundwater flow direction beneath the pond and confirm clean groundwater.
- At Waste Disposal Area 2:
  - Collect ten sediment samples from the pond sediments to determine the amount of contamination in pond sediments.
  - Drill three deeper soil borings (to 20 feet maximum) to determine the depth of soil contamination.
  - Place two additional 2-inch-diameter monitoring wells to determine local groundwater flow direction beneath the pond and determine the likely extent of groundwater contamination.
- Perform a preliminary hazard evaluation and sensitive receptor analysis to determine if immediate action is required at the site, even though the HRS score was 0.0.

Table 3-1. Summary of Contaminants in Various Media at the Former Plum Brook Ordnance Works

Location	Contaminant	Soil	Ground Water
Waste Disposal Area 1	Volatile organic compounds	NP	NP
	Semivolatile organic compounds	P	NP
	Nitro-aromatic explosive compounds	P	NP
	Metals	NP	NP
	Sulfate, nitrate, pH	P	NP
Waste Disposal Area 2	Volatile organic compounds	NP	NP
	Semivolatile organic compounds	NP	P
	Nitro-aromatic explosive compounds	NP	NP
	Metals	NP	P
	Sulfate, nitrate, pH	P	NP
Rubbish Burning Ground	Volatile organic compounds	NP	N/S
	Semivolatile organic compounds	NP	N/S
	Nitro-aromatic explosive compounds	NP	N/S
	Metals	NP	N/S
	Sulfate, nitrate, pH	NP	N/S
Scheid Road Burning Ground	Volatile organic compounds	NP	N/S
	Semivolatile organic compounds	NP	N/S
	Nitro-aromatic explosive compounds	P	N/S
	Metals	NP	N/S
	Sulfate, nitrate, pH	NP	N/S

NP = Not present in elevated amounts.

P = Present in elevated amounts.

N/S = No sample.