Cost and Performance Summary Report
Thermal Desorption at the Waldick Aerospace Devices Site
Wall Township, New Jersey

Summary Information [1, 2, 3, 5, 6]

The Waldick Aerospace Devices Superfund Site is a 1.7-acre hazardous waste site located in Wall Township (Monmouth County), New Jersey. The site was used primarily as a manufacturing facility that included degreasing and metal-plating operations. The property presently houses three vacant buildings: the Main Waldick Building, the Pac-n-Post Building, and the Auxiliary Building.

Wastewaters containing heavy metals and solvents were discharged directly to the ground surrounding the main building for a period of at least three years, and spent machine oil leaked onto the ground from perforated drums located near the main building. In 1982, the state ordered Waldick to conduct cleanup activities (specific activities not specified); however, sampling following these activities indicated that the soil and groundwater at the site were still contaminated with volatile organics and metals.

From May 1985 through September 1986, EPA conducted a remedial investigation (RI) and feasibility study (FS) at the Waldick site. Primary contaminants of concern in soil and groundwater included benzene, toluene, ethylbenzene, and xylene (BTEX); petroleum hydrocarbons (PHC); other nonhalogenated volatile organic compounds (VOC); and cadmium, chromium, and other metals. Concentration data provided by the EPA Remedial Project Manager (RPM) showed a number of constituents in the soil, including total petroleum hydrocarbons at 493 milligrams per kilogram (mg/kg); toluene and tetrachloroethane at 26 mg/kg; tetrachloroethene at 160 mg/kg; cadmium at 1,220 mg/kg; chromium at 548 mg/kg; nickel at 100 mg/kg; and lead at 625 mg/kg.

The initial Record of Decision (ROD) for this site, signed September 29, 1987, specified in situ air stripping for contaminated soil. However, this remedial activity was not performed. A second ROD, signed March 29, 1991, revised the remedy to replace in situ air stripping with low temperature thermal desorption followed by stabilization/solidification.

Remedial work at the site was performed from May 1993 until October 1993. Remedial activities included demolition of two buildings, removal of three underground fuel oil storage tanks, and removal of the septic tank at the Main Waldick Building. Contaminated soils were treated on site by low temperature thermal desorption, followed by off-site stabilization and solidification. The solid residues were disposed of as hazardous waste under the provisions of the Resource Conservation and Recovery Act (RCRA). Approximately 3,450 cubic yards (yd^3) of soil were treated in this application.

CERCLIS ID Number:	NJD054981337
Lead:	Federal Lead/Fund-Financed

Timeline [1, 2, 3, 5, 6]

May 1985 - September 1986	RI/FS conducted
September 29, 1997	Initial ROD signed
March 29, 1991	Second ROD signed
June - October 1993	Thermal desorber operated
August 26 - September 14, 1993	Thermal desorber temporarily shut down

Factors That Affected Cost or Performance of Treatment [6]

Listed below are the key matrix characteristics for this technology and the values measured for each during site characterization.

Matrix Characteristics

Parameter	Value
Soil Classification:	Sand with some silt and clay and gravel
Clay Content and/or Particle Size Distribution:	Range of 0.1 to 10 mm - sand (5 of 6 borings at 3 ft to 11 ft bgs); <0.1 mm - silt (1 boring)
Moisture Content:	Range 12-14%; mean 13.8%
pH:	Not available
Petroleum Hydrocarbons:	493 mg/kg
Bulk Density:	Not available

Treatment Technology Description [1, 3, 6, 7]

The thermal desorption unit used at the Waldick site was a Low Temperature Volatilization System (LTVS) designed by Rust Remedial Services (Rust). The unit is trailer-mounted and included feed hoppers/conveyors, a primary treatment unit (rotary drum), a discharge conveyor with pugmill, cyclones, a secondary treatment unit (thermal oxidizer), a quench tower, a baghouse, packed-bed scrubbers with stacks, and a power generator operated with fuel oil. Contaminated soil was stored in twin feed hoppers (7.5 yd^3 capacity) and fed to the primary treatment unit via conveyors. The primary treatment unit was a rotary drum with a burner. An external Hauck dual propane/fuel oil burner was used to force heated air into the primary treatment unit. The treated soil exiting the primary treatment unit was discharged to a pugmill where it was mixed with water to minimize fugitive dust emissions. From the pugmill, the treated soil was sent to a stockpile for analysis and storage prior to transport off-site for disposal.

Vapors and particles from the primary treatment unit were directed to four high efficiency cyclone separators, each 2.66 ft in diameter and rated at 27,500 cubic feet per minute (cfm) at 800°F. The particulate matter from the cyclones was discharged to the pugmill via a screw conveyor where it was mixed with the treated soil and water. The process air stream was directed to the secondary treatment unit, which consisted of a refractory-lined horizontal cylinder with a burner. The process air stream was heated to a minimum temperature of 1,800°F for 1.9 seconds to destroy organics. The process air stream was then sent through a spray cooler to a baghouse. Particulates removed from the process air stream were sent to the pugmill and the off-gas was routed to a packed-bed wet scrubber (counter current flow of 300 to 360 gpm) and discharged through a stack. The scrubber blowdown was sent to the pugmill.

The unit had a design capacity of 35 tons/hr. The actual average system throughput was 20 tons/hr at a soil temperature of 450 to 500°F. The unit was operated for a total of approximately 540 hours (45 days at 12 hr/day). The unit began operating in June 1993 and had been operating for six weeks when the first performance testing was conducted. According to the EPA RPM, the six weeks of operation included time to perform startup and shakedown of the system, and time to receive analytical results from the laboratory (due to normal laboratory turnaround time), and the conduct of internal data quality reviews.

The results of the July 1993 testing indicated that the emissions failed to meet air permit requirements, and the unit was shut down on August 26, 1993. On September 3, 1993, Rust (formerly CWM) proposed an extensive list of modifications to the LTVS to correct the problems and requested approval from the New Jersey Department of Environmental Protection and Energy (NJDEPE) to re-start operations. At that time, the contractor estimated that only about 2 to 3 days of operating time was necessary to complete the cleanup at the site. On September 8, 1993, NJDEPE approved restarting operations after corrective measures had been implemented, including operating the system at no more than 25 tons/hr (versus the design capacity of 35 tons/hr), reducing system air flow, adding a pre-coat to the baghouse, improving the scrubber system, monitoring pH, and adjusting burners to control nitrogen oxide emissions. Operations were authorized to restart on September 14, 1993. Thermal processing of the remaining soils was completed from September 28 through October 7, 1993. Available emissions data indicated that the unit was in compliance with all air permit requirements.

Following treatment, the soil was stabilized to contain metals, which were not destroyed by thermal desorption. The stabilized soil was disposed of off-site in a Class C landfill.

Listed below are the key operating parameters for this technology and the values measured for each.

Operating Parameters

Operating Parameter	Value
Residence Time:	7-8 minutes
System Throughput:	20 tons/hr
Soil Temperature:	450 - 500°F

Performance Information [1, 4, 6, 7]

The ROD identified the following cleanup goals for soil:

- Total VOCs - 1.0 mg/kg
- Total PHCs - 100 mg/kg
- Cadmium - 3.0 mg/kg
- Chromium - 100 mg/kg
- Nickel - 100 mg/kg
- Zinc - 350 mg/kg

Air emissions standards were specified in the NJDEPE air permit for the unit. Emission standards were specified for particulates, sulfur oxides, nitrogen oxides, carbon monoxide, total hydrocarbons, hydrogen chloride, VOCs and metals.

The soil treated by the thermal desorber met the cleanup goals for total VOCs and total PHCs. As discussed above, the results of the performance testing indicated that the unit did not meet the air emission standards. After instituting corrective measures defined by NJDEPE, the unit met all air emission standards specified in the permit.

Performance Data Quality

No information was provided on quality assurance/quality control for this application.

Cost Information [2, 3]

Cost information provided by the U.S. Army Corps of Engineers (USACE) indicated that a total of $4,995,159 was expended for remedial activities at Waldick. The total consists of $3,610,086 for activities related to the remediation of contaminated soil and $1,385,073 for such other activities as demolition of two buildings and off-site disposal of debris, removal of three underground storage tanks and off-site disposal of equipment and debris, and abandonment of 17 wells at the site.

The cost of $3,610,086 for activities related to the soil remediation includes $2,017,361 for the sum of costs for capital and O&M elements; this corresponds to a unit cost of $585 per yd^3 of soil treated (3,450 yd^3 treated).

Actual Project Costs

Cost Element	Cost ($ in 1993)
Excavation (of soil)	**552,000**
Capital	
Mobilization/Demobilization	
- Mobilization	20,000
- Demobilization	15,000
Site Work/Preparation	
- Site security	60,822
- Site access	2,000
- Prepare and revise plans, conduct site survey	90,000
- Construct soil storage and decontamination areas	37,500
- Site utilities and temporary facilities	18,000
- Earthwork - gravel, backfill, paving	227,300
- Vegetative cover, installation and maintenance of black pine trees	75,050
Equipment and Appurtenances	
- Process equipment and appurtenances	801,811
- Miscellaneous (not specified)	556,845
Startup and Testing	
- Project startup	25,000
Capital Subtotal	**1,929,328**
Operation & Maintenance	
Direct Labor/Materials	Included with capital costs
Health and Safety	66,469
Analytical (related to technology performance, not compliance monitoring)	
- Stack sampling	21,564
O&M Subtotal	**88,033**
Disposal of Residuals	**955,650**
Analytical (related to compliance monitoring, not technology performance)	**85,075**
Total Project Cost	**$3,610,086**

Observations and Lessons Learned [6]

The costs for excavation of soil and disposal of residuals were relatively high compared with the capital and O&M costs for this application. Approximately $1,000,000 was spent on commercial disposal of treated soil, which may be attributed to the disposal of treated soil as a RCRA hazardous waste.

The unit had been operating for six weeks and the treatment was almost complete (within 2-3 days) before the initial performance test was performed. The system was shut down when the unit failed to meet applicable air emission standards. According to the EPA RPM, it would have been preferable to identify the non-compliance at an earlier time. Further, the RPM indicated that better emissions control design would have prevented the problem.

The RPM indicated that the cost of the project was higher than originally estimated because the total amount of soil treated was greater than anticipated. The additional cost was negotiated between the contractor and USACE.

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References

The following references were used in the preparation of this report.

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2. U.S. Army Corps of Engineers (USACE). 1995. *Payment Estimate for Waldick Aerospace Devices Site*. July.

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