Cost and Performance Summary Report
Thermal Desorption at the Metaltec/Aerosystems Superfund Site
Franklin Borough, New Jersey

Summary Information [1,2,3,7,9,10]

From 1965 to the mid 1980s, the Metaltec Corporation, a subsidiary of Aerosystems Technology Corporation, operated a metal-plating facility in Franklin Borough, Sussex County, New Jersey. The facility produced assorted metal parts including metal ballpoint pen casings, paint spray guns, and lipstick cases. During that time, wastewater from the plating operations was discharged on-site to an unlined wastewater lagoon. In addition, wastes were spilled and dumped in various locations at the facility. The unlined wastewater lagoon was abandoned sometime in the 1980s and subsequently backfilled by the owners. The site is currently being used to manufacture glassware and to assemble ice machines.

In 1980, the New Jersey Department of Environmental Protection (NJDEP) conducted several investigations of the former wastewater lagoon and a pile of green material that was stored at the site (referred to as the green pile area). The results of the investigations found soil and groundwater contamination in these areas, including organics such as trichloroethene (TCE) and heavy metals such as nickel and chromium. In addition, the Borough's public drinking water well and several private drinking water wells in the vicinity of the site were found to be contaminated.

A remedial investigation (RI), conducted in 1984, defined four discrete parcels of property at the site with elevated levels of organics and metals in soil and groundwater. The highest levels of organic contamination were found in the area of Parcel 1, where the former wastewater lagoon was located. TCE and trans-1,2-dichloroethene were found in soil at levels as high as 7,600 mg/kg and 6,600 mg/kg, respectively. TCE and trans-1,2-dichloroethene were found in groundwater at levels as high as 3.9 mg/L and 10 mg/L, respectively.

The contamination in Parcels 2 (loading dock area), 3 (area in rear of manufacturing building), and 4 (former location of green pile) was primarily metals, including copper, zinc, lead, chromium, and manganese.

The site was placed on the National Priorities List (NPL) in September, 1983. In June 1986, EPA signed a record of decision (ROD) for operable unit (OU) 1 at the site specifying remediation of soil and restoration of the water supply (groundwater remediation was subsequently addressed in a 1990 ROD for OU 2). For Parcel 1, the ROD specified excavation of contaminated soil and treatment using an asphalt dryer (thermal desorption). For Parcels 2, 3, and 4, the ROD specified excavation, followed by off-site disposal. According to the ROD, because the soil contamination in Parcels 2, 3, and 4 was primarily inorganic, the soil could not be treated in the same manner as the soil from Parcel 1. This report focuses on the treatment of contaminated soil from Parcel 1 using thermal desorption.

A total of 4,215 cubic yards of contaminated soil from Parcel 1 was treated using thermal desorption. The period of operation for this application was December 1, 1994 through January 29, 1995.

CERCLIS ID Number:	NJD002517472
Type of Action:	Remedial
Lead:	EPA

Timeline [2,9]

June 30, 1986	ROD signed for OU 1 addressing soil contamination and restoration of drinking water supply
September 27, 1990	ROD signed for OU 2 addressing groundwater contamination
December 1994 - January 1995	Treatment performed
May 1, 1995	Project closeout

Factors That Affected Cost or Performance of Treatment [8,10]

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:	Stiff sandy clays; silty, sandy clays; sands and gravel
Clay Content and/or Particle Size Distribution:	Particle size ranges from 0.001 mm to 50 mm
Moisture Content:	<20%
Petroleum Hydrocarbons:	Not available
Bulk Density:	2.26 tons/cubic yard

Treatment Technology Description [2,6,9,10]

The technology used to treat the contaminated soil from Parcel 1 at this site was the low temperature enhanced volatilization (LTEV) system provided by Williams Environmental Services, Inc. (Williams), the technology vendor. The system was a countercurrent thermal desorber that used a rotary dryer, equipped with a gas fired burner, to provide direct heat to volatilize the organic constituents from the soil. The unit was operated under negative pressure and a blower and fan were used to provide air to the burner. Emissions controls included a baghouse, thermal oxidizer, quench, and scrubber.

As the soil passed through the desorber, the soil temperature initially was raised to 212°F to remove water, then was raised to approximately 750°F as the soil moved toward the discharge end of the desorber. According to Williams, the use of a countercurrent flow allowed high exit soil temperatures to be readily attained and the desorber was constructed of a special alloy designed to withstand temperatures up to 1000°F.

As the treated soil exited the desorber (at 750°F) on the conveyor, it was combined with baghouse dust. The soil was then quenched and a negative pressure was maintained on the discharge conveyor through the desorber breaching to capture steam generated during the quenching operation. The treated soil was then removed and stockpiled.

Off-gases were sent to a baghouse to remove particulates, then to a thermal oxidizer to destroy residual organics. The thermal oxidizer was operated at about 1800°F. The gases were then rapidly cooled to 185°F in the quencher and sent to the scrubber where the gases were neutralized with caustic prior to discharge to the atmosphere.

The unit was initially operated 12 hours per day, six days a week. According to the vendor, after working with the community, operations were able to be expanded to 24 hours per day, seven days a week.

Treated soil that met the cleanup goals for volatiles and for toxicity characteristic leaching procedure (TCLP) metals were disposed off-site in an approved RCRA landfill.

Operating Parameters [2,10]

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

Operating Parameter	Value
Residence Time	15-20 minutes
System Throughput	16.38 tons per hour
Soil Exit Temperature	750° F
Rotary Dryer Exit Gas Temperature	350 - 500°F
Pressure (I.D. Fan pressure differential)	17 inches of water
Pressure (Rotary Dryer Burner)	-0.05 inches of water
Thermal Oxidizer Temperature	1800°F
Quench Temperature	185°F

Performance Information [1,2,5,10]

The ROD specified the following cleanup goals for treated soil:

- vinyl chloride - 33 mg/kg
- tetrachloroethene - 0.05 mg/kg
- trans-1,2-dichloroethene - 33 mg/kg
- TCE - 5.6 mg/kg
- chloroform - 5.6 mg/kg
- 1,1,1-trichloroethane - 0.41 mg/kg
- 1,1-dichloroethane - 7.2 mg/kg

In addition, the ROD required that treated soil that failed to meet the TCLP metals requirements be shipped off-site for stabilization and disposal at an approved RCRA permitted facility.

The air emissions standards specified in the NJDEP air permit for the unit were a destruction and removal efficiency (DRE) for the thermal oxidizer of 99.99%, and:

- nitrogen oxides - 10.12 lb/hr
- carbon monoxide - 3.49 lb/hr (50 ppmdv @ 7% O_2)
- total non-methane hydrocarbons (as CH_4) - 1 lb/hr (25 ppmdv @ 7% O_2)
- total suspended particulates - 4.12 lb/hr (0.03 gr/dscf)

- respirable particulates (PM-10) - 4.12 lb/hr (0.03 gr/dscf)
- arsenic - 9.59 $x10^{-6}$ lb/hr
- beryllium - 4.11 $x10^{-11}$ lb/hr
- lead - 1.10 $x10^{-4}$ lb/hr
- sulfur oxides - 0.014 lb/hr
- hydrogen chloride - 3.67 lb/hr

A performance test was performed to demonstrate compliance with soil cleanup requirements and air emissions standards, and to establish operating parameters for the remainder of the project. During the performance test (three runs), all treated soil samples were below the detection limit of 0.002 mg/kg for PCE and TCE. All emission results met the test objectives with the exception of lead and sulfur oxides. The exceedance of the lead limit occurred in one run and was considered to be an outlier, attributed to a hot spot of lead contamination. The exceedance of the sulfur oxide limit was found to be the results of the sulfur content of the propane. As a result, the permit exceedances were deemed acceptable by the USACE and EPA representatives for the site and the system was found to be in compliance with all air permit requirements.

A total of 4,215 cubic yards of contaminated soil was treated during this application. All soil met the cleanup goals on the first pass and no soil was retreated. Data on the concentration of individual constituents in the treated soil were not provided.

Performance Data Quality

No specific information on performance data quality was provided in the available references. However, no deviations were noted.

Cost Information [4,9]

The thermal treatment of the Parcel 1 contaminated soil was procured by the U.S. Army Corps of Engineers (USACE) through an open solicitation. USACE provided oversight during the application. Sevenson Environmental Services, Inc. was awarded the contract and subcontracted to Williams Environmental Services, Inc. to provide the thermal desorber.

The actual costs for this project were provided by the remediation contractor, Sevenson Environmental Services, Inc., based on invoiced costs, and by Williams Environmental Services, Inc. Table 1 presents the costs for the project.

The total cost for the LTEV application for the treatment of 4,215 cubic yards contaminated soil from Parcel 1 at the Metaltec/Aerosystems site was $998,238. The calculated unit cost for this application was $237 per cubic yard of soil (based on a total of 4,215 cubic yards of treated soil).

Table 1 - Actual Project Costs [4,10]

Cost Category/Element	Cost (1998 $ Basis)
1. Capital Cost for Technology	
Technology mobilization, setup, and demobilization - mobilization/demobilization of LTEV equipment	289,771
Planning and preparation	50,000
Site work	See other project costs
Equipment and appurtenances - thermal treatment (4,215 CY)	658,467
Startup and testing	Included in capital costs
Other (Includes nonprocess equipment)	0
TOTAL CAPITAL COSTS	998,238
2. O&M for Technology	
Labor; materials; utilities and fuel; equipment ownership, rental, or lease; performance testing and analysis; other	Included in capital costs
TOTAL OPERATION AND MAINTENANCE COSTS	Included in capital costs
3. Other Technology-Specific Costs	
Compliance testing and analysis - post-treatment sampling - post-excavation confirmation sampling	 55,100 33,120
Soil, sludge, and debris excavation, collection, and control - contaminated soil excavation (5583 CY) - contaminated soil excavation (2858 CY)	 290,316 375,173
Disposal of residues - transport and disposal of treated soil as hazardous waste - backfill and grading - common fill - off-site transportation and disposal as hazardous waste of excavated soil material too large to be thermally treated and below grade vegetation debris (150 tons) - off-site transportation and disposal as hazardous waste of excavated soil material too large to be thermally treated and below grade vegetation debris (2858 tons) - backfilling and grading P00002	 838,785 94,911 39,450 751,654 11,487

Table 1 (continued)- Actual Project Costs [4,10]

Cost Category/Element	Cost (1998 $ Basis)
4. Other Project Costs	
- health and safety services	130,000
- gravel base in CRZ (500 CY)	22,000
- gravel base in CRZ (43 CY)	1,892
- off-site transportation and disposal of gravel from CRZ as hazardous waste (500 CY)	82,500
- off-site transportation and disposal of gravel from CRZ as hazardous waste (43 CY)	7,095
- groundwater collection and treatment facilities	284,000
- All other project work	665,000
Total cost (year basis for cost)	4,680,721
Total cost for calculating unit cost	998,238
Quantity treated	4,215 cubic yards
Calculated unit cost	237 per cubic yard
Basis for quantity treated	quantity of soil treated in thermal desorber

Observations and Lessons Learned

The LTVS system treated soil contaminated with VOCs to below cleanup goals in less than 2 months, with no soil requiring retreatment.

According to the vendor, the LTVS was operated at a 75% on-stream efficiency despite severe weather conditions. In addition, the vendor was able to maintain the contract required schedule despite delays in the air permitting process.

The vendor also indicated that developing an active relationship with the community allowed operations to be extended from 12 hours/day to 24 hours/day, which was critical to maintaining the project schedule. Good community relations were also important as the nearest residence was only 50 feet from the soil discharge pad.

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References

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

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