HRS DOCUMENTATION RECORD

Name of Site: Chem-Fab

EPA ID No.: PAD002323848

Contact Persons

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Pathways, Components, or Threats Not Scored

The surface water migration pathway was not scored because the pathway does not significantly affect the overall site score. Evidence that a release of hazardous substances from the Chem-Fab facility to Cooks Run, a perennial tributary adjacent to the facility, can be documented (Reference [Ref.] 3, p. 5-4). However, no targets have been identified within Cooks Run. Targets, including Neshaminy Creek wetlands and fishery, are located downstream along the 15-mile target distance limit (TDL) surface water migration pathway (Refs. 41; 42; 96). Even though the surface water migration pathway is a concern and may be a possible threat, it was not scored because it would not affect the *National Priorities List* (NPL) listing decision.

The soil exposure pathway was not scored because surface soil contamination on a residential property has not been documented. In the absence of surface soil contamination on a residential property, the pathway does not significantly affect the overall site score. Properties in the immediate vicinity of the Chem-Fab facility are commercial. The air migration pathway was not scored because no air samples have been collected. These pathways would not likely contribute significantly to the site score.

HRS DOCUMENTATION RECORD

Name of Site:	Chem-Fab
EPA Region:	3
Date Prepared:	September 2007
Street Address of Site*:	300 North Broad Street
City, County, State:	Doylestown, Bucks County, Pennsylvania
General Location in the State:	Southeast
Topographic Map:	Doylestown, Pennsylvania
Latitude:	40º18'57.45" north
Longitude:	75º08'09.61" west

The coordinates of the Chem-Fab facility were calculated from the southwest corner of the abandoned warehouse. The facility location is shown in Reference 72, and the facility layout is shown in Reference 73. The coordinates were measured using map interpolation on the U.S. Geological Survey (USGS) 7.5-minute topographic map of the Doylestown, Pennsylvania, quadrangle, using ArcGIS 9 software (Ref. 97). Universal Transverse Mercator (or UTM) coordinates were converted to latitude and longitude North American Datum (NAD)83 using CorpsCon software of the U.S. Army Corps of Engineers Topographic Engineering Center.

**The street address, coordinates, and contaminant locations presented in this Hazard Ranking System (HRS) documentation record identify the general site location. The information represents one or more locations the U.S. Environmental Protection Agency (EPA) considers part of the site based on screening information EPA used to evaluate the site for NPL listing. EPA assigns nation priorities from the known "releases or threatened releases" of hazardous substances; thus, the focus is on the release, and not on precisely delineated boundaries. A site is defined as an area where a hazardous substance has been "deposited, stored, placed, or otherwise have come to be located." Generally, HRS scoring and the subsequent listing of a release represent the initial determination that a certain area may need to be addressed under the Comprehensive, Environmental Response, Compensation, and Liability Act (CERCLA). Accordingly, EPA contemplates that the preliminary description of site boundaries at the time of HRS scoring will be defined as more information is developed on the locations of contamination.*

Migration Pathway	Pathway Score
Ground Water Migration Pathway	100.00
Surface Water Migration Pathway	NS
Soil Exposure Pathway	NS
Air Migration Pathway	NS
HRS SITE SCORE	50.00

Note:
NS = not scored

WORKSHEET FOR COMPUTING HRS SITE SCORE

	S pathway	S^2 pathway
Ground Water Migration Pathway Score (S_{gw})	100	10,000
Surface Water Migration Pathway Score (S_{sw})	NS	NS
Soil Exposure Pathway Score (S_s)	NS	NS
Air Migration Score (S_a)	NS	NS
$S^2_{gw} + S^2_{sw} + S^2_s + S^2_a$		10,000
$(S^2_{gw} + S^2_{sw} + S^2_s + S^2_a)/4$		2,500
$\sqrt{(S^2_{gw} + S^2_{sw} + S^2_s + S^2_a)/4}$		50.00

Note:
NS = not scored

Table 3-1 --Ground Water Migration Pathway Scoresheet

Factor categories and factors	Maximum Value	Value Assigned	
Aquifer Evaluated:			
Likelihood of Release to an Aquifer:			
1. Observed Release	550	550	
2. Potential to Release:			
2a. Containment	10		
2b. Net Precipitation	10		
2c. Depth to Aquifer	5		
2d. Travel Time	35		
2e. Potential to Release [lines 2a(2b + 2c + 2d)]	500		
3. Likelihood of Release (higher of lines 1 and 2e)	550		550
Waste Characteristics:			
4. Toxicity/Mobility	(a)	10,000	
5. Hazardous Waste Quantity	(a)	100	
6. Waste Characteristics	100		32
Targets:			
7. Nearest Well	(b)	50	
8. Population:			
8a. Level I Concentrations	(b)	27,750	
8b. Level II Concentrations	(b)	4,251	
8c. Potential Contamination	(b)	227	
8d. Population (lines 8a + 8b + 8c)	(b)	32,228	
9. Resources	5	0	
10. Wellhead Protection Area	20	20	
11. Targets (lines 7 + 8d + 9 + 10)	(b)		32,298
Ground Water Migration Score for an Aquifer:			
12. Aquifer Score [(lines 3 x 6 x 11)/82,5000][c]	100		100
Ground Water Migration Pathway Score:			
13. Pathway Score (S_{gw}), (highest value from line 12 for all aquifers evaluated)[c]	100		100
[a] Maximum value applies to waste characteristics category [b] Maximum value not applicable [c] Do not round to nearest integer			

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SITE SUMMARY

The Chem-Fab facility is located between 300 through 360 North Broad Street in Doylestown Township, Bucks County, Pennsylvania (Ref. 3, p. 2-1). Reference 72 shows the facility location. The facility is bordered to the east by an operating business, to the west and south by an active storage facility, and to the north by North Broad Street (Ref. 3, p. 2-2). A facility layout map is provided as Figure 2-1 of Reference 3 and in Reference 73. When operational, the facility contained two industrial buildings, a vacant residence, a large warehouse/manufacturing building, and two trailers (Ref. 23, pp. 1, 10).

Chem-Fab, Inc., an electroplating and metal etching company, operated the facility from 1965 to approximately 1994. The large warehouse/manufacturing building, constructed in approximately 1965, was used for electroplating and etching operations. Chem-Fab manufactured templates for circuit boards and generated wastes that included ferric chloride, mineral spirits, chromic acid rinse water and sludge, chromic acid, sulfuric acid, sodium bisulfate, sodium hydroxide, and lime. Prior to 1969, acids were mixed outside on the ground. A trichloroethene (TCE) vapor degreasing process was used until 1973 (Refs. 3, p. 2-3; 18, p. 1; 28; 32, p. 1; 38, p. 1). Electroplating operations ceased in approximately 1978 (Ref. 38, p. 1). Chem-Fab, Inc. shared the property with Electronic Metals during an unidentified period of time (Ref. 23, p. 1). The Chem-Fab facility is currently used as a business office and warehouse storage area (Ref. 3, p. 2-1).

Environmental Consultants to the Pennsylvania Department of Environmental Protection (PADEP), (previously Pennsylvania Department of Environmental Resources [PADER]), conducted two soil sampling investigations at the Chem-Fab facility. Several areas of contaminated soil were identified. The soil was contaminated primarily with chromium (III), hexavalent chromium, TCE, and tetrachloroethylene (PCE). The soil contamination was identified at 2 to 14 feet below ground surface (bgs) (Refs. 3, Tables 3-1, 5-1a, and Table 5-1b; 27, Tables 3-2, 5-1b, and 5-1c).

Environmental Consultants to PADEP also collected ground water samples from the Chem-Fab facility in the years 2000, 2001, 2002, 2003, 2004, and 2006. The ground water samples document an observed release of chromium (III); chromium (VI); cis-1,2-dichloroethene (DCE); 1,2-DCE (total); methylene chloride; PCE; 1,1,1-trichloroethane (TCA); and TCE (Refs. 27, Tables 3-5, 5-3a, 5-3b, and 5-3c; 50, Tables 3-1, 4-1a, and 4-1b; 51, Tables 3-1, 4-1a, and 4-1b). Several of the volatile organic compounds (VOC) detected in the observed release samples also were detected in two private drinking water wells and one municipal drinking water well at concentrations exceeding the EPA maximum contaminant levels (MCL) as documented in Section 3.1.1 of this documentation record.

Two creeks, Pine Run and Cooks Run, are located within a 2-mile radius of the facility, as shown in Figure 1-1 of Reference 3. Residents of Doylestown rely on ground water as a source of potable drinking water. Ground water underlying the facility is relatively shallow. Private drinking water and municipal water wells are located close to the facility. A municipal well and several of the drinking water wells have been abandoned for drinking water purposes because of TCE contamination in ground water (Refs. 3, pp. 2-8, 3-7, 3-8, and 3-9; 27, pp. 6-2 and 6-3; 48, pp. 20, 21, and 25). In February 2007, contamination related to the Chem-Fab facility was detected in active municipal wells. This indicates that ground water contamination from the facility continues to migrate from the facility towards active municipal wells (Ref. 98).

Site Use History

According to historical information, two diked areas were constructed south of the large warehouse/manufacturing building. An aboveground storage tank (AST) farm was located within the

diked area. The AST farm appeared to contain three ASTs, including one 2,500-gallon AST, one 4,000-gallon AST, and one 8,500-gallon AST, and one underground catch basin believed to be 1,000 gallons. The contents of these ASTs have not been determined (Refs. 3, p. 2-3; 73).

One underground storage tank (UST) was located west of the warehouse building. The UST had a capacity of 10,000 gallons (Ref. 3, p. 2-3) and stored waste chromic acid rinse water used during electroplating operations (Refs. 4; 10, p. 2). Historical files also indicate that USTs may have been present in a driveway area east of the manufacturing/warehouse building. However, the presence of USTs below the driveway has not been confirmed (Ref. 3, p. 2-3). A drum storage area was located south of the warehouse building in the driveway area (Ref. 31).

In December 1998, the Chem-Fab site contained the large warehouse building, a smaller storage building, and the residential building. The warehouse building was of slab-on-grade construction, with block walls and a steel frame. An AST farm was located south of the warehouse building at the southern edge of the property. The storage building appeared to be empty and consisted of a two-story stone structure with a basement or crawl space. The residential property consisted of a two-and-one-half story structure with a partial crawl space. Roll-off containers containing debris from the partial demolition of the warehouse/storage building were observed on the property (Ref. 3, p. 2-5).

In December 1999, the Chem-Fab property appeared to have undergone renovations and demolition. The warehouse building had been renovated and was occupied by one tenant. The AST farm area south of the warehouse building had been demolished, with only the concrete slab remaining. The storage and stone residential buildings were being renovated as office space. Utilities were brought in for the two smaller buildings. The area between the warehouse building and Tilley Fire Equipment, located on an adjacent property to the east, had recently been paved with asphalt. Additional concrete had been placed along the rear of the warehouse building. Also, stone had been replaced in the area west of this building. Several roll-off containers remained on the property for the storage and disposal of debris from the renovation and demolition activities (Ref. 3, pp. 2-5 and 2-6).

Site Investigations

The Bucks County Health Department and PADEP records indicate that the Chem-Fab facility was cited several times in the 1960s and 1970s for spills and releases of industrial wastes from the ASTs, USTs, and catch basins to the nearby creek (Cooks Run), for improper storage of wastes, and for releases of industrial waste to the Doylestown sewer system. Waste discharge reports dating from 1967 issued by the Commonwealth of Pennsylvania Health Department indicate that discharges from the facility to the stream (presumably Cooks Run) were abated by removing seeping abandoned USTs (Refs. 3, p. 2-3; 4 through 10; 29; 30; 33; 34).

According to Bucks County Health Department records, the Chem-Fab facility was investigated in the early 1970s and confirmed to have released industrial wastes that degraded the quality of surface water in Cooks Run and the drainage ditch leading from the southern portion of the Chem-Fab facility to Cooks Run. Yellow water (chromic acid-contaminated ground water) flowed over the ground to the ditch and finally Cooks Run. Several releases to Cooks Run from the Chem-Fab facility occurred in violation of the Clean Streams Laws of the Commonwealth of Pennsylvania, including a chromic acid rinse water spill from a broken valve on pretreatment tanks and overflows of the catch basin (Refs. 3, p. 2-3; 4; 5; 6; 7; 8; 9).

SITE SUMMARY (Continued)

In the 1970s, PADEP received several complaints about odors (Refs. 13; 14). One of the complaints was received after Chem-Fab had a spill of an unknown substance and quantity that, according to PADEP, lasted 1 hour (Ref. 14). Some of the complaints noted strong chlorine odors that caused headaches and irritated eyes and nasal passages. The owner of a property adjacent to the Chem-Fab facility stated that exhaust from the facility had corroded machinery (Ref. 15). According to PADEP's notes regarding these complaints, Chem-Fab used three units that made electronic components by etching metal with a 42° Baum'e ferric chloride solution. The process was performed on various metals. Fumes in the etching chamber were exhausted to a packer scrubber. A 3 to 5 percent caustic solution was supplied to the scrubber at a rate of 2.5 gallons per minute. The scrubber controlled the three units. The odors were related to the scrubber not having a stack set at an appropriate height, the scrubber not operating effectively, and the concentration of chloride varying between etchings (Refs. 15, pp. 1, 2; 16). In 1993, etching machine use was discontinued (Ref. 16).

In 1972, PADEP conducted waste discharge inspections of the Chem-Fab facility. One of the inspection reports describes the facility's wastewater treatment system. Rinse waters (constituents not described) from the plant were piped to a 1,000-gallon buried holding pit, where the water was pumped up into a 2,500-gallon pre-treatment tank. (The type of treatment is not identified in reference documentation.) After treatment, wastes were pumped to a 9,500-gallon holding tank for settling prior to discharge to the Doylestown Borough sanitary sewer system. A drawing of the treatment system identifies the locations of the tanks and pit and identifies a "4,000-gallon Fresh Chemical Storage Tank" containing ferric chloride. The tanks are not described as being above or below ground but appear to have been above ground. The tanks were located on the northwest side of the abandoned warehouse (manufacturing area) in an area described in recent reports as the former "UST area" (Ref. 35). A 1975 waste discharge inspection report identifies a 9,500-gallon concentrated waste acid tank. According to the 1975 inspection report, concentrated waste acid stored in the 9,500-gallon tank and sludge from the 9,500-gallon settling tank were removed by a hauler (Ref. 36).

In 1986, PADEP completed a preliminary assessment (PA) report for the Chem-Fab facility. According to the report, the facility used TCE, chromium, caustics, and electroplating wastes (Ref. 18, p. 1). The PA report indicates that in 1971, chromic acid rinse water from an inactive and closed UST discharged to a drainage ditch, which flowed 1,500 feet from the facility to Cooks Run (Ref. 18, pp. 1, 5).

In August 1987, EPA performed a PA and site inspection (SI) of the Doylestown Ground Water site and the Chem-Fab site. During this assessment, water samples were collected from residential wells and a municipal well located in the vicinity of the Chem-Fab facility. Analytical results indicated that the ground water in the vicinity of the facility was contaminated with VOCs, including TCE and 1,2-dichloroethene (DCE) at concentrations exceeding the drinking water equivalent and MCLs set for public water supplies. In a Special Bulletin dated October 1987, EPA considered the levels of drinking water contaminants in the vicinity of the facility to be high enough to meet the criteria to elicit an emergency removal action that included the delivery of bottled water to the affected residences and the determination and identification of a responsible party(s) (Refs. 3, p. 2-4; 21; 43; 44; 45). There is no documentation of identification of responsible parties.

In March 1989, ground water samples were collected from drinking water supply wells located near the Chem-Fab facility. The ground water samples contained 1,1-DCE (up to 22 microgram per liter [µg/L]); cis-1,2-DCE (up to 180 µg/L); 1,1,1-TCA (up to 55 µg/L); TCE (up to 156 µg/L); trichlorofluoromethane (up to 256 µg/L); and PCE (up to 60 µg/L) (Ref. 46, pp. 1, B-1 through B-8). The source of the ground water contamination was not identified (Ref. 48, p. 7).

SITE SUMMARY (Continued)

In 1993, PADEP issued a notice of violation (NOV) to the president of Chem-Fab for the improper storage and transport of hazardous waste and for not having a preparedness, prevention, and contingency plan (Ref. 12).

In March 1994, the Chem-Fab facility was abandoned, and over 50 drums remained on the property (Ref. 26).

In September 1994, the EPA National Enforcement Investigations Center (NEIC) collected 57 samples from containers, an UST (including liquid and soils surrounding the tank), and an excavated sump as well as background soil samples. At the time of this sampling activity, the facility was fenced and bordered on three sides by industrial facilities. Residential neighborhoods and a public park were located nearby. Three buildings located on the property included a computer component building (Building 3), an abandoned warehouse (Building 1), and a residence (Building 2). Two trailers were located west of the computer building. The computer building was located in the northwestern portion of the property and included a packing and shipping area and a storage room on the lower level and an office upstairs. During the sampling activity, the computer building was being used by the Electronic Marketing Group, Inc. Fifty-one drums were located in the storage room on the southwest end of the lower level of the computer building (Refs. 23, p. 5; 73).

During the 1994 NEIC sampling activity, the abandoned warehouse (manufacturing area) (Building 1) in the southern section of the property contained a large, abandoned warehouse (manufacturing area), photo etching laboratories, storage rooms, and offices. A concrete-capped sump was located in the abandoned warehouse/manufacturing area. A liquid and sludge sample collected from the sump had Resource, Conservation, and Recovery Act (RCRA) hazardous waste characteristic of toxicity for TCE (Ref. 23, pp. 6, 9). Nine drums were stored in the storage room in the southwest corner of the building. Thirteen 55-gallons drums were stored outside of the abandoned warehouse along the south wall (Refs. 23, p. 6; 73).

NEIC identified an UST west of the abandoned warehouse (manufacturing area). NEIC uncovered the UST containing about 6,000 gallons of liquid and sludge. A trench was excavated along the UST, and orange-tinted ground water infiltrated the trench (Ref. 23, p. 6). A 1986 waste manifest indicates that some of the sludge from the UST was disposed of off site (Ref.100). The UST contents were sampled and found to have the RCRA hazardous waste characteristics of toxicity for chromium (Ref. 23, p. 8).

NEIC inventoried the two semi-truck trailers located west of the computer building. Trailer 1 contained a large amount of laboratory equipment, nine 55-gallon drums, one 20-gallon container, one 5-gallon container, and several small containers. Trailer 2 contained a large amount of laboratory equipment, one 55-gallon drum, and eight 5-gallon containers (Ref. 23, pp. 6 and 7).

NEIC sampled the contents of drums identified on the Chem-Fab property. The drums contents had the RCRA hazardous waste characteristics of ignitability, corrosivity, and toxicity for chromium and TCE (Ref. 23, pp. 7, 8). Analytical results and an inventory of all the drums are summarized in Tables 1 and 2 of Reference 23.

From September 1994 to October 1995, EPA conducted CERCLA removal actions at the Chem-Fab facility. The removal actions included the removal and disposal of 117 drums of wastes and 8,400 gallons of pumped liquid wastes, along with other solid wastes and fuel oils. During the removal actions, the contents of the chromium waste UST were sampled and found to contain hexavalent chromium. Also, one drum contained radioactive thorium nitrate (Refs. 3, p. 2-4; 11; 20, p. 2). Drums

contained methyl isobutyl ketone and hydrochloric acid (Ref. 19). In November 1998, PADEP assumed the lead role from EPA for assessment of the Chem-Fab facility (Refs. 3, p. 2-4; 22).

Previous reports, including the SI report prepared by EPA, document analytical results for soil, sediment, and aqueous sample parameters including VOCs, polychlorinated biphenyls (PCB), pesticides/herbicides, semivolatile organic compounds (SVOC), metals, and polyaromatic hydrocarbons (PAH). Results indicate constituents, primarily of VOCs and metals, at concentrations exceeding state and federal cleanup standards in both on- and off-property areas. Liquids and sludges sampled revealed similar results. Analysis of several drinking water samples collected from nearby residences revealed elevated concentrations of VOCs and metals above EPA drinking water standards (Ref. 3, p. 2-5).

From 1999 to 2000, PADEP's environmental consultant performed an initial site characterization at the Chem-Fab facility and the adjacent Doylestown Store and Lock (also known as the Extra Space Storage) property. The initial site characterization included soil and ground water sampling activities documented in the "Final Site Characterization Report for the Chem-Fab Site" (Refs. 51, p. 2; 3). The initial site characterization investigation identified TCE, PCE, and methylene chloride in soil (Ref. 3, pp. 6-1). The report also indicated that ground water was contaminated with chromium (III), chromium (VI), 1,1,1-TCA, 1,1-DCE, 1,1-DCA, methylene chloride, PCE, TCE, vinyl chloride, and cis-1,2-DCE (Ref. 3, p. 6-2).

From May 2001 to January 2002, PADEP's environmental consultant conducted a Phase II site investigation that included additional soil and ground water sampling (Ref. 51, p. 2). The results from the Phase II investigation are documented in the "Final – Phase II Site Characterization Report, Volume I, Chem-Fab Site" (Ref. 27). The soil sampling results identified PCE, TCE, 1,2-DCE, and hexavalent chromium in soil (Ref. 27, p. 5-2). The ground water sampling results revealed metals, 1,1-DCE, PCE, TCE, and methylene chloride in ground water (Ref. 27, pp. 5-6 through 5-8).

Two additional rounds of ground water sampling were conducted in May and September 2002. The analytical results are documented in the "Phase II Site Characterization Report, Addendum, Chem-Fab Site," dated January 14, 2003 (Ref. 49, p. 3). The following contaminants were detected in ground water: 1,-DCE, 1,2-dichloroethane (DCA), PCE, TCE, chromium, and hexavalent chromium. (Ref. 49, pp. 4-2 - 4-6).

In 2003 and 2004, PADEP' environmental consultant conducted supplemental ground water sampling to monitor the migration of contaminants in ground water (Refs. 50, p. 4; 51, p. 3). The sampling indicated that the ground water plume underlying the Chem-Fab facility was migrating from the facility (Ref. 50, p. 25).

The concentrations of hazardous substances detected in soil samples collected during the investigations above are documented in Section 2.4 of this documentation record for Source 1. The concentrations of hazardous substances detected in ground water during the above investigations are summarized in Section 3.1.1.

2.2 SOURCE CHARACTERIZATION

SOURCE IDENTIFICATION

Name of source: Contaminated Soil

Number of sources: 1

Source type: Contaminated Soil

Source 1 includes areas of soil contamination detected in a range of depths within a 240-square-foot area on the Chem-Fab facility and adjacent Doylestown Store and Lock property, also known as the Extra Space property. Numerous investigations identified the presence of this contaminated soil. A subsurface soil investigation completed as part of PADEP's initial site characterization of the facility included the collection of soil samples from 41 soil borings installed throughout the Chem-Fab and on the adjacent Doylestown Store and Lock properties (Ref. 3, pp. 1-1, 3-2). Additional soil samples were collected from the Chem-Fab and Doylestown Store and Lock properties during the Phase II site characterization to further delineate the soil contamination identified during the initial site characterization investigation (Ref. 27, pp. 1-1, 2-4). Subsurface soil samples were collected by drilling 20 soil borings throughout the Chem-Fab and Doylestown Store and Lock properties (Ref. 27, p. 3-4). From September 24 through September 27, 2001, PADEP's environmental consultant installed soil borings and collected soil samples from the interior of the abandoned warehouse located on the Chem-Fab property and a swale (drainage ditch) located on the Doylestown Store and Lock property (Ref. 27, p. 3-5).

The soil sample results from the initial site characterization and Phase II site characterization studies document the presence of soil contamination. As documented in Section 2.4.1, the soil on the Chem-Fab and Doylestown Store and Lock properties is contaminated with chromium, cis-1,2-DCE, 1,2-DCE, methylene chloride, PCE, 1,1,1-TCA, and TCE.

The contaminated soil resulted from leaks from the waste chromic acid rinse water UST and drums improperly stored at the facility (Refs. 3, pp. 2-3 and 2-4; 4, p. 1; 5; 6; 7; 8; 9; 20, p. 1; 23, pp. 3, 4, 5, 6; and 26). The drum samples exhibited RCRA hazardous waste characteristics of ignitability, corrosivity, and toxicity for chromium and TCE (Ref. 23, pp. 3, 4, 7, 8, and Tables 1 and 2). A concrete sump located in the former warehouse (manufacturing) building may have released contaminants to underlying soil (Ref. 23, pp. 6, 9). Samples from the sump contained TCE (Ref. 23, p. 9). Soil contamination may also be from the AST farm formerly located in the southern corner of the property (Ref. 3, p. 2-3 and Figure 2-1). The contents of the ASTs are not documented.

SD-CHARACTERIZATION AND CONTAINMENT
SOURCE NO. 1

Location of the source, with reference to a map of the facility: See Reference 82 for the location of Source 1.

Containment:

Release to ground water: The source has no known liner or containment system. Therefore, a containment factor value of 10 is assigned to this source (Ref. 1, Table 3-2).

Release via overland migration and/or flood: The surface water migration pathway was not scored.

Gas release to air: The air migration pathway was not scored.

Particulate release to air: The air migration pathway was not scored.

2.4 WASTE CHARACTERISTICS

2.4.1 HAZARDOUS SUBSTANCES

The hazardous substances associated with Source 1 were identified during soil sampling investigations. Each investigation is summarized below. Background soil samples were not designated during PADEP's initial or Phase II site characterizations. Therefore, comparable background soil sample locations were selected based on similarity (date of sampling, type of analysis, and sampling depths). Only hazardous substances that are not naturally occurring and known to be stored or used at the Chem-Fab facility are used to characterize and document the presence of contaminated soil.

The soils at the Chem-Fab and the Doylestown Store and Lock properties are associated with the Doylestown and Abbottstown Series, consisting of deep, poorly drained, nearly level to gently sloping soils on uplands. The background and contaminated soil samples were collected from the same type of soil, which mainly consists of the Doylestown silt loam, with 0 to 3 percent slopes. A soils map for the Doylestown area is included as Figure 2-2 of Reference 3. The soil boring logs are provided in Reference 3, Appendix C. Background and release soil samples were collected from similar soil types.

All facility characterization activities conducted by PADEP and presented in the sections below were conducted in accordance with the April 1, 1999, Final Site Characterization Specification of Services, Chem-Fab Site, Doylestown Township, Bucks County, Pennsylvania (Ref. 24, pp. 1-1, 1-9, and 2-1). According to the specification of services, the soil samples were analyzed by a PADEP-approved laboratory using EPA Methods 5035 and 8260 for VOCs analysis, EPA Method 8270 for SVOCs analysis, and EPA Method 6010 for target analyte list (TAL) metals analysis, including cyanide and hexavalent and total chromium (Ref. 24, p. 2-12). The analytical data were validated in accordance with PADEP's Standard Operating Procedures (SOP) consistent with EPA Contract Laboratory Program (CLP) protocols and quality control (QC) Level IV requirements (Ref. 24, pp. 2-25, 2-26).

Initial Site Characterization

From December 1999 through May 2000, PADEP's environmental consultant conducted an initial site characterization at the Chem-Fab facility. A geophysical survey was conducted to identify potential areas of waste disposal, buried drums, and USTs on the Chem-Fab property. A subsurface soil investigation was completed in areas of concern and throughout the facility to identify areas impacted by past activities (Ref. 3, pp. 3-1 and 3-2).

The subsurface soil investigation was conducted from January 4 through January 14, 2000, and included the installation of 41 soil borings throughout the Chem-Fab facility and on the adjacent Doylestown Store and Lock property. During installation each soil boring was screened with a photoionization detector (PID) to detect the presence of VOCs (Ref. 3, pp. 3-2, 3-3, 3-4).

In total, 83 soil samples were collected from the 41 soil borings. Two soil samples were collected from each boring location except at SB-03, where three samples were collected because of an elevated PID reading, and at SB-11, SB-12, and SB-13, where only one sample was collected from each boring because of the presence of stone in the former tank void. Three duplicate samples were collected (SB-27-01, SB-35-01, and SB-41-01); the samples were duplicates of SB-25-01, SB-34-02, and SB-40-01, respectively (Ref. 3, p. 3-3). Figure 4-1 in Reference 3 shows the sampling locations. Figure 4-1 identifies the computer building as the 2-story masonry building, the residence as the 2-story frame

building, and the abandoned warehouse as the block building. Reference 3, Table 3-1, summarizes the subsurface soil sampling program conducted at the Chem-Fab facility. Table 1 below provides a summary of the background samples selected for the initial site characterization (Ref. 3). As Table 1 shows, a background sample was selected for each specific sample depth. The boring logs are provided in Appendix C of Reference 3. Table 2 summarizes the hazardous substances detected in Source 1 during the initial site characterization. Table 2 represents validated data presented in the initial site characterization report (Ref. 3, Section 5.4). All concentrations presented in Table 2 are above the laboratory method detection limits (MDL) or reporting limit unless qualified as "ND" (not detected above MDL or reporting limit) (Ref. 3, Section 5.1).

Soil samples were placed in laboratory-supplied bottleware and sent to Quality Control, Inc., of Southampton, Pennsylvania, a PADEP-approved laboratory. The samples were analyzed for VOCs using EPA Method 8260, SVOCs using EPA Method 8270, and TAL metals using EPA Method 6010, including cyanide and hexavalent and total chromium. EPA Method 5035 was used for sample collection and preservation for the VOCs (Ref. 3, p. 3-4). The chain-of-custody record for the samples is provided in Appendix B of Reference 3.

TABLE 1
BACKGROUND SAMPLING LOCATIONS
INITIAL SITE CHARACTERIZATION

Depth	**2-2.5**	**3-3.5**	**3.5-4**	**5-5.5**
Background Soil Samples	SB-25-01	SB-10-01	SB-09-01	SB-08-01
Date	1/11/2000	1/6/2000	1/6/2000	1/5/2000
Reference	3, Table 3-1, p. 2 and Appendix C, p. 25	3, Table 3-1, p. 1 and Appendix C, p. 10	3, Table 3-1, p. 1 and Appendix C, p. 9	3, Table 3-1, p. 1 and Appendix C, p. 8
Depth	**5.5-6**	**6-6.5**	**6.5-7**	**7-7.5**
Background Soil Samples	SB-30-01	SB-31-01	SB-26-02	SB-42-01
Date	1/12/2000	1/12/2001	1/11/2000	1/14/2000
Reference	3, Table 3-1, p. 3 and Appendix C, p. 29	3, Table 3-1, p. 3 and Appendix C, p. 30	3, Table 3-1, p. 2 and Appendix C, p. 26	3, Table 3-1, p. 3 and Appendix C, p. 39
Depth	**8-8.5**	**8.5-9**	**9-9.5**	**9.5-10**
Background Soil Samples	SB-09-02	SB-08-02	SB-24-02	SB-21-02
Date	1/6/2000	1/5/2000	1/11/2000	1/10/2000
Reference	3, Table 3-1, p. 1 and Appendix C, p. 9	3, Table 3-1, p. 1 and Appendix C, p. 8	3, Table 3-1, p. 2 and Appendix C, p. 24	3, Table 3-1, p. 2 and Appendix C, p. 21

Depth	**10.5-11**	**11.5-12**	**13-13.5**	**13.5-14**
Background Soil Samples	SB-23-02	SB-01-02	SB-42-02	SB-20-02
Date	1/10/2000	1/4/2000	1/14/2000	1/10/2000
Reference	3, Table 3-1, p. 2 and Appendix C, p. 23	3, Table 3-1, p. 1 and Appendix C, p. 1	3, Table 3-1, p. 3 and Appendix C, p. 39	3, Table 3-1, p. 2 and Appendix C, p. 20

Note:
SB = Soil boring

TABLE 2
HAZARDOUS SUBSTANCES ASSOCIATED WITH SOURCE 1
INITIAL SITE CHARACTERIZATION

Sample ID	**SB-25-01**	**SB-01-01**
Lab ID	L614337-3	L609880-1
Sampling location	Background, east of block building	Patched asphalt area southern portion of property
Date	1/11/2000	1/4/2000
Reference	3, Table 3-1, p. 2; Table 5-1a, p. 11; Figure 4-1; Appendix C, p. 25; Appendix D, pp. 10, 23	3, Table 3-1, p. 1; Table 5-1a, p. 5; Figure 4-1; Appendix C, p. 1; Appendix D, pp. 145, 155
Sampling depth	2-2.5 feet bgs	2-2.5 feet bgs
Metals (mg/kg)		
Chromium (III)	19.9	111
Hexavalent chromium	ND	43.7 J
Sample ID	**SB-08-01**	**SB-02-01**
Lab ID	L610077-6	L609880-3
Sampling location	Background, west of concrete pad	Patched asphalt area southern portion of facility
Date	1/5/2000	1/4/2000
Reference	3, Table 3-1, p. 1; Table 5-1a, p. 6; Table 5.1b, p. 4; Figure 4-1; Appendix C, p. 8; Appendix D, pp. 171, 179, 499	3, Table 3-1, p. 1; Table 5-1a, p.5; Table 5-1b, p. 3; Figure 4-1; Appendix C, p. 2; Appendix D, pp. 147, 159, 473
Sampling depth	5-5.5 feet bgs	5-5.5 feet bgs
VOCs (µg/kg)		
cis-1,2-DCE	ND	173 J
TCE	ND	528
Metals (mg/kg)		
Chromium (III)	24	185
Hexavalent chromium	ND	11 J

Sample ID	**SB-42-01**	**SB-02-02**
Lab ID	L614520-1	L609880-4
Sampling location	Background on Doylestown Store and Lock Space property	Patched asphalt area southern portion of property
Date	1/14/2000	1/4/2000
Reference	3, Table 3-1, p. 3; Table 5-1a, p. 16; Table 5-1b, p. 9; Figure 4-1; Appendix C, p. 39; Appendix D, pp. 270, 274, 455	3, Table 3-1, p. 1; Table 5-1a, p. 5; Table 5-1b, p. 3; Figure 4-1; Appendix C, p. 2; Appendix D, pp. 148, 159, 475
Sampling depth	7-7.5 feet bgs	7-7.5 feet bgs
VOCs (µg/kg)		
cis-1,2-DCE	ND	242
PCE	ND	228
TCE	ND	1,150
Metals (mg/kg)		
Chromium (III)	36.7 J	3,030
Hexavalent chromium	ND	80.2 J
Sample ID	**SB-10-01**	**SB-03-01**
Lab ID	L610149-3	L609880-5
Sampling location	Background, former UST area	Patched asphalt area southern portion of property
Date	1/6/2000	1/4/2000
Reference	3, Table 3-1, p. 1; Table 5-1a, p. 1; Figure 4-1; Appendix C, p. 10; Appendix D, p. 191	3, Table 3-1, p. 1; Table 5-1a, p. 5; Figure 4-1; Appendix C, p. 3; Appendix D, p. 160
Sampling depth	3-3.5 feet bgs	3-3.5 feet bgs
Metals (mg/kg)		
Hexavalent chromium	1.39	65.9 J

Sample ID	**SB-31-01**	**SB-03-02**
Lab ID	L614376-3	L609880-6
Sampling location	Background on Doylestown Store and Lock property west of 2-story masonry building	Patched asphalt area southern portion of property
Date	1/12/2000	1/4/2000
Reference	3, Table 3-1, p. 3; Table 5-1a, p. 12; Figure 3-1; Appendix C, p. 30; Appendix D, p. 258	3, Table 3-1, p. 1; Table 5.1a, p. 6; Figure 3-1; Appendix C, p. 3; Appendix D, p. 161
Sampling depth	6-6.5 feet bgs	6-6.5 feet bgs
Metals (mg/kg)		
Hexavalent chromium	1.79	37.7 J
Sample ID	**SB-10-01**	**SB-04-01**
Lab ID	L610149-3	L609880-9
Sampling location	Background, former UST area	AST farm
Date	1/6/2000	1/4/2000
Reference	3, Table 3-1, p. 1; Table 5-1b, p. 1; Figure 4-1; Appendix D, p. 385	3, Table 3-1, p. 1; Table 5-1b, p. 1; Figure 4-1; Appendix D, p. 483
Sampling depth	3-3.5 feet bgs	3-3.5 feet bgs
VOCs (µg/kg)		
PCE	ND	1,710
Sample ID	**SB-42-01**	**SB-04-02**
Lab ID	L614520-1	L609880-10
Sampling location	Background on Doylestown Store and Lock property	AST farm
Date	1/14/2000	1/4/2000
Reference	3, Table 3-1, p. 3; Table 5-1a, p. 16; Table 5-1b, p. 9; Figure 4-1; Appendix C, p. 39; Appendix D, pp. 274, 455	3, Table 3-1, p. 1; Table 5-1a, p. 2; Table 5-1b, p. 1; Figure 4-1; Appendix C, p. 4; Appendix D, pp. 164, 485
Sampling depth	7-7.5 feet bgs	7-7.5 feet bgs
VOCs (µg/kg)		
PCE	ND	618
Metals (mg/kg)		
Hexavalent chromium	ND	1.78 J

Sample ID	**SB-31-01**	**SB-05-01**
Lab ID	L610218-3	L609880-11
Sampling location	Background, Doylestown Store and Lock property	Concrete pad area
Date	1/12/2000	1/4/2000
Reference	3, Table 3-1, p. 3; Table 5-1b, p. 7; Figure 4-1; Appendix C, p. 30; Appendix D, pp. 402, 403	3, Table 3-1, p. 1; Table5-1b, p. 2; Figure 4-1; Appendix C, p. 5; Appendix D, pp. 487, 488
Sampling depth	6-6.5 feet bgs	6-6.5 feet bgs
VOCs (µg/kg)		
cis-1,2-DCE	ND	6,060
m and p Xylene	ND	130,000
o-Xylene	ND	47,400
PCE	ND	81,700
Toluene	ND	1,260 J
TCE	ND	30,100
Sample ID	**SB-24-02**	**SB-05-02**
Lab ID	L614337-2	L610077-1
Sampling location	Background, east of warehouse	Concrete pad area
Date	1/11/2000	1/5/2000
Reference	3, Table 3-1, p. 2; Table 5-1a, p. 11; Table 5-1b, p. 6; Figure 4-1; Appendix D, pp. 9, 22, 366, 367	3, Table 3-1, p. 1; Table 5-1a, p. 3; Table 5-1b, p. 2; Figure 4-1; Appendix D, pp. 166, 173, 489, 490
Sampling depth	9-9.5 feet bgs	9-9.5 feet bgs
VOCs (µg/kg)		
1,1,1-TCA	ND	569 J
cis-1,2-DCE	ND	1,500 J
m and p Xylene	ND	30,300 J
Methylene chloride	ND	752 J
o-Xylene	ND	9,220 J
PCE	ND	38,000 J
Toluene	ND	573 J
TCE	ND	6,700 J
Metals (mg/kg)		
Chromium (III)	34.8	360
Hexavalent chromium	2.9	28.1 J

Sample ID	**SB-09-01**	**SB-06-01**
Lab ID	L610149-1	L610077-2
Sampling location	Background, UST area	AST farm
Date	1/6/2000	1/5/2000
Reference	3, Table 3-1, p. 1; Table 5-1a, p. 1; Figure 4-1; Appendix C, p. 9; Appendix D, pp. 182, 189	3, Table 3-1, p. 1; Table 5-1a, p. 3; Figure 4-1; Appendix C, p. 6; Appendix D, pp. 167, 175
Sampling depth	3.5-4 feet bgs	3.5-4 feet bgs
Metals (mg/kg)		
Chromium (III)	21.4	763
Hexavalent chromium	ND	136 J
Sample ID	**SB-08-02**	**SB-06-02**
Lab ID	L610077-7	L610077-3
Sampling location	Background, west of northern most concrete pad	AST farm
Date	1/5/2000	1/5/2000
Reference	3, Table 3-1, p. 1; Table 5-1a, p. 6; Table 5-1b, p. 4; Figure 4-1; Appendix C, p. 8; Appendix D, pp. 180, 500	3, Table 3-1, p. 1; Table 5-1a, p. 3; Table 5-1b, p. 2; Figure 4-1; Appendix C, p. 6; Appendix D, pp. 176, 493, 494
Sampling depth	8.5-9 feet bgs	8.5-9 feet bgs
VOCs (µg/kg)		
m and p Xylene	ND	1,030 J
o-Xylene	ND	236 J
PCE	ND	1,490 J
Metals (mg/kg)		
Hexavalent chromium	14.8 J	50.3 J
Sample ID	**SB-30-01**	**SB-07-01**
Lab ID	L614376-1	L610077-4
Sampling location	Background, west abandoned warehouse on Doylestown Store and Lock property	AST farm
Date	1/12/2000	1/5/2000
Reference	3, Table 3-1, p. 3; Table 5-1b, p. 7; Figure 4-1; Appendix C, p. 291; Appendix D, pp. 397, 399	3, Table 3-1, p. 1; Table 5-1b, p. 2; Figure 4-1; Appendix C, p. 7; Appendix D, pp. 495, 496
Sampling depth	5.5-6 feet bgs	5.5-6 feet bgs
VOCs (µg/kg)		
cis-1,2-DCE	ND	265 J

m and p Xylene	ND	666 J
o-Xylene	ND	371 J
PCE	ND	821 J
TCE	ND	2,130 J
Sample ID	**SB-09-02**	**SB-07-02**
Lab ID	L610149-2	L610077-5
Sample location	Background, UST area	AST Farm
Date	1/6/2000	1/5/2000
Reference	3, Table 3-1, p. 1; Table 5-1a, p. 1; Table 5-5b, p. 1; Figure 4-1; Appendix C, p. 9; Appendix D, pp. 183, 190, 383, 384	3, Table 3-1, p. 1; Table 5-1a, p. 4; Table 5-1b, p. 2, Figure 4-1; Appendix C, p. 7; Appendix D, pp. 170, 178, 497, 498
Sampling depth	8-8.5 feet bgs	8.5-9 feet bgs
VOCs (µg/kg)		
1,1,1-TCA	ND	288 J
m and p Xylene	ND	20,300 J
o-Xylene	ND	7,410 J
PCE	ND	12,200 J
Toluene	ND	232 J
TCE	ND	12,500 J
Metals (mg/kg)		
Chromium (III)	26.3	297
Hexavalent chromium	ND	129 J
Sample ID	**SB-09-02**	**SB-14-01**
Lab ID	L610149-2	L610218-1
Sampling location	Background, UST area	North of UST area
Date	1/6/2000	1/7/2000
Reference	3, Table 3-1, p. 1; Table 5-1a, p. 1; Figure 4-1; Appendix C, p. 9; Appendix D, p. 190	3, Table 3-1, p. 1; Table 5-1a, p. 6; Figure 4-1; Appendix C, p. 14; Appendix D, p. 196
Sampling depth	8-8.5 feet bgs	8-8.5 feet bgs
Metals (mg/kg)		
Hexavalent chromium	ND	24 J

Sample ID	**SB-20-02**	**SB-14-02**
Lab ID	L614044-6	L610218-2
Sampling location	Background, east of 2-story masonry building	North of UST area
Date	1/10/2000	1/7/2000
Reference	3, Table 3-1, p. 2; Table 5-1a, p. 9; Figure 4-1; Appendix C, p. 20; Appendix D, p. 233	3, Table 3-1, p. 1; Table 5-1a, p. 7; Figure 4-1; Appendix C, p. 4; Appendix D, p. 198
Sampling depth	13.5-14 feet bgs	14-14.5 feet bgs
Metals (mg/kg)		
Hexavalent chromium	ND	58.4 J
Sample ID	**SB-42-02**	**SB-15-02**
Lab ID	L614520-2	L610218-4
Sampling location	Background on Doylestown Store and Lock property northwest of 2-story masonry building	North of UST area
Date	1/14/2000	1/7/2000
Reference	3, Table 3-1, p. 3; Table 5-1a, p. 16; Figure 4-1; Appendix C, p. 39; Appendix D, pp. 271, 275	3, Table 3-1, p. 2; Table 5-1a, p. 7; Figure 4-1; Appendix C, p. 15; Appendix D, pp. 200, 208
Sampling depth	13-13.5 feet bgs	13-13.5 feet bgs
Metals (mg/kg)		
Chromium (III)	14.5 J	1,200
Hexavalent chromium	ND	249 J
Sample ID	**SB-09-01**	**SB-16-01**
Lab ID	L614520-5	L610218-5
Sampling location	Background on Doylestown Store and Lock property northwest of 2-story masonry building	West of 2-story masonry building
Date	1/14/2000	1/7/2000
Reference	3, Table 3-1, p. 3; Table 5-1a, p. 17; Figure 4-1; Appendix C, p. 41; Appendix D, p. 190	3, Table 3-1, p. 2; Table 5-1a, p. 7; Figure 4-1; Appendix C, p. 16; Appendix D, p. 201
Sampling depth	3.5-4 feet bgs	4.5-5 feet bgs
Metals (mg/kg)		
Hexavalent chromium	ND	9.53 J

Sample ID	**SB-08-01**	**SB-17-01**
Lab ID	L610077-6	L610218-7
Sampling location	Background, west of northern most section of concrete pad	West of former computer building
Date	1/5/2000	1/7/2000
Reference	3, Table 3-1, p. 1; Table 5-1a, p. 6; Figure 4-1; Appendix C, p. 8; Appendix D, p. 179	3, Table 3-1, p. 2; Table 5-1a, p. 8; Figure 4-1; Appendix C, p. 17; Appendix D, p. 203
Sampling depth	5-5.5 feet bgs	5-5.5 feet bgs
Metals (mg/kg)		
Hexavalent chromium	ND	4.63 J
Sample ID	**SB-08-02**	**SB-19-01**
Lab ID	L610077-7	L614044-3
Sampling location	Background, west of northern most section of concrete pad	West of 2-story masonry building
Date	1/8/2000	1/10/2000
Reference	3, Table 3-1, p. 1; Table 5-1b, p. 4; Figure 4-1; Appendix C, p. 8; Appendix D, p. 501	3, Table 3-1, p. 2; Table 5-1b, p. 5; Figure 4-1; Appendix C, p. 19, Appendix D, p. 344
Sampling depth	8.5-9 feet bgs	8.5-9 feet bgs
VOCs (µg/kg)		
TCE	ND	1,160 J
Sample ID	**SB-26-02**	**SB-28-01**
Lab ID	L614337-6	L614337-13
Sampling location	Background, east of block building	AST Farm
Date	1/11/2000	1/11/2000
Reference	3, Table 3-1, p. 2; Table 5-1a, p. 11; Figure 3-1; Appendix C, p. 26; Appendix D, p. 26	3, Table 3-1, p. 1; Table 5-1a, p. 4; Figure 3-1; Appendix C, p. 28; Appendix D, p. 30
Sampling depth	6.5-7 feet bgs	6.5-7 feet bgs
Metals (mg/kg)		
Hexavalent chromium	ND	15.6

Sample ID	**SB-08-02**	**SB-28-02**
Sampling location	Background, west of northern most section of concrete pad	AST farm
Lab ID	L610077-7	L614337-14
Date	1/5/2000	1/11/2000
Reference	3, Table 3-1, p. 1; Table 5-1a, p. 6; Table 5-1b, p. 4; Figure 4-1; Appendix C, p. 8; Appendix D, pp. 18, 501, 502	3, Table 3-1, p. 1; Table 5-1a, p. 4; Table 5-1b, p. 2; Figure 4-1; Appendix C, p. 27; Appendix D, pp. 31, 379, 380
Sampling depth	8.5-9 feet bgs	8.5-9 feet bgs
VOCs (µg/kg)		
1,1,1-TCA	ND	956
cis-1,2-DCE	ND	913
m and p Xylene	ND	24,400
Methylene chloride	ND	693 J
o-Xylene	ND	7,880
PCE	ND	34,200
Toluene	ND	654 J
TCE	ND	10,500
Metals (mg/kg)		
Hexavalent chromium	14.8	108
Sample ID	**SB-09-01**	**SB-29-01**
Lab ID	L614520-5	L614337-15
Sampling location	Background on Doylestown Store and Lock property	AST farm
Date	1/14/2000	1/11/2000
Reference	3, Table 3-1, p. 3; Table 5-1a, p. 17; Table 5-1b, p. 10; Figure 4-1; Appendix C, p. 41; Appendix D, pp. 190, 383	3, Table 3-1, p. 1; Table 5-1a, p. 4; Table 5-1b, p. 2; Figure 4-1; Appendix C, p. 28; Appendix D, pp. 32, 381
Sampling depth	4.5-5 feet bgs	4.5-5 feet bgs
VOCs (µg/kg)		
Methylene chloride	ND	336 J
Metals (mg/kg)		
Hexavalent chromium	ND	2.39

Sample ID	**SB-42-01**	**SB-29-02**
Lab ID	L614520-1	L614337-16
Sampling location	Background on Doylestown Store and Lock property northwest of 2-story masonry building	AST farm
Date	1/14/2000	1/11/2000
Reference	3, Table 3-1, p. 3; Table 5-1a, p. 16; Table 5-1b, p. 9; Figure 4-1; Appendix C, p. 39; Appendix D, pp. 274, 455	3, Table 3-1, p. 1; Table 5-1a, p. 4; Table 5-1b, p. 3; Figure 4-1; Appendix C, p. 28; Appendix D, pp. 33, 383, 384
Sampling depth	7-7.5 feet bgs	7-7.5 feet bgs
VOCs (µg/kg)		
cis-1,2-DCE	ND	118 J
m and p Xylene	ND	3,720
o-Xylene	ND	1,230
PCE	ND	3,470
TCE	ND	2,830
Metals (mg/kg)		
Hexavalent chromium	ND	24.3
Sample ID	**SB-25-01**	**SB-33-01**
Lab ID	L614337-3	L614376-7
Sampling location	Background east of block building	West of 2-story masonry building
Date	1/11/2000	1/12/2000
Reference	3, Table 3-1, p. 1; Table 5-1b, p. 6; Figure 4-1; Appendix C, p. 25; Appendix D, pp. 368, 369	3, Table 3-1, p. 3; Table 5-1b, p. 8; Figure 4-1; Appendix C, p. 32; Appendix D, pp. 410, 411
Sampling depth	2-2.5 feet bgs	1.5-2 feet bgs
VOCs (µg/kg)		
m and p Xylene	ND	4,210
o-Xylene	ND	2,260

Sample ID	**SB-26-02**	**SB-33-02**
Lab ID	L614337-6	L614376-8
Sampling location	Background, east of block building	West of 2-story masonry building
Date	1/11/2000	1/12/2000
Reference	3, Table 3-1, p. 2; Table 5-1a, p. 11; Figure 3-1; Appendix C, p. 26; Appendix D, p. 374	3, Table 3-1, p. 3; Table 5-1b, p. 8; Figure 4-1; Appendix C, p. 32; Appendix D, pp. 412, 413
Sampling depth	6.5-7 feet bgs	6.5-7 feet bgs
VOCs (µg/kg)		
cis-1,2-DCE	ND	829
TCE	ND	426
Sample ID	**SB-24-02**	**SB-34-01**
Lab ID	L614337-2	L614376-9
Sampling location	Background, east of block building	West of 2-story masonry building
Date	1/11/2000	1/12/2000
Reference	3, Table 3-1, p. 2; Table 5-1a, p. 11; Figure 4-1; Appendix C, p. 24; Appendix D, p. 22	3, Table 3-1, p. 3; Table 5-1a, p. 13; Figure 4-1; Appendix C, p. 33; Appendix D, p. 264
Sampling depth	9-9.5 feet bgs	9-9.5 feet bgs
Metals (mg/kg)		
Hexavalent chromium	2.93	12.1
Sample ID	**SB-23-02**	**SB-37-02**
Lab ID	L614044-12	L614458-2
Sampling location	Background residence	North of UST area
Date	1/10/2000	1/13/2000
Reference	3, Table 3-1, p. 2; Table 5-1a, p.10; Figure 4-1; Appendix C, p. 23; Appendix D, pp. 226, 239	3, Table 3-1, p. 3; Table 5-1a, p. 15; Figure 4-1; Appendix C, p. 35; Appendix D, pp. 42, 56, 69
Sampling depth	10.5-11 feet bgs	10.5-11 feet bgs
Metals (mg/kg)		
Chromium (III)	29	201
Hexavalent chromium	0.7	102.0

Sample ID	**SB-08-02**	**SB-38-01**
Lab ID	L610077-7	L614458-3
Sampling location	Background west of northern most section of concrete pad	North of UST area
Date	1/8/2000	1/13/2000
Reference	3, Table 3-1, p. 1; Table 5-1a p. 6; Figure 4-1; Appendix C, p. 8; Appendix D, p. 172, 180	3, Table 3-1, p. 3; Table 5-1a, p. 15; Figure 4-1; ; Appendix C, p. 36; Appendix D pp. 43, 57, 70
Sampling depth	8.5-9 feet bgs	8.5-9 feet bgs
Metals (mg/kg)		
Chromium (III)	31.1	1,910
Hexavalent chromium	14.8 J	478.0
Sample ID	**SB-01-02**	**SB-38-02**
Lab ID	L609880-2	L614458-4
Sampling location	Background, patched asphalt area	North of UST area
Date	1/4/2000	1/13/2000
Matrix	Soil	Soil
Reference	3, Table 3-1, p. 1; Table 5-1a, p. 5; Figure 4-1; Appendix C, p. 1; Appendix D, pp. 146, 157	3, Table 3-1, p. 3; Table 5-1a, p. 15; Figure 4-1; Appendix C, p. 36; Appendix D, pp. 44, 58, 71
Sampling depth	11.5-12 feet bgs	11.5-12 feet bgs
Metals (mg/kg)		
Chromium (III)	140	1,830
Hexavalent chromium	4.59 J	500
Sample ID	**SB-08-01**	**SB-39-01**
Lab ID	L610077-6	L614458-5
Sampling location	Background, west of concrete pad	Northeast corner Chem-Fab property
Date	1/5/2000	1/13/2000
Reference	3, Table 3-1, p. 1; Table 5-1a, p. 6; Figure 4-1; Appendix C, p. 8; Appendix D, pp. 171, 179	3, Table 3-1, p. 3; Table 5-1a, p. 15; Figure 4-1; Appendix C, p. 37; Appendix D, pp. 45, 59, 72
Sampling depth	5-5.5 feet bgs	5-5.5 feet bgs
Metals (mg/kg)		
Chromium (III)	24	131

Hexavalent chromium	ND	11
Sample ID	**SB-21-02**	**SB-43-02**
Lab ID	L614044-8	L614520-4
Sampling location	Background west of 2-story frame building	Doylestown Store and Lock property
Date	1/10/2000	1/14/2000
Reference	3, Table 3-1, p. 2; Table 5-1a, p. 9; Figure 4-1; Appendix C, p. 21; Appendix D, pp. 222, 235	3, Table 3-1, p. 3; Table 5-1a, p. 17; Figure 4-1; Appendix C, p. 40; Appendix D, pp. 272, 276
Sampling depth	9.5-10 feet bgs	9.5-10 feet bgs
Metals (mg/kg)		
Chromium (III)	18.5	65 J
Hexavalent chromium	1.26	24.7

Notes:
AST = Aboveground storage tank
bgs = Below ground surface
DCE = Dichloroethene
ID = Identification
J = Estimated concentration
mg/kg = Milligram per kilogram
ND = Not detected above laboratory method detection limits
PCE = Tetrachloroethylene
SB = Soil boring
TCA = Trichloroethane
TCE = Trichloroethene
µg/kg = Microgram per kilogram
UST = Underground storage tank
VOC = Volatile organic compound

Phase II Site Characterization

From May 2 through 4, 2001, PADEP's environmental consultant collected additional soil boring samples from the Chem-Fab and Doylestown Store and Lock properties to further delineate the soil contamination identified during the initial site characterization (Ref. 27, pp. 1-1 and 3-4). Subsurface soil samples were collected by drilling 20 soil borings throughout the Chem-Fab and Doylestown Store and Lock properties (Ref. 27, p. 3-4). From September 24 through 27, 2001, PADEP's environmental consultant collected soil boring samples from inside of the abandoned warehouse on the Chem-Fab property and a drainage ditch (swale) on the Doylestown Store and Lock property (Ref. 27, p. 3-5).

Soil samples collected during the Phase II site characterization activities were placed in laboratory-supplied bottleware; sent to Severn Trent Laboratories, Inc., of Pittsburgh, Pennsylvania, a PADEP-contract laboratory; and analyzed for VOCs using EPA Method 8260, SVOCs using EPA Method 8270, TAL metals using EPA Method 6010, and cyanide and hexavalent and total chromium. EPA Method 5035 was used for VOC analysis (Ref. 27, p. 3-7).

Phase II Site Characterization - Exterior Chem-Fab Facility Sampling

In total, 35 soil samples were collected from the 20 soil borings and designated by the location and then by the sample number (i.e., B-01-01). Two soil samples were collected from each boring except B-09, B-13, B-15, B-19, and B-20, where only one sample was collected from each because of low PID readings and/or low soil recovery. One duplicate sample was collected (B-08-02); this sample was a duplicate of B-08-01 (Ref. 27, pp. 3-4, 3-5). References 82 and 83 show the sampling locations. Table 3 provides a summary of the background samples for the Phase II Site Characterization. As Table 3 shows, a background sample was selected for each specific sample depth. Table 4 summarizes the hazardous substances detected in Source 1 during the Phase II site characterization.

TABLE 3
BACKGROUND SAMPLING LOCATIONS
PHASE II SITE CHARACTERIZATION
EXTERIOR CHEM-FAB FACILITY

Depth (feet bgs)	**0-2**	**2-4**	**4-6**	**6-8**
Background Soil Samples	B-16-01	B-20-01	B-05-01	B-12-01
Date	5/3/2001	5/4/2001	5/3/2001	5/2/2001
Reference	27, Table 3-2, p. 1	27, Table 3-2, p. 1	27, Table 3-2, p. 1	27, Table 3-2, p. 1
Depth (feet bgs)	**8-10**	**10-11**	**10-12**	
Background Soil Samples	B-14-02	B-12-02	B-07-02	
Date	5/1/2001	5/2/2001	5/2/2001	
Reference	27, Table 3-2, p. 1	27, Table 3-2, p. 1	27, Table 3-2, p. 1	

Notes:
B = Boring
bgs = Below ground surface

TABLE 4
HAZARDOUS SUBSTANCES ASSOCIATED WITH SOURCE 1
PHASE II SITE CHARACTERIZATION
EXTERIOR CHEM-FAB FACILITY

Sample ID	**B-20-01**	**B-01-01**
Lab ID	C1E070115007	C1E030135003
Sampling Location	Background, west of AST farm	Southeast corner of AST farm
Date	5/4/2001	5/2/2001
Reference	27, Table 3-2, p. 1, Table 5-1a-3, p. 6, Table 5-1c, p. 5; 83; 121, pp. 5, 25, 26, 27	27, Table 3-2, p. 1, Table 5-1a-3, p. 1, Table 5-1c, p. 1; 82; 118, pp. 5, 16, 17, 42
Sampling depth	2-4 feet bgs	2-4 feet bgs
VOCs (µg/kg)		
1,2-DCE (total)	ND	11.0
PCE	ND	6,000
TCE	ND	64
Xylene (total)	ND	34
Metals (mg/kg)		
Hexavalent chromium	ND	10.4
Sample ID	**B-12-01**	**B-01-02**
Lab ID	C1E030135001	C1E030135004
Sampling location	Background, east of trailer area	Southeast corner of AST farm
Date	5/2/2001	5/2/2001
Reference	27, Table 3-2, p. 1, Table 5-1a-3, p. 3; 83; 118, pp. 5, 12, 13	27, Table 3-2, p. 1, Table 5-1a-3, p. 1; 82; 118, pp. 5, 20
Sampling depth	6-8 feet bgs	6-8 feet bgs
VOCs (µg/kg)		
1,1,1-TCA	ND	8
1,2-DCE (total)	ND	18.0
PCE	ND	110

Sample ID	**B-14-02**	**B-02-02**
Lab ID	C1E040175005	C1E030135006
Sampling location	Background, north corner of the property	Southeast of AST farm
Date	05/03/2001	05/05/2001
Reference	27, Table 3-2, p. 1, Table 5-1a-1, p. 5; 83; 120, pp. 5, 40, 41	27, Table 3-2, p. 1, Table 5-1c, p. 1; 82; 118, pp. 5, 42, 43
Sampling depth	8-10 feet bgs	8-10 feet bgs
Metals (mg/kg)		
Hexavalent chromium	ND	27.4
Sample ID	**B-05-01**	**B-03-01**
Lab ID	C1E040175008	C1E040175006
Sampling location	Background, AST farm	Former drum storage area
Date	5/3/2001	5/3/2001
Reference	27, Table 3-2, p. 1, Table 5-1a-3, p. 2, Table 5-1b, p. 3, Table 5-1c, p. 2; 83; 120, pp. 5, 31, 32, 39, 41	27, Table 3-2, p. 1, Table 5-1a-3, p. 1, Table 5-1b, p. 1, Table 5-1c, p. 1; 82; 120, pp. 5, 27, 28, 40, 41,
Sampling depth	4-6 feet bgs	4-6 feet bgs
VOCs (µg/kg)		
1,1,1-TCA	ND	11,000
1,2-DCE (total)	ND	4,500
PCE	ND	190,000
TCE	ND	130,000
Xylene (total)	ND	160,000
Metals (mg/kg)		
Chromium	23	7,870
Hexavalent chromium	11.2	243
Sample ID	**B-07-02**	**B-03-02**
Lab ID	C1E030135012	C1E040175007
Sampling location	Background, northeast of AST farm	AST farm
Date	5/2/2001	5/3/2001
Reference	27, Table 3-2, p. 1, Table 5-1a-3, p. 2, Table 5-1b, p. 5, Table 5-1c, p. 3; 83; 118, pp. 5, 40, 41, 42, 43	27, Table 3-2, p. 1, Table 5-1a-3, p. 1, Table 5-1b, p. 1, Table 5-1c, p. 1; 82; 120, pp. 5, 29, 30, 39, 41
Sampling depth	10-12 feet bgs	10-12 feet bgs
VOCs (µg/kg)		
1,1,1-TCA	ND	5,100 J

PCE	ND	110,000
TCE	13	120,000
Xylene (total)	ND	190,000
Metals (mg/kg)		
Hexavalent chromium	12.5	568
Sample ID	**B-12-01**	**B-04-01**
Lab ID	C1E030135001	C1E030135007
Sampling Location	Background, south trailer area	AST farm
Date	05/02/2001	05/02/2001
Reference	27, Table 3-2, p. 1, Table 5-1a-3, p. 3; 83; 118, pp. 5, 12, 13	27, Table 3-2, p. 1, Table 5-1a-3, p. 1; 82; 118, pp. 5, 26, 27
Sampling depth	6-8 feet bgs	6-8 feet bgs
VOCs (µg/kg)		
1,2-DCE (total)	ND	2,300
TCE	8.5	2,500
Xylene (total)	43	730 J
Sample ID	**B-07-02**	**B-04-02**
Lab ID	C1E030135012	C1E030135008
Sampling location	Background, northwest of AST farm	AST farm
Date	5/2/2001	5/2/2001
Reference	27, Table 3-2, p. 1, Table 5-1a-3, p. 2; Table 5-1c, p. 3; 83; 118, pp. 5, 40, 41, 42, 43	27, Table 3-2, p. 1, Table 5-1a-3, p. 2, Table 5-1c, p. 2; 82; 118, pp. 5, 28, 29, 43
Sampling depth	10-12 feet bgs	10-12 feet bgs
VOCs (µg/kg)		
1,2-DCE (total)	ND	7,200
PCE	ND	3,900
TCE	13	140,000
Xylene (total)	ND	45,000

Sample ID	**B-14-02**	**B-05-02**
Lab ID	C1E040175005	C1E040175009
Sampling location	Background, north corner of the property	AST farm
Date	05/03/2001	05/03/2001
Reference	27, Table 3-2, p. 1, Table 5-1a-3, p. 5; 83; 120, pp. 5, 25, 26	27, Table 3-2, p. 1, Table 5-1a-3, p. 2; 82; 120, pp. 5, 33, 34
Sampling depth	8-10 feet bgs	8-10 feet bgs
VOCs (µg/kg)		
1,1,1-TCA	ND	70 J
1,2-DCE (total)	ND	600
PCE	ND	680
TCE	ND	210 J
Sample ID	**B-20-01**	**B-06-01**
Lab ID	C1E070115007	C1E030135009
Sampling location	Background, west of AST farm	Northwest of AST farm
Date	5/3/2001	5/2/2001
Reference	27, Table 3-2, p. 1, Table 5-1a-3, p. 6; 83; 121, pp. 5, 25, 26	27, Table 3-2, p. 1, Table 5-1a-3, p. 2; 82; 118, pp. 5, 32, 33
Sampling depth	2-4 feet bgs	2-4 feet bgs
VOCs (µg/kg)		
1,2-DCE (total)	ND	990 J
PCE	ND	300 J
TCE	ND	44,000
Xylene (total)	ND	29,000
Sample ID	**B-12-01**	**B-06-02**
Lab ID	C1E030135001	C1E030135010
Sampling location	Background, south of trailer area	North of AST farm
Date	5/2/2001	5/2/2001
Reference	27, Table 3-2, p.1, Table 5-1a-3, p. 3; 83; 118, pp. 5, 12, 13	27, Table 3-2, p. 1, Table 5-1a-3, p. 2; 82; 118, pp. 5, 34, 35
Sampling depth	6-8 feet bgs	6-8 feet bgs
VOCs (µg/kg)		
TCE	8.5	2,200,000
Xylene (total)	43	180,000

Sample ID	**B-16-01**	**B-07-01**
Lab ID	C1E040175010	C1E030135011
Sampling location	Background, south of the trailer area	Southwest of abandoned warehouse
Date	5/3/2001	5/2/2001
Reference	27, Table 3-2, p. 1, Table 5-1a-3, p. 5; 83; 120, pp. 5, 35, 36	27, Table 3-2, p. 1, Table 5-1a-3, p. 2; 82; 118, pp. 5, 38, 39
Sampling depth	0-2 feet bgs	0-2 feet bgs
VOCs (µg/kg)		
1,2-DCE (total)	ND	14
TCE	ND	7.2
Sample ID	**B-05-01**	**B-08-01**
Lab ID	C1E040175008	C1E040175001
Sampling location	Background, AST farm	UST area
Date	5/3/2001	5/2/2001
Reference	27, Table 3-2, p. 1, Table 5-1a-3, p. 2; 83; 120, pp. 5, 31, 32	27, Table 3-2, p. 1, Table 5-1a-3, p. 2; 82; 120, pp. 5, 11, 12
Sampling depth	4-6 feet bgs	4-6 feet bgs
VOCs (µg/kg)		
1,2-DCE (total)	ND	9.5
PCE	ND	29
TCE	ND	450
Xylene (total)	ND	510
Sample ID	**B-05-01**	**B-08-02**
Lab ID	C1E040175008	C1E040175002
Sampling location	Background, AST farm	Southern corner of UST area
Date	5/3/2001	5/2/2001
Reference	27, Table 3-2, p. 1, Table 5-1a-3, p. 2; Table 5-1c, p. 2; 83; 120, pp. 5, 31, 32, 39	27, Table 3-2, p. 1, Table 5-1a-3, p. 3; Table 5-1c; p. 3; 82; 120, pp. 5, 15, 16, 39
Sampling depth	4-6 feet bgs	4-6 feet bgs
VOCs (µg/kg)		
1,2-DCE (total)	ND	9.8
PCE	ND	35
TCE	ND	260
Xylene (total)	ND	190

Metals (mg/kg)		
Hexavalent chromium	11.2	56.3
Sample ID	**B-12-02**	**B-08-03**
Lab ID	C1E030135002	C1E040175003
Sampling location	Background, south of trailer area	Southern corner of UST area
Date	5/2/2001	5/2/2001
Reference	27, Table 3-2, p. 1, Table 5-1a-3, p. 4; 83; 118, pp. 5, 14, 15	27, Table 3-2, p. 1, Table 5-1a-3, p. 3; 82; 120, pp. 5, 19, 20
Sampling depth	10-11 feet bgs	12-14 feet bgs
VOCs (µg/kg)		
1,2-DCE (total)	ND	9.8
PCE	ND	14
TCE	3.2 J	280
Xylene (total)	ND	110
Sample ID	**B-14-02**	**B-09-01**
Lab ID	C1E040175005	C1E020195003
Sampling location	Background, north corner of the property	Trailer area
Date	5/3/2001	5/1/2001
Reference	27, Table 3-2, p. 1, Table 5-1a-3, p. 5; 83; 120, pp. 5, 25, 26	27, Table 3-2, p. 1, Table 5-1a-3, p. 3; 82; 119, pp. 5, 17, 18
Sampling depth	8-10 feet bgs	8-10 feet bgs
VOCs (µg/kg)		
Xylene (total)	ND	9,800
Sample ID	**B-20-01**	**B-10-01**
Lab ID	C1E070115007	C1E020195001
Sampling Location	Background, west of AST farm area	Northwest corner of trailer area
Date	5/4/2001	5/1/2001
Reference	27, Table 3-2, p. 1, Table 5-1a-3, p. 6; 83; 121, pp. 5, 25, 26	27, Table 3-2, p. 1, Table 5-1a-3, p. 3; 82; 119, pp. 5, 11, 12
Sampling depth	2-4 feet bgs	2-4 feet bgs
VOCs (µg/kg)		
1,2-DCE (total)	ND	7.1
PCE	ND	3.5 J
Xylene (total)	ND	2,100

Sample ID	**B-05-01**	**B-10-02**
Lab ID	C1E040175008	C1E020195002
Sampling location	Background, AST farm	Northwest corner of trailer area
Date	5/3/2001	5/1/2001
Reference	27, Table 3-2, p. 1, Table 5-1a-3, p. 2; 83; 120, pp. 5, 31, 32	27, Table 3-2, p. 1, Table 5-1a-3, p. 3; 82; 119, pp. 5, 15, 16
Sampling depth	4-6 feet bgs	4-6 feet bgs; 119, pp. 5, 15, 16
VOCs (µg/kg)		
Xylene (total)	ND	240,000
Sample ID	**B-14-02**	**B-11-02**
Lab ID	C1E040175005	C1E020195006
Sampling location	Background, north corner of the property	Drum area
Date	5/3/2001	5/1/2001
Reference	27, Table 3-2, p. 1, Table 5-1a-3, p. 5; 83; 120, pp. 5, 25, 26	27, Table 3-2, p. 1, Table 5-1a-3, p. 3; 82; 119, pp. 5, 23, 24
Sampling depth	8-10 feet bgs	8-10 feet bgs
VOCs (µg/kg)		
TCE	ND	37
Xylene (total)	ND	34
Sample ID	**B-14-02**	**B-13-01**
Lab ID	C1E040175005	C1E020195004
Sampling location	Background, north corner of the property	UST area
Date	5/3/2001	5/1/2001
Reference	27, Table 3-2, p. 1, Table 5-1a-3, p. 5; 83; 120, pp. 5, 25, 26	27, Table 3-2, p. 11 Table 5-1a-3, p. 5; 82; 119, pp. 5, 19, 20
Sampling depth	8-10 feet bgs	8-10 feet bgs
VOCs (µg/kg)		
Xylene (total)	ND	4,100

Sample ID	**B-16-01**	**B-14-01**
Lab ID	C1E040175010	C1E040175004
Sampling location	Background, south of the trailer area	North corner of Chem-Fab property
Date	5/3/2001	5/3/2001
Reference	27, Table 3-2, p. 3, Table 5-1a-3, p. 5; 83; 120, pp. 5, 35, 36	27, Table 3-2, p. 1, Table 5-1a-3, p. 5; 82; 120, pp. 5, 23, 24
Sampling depth	0-2 feet bgs	0-2 feet bgs
VOCs (µg/kg)		
TCE	ND	7.8
Sample ID	**B-12-01**	**B-16-02**
Lab ID	C1E030135001	C1E040175011
Sampling location	Background, south of the trailer area	Southwest of Chem-Fab property
Date	5/2/2001	5/3/2001
Reference	27, Table 3-2, p. 1, Table 5-1a-3, p. 3; 83; 118, pp. 5, 12, 13	27, Table 3-2, p. 1, Table 5-1a-3, p. 5; 82; 120, pp. 5, 37, 38
Sampling depth	6-8 feet bgs	6-8 feet bgs
VOCs (µg/kg)		
1,1,1-TCA	ND	10
1,2-DCE (total)	ND	21
TCE	8.5	260
Sample ID	**B-12-01**	**B-17-01**
Lab ID	C1E030135001	C1E070115001
Sampling location	Background, south of the trailer area	Southwest of Chem-Fab property
Date	5/2/2001	5/4/2001
Reference	27, Table 3-2, p. 1, Table 5-1a-3, p. 3; 83; 118, pp. 5, 12, 13	27, Table 3-2, p. 1, Table 5-1a-3, p. 5; 82; 121, pp. 5, 11, 12
Sampling depth	6-8 feet bgs	6-8 feet bgs
VOCs (µg/kg)		
1,2-DCE (total)	ND	29
PCE	ND	10

Sample ID	**B-14-02**	**B-17-02**
Lab ID	C1E040175005	C1E070115002
Sampling location	Background, north corner of the property	Southwest of Chem-Fab property
Date	5/3/2001	5/4/2001
Reference	27, Table 3-2, p. 1, Table 5-1a-3, p. 5; 83; 120, pp. 5, 25, 26	27, Table 3-2, p. 1, Table 5-1a-3, p. 5; 82; 121, pp. 5, 15, 16
Sampling depth	8-10 feet bgs	8-10 feet bgs
VOCs (µg/kg)		
TCE	ND	36
Sample ID	**B-05-01**	**B-18-01**
Lab ID	C1E040175008	C1E070115004
Sampling location	Background, AST farm	West of AST farm
Date	5/3/2001	5/4/2001
Reference	27, Table 3-2, p. 1, Table 5-1a-3, p. 2; 83; 120, pp. 5, 31, 32	27, Table 3-2, p. 1, Table 5-1a-3, p.6; 82; 121, pp. 5, 19, 20
Sampling depth	4-6 feet bgs	4-6 feet bgs
VOCs (µg/kg)		
TCE	ND	430
Sample ID	**B-14-02**	**B-18-02**
Lab ID	C1E040175005	C1E070115005
Sampling location	Background, north corner of the property	West of AST farm
Date	5/3/2001	5/4/2001
Reference	27, Table 3-2, p. 1, Table 5-1a-3, p. 5; 83; 120, pp. 5, 25, 26	27, Table 3-2, p. 1, Table 5-1a-3, p. 6; 82; 121, pp. 5, 21, 22
Sampling depth	8-10 feet bgs	8-10 feet bgs
VOCs (µg/kg)		
TCE	ND	1,200

Sample ID	**B-12-01**	**B-19-01**
Lab ID	C1E030135001	C1E070115006
Sampling location	Background, south trailer area	West of AST farm
Date	5/2/2001	5/4/2001
Reference	27, Table 3-2, p. 1, Table 5-1a-3, p. 3; 83; 118, pp. 5, 12, 13	27, Table 3-2, p. 1, Table 5-1a-3, p. 6; 82; 121, pp. 5, 23, 24
Sampling depth	6-8 feet bgs	6-8 feet bgs
VOCs (µg/kg)		
1,2-DCE (total)	ND	21
PCE	ND	6.2

Notes:
AST = Aboveground storage tank
B = Boring
bgs = Below ground surface
DCE = Dichloroethene
E = The reported valued is estimated because of interference (Ref. 27, Table 5-1c, p. 2).
ID = Identification
J = Estimated concentration
mg/kg = Milligram per kilogram
ND = Not detected above laboratory method detection limits
PCE = Tetrachloroethylene
TCA = Trichloroethane
TCE = Trichloroethene
µg/kg = Microgram per kilogram
VOC = Volatile organic compound

Phase II Site Characterization - Interior Chem-Fab Warehouse Sampling

On September 24 through 27, 2001, additional subsurface soil investigations were performed as part of the Phase II site characterization to investigate a portion of the interior of the abandoned warehouse. A grid measuring approximately 25 by 65 feet bgs with 10-square-foot squares was established over the interior of the abandoned warehouse, and 15 soil borings were installed within this grid. The soil borings, identified as IB-01 to IB-15, were drilled to refusal (8 feet 4 inches to 11 feet 4 inches in depth). The borings were field screened continuously using a PID and examined for obvious signs of staining and odor. Samples were collected from two areas within the borings, biased on elevated PID readings and the bedrock/soil interface (Ref. 27, p. 3-5).

Thirty-two soil samples (two per boring plus two duplicate samples) were collected for laboratory analysis. Samples IB-16-01 and IB-16-02 were duplicates of IB-12-01 and IB-12-02, respectively. During soil sampling activities, the borings remained open to allow observation of whether water entered the boring. When encountered, samples of this water were collected into glass containers for visual review. Several of these samples were yellow. No aqueous samples were submitted for analysis (Ref. 27, p. 3-5). The soil sampling locations are illustrated on maps in References 82 and 83. Table 5 provides a summary of the background samples for the Phase II site characterization. As Table 5 shows, a background sample was selected for each specific sample depth. Table 6 summarizes the hazardous substances detected in Source 1 during the Phase II site characterization.

TABLE 5
BACKGROUND SAMPLING LOCATIONS
PHASE II SITE CHARACTERIZATION
INTERIOR CHEM-FAB WAREHOUSE

Depth (feet bgs)	**0.5-1.5**	**4-5**	**5-6**	**6-7**
Background Soil Samples	IB-07-01	IB-09-01	IB-15-02	XB-08-01
Date	9/27/2001	9/25/2001	9/25/2001	9/27/2001
Reference	27, Table 3-2, p. 2	27, Table 3-2, p. 2	27, Table 3-2, p. 2	27, Table 3-2, p. 3
Depth (feet bgs)	**8.5-9.5**	**10.5-11.5**		
Background Soil Samples	IB-14-02	IB-11-02		
Date	9/25/2001	9/25/2001		
Reference	27, Table 3-2, p. 2	27, Table 3-2, p. 2		

Notes:
bgs = Below ground surface
IB = Interior boring
XB = Exterior boring

TABLE 6
HAZARDOUS SUBSTANCES ASSOCIATED WITH SOURCE 1
PHASE II SITE CHARACTERIZATION
INTERIOR CHEM-FAB WAREHOUSE

Sample ID	**XB-08-01**	**IB-01-01**
Sampling location	Background, Doylestown Store and Lock property	Abandoned warehouse area west of etching lab
Reference	27, Table 3-2, p. 3, Table 5-1a-1, p. 2; 83; 124, pp. 5, 7, 29, 30	27, Table 3-2, p. 2, Table 5-1a-2, p. 1; 82; 122 p. 6, 28, 29
Date	9/27/2001	9/24/2001
Sampling depth	6-7 feet bgs	7-8 feet bgs
VOCs (µg/kg)		
1,2-DCE (total)	ND	24
TCE	ND	180
Sample ID	**IB-11-02**	**IB-01-02**
Sampling location	Background, warehouse	Abandoned warehouse area west of etching lab
Date	9/25/2001	9/24/2001
Reference	27, Table 3-2, p. 2, Table 5-2a, p. 4; 83; 123, pp. 5, 17, 18	27, Table 3-2, p. 2, Table 5-1a-2, p.1; 82; 122, p. 6, 30, 31
Sampling depth	10.5-11.5 feet bgs	10-11 feet bgs
VOCs (µg/kg)		
TCE	ND	1,200
Sample ID	**IB-14-02**	**IB-02-02**
Sampling location	Background, warehouse	Abandoned warehouse area west of etching lab
Date	9/25/2001	9/24/2001
Reference	27, Table 3-2, p. 2, Table 5-1a-2, p. 5; 83; 123, pp. 5, 33, 34	27, Table 3-2, p. 2, Table 5-1a-2, p. 1; 82; 122, pp. 6, 34, 35
Sampling depth	8.5-9.5 feet bgs	8-9 feet bgs
VOCs (µg/kg)		
1,2-DCE (total)	ND	5.8
TCE	1.9 J	110

Sample ID	**XB-08-01**	**IB-03-02**
Sampling location	Background, Doylestown Store and Lock property	Abandoned warehouse area north of former sump
Date	9/27/2001	9/24/2001
Reference	27, Table 3-2, p. 3, Table 5-1a-1, p. 1; 83; 124, pp. 5, 29, 30	27, Table 3-2, p. 2, Table 5-1a-2, p. 1; 82; 122, pp. 6, 38, 39
Sampling depth	6-7 feet bgs	7-8 feet bgs
VOCs (µg/kg)		
1,2-DCE (total)	ND	13
PCE	ND	13
TCE	ND	490
Sample ID	**IB-07-01**	**IB-04-01**
Sampling location	Background, warehouse	Abandoned warehouse area north of AST farm
Date	9/25/2001	9/25/2001
Reference	27, Table 3-2, p. 2, Table 5-1a-2, p. 3; 83; 122, p. 7, 56, 57	27, Table 3-2, p. 2, Table 5-1a-2, p. 2; 82; 122, pp. 6, 42, 43
Sampling depth	0.5-1.5 feet bgs	0.5-1.5 feet bgs
VOCs (µg/kg)		
1,2-DCE (total)	18	100
TCE	ND	52
Sample ID	**XB-08-01**	**IB-04-02**
Sampling location	Background, Doylestown Store and Lock property	Abandoned warehouse area north of AST farm
Date	9/27/2001	9/25/2001
Reference	27, Table 3-2, p. 3, Table 5-1a-3, p. 1; 83; 124, p. 29, 30	27, Table 3-2, p. 2, Table 5-1a-2 , p. 2; 82; 122, pp. 6, 44, 45
Sampling depth	6-7 feet bgs	6.5-7.5 feet bgs
VOCs (µg/kg)		
1,2-DCE (total)	ND	66
PCE	ND	15
TCE	ND	230

Sample ID	**IB-15-02**	**IB-05-01**
Sampling location	Background, warehouse	North corner of AST farm
Date	9/25/2001	9/25/2001
Reference	27, Table 3-2, p. 2, Table 5-1a-2, p. 5; 83; 123, pp. 5, 13, 14	27, Table 3-2, p. 2, Table 5-1a-2, p. 2; 82; 122, pp. 7, 48, 49
Sampling depth	5-6 feet bgs	5-6 feet bgs
VOCs (µg/kg)		
1,2-DCE (total)	ND	44
TCE	4.5 J	28
Sample ID	**IB-14-02**	**IB-05-02**
Sampling location	Background, warehouse	North corner of AST farm
Date	9/25/2001	9/25/2001
Reference	27, Table 3-2, p. 2, Table 5-1a-2, p. 5; 83; 123, pp. 33, 34	27, Table 3-2, p. 2, Table 5-1a-2, p. 2; 82; 122, pp. 7, 50, 51
Sampling depth	8.5-9.5 feet bgs	8-9 feet bgs
VOCs (µg/kg)		
1,2-DCE (total)	ND	61
TCE	1.9 J	52
Sample ID	**IB-07-01**	**IB-06-01**
Sampling location	Background, warehouse	Abandoned warehouse north of AST farm
Date	9/25/2001	9/25/2001
Reference	27, Table 3-2, p. 2, Table 5-1a-2, p. 3; 83; 122, pp. 7, 56, 57	27, Table 3-2, p. 2, Table 5-1a-2, p. 2; 82; 122, pp. 7, 52, 53
Sampling depth	0.5-1.5 feet bgs	1.5-2.5 feet bgs
VOCs (µg/kg)		
1,2-DCE (total)	18	2,500
PCE	ND	1,400
TCE	ND	3,700

Sample ID	**IB-14-02**	**IB-06-02**
Sampling location	Background, warehouse	Abandoned warehouse north of AST farm
Date	9/25/2001	9/25/2001
Reference	27, Table 3-2, p. 2, Table 5-1a-2, p. 5; 83; 123, pp. 6, 33, 34	27, Table 3-2, p. 2, Table 5-1a-2, p. 2; 82; 122, pp. 7, 54, 55
Sampling depth	8.5-9.5 feet bgs	8-9 feet bgs
VOCs (µg/kg)		
1,2-DCE (total)	ND	170 J
PCE	ND	120 J
TCE	1.9 J	440
Sample ID	**IB-09-01**	**IB-07-02**
Sampling location	Background, warehouse	Abandoned warehouse north of AST farm
Date	9/25/2001	9/25/2001
Reference	27, Table 3-2, p. 2, Table 5-1a-2, p. 3; 83; 122, pp. 7, 64, 65	27, Table 3-2, p. 2, Table 5-1a-2, p. 3; 82; 122, pp. 7, 58, 59
Sampling depth	4-5 feet bgs	5-6 feet bgs
VOCs (µg/kg)		
1,2-DCE (total)	ND	180
PCE	ND	12
TCE	ND	98
Sample ID	**IB-07-01**	**IB-08-01**
Sampling location	Background, warehouse	Abandoned warehouse north of AST farm
Date	9/25/2001	9/25/2001
Reference	27, Table 3-2, p. 2, Table 5-1a-2, p. 3; 83; 122, pp. 7, 56, 57	27, Table 3-2, p. 2, Table 5-1a-2, p. 3; 82; 122, pp. 7, 60, 61
Sampling depth	0.5-1.5 feet bgs	0-1 feet bgs
VOCs (µg/kg)		
TCE	ND	150 J

Sample ID	**IB-09-01**	**IB-08-02**
Sampling location	Background, warehouse	Abandoned warehouse north of AST farm
Date	9/25/2001	9/25/2001
Reference	27, Table 3-2, p. 2, Table 5-1a-2, p. 3; 83; 122, pp. 7, 64, 65	27, Table 3-2, p. 2, Table 5-1a-2, p. 3; 82; 122, pp. 7, 62, 63
Sampling depth	4-5 feet bgs	4-5 feet bgs
VOCs (µg/kg)		
1,2-DCE (total)	ND	7
TCE	ND	10
Sample ID	**IB-07-01**	**IB-10-01**
Sampling location	Background, warehouse	Abandoned warehouse south of UST area
Date	9/25/2001	9/25/2001
Reference	27, Table 3-2, p. 2, Table 5-1a-2, p. 3; 83; 122, pp. 7, 56, 57	27, Table 3-2, p. 2, Table 5-1a-2, p. 4; 82; 122, pp. 7, 68, 69
Sampling depth	0.5-1.5 feet bgs	0-1 feet bgs
VOCs (µg/kg)		
TCE	ND	42
Sample ID	**XB-08-01**	**IB-10-02**
Sampling location	Background, Doylestown Store and Lock property	Abandoned warehouse south of UST area
Date	9/27/2001	9/25/2001
Reference	27, Table 3-2, p. 2, Table 5-1a-1, p. 2; 83; 124, pp. 5, 29, 30	27, Table 3-2, p. 2, Table 5-1a-2, p. 4; 82; 122, pp. 7, 70, 71
Sampling depth	6-7 feet bgs	7-8 feet bgs
VOCs (µg/kg)		
1,2-DCE (total)	ND	20
PCE	ND	5.3
TCE	ND	67

Sample ID	**IB-07-01**	**IB-11-01**
Sampling location	Background, warehouse	UST area
Date	9/25/2001	9/25/2001
Reference	27, Table 5-1a-2, p. 3; 83; 122, pp. 7, 56, 57	27, Table 5-1a-2, p. 4; 82; 123, pp. 5, 16
Sampling depth	0.5-1.5 feet bgs	0.5-1.5 feet bgs
VOCs (µg/kg)		
TCE	ND	20
Sample ID	**XB-08-01**	**IB-12-01**
Sampling location	Background, Doylestown Store and Lock property	Abandoned warehouse south of UST area
Date	9/27/2001	9/25/2001
Reference	27, Table 3-2, p. 2, Table 5-1a-1, p. 2; 83; 124, pp. 5, 29, 30	27, Table 3-2, p. 2, Table 5-1a-2, p. 4; 82; 122, pp. 8, 72, 73
Depth	6-7 feet bgs	7-8 feet bgs
VOCs (µg/kg)		
1,2-DCE (total)	ND	270
PCE	ND	91 J
TCE	ND	610
Sample ID	**IB-14-02**	**IB-12-02**
Sampling location	Background, warehouse	Abandoned warehouse south of UST area
Date	9/25/2001	9/25/2001
Reference	27, Table 3-2, p. 2, Table 5-1a-2, p. 5; 83; 123, pp. 5, 33, 34	27, Table 3-2, p. 2, Table 5-1a-2, p. 4; 82; 122, pp. 8, 74, 75
Sampling depth	8.5-9.5 feet bgs	8.5-9.5 feet bgs
VOCs (µg/kg)		
1,2-DCE (total)	ND	480
PCE	ND	120
TCE	1.9 J	590

Sample ID	**IB-07-01**	**IB-13-01**
Sampling location	Background, warehouse	Abandoned warehouse south of UST area
Date	9/25/2001	9/25/2001
Reference	27, Table 3-2, p. 2, Table 5-1a-2, p. 3; 83; 122, pp. 7, 56, 57	27, Table 3-2, p. 2, Table 5-1a-2, p. 5; 82; 122, pp. 8, 78, 79
Sampling depth	0.5-1.5 feet bgs	0.5-1.5 feet bgs
VOCs (µg/kg)		
TCE	ND	6
Sample ID	**XB-08-01**	**IB-13-02**
Sampling location	Background, Doylestown Store and Lock property	Abandoned warehouse south of UST area
Date	9/27/2001	9/25/2001
Reference	27, Table 3-2, p. 2, Table 5-1a-1, p. 2; 83; 124, pp. 5, 29, 30	27, Table 3-2, p. 2, Table 5-1a-2, p. 5; 82; 122, pp. 8, 80, 81
Sampling depth	6-7 feet bgs	5-6 feet bgs
VOCs (µg/kg)		
1,2-DCE (total)	ND	7.3
TCE	ND	20
Sample ID	**XB-08-01**	**IB-16-01**
Sampling location	Background, Doylestown Store and Lock property	Duplicate of IB-12-01
Date	9/27/2001	9/25/2001
Reference	27, Table 3-2, p. 2, Table 5-1a-1, p. 2; 83; 124, pp. 5, 29, 30	27, Table 3-2, p. 2, Table 5-1a-2, p. 6; 82; 122, pp. 8, 82, 83
Sampling depth	6-7 feet bgs	7-8 feet bgs
VOCs (µg/kg)		
1,2-DCE (total)	ND	480
PCE	ND	180 J
TCE	ND	960

Sample ID	**IB-14-02**	**IB-16-02**
Sampling location	Background, warehouse	Duplicate of IB-12-02
Date	9/25/2001	9/25/2001
Reference	27, Table 3-2, p. 2, Table 5-1a-2, p. 5; 83; 123, pp. 5, 33 34	27, Table 3-2, p. 2, Table 5-1a-2, p. 6; 82; 122, pp. 8, 84, 85
Sampling depth	8.5-9.5 feet bgs	8.5-9.5 feet bgs
VOCs (µg/kg)		
1,2-DCE (total)	ND	140
PCE	ND	39
TCE	1.9 J	170

Notes:
AST = Aboveground storage tank
bgs = Below ground surface
DCE = Dichloroethene
IB = Interior boring
ID = Identification
J = Estimated concentration
ND = Not detected above laboratory method detection limits
PCE = Tetrachloroethylene
TCE = Trichloroethene
µg/kg = Microgram per kilogram
VOC = Volatile organic compound
XB = Exterior boring

Phase II Site Characterization – Drainage Swale Sampling

During the Phase II site characterization, Geoprobe sampling was completed in an area of concern observed on the Doylestown Store and Lock property. This area of concern was in the southwest corner of the Doylestown Store and Lock property, in a drainage swale where yellow water and sheen was observed. Preliminary gas chromatograph results collected earlier when yellow water was first observed indicated the area contained elevated concentrations of VOCs. In total, 16 soil borings (designated as XB-01 to XB-16) were drilled in the drainage swale. Soil samples were collected from two areas within the borings, biased on elevated PID readings and the soil/water or bedrock/soil interface. In total, 32 soil samples were collected for laboratory analysis. During the soil sampling activities, the borings remained open and when water was encountered, grab samples were collected for visual observation. Many of the samples were yellow (Ref. 27, p. 3-6).

Reference 82 shows the contaminated soil boring locations and Reference 83 shows the background soil boring locations. Table 7 provides a summary of the background samples for the Phase II site characterization. As Table 7 shows, a background sample was selected for each specific sample depth. Table 8 summarizes the concentrations of hazardous substances detected in soil samples collected from the drainage swale during Phase II site characterization activities.

TABLE 7
BACKGROUND SAMPLING LOCATIONS
PHASE II SITE CHARACTERIZATION
DRAINAGE SWALE SAMPLING

Depth (feet bgs)	**1-2**	**6-7**	**8-9**
Background Soil Samples	XB-16-01	XB-08-01	XB-14-01
Date	9/27/2001	9/27/2001	9/27/2001
Reference	27, Table 3-2, p. 3	27, Table 3-2, p. 3	27, Table 3-2, p. 3
Depth (feet bgs)	**9.5-10.5**	**10-11**	
Background Soil Samples	XB-11-02	XB-13-02	
Date	9/26/2001	9/27/2001	
Reference	27, Table 3-2, p. 3	27, Table 3-2, p. 3	

Notes:
bgs = Below ground surface
XB = Exterior boring

TABLE 8
HAZARDOUS SUBSTANCES ASSOCIATED WITH SOURCE 1
PHASE II SITE CHARACTERIZATION
DRAINAGE SWALE SAMPLING

Sample ID	**XB-08-01**	**XB-01-01**
Sampling location	Background, Doylestown Store and Lock property	Doylestown Store and Lock property
Date	9/27/2001	9/24/2001
Reference	27, Table 3-2, p. 3; Table 5-1a-1, p. 2; 83; 124, pp. 5, 29, 30	27, Table 3-2, p. 3; Table 5-1a-1, p. 1; 82; 122, pp. 6, 22, 23
Sampling depth	6-7 feet bgs	4-5 feet bgs
VOCs (µg/kg)		
1,2-DCE (total)	ND	8.2
TCE	ND	290

Sample ID	**XB-08-01**	**XB-01-02**
Sampling location	Background, Doylestown Store and Lock property	Doylestown Store and Lock property
Date	9/27/2001	9/24/2001
Reference	27, Table 3-2, p. 3; Table 5-1a-1, p. 2; 83; 124, pp. 5, 30	27, Table 3-2, p. 3; Table 5-1a-1, p. 1; 82; 122, pp. 6, 26, 27
Sampling depth	6-7 feet bgs	7-8 feet bgs
VOCs (µg/kg)		
TCE	ND	130
Sample ID	**XB-16-01**	**XB-03-01**
Sampling location	Background, Doylestown Store and Lock property	Doylestown Store and Lock property
Date	9/27/2001	9/24/2001
Reference	27, Table 3-2, p. 3; Table 5-1a-1, p. 4; 83; 124, pp. 6, 57, 58	27, Table 3-2, p. 3; Table 5-1a-1, p. 1; 82; 122, pp. 6, 16, 17
Sampling depth	1-2 feet bgs	2-3 feet bgs
VOCs (µg/kg)		
1,2-DCE (total)	ND	34
PCE	ND	5.6
TCE	ND	230
Sample ID	**XB-11-02**	**XB-03-02**
Sampling location	Background, Doylestown Store and Lock property	Doylestown Store and Lock property
Date	9/26/2001	9/24/2001
Reference	27, Table 3-2, p. 3; Table 5-1a-1, p. 3; 83; 123, pp. 5, 21, 22	27, Table 3-2, p. 3; Table 5-1a-1, p. 1; 82; 122, pp. 6, 21
Sampling depth	9.5-10.5 feet bgs	10-11 feet bgs
VOCs (µg/kg)		
TCE	1.4 J	12

Sample ID	**XB-14-02**	**XB-04-02**
Sampling location	Background, Doylestown Store and Lock property	Doylestown Store and Lock property
Date	9/27/2001	9/27/2001
Reference	27, Table 3-2, p. 3; Table 5-1a-1, p. 4; 83; 124, pp. 5, 40	27, Table 3-2, p. 3; Table 5-1a-1, p. 1; 82; 124, pp. 6, 44
Sampling depth	8-9 feet bgs	8.5-9.5 feet bgs
VOCs (µg/kg)		
TCE	ND	60
Sample ID	**XB-08-01**	**XB-05-02**
Sampling location	Background, Doylestown Store and Lock property	Doylestown Store and Lock property
Date	9/27/2001	9/27/2001
Reference	27, Table 3-2, p. 3; Table 5-1a-1, p. 2; 83; 124, pp. 5, 30	27, Table 3-2, p. 3; Table 5-1a-1, p. 2; 82; 124, pp. 5, 36
Sampling depth	6-7 feet bgs	6-7 feet bgs
VOCs (µg/kg)		
TCE	ND	33
Sample ID	**XB-08-01**	**XB-06-02**
Sampling location	Background, Doylestown Store and Lock property	Doylestown Store and Lock property
Date	9/27/2001	9/26/2001
Reference	27, Table 3-2, p. 3; Table 5-1a-1, p. 2; 83; 124, pp. 5, 30	27, Table 3-2, p. 3; Table 5-1a-1, p. 2; 82; 123, pp. 5, 30
Sampling depth	6-7 feet bgs	6.5-7.5 feet bgs
VOCs (µg/kg)		
TCE	ND	5.3
Sample ID	**XB-08-01**	**XB-07-01**
Sampling location	Background, Doylestown Store and Lock property	Doylestown Store and Lock property
Date	9/27/2001	9/26/2001
Reference	27, Table 3-2, p. 3; Table 5-1a-1, p. 2; 83; 124, pp. 5, 30, 65	27, Table 3-2, p. 3; Table 5-1a-1, p. 2; 82; 124, pp. 5, 22, 65
Sampling depth	6-7 feet bgs	4.5-5.5 feet bgs
VOCs (µg/kg)		
TCE	ND	34

Sample ID	**XB-08-01**	**XB-07-01**
Metals (mg/kg)		
Hexavalent chromium	ND	30.2
Sample ID	**XB-08-01**	**XB-07-02**
Sampling location	Background, Doylestown Store and Lock property	Doylestown Store and Lock property
Date	9/27/2001	9/26/2001
Reference	27, Table 3-2, p. 3; Table 5-1a-1, p. 2; 83; 124, pp. 5, 29, 30	27, Table 3-2, p. 3; Table 5-1a-1, p. 2; 82; 124, pp. 5, 23, 24
Sampling depth	6-7 feet bgs	7.5-8.5 feet bgs
VOCs (µg/kg)		
1,2-DCE (total)	ND	29
PCE	ND	14
TCE	ND	130
Sample ID	**XB-11-02**	**XB-08-02**
Sampling location	Background, Doylestown Store and Lock property	Doylestown Store and Lock property
Date	9/26/2001	9/27/2001
Reference	27, Table 3-2, p. 3; Table 5-1a-1, p. 3, Table 5-1c-3, p. 3; 83; 123, pp. 5, 21, 22, 35	27, Table 3-2, p. 3; Table 5-1a-1, p. 2, Table 5-1c-3, p. 2; 82; 124, pp. 5, 31, 32, 65
Sampling depth	9.5-10.5 feet bgs	9-10 feet bgs
VOCs (µg/kg)		
1,2-DCE (total)	ND	5.8
TCE	1.4 J	14
Metals (mg/kg)		
Hexavalent chromium	0.71	57.5

Sample ID	**XB-08-01**	**XB-09-01**
Sampling location	Background, Doylestown Store and Lock property	Doylestown Store and Lock property
Date	9/27/2001	9/27/2001
Reference	27, Table 3-2, p. 3; Table 5-1a-1, p. 2, Table 5-1c-3, p. 2; 83; 124, pp. 5, 29, 30, 64, 65	27, Table 3-2, p. 3; Table 5-1a-1, p. 3, Table 5-1c-3, p. 3; 82; 124, pp. 5, 25, 26, 64, 65
Sampling depth	6-7 feet bgs	6.5-7.5 feet bgs
VOCs (µg/kg)		
1,2-DCE (total)	ND	5.9
TCE	ND	5.7
Metals (mg/kg)		
Hexavalent chromium	ND	26.9
Sample ID	**XB-08-01**	**XB-10-01**
Sampling location	Background, Doylestown Store and Lock property	Doylestown Store and Lock property
Date	9/27/2001	9/26/2001
Reference	27, Table 3-2, p. 3; Table 5-1a-1, p. 2, Table 5-1c-3, p. 2; 83; 124, pp. 5, 29, 30, 64, 65	27, Table 3-2, p. 3; Table 5-1a-1, p. 3, Table 5-1c-3, p. 3; 82; 124, pp. 5, 17, 18, 66
Sampling depth	6-7 feet bgs	7-8 feet bgs
VOCs (µg/kg)		
1,2-DCE (total)	ND	23
PCE	ND	12
TCE	ND	64
Xylene (total)	ND	16
Metals (mg/kg)		
Hexavalent chromium	ND	44.3

Sample ID	**XB-11-02**	**XB-10-02**
Sampling location	Background, Doylestown Store and Lock property	Doylestown Store and Lock property
Date	9/26/2001	9/26/2001
Reference	27, Table 3-2, p. 3; Table 5-1a-1, p. 3; 83; 123, pp. 5, 21, 22	27, Table 3-2, p. 3; Table 5-1a-1, p. 3; 82; 124, pp. 5, 19, 20
Sampling depth	9.5-10.5 feet bgs	9-10 feet bgs
VOCs (µg/kg)		
1,2-DCE (total)	ND	30
PCE	ND	17
TCE	1.4 J	100
Xylene (total)	ND	20
Sample ID	**XB-11-02**	**XB-12-02**
Sampling location	Background, Doylestown Store and Lock property	Doylestown Store and Lock property
Date	9/26/2001	9/26/2001
Reference	27, Table 3-2, p. 3; Table 5-1a-1, p. 2; 83; 123, pp. 5, 21	27, Table 3-2, p. 3; Table 5-1a-1, p. 2; 82; 123, pp. 5, 26
Sampling depth	9.5-10.5 feet bgs	9-10 feet bgs
VOCs (µg/kg)		
TCE	1.4 J	63
Sample ID	**XB-14-02**	**XB-15-01**
Sampling location	Background, Doylestown Store and Lock property	Doylestown Store and Lock property
Date	9/27/2001	9/27/2001
Reference	27, Table 3-2, p. 3; Table 5-1a-1, p. 3; 83; 124, pp. 5, 39, 40	27, Table 3-2, p. 3; Table 5-1a-1, p. 3; 82; 124, pp. 6, 45, 46
Sampling depth	8-9 feet bgs	8.5-9.5 feet bgs
VOCs (µg/kg)		
TCE	ND	41

Sample ID	**XB-13-02**	**XB-15-02**
Sampling location	Background, Doylestown Store and Lock property	Doylestown Store and Lock property
Date	9/27/2001	9/27/2001
Reference	27, Table 3-2, p. 3; Table 5-1a-1, p. 3; 83; 124, pp. 6, 55, 56	27, Table 3-2, p. 3; Table 5-1a-1, p. 3; 82; 124, pp. 6, 47, 48
Sampling depth	10-11 feet bgs	10.5-11.5 feet bgs
VOCs (µg/kg)		
1,2-DCE (total)	ND	18
TCE	ND	170
Sample ID	**XB-14-02**	**XB-16-02**
Sampling location	Background, Doylestown Store and Lock property	Doylestown Store and Lock property
Date	9/27/2001	9/27/2001
Reference	27, Table 3-2, p. 3; Table 5-1a-1, p. 3; 83; 124, pp. 5, 39, 40	27, Table 3-2, p. 3; Table 5-1a-1, p. 3; 82; 124, pp. 6, 59, 60
Sampling depth	8-9 feet bgs	8.5-9.5 feet bgs
VOCs (µg/kg)		
1,2-DCE (total)	ND	59
PCE	ND	47
TCE	ND	500

Notes:
bgs = Below ground surface
DCE = Dichloroethene
ID = Identification
J = Estimated concentration
mg/kg = Milligram per kilogram
ND = Not detected above laboratory method detection limits
PCE = Tetrachloroethylene
TCE = Trichloroethene
µg/kg = Microgram per kilogram
VOC = Volatile organic compound
XB = Exterior boring

2.4.2 Hazardous Waste Quantity

2.4.2.1.1 Hazardous Constituent Quantity

The information available is not sufficient to adequately support the evaluation of the hazardous constituent quantity for Source No. 1.

Sum (pounds): Unknown
Hazardous Constituent Quantity Value (C): Not applicable (NA)

2.4.2.1.2 Hazardous Waste Stream Quantity

The information available is not sufficient to adequately support the evaluation of the hazardous waste stream quantity for Source No. 1.

Sum (pounds): Unknown
Hazardous Waste Stream Quantity: NA

2.4.2.1.3 Volume

The volume of contaminated soil (Source No. 1) has not been documented.

Dimensions of source (cubic yards [yd^3] or gallons): unknown
Volume Assigned Value: 0

2.4.2.1.4 Area

Because the volume of contaminated soil associated with Source No. 1 has not been adequately determined, the area of Source No. 1 was evaluated (Ref. 1, Section 2.4.2.1.3). Source 1 consists of areas of soil contamination detected in a range of depths within a 240-square-foot area, which comprises the Chem-Fab facility and the Doylestown Store and Lock property (Ref. 82). The contamination detected in these areas impacts similar target populations for the ground water migration pathway, is comprised of the same source type (contaminated soil), and has similar containment for the ground water pathway, therefore, they were combined as one source (see Tables 2, 4, 6, and 8 of the HRS documentation record). The area of contamination cannot be determined from available data. Therefore, the area of contamination is evaluated as greater than zero, but unknown.

Area of Source (square feet bgs): greater than zero, but unknown
Area Assigned Value: greater than zero, but unknown

2.4.2.1.5 Source Hazardous Waste Quantity Value

The source hazardous waste quantity value (HWQ) for Source No. 1 is assigned a source HWQ area value of greater than zero, but unknown (Ref. 1, Table 2-6).

Source Hazardous Waste Quantity (HWQ) Value: greater than zero, but unknown

OTHER POTENTIAL SORUCES

A 10,000-gallon UST was used to store waste chromic acid rinse water from electroplating operations. (Refs. 3,p. 2-4; 4; 10, p. 2; 27, p. 2-3). The UST was sampled. The samples revealed hexavalent chromium. EPA removed approximately 8,400 gallons of liquid waste from the UST during a response action completed between September 1994 and October 1995 (Refs. 3, p. 2-4; 11, pp. 1, 29). The UST contained a yellow liquid with a pH of 3 (Ref. 11, p. 7). A sample collected from the UST contained hexavalent chromium (Ref. 11, p. 15). The tank was located on the western side of the one-story block building (Ref. 3, Figure 4-1). From environmental inspection notes, the UST may have been a holding tank for treated rinse waters. The treated wastes were stored in the UST for settling prior to discharge to the borough sanitary sewer system (Refs. 35, p. 1; 36, p. 1). The tank was known to leak (Ref. 23, p. 1). Liquid samples collected from a trench dug outside of the tank exhibited RCRA hazardous waste characteristic of toxicity for chromium and contained hexavalent chromium, TCE, cis-1,2-DCE, and methylene chloride (Ref. 23, pp 4, 8, and 9, 19). The water in the trench had an orange (yellow) tint indicating the contents of the tank (chromium waste water) leaked (Ref. 23, p. 1).

Other potential sources included tanks associated with a wastewater treatment system and a sump. A 9,500-gallon UST is described during PADEP waste discharge inspections at the Chem-Fab facility. A 1972 inspection report describes the facility's wastewater treatment system. Rinse waters (constituents not described) from the plant were piped to a 1,000-gallon buried holding pit, where the water was pumped up into a 2,500-gallon pre-treatment tank. (The type of treatment is not identified in reference documentation.) After treatment, wastes were pumped to a 9,500-gallon holding tank for settling prior to discharge to the Doylestown Borough sanitary sewer system. A drawing of the treatment system identifies the locations of the tanks and pit and identifies a "4,000-gallon Fresh Chemical Storage Tank" containing ferric chloride. The tanks are not described as being above or below ground but appear to have been above ground. The tanks were located on the northwest side of the abandoned warehouse (manufacturing area) in an area described in recent reports as the former "UST area" (Ref. 35). A 1975 waste discharge inspection report identifies a 9,500-gallon concentrated waste acid tank. According to the 1975 inspection report, concentrated waste acid stored in the 9,500-gallon tank and sludge from the 9,500-gallon settling tank were removed by a hauler (Ref. 36). No other documentation regarding the system is available. A concrete sump located in the former warehouse (manufacturing) building may have released contaminants to underlying soil (Ref. 23, pp. 6, 9). Samples from the sump contained TCE (Ref. 23, p. 9).

3.0 GROUND WATER MIGRATION PATHWAY

3.0.1 GENERAL CONSIDERATIONS

Ground Water Migration Pathway Description

- Regional Geology

The Chem-Fab facility is located in Bucks County, which is predominantly an undulating plain characterized by low hills and ridges. Rocks underlying the county consist of schist, gneiss, shale, sandstone, quartzite, conglomerate, and limestone. Bucks and Philadelphia Counties lie within two main physiographic divisions: the Appalachian Highlands on the northwest and the Atlantic Coastal Plain on the southeast. The Appalachian Highlands is divided into several provinces, which in the Bucks County area include the Piedmont province, the Triassic-Lowland province, and the New England province (Refs. 27, p. 2-7; 47, p. 13).

The Chem-Fab facility lies within the Triassic-Lowland physiographic province in Bucks County. This area is characterized by an uplifted plain formed by easily eroded inclined strata with residual ridges marking the more resistant, tilted, volcanic rock. Local relief does not exceed 250 feet bgs in elevation change. The bedrock underlying the facility is Triassic-age Stockton lithofacies, which consists of light-colored, coarse-grained sandstone and conglomerate, red to brown fine-grained siliceous sandstone, and red shale. The shale and sandstone are interbedded in no order and repeated within individual bedding planes pinching out in short distances. This geologic unit has an average dip of 10 degrees (Refs. 3, pp. 2-7 and 2-8; 27, pp. 13 and 14; 47, pp. 13 and 14). Reference 116, page 15, indicates that one of the Stockton Formation members is 4,200 feet in thickness in the Doylestown Pennsylvania area. However, reports documenting investigations conducted at the Chem-Fab facility indicate that the Stockton Formation has a calculated thickness of 3,000 feet (Ref. 3, p. 2-8; 27, p. 14; 47, p. 14). The Stockton Formation is cut by a well-developed system of joints and fractures. Bedrock encountered during investigations conducted on the Chem-Fab facility and the adjacent property concurs with the geology discussed above (Refs. 3, pp. 2-7 and 2-8; 27, pp. 13 and 14; 47, pp. 13 and 14).

The Stockton Formation is divided into three members: the arkose member, the middle arkose member, and the upper shale member. The arkose member is characterized by the abundance of coarse-grained arkosic sandstone and arkosic conglomerate. The middle arkose member is characterized by the abundance of fine- and medium-grained arkosic sandstone. The upper shale member is characterized by the predominance of shale and siltstone (Ref. 116, p. 9).

Faults are common in the Stockton Formation. A major fault forms the southern boundary of the northern belt in Bucks County (Ref. 116, p. 21). The fault is approximately 2.5 miles south of the Chem-Fab facility (Refs. 27, Figure 2-3; 117). The fault is not an aquifer discontinuity. Diabase dikes intrude the Stockton in several places. Two dikes are present in the northern belt in Bucks County (Refs. 116, p. 22; 117).

- Site-Specific Geology -

An analysis of soil boring logs (from zero to 14 feet bgs) indicated that the shallow subsurface formation is comprised of silty clay and silty sand. The presence of clay in the matrix of the unconsolidated

formation makes this shallow or uppermost part of the subsurface less permeable. Locally, this situation could lead to a perched water table. However, the vertical migration of TCE is documented in this lithological unit (Ref. 27, Appendix E). An observed release of TCE to ground water is documented in Section 3.1.1.

Geologic cross sections were prepared for the Chem-Fab facility based on monitoring well boring logs. The bedrock lithology encountered at the Chem-Fab facility consists primarily of sandstone, siltstone, and shale of the Stockton Formation (Ref. 27, p. 4-1). The cross sections identify weathered shale with clayey sediments, sandstone, banded shale, and sandstone (Ref. 27, p. 4-2). The cross sections indicated that various Stockton lithological formation encountered are discontinuous, therefore, making well-to-well correlation difficult or impossible (Ref. 27, Figures 4-2 a, 4-2b, and 4-2c). The geologic map for the facility is included as Figure 2-3 in Reference 27.

Figure 4-2a in Reference 27 shows a cross section (A-A') profiles for monitoring wells MW-1, MW-2, MW-4, MW-5, MW-6, MW-7, MW-10, MW-11, and MW-19. The cross section profile illustrates that the sandstone, siltstone, and shales of the Stockton Formation are not continuous. Bedrock lithology encountered included weathered shale with clayey sediments, sandstone, banded shale and sandstone as shown in Figure 4-2a of Reference 27.

The cross section from the profiles of monitoring wells MW2, MW-3, MW-6, MW-7, MW-8, MW-12 and MW-17 is shown in Figure 4-2b of Reference 27. Bedrock lithology encountered in this series of wells included weathered shale with clayey sediments, sandstone, banded shale, and sandstone (Ref. 27, Figure 4-1b).

The cross section from profiles of domestic well (DW) and monitoring wells MW-3, MW-10, MW-11, MW-14, and MW-15 is shown in Figure 4-1c of Reference 27. Bedrock lithology encountered in this series of wells included weathered shale with clayey sediments, sandstone, banded shale, and sandstone (Ref. 27, Figure 4-1c).

As shown in these cross sections, none of the lithofacies appear to be continuous across the facility (Ref. 27, Figures 4-1a, 4-1b, and 4-1c). No barriers to ground water flow were identified in any of the monitoring well logs (Ref. 27, Appendix G). The well log for MW-11 identifies fractured bedrock at 220 feet bgs (Ref. 27, Appendix G, p. 10).

- Regional Hydrogeology

The Stockton lithofacies are a good source of water in Bucks County. Ground water is contained in intergranular openings within the sedimentary rock, where the cement has been weathered away. Therefore, the occurrence and movement of ground water are functions of the degree of weathering of the rock. Ground water commonly occurs under artesian conditions where the sandstone and conglomerate beds are interlayered with red shale. This artesian flow is probably a function of the dip and orientation of the bedding. The dip of the Stockton Formation averages 10 degrees or more. Therefore, a selected water-bearing bed stops bearing water as the bed grades into unweathered bedrock. The formation has a wide range in permeability; recorded yields for the Stockton range from 2 to 440 gallons per minute (gpm), with an average yield of 78 gpm. According to the geologic map for the area, dip at the facility is approximately 10 degrees towards Cooks Run. Ground water movement in the Stockton Formation is through a network of interconnecting secondary openings-fractures, bedding plans, and joints. The ground water system consists of beds with a relatively high transmissivity separated by beds with a

relatively low transmissivity that form a leaky, multi-aquifer system. Ground water is unconfined in the shallower part of the aquifer and confined or semi-confined in the deeper part of the aquifer. Most deep wells are open to several water-bearing zones and are multi-aquifer wells (Ref. 27, p. 2-8; 47, pp. 52 and 53; 99, p-. 1).

Wells drilled in the Stockton Formation penetrate many rock types. The sequence of rock penetrated consists generally of alternating beds of fine- and coarse-textured materials. The relative proportions of fine- and coarse-textured rocks change throughout the formation. These features along with the lateral changes in the lithology of the rocks are responsible for much of the variation in well yields from place to place (Ref. 116, p. 24).

The Stockton Formation is divided into three members. The highest yields and specific capacities reported are for wells completed in the middle arkose member. The arkose member is characterized by alternating beds of arkosic sandstone and shale of nearly equal thickness and a lack of conglomerate. The arkosic sandstones and conglomerates contain both primary and secondary openings through which ground water can flow. Most of the beds of arkosic sandstone and conglomerate in the Stockton Formation are neither well sorted nor firmly cemented. The permeability of the sandstone and conglomerate is due to a combination of primary and secondary openings (Ref. 116, pp. 24 and 25).

The shales and siltstones are too fine grained to contain primary or intergranular openings of sufficient size for ground water to circulate. The rocks are relatively impermeable except where broken by joints and fractures. The shales and siltstones have small capability to store and transmit ground water (Ref. 116, p. 25).

The hydrologic character of the Stockton Formation is complex because of the lateral changes in lithology. The changes are abrupt because the rocks were deposited on alluvial fans. The structure is an intricate intermingling of pervious and impervious materials (Ref. 116, p. 26).

Pump tests conducted in the Stockton Formation, including a location in Doylestown, indicate that the Stockton Formation does not respond to pumping as an ideal aquifer would. Two reasons for this are that the formation is not isotropic, and it is not infinite in areal extent. It contains alternating sequences of material of grossly different hydraulic properties that are intermingled in such a way as to defy simple definition by means of coefficients (Ref. 116, pp. 37 and 38). The hydraulic character of the Stockton Formation is too complex to be defined adequately by coefficients (Ref. 116, p. 38).

No physical barriers to ground water flow, such as mountains or large rivers, have been identified within a 4-mile radius of the Chem-Fab facility (Refs. 40; 118).

Public drinking water supply wells drawn from the Stockton Formation have depths ranging from 160 to 555 feet bgs. The majority of the wells are completed within 200 to 400 feet bgs with an average depth of 370 feet bgs (Refs. 59; 62; 64). Based on the depth of the public drinking water supply wells, the wells are probably completed in the middle member of the Stockton Formation (Ref. 116, p. 14). According to Reference 116, the middle member of the Stockton Formation reaches a thickness of 4,200 feet in the area of the Chem-Fab facility (Ref. 116, p. 15). Therefore, most of the wells within the 4-mile radius of the Chem-Fab facility are probably completed within the middle member of the Stockton Formation. The well logs for the Borough of Doylestown wells indicate that the wells are completed in a formation that is characteristic of the middle member of the Stockton Formation (Refs. 107; 116, p. 14).

- Site Specific Hydrogeology

Ground water contours for the Chem-Fab facility and adjacent property were determined based on information obtained from a survey of monitoring wells completed on and around the Chem-Fab facility. Based on the ground surface elevation and ground water elevation, the ground water contours and the presumed ground water flow direction were determined. It should be noted that the wells were screened in different intervals and that the connectivity of the fractured bedrock beneath the facility is unclear (Ref. 27, p. 4-1). The ground water contours and presumed ground water flow direction are shown in Reference 27, Figures 4-1. The ground water flow direction is to the west (Ref. 27, Figure 4-1). Figures 4-1a through 4-1c of Reference 27 represent ground water elevations above mean sea level (amsl), along with a presumed ground water flow direction. The presumed ground water flow direction shown in Figures 4-1a through 4-1c is incorrect. The contours are drawn from two different zones, shallow and deep. Reference 51, Figures 3-2, 3-2a, 3-3, and 3-3a, illustrate ground water elevations for July 2003 and October 2003 (Ref. 51, Figures 3-2, 3-2a, 3-3, and 3-3a). Based on the ground water elevations, ground water flows to the west. Reference 51, Figure 3-3, illustrates ground water elevations for August 2004 (Ref. 51, Figures 3-2 and 3-3). Based on the ground water elevations, ground water flows to the west (Ref. 51, Figure 3-3).

3.1 LIKELIHOOD OF RELEASE

3.1.1 OBSERVED RELEASE

Aquifer Being Evaluated: Stockton

The aquifer evaluated is the ground water within the Stockton Formation. As documented in the sections above, this aquifer underlies the Chem-Fab facility and is the principle aquifer within a 4-mile radius of the Chem-Fab facility (Ref. 27, p. 2-8). No confining layers or boundaries to ground water flow have been identified in geologic and hydrogeologic reports for the Stockton Formation. The Stockton Formation is evaluated as one aquifer for the following reasons:

1. Based on the topography of the area within a 4-mile radius of the Chem-Fab, no physical barriers to ground water flow, such as mountains or large rivers, have been identified (Refs. 40; 117).
2. The Stockton aquifer is comprised of a single formation (Refs 47, pp. 52 and 53; 99, p. 1). The lithofacies of the Stockton aquifer are not continuous, individual bedding planes pinch out in short distances (Ref. 47, pp. 13 and 14).
3. Ground water within the Stockton aquifer is connected through a network of interconnected secondary openings including fractures, bedding plans, and joints (Ref. 99, p. 1).
4. As documented in the source description and observed release section of this record, TCE has been detected in sources on the Chem-Fab facility and in monitoring wells and drinking water wells at concentrations meeting the criteria for documenting an observed release. The presence of TCE in sources and in ground water on and off the Chem-Fab facility indicates that the ground water (aquifer) underlying the Chem-Fab facility is connected with ground water (aquifer) drawn for drinking water. Additionally, TCE has been detected in drinking water wells located within 0.50 mile of the Chem-Fab facility (Refs. 98, p, 4; 40)

Observed releases detected during each investigation conducted at the Chem-Fab facility are discussed below.

Observed Release by Direct Observation

Yellow ground water was pumped from wells installed on the Chem-Fab facility providing visual evidence of an observed release to ground water from the facility (Refs. 49, Table 3-1; 51, pp. 6, 8, 9 and 10 and Table 3-4). An UST contained a yellow liquid with a pH of 3 (Ref. 11, p. 7). Liquid samples collected from a trench dug outside of the tank exhibited RCRA hazardous waste characteristic of toxicity for chromium and contained hexavalent chromium, TCE, cis-1,2-DCE, and methylene chloride (Ref. 23, pp 4, 8, and 9, 19). A sample collected from the UST contained hexavalent chromium (Ref. 11, p. 15). The UST contained yellow water (Ref. 11, p. 7). During the soil sampling activities, the borings remained open and when water was encountered, grab samples were collected for visual observation. Many of the samples were yellow (Ref. 27, p. 3-6). The presence of yellow water in the ground water and in the UST indicates that the UST contents released directly to ground water.

Hazardous substances released: hexavalent chromium (Ref. 11, p. 15)

Chemical Analysis – Borough of Doylestown Supply Wells:

The Borough of Doylestown water system includes five active wells and one inactive well (well DB13). The inactive well was closed in October 2001 due to TCE and chromium contamination from the Chem-Fab facility (Refs. 57; 102). Ground water contamination, including TCE, has been detected in the Borough of Doylestown supply wells since 1984 (Ref. 98, p. 2). An observed release to the Borough of Doylestown supply wells is documented for the years 2001 and 2007 because the most complete data sets are available for these years (Refs. 108 and 109).

The Borough of Doylestown supply well locations are distributed as follows: two wells (DB 10 and DB 13) within 0- to 0.25-mile radius; two wells (DB 7 and DB 8) within 0.25- to 0.50-mile radius; one well (DB 12) within 0.50- and 1.0-mile radius; and one well (DB 9) within 1.0- to 2.0-mile radius of the facility. Well locations are shown in Reference 40. The distances from the wells were measured from the outer boundaries of Source 1. The locations (latitude and longitude coordinates) of the wells were provided by the Borough of Doylestown (Refs. 40; 58). The Borough of Doylestown supply wells are identified in Reference 59 as being completed in the Stockton Formation (Ref. 59). A representative from the borough verified that the wells are all completed in the Stockton Formation (Ref. 102). Well logs for each well have not been located. Available well logs are provided in Reference 107. The well logs do not identify a screened interval. The wells appear to be open bore holes (Ref. 107). Reference 59 (excerpts from the PADEP ground water well inventory) identifies wells owned by the Borough of Doylestown and the depths of the wells. The depth of wells 9 and 13 were obtained from Reference 59 because the depths were not available from the Borough of Doylestown. The well numbers are not presented in Reference 59. The wells were identified in Reference 59 by using the distance and direction of the well from Source 1. A summary of well depths is provided in Table 9.

TABLE 9
DEPTH OF BOROUGH OF DOYLESTOWN SUPPLY WELLS

Well Identification	Well Depth (feet below ground surface)	Reference
7	272	107, p. 1
8	397	107, p. 2
9	270	59, p. 13
10	400	107, p. 4
12	305	107, p. 5
13	475	59, p. 12

Background Well Sample – Borough of Doylestown:

The Borough of Doylestown well 9 was used as the background well for the Borough of Doylestown supply wells. Well 9 is located 1.5-mile northeast from Source 1. The locations of the Borough of Doylestown supply wells are shown on Reference 40. Well 9 was selected as background because ground water from the Chem-Fab facility primarily flows to the west (Refs. 27, Figure 4-1; 50, Figures 3-2, 3-2a, 3-3, and 3-3a; 51, Figures 3-2 and 3-3). The Borough of Doylestown well 9 is located outside of the influence of the facility (Refs. 3, p. 6-2; 27, Figure 4-1). Ground water flow direction is based on the ground water elevations of the monitoring wells on the Chem-Fab facility. The elevations change seasonally. The elevations also are affected by the depth of the wells. Wells installed on the Chem-Fab facility are completed in the shallow, intermediate, and deep portions of the Stockton Formation (Ref. 27, Table 3-4, and Figures 4-1, 4-1a, 4-1b, and 4-1c). The ground water samples collected from the Borough of Doylestown wells were collected from untreated water (Ref. 102). Table 10 summarizes the concentrations of hazardous substances detected in samples collected from well 9.

TABLE 10
BACKGROUND WELL SAMPLE – BOROUGH OF DOYLESTOWN
HAZARDOUS SUBSTANCE CONCENTRATIONS

Sample Identification	**Well Number 9**	**Well Number 9**
Date sampled	02/31/2001	02/23/2007
Reference	108, pp. 5 and 6	109, pp 5 and 6
Volatile Organic Compounds (microgram per liter)		
1,1-Dichoroethene	ND	ND
cis-1,2-Dichlorothene	ND	ND
Tetrachloroethylene	ND	ND
1,1,1-Trichloroethane	ND	ND
Trichloroethene	ND	ND

Notes:
ND = Not detected above laboratory reporting limits

Contaminated Borough of Doylestown Supply Wells:

Analytical results for ground water samples collected from the Borough of Doylestown supply wells in 2001 and 2007 are summarized in the Tables 11 and 12. The concentrations summarized in the tables meet the criteria for documenting an observed release to ground water (Ref. 1, Table 2-3). The Borough of Doylestown well 13 was sampled in September 2001, before the well the closed and removed (Refs. 102; 110, p. 1). A background well for the September 2001 sampling date could not be identified. Therefore, the background concentrations for February 2001 are used to establish background conditions for well 13 that was sampled in September 2001.

TABLE 11
2001 – BOROUGH OF DOYLESTOWN
CONTAMINATED SUPPLY WELLS

Sample Identification	**Well 7**
Reference	108, p. 2
Date	02/13/2001
Volatile Organic Compounds (microgram per liter)	
Tetrachloroethene	0.99 (0.20)
Sample Identification	**Well 8**
Date	02/28/2001
Reference	108, p. 4
Volatile Organic Compounds (microgram per liter)	
Tetrachloroethylene	1.40 (0.20)
Trichoroethene	1.68 (0.20)
Sample Identification	**Well 10**
Date	02/13/2001
Reference	108, pp. 7 and 8
Volatile Organic Compounds (microgram per liter)	
1,1,1-Trichloroethane	6.96 (0.30)
1,1-Dichloroethene	6.45 (0.30)
Tetrachloroethylene	0.78 (0.20)

Sample Identification	**Well 12**
Date	02/13/2001
Reference	108, pp. 10 and 11
Volatile Organic Compounds (microgram per liter)	
1,1,1-Trichloroethane	1.11 (0.30)
1,1-Dichloroethene	0.88 (0.30)
Sample Identification	**Well 13**
Date	09/19/2001
Reference	110, pp.1
Volatile Organic Compounds (microgram per liter)	
1,1-Dichloroethene	2.45 (0.25)
Tetrachoroethylene	3.67 (0.25)
1,1,1-Trichloroethane	2.70 (0.25)
Trichloroethene	13.5 (0.25)

Notes:
( ) = Reporting limit

TABLE 12
2007 – BOROUGH OF DOYLESTOWN
CONTAMINATED SUPPLY WELLS

Sample Identification	**Well 8**
Reference	109, pp. 3 and 4
Date	02/19/2007
Volatile Organic Compounds (microgram per liter)	
Tetrachloroethylene	1.71 (0.29)
Trichloroethene	1.11 (0.26)
Sample Identification	**Well 10**
Reference	109, pp. 7 and 8
Date	02/19/2007
Volatile Organic Compounds (microgram per liter)	
1,1-Dichloroethene	1.12 (0.23)
Tetrachloroethylene	0.70 (0.27)
1,1,1-Trichloroethane	0.35 (0.29)

Notes:
( ) = Reporting limit

Chemical Analysis – Initial Site Characterization - Potable Wells (and/or formerly potable wells)

The initial site characterization investigation of the Chem-Fab facility was conducted by PADEP's environmental consultant from December 1999 through May 2000 (Ref. 3, p. 3-1). During the initial site characterization, a search was conducted for nearby wells within a 0.25-mile radius that may have been impacted by the Chem-Fab facility. Based on information obtained from the Bucks County Health Department regarding wells in the vicinity of the facility, six wells were selected for sampling. The location of the wells may be found in Reference 3, Figure 3-2 (Ref. 3, pp. 3-8 and 3-9). On March 2 and 3, 2000, PADEP's environmental consultant collected five ground water samples (OSW-BF-01, OSW-TH-01, OSW-RH-01, and OSW-QC-01) and one duplicate sample (OSW-RH-2-01) from residential and commercial potable supply water wells and a municipal potable water well (Borough of Doylestown Well 13[OSW-BW13-01]) (Ref. 3, pp. 3-8 and 3-9, Table 3-4). Well locations are shown in Reference 3, Figure 3-2. In 1991, the residential and commercial buildings were connected to public drinking water because the wells were contaminated with 1,1-DCA, 1,1-DCE, PCE, 1,2-trans-dichloroethylene, 1,1,1-TCA, and TCE (Refs. 3, p. 3-9; 48, pp. 15, 16, 21, and 26). Samples were collected from an outdoor faucet after allowing the water to run and flush the water tank and piping for approximately 20 minutes. Faucets from which the samples were collected were connected directly to the well, without any treatment (Ref. 3, pp. 3-8 and 3-9). The information presented in Reference 3 indicates that the residential and commercial wells were closed drinking water wells (not used for drinking water) (Ref. 3, pp. 3-8 and 3-9 and Table 3-4).

The ground water samples were placed under proper chain of custody, and delivered at the end of each day of sample collection to Quality Control, Inc., laboratory, a PADEP-approved laboratory. Samples were analyzed for VOCs using EPA Method 8260, SVOCs using EPA Method 8270, TAL metals using EPA Method 6010, cyanide using EPA Method 9010/9014, and hexavalent chromium using EPA Method 3060A (Ref. 3, p. 3-9). Table 3-4 in Reference 3 summarizes the nearby well sampling program for the Chem-Fab facility (Ref. 3, p. 3-9).

A summary of background and contaminated potable wells sampled during the initial site characterization is presented in the sections below.

Initial Site Characterization - 2000 - Background Potable Well Samples:

No background monitoring well or ground water sample was identified in the initial site characterization report and investigation. Therefore, the Borough of Doylestown well 9 was used to establish background concentrations. The Doylestown Borough well 9 was selected as background because ground water from the Chem-Fab facility primarily flows to the west and the well is located to the northeast (Refs. 27, Figure 4-1; 40; 50, Figures 3-2, 3-2a, 3-3, and 3-3a; 51, Figures 3-2 and 3-3). Well 9 was sampled in February 2001. The location of well 9 is shown on Reference 40. Ground water flow direction is based on the ground water elevations of the monitoring wells on the Chem-Fab facility. The elevations change seasonally. The elevations also are affected by the depth of the wells. Wells installed on the Chem-Fab facility are completed in the shallow, intermediate, and deep portions of the Stockton Formation (Ref. 27, Table 3-4, and Figures 4-1, 4-1a, 4-1b, and 4-1c). Well 9 is outside the influence of the facility (Refs. 3, p. 6-2; 27, Figure 4-1). The ground water samples collected from the Doylestown Borough wells were collected from untreated water (Ref. 102). All wells near the Chem-Fab facility are completed in the bedrock (Stockton Formation) (Ref. 3, p. 6-3). Table 13 summarizes the concentrations of hazardous substances detected in samples collected from well 9.

TABLE 13
BACKGROUND WELL SAMPLE – BOROUGH OF DOYLESTOWN WELL 9
HAZARDOUS SUBSTANCE CONCENTRATIONS

Sample Identification	**Borough of Doylestown Well Number 9**	**Borough of Doylestown Well Number 9**
Date sampled	02/31/2001	02/23/2007
Reference	108, pp. 5 and 6	109, pp 5 and 6
Volatile Organic Compounds (microgram per liter)		
1,1-Dichoroethene	ND	ND
cis-1,2-Dichlorothene	ND	ND
Tetrachloroethylene	ND	ND
1,1,1-Trichloroethane	ND	ND
Trichloroethene	ND	ND

Note:
ND = Not detected above laboratory reporting limits

Initial Site Characterization - 2000 - Contaminated Potable Well Samples (and/or formerly potable wells)

On March 2 and 3, 2000, PADEP's environmental consultant collected five ground water samples (OSW-BF-01, OSW-BW13-01, OSW-TH-01, OSW-RH-01, and OSW-QC-01) and one duplicate sample (OSW-RH-2-01) from residential and commercial potable supply water wells and a municipal potable water well (Borough of Doylestown Well 13) (Ref. 3, pp. 3-8 and 3-9, Table 3-4). Well locations are shown in Reference 3, Figure 3-2. Samples were collected from an outdoor faucet after allowing the water to run and flush the water tank and piping for approximately 20 minutes. Faucets from which the samples were collected were connected directly to the well, without any treatment (Ref. 3, pp. 3-8 and 3-9). In 1991, these residential and commercial sampling locations were connected to public drinking water because the wells were contaminated with 1,1-DCA, 1,1-DCE, PCE, 1,2-trans-dichloroethylene, 1,1,1-TCA, and TCE (Refs. 3, p. 3-9; 48, pp. 15, 16, 21, and 26). Reference documentation does not indicate if the wells were used for drinking water when they were sampled in 2000. However, OSW-BW-13-01 was used as a public water supply well. The well was closed and removed in October 2001 (Ref. 102).

Section 5.4 of Reference 3 discusses the data validation of the data packages for the samples collected during the initial site characterization. The data were validated by PADEP's environmental consultant that conducted the initial site characterization investigation. The data summary for VOC analysis of ground water samples is presented in Reference 3, Table 5-5b. The data qualifiers in Table 5-5b do not match the data qualifiers on the original data sheets. The data qualifiers on the original data sheets are used as the data qualifiers. Explanations for the data qualifiers are not presented on the data sheets. In most cases, the data qualifier cited is "J," estimated concentration. The reason for each specific qualification is not stated in the data validation section of Reference 3. The data validation section in Reference 3 discusses the reasons for qualifying the data; however, the reason for assigning a specific qualification to a specific sample, hazardous substance, and concentration is not provided in the data validation summary (Ref. 3, Section 5.4).

Concentrations with "J" data qualifiers are adjusted according to Reference 79, *Using Qualified Data to Document an Observed Release and Observed Contamination*. Because the reason the assigned data qualifier is not specified, the biases are also unknown; therefore, the concentrations detected are divided by the factor values in Reference 79 (Ref. 79, Exhibit 3, p. 8).

Table 3-4 in Reference 3 summarizes the nearby well sampling program for the Chem-Fab facility (Ref. 3, p. 3-9). Table 14 summarizes the contaminated potable wells sampled, and Table 15 provides the concentrations of hazardous substances detected in the potable well samples. All wells near the Chem-Fab facility are completed in the bedrock (Stockton Formation) (Ref. 3, p. 6-3). Well depths are not available for the residential and commercial wells summarized in Table 14. The Borough of Doylestown well number 9 has an estimated depth of 270 feet bgs (Ref. 59, p. 13).

TABLE 14
CONTAMINATED POTABLE WELL SAMPLING LOCATIONS (and/or formerly potable wells)

Sample ID	Date Collected	Time Collected	Well Owner's Address	Comments	Reference
OSW-BW13-01	03/02/2000	1035	Doylestown Borough Well 13 57 West Court Street Doylestown, PA 18902	Collected from inactive municipal potable well	3, Table 3-4
OSW-TH-01	03/02/2000	1127	410 North Broad Street Doylestown, PA 18903	Collected from outside faucet at guest house	3, Table 3-4
OSW-RH-01	03/02/2000	1200	430 North Broad Street Doylestown, PA 18903	Collected from outside faucet	3, Table 3-4
OSW-RH-2-01	03/02/2000	1210	430 North Broad Street Doylestown, PA 18903	Duplicate of OSW-RH-01	3, Table 3-4

Notes:
ID = Identification
BW = Borough well
OSW = Off-site well
RH = Romanczak
TH = Tilley

TABLE 15
CONTAMINATED POTABLE WELL SAMPLES (and/
HAZARDOUS SUBSTANCE CONCENTRATIONS

Sample Identification	**OSW-BW13-01**
Lab Identification	L624531-2
Reference	3, Table 5-5b, and Appendix D, p. 282
Volatile Organic Compounds (microgram per liter)	
TCE	8.38 J [5.05] (1.00)
Sample Identification	**OSW-TH-01**
Lab Identification	L624531-3
Reference	3, Table 5-5b, and Appendix D, p. 284
Volatile Organic Compounds (microgram per liter)	
1,1-DCE	33.5 J [3.35] (2.00)
cis-1,2-DCE	58.50 J [5.85] (2.00)
PCE	32.0 J [3.20] (2.00)
1,1,1-TCA	54.90 J [5.49] (1.00)
TCE	94.3 J [56.8] (1.00)
Sample Identification	**OSW-RH-01**
Lab Identification	L624531-4
Reference	3, Table 5-5b, and Appendix D, p. 286
Volatile Organic Compounds (microgram per liter)	
cis-1,2-DCE	24.10 J [2.41] (2.00)
PCE	13.6 J [1.36] (1.00)
1,1,1-TCA	45.20 J [4.52] (1.00)
TCE	39.5 J [23.8] (1.00)
Sample Identification	**OSW-RH-2-01**
Lab Identification	L624531-5
Reference	3, Table 5-5b, and Appendix D, p. 288
Volatile Organic Compounds (microgram per liter)	
cis-1,2-DCE	22.60 J [2.26] (2.00)
PCE	13.9 (1.00)
TCE	37.0 J [22.3] (1.00)

Notes:
[ ] = Adjusted concentration. The bias is not known. The concentration is adjusted according to Reference 79. The TCE concentrations are divided by the adjustment factor value of 1.66. All other concentrations are divided by the adjustment factor value of 10 (Ref. 79, Exhibit 3, pp. 8, 11, 12).
( ) = Practical quantitation limit
BW = Doylestown Borough Well 13
DCE = Dichloroethene
J = Estimated concentration. The bias is not known.
OSW = Off-site well
TCA = Trichloroethane
TCE = Trichloroethene
RH = Romanczak
TH = Tilley

Level I Samples

The Borough of Doylestown drinking water well 13 (OSW-BW13-01, DB13) was closed in October 2001 because of a release of hazardous substances from the Chem-Fab facility to ground water (Ref. 48, pp. 3, 7, and 15). Therefore, concentrations of hazardous substances detected in the ground water samples collected prior to October 2001 were compared to EPA health-based benchmarks, and it was determined that sample results for the Borough of Doylestown well 13 meet the criteria for actual contamination at Level I concentrations (Ref. 1, Section 3.3.1). The concentrations of hazardous substances detected in the Borough of Doylestown potable wells 8 and 13 are documented in Tables 11, 12, and 15. Table 16 presents the wells that meet the criteria for actual contamination at Level I concentrations.

TABLE 16
DRINKING WATER WELLS – LEVEL I CONCENTRATIONS

Sample Identification	Hazardous Substance	Concentration (µg/L)	Benchmark Concentration (µg/L)	Benchmark	Reference for Benchmark
Well 8	TCE	1.68	0.21	Cancer risk	2, p. BI, B2-1
Well 13	TCE	13.5	5	MCL	2, p. BI, B2-1
OSW-BW13-01	TCE	5.05	5	MCL	2, p. BI, B2-1

Notes:
BW = Doylestown Borough Well 13
MCL = Maximum contaminant level
OSW = Off-site well
TCE = Trichloroethene
µg/L = Microgram per liter

Chemical Analysis – Phase II Site Characterization Ground Water Samples

Ground water samples collected from monitoring wells during the Phase II site characterization were analyzed for VOCs using EPA Method 8260, TAL metals using EPA Method 6010, and hexavalent chromium using EPA Method 3060A (Ref. 27, p. 5-24). The method detection limit (MDL) was adjusted for the dilution factor (DF) by multiplying the MDL by the DF (Ref. 74).

A summary of background and contaminated wells sampled during the Phase II site characterization is presented below.

Background Ground Water Well - Phase II Site Characterization:

During the Phase II site characterization, no background monitoring well was installed or sampled. Therefore, the inactive potable well located on the Chem-Fab facility was used to document ground water background concentrations for shallow monitoring wells (40 to 55 feet bgs). On May 11, 2000, the buried wellhead of the Chem-Fab inactive potable well was uncovered near the stone building (residence). The cap was removed and revealed a 6-inch diameter well with a measured well depth of 57 feet bgs. The depth to ground water was 3.5 feet bgs. The well was constructed with a 6-inch steel casing starting 34 inches below grade. At the top of the steel casing, a 6-inch section of polyvinyl chloride (PVC) was added, extending 22 inches, with a PVC cap on the top. The PVC riser was probably used as an extension for the top of the well (Ref. 3, pp. 3-7 and 6-2). Ground water samples were collected from this well in June 2001, October 2001, and January 2002. The ground water samples collected from the well have "DW" (domestic well) in the sample identifier. DW is used to establish background concentrations for monitoring wells completed within 40 to 55 feet bgs (Ref. 27, Table 3-5, p. 1). Based on ground water elevations, DW is located hydraulically upgradient of the release wells (Ref. 3, Figures 4-1, 4-1a, 4-1b, and 4-1c).

Table 17 summarizes background concentrations for shallow water wells and the depth of the background wells.

TABLE 17
BACKGROUND CONCENTRATIONS– SHALLOW GROUND WATER
PHASE II SITE CHARACTERIZATION

Sample ID	**DW-01**		**DW-02**	
Dilution Factor	1		1	
Depth	57 feet bgs		57 feet bgs	
Date	6/22/2001		10/30/2001	
Reference	27, Tables 3-5, 5-3a (p. 6), 5-3c (p. 10), and Appendix F, p. 8; 76, pp. 19, 20, and 70		27, Tables 3-5, 5-3a (p. 6), 5-3c (p. 10), and Appendix F, pp. 11, 34, and 35; 78, pp. 10, 11, 37, and 38; 112, p. 2	
1,1-Dichloroethane	ND		ND	
1,2-Dichloroethane	ND		ND	
1,1-DCE	ND		ND	
1,2-DCE (total)	2.6 J (26)		ND	
cis-1,2-DCE	ND		ND	
trans-1,2-DCE	ND		ND	
Methylene chloride	ND		ND	
PCE	4.8 J (48)		5.0	
Toluene	ND		ND	
1,1,1-TCA	ND		ND	
TCE	8.0		7.0	
Xylene (total)	ND		ND	
Metals	**Dissolved**	**Total**	**Dissolved**	**Total**
Chromium (Total) (µg/L)	NA	14.8	6.2	9.0
Hexavalent chromium (mg/L)	NA	NA	NA	ND

Notes:
The MDL for all the VOCs, except xylene, is 5 µg/L. Xylene has the MDL of 15 µg/L. The MDL is the concentration on the data sheet with the "U," not detected, data qualifier (Refs. 76, pp. 17, 18; 77, pp. 10, 11). The reporting limit for chromium is 5 µg/L (Refs. 74; 76, p. 70; 78, p. 37) and the reporting limit for hexavalent chromium is 1 mg/L (Ref. 112, p. 2).

( )	=	Adjusted concentration
bgs	=	Below ground surface
DCE	=	Dichloroethene
DW	=	Domestic well
ID	=	Identification
J	=	Estimated concentration. The bias is not known. The concentration is adjusted according to Reference 79. The concentration is multiplied by the adjustment factor of 10 (Ref. 79, Exhibit 3, and pp. 7 and 11).
MDL	=	Method detection limit
mg/L	=	Milligram per liter
NA	=	Not analyzed
ND	=	Not detected above laboratory MDLs
PCE	=	Tetrachloroethylene
TCA	=	Trichloroethane
TCE	=	Trichloroethene
µg/L	=	Microgram per liter
VOC	=	Volatile organic compounds

Contaminated Ground Water Wells – Phase II Site Characterization:

During the Phase II site characterization study, numerous monitoring wells were installed on and around the Chem-Fab facility. The well construction details for wells on the Chem-Fab facility are summarized in Table 18. An observed release to ground water by chemical analysis is documented from the analysis of ground water samples collected from the wells summarized in Table 18. The ground water sample collected from the domestic well designated "DW" is used to document background concentrations for the shallow ground water samples collected from MW-1, MW-3, MW-5, MW-7, and MW-12, and the ground water sample collected from MW-16 is used to document background concentrations for the deep ground water samples collected from MW-2, MW-4, MW-09, MW-10, MW-15, MW-18, and MW-20.

The monitoring well locations are shown on Figure 3-1 in Reference 27. Ground water elevations are shown on Figures 4-1, 4-1a, 4-1b, and 4-1c of Reference 27. The information in Table 18 is documented in Table 3-4 of Reference 27. The information related to the DW (inactive potable well) was obtained from Reference 3, page 3-7.

Table 19 summarizes the concentrations of hazardous substances detected in shallow ground water samples collected from the monitoring wells at concentrations documenting an observed release to ground water (Ref. 1, Table 2-3). The MDLs listed in Table 19 are the concentrations on the data sheet with the "U," not detected, data qualifier (Ref. 74).

TABLE 18
WELL CONSTRUCTION DETAILS

Well ID	Well Depth (feet bgs)	Screened Interval (feet bgs)	Outer Casing Depth (feet bgs)
DW (background for wells 40 to 55 feet bgs)	57	Not available	Not measured
MW-01 (shallow)	55	40-55	0-20
MW-02 (deep)	75	60-75	0-20
MW-03 (shallow)	50	35-50	0-20
MW-04 (deep)	75	60-75	0-20
MW-05 (shallow)	37	27-37	0-20
MW-07 (shallow)	37	27-37	0-20
MW-09 (deep)	75	60-75	0-20
MW-10 (deep)	75	60-75	0-20
MW-12 (shallow)	37	27-37	0-20
MW-15 (deep)	80	60-80	0-20
MW-16 (deep) (background for wells 60 to 80 feet bgs)	70	50-70	0-20
MW-18 (deep)	73	58-73	0-20
MW-20 (deep)	75	55-75	0-20

Notes:
Each well is constructed of 4-inch diameter polyvinyl chloride; has a 1-foot interval of bentonite seal above the sand pack and is cement grouted from the top of the bentonite seal to the ground surface (Ref. 27, Table 3-4).
bgs = Below ground surface
DW = Domestic well
ID = Identification
MW = Monitoring well

Phase II Site Characterization

TABLE 19
RELEASE CONCENTRATIONS – SHALLOW GROUND WATER
PHASE II SITE CHARACTERIZATION

Sample ID	**MW-01-01**		**MW-01-02**	
Dilution Factor	1		1	
Date	06/20/2001		10/23/2001	
Reference	27, Tables 3-5 and 5-3a (p. 1), and Appendix F, p. 9; 75, pp. 10, 11, 16, 17		27, Tables 3-5, 5-3a (p. 1), Appendix D, pp. 2 and 3 and Appendix F, p. 27; 75, pp. 16, 17	
1,1-DCE	9.4 (5)		13 (5)	
TCE	36 (5)		74 (5)	
Sample ID	**MW-03-01**		**MW-03A**	
Dilution Factor for VOCs	10		100	
Date	06/21/2001		06/21/2001	
Reference	27, Tables 3-5, 5-3a (p. 1), and 5-3c (p. 2), and Appendix F, p. 7; 76, pp. 11, 12, 17, 18, 66, 68		27, Tables 3-5, 5-3a (p. 1), and 5-3c (p. 2), and Appendix F, p. 7; 76, pp. 15, 16, 17, 18, 66, 68	
VOCs (µg/L)				
1,1-DCE	64 (5)		--	
1,2-DCE (total)	89 (5)		--	
Methylene chloride	1,900 (5)		2,400 (5)	
PCE	150 (5)		--	
TCE	13,000 (5)		13,000 (5)	
Xylene (total)	240 (15)		--	
Metals	**Dissolved**	**Total**	**Dissolved**	**Total**
Chromium (total) (µg/L)	--	112,000 (50)	--	134,000 (50)
Sample ID	**MW-03-02**		**MW-03A-02**	
Dilution Factor for VOCs	25		25	
Date	10/24/2001		10/24/2001	
Reference	27, Tables 3-5, 5-3a (p. 1), and 5-3c (p. 3) and Appendix F, p. 28; 77, pp. 12, 13, 71; 114, p. 3		27, Tables 3-5, 5-3a (p. 1), and 5-3c (p. 3), and Appendix F, p. 28; 77, pp. 14, 15, 73; 114, p. 4	
VOCs (µg/L)				
1,2-DCE (total)	120 (5)		120 (5)	
Methylene chloride	320 (5)		340 (5)	
TCE	3,000 (5)		4,000 (5)	

Sample ID	**MW-03-01**		**MW-03A**	
Metals	**Dissolved**	**Total**	**Dissolved**	**Total**
Chromium (total) (µg/L)	NA	166,000 (50)	NA	169,000 (50)
Hexavalent chromium (mg/L)	NA	--	NA	261 (10)
Sample ID	**MW-05-01**		**MW-05-02**	
Dilution Factor for VOCs	10		200	
Date	07/05/2001		10/24/2001	
Reference	27, Tables 3-5, 5-3a (p. 2), and 5-3c (p. 3), and Appendix F, pp. 11, 12; 80, pp. 16, 17; 81, pp. 16, 17, 75		27, Tables 3-5, 5-3a (p. 2), and 5-3c (p. 3), Appendix F, pp. 28, 29; 77, pp. 16, 17, 75, 76; 80, pp. 16, 17; 114, p. 5	
VOCs (µg/L)				
1,1-DCE	160 (5)		--	
1,2-DCE (total)	1,400 (5)		--	
Methylene chloride	2,800 (5)		3,100 (5)	
PCE	330 (5)		ND	
1,1,1-TCA	67 (5)		ND	
TCE	30,000 (5)		29,000 (5)	
Xylene (total)	540 (15)		--	
Metals (µg/L)	**Dissolved**	**Total**	**Dissolved**	**Total**
Chromium (total)	--	287 (5)	433 (5)	1,720 (5)
Hexavalent chromium (mg/L)	--	--	--	1.85 (0.10)
Sample ID	**MW-07-01**		**MW-07-02**	
Dilution Factor for VOCs	10		20	
Date	06/20/2001		10/23/2001	
Reference	27, Tables 3-5, 5-3a (p. 3), and 5-3c (p. 4), and Appendix F, p. 10; 75, pp. 16, 17, 18, 19, 56		27, Tables 3-5, 5-3a (p. 3), 5-3c (p. 4), Appendix D, pp. 5, 6, 14, 15, and Appendix F, pp. 26, 27; 113, p. 6	
VOCs (µg/L)				
1,2-Dichloroethane	--		140 (5)	
Methylene chloride	140 (5)		380 (5)	
PCE	650 (5)		600 (5)	
1,1,1-TCA	110 (5)		100 (5)	
TCE	1,500 (5)		2,900 (5)	
Metals	**Dissolved**	**Total**	**Dissolved**	**Total**
Chromium (total) (µg/L)	--	14,200 (5)	--	133,000 E (50)
Hexavalent chromium (mg/L)	--	--	--	125 (5)

Sample ID	**MW-12-01**	**MW-12-02**
Dilution Factor	1	1
Date	09/21/2001	10/24/2001
Reference	27, Tables 3-5 and 5-3a (p. 4), and Appendix F, pp. 15, 17; 80, p. 17; 84, p. 22	27, Tables 3-5 and 5-3a (p. 4), and Appendix F, pp. 28, 29; 77, p. 21; 80, p. 17
TCE	39	38

Notes:

--	=	Not detected at a concentration documenting an observed release to ground water or not analyzed for
( )	=	Method detection limit or reporting limit as shown on data sheets
A	=	Duplicate sample of MW-03-01
ID	=	Identification
DCE	=	Dichloroethene
E	=	Reported value is estimated because of the presence of interference. The adjusted concentration for an estimated chromium concentration with no bias is 122,000 divided by 1.3 and 133,000 divided by 1.3, or 93,846 and 102,308, respectively (Ref. 79, Exhibit 3, p. 18).
mg/L	=	Milligram per liter
MW	=	Monitoring well
PCE	=	Tetrachloroethylene
TCA	=	Trichloroethane
TCE	=	Trichloroethene
µg/L	=	Microgram per liter
VOC	=	Volatile organic compound

Chemical Analysis –Phase II Site Characterization Addendum Ground Water Samples

In 2002, as a supplement to the Phase II site characterization, an environmental consultant for PADEP conducted two additional rounds of ground water sampling at the property monitoring wells (MW-01, MW-02, MW-03, MW-06, MW-07, and DW) and monitoring wells (MW-04, MW-05, and MW-08 through MW-20) off of Chem-Fab property (Ref. 49, p. 1-1). The wells sampled during this additional investigation were the same wells sampled during the Phase II site characterization. Figure 3-1 in Reference 49 shows the sampling locations. Table 18 summarizes the monitoring well construction details.

Ground water samples were analyzed for VOCs using EPA Method 8260, SVOCs using EPA Method 8270, TAL metals using EPA Method 6010, cyanide using EPA Method 9010/9014, and hexavalent chromium using EPA Method 3060A (Ref. 49, p. 4-20). The MDLs are listed on the laboratory data sheets for the ground water samples collected during this sampling event. The number reported on the data sheets adjacent to the data qualifier "U" (not detected) is the MDL. The MDL was adjusted for the DF by multiplying the MDL by the DF (Ref. 74).

The concentrations of hazardous substances detected in the background and release samples, followed by the MDL in parenthesis, are presented in the sections below.

Phase II Site Characterization Addendum- Background Well Samples

Information related to the selection of the shallow background well (DW) is provided under the Phase II site characterization discussion (Ref. 49, p. 1-1). Monitoring well 16 (MW-16) was used to establish background concentrations for monitoring wells completed at 60 to 80 feet bgs. The monitoring well is located within the ground water plume identified at the Chem-Fab facility. However, no other background sampling location could be identified for this depth (Ref. 27, Table 3-4 and Figures 5-2a and 5-2b). MW-16 was selected as a background well based on ground water elevations (Ref. 49, Figures 3-3, 3-3a, 3-4, and 3-4a).

Tables 20 and 21 summarize background concentrations for shallow and deep ground water wells.

TABLE 20
BACKGROUND CONCENTRATIONS – SHALLOW GROUND WATER
PHASE II SITE CHARACTERIZATION ADDENDUM

Sample ID	**DW-04**		**DW-05**	
Dilution Factor for VOCs	1		1	
Date	05/10/2002		09/09/2002	
Reference	49, Tables 3-1 (p. 1), 4-1a (p. 21), and 4-1b (p. 11), and App. A, p. 5, and App. B, pp. 174, 175, 176, 193		49, Table 3-1 (p. 1), 4-1a (p. 21), and 4-1b (p. 11), and App. A, p. 13 and App. B, p. 406; 85, pp. 2, 32, 33	
VOCs (µg/L)				
1,2-Dichloroethane	ND		ND	
1,1-DCE	ND		ND	
cis-1,2-DCE	0.8 J (0.8) [8.0]		ND	
Methylene chloride	ND		ND	
PCE	6 (0.8)		6 (1)	
TCE	7 (1)		10 (0.8)	
Xylene	ND		ND	
Metals (µg/L)	**Dissolved**	**Total**	**Dissolved**	**Total**
Chromium (Total)	2.7 J [2]	12.2 J (2) [15.86]	8.6 J [11.18] (2)	64.3 (2)
Hexavalent chromium	NA	ND	NA	ND

Notes:
The MDLs and reporting limits are listed on the data sheets. The concentration in parenthesis is the MDL or reporting limit (Refs. 49, p. 3-3; 74).

[ ] = Adjusted concentration
( ) = Method detection limit or reporting limit
App. = Appendix
ID = Identification
J = Estimated concentration. The bias is not known. The concentration is adjusted according to Reference 79. The chromium concentration is multiplied by the adjustment factor of 1.30 and the cis-1,2-DCE concentration is multiplied by the adjustment factor of 10 (Ref. 79, Exhibit 3, pp. 7, 11, and 18).
DCE = Dichloroethene
DW = Drinking water
MDL = Method detection limit
MW = Monitoring well
NA = Not analyzed
ND = Not detected above the method detection limit
PCE = Tetrachloroethylene
µg/L = Microgram per liter

TABLE 21
BACKGROUND CONCENTRATIONS – DEEP GROUND WATER
PHASE II SITE CHARACTERIZATION ADDENDUM

Sample ID	**MW-16-02**		**MW-16-03**	
Dilution Factor for VOCs	1		1	
Date	05/06/2002		09/10/2002	
Reference	49, Tables 3-1 (p. 2), 4-1a (p. 17), and 4-1b (p. 9), and App. A, p. 1, and App. B, pp. 5, 6, 7, 24		49, Tables 3-1 (p. 2), 4-1a (p. 17), and 4-1b (p. 9), and App. A, p. 14, and App. B, p. 412; 85, pp. 4, 32, 33	
VOCs (µg/L)				
1,1-DCE	280 (0.8)		250 (0.8)	
cis-1,2-DCE	120 (0.8)		100 (0.8)	
Methylene chloride	ND		ND	
PCE	220 (0.8)		180 (0.8)	
TCE	230 (1)		200 (1)	
Xylene (total)	ND		ND	
Metals (µg/L)	**Dissolved**	**Total**	**Dissolved**	**Total**
Chromium (Total)	166 (2)	172 (2)	157 (2)	137 (2)
Hexavalent chromium	NA	167 (0.6)	NA	149 (0.6)

Notes:
The MDLs and reporting limits are listed on the data sheets. The concentration in parenthesis is the MDL or reporting limit (Refs. 49, p. 3-3; 74).

( ) = Method detection limit or reporting limit
App. = Appendix
DCE = Dichloroethene
ID = Identification
MDL = Method detection limit
MW = Monitoring well
NA = Not analyzed
PCE = Tetrachloroethylene
TCE = Trichloroethene
VOC = Volatile organic compound
µg/L = Microgram per liter

Phase II Site Characterization Addendum – Contaminated Well Samples

Tables 22 through 23 summarize the concentrations of hazardous substances detected in shallow and deep ground water samples collected from the monitoring wells at concentrations documenting an observed release to ground water (Ref. 1, Table 2-3).

TABLE 22
RELEASE CONCENTRATIONS – SHALLOW GROUND WATER
PHASE II SITE CHARACTERIZATION ADDENDUM

Sample ID	**MW-01-04**	**MW-01-05**
Dilution Factor	1	1
Date	05/05/2002	09/09/2002
Reference	49, Tables 3-1 (p. 1) and 4-1b (p. 1), App. A, p. 1, and App. B, p. 12	49, Tables 3-1 (p. 1), and 4-1b (p. 1), and App. A, p. 13; 85, p. 2
VOCs (µg/L)		
1,2-Dichloroethane	NA	8 (1)
1,1-DCE	9 (0.8)	--
TCE	46 (1)	41 (1)
Sample ID	**MW-03-04**	**MW-03C-04**
Dilution Factor	4,40	4,40
Date	05/09/2002	05/09/2002
Reference	49, Tables 3-1 (p. 1), and 4-1b (p. 2), App. A, p. 4, and App. B, p. 100	49, Tables 3-1 (p. 1), and 4-1b (p. 2), and App. A, p. 4, and App. B, p. 107
1,1-DCE	39 (3)	40 (3)
cis-1,2-DCE	160 (3)	160 (3)
Methylene chloride	300 (8)	300 (8)
PCE	65 (3)	65 (3)
TCE	5,000 (40)	5,100 (40)
Sample ID	**MW-03-05**	**MW-03D-05**
Dilution Factor	4,40	5,50
Date	09/16/2002	09/16/2002
Reference	49, Tables 3-1 (p. 1), and 4-1b (p. 2), and App. A, p. 18; 86, p. 1	49, Tables 3-1 (p. 1), and 4-1b (p. 2), and App. A, p. 18; 86, p. 1
1,1-DCE	54 (4)	53 (4)
cis-1,2-DCE	200 (4)	200 (4)
Methylene chloride	320 (10)	320 (10)
PCE	73 (4)	71 (4)
TCE	5,300 (50)	5,300 (50)

Sample ID	**MW-05-04**	**MW-05-05**
Dilution Factor	20,200	1,50,250
Date	05/14/2002	09/10/2002
Reference	49, Tables 3-1 (p. 1), and 4-1b (p. 3), and App. A, p. 7, and App. B, p. 233	49, Tables 3-1 (p. 1), and 4-1b (p. 3), and App. A, p. 14; 85, pp. 5, 6
VOCs (µg/L)		
1,1-DCE	--	110 (0.8)
cis-1,2-DCE	1,400 (16)	1,100 (40)
Methylene chloride	3,400 (40)	4,400 (100)
PCE	260 (16)	190 (0.8)
TCE	32,000 (200)	28,000 (250)
Xylene (total)	--	530 (4)
Sample ID	**MW-07-04**	**MW-07-05**
Dilution Factor	4,40	10,100
Date	05/07/2002	09/09/2002
Reference	49, Tables 3-1 (p. 1), and 4-1b (p. 4), and App. A, p. 2, and App. B, pp. 39, 40	49, Tables 3-1 (p. 1), and 4-1b (p. 5), and App. A, p. 13; 85, p. 1
VOCs (µg/L)		
1,1-DCE	75 (3)	160 (8)
cis-1,2-DCE	180 (3)	430 (8)
Methylene chloride	440 (8)	1,000 (20)
PCE	590 (3)	1,900 (8)
1,1,1-TCA	190 (3)	620 (8)
TCE	3,600 (40)	9,600 (100)
Xylene (total)	350 (3)	1,300 (8)

Notes:
The MDLs are listed on the data sheets. The concentration in parenthesis is the MDL (Refs. 49, p. 3-3; 74).
( ) = Value in parenthesis is the MDL
App. = Appendix
C = Duplicate sample of MW-03-04
D = Duplicate sample of MW-03-05
DCE = Dichloroethene
ID = Identification
MDL = Method detection limit
MW = Monitoring well
PCE = Tetrachloroethylene
TCE = Trichloroethene
µg/L = Microgram per liter
VOC = Volatile organic compound

TABLE 23
RELEASE CONCENTRATIONS – DEEP GROUND WATER
PHASE II SITE CHARACTERIZATION ADDENDUM

Sample ID	**MW-02-04**	**MW-02-05**
Dilution Factor	4,40	5,50
Date	05/07/2002	09/10/2002
Reference	49, Table 3-1 (p. 1), and 4-1b (p. 1), App, A, p. 2, and App. B, pp. 46, 47	49, Tables 3-1 (p. 1), and 4-1b (p. 1), and App. A, p. 14; 85, pp. 4, 5
VOCs (µg/L)		
cis-1,2-DCE	--	390 (4)
Methylene chloride	420 (8)	700 (10)
PCE	720 (3)	1,800 (40)
Toluene	--	31 (4)
TCE	3,500 (40)	6,600(250)
Xylene (total)	250 (3)	840 (4)
Sample ID	**MW-04-04**	**MW-04-05**
Dilution Factor	20,200	25,250
Date	05/16/2002	09/17/2002 A
Reference	49, Tables 3-1 (p. 1), and 4-1b (p. 3), App. A, p. 9, and App. B, pp. 328, 329	49, Tables 3-1 (p. 1), and 4-1b (p. 3), and App. A, p. 19; 86, pp. 2, 3
VOCs (µg/L)		
1,1-DCE	--	260 (20)
cis-1,2-DCE	580 (16)	600 (20)
Methylene chloride	9,700 (400)	9,400 (500)
TCE	35,000 (200)	35,000 (250)
Xylene (total)	1,800 (16)	1,600 (20)
Sample ID	**MW-10-04**	**MW-10-05**
Dilution Factor	10,100	20,200
Date	05/10/2002	09/13/2002
Reference	49, Tables 3-1 (p. 1), and 4-1b (p. 6), App. A, p. 5, and App. B, p. 158	49, Tables 3-1 (p. 1), and 4-1b (p. 6), and App. A, p. 17; 85, p. 12
VOCs (µg/L)		
TCE	13,000 (100)	11,000 (200)

Sample ID	**MW-15-02**	**MW-15-03**
Dilution Factor	5,50	4,40
Date	05/16/2002	09/17/2002
Reference	49, Tables 3-1 (p. 2), and 4-1b (p. 8), App. A, p. 9, and App. B, p. 336	49, Tables 3-1 (p. 2) and 4-1b (p. 8), and App. A, p. 19; 86, p. 3
VOCs (µg/L)		
TCE	4,400 (50)	4,800 (40)
Sample ID	**MW-20-02**	**MW-20A-02**
Dilution Factor	2,10	2,10
Date	05/15/2002	05/15/2002
Reference	49, Tables 3-1 (p. 2), and 4-1b (p. 10), App. A, p. 8, and App. B, p. 265	49, Tables 3-1 (p. 2), and 4-1b (p. 10), App. A, p. 8, and App. B, p. 273
TCE	1,600 (10)	1,600 (10)
Sample ID	**MW-20-03**	**MW-20B-03**
Dilution Factor	1,10	1,10
Date	09/18/2002	09/18/2002
Reference	49, Tables 3-1 (p. 2), and 4-1b (p. 10), and App. A, p. 12; 86, p. 3	49, Tables 3-1 (p. 2), and 4-1b, (p. 10), and App. A, p. 12; 86, p. 3
VOCs (µg/L)		
TCE	1,300 (10)	1,200 (10)

Notes:
The MDLs are listed on the data sheets. The concentrations in parenthesis are the MDLs (Refs. 49, p. 3-3; 74).

( ) = Value in parenthesis is the MDL
-- = Not detected at a concentration documenting an observed release to ground water
App. = Appendix
DCE = Dichloroethene
ID = Identification
MDL = Method detection limit
MW = Monitoring well
PCE = Tetrachloroethylene
TCE = Trichloroethene
µg/L = Microgram per liter
VOC = Volatile organic compound

Chemical Analysis – July 2003 Supplemental Ground Water Investigation

In 2003, an environmental consultant for PADEP conducted two additional rounds of ground water sampling at the Chem-Fab facility (Ref. 50, pp. 3 and 4).

Ground water samples were analyzed for VOCs using EPA Method 8260, SVOCs using EPA Method 8270, TAL metals using EPA Method 6010, cyanide using EPA Method 9010/9014, and hexavalent chromium using EPA Method 3060A (Ref. 50, p. 5). The MDLs are listed on the laboratory data sheets for the ground water samples collected during this sampling event. The number reported on the data sheets adjacent to the data qualifier "U" (not detected) is the MDL. The MDL was adjusted for the DF by multiplying the MDL by the DF (Ref. 74).

The concentrations of hazardous substances detected in the background and release samples, followed by the MDL in parenthesis, are presented in the sections below.

July 2003 – Supplemental Ground Water Investigation - Background Wells

The wells sampled during this supplemental ground water investigation were the same wells sampled during the Phase II site characterization. Information related to the selection of background wells is provided under the Phase II site characterization discussion. Figure 3-1 in Reference 49 shows the sampling locations. Table 18 summarizes the well construction details (Ref. 50, p. 4). Tables 24 and 25 summarize the background concentrations for shallow and deep ground water wells.

TABLE 24

BACKGROUND CONCENTRATIONS – SHALLOW GROUND WATER
2003 SUPPLEMENTAL GROUND WATER INVESTIGATION

Sample ID	**DW-06**		**DW-07**	
Dilution Factor	1		1	
Date	07/08/2003		10/08/2003	
Reference	50, Tables 3-1 (p. 1), 4-1a (p. 28), and 4-1b (p. 13), and App. A, p. 2; 87, pp. 3, 8, 9; 88, p. 2		50, Tables 3-1 (p. 1), 4-1a (p. 28), and 4-1b (p. 13), and App. A, p. 8; 104, p. 6; 106, pp. 1, 2, 26	
VOCs (µg/L)				
1,1-DCE	ND		0.1 J (0.1) [0.235]	
cis-1,2-DCE	0.6 (0.5)		0.5 (0.1)	
PCE	5.2 (0.1)		4.9 (0.1)	
1,1,1-TCA	0.2 J (0.1) [2]		0.4 J (0.1) [4]	
TCE	8.2 (.01)		6.7 (0.1)	
Xylene (total)	ND		ND	
Metals	**Dissolved**	**Total**	**Dissolved**	**Total**
Chromium (Total) (µg/L)	4.5 J [5.85] (2.2)	34.6 (2.2)	ND	15.8 (2.2)
Hexavalent chromium (mg/L)	NA	0.00078 (0.00060)	NA	0.00074 (0.00060)

Notes:
The MDLs or reporting limits are listed on the data sheets. The concentrations in parenthesis are the MDLs or reporting limit (Refs. 50 p. 5; 74).

[ ] = Adjusted concentration
( ) = Value in parenthesis is the MDL
App. = Appendix
ID = Identification
DCE = Dichloroethene
DW = Domestic well
J = Estimated concentration. The bias is not known. The concentration is adjusted according to Reference 79. The 1,1-DCE concentration is multiplied by the adjustment factor of 2.35, the chromium concentration is multiplies by the adjustment factor of 1.30, and the 1,1,1-TCA concentration is multiplied by the adjustment factor of 10 (Ref. 79, Exhibit 3, p. 11).
MDL = Method detection limit
mg/L = Milligram per liter
NA = Not analyzed
ND = Not detected above laboratory MDLs
PCE = Tetrachloroethylene
TCA = Trichloroethane
TCE = Trichloroethene
µg/L = Microgram per liter
VOC = Volatile organic compound

TABLE 25
BACKGROUND CONCENTRATIONS – DEEP GROUND WATER SAMPLES
2003 SUPPLEMENTAL GROUND WATER INVESTIGATION

Sample ID	**MW-16-04**		**MW-16-05**	
Dilution Factor	2		2.5	
Date	07/07/2003		10/06/2003	
Reference	50, Tables 3-1 (p. 2), 4-1a (p. 22), and 4-1b (p. 11), and App. A, p. 1, and App. B, pp. 74, 79; 88, p. 1; 105, pp. 6, 7, and 8		50, Tables 3-1 (p. 2), 4-1a (p. 22), and 4-1a (p. 11), and App. A, p. 6, and App. B, p. 119; 104, p. 2; 106, pp. 23, 24, and 25	
VOCs (µg/L)				
cis-1,2-DCE	97 (2.0)		86 (2.5)	
PCE	170 (2.0)		150 (2.5)	
TCE	200 (2.0)		170 (2.5)	
Xylene (total)	ND (0.2)		ND (0.25)	
Metals	**Dissolved**	**Total**	**Dissolved**	**Total**
Chromium (Total) (µg/L)	257 (2.2)	243 (2.2)	257 (2.2)	261 (2.2)
Hexavalent chromium (mg/L)	-	0.24 (0.0012)	-	0.25 (0.0030)

Notes:
The MDLs or reporting limits are listed on the data sheets. The concentrations in parenthesis are the MDLs or reporting limits (Refs. 50 p. 5; 74).

( ) = Value in parenthesis is the MDL
App. = Appendix
ID = Identification
DCE = Dichloroethene
MDL = Method detection limit
mg/L = Milligram per liter
MW = Monitoring well
ND = Not detected above laboratory MDLs
PCE = Tetrachloroethylene
TCE = Trichloroethene
µg/L = Microgram per liter
VOC = Volatile organic compound

Tables 26 through 27 summarize the concentrations of hazardous substances detected in shallow and deep ground water samples collected from the monitoring wells at concentrations documenting an observed release to ground water (Ref. 1, Table 2-3).

TABLE 26
MW-03 - RELEASE CONCENTRATIONS
2003 SUPPLEMENTAL GROUND WATER INVESTIGATION

Sample ID	**MW-03-06**		**MW-03E-06**	
Dilution Factor	100		100	
Date	07/08/2003		07/07/2003	
References	50, Tables 3-1 (p. 1), 4-1a (p. 5), and 4-1b (p. 2), and App. A, p. 2, and App. B, pp. 13, 17; 87, pp. 2, 8, and 9; 105, p. 6		50, Tables 3-1 (p. 1), 4-1a (p. 5), and 4-1b (p. 2), and App. A, p. 2, and App. B, pp. 19, 23; 87, pp. 3, 8, and 9	
cis-1, 2-DCE	150 (10)		140 (10)	
PCE	140 (10)		120 (10)	
TCE	12,000 (100)		11,000 (100)	
Metals	**Dissolved**	**Total**	**Dissolved**	**Total**
Chromium (total) (µg/L)	114,000 (11.0)	113,000 (22.0)	115,000 (11.0)	113,000 (22.0)
Hexavalent chromium (mg/L)	NA	113 (0.60)	NA	109 (0.60)
Sample ID	**MW-03-07**		**MW-03F-07**	
Dilution Factor	200		200	
Date	10/08/2003		10/08/2003	
References	50, Tables 3-1 (p. 1), 4-1a (p. 6), and 4-1b (p. 2), and App. A, p. 8, and App. B, pp. 146, 203; 104, p. 5; 106, pp. 8 and 9		50, Tables 3-1 (p. 1), 4-1a (p. 6), and 4-1b (p. 2), and App. A, p. 8, and App. B, pp. 150, 205; 104, p. 5; 106, pp. 6 and 7	
cis-1,2-DCE	120 (20)		120 (20)	
PCE	120 (20)		120 (20)	
TCE	12,000 (200)		12,000 (200)	
Metals	**Dissolved**	**Total**	**Dissolved**	**Total**
Chromium (total) (µg/L)	117,000 (11.0)	121,000 (11.0)	114,000 (11.0)	118,000 (2.2)
Hexavalent chromium (mg/L)	NA	117 (1.2)	NA	115 (1.2)
Sample ID	**MW-05-06**		**MW-05-07**	
Dilution Factor	250		250	
Date	07/10/2003		10/09/2003	
Reference	50, Tables 3-1 (p. 1), 4-1a (p. 8), and 4-1b (p. 4), and App. A, p. 4, and App. B, p. 31; 89, pp. 1, 2, 3; 88, p. 5		50, Tables 3-1 (p. 1), 4-1a (p. 8), and 4-1b (p. 4), and App. A, p. 9, and App. B, p. 169; 104, p. 7; 106, pp. 12 and 13	
VOCs (µg/L)				
cis-1,2-DCE	990 (25)		420 (25)	
PCE	250 (25)		430 (25)	

Sample ID	**MW-05-06**		**MW-05-07**	
TCE	28,000 (250)		27,000 (250)	
m & p Xylene	200 (25)		730 (25)	
Metals	**Dissolved**	**Total**	**Dissolved**	**Total**
Chromium (total) (µg/L)	14,300 (2.2)	14,000 (2.2)	159,000 (11.0)	167,000 (11.0)
Hexavalent chromium (mg/L)	NA	13.6 (0.12)	NA	156 (1.2)
Sample ID	**MW-07-06**		**MW-07-07**	
Dilution Factor	25		25	
Date	07/07/2003		10/08/2003	
Reference	50, Tables 3-1 (p. 1), 4-1a (p. 11), and 4-1b (p. 5), and App. A, p. 1, and App. B, p. 43; 87, pp. 1, 8, 9; 88, p. 1		50, Tables 3-1 (p. 1), 4-1a (p. 12), and 4-1b (p. 5), and App. A, p. 6, and App. B, pp. 108, 185; 104, p. 1; 106, pp. 14 and 15	
VOCs (µg/L)				
1,1-DCE	44 (2.5)		41 (2.5)	
cis-1,2-DCE	100 (2.5)		97 (2.5)	
PCE	390 (2.5)		330 (2.5)	
1,1,1-TCA	100 (2.5)		90 (2.5)	
TCE	2,600 (25)		2,300 (25)	
Xylene (total)	57 (2.5)		37 (2.5)	
Metals	**Dissolved**	**Total**	**Dissolved**	**Total**
Chromium (total) (µg/L)	19,600 (2.2)	18,600 (2.2)	16,200 (2.2)	15,400 (2.2)
Hexavalent chromium (mg/L)	NA	18.4 (0.12)	NA	15.6 (0.12)

Notes:
The MDLs and reporting limits are listed on the data sheets. The concentrations in parenthesis are the MDLs or reporting limits (Refs. 50 p. 5; 74).

( ) = Value in parenthesis is the MDL or reporting limit
App. = Appendix
DCE = Dichloroethene
ID = Identification
MDL = Method detection limit
mg/L = Milligram per liter
MW = Monitoring well
NA = Not analyzed
PCE = Tetrachloroethylene
TCE = Trichloroethene
µg/L = Microgram per liter
VOC = Volatile organic compound

TABLE 27
RELEASE CONCENTRATIONS – DEEP GROUND WATER
2003 SUPPLEMENTAL GROUND WATER INVESTIGATION

Sample ID	**MW-02-06**		**MW-02-07**	
Dilution Factor	25		25	
Date	07/07/2003		10/06/2003	
Reference	50, Tables 3-1 (p. 2), 4-1a (p. 3), and 4-1b (p. 2), and App. A, p.1; 87, pp. 4, 5, 8, 9; 88, p. 3		50, Tables 3-1 (p. 2), 4-1a (p. 3), and 4-1b (p. 2), and App. A, p. 6, and App. B, pp. 115, 116, 117; 104, p. 2; 106, pp. 3, 4, and 5	
VOCs (µg/L)				
PCE	590 (25)		550 (25)	
TCE	3,200 (25)		2,900 (25)	
Xylene (total)	34 (2.5)		14 (2.5)	
Metals	**Dissolved**	**Total**	**Dissolved**	**Total**
Chromium (total) (µg/L)	30,800 (2.2)	29,700 (2.2)	23,400 (2.2)	24,400 (2.2)
Hexavalent chromium (mg/L)	NA	36.5 (0.30)	NA	23.6 (0.30)
Sample ID	**MW-04-06**		**MW-04-07**	
Dilution Factor for VOCs	250		500	
Date	07/09/2003		10/07/2003	
Reference	50, Tables 3-1 (p. 2), 4-1a (p. 7), and 4-1b (p. 3), and App. A, p. 3 and App. B, pp. 25, 29; 87, pp. 6, 8, 9; 88, p. 4		50, Tables 3-1 (p. 2), 4-1a (p. 7), and 4-1b (p. 3), and App. A, p. 7, and App. B, pp. 127, 195; 104, p. 3; 106, pp. 10 and 11	
VOCs (µg/L)				
cis-1,2-DCE	530 (25)		440 (50)	
PCE	530 (25)		--	
TCE	32,000 (250)		24,000 (500)	
Xylene (total)	840 (25)		530 (50)	
Metals	**Dissolved**	**Total**	**Dissolved**	**Total**
Chromium (total) (µg/L)	185,000 (11)	183,000 (11)	140,000 (11)	154,000 (22)
Hexavalent chromium (mg/L)	NA	172 (0.60)	NA	146 (0.60)

Sample ID	**MW-09-06**		**MW-09-07**	
Dilution Factor	5		10	
Date	07/09/2003		10/07/2003	
Reference	50, Tables 3-1 (p. 2), and 4-1b (p. 6), and App. A, p. 3; 87, p. 5		50, Tables 3-1 (p. 2), and 4-1b (p. 6), and App. A, p. 7; 106, p. 18	
VOCs (µg/L)				
TCE	700 (5.0)		700 (20)	
Sample ID	**MW-10-06**		**MW-10-07**	
Dilution Factor	125		200	
Date	07/10/2003		10/09/2003	
Reference	50, Tables 3-1 (p. 2) and 4-1b (p. 7), and App. A, p. 9; 89, p. 4		50, Tables 3-1 (p. 2) and 4-1b (p. 7), and App. A, p. 9; 106, p. 20	
VOCs (µg/L)				
TCE	16,000 (200)		15,000 (200)	
Sample ID	**MW-15-04**		**MW-15-05**	
Dilution Factor for VOCs	25		25	
Date	07/09/2003		10/07/2003	
Reference	50, Tables 3-1 (p. 2), 4-1a (p. 20), and 4-1b (p. 10), App. A, p. 3, and App. B, pp. 68, and 72; 105, p. 1		50, Tables 3-1 (p. 2), 4-1a (p. 20), and 4-1b (p. 10), App. A, p. 7, and App. B, p. 138; 104, p. 4; 106, pp. 21 and 26	
VOCs (µg/L)				
TCE	1,900 (25)		1,700 (25)	
Metals	**Dissolved**	**Total**	**Dissolved**	**Total**
Chromium (total) (µg/L)	13,300 (2.2)	12,000 (2.2)	10,500 (2.2)	9,750 (2.2)
Hexavalent chromium (mg/L)	NA	12.8 (0.12)	NA	10.2 (0.12)

Notes:
The MDLs and reporting limits are listed on the data sheets. The concentrations in parenthesis are the MDLs or reporting limits (Refs. 50 p. 5; 74).

( ) = Value in parenthesis is the MDL or reporting limit
-- = Not detected at a concentration documenting an observed release to ground water
App. = Appendix
ID = Identification
DCE = Dichloroethene
MDL = Method detection limit
mg/L = Milligrams per liter
MW = Monitoring well
NA = Not analyzed
PCE = Tetrachloroethylene
TCE = Trichoroethene
µg/L = Microgram per liter
VOC = Volatile organic compound

Chemical Analysis – September 2004 Phase II Investigation and Bench Scale Study

In 2004, an environmental consultant for PADEP conducted an additional round of ground water sampling at the Chem-Fab facility. Ground water samples were collected from six monitoring wells on the Chem-Fab facility and 15 monitoring wells installed off of the Chem-Fab property (Ref. 51, pp. 1, 10). A summary of background and contaminated wells sampled during the 2004 Phase II investigation is presented in the tables that follow.

Ground water samples were analyzed for VOCs using EPA Method 8260, SVOCs using EPA Method 8270, TAL metals using EPA Method 6010, cyanide using EPA Method 9010/9014, and hexavalent chromium using EPA Method 3060A (Ref. 51, p. 12). The MDLs are listed on the laboratory data sheets for the ground water samples collected during this sampling event. The number reported on the data sheets adjacent to the data qualifier "U" (not detected) is the MDL. The MDL was adjusted for the DF by multiplying the MDL by the DF (Ref. 74).

The concentrations of hazardous substances detected in the background and release samples, followed by the MDL in parenthesis, are presented in the tables that follow.

2004 - Phase II Investigation and Bench Scale Study - Background Well Samples

The wells sampled during the 2004 sampling event were the same wells sampled during earlier sampling events. Information related to the selection of background wells and well construction details are provided in the background well section for the Phase II site characterization and in Table 18 (Ref. 51, pp. 1, 10).

Tables 28 and 29 summarize the background concentrations for shallow and deep ground water samples.

TABLE 28
BACKGROUND CONCENTRATIONS – SHALLOW GROUND WATER
2004 PHASE II INVESTIGATION AND BENCH SCALE STUDY

Sample ID	**DW-08**	
Dilution Factor for VOCs	1	
Date	08/09/2004	
Reference	51, Tables 3-4 (p. 1), 4-1a (p. 6), and 4-1b (p. 3); 90, pp. 1, 2, 7, 8; 91, p. 1	
VOCs (µg/L)		
1,1-DCE	1.8 J (0.5) [4.23]	
cis-1,2-DCE	8 (0.5)	
Methylene chloride	17 (1.0)	
PCE	11 (0.5)	
TCE	230 (5.0)	
Xylene (Total)	2.4 J (0.5) [24]	
Sample ID	**DW-08**	
Metals	**Dissolved**	**Total**
Chromium (Total) (µg/L)	ND	828 (2.5)
Hexavalent chromium (mg/L)	NA	ND

Notes:
[ ] = Adjusted concentration
( ) = Value in parenthesis is the MDL or reporting limit
DCE = Dichloroethene
DW = Domestic well
ID = Identification
J = Estimated concentration. The bias is not known. The concentration is adjusted according to Reference 79. The 1,1-DCE concentration is multiplied by the adjustment factor of 2.35 and the xylene concentration is multiplied by adjustment factor value of 10 (Ref. 79, Exhibit 3, pp. 7, 12, and 18).
MDL = Method detection limit
mg/L = Milligram per liter
NA = Not analyzed
ND = Not detected above laboratory MDLs
PCE = Tetrachloroethene
TCE = Trichloroethene
µg/L = Microgram per liter
VOC = Volatile organic compound

TABLE 29
BACKGROUND CONCENTRATIONS – DEEP GROUND WATER
2004 PHASE II INVESTIGATION AND BENCH SCALE STUDY

Sample ID	**MW-16-06**	
Dilution Factor	2.5,25	
Date	08/18/2004	
Reference	51, Tables 3-4 (p. 2), 4-1a (p. 4), and 4-1b (p. 2); 90, pp. 2, 3, 7, and 8; 91, p. 1	
VOCs (µg/L)		
1,1-DCE	200 (2.5)	
cis-1,2-DCE	100 (2.5)	
Methylene chloride	0.6 J (0.5) [6]	
PCE	190 (2.5)	
TCE	160 (2.5)	
Xylene (Total)	ND	
Metals	**Dissolved**	**Total**
Chromium (Total) (µg/L)	236 (2.5)	231 (2.5)
Hexavalent chromium (mg/L)	NA	0.2 (0.0028)

Notes:
[ ] = Adjusted concentration
( ) = Value in parenthesis is the MDL or reporting limit
DCE = Dichloroethene
ID = Identification
J = Estimated concentration. The bias is not known. The concentration is adjusted according to Reference 79. The methylene chloride concentration is multiplied by the adjustment factor of 10 (Refs. 90, p. 10; 79, Exhibit 3, pp. 7 and 12).
MDL = Method detection limit
mg/L = Milligram per liter
MW = Monitoring well
NA = Not analyzed
ND = Not detected above laboratory MDLs
PCE = Tetrachloroethylene
TCE = Trichloroethene
µg/L = Microgram per liter
VOC = Volatile organic compound

2004 Phase II Investigation and Bench Scale Study - Contaminated Shallow Ground Water

Tables 30 and 31 summarize the concentrations of hazardous substances detected in shallow and deep ground water samples collected from the monitoring wells at concentrations documenting an observed release to ground water (Ref. 1, Table 2-3).

TABLE 30
RELEASE CONCENTRATIONS – SHALLOW GROUND WATER
2004 PHASE II INVESTIGATION AND BENCH SCALE STUDY

Sample ID	**MW-01-08**	
Date	08/09/2004	
Reference	51, Tables 3-4 (p. 1), and 4-1a (p. 1); 90, p. 8	
Metals		
Hexavalent chromium (mg/L)	0.051 (0.00070)	
Sample ID	**MW-03-08**	
Dilution Factor for VOCs	20	
Date	08/10/2004	
Reference	51, Tables 3-1 (p.1), 4-1a (p. 1), and 4-1b (p. 1); 90, pp. 1, 7, 8; 91 p. 1	
VOCs (µg/L)		
Methylene chloride	87 (4.0)	
Metals	**Dissolved**	**Total**
Chromium (total) (µg/L)	5,490 (2.5)	5,370 (2.5)
Hexavalent chromium (mg/L)	NA	4.9 (0.14)
Sample ID	**MW-05-08**	
Dilution Factor for VOCs	250,2500	
Date	08/11/2004	
Reference	51, Tables 3-12 (p. 1), 4-1(p. 1), and 4-1b (p. 1); 90, pp. 4, 5, 7, 8; 91, p. 1	
VOCs (µg/L)		
cis-1,2-DCE	770 (25)	
Methylene chloride	1,800 (50)	
PCE	260 (25)	
TCE	23,000 (250)	
Metals	**Dissolved**	**Total**
Chromium (total) (µg/L)	15,800 (2.5)	16,200 (2.5)
Hexavalent chromium (mg/L)	NA	15.8 (0.14)

Sample ID	**MW-07-08**	
Dilution Factor for VOCs	20,200	
Date	08/13/2004	
Reference	51, Tables 3-1 (p. 1), 4-1a (p. 2), and 4-1b (p. 1); 92, pp. 1, 2, 3, 4	
VOCs (µg/L)		
1,1-DCE	32 (2.0)	
cis-1,2-DCE	97 (2.0)	
Methylene chloride	100 (4.0)	
PCE	250 (2.0)	
TCE	1,400 (20)	
Xylene (total)	92 (2.0)	
Metals	**Dissolved**	**Total**
Chromium (total) (µg/L)	16,800 (2.5)	17,000 (2.5)
Hexavalent chromium (mg/L)	NA	15.9 (0.35)

Notes:
( ) = Value in parenthesis is the MDL or reporting limit
DCE = Dichloroethene
ID = Identification
MDL = Method detection limit
MW = Monitoring well
mg/L = Milligram per liter
NA = Not analyzed
PCE = Tetrachloroethylene
TCE = Trichloroethene
µg/L = Microgram per liter
VOC = Volatile organic compound

TABLE 31
RELEASE CONCENTRATIONS – DEEP GROUND WATER
2004 PHASE II INVESTIGATION AND BENCH SCALE STUDY

Sample ID	**MW-02-08**	
Dilution Factor for VOCs	5,100	
Date	08/10/2004	
Reference	51, Table 3-1 (p. 1), 4-1a (p. 1), and 4-1b (p. 1); 90, pp. 3, 7, 8	
VOCs (µg/L)		
Methylene chloride	69 (1.0)	
TCE	1,500 (10)	
Xylene (Total)	32 (0.5)	
Metals	**Dissolved**	**Total**
Chromium (Total) (µg/L)	11,200 (2.5)	10,700 (2.5)
Hexavalent chromium (mg/L)	NA	10 (0.14)
Sample ID	**MW-04-08**	
Dilution Factor for VOCs	250,2500	
Date	08/11/2004	
Reference	51, Tables 3-1 (p. 1), 4-1a (p. 1), and 4-1b (p. 1); 90, pp. 4, 7, 8; 91, p. 1	
VOCs (µg/L)		
cis-1,2-DCE	480 (25)	
Methylene chloride	5,800 (50)	
TCE	30,000 (250)	
Xylene (Total)	1,300 (25)	
Metals	**Dissolved**	**Total**
Chromium (Total) (µg/L)	182,000 (25)	183,000 (0.76)
Hexavalent chromium (mg/L)	NA	168 (1.4)
Sample ID	**MW-09-08**	
Dilution Factor for VOCs	10	
Date	08/12/2004	
Reference	51, Tables 3-1 (p. 2), 4-1a (p. 2), and 4-1b (p. 1); 90, pp. 6, 7, 8; 91, p. 1	
VOCs (µg/L)		
TCE	620 (10)	

Sample ID	**MW-10-08**	
Dilution Factor for VOCs	250	
Date	08/12/2004	
Reference	51, Tables 3-1 (p.2), 4-1a, p. 3, and 4-1b (p. 1); 90, pp. 5, 6, 7; 91, p. 1	
VOCs (µg/L)		
cis-1,2-DCE	570 (25)	
TCE	18,000 (250)	
Sample ID	**MW-15-06**	
Dilution Factor for VOCs	20,200	
Date	08/16/2004	
Reference	51, Tables 3-1 (p. 2), 4-1a (p. 4), and 4-1b (p. 2); 92, p. 2, 3	
VOCs (µg/L)		
TCE	2,100 (20)	
Metals	**Dissolved**	**Total**
Chromium (total) (µg/L)	8,440 (2.5)	9,470 (2.5)
Hexavalent chromium (mg/L)	NA	9 (0.14)

Notes:
( ) = Value in parenthesis is the MDL
DCE = Dichloroethene
ID = Identification
MDL = Method detection limit
mg/L = Milligram per liter
MW = Monitoring well
NA = Not analyzed
TCE = Trichloroethene
µg/L = Microgram per liter
VOC = Volatile organic compound

Attribution

The ground water contamination identified in monitoring wells at the Chem-Fab facility and nearby drinking water wells is attributable to releases of hazardous substances from Source 1 on the Chem-Fab facility. As documented in the source description section of this HRS documentation record, Sections 2.4 and 3.1.1, hazardous substances detected in ground water samples documenting an observed release to the Stockton Formation were also detected in soil samples collected from Source 1. These hazardous substances include hexavalent chromium; chromium; 1,1-DCA; 1,1-DCE; cis-1,2-DCE; 1,2-DCE (total); 1,1-DCE; methylene chloride; PCE; toluene; 1,1,1-TCA; TCE; and xylene. Source 1 is an area of contaminated soil with no containment. A 10,000-gallon UST contained hexavalent chromium wastes (Refs. 3, p. 2-4; 11, pp. 7 and 15; 23, p. 1). Liquid samples collected from a trench dug outside of The contents of the UST exhibited RCRA hazardous waste characteristic of toxicity for chromium and contained hexavalent chromium, TCE, cis-1,2-DCE, methylene chloride, and toluene (Ref. 23, pp 4, 8, 9, 19, and 20). The water in a trench dug adjacent to the UST had an orange (yellow) tint indicating the contents of the tank (chromium waste water) leaked (Ref. 23, p. 1). Yellow water was observed in the UST and in ground water samples from on-site monitoring wells (Refs. 49, Table 3-1; 51, pp. 6, 8, 9 and 10 and Table 3-4). The UST contained a yellow liquid with a pH of 3 (Ref. 11, p. 7). A sample collected from the UST contained hexavalent chromium (Ref. 11, p. 15). The presence of yellow water in the ground water and in the UST indicates that the UST contents released directly to ground water.

Xylene, toluene, chromic acid rinse water and sludge, chromic acid, methylene chloride, and TCE were used on the facility for plating operations (Refs. 3, p. 2-3; 11, p. 4; 28; 38, p. 1; 94, p. 1). Xylene, toluene, methylene chloride, chromium, and TCE were detected in Source 1 soil samples and in ground water samples documenting an observed release to ground water (see Section 2.4 for Source 1 and Section 3.1.1 for documentation of observed release to ground water). The uses of these hazardous substances at the Chem-Fab facility and their presence in Source 1 and underlying ground water indicate that operations at the Chem-Fab facility released hazardous substances to soil and ground water.

The presence of TCE and other hazardous substances in ground water, including drinking water wells, is attributable to operations conducted at the Chem-Fab facility. In 1995, during an NEIC investigation of the Chem-Fab facility, drums throughout the facility were sampled. The drum contents had the RCRA hazardous waste characteristics of ignitability, corrosivity, and toxicity for chromium and TCE (Ref. 23, pp. 7 and 8). An UST located at the facility contained a RCRA hazardous waste due to the characteristic of toxicity from chromium (Ref. 23, p. 8). A liquid and sludge sample collected from the sump located in the warehouse contained a RCRA hazardous waste exhibiting the characteristic of toxicity for TCE (Ref. 23, p. 9). Tables 1 and 2 of Reference 23 summarize the analytical results and an inventory of all the drums (Ref. 23, pp. 4, 9, 20). Drums sampled by NEIC also contained TCE, toluene, xylene, solvent degreaser, and mineral spirits. Some of the drums were stored directly on the ground outside of the onsite buildings (Ref. 23, p. 7, 15, 16, 24, 25). A liquid sample collected adjacent to the 10,000-gallon UST contained chromium, hexavalent chromium, TCE, cis-1,2-DCE, methylene chloride, and toluene (Ref. 23, pp. 19 and 20).

PCE, TCE, and 1,1,1-TCA are commonly used as degreasers in metals, electronics, and plastics' industries (Ref. 47, p. 73). The presence of these chlorinated compounds in soil and ground water underlying the Chem-Fab facility is attributable to the degreasing operations conducted at the facility (Refs. 3, p. 2-3; 28; 38, p. 1; 94, p. 1).

According to historical information, an AST farm located at the facility appeared to have contained three ASTs, including one 2,500-gallon AST, one 4,000-gallon AST, and one 8,500-gallon AST. The tank

farm was believed to have an underground catch basin with a 1,000-gallon capacity. The contents of these ASTs have not been determined (Ref. 3, p. 2-3).

The ASTs are a potential source of the ground water contamination underlying the Chem-Fab facility. Contaminants such as ethylbenzene and PAHs may be related to petroleum stored in the ASTs. Because petroleum products are excluded from CERCLA evaluation, petroleum-related contaminants such as ethylbenzene and PAHs are not evaluated in this HRS documentation record (Refs. 53; 54; 55; and 56). Xylene and toluene are included in this evaluation because drums containing xylene and toluene were identified on the facility (Ref. 23, pp. 15, 17).

Federal, state, and local database records reviewed for the area surrounding the Chem-Fab facility identified other possible sources of contamination to ground water. The Cartex Corporation facility at Broad Street and Veterans Lane, is located approximately 660 feet northwest of the Chem-Fab facility. Three VOCs, including 1,1-DCE; 1,1,1-TCA; and TCE, were detected in two of the nine pumping wells at the Cartex Corporation facility used in an onsite remediation process. According to PADEP records, the VOCs did not migrate off site and the concentrations detected in the wells were below PADEP's Act 2 medium specific concentrations for organic regulated substances in ground water (Ref. 52, pp. 3, 12, 13, 18, and 19). The database search also identified 10 leaking USTs within a 0.5-mile radius of the Chem-Fab facility (Ref. 52, p. 12). These tanks received a "No Further Corrective Action is Necessary" determination from PADEP. A used motor oil tank is located within a 0.5-mile radius of the Chem-Fab facility (Ref. 52, pp. 12 and 13). Numerous RCRA generators were identified within a 0.25-mile radius of the Chem-Fab facility (Ref. 52, pp. 13, 14).

During the emergency response action conducted at the Doylestown Ground Water site, an investigation of the potentially responsible parties was conducted (Ref. 48, p. 7). The investigation identified the following corporations or disposal areas potentially responsible for the ground water contamination in the Doylestown area: Cartex Corporation; Chem-Fab Corporation; and an unnamed dump (landfill) (Refs. 93; 94; 95). A letter obtained from the Woodbridge Foam Corporation, formerly the Cartex Corporation, indicated that the Cartex facility leased property in Doylestown from Bucks County in 1965. The foam molding operation was located on this property until 1985 (Ref. 93, p. 1). In December 1985, Woodbridge Foam Corporation purchased the Cartex Corporation. In 1987 operations were discontinued. In July 1988, the buildings on the property were demolished. In 1994, the property was still owned by Woodbridge Foam Corporation. 1,1,1-TCA and methyl chloride were used at the facility (Ref. 93, p. 1). A sample collected from an on-site well contained 1,1,1-TCA, PCE, TCE, and 1,1-DCE (Ref. 93, p. 2).

Person interviewed in regards to the landfill indicated:

- The landfill was located at Doyle Street and Harvey Avenue (Ref. 95, p. 4). The landfill received household refuse (Ref. 95, p. 6).
- No records of the landfill were identified within the Borough of Doylestown (Ref. 95, p. 3).
- Several industries operated in the area of the landfill (Ref. 95, pp. 5, 8, 9, and 11).

No other information regarding the Cartex Corporation or the landfill was identified (Refs. 93 and 95).

As documented above, other sources of potential ground water contamination exist in the Doylestown, Pennsylvania area. However, the Chem-Fab facility is at least partially responsible for the ground water contamination. Ground water isoconcentrations and ground water elevations for the monitoring wells on the Chem-Fab property indicate that the Chem-Fab facility is one of the sources of the ground water

release to the Borough of Doylestown drinking water wells located near the facility (Refs. 3, Figure 3-2; 51, Figures 4-1, 4-2, and 4-3). As documented in Sections 2.4 and 3.1.1, hazardous substances detected in sources on the Chem-Fab facility with no containment were also detected in a documented observed release to ground water.

Hazardous Substances Released:

Chromium (total)
Chromium (VI)
cis-1,2-DCE
1,2-DCE (total)
Methylene chloride
PCE
Toluene
1,1,1-TCA
TCE
Xylene

Ground Water Observed Release Factor Value: 550

3.2 WASTE CHARACTERISTICS

3.2.1 TOXICITY/MOBILITY

The toxicity and mobility factor values for the hazardous substances detected in the source samples with containment factor values of greater than 0 are summarized in Table 32 below. The combined toxicity and mobility factor values are assigned in accordance with Reference 1, Section 3.2.1. Hazardous substances detected in the observed release to ground water are assigned a mobility factor value of 1.

TABLE 32
TOXICITY/MOBILITY FACTOR VALUES

Hazardous Substance	Source No.	Toxicity Factor Value	Mobility Factor Value	Observed Release?	Toxicity/ Mobility	Reference
Chromium (total)	1	1	1	Yes	1	2, p. BI-3
Chromium (VI)	1	10,000	1	Yes	10,000	2, p. BI-3
1,2-DCA	N/A	100	1	Yes	100	2, p. BI-4
cis-1,2-DCE	1	100	1	Yes	100	2, p. BI-5
1,1-DCE	N/A	100	1	Yes	100	2, p. BI-5
1,2-DCE (total)	1	100	1	Yes	100	2, p. BI-5
Methylene chloride	1	10	1	Yes	10	2, p. BI-9
PCE	1	100	1	Yes	100	2, p. BI-10
1,1,1-TCA	1	1	1	Yes	1	2, p. BI-11
TCE	1	10,000	1	Yes	10,000	2, p. A-2
Toluene	1	10	1	Yes	10	2, p. BI-11
Xylene	1	100	1	Yes	100	2, p. BI-12

Notes:
DCE = Dichloroethene
PCE = Tetrachloroethylene
TCA = Trichloroethane
TCE = Trichloroethene
NA = Not available

Highest Toxicity/Mobility Factor Value: 10,000

3.2.2 HAZARDOUS WASTE QUANTITY

Source No.	Source Type	Source Hazardous Waste Quantity
1	Contaminated Soil	Greater than zero, but unknown

The assigned HWQ factor value is 100 because a target (drinking water well) is subject to actual contamination at Level I concentrations as documented Tables 12, 15, and 16 in Section 3.0 of this documentation record (Ref. 1, Section 2.4.2.2).

Hazardous Waste Quantity Factor Value: 100
(Ref. 1, Section 2.4.2.2)

3.2.3 WASTE CHARACTERISTICS FACTOR CATEGORY VALUE

The waste characteristics factor category was obtained by multiplying the toxicity/mobility and hazardous waste quantity factor values, subject to a maximum product of 1×10^8. Based on this product, a value was assigned based on Reference 1, Table 2-7.

Toxicity/Mobility Factor Value: 10,000.00
Hazardous Waste Quantity Factor Value: 100.00

Toxicity/Mobility Factor Value ×
Hazardous Waste Quantity Factor Value: 100,000.00

Waste Characteristics Factor Category Value: 32
(Reference 1, Table 2-7)

3.3 TARGETS

In 1981, the Bucks County Health Department identified ground water contamination in the Chem-Fab facility area. Ground water samples were collected from the Borough of Doylestown Water Works. TCE and PCE were detected in two of the untreated water samples (wells DB 7 and DB 8) and PCE and 1,1,1-TCE were detected in one of the untreated well samples (well DB 10) (Ref. 37). These findings initiated an investigation of the source of ground water contamination. Numerous residential, business, and public drinking water wells were subsequently sampled and found to be contaminated with TCE, PCE, and other chlorinated compounds (Ref. 48, p. 3). Affected residences and businesses were connected to the Borough of Doylestown public water line (Ref. 48, pp. 3, 7, 15, and 17).

A summary of drinking water wells located within a 4-mile radius of the Chem-Fab facility is provided in the paragraphs below. Three municipal water suppliers were identified within the 4-mile radius of the Chem-Fab facility: Borough of Doylestown Water Works; Doylestown Township Municipal Authority; and the Buckingham Township Municipal Authority. Other non-municipal public water suppliers within the 4-mile radius were identified from the Environmental FirstSearch™ database (Refs. 40; 58; 61; 62; 63).

The Borough of Doylestown water system includes five active wells and one inactive well (well DB13, also known as OSW-BW13-01). The inactive well was closed because TCE and chromium from the Chem-Fab facility contaminated the well. The water in this system is blended and treated prior to distribution. The population served is between 8,500 and 9,000 people. No single well provides greater than 40 percent of the total supply (Ref. 57). Well DB13 was closed because of contamination released from the Chem-Fab facility, therefore, the well is included in the evaluation of the public water supply system. The population assigned to each of the Borough of Doylestown wells is 1,417 or 8,500 divided by six. Well locations are distributed as follows: two wells (DB 10 and DB 13) within 0- to 0.25-mile radius; two wells (DB 7 and DB 8) within 0.25- to 0.50-mile radius; one well (DB 12) within 0.50- and 1.0-mile radius; and one well (DB 9) within 1.0- to 2.0-miles radius of the facility. Well locations are shown in Reference 40. The distances from the wells were measured from the outer boundaries of Source 1. The locations (latitude and longitude coordinates) of the wells were provided by the Borough of Doylestown (Refs. 40; 58). The locations of the wells are confidential. Therefore, information related to the exact location of the wells is provided in a confidential reference (Ref. 58). The Borough of Doylestown supply wells are identified in Reference 59 as being completed in the Stockton Formation (Ref. 59). A representative from the borough verified that the wells were all completed in the Stockton Formation (Ref. 102). DB13 was closed in October 2001. To determine the population served by DB13 in the year 2001, U.S. Census data was used. In 1990, the population of the Borough of Doylestown was 8,575 persons. In the year 2000, the population was 8,227 persons. Between the years 1990 to 2000 the Borough of Doylestown population decreased by 348 persons (Ref. 125). Therefore, assuming that this population trend has continued, 348 persons are subtracted from the population currently served by the Borough of Doylestown to provide a conservative estimate of the population at well closure. The population served by the Borough of Doylestown in 2001 is estimated to be 8,152 persons (8,500 – 348 = 8,152). The population served by each well is 8,152 persons divided by six wells or 1,358 persons per well.

In 2000, sample analysis from the Borough of Doylestown well 13 revealed a TCE concentration above the MCL as documented in Tables 15 and 16. In 2001, PCE, 1,1,1-TCA, 1,1-DCE, and TCE were detected in the Borough of Doylestown active supply wells (Ref. 108). The TCE concentration in well 13 exceeded the MCL (see Table 16). In 2007, 1,1-DCE, PCE, and 1,1,1-TCA were detected in the active supply wells (Ref. 109). None of the concentrations were above MCLs.

Residents within a 4-mile radius of the Chem-Fab facility also obtain water supplies from the Doylestown Township Municipal Authority. This system includes 14 active wells. The water from these 14 wells is blended, treated, and distributed to 5,254 residents. No single well provides greater than 40 percent of the total supply (Ref. 60). Well locations are distributed as follows: eight wells (NW1 through NW5, CW1, CW5, and CW7) within 1.0- and 2.0-miles radius; two wells (CW3 and NWW1) within 2.0-to 3.0-miles radius; and four wells (SW1, SW2, SW6, and SW7) within 3.0- and 4.0-miles radius. The population assigned to each well is 375 (5,254 persons divided by 14 wells). Well locations are shown on Reference 40 and were plotted using Reference 61. The distances were measured from the outer boundaries of Source 1 (Refs. 40; 61). The locations (latitude and longitude coordinates) of the wells were provided by Doylestown Township Municipal Authority. The exact location of the wells is confidential. Therefore, information related to the location of the wells is provided in a confidential reference (Ref. 61). Reference 62 indicates that the Doylestown Township Municipal Authority wells are all completed in the Stockton Formation (Ref. 62, 102).

The third municipal water supply system that maintains supply wells within a 4-mile radius of the Chem-Fab facility is Buckingham Township. Buckingham Township has three wells located within the 2- to 3-miles radius of the facility, CS-1, CS-2, and CS-3. These wells supply water to 5,600 to 5,700 persons (Refs. 40; 63; 103, p. 13). These wells are completed in the Stockton Formation (Ref. 103, p. 2). Buckingham Township maintains a second system called the Field Stone System, which supplies water to 333 persons. The second system has two wells, FS-1 and FS-2, located between 1.0 to 2.0 miles from the Chem-Fab facility. No single well provides greater than 40 percent of the total supply (Refs. 40; 63; 103, p. 14). These wells are completed in the Stockton Formation (Ref. 103. p. 2). A third Buckingham Township system (Furlong) has three wells (F-1, F-2, and F-3) within 3 to 4 miles of the Chem-Fab facility that serves a population of 1,177 persons. No single well of the Furlong system provides greater than 40 percent of the total supply (Refs. 40; 63; 103, p. 2). F-1 is completed in the Brunswick Formation. F-2 is completed in the Brunswick/Lockatong Formation. F-3 is completed in the Lockatong Formation (Ref. 103, p. 2). A fourth Buckingham Township system (Buckingham Village) has two wells (BV-1 and BV-2) within 3 to 4 miles of the Chem-Fab facility that serves a population of 340 (Refs. 63; 103, pp. 2 and 12).

Other non-municipal public drinking water supply wells that were identified from the Environmental FirstSearch™ database are included in the Table 33 (Ref. 65). The latitude and the longitude of Source 1 were entered into the database (Ref. 65, p. 3). All drinking water wells within a 4-mile radius of Source 1 were identified by the database. In the summary sheets beginning on page 1 of Reference 65, the database summarizes all the drinking water wells within a 4-mile radius of Source 1. The second column indicates if the well is used for drinking using the abbreviation of PWS (public water supply). The third column identifies the owner of the well. The fifth column identifies the distance and the direction from Source 1. A detailed report for each well is provided in the section following the summary sheets. For example, on page 72, a detailed report is provided for a Borough of Doylestown well. The distance from Source 1 is shown in the second row, 0.53 NE (northeast). The formation, well depth, water use, and population served also are provided in the detailed reports.

The database used for the Environmental FirstSearch™ report was last updated in June 1, 1998 (Ref. 65, p. 2). The database obtains data from the Pennsylvania Ground Water Information System (PaGWIS). This database is maintained by the Pennsylvania Topographic and Geological Survey (PaGS). The database was created to manage data supplied to PaGS by water well drillers. Data submission began in 1966 using paper forms. Latitude and longitude was determined by PaGS. A detailed description of the database is presented on page 1,458 of Reference 65.

TABLE 33
SUMMARY OF PUBLIC DRINKING WATER SUPPLY WELLS

Well ID	Distance Ring Miles	Level I	Level II	Potential	Population Served	Reference
DB Well 10	0 to 0.25	No	Yes	No	1,417	40, 57, 58
DB Well 13	0 to 0.25	Yes	No	No	1,358	40, 57, 58, 125
DB Well 7	0.25 to 0.50	No	Yes	No	1,417	40, 57, 58
DB Well 8	0.25 to 0.50	Yes	No	No	1,417	40, 57, 58
DB Well 12	0.50 to 1.0	No	Yes	No	1,417	40, 57, 58
Colonial Green	0.50 to 1.0	No	No	Yes	900	67
Delaware Valley Tech College (2 wells)	0.50 to 1.0	No	No	Yes	1,200	67; 115
DB Well 9	1.0 to 2.0	No	No	Yes	1,417	40, 57, 58
Field Stone[a]	1.0 to 2.0	No	No	Yes	333	40, 63
CW1[b]	1.0 to 2.0	No	No	Yes	375	40, 60, 61
CW5[b]	1.0 to 2.0	No	No	Yes	375	40, 60, 61
CW7[b]	1.0 to 2.0	No	No	Yes	375	40, 60, 61
NW1[b]	1.0 to 2.0	No	No	Yes	375	40, 60, 61
NW2[b]	1.0 to 2.0	No	No	Yes	375	40, 60, 61
NW3[b]	1.0 to 2.0	No	No	Yes	375	40, 60, 61
NW4[b]	1.0 to 2.0	No	No	Yes	375	40, 60, 61
NW5[b]	1.0 to 2.0	No	No	Yes	375	40, 60, 61
Cross Keys Place	1.0 to 2.0	No	No	Yes	1,000	67
Lake Ridge Mobile Home Park	1.0 to 2.0	No	No	Yes	105	67; 70
Tabor Children Services	1.0 to 2.0	No	No	Yes	120	67
Edison Mobile Home Park	1.0 to 2.0	No	No	Yes	40	67
Buckingham Twp. (CS1, CS2, CS3)	2.0 to 3.0	No	No	Yes	5,600	63
CW3[b]	2.0 to 3.0	No	No	Yes	375	40, 60, 61
NWW1[b]	2.0 to 3.0	No	No	Yes	375	40, 60, 61
Grayman Elementary School	2.0 to 3.0	No	No	Yes	432	66; 67
Valley View Mobile Home Park	2.0 to 3.0	No	No	Yes	585	67
SW1[b]	3.0 to 4.0	No	No	Yes	375	40, 60, 61
SW2[b]	3.0 to 4.0	No	No	Yes	375	40, 60, 61
SW6[b]	3.0 to 4.0	No	No	Yes	375	40, 60, 61

Well ID	Distance Ring Miles	Level I	Level II	Potential	Population Served	Reference
SW7[b]	3.0 to 4.0	No	No	Yes	375	40, 60, 61
Furlong[a]	3.0 to 4.0	No	No	Yes	392	63

Notes:
[a] Wells are part of the Buckingham Township water supply system.
[b] Wells are part of the Doylestown Township Municipal Water Authority water supply system.
DB Doylestown Borough

In addition to public water supply wells, residents living within a 4-mile radius of the Chem-Fab facility rely on private residential wells for their potable water supply. Locations of private residential wells were identified in the Environmental FirstSearch™ database in the same manner that the public water supply wells were identified. The population served by each well is estimated by multiplying the average number of residents per household residing in Bucks County (2.69) by the number of wells within a given radius, as identified by the Environmental FirstSearch™ database (Refs. 65; 68; 69, p. 26). The population served by private residential wells is summarized in the Table 34.

TABLE 34
RESIDENTIAL WELL POPULATION

Radius	Number of Wells	Population Served
0 - 0.25	0	0
0.25 - 0.5	0	0
0.5 - 1.0	67	180
1.0 - 2.0	281	775
2.0 - 3.0	430	1,156
3.0 - 4.0	378	1,016

Notes:
Refs. 65; 68; 69, p. 26

3.3.1 NEAREST WELL

Well ID: Borough of Doylestown Wells 8 and 13
Level of Contamination (I, II, or potential): Level I

The nearest wells were determined to be Borough of Doylestown supply wells 8 and13, less than 0.25 mile west of Source 1 (Refs. 40, 57, 58). Level I concentrations have been documented in supply wells 8 and 13 (see Section 3.0 and Table 16); therefore, a nearest well factor value of 50 is assigned to the well (Ref. 1, Section 3.3.1).

Nearest Well Factor Value: 50
(Ref. 1, Section 3.3.1, Table 3-11)

3.3.2 POPULATION

3.3.2.2 Level I Concentrations

As documented in the observed release to ground water section of this documentation record, Table 16, Level I concentrations are present in drinking water wells 8 and 13. Table 35 summarizes the drinking water wells with Level I concentrations and the population served by each well. The population information is presented in Table 33 of this documentation record. As presented in Table 33, the population served by the Borough of Doylestown well 8 is 1,417 persons and well 13 is 1,358 (Ref. 1, Section 3.3.2.1 and Table 3-10).

TABLE 35
LEVEL I POPULATION

Level I Well Sample	Aquifer	Population	References
OSW-BW-13-01 (year 2000) Doylestown Borough Well 13 (year 2001)	Stockton	1,358	40, 57, 58, 98
Well 8	Stockton	1,417	40, 57, 58, 98
Total Population		2,775	

Notes:
BW = Borough Well
OSW = Off-site well
OSW-BW-01 = Doylestown Borough Well 13 (Ref. 3, p. 3-8)

Sum of Population Served by Level I Wells: 2,775
Sum of Population Served by Level I Wells × 10: 27,750

Level I Concentrations Factor Value: 27,750

3.3.2.3 Level II Concentrations

As documented in the observed release to ground water section of this documentation record, Tables 11 and 12, Level II concentrations are present in drinking water wells 7, 10, and 12. Table 36 summarizes the drinking water wells with Level II concentrations and the population served by each well. The population information is presented in Table 33 of this documentation record. As presented in Table 33, the population served by the Borough of Doylestown wells 7, 10, and 12 is 1,417 persons, each (Ref. 1, Section 3.3.2.1 and Table 3-10; 68).

TABLE 36
LEVEL II POPULATION

Level I Well Sample	Aquifer	Population	References
Well 7	Stockton	1,417	40, 57, 58, 98
Well 10	Stockton	1,417	40, 57, 58, 98
Well 12	Stockton	1,417	40, 57, 58, 98
Total Population		4,251	

Sum of Population Served by Level I Wells: 5,668

Level II Concentrations Factor Value: 4,251

3.3.2.4 Potential Contamination

The population subject to potential contamination is that population served by drinking water supply wells as summarized in Table 33 which are not subject to Level I or II concentrations. The distance-weighted values for that population are listed in Table 37, as specified in Reference 1, Section 3.3.2.4, Table 3-12.

TABLE 37
DISTANCE-WEIGHTED POPULATION VALUES

Distance Category (Miles)	Population	Distance-Weighted Population Value (Table 3-12)	Reference
0 to 0.25	0	0	40; 57; 58
Greater than 0.25 to 0.50	0	0	40; 57; 58
Greater than 0.50 to 1.0	2,280	523	40; 57; 58; 63; 67
Greater than 1.0 to 2.0	6,771	939	40, 57, 58, 60, 61
Greater than 2.0 to 3.0	8,523	678	3; 58
Greater than 3.0 to 4.0	2,908	131	3; 58

Calculations:

Sum of Distance-Weighted Population Values: 2,271
Sum of Distance-Weighted Population Values/10: 227

Potential Contamination Factor Value: 227

3.3.3 RESOURCES

No resource wells were identified (Ref. 1, Section 3.3.3).

Resources: 0

3.3.4 WELLHEAD PROTECTION AREA

The ground water contamination within the Chem-Fab facility is located within a wellhead protection area because a public water supply well is located within a 0.50-mile radius of Source 1. Under the Pennsylvania Safe Drinking Water Act, a 0.5-mile radius around a public drinking water intake is a wellhead protection area (Ref. 1, Section 3.3.4; 40; 71). The public water supply wells are shown on Reference 40 and Source 1 is at the center of the 0.25 distance radius ring.

Wellhead Protection Area Factor Value: 20