DRAFT
BROWNFIELDS TARGETED SITE ASSESSMENT

INTERROYAL CORPORATION SITE
PLAINFIELD, CONNECTICUT

RESPONSE ACTION CONTRACT (RAC), REGION I

For
U.S. Environmental Protection Agency

By
Tetra Tech NUS, Inc.

EPA Contract No. 68-W6-0045
EPA Work Assignment No. 114-SIBZ-01ZZ
TtNUS Project No. N4128

November 2001

TETRA TECH NUS, INC.

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INTERROYAL CORPORATION SITE
PLAINFIELD, CONNECTICUT

APPENDICES

ACRONYMS

AAS	Atomic Absorption Spectrophotometry
ACM	Asbestos-Containing Materials
AS/SVE	Air Sparging/Soil-Vapor Extraction
AST	Aboveground Storage Tank
bgs	Below Ground Surface
BHC	Benzene Hexachloride
BTSA	Brownfields Targeted Site Assessment
CFR	Code of Federal Regulations
CTDEP	Connecticut Department of Environmental Protection
DDT	Dichlorodiphenyltrichloroethane
DEC	Direct Exposure Criteria
DPT	Direct Push Technology
DQO	Data Quality Objectives
EP	Extraction Procedure
EPA	Environmental Protection Agency
EPALAB	EPA Mobile Laboratory
ETPH	Extractable Total Petroleum Hydrocarbons
GPC	Groundwater Protection Criteria
HUD	Housing and Urban Development
I/C	Industrial/Commercial
LEP	Licensed Environmental Professional
LSP	Licensed Site Professional
MADEP	Massachusetts Department of Environmental Protection
MW	Monitoring Well
ORC	Oxygen Release Compound
OSHA	Occupational Safety and Health Administration
P&W	Providence and Worcester
PCBs	Polychlorinated Biphenyls
PCE	Tetrachloroethene
PID	Photoionization Detector
PLM	Polarized Light Microscopy
PMC	Pollutant Mobility Criteria

R&D	Research and Development
RAC	Response Action Contract
RCRA	Resource Conservation and Recovery Act
RSR	Remediation Standard Regulation
SDDW	Small-Diameter Driven Well
SIP	Site Inspection Prioritization
SPLP	Synthetic Precipitation Leaching Procedure
START	Superfund Technical Assistance and Response Team
SVOCs	Semivolatile Organic Compounds
SWPC	Surface Water Protection Criteria
TAL	Target Analyte List
TCA	Trichloroethane
TCE	Trichloroethene
TCLP	Toxicity Characteristic Leaching Procedure
TEM	Transmission Electron Microscopy
TPH	Total Petroleum Hydrocarbons
TtNUS	Tetra Tech NUS, Inc.
UST	Underground Storage Tank
VC	Volatility Criteria
VOCs	Volatile Organic Compounds
WSC	Waste Site Cleanup
XRF	X-Ray Fluorescence

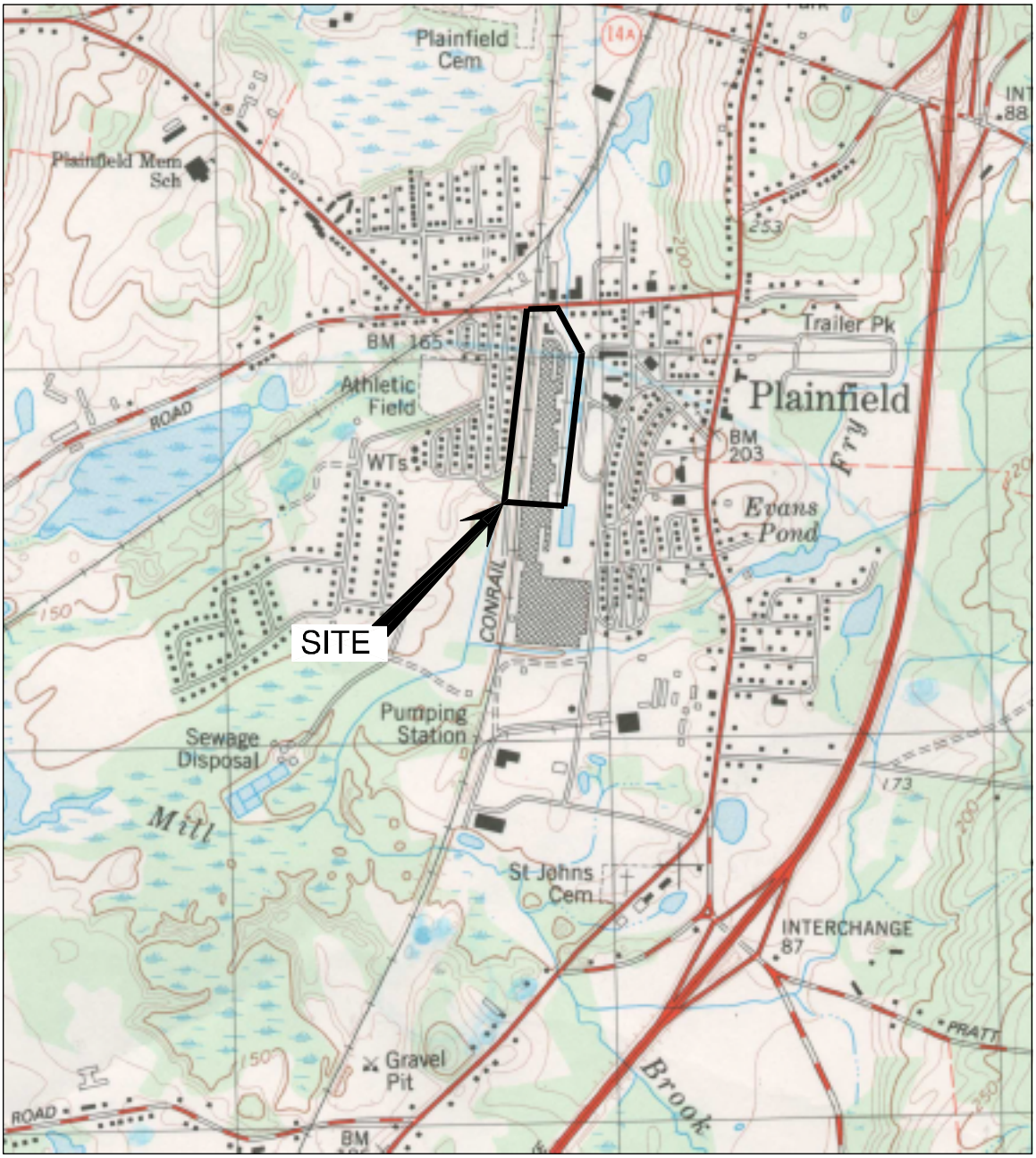
1.0 SITE BACKGROUND

The InterRoyal Corporation Site (the Site) consists of a 16.6-acre parcel of land located in the Town of Plainfield, Connecticut (Figure 1-1). The Site is bounded by Railroad Avenue to the north, the Providence and Worcester Railroad (P&W) tracks and a residential area to the west, the Pervel Industries property to the south (Figure 1-2), and a residence, social club, nursing home, town hall, and a recreational area to the east along Reservoir Road.

There are two buildings on the Site, both of which are constructed of brick masonry. The largest of these structures is the manufacturing building that consists of a 653,000-square foot three-story section with a basement and a one-story 70,146-square foot section, also with a basement (mill building). The other building is an approximately 4,500 square foot building located north of the manufacturing facility that is known as the Research and Development (R&D) building. A brick boiler exhaust stack that is approximately 100 feet in height is also present on the Site. The stack is located immediately west of the boiler room. The Site and vicinity are serviced by municipal drinking water supply and sewer systems (TtNUS, 1999). These structures are depicted on Figure 1-2.

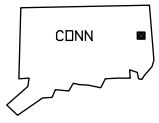
A water body identified as Horse Brook flows from north to south through the Site. Horse Brook enters the Site from a culvert under Railroad Avenue and flows south into a series of three manmade reservoirs (Reservoir No. 1 through Reservoir No. 3) that are present in the eastern portion of the Site. These reservoirs were formerly used as a source of process water and for fire protection. The reservoirs are no longer used for any purpose.

Horse Brook flows out of the southernmost reservoir (Reservoir No. 3) through a control structure and enters an underground culvert that passes beneath the southern portion of the mill building. The culvert discharges to a channeled section of Horse Brook through a headwall located approximately 240 feet southwest of the southwestern corner of the mill building (Figure 1-2). The brook joins Mill Brook approximately 0.4 miles south of the Site. Mill Brook enters the Quinebaug River approximately 3.4 miles southwest of the Site.



BASEMAP: A PORTION OF USGS QUADRANGLE, PLAINFIELD, CONN., 1983

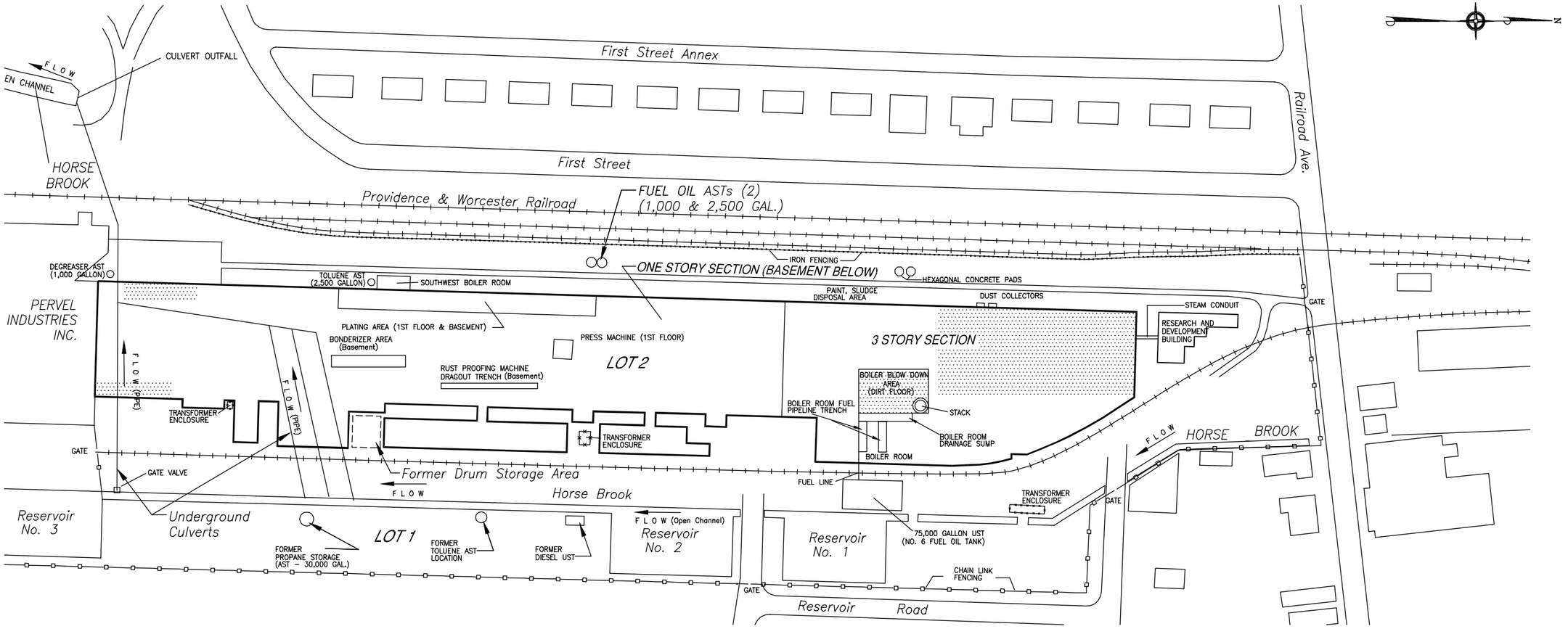
1/2 MILE 0 1 MILE



QUADRANGLE LOCATION

SITE LOCATION MAP		FIGURE 1-1	
INTERROYAL CORPORATION SITE			
PLAINFIELD, CONNECTICUT			
DRAWN BY:	D.W. MACDOUGALL	REV.:	0
CHECKED BY:	S. VETERE	DATE:	NOVEMBER 2001
SCALE:	AS SHOWN	ACAD NAME:	DWG\4128\0590\FIG_1-1.DWG

TETRA TECH NUS, INC.
55 Jonspin Road Wilmington, MA 01887
(978)658-7899



LEGEND

- ○ ABOVEGROUND STORAGE TANK (AST)
- □ UNDERGROUND STORAGE TANK (UST)
- ▨ DIRT FLOOR

NOTES:

1. PLAN NOT TO BE USED FOR DESIGN.
2. ALL LOCATIONS TO BE CONSIDERED APPROXIMATE.
3. BASEMAP ADAPTED FROM A PLAN ENTITLED: "GROUNDWATER ELEVATIONS AND FLOW DIRECTION", BY LOUIS BERGER & ASSOCIATES, INC., HORSE BROOK FLOOD CONTROL PROJECT, PLAINFIELD, CT, DATED: DECEMBER 1998.

GRAPHIC SCALE

0′ 150′ 300′

1 INCH = 150 FEET

SITE PLAN

INTERROYAL CORPORATION SITE

PLAINFIELD, CONNECTICUT

DRAWN BY:	R.G. DEWSNAP	REV.:	0
CHECKED BY:	S. VETERE	DATE:	NOVEMBER 2001
SCALE:	1" = 150'	FILE NO.:	DWG\4128\0590\FIG_1-2A.DWG

FIGURE 1-2

TETRA TECH NUS, INC.
55 Jonspin Road Wilmington, MA 01887
(978)658-7899

1.1 Previous Site Use and Ownership

Prior to 1880, the property was used as farmland. In 1880, an iron foundry, which produced cast iron stoves, cookware, and farm equipment, began operating on the Site. The foundry, which was located in the vicinity of the R&D building, operated until 1902 when it was destroyed by fire. The property remained vacant until 1904, when the current on-site buildings were constructed. Construction of the buildings occurred from 1904 and 1906. From 1906 through the mid-1930s, the Site was occupied by Lawton Mills, which manufactured cotton cloth. After the mid-1930s, the manufacturing facility was vacant for a number of years.

From 1937 until 1969, Royal Robe (a Clothing Manufacturer), National Manufacturing (a metal furniture manufacturer), and the Eastern Wood Products Company (a wood products manufacturer) operated on the property and remained there until it was purchased by the InterRoyal Corporation in 1970. InterRoyal was involved in the manufacturing of wood and metal office and institutional furniture, including desks, hospital beds, bookcases, and chairs. They operated at the property from the early 1970s until 1986, when the facility shut down due to bankruptcy. Following the 1986 closure of the facility, InterRoyal, at different times, leased portions of the facility to a plastics recycler, a woodworking company, a wooden staircase manufacturer, and as warehouse space for plumbing fixtures until 1995. The manufacturing facility has been abandoned since approximately 1995. The structural condition of the buildings has deteriorated steadily since that time.

Based on available Assessor's information, City directories, and deed research, the identified owners listed between 1937 and 1995 were corporations. The Town assessor’s records indicate that prior to 1937, the Site was owned by the Plainfield Company. From January 1937 to May 1955, the Plainfield Manufacturing Company/National Manufacturing Company owned the Site. From May 1955 to January 2, 1970, the Site was owned by the Royal Metal Manufacturing Company/Royalmetal Corporation. InterRoyal Corporation has owned the Site since January 2, 1970 (TtNUS, 1999).

1.2 Oil and Hazardous Materials

Numerous sources of potential releases of oil and hazardous materials have been identified at the Site. These are discussed below.

1.2.1 Storage Tanks

CTDEP records indicate that two underground storage tanks (USTs) were registered for the Site. A description and current status of these USTs, whose location are depicted on Figure 1-2, is as follows:

- One steel 2,000-gallon capacity UST containing diesel fuel that was located in the southeast portion of the Site was tested tight in May 1988 and removed in 1989.

- One existing 49-year old, 75,000-gallon concrete UST containing No. 6 heating oil. CTDEP removed approximately 12,000 gallons of No. 6 fuel oil from this UST in 1997 as part of a non-CERCLA substance removal action. This UST is located between Reservoir No. 1 and the boiler room (Figure 1-2).

Information available from a Final Site Inspection Prioritization (SIP) report prepared in 1998 by EPA's Superfund Technical Assistance and Response Team (START) contractor indicated that six aboveground storage tanks (ASTs) were present on the Site (Weston, 1999). Two hexagonal concrete pads are present in the western part of the Site near the P&W Railroad tracks that may have been mounting bases for ASTs. No documentation that confirms the former existence of ASTs at this location was available. A description and current status of these ASTs, whose location are depicted on Figure 1-2, is as follows:

- An existing 1,000-gallon (approximate) capacity steel AST containing degreasing solvents (degreaser tank) that is located outside the southwest corner of the mill building (near Pervel Industries). This AST is apparently empty;

- Two existing steel ASTs (one 2,500-gallon and one 1,000-gallon), containing No. 2 fuel oil located outside the west central portion of the mill building (near the P&W Railroad tracks). The 2,500-gallon AST has approximately 1 foot of product remaining in it;

- An existing 2,500-gallon AST on a wooden cradle that is located immediately south of the southwest boiler room (located near the P&W Railroad tracks). This tank is empty and appears to be clean. ERT (1988) indicated that this AST is one of two 2,500-gallon

steel ASTs containing toluene that were removed from their original location on the east side of the mill building just south of Reservoir No. 2; and

- A 30,000-gallon propane tank was located in the southeast section of the Site. This AST was reported to have been removed from the Site during the mid-1980s (Weston, 1999), although no documentation of the removal was available.

1.2.2 Use, Generation, and Disposal of Oil and Hazardous Materials

Manufacturing processes at the InterRoyal Corporation included fabrication of wood and metal furniture products. Production of the wooden furniture involved small amounts of hazardous materials. InterRoyal's manufacture of metal furniture involved forming, degreasing, painting, and plating metal parts. The plating processes included chromium, nickel, and zinc plating lines. The following information on hazardous waste use, generation, disposal and contamination at the Site was obtained from review of CTDEP file data and previous environmental reports.

Oil and hazardous materials used at the Site included lead and zinc-based paints, aromatic and aliphatic hydrocarbon and chlorinated hydrocarbon solvents, petroleum fuels, plating chemicals (including nickel, cadmium, chromium and zinc salts, cyanide, and acids), and petroleum based lubricants (Berger, 1999). Hazardous wastes generated by the InterRoyal facility included paint sludge, waste solvents, metal plating sludge, and waste corrosive liquids (CTDEP, February 1991).

Prior to 1970, process wastes from Plainfield Manufacturing/National Manufacturing were discharged directly to Horse Brook through culverts under the southern end of the mill building (Figure 1-2). A wastewater pre-treatment system was installed in 1970 by InterRoyal. Environmental Waste Resources of Waterbury, Connecticut transported the wastes that were not treated and discharged by the on-site pre-treatment system (Weston, 1999).

Prior site investigations indicated that wastes were also discharged to the ground on the Site. These reports stated that a waste paint sludge disposal area was identified on the ground along the western side of the mill building (ERT, 1988; ENSR, April 1990).

Several releases of hazardous material were recorded on the adjacent Pervel Industries property, which abuts the Site to the south. In 1985, 600 to 800 gallons of 1,1,1-trichloroethane (1,1,1-TCA) were spilled on the Pervel property, and although a cleanup was undertaken, some of the solvent migrated onto the Site. In 1987, two additional spills were reported on the Pervel Industries property. The first spill, which occurred on December 12, 1987, involved a release of 300 to 400 gallons of toluene that impacted groundwater. Groundwater recovery and treatment was attempted to remediate the contaminated groundwater. No information was available regarding the success of this remediation effort. On December 31, 1987 Pervel Industries illegally discharged colored dye into Horse Brook. This incident was referred to in the CTDEP water compliance section. No information on the outcome of the referral is available.

When InterRoyal ceased operations in 1986, a large quantity of hazardous material and hazardous wastes remained on the property. During the period from December 1986 to March 1988, InterRoyal made some attempts to remove or sell useable plating solutions and chemicals left at the mill. Some drums of waste paint sludge were also removed during this period. However, most of the hazardous materials remained at the Site. In addition, as discussed in Section 1.1, the property was owned and/or leased to other companies prior to abandonment in 1995.

1.3 Summary of Previous Investigations

Eight environmental investigations have been performed on the Site that document the presence of environmental contamination due to releases of oil or hazardous materials (ERT, 1988; ENSR, April 1990, ENSR, August 1990; ENSR, September 1990; ENSR, November 1990; ENSR, October 1991, Weston, 1999 and Berger 1999). These investigations were described in detail by TtNUS in the Background Memorandum for the InterRoyal Corporation Site submitted in June 1999 (TtNUS, 1999). This section provides a summary of the background memorandum for the areas that have been identified as contaminated with oil and hazardous materials by one or more of these previous investigations.

1.3.1 Release Areas Adequately Characterized by Previous Investigations

The following is a summary of the areas of contamination for which information on the nature and extent of contamination is adequate to estimate the volume of contaminated environmental

media and make preliminary recommendations and cost estimates. These areas were not investigated by TtNUS during this Brownfields Targeted Site Assessment (BTSA), but do represent areas requiring remedial action.

1.3.1.1 Fuel Oil AST Area

Soil and groundwater in the area south of the fuel oil ASTs (located adjacent to the P&W Railroad tracks) is contaminated with volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and total petroleum hydrocarbons (TPH) (ERT, 1988; ENSR, April 1990; ENSR, October 1991; Weston, 1999 and Berger, 1999). The vertical and horizontal limits of petroleum-contaminated soil in this area were delineated and it was determined that the contamination has migrated off site onto the P&W Railroad property. At least 1,500 cubic yards of petroleum-contaminated soil is present in this area (Berger, 1999).

1.3.1.2 Hexagonal Concrete Pads

Soil in the area south of the hexagonal concrete pads (located adjacent to the P&W Railroad tracks) is visibly contaminated with TPH. The vertical and horizontal limits of petroleum contaminated soil in this area were delineated and it was determined that the contamination has migrated off the Site onto the P&W property. At least 180 cubic yards of petroleum-contaminated soil is present in this area (Berger, 1999).

1.3.1.3 Waste Paint Sludge Disposal Area

Soil samples collected from the paint sludge disposal area located west of the mill building along the P&W Railroad tracks contained elevated concentrations of lead, zinc, and VOCs. An extraction procedure (EP) toxicity analysis on these soils determined that they were non-hazardous. The approximate volume of the waste paint sludge is 231 cubic yards. This area should be remediated and the material disposed of as a solid waste (ENSR, 1990 and Berger, 1999).

1.3.1.4 Boiler Blow-Down Area

Soils within the boiler blow-down area are contaminated with TPH, chlorinated VOCs, and low concentrations of polychlorinated biphenyls (PCBs). The boiler blow down area is a courtyard-like area located immediately west of the boiler room. The boiler stack abuts this area. The boiler blow down area received steam blow-off and boiler blow-down discharges from the adjacent boiler room. There is approximately 35 cubic yards of contaminated soil present in this area (ENSR, 1991).

1.3.1.5 Former Drum Storage Area

Elevated concentrations of tetrachloroethene (PCE) were detected in soils collected from two test pits in the barrel storage area which is located in the southeastern section of the one-story portion of the mill building. No VOCs were detected in soil collected from this area (Weston, 1999) or in groundwater samples collected from this area (Berger, 1999). It is estimated that 35 cubic yards of contaminated soil are present in this area (ENSR, 1991).

1.3.2 Release Areas Not Adequately Characterized by Previous Investigations

The following is a brief description of release areas discussed in the Background Memorandum for which the nature and extent of soil, sediment, or groundwater contamination had not yet been sufficiently determined through previous investigations. Investigations were performed at several areas located both inside and outside of the mill buildings from August 2000 to August 2001.

1.3.2.1 Release Areas Outside of the Mill Buildings

The following is a discussion of environmental conditions in release areas located outside the buildings.

Horse Brook and Reservoirs No. 1, 2, and 3

Sediments in the channel of Horse Brook, south of the mill building drainage culvert discharge, were found to contain elevated concentrations of TPH, chlorinated VOCs, SVOCs, PCBs, and

metals (chromium, lead, zinc, and nickel) (Weston, 1999 and Berger, 1999). Sediments collected from Reservoir No. 2 (located east of the mill building) contained elevated concentrations of SVOCs and detectable concentrations of mercury (Weston, 1999). The extent of contaminated sediment in Horse Brook and the water storage reservoirs had not been determined through previous investigations. Surface water samples collected from Horse Brook contained detectable concentrations of mercury at the point where Reservoir No. 3 discharges to the culvert under the mill building, and detectable concentrations of PCE, trichloroethene (TCE), and trans-1,2-dichloroethene in the brook's channel 800 feet downstream (south) of the culvert headwall.

Southern Portion of the Mill Building/Degreaser AST Area (near Pervel Industries)

Elevated concentrations of PCE, TCE, chloroethane, and styrene were detected in groundwater samples collected from microwells SDDW-17 and SDDW-18 placed inside the southern portion of the mill building (Berger, 1999). Elevated concentrations of chlorinated solvents were detected in a monitoring well (MW-9S) located outside the southwest corner of the building near the degreaser AST (ENSR, 1990 and Berger, 1999). The source and extent of this contamination has not been determined to date.

The 75,000-gallon UST

The 75,000-gallon UST was formerly used to store No. 6 fuel oil for the main boilers. Residual product remains within this UST. Since PCBs were detected in the boiler blow-down area (ENSR, April 1990), it is possible that the facility burned waste oil containing PCBs. If so, residual product in this UST may contain PCBs and the boiler stack flue ash may contain dioxins. ERT detected moderate concentrations of TPH in groundwater collected in 1988 from a well located adjacent to this UST. Berger's 1998 investigation did not detect TPH in groundwater collected from a well (MW-15) placed immediately south of the UST. However, a soil sample collected from the boring used to install this well contained a low concentration of TPH. The extent of contamination in the vicinity of this UST has not been determined to date.

Transformer Enclosures

The five transformers located east of the mill building are located in three separate fenced enclosures. EPA removed approximately 3,866 gallons of PCB-contaminated dielectric fluid from these transformers for disposal. However, PCB-contaminated soil may be present around the transformer mounting pads. The presence of PCBs in the soil within the transformer enclosures has not been determined to date.

Former Toluene AST Area

A soil gas survey conducted in the former toluene AST area on Lot 1 detected low concentration of organic vapors (ENSR, November 1990). Subsequent confirmatory soil samples collected from this area did not contain detectable concentrations of VOCs (ENSR, 1991). ENSR determined that this area did not require remediation, since VOCs were not detected in any of the samples. TtNUS did not investigate this area of the Site.

1.3.2.2 Release Areas Inside the Mill Building

Contaminated areas inside the mill building include the earthen basement floor in the three-story section of the mill building, the boiler room drainage sump, the basement plating area, the bonderizer sumps, the rust proofing machine dragout trench, and the southern portion of the mill building. Remedial measures were recommended for the bonderizer area, the dragout trench, and the southern portion of the building (ENSR, 1991). InterRoyal did not implement any of these recommendations.

The following is a discussion of the environmental conditions in release areas located inside the mill building.

Basement of the Three-Story Portion of the Mill Building

The basement of the three-story portion of the mill building is primarily composed of earth. The southern portion of this basement was used for storage, whereas the remaining area of the basement was unused. Soil samples collected from the basement of the three-story portion of the mill building contained concentrations of SVOCs exceeding the Industrial/Commercial Direct

Exposure Criteria (I/C DEC) (Berger, 1999). The extent of this contamination has not been determined through previous investigations.

Boiler Room Drainage Sump

The boiler room drainage sump in the mill building contains sludge that appears (through visual observation) to be contaminated with TPH (Berger, 1999). This material was not analyzed to determine the type and concentration of contaminants. This sludge may also be contaminated with PCBs, as they were detected in the boiler blow-down area. However, soil and groundwater samples collected from beneath the concrete floor of the sump did not contain detectable concentrations of TPH, VOCs, or PCBs. (Berger, 1999).

Basement Plating Area

A plating operation was conducted in the basement of the one-story section of the mill building from approximately 1970 until 1986. Soil samples collected from beneath the concrete floor in this area contained elevated concentrations of chromium, lead, nickel, and zinc. Groundwater samples collected from beneath the basement floor contained elevated concentrations of cadmium, nickel, and cyanide. Groundwater samples collected from monitoring wells located in the adjacent area outside the building contained elevated concentrations of chromium, zinc, and bis(2-ethylhexyl)phthalate (Berger, 1999). The extent of soil and groundwater contamination in this area has not been determined to date.

Bonderizer Sumps

There are six inter-connected bonderizer sumps located in the basement of the one-story portion of the mill building. The bonderizer was used to wash metal parts to remove scale, oil, and degreasing solvents prior to delivery to the painting area. Elevated concentrations of TPH and EP toxicity leachable (but non-hazardous) concentrations of barium and arsenic detected in sludge from Bonderizer Unit No. 6, whereas sludge from Bonderizer Unit No. 1 was composed of 44 percent TPHs. Cracks or holes may be present in the sumps that allow exchange between the sumps and groundwater (ENSR, April 1990). Removal and disposal of the water and sludge in the bonderizer sumps was recommended. It was not determined through

previous investigations if soil and groundwater in the vicinity of the bonderizer sumps is contaminated.

Rust Proofing Machine Dragout Trench

The rustproofing dragout trench was located immediately down the process line from the rustproofing machine. The dragout trench caught drippings of rustproofing material that was applied to metal parts by the rustproofing machine. Elevated concentrations of TCE, PCE, benzene, toluene, and xylenes were detected in soil samples collected from this area (ENSR, September 1990). Removal and disposal of VOC-contaminated soil from this area was recommended (ENSR, November 1990), however the volume of contaminated soil had not been determined.

Southern Portion of the Mill Building

Groundwater samples collected from a SDDW (SDDW-17) placed inside the southwest portion of the mill building contained elevated concentrations of VOCs, including PCE, TCE, cis-1,2-dichloroethene, and vinyl chloride. Groundwater collected from the former drum storage area located in the building's southeast corner (SDDW-18) contained elevated concentrations of chloroethane and styrene (Berger, 1999). The source and extent of soil and groundwater contamination in this area has not been determined to date.

1.4 Environmental Setting

The following section provides a description of the surficial and bedrock geology and hydrogeology that have been noted at the Site during the course of previous environmental investigations.

1.4.1 Surficial and Bedrock Geology

The surficial geology of the Site is characterized by a stratified drift deposit overlying glacial till. The stratified drift consists of shallow fluvial deposits overlying fine-grained (primarily silt) lake bed deposits (Stone and Randall, 1977). A previous investigation indicated that the stratified drift consists principally of fine sand and silt, with lenses of medium to coarse sand at a depth

ranging from 5 to 25 feet below ground surface (bgs). An intermittent layer of peat ranging in thickness from 0.5 to 3 feet is present at the Site at a depth of 5 to 10 feet bgs. The peat is overlain by one to eight feet of medium to coarse sand fill material (ENSR, April 1990).

The site characterization investigation found that the stratified drift is approximately 55 feet thick and is underlain by a dense glacial till. Depth to bedrock within the Site is not known, but is likely to be greater than 60 feet bgs. Bedrock underlying the till layer consists of the Quinebaug Gneiss. This rock unit is a well layered gray to dark gray gneiss (Rodgers, 1985)

Additional investigations indicate that the surficial geology of the area located under the footprint of the mill building consists of a 1 to 2-foot layer of coarse to medium sand fill overlying an intermittent 1 to 2-foot thick peat layer. The peat is underlain by fine to very fine sand and silt. Areas outside the building consist of an 8 to 10-foot thick layer of artificial fill composed of fine to medium sand, which is underlain by 1 to 2 feet of peat in the central and northern part of the Site. The peat is underlain by fine to very fine sand and silt. The estimated hydraulic conductivity of the material in the saturated zone ranged from 0.003 feet/second to 0.03 feet/second (Berger, 1999).

The portion of Horse Brook's channel south of the InterRoyal Mill property consists of a 2-foot thick layer of organic swamp deposits underlain by fine to very fine sand and silt. Below 11 feet this material generally consisted of fine to medium sand (Berger, 1999).

1.4.2 Groundwater

The Site lies within a GB groundwater use and protection class zone (CTDEP, 1998). CTDEP classifies GB groundwater as groundwater that is known or may reasonably be presumed to be degraded due to a variety of pollution sources. Designated uses of GB groundwater include industrial process water and cooling. This groundwater is not considered to be suitable for direct human consumption without treatment. According to the CTDEP Water Quality classification map of the Thames River watershed (CTDEP, 1998), the Site is not within the zone of influence of the Gallup Water Company public water supply wells which are located approximately 1,200 feet southwest of the Site.

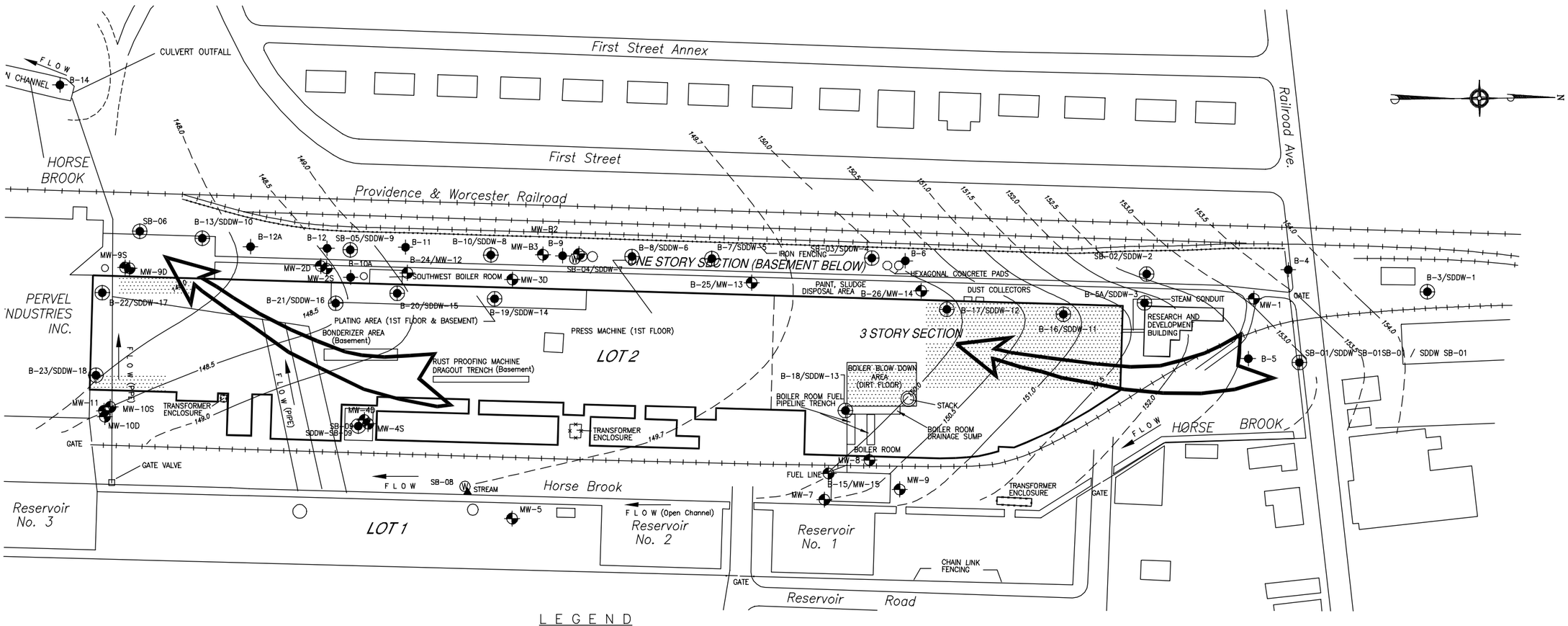
The depth to groundwater below ground surface on the Site ranges from 6 to 12 feet. Depth to groundwater beneath the mill building ranges from 1.5 to 2 feet below the floor in both sections of the mill building. Based on these investigations and subsequent groundwater measurements in 1998, the horizontal component of groundwater flow within the Site is to the southwest, toward the open channel of Horse Brook. This groundwater flow direction appears consistent with local topography (ERT, 1988; ENSR, April 1990 and October, 1991; Berger, 1999).

The average horizontal groundwater flow gradient across the Site was estimated to be 0.009 feet/foot. The estimated horizontal hydraulic gradient is greater in the northern and southern portions of the Site (0.017 feet/foot and 0.006 feet/foot, respectively), than in the central portion (0.003 feet/foot). Analysis of vertical flow gradient between several well couplets within the InterRoyal property indicate that the average vertical flow gradient in the southeast portion of the Site is 0.002 feet/foot upward whereas in the southwest portion of the Site the vertical gradient is 0.006 feet/foot downward (Berger, 1999). A pump test was performed in July 1991 and the transmissivity of the shallow stratified drift aquifer ranged from 120 ft^2/day to 160 ft^2/day (ENSR, October 1991).

Groundwater in the northern portion of the Site flows toward the southeast. The flow gradually changes direction toward the west in the central portion of the Site, and becomes southwest at the Site's southern border. Groundwater elevation measurements collected in 1998 were used to generate the groundwater contours and inferred groundwater flow directions that are depicted on Figure 1-3 (Berger, 1999).

1.4.3 Surface Water

The Site is located in the Quinebaug River subbasin of the Thames River drainage. Drainage from the Site enters Horse Brook. The brook joins Mill Brook approximately 0.4 miles south of the Site. Mill Brook enters the Quinebaug River approximately 3.4 miles southwest of the Site. CTDEP has designated the use class of Horse Brook as “Bc” (CTDEP, 1998). Use class Bc indicates that the State’s goal is to maintain water quality suitable for recreational use, cold water fisheries and wildlife habitat (CTDEP, 1997). Groundwater recharge is expected to occur on unpaved portions of the Site as the result of infiltration of precipitation and surface water flow. It is expected that groundwater within the Site will discharge to Horse Brook.



L E G E N D

- ABOVE GROUND STORAGE TANK
- UNDERGROUND STORAGE TANK
- DIRT FLOOR
- 149.0 GROUNDWATER ELEVATION CONTOUR
- SOIL BORING
- SMALL DIAMETER DRIVEN WELL
- MONITORING WELL
- INFERRED GROUNDWATER FLOW DIRECTION

GRAPHIC SCALE

0′ 150′ 300′

1 INCH = 150 FEET

NOTES:

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GROUNDWATER ELEVATION AND FLOW DIRECTION
INTERROYAL CORPORATION SITE
PLAINFIELD, CONNECTICUT

DRAWN BY:	R.G. DEWSNAP	REV.:	0
CHECKED BY:	S. VETERE	DATE:	NOVEMBER 2001
SCALE:	1" = 150'	FILE NO.:	\DWG\4128\0590\FIG_1-3A.DWG

FIGURE 1-3

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1.5 Report Summary

In June 1999, TtNUS submitted a Background Memorandum (TtNUS, 1999) summarizing the previous investigations and current environmental conditions at the Site. The report recommended additional investigations throughout the exterior and interior of the mill building to support the redevelopment of the Site for industrial/commercial use. In April 2000, TtNUS prepared a Sampling and Analysis Plan (TtNUS, 2000) detailing the sampling activities and procedures that would be used to conduct a BTSA at the Site. In July and August 2000, TtNUS performed a passive soil gas survey, advanced soil borings, constructed SDDWs, and collected sediment, surficial soil, residual material, and groundwater samples to obtain additional information on the nature and extent of contamination at several release areas at the Site. In January/February 2001, TtNUS conducted an asbestos, lead-based paint, and contaminated building materials survey throughout the interior of the mill building; and collected soil, sludge, and building material samples from the interior of the mill building. In August 2001, based on the results of this analysis and on observations made during the asbestos and lead-based paint survey, additional samples of building materials were collected to analyze for asbestos and lead, and to conduct a survey of the electrical equipment remaining within the building's interior. This BTSA report contains a summary of the results of these field investigations and recommendations for remedial actions required to facilitate the redevelopment of the Site.

2.0 FIELD INVESTIGATIONS

Between July 2000 and August 2001, TtNUS performed some of the environmental investigations that were recommended in the Background Memorandum (TtNUS, 1999). Investigative activities were conducted both outside and inside of the mill building. These activities are discussed below.

2.1 Investigations Outside of the Mill Building

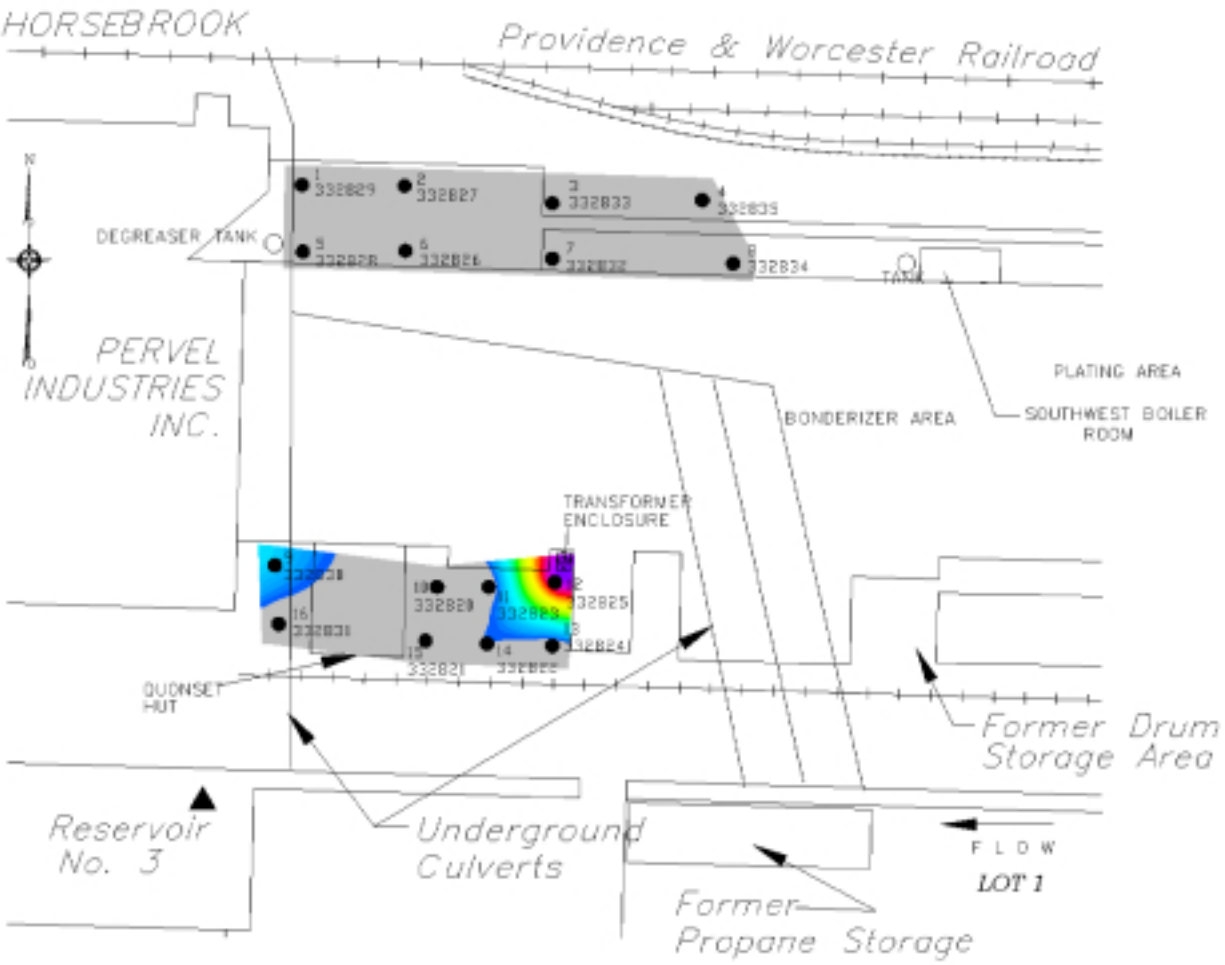
In July and August 2000, TtNUS conducted a subsurface investigation at the Site. The investigation included a passive soil gas survey (soil gas survey); advancement of Direct Push Technique (DPT) soil borings; installation of small-diameter driven wells (SDDWs); and collection of surficial soil samples, sediment samples, and residual material samples from areas that had been identified as requiring additional investigation.

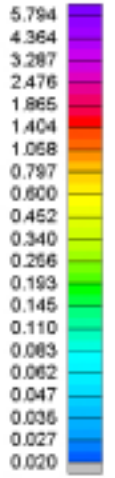
2.1.1 Soil Gas Survey

In July 2000, TtNUS conducted a passive soil gas survey in the southern portion of the Site in areas where chlorinated VOCs were previously detected in soil and groundwater. The objective of the soil gas survey was to identify the distribution of VOCs in this area of the Site to provide direction for the placement of soil borings. The soil gas survey consisted of 16 sample points. Eight Gore Sorber™ soil gas modules were installed on the southeastern and southwestern sides of the mill building encompassing the presumed area of VOC contamination. One week after placement of the modules, they were retrieved and submitted for analysis of 1,2-dichloroethane (1,2-DCE), TCE, and PCE. The locations of soil gas sample points are depicted on Figures 2-1 through 2-3, along with VOC concentration contours resulting from soil gas module analysis. These contours were used as a basis for the placement of soil borings described in Section 2.1.2. The report detailing the results of the soil gas survey is attached as Appendix A and discussed in Section 4.1.3.

2.1.2 Direct Push Technique Soil Borings

In August 2000, TtNUS completed seven DPT soil borings at the Site (B27 through B33). Five DPT borings were located within the southern portion of the Site in the areas of VOC





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LEGEND

● GORE-SORBER Module Location

SOIL GAS SURVEY RESULTS – CIS– & TRANS–1,2–DICHLOROETHENE			FIGURE 2–1
INTERROYAL CORPORATION SITE			
PLAINFIELD, CONNECTICUT			
DRAWN BY:	D.W. MACDOUGALL	REV.:	0
CHECKED BY:	S. VETERE	DATE:	NOVEMBER 2001
SCALE:	AS NOTED	FILE NO.:	DWG\4128\0590\FIG_2–1.DWG

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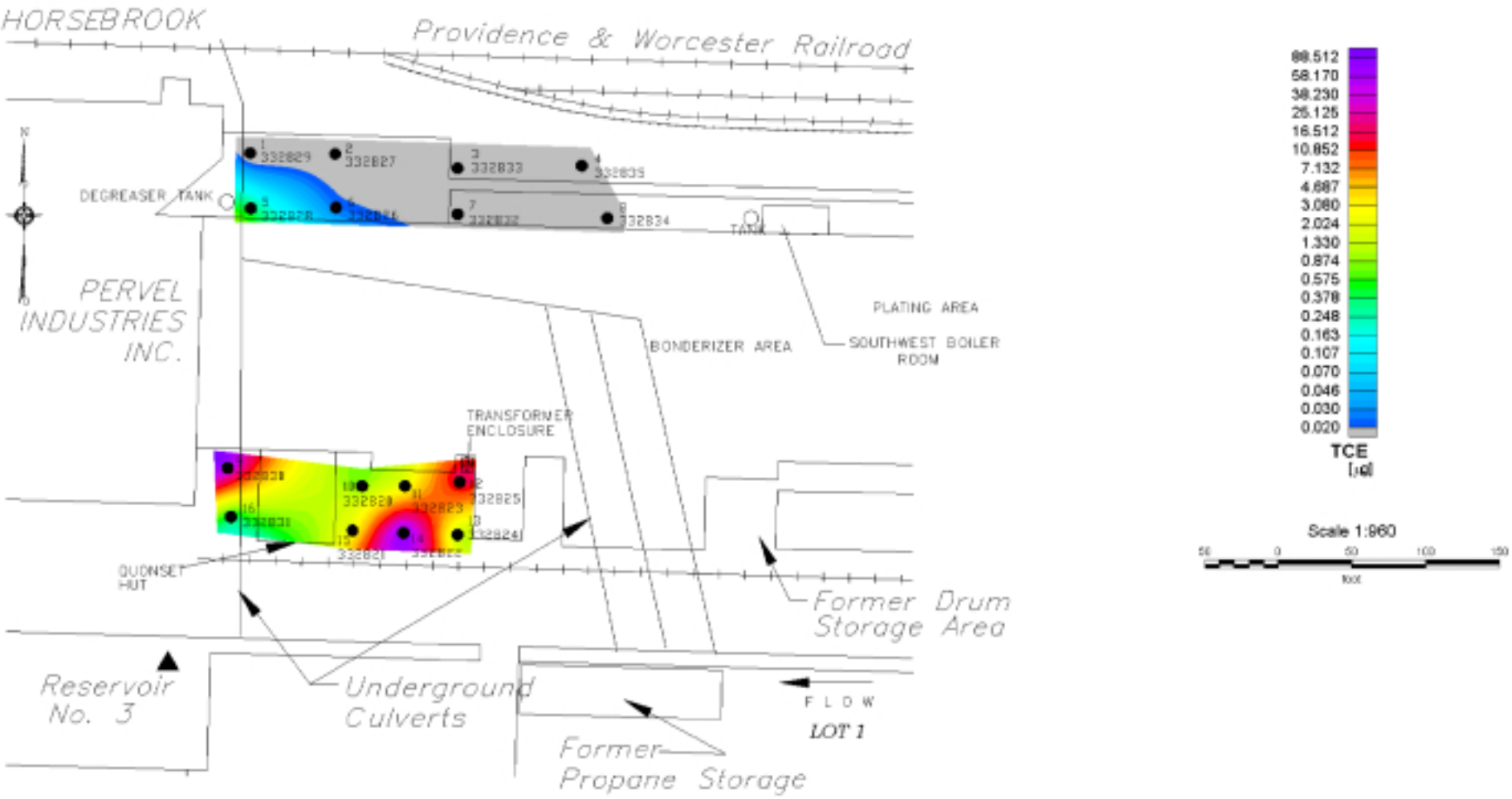

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3. BASEMAP ADAPTED FROM A PLAN ENTITLED: "GROUNDWATER ELEVATIONS AND FLOW DIRECTION", BY LOUIS BERGER & ASSOCIATES, INC., HORSE BROOK FLOOD CONTROL PROJECT, PLAINFIELD, CT, DATED: DECEMBER 1998.

LEGEND

● GORE-SORBER Module Location

SOIL GAS SURVEY RESULTS – TRICHLOROETHENE			FIGURE 2–2
INTERROYAL CORPORATION SITE			
PLAINFIELD, CONNECTICUT			
DRAWN BY:	D.W. MACDOUGALL	REV.:	0
CHECKED BY:	S. VETERE	DATE:	NOVEMBER 2001
SCALE:	AS NOTED	FILE NO.:	DWG\4128\0590\FIG_2-2.DWG

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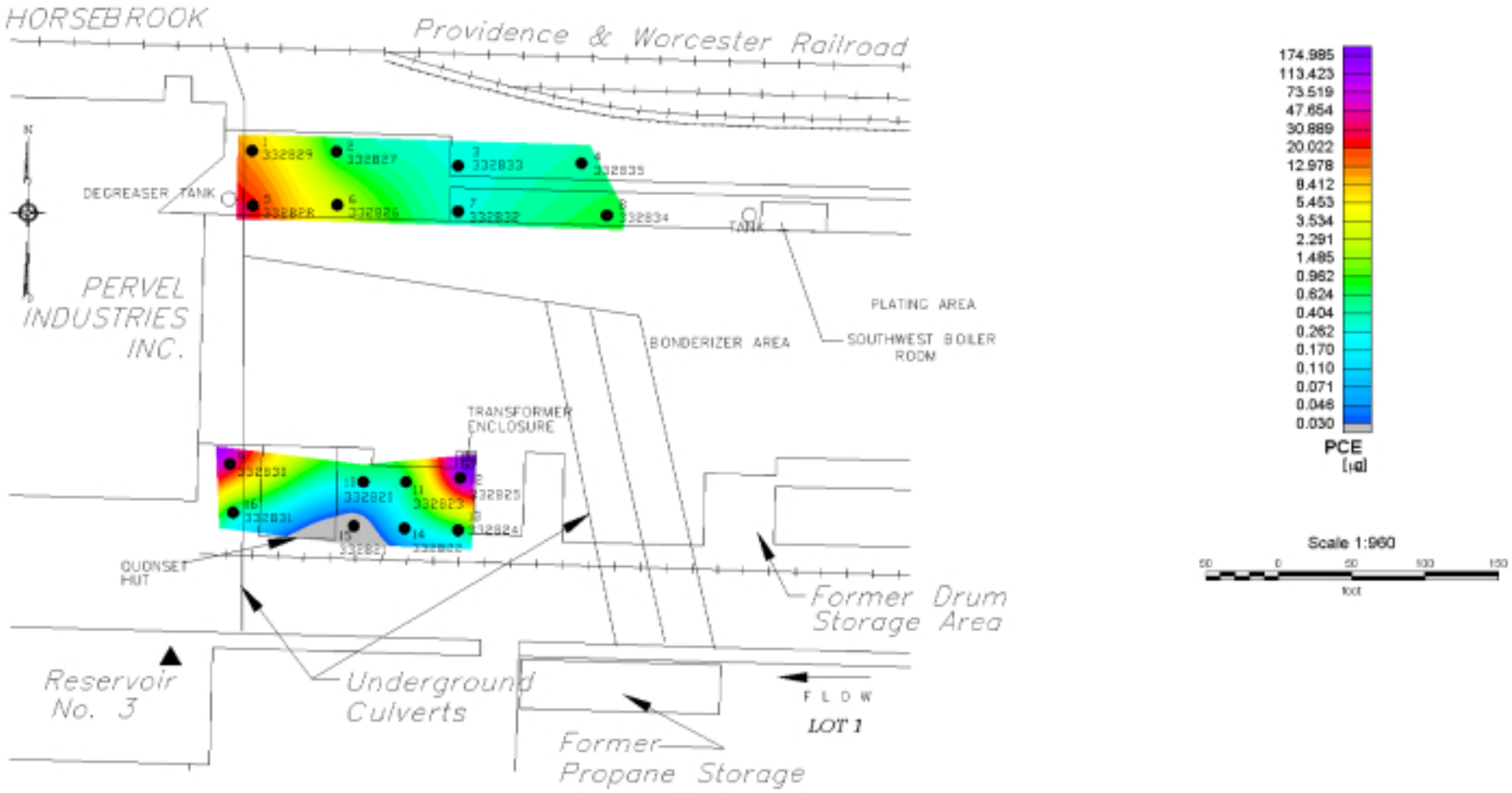

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3. BASEMAP ADAPTED FROM A PLAN ENTITLED: 'GROUNDWATER ELEVATIONS AND FLOW DIRECTION', BY LOUIS BERGER & ASSOCIATES, INC., HORSE BROOK FLOOD CONTROL PROJECT, PLAINFIELD, CT, DATED DECEMBER 1998.

LEGEND

● GORE-SORBER Module Location

SOIL GAS SURVEY RESULTS – TETRACHLOROETHENE			FIGURE 2–3
INTERROYAL CORPORATION SITE			
PLAINFIELD, CONNECTICUT			
DRAWN BY:	D.W. MACDOUGALL	REV.:	0
CHECKED BY:	S. VETERE	DATE:	NOVEMBER 2001
SCALE:	AS NOTED	FILE NO.:	DWG\4128\0590\FIG_2-3.DWG

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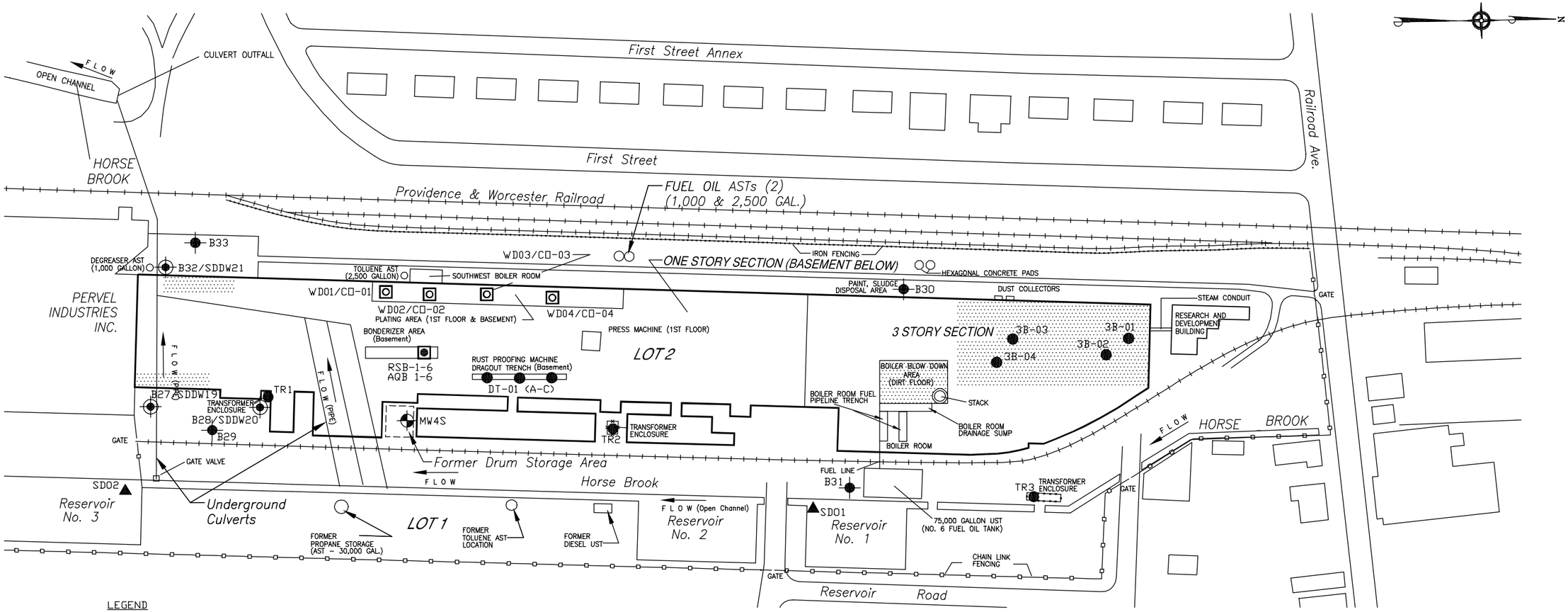
contamination (B27, B28, B29, B32, and B33). Based on the results of the soil gas survey, the location of the soil borings were selected. At these borings, a 4-foot long, 2.0-inch inside-diameter sampler with a plastic liner sleeve was used to collect soil samples from continuous 4-foot intervals between the ground surface and the top of the water table (or until refusal, if encountered first). Soil samples from each interval were described and field screened for organic vapors using the Massachusetts Department of Environmental Protection (MADEP) Jar Headspace Technique (MADEP Policy WSC-97). Based on this technique, soil samples from the depth interval of each boring indicating the highest concentration of organic vapors were submitted for laboratory analysis of VOCs, SVOCs, pesticides/PCBs, target analyte list (TAL) metals, and cyanide. DPT boring locations in the southern portion of the Site are depicted on Figure 2-4.

A sixth boring (B30) was advanced on the western side of the Site in the paint sludge disposal area (Figure 2-4). The purpose of this boring was to collect samples for analysis to help delineate the vertical extent of paint sludge contamination and assess the hazardous characteristics and leachability of metals previously identified in this area. Soil samples were collected from continuous two-foot intervals to a depth of 6 feet bgs. Soil samples from all three depth intervals were field screened for organic vapors and submitted for laboratory analysis of VOCs, SVOCs, pesticides/PCBs, metals, and cyanide. The sample collected from the 0- to 2-foot bgs depth interval was submitted for laboratory analysis of leachable metals by the Toxicity Characteristic Leaching Procedure (TCLP). Soil samples collected from the 2 to 4-foot and 4 to 6-foot depth intervals were submitted for laboratory analysis of leachable metals by the Synthetic Precipitation Leaching Procedure (SPLP).

A seventh boring (B31) was placed at the northern end of the Site adjacent to the 75,000-gallon No. 6 fuel oil tank (Figure 2-4). Several attempts were made to advance this boring to the water table, with each attempt encountering refusal at approximately 2 feet bgs. A soil sample was collected from the 0- to 2-foot bgs depth interval and submitted for laboratory analysis of VOCs, ETPH, SVOCs, pesticides/PCBs, metals, and cyanide.

In total, 10 soil samples were collected for laboratory analysis. Additional quality control samples collected during the subsurface soil investigation included one trip blank (VOCs only) and one equipment rinsate blank. Sample collection summary sheets, jar headspace logs, and



LEGEND

RSB-1-6 / AQB 1-6	RESIDUAL MATERIAL SAMPLES
WD01/CD-01	BUILDING MATERIAL SAMPLES
B29	SOIL BORING
B27/SDDW19	SMALL-DIAMETER DRIVEN WELL
MW4S	EXISTING MONITORING WELL
SD01	SEDIMENT SAMPLE
TR1	SURFICIAL SOIL SAMPLE
RS01	RESIDUAL MATERIAL SAMPLE

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GRAPHIC SCALE

0′ 150′ 300′

1 INCH = 150 FEET

TtNUS SAMPLE LOCATION MAP

INTERROYAL CORPORATION SITE

PLAINFIELD, CONNECTICUT

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CHECKED BY:	S. VETERE	DATE:	NOVEMBER 2001
SCALE:	1" = 150'	FILE NO.:	DWG\4128\0590\FIG_2-4A.DWG

FIGURE 2-4

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soil boring logs are contained in Appendix B. Subsurface soil analytical results are discussed in Section 4.1.4.

2.1.3 Groundwater Sampling

Three SDDWs (SDDW19, SDDW20, and SDDW21) were installed and developed during the subsurface investigation. One week after the well installation and development activities, the EPA "low flow" purging and sampling procedure (EPA SOP No. GW-001) was used to collect groundwater samples from wells SDDW19, SDDW20, SDDW21, and previously existing well MW-4S. In total, five groundwater samples were collected, including one field duplicate (SDDW20), for analysis of VOCs, ETPH, SVOCs, TAL metals, and cyanide. Additional quality control samples collected during the groundwater investigation included one trip blank (for VOCs only) and one equipment rinsate blank. The locations of the three SDDWs and existing well MW-4S are depicted on Figure 2-4. Monitoring well construction logs, groundwater sample log sheets, sample collection summary sheets, and groundwater level measurement logs are contained in Appendix B. Groundwater analytical results are discussed in Section 4.1.5.

2.1.4 Surficial Soil Samples

The subsurface investigation conducted by TtNUS also included a screening analysis for PCBs that consisted of the collection of one composite surficial soil sample from each of the three transformer enclosures located at the Site (TR1, TR2, and TR3; shown on Figure 2-4). A stainless steel bowl and trowel were used to collect three grab samples of surface soil from the uppermost six inches of soil in each enclosure. The surficial soil grab samples were field screened for organic vapors using the MADEP jar headspace technique. The grab samples were then combined to create one composite sample from each enclosure. The composite samples were submitted for laboratory analysis of ETPH and pesticides/PCBs. Sample log sheets and jar headspace logs are contained in Appendix B. Surficial soil sample results are discussed in Section 4.1.6.

2.1.5 Reservoir Sediment Samples

A stainless steel Eckman sampler was used to collect sediment samples near the outflows of Reservoirs No. 1 and 3 (Figure 2-4). Sediment samples were not collected from Reservoir

No. 2, since analytical data was available from reservoir sediment sampling performed in 1999 (Weston, 1999). Sediment samples were collected from the uppermost six inches of sediment. Samples were field screened for organic vapors using the MADEP jar headspace technique and submitted for laboratory analysis of VOCs, extractable total petroleum hydrocarbons (ETPH), SVOCs, pesticides/PCBs, metals, and cyanide. In total, three sediment samples were collected as part of the TtNUS investigation, including one field duplicate. Additional quality control samples collected as part of the sediment sampling activities included one trip blank (for VOCs only). Sample log sheets and jar headspace logs are contained in Appendix B. Sediment analytical results are discussed in Section 4.1.7.

2.1.6 Residual Material Sample

One residual material sample was collected from the residual oil remaining in the 75,000-gallon UST located at the Site. The objective of this sample was to test for the presence of PCBs in the remaining contents of the tank. A "pond sampler"-like device consisting of a stainless-steel trowel clamped to a 15-foot metal rod was used to collect the residual material sample from the bottom of the tank. This sample was submitted for laboratory analysis of PCBs. Residual material analytical results are discussed in Section 4.1.8 of this report.

2.2 Inspections Inside the Mill Building

TtNUS performed an asbestos and lead-based paint inspection, a contaminated building materials survey of the mill building and R&D building; and collected soil, sludge, concrete, and wood samples from the several locations inside of the mill building. These activities are summarized in this section.

2.2.1 Asbestos, Lead-Based Paint, and Contaminated Building Materials Survey

In January and August 2001, an inspection for asbestos containing materials (ACM), a screening of painted surfaces for lead, lead paint chip sampling, and an evaluation of fluorescent light fixtures for PCB-containing ballasts and mercury-containing light tubes was performed. Samples were collected for TCLP metals analysis from representative waste materials expected to be generated by the demolition of the building. The report summarizing

these investigations is included as Appendix C. The results of these investigations are presented below.

2.2.1.1 Asbestos Inspection

An asbestos inspection of both buildings was performed. This inspection included collection of suspected ACM samples from the interior of the building. Suspected ACM was visually identified, sampled, and separated into groups of homogeneous building materials. Each of the two sections of the mill (three-story section, one-story section) and the R&D Building were considered separate homogeneous areas, and evaluated as separate building areas. Samples from each building area were collected by obtaining a cross section of the building materials to the base substrate. A minimum of three samples of each homogeneous building material was collected to provide a representative sample. If analysis of all three samples of a homogeneous set of building materials determined that less than one percent asbestos was present, then the material was considered non-asbestos containing. If any of the three samples were determined to contain greater than one percent asbestos, the material was considered ACM. The 107 homogeneous sets and six individual samples of suspected ACM were collected and analyzed in January 2001.

Subsequent to the partial demolition of the mill building that occurred in November 2000, two piles of demolition debris, located in the northern and southern ends of the building, were created in the one-story portion of the mill building. In August 2001, an additional 18 samples of fly ash, rope gasket, fire brick, and fire brick mortar from the main boiler room, and soil from the north and south demolition debris piles were collected for asbestos analysis. Most of the samples of suspected ACM collected during January 2001 were analyzed using polarized light spectroscopy (PLM) by an on-site EPA mobile laboratory unit (EPALAB). At least one sample from approximately 70 of the homogeneous groups of suspected ACM was sent to a fixed off-site laboratory for asbestos analysis by PLM or point count methods. Six samples were analyzed for asbestos using transmission electron microscopy (TEM). These samples included one floor tile sample from the R&D Building and four samples of floor tiles stored in boxes in the basement of the 1-story portion of the mill building. A summary of asbestos samples collected, analytical results, and an estimation of quantities of ACM is provided in Section 4.2.1.

2.2.1.2 Lead-Based Paint Inspection

A lead-based paint screening was conducted throughout the interior and exterior of the mill building. The screening was performed using an X-Ray Fluorescence (XRF) Analyzer calibrated prior to each use with a manufacturer's block containing a known lead standard concentration. Approximately 192 locations throughout the mill building were screened for lead-based paint using XRF. Results of the lead-based paint screening are contained in Appendix C. A discussion of the lead-based paint screening results is presented in Section 4.2.2.

2.2.1.3 Paint Chip Sample Collection

Five paint chip samples were collected from selected locations throughout the interior of the mill building to analyze for the presence of lead-based paint. Paint chip samples were analyzed by Atomic Absorption Spectrophotometry (AAS) analysis in accordance with HUD-approved analytical protocols. Paint chip samples containing greater than 0.5 percent lead by dry weight are considered toxic by HUD and the State of Connecticut regulations. Paint chip sampling results are contained in Appendix C. A discussion of paint chip sampling results is presented in Section 4.2.2.

2.2.1.4 Ballast Inspection

An inspection of representative fluorescent light fixtures was performed to identify possible PCB-containing ballasts. Ballasts were examined in place on their fixtures for evidence of "No PCB" labels or for manufacturer's information that could be used to determine PCB content. If neither of these were present, the ballasts were assumed to contain PCBs. An inventory of mercury-containing fluorescent lamps, thermometers, and switches was prepared throughout the interior of the mill building. The results of this inspection are contained in Appendix C. A summary of suspected PCB-containing light fixtures and mercury-containing equipment is presented in Section 4.2.2.

2.2.1.5 Building Component Inspection

Representative composite samples of building components were collected from the Site for analysis of lead by TCLP. Sample collection for TCLP analysis involved cutting a cross section

of various building components to obtain the volume of individual parts of the building that were represented in the sampling. Individual building components (e.g. wood, concrete, brick, etc.) were mixed in the same volume ratio as they were observed at the Site. One TCLP sample each was collected from the R&D Building, the Three-Story Building, the One-Story Building North Demolition Pile, the One-Story Building South Demolition Pile, and the intact section of the One-Story Building. The Resource Conservation and Recovery Act (RCRA) regulatory level for hazardous characteristics of lead-containing materials is a TCLP analysis result at or above 5 mg/l (ppm) of leachable lead. Samples analyzed by TCLP were considered to be hazardous due to toxic characteristics if they exceeded this concentration of leachable lead. TCLP analysis results are provided in Appendix C, and are discussed in Section 4.2.2 of this BTSA.

2.2.2 Environmental Samples Collected Inside the Mill Building

In February 2001, samples were collected from release areas in the interior of the mill building that had not been adequately characterized by previous investigations. Four soil samples were collected from the basement floor of the three-story section of the mill. Each of these soil samples were analyzed for the presence of SVOCs. Sample locations are depicted on Figure 2-4.

Two soil samples were collected from bucket augers located in the rustproofing machine dragout trench. One composite sample, consisting of equal volumes of soil from each auger, was analyzed for the presence of VOCs, TPH, metals, corrosivity, and reactivity. Sample locations are depicted on Figure 2-4.

A composite sample of sludge, consisting of equal volumes of sludge collected from each of the six bonderizer sumps, was collected and analyzed for the presence of VOCs, TPH, metals, and corrosivity. An aqueous sample was also collected from Bonderizer Unit No. 1 and analyzed for ETPH, metals, and flashpoint. The location of the bonderizer sumps is depicted on Figure 2-4.

Five samples of wood were collected from beams above the basement plating area, and five samples of concrete were collected from the floor of the basement plating area. These samples were analyzed for metals. The location of the basement plating area is depicted on Figure 2-4.

One sample of hydraulic oil was collected from a hydraulic press located on the first floor of the 1-story portion of the mill building and analyzed for PCBs. Sample analytical results are presented in Section 4.3. An attempt was also made to collect a hydraulic oil sample from the adjacent sheer machine, but the hydraulic oil reservoirs were empty.

3.0 APPLICABLE REGULATORY STANDARDS

The CTDEP has developed risk-based numerical criteria for the remediation of polluted soil and groundwater. These criteria were promulgated in the CTDEP Remediation Standard Regulations (RSRs) (CTDEP January, 1996). The RSRs provide numerical threshold concentrations for selected environmental contaminants (termed "polluting substances") below which soil and groundwater are considered sufficiently remediated.

3.1 Soil Regulatory Standards

Criteria for soils are segregated into two major categories. Direct Exposure Criteria (DEC) were developed to protect humans from direct exposure to contaminated soils. DEC has been further subdivided into criteria specific for residential and industrial site activities. Pollutant Mobility Criteria (PMC) were developed to protect groundwater from substances leaching from contaminated soil. PMC has been further subdivided into criteria for GAA/GA groundwater and GB groundwater. Alternate soil and groundwater criteria can be developed subject to review and approval by CTDEP.

The DEC do not apply to inaccessible soil when the contaminant is a substance other than PCBs. The RSRs consider inaccessible soil to be at a depth of more than four feet bgs if unpaved, or more than 2 feet bgs if paved with 3 or more inches of bituminous concrete or cement concrete, or beneath an existing permanent building or structure. If soil is inaccessible due to being beneath pavement or a structure, then an Environmental Land Use Restriction (ELUR) is required to maintain the pavement, building, other structure, or condition that maintains the soil's inaccessibility.

3.2 Sediment Regulatory Standards

The DEC generally do not apply to sediments. However, for the purpose of this BTSA laboratory analytical data from sediment samples collected during the subsurface investigation will be compared to industrial/commercial (I/C) DEC. Sediments in Horse Brook and the reservoirs are not likely to provide an exposure pathway to future users of the Site, however, use of the DEC are intended to assess the threat of harmful exposure to sediment contamination if and/or when sediments become accessible.

3.3 Groundwater Regulatory Standards

Criteria for groundwater are segregated into three major categories. Groundwater Protection Criteria (GPC) have been developed for GA and GAA groundwater. Surface Water Protection Criteria (SWPC) have been developed for discharges of contaminated groundwater plumes into surface water bodies. Volatilization Criteria (VC) have been developed for migration of VOC vapors from contaminated groundwater into indoor air of overlying buildings. The VC has been further subdivided into criteria specific to residential and industrial/commercial site activities.

3.4 Regulatory Standards Applicable to the Site

The Site has historically been used for industrial activity. The Town of Plainfield intends to continue utilizing this property for industrial/commercial use. Therefore, for the purposes of this BTSA, I/C DEC will apply to soil and sediment samples collected from the ground surface to a depth of 4 feet bgs. Since groundwater on the Site is rated use class GB, and is not used as a source of private or public water supply, GB PMC apply. SWPC apply due to the close proximity of the Site to Horse Brook and the continued discharge into the brook from the three reservoirs still located on the Site. I/C VC would apply to groundwater under any building currently on-site or constructed on the Site as part of future redevelopment. Previous investigations of the Site show no indication that contaminated groundwater from the Site is migrating onto adjacent residential properties. If such migration is identified, residential volatilization criteria would apply to contaminated groundwater in residential areas.

Asbestos and lead analytical results are evaluated using EPA, CTDEP, and Housing and Urban Development (HUD) regulations for the characterization of building materials containing hazardous substances. EPA defines any material that contains greater than one percent asbestos to be ACM. Painted surfaces screened with XRF will be considered lead-containing if they contain greater than 1.0 mg/cm^2, a regulatory standard established by HUD and the State of Connecticut. Paint chip samples containing greater than 0.5 percent lead by dry weight will be considered hazardous by HUD and Connecticut regulations. Samples of building materials that were analyzed for TCLP lead will be considered toxic if they contain greater than 5 mg/L lead, a regulatory standard for hazardous characteristics due to toxicity established by the Resource Conservation and Recovery Act (RCRA).

4.0 FIELD INVESTIGATION FINDINGS

This section presents a comparison of laboratory analytical results for soil, sediment, groundwater, residual material, building materials, and other solid wastes that were sampled during the BTSA, with the site-applicable regulatory standards established by EPA, CTDEP, and other environmental regulations.

4.1 Field Investigations Outside the Mill Buildings

This section summarizes the analytical data that was collected by TtNUS during the subsurface investigation performed around the perimeter of the mill building, and provides a comparison of results to the applicable regulatory standards referenced in Section 3.0.

4.1.1 Site Geology

As discussed in Section 2.1.2, seven DPT soil borings were advanced at the Site. Soil boring logs prepared during the field investigation (Appendix B) indicate that samples collected from the upper four feet of soil consist mainly of medium to coarse sand with some gravel. Brick fragments were noted in borings B27, B29, B30, and B31 and cinders were observed in borings B27 and B28. Below a depth of four feet bgs, soils were generally fine-grained, with fine sands and silt becoming more prevalent. The only visual or olfactory signs of potential contamination encountered during the subsurface investigation were red stains (of unknown origin) in the upper 4 feet of boring B27 and between 12 and 16 feet bgs in boring B32.

4.1.2 Analytical Data Validation and Verification Methods

A modified Tier II-like data validation was performed on the soil, sediment, groundwater, and residual material sample laboratory analytical data obtained during the BTSA. The data validation procedures included checking chain-of-custody records for accuracy and completeness of sampling, shipping, analysis, and reporting. The results of the data validation indicated that soil and groundwater analytical results met validation criteria and Data Quality Objectives (DQOs) and are useable for the purposes of this BTSA. The chain-of-custody forms are contained in Appendix B. Analytical data summaries are contained in Appendix D.

4.1.3 Soil Gas Survey Results

Results from the passive soil gas survey indicate that multiple sources of chlorinated VOC contamination may exist beneath the building. Concentrations of PCE vapors detected in soil gas modules placed immediately adjacent to the southeast and southwest corners of the mill building suggest that contamination identified in these areas is likely to originate from sources located within the building's footprint. Further investigation of the areas inside and outside of the southern portion of the building is necessary to confirm this assumption and determine the extent of VOC contamination.

4.1.4 Soil Analytical Results from DPT Borings

Soil samples collected from DPT borings advanced in the southern portion of the Site (B27, B28, B29, B32, and B33) contained concentrations of several VOCs, SVOCs, pesticides, and metals. However, only one SVOC (indeno[1,2,3-cd]pyrene) was detected at a concentration exceeding the CTDEP GB Groundwater Pollutant Mobility Criteria (GB PMC). No concentrations of contaminants exceeding the CTDEP I/C DEC were detected in soil samples collected from these borings. A summary of compounds detected in soil samples collected from DPT borings advanced in the southern portion of the Site is provided in Table 4-1.

Soil samples collected from the DPT boring (B30) advanced in the paint sludge disposal area contained one VOC (methyl acetate), several SVOCs, and metals. Concentrations of chromium and lead exceeding the I/C DEC were detected in the 0- to 2-foot bgs depth interval of this boring. The concentrations of dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, chromium, and lead detected in this depth interval also exceeded the GB PMC. All other compounds were detected at levels below applicable regulatory standards. A summary of compounds detected in soil samples collected from the paint sludge disposal area is presented in Table 4-2.

Soil samples collected from the DPT boring (B31) advanced adjacent to the 75,000-gallon storage tank contained one VOC (methyl acetate), TPH, several SVOCs, pesticides, and metals. Concentrations of benzo(a)pyrene and TPH detected at the 0 to 2-foot depth interval exceeded the I/C DEC. Concentrations of benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzofuran, indeno(1,2,3-cd)pyrene, beta-BHC, and TPH detected at the 0 to 2-foot depth interval exceeded the GB PMC. All other

TABLE 4-1
SUMMARY OF POSITIVE DETECTIONS IN SOIL SAMPLES COLLECTED IN SOUTHERN PORTION OF THE SITE
DRAFT BROWNFIELDS TARGETED SITE ASSESSMENT
INTERROYAL CORPORATION SITE
PLAINFIELD, CONNECTICUT

SAMPLE ID			IR-SO-B27-0408		IR-SO-DUP-01		IR-SO-B28-1216		IR-SO-B29-0408		IR-SO-B32-1216		IR-SO-B33-0408	
DATE SAMPLED			8/8/2000		8/8/2000		8/8/2000		8/8/2000		8/8/2000		8/8/2000	
QC IDENTIFIER			Field Dup. IR-SO-B27-0408		Field Dup. IR-SO-DUP-01		None		None		None		None	
DEPTH SAMPLED (ft bgs)			4.0-8.0		4.0-8.0		12.0-16.0		4.0-8.0		12.0-16.0		4.0-8.0	
	I/C DEC	GB PMC*												
Volatile Organic Compounds (ug/kg)														
Acetone	1000000	140000	400	JEB	280	UJ	250	U	400	U	300	U	210	U
Methyl Acetate	Nav	Nav	750		660		250	U	400	U	300	U	210	U
Methylene Chloride	760000	1000	63	J	280	U	250	U	400	U	300	U	41	J
Tetrachloroethene	110000	1000	340	U	280	U	250	U	400	U	280	J	210	U
Trichloroethene	520000	1000	340	U	280	U	250	U	410		33	J	210	U
Semivolatile Organic Compounds (ug/kg)														
Anthracene	2500000	400000	420	U	48	J	380	U	390	U	380	U	370	U
Benzo(a)anthracene	7800	1000	420	U	89	J	380	U	390	U	380	U	370	U
Benzo(a)pyrene	1000	1000	420	U	71	J	380	U	390	U	380	U	370	U
Benzo(b)fluoranthene	7800	1000	420	U	55	J	380	U	390	U	380	U	370	U
Benzo(g,h,i)perylene	2500000	40000	420	U	49	J	380	U	390	U	380	U	370	U
Benzo(k)fluoranthene	78000	1000	420	U	66	J	380	U	390	U	380	U	370	U
Chrysene	780000	960	420	U	87	J	380	U	41	J	380	U	370	U
Di-n-Butylphthalate	2500000	140000	420	U	49	JEB	380	U	390	U	380	U	370	U
Fluoranthene	2500000	56000	66	J	180	J	380	U	83	J	380	U	55	J
Indeno(1,2,3-cd)pyrene	7800	9.6	420	U	**45**	J	380	U	390	U	380	U	370	U
Phenanthrene	2500000	40000	66	J	200	J	380	U	81	J	380	U	42	J
Pyrene	2500000	40000	65	J	170	J	380	U	79	J	380	U	64	J
Pesticides/PCBs (ug/kg)														
4,4'-DDD	24000	29	4.2	U	4.2	UJ	3.8	U	0.27	J	3.8	U	0.26	J
4,4'-DDT	17000	21	4.2	U	4.2	UJ	3.8	U	3.9	U	3.8	U	0.29	J
alpha-BHC	910	1.1	0.29	J	2.2	UJ	2.0	U	2.0	U	1.9	U	1.9	U
alpha-Chlordane	2200	66	0.35	J	2.2	UJ	0.21	J	0.42	J	0.26	J	1.9	U
beta-BHC	3200	3.9	2.2	U	0.61	J	0.41	J	2.0	U	0.68	J	1.9	U
delta-BHC	910	1.1	0.28	J	2.2	UJ	2.0	U	2.0	U	0.14	J	0.43	J
Endosulfan II	1200000	8400	0.27	J	4.2	UJ	3.8	U	0.35	J	0.12	J	3.7	U
Endrin Aldehyde	610000	Nav	4.2	U	4.2	UJ	3.8	U	3.9	U	38	U	1.1	J
Endrin Ketone	610000	Nav	0.66	J	4.2	UJ	0.079	J	1.1	J	0.064	J	0.60	J
Total Metals (mg/kg)														
Aluminum	Nav	Nav	6390		6680		3220		6110		3640		5980	
Barium	140000	200	38.1		37.4		21.2		30.0		31.4		43.2	
Calcium	Nav	Nav	2120		1850		1420		1460		1150	U	1630	
Chromium	100	10	**11.5**		**11.6**		7.3		**15.1**		**22.9**		**14.7**	
Cobalt	2500	Nav	4.8		4.9		2.4		3.9		4.4		6.9	
Iron	Nav	Nav	6660		6950		4730		4840		5860		8540	
Lead	1000	3	4.0		**4.4**		0.83	J	2.8		2.4		2.1	
Magnesium	Nav	Nav	2390		2290		1410		2040		2060		2800	
Manganese	47000	Nav	75.1		85.6		51.6		54.6		68.2		127	
Nickel	7500	20	6.8	U	7.0	U	4.2	U	6.7	U	**32.7**		11.8	
Potassium	Nav	Nav	932		909		583		752		996		1400	
Vanadium	14000	10	17.2		**17.6**		**10.7**		**13.6**		**13.6**		**19.3**	

Notes:
Bold type = criteria exceeded
I/C DEC = CTDEP Industrial/Commercial Direct Exposure criteria
GB PMC = CTDEP Pollutant Mobility criteria for GB groundwater
U = Not detected
UJ = Detection limit approximate
* = PMC for metals are modified (multiplied by 20) to estimate the potential for pollutant mobility from total metals data
J = Quantitation approximate
Nav = Not available
NA = Not analyzed
EB/TB = Analyte associated with equipment blank/trip blank contamination

TABLE 4-2 (cont.)
SUMMARY OF POSITIVE DETECTIONS IN SOIL SAMPLES COLLECTED
FROM THE PAINT SLUDGE DISPOSAL AREA
DRAFT BROWNFIELDS TARGETED SITE ASSESSMENT
INTERROYAL CORPORATION SITE
PLAINFIELD, CONNECTICUT

SAMPLE ID			IR-SO-B30-0002		IR-SO-DUP-02		IR-SO-B30-0204		IR-SO-DUP-03		IR-SO-B30-0406	
DATE SAMPLED			8/8/2000		8/8/2000		8/8/2000		8/8/2000		8/8/2000	
QC IDENTIFIER			Field Dup. IR-SO-DUP-02		Field Dup. IR-SO-B30-0002		Field Dup. IR-SO-DUP-03		Field Dup. IR-SO-B30-0204		None	
DEPTH SAMPLED (ft bgs)			0.0-2.0		0.0-2.0		2.0-4.0		2.0-4.0		4.0-6.0	
	I/C DEC	GB PMC										
Volatile Organic Compounds (ug/kg)												
Methyl Acetate	Nav	Nav	140	J		NA	200	U		NA	110	U
Semivolatile Organic Compounds (ug/kg)												
1,1'-Biphenyl	Nav	Nav	870	U		NA	400	U		NA	210	J
2-Methylnaphthalene	2500000	56000	600	J		NA	400	U		NA	2100	
Acenaphthene	2500000	84000	120	J		NA	400	U		NA	800	U
Anthracene	2500000	400000	140	J		NA	400	U		NA	800	U
Benzo(a)anthracene	7800	1000	560	J		NA	400	U		NA	800	U
Benzo(a)pyrene	1000	1000	660	J		NA	400	U		NA	800	U
Benzo(b)fluoranthene	7800	1000	680	J		NA	400	U		NA	800	U
Benzo(g,h,i)perylene	2500000	40000	340	J		NA	400	U		NA	800	U
Benzo(k)fluoranthene	78000	1000	730	J		NA	400	U		NA	800	U
bis(2-Ethylhexyl)phthalate	410000	11000	750	JEB		NA	400	U		NA	800	U
Chrysene	780000	960	750	J		NA	400	U		NA	800	U
Di-n-Butylphthalate	2500000	140000	270	JEB		NA	400	U		NA	420	JEB
Dibenzo(a,h)anthracene	780	0.96	**120**	J		NA	400	U		NA	800	U
Dibenzofuran	2500000	5600	870	U		NA	400	U		NA	110	J
Fluoranthene	2500000	56000		NA		NA	400	U		NA	140	J
Fluorene	2500000	56000	100	J		NA	400	U		NA	800	U
Indeno(1,2,3-cd)pyrene	7800	9.6	**310**	J		NA	400	U		NA	800	U
Naphthalene	2500000	56000	870	U		NA	400	U		NA	1000	
Nitrobenzene	Nav	Nav	870	UJ		NA	400	UJ		NA	220	J
Phenanthrene	2500000	40000	780	J		NA	400	U		NA	220	J
Pyrene	2500000	40000	870	U		NA	400	U		NA	84	J

I/C DEC = CTDEP Industrial/Commercial Direct Exposure criteria
GB PMC = CTDEP Pollutant Mobility criteria for GB groundwater
Bold type = criteria exceeded
U = Not detected
UJ = Detection limit approximate
J = Quantitation approximate
Nav = Not available
NA = Not analyzed
EB/TB = Analyte associated with equipment blank/trip blank contamination

TABLE 4-2 (cont.)
SUMMARY OF POSITIVE DETECTIONS IN SOIL SAMPLES COLLECTED
FROM THE PAINT SLUDGE DISPOSAL AREA
DRAFT BROWNFIELDS TARGETED SITE ASSESSMENT
INTERROYAL CORPORATION SITE
PLAINFIELD, CONNECTICUT

SAMPLE ID			IR-SO-B30-0002		IR-SO-DUP-02		IR-SO-B30-0204		IR-SO-DUP-03		IR-SO-B30-0406	
DATE SAMPLED			8/8/2000		8/8/2000		8/8/2000		8/8/2000		8/8/2000	
QC IDENTIFIER			Field Dup. IR-SO-DUP-02		Field Dup. IR-SO-B30-0002		Field Dup. IR-SO-DUP-03		Field Dup. IR-SO-B30-0204		None	
DEPTH SAMPLED (ft bgs)			0.0-2.0		0.0-2.0		2.0-4.0		2.0-4.0		4.0-6.0	
	I/C DEC	GB PMC										
Total Metals (mg/kg)												
Aluminum	Nav	Nav	8060			NA	9990			NA	9170	
Barium	140000	Nav	6130			NA	23.9			NA	1370	
Cadmium	1000	Nav	4.2			NA	0.12	U		NA	0.13	UJ
Calcium	Nav	Nav	2280			NA	670	U		NA	1030	U
Chromium	100	Nav	**2440**			NA	85.0			NA	**395**	
Cobalt	2500	Nav	78.0			NA	7.1			NA	16.3	
Iron	Nav	Nav	12900			NA	10100			NA	13600	
Lead	1000	Nav	**1330**			NA	4.3			NA	186	
Magnesium	Nav	Nav	2100			NA	1800			NA	2550	
Manganese	47000	Nav	419			NA	62.7			NA	120	
Nickel	7500	Nav	10.1			NA	5.3	U		NA	6.2	U
Potassium	Nav	Nav	464			NA	313			NA	575	
Vanadium	14000	Nav	30.9			NA	22.5			NA	29.2	
Zinc	610000	Nav	26200			NA	39.4			NA	4180	
TCLP Metals (ug/l)												
Barium	Nav	10000	65.4	UJ	2480	J		NA		NA		NA
Cadmium	Nav	50	0.52	UJ	42.6	J		NA		NA		NA
Chromium	Nav	500	3.8	UJ	**2890**	J		NA		NA		NA
Lead	Nav	150	7.8	UJ	**275**	J		NA		NA		NA
SPLP Metals (ug/l)												
Barium	Nav	10000		NA		NA	13.1	U	11.7	U	113	
Cadmium	Nav	50		NA		NA	0.77	U	0.88	U	1.9	
Chromium	Nav	500		NA		NA	24.4	J	19.2	J	401	
Copper	Nav	13000		NA		NA	10.6	U	12.3		7.9	U
Lead	Nav	150		NA		NA	8.7	UJ	10.9	J	24.4	J
Zinc	Nav	50000		NA		NA	20.9	UJ	30.5	UJ	1080	

I/C DEC = CTDEP Industrial/Commercial Direct Exposure criteria
GB PMC = CTDEP Pollutant Mobility criteria for GB groundwater
Bold type = criteria exceeded
U = Not detected
UJ = Detection limit approximate
J = Quantitation approximate
Nav = Criterion not available
NA = Not analyzed
EB/TB = Analyte associated with equipment blank/trip blank contamination

compounds were detected at levels below applicable regulatory standards. A summary of compounds detected in soil samples collected from boring B31 is presented in Table 4-3.

4.1.5 Groundwater Analytical Results

As discussed in Section 2.1.3, groundwater samples were collected from the 3 SDDWs installed during the subsurface investigations (SDDW19, SDDW20, and SDDW21) and from one existing monitoring well (MW-4S). Concentrations of polluting substances exceeding the I/C Volatility Criteria (VC) were detected in groundwater samples collected from the southern portion of the Site, adjacent to the Pervel Industries property. Concentrations of vinyl chloride detected in groundwater samples collected from SDDW20 and SDDW21 exceeded the I/C VC. Concentrations of PCE detected in groundwater samples collected from SDDW20 and SDDW21 exceeded CTDEP Surface Water Protection Criteria. All other compounds were detected at levels below applicable regulatory standards. A summary of compounds detected in groundwater samples collected during the BTSA are presented in Table 4-4.

4.1.6 Surficial Soil Sample Analytical Results

Surficial (0 to 0.5-feet bgs) soil samples collected from the three transformer enclosures located east of the mill building (TR1, TR2, and TR3) contained several pesticides, the PCB mixtures Aroclor 1248 and Aroclor 1254, and TPH. None of the contaminant concentrations detected in soil samples collected from the transformer enclosures exceeded the I/C DEC. Concentrations of aldrin were detected in all three samples at concentrations exceeding the GB PMC. Concentrations of delta-BHC were detected in sample TR1 that exceeded the GB PMC, and concentrations of 4,4'-DDT were detected in sample TR2 that exceeded the GB PMC. All other compounds were detected at levels below applicable regulatory standards. A summary of compounds detected in surficial soil samples collected from transformer enclosures at the Site is provided in Table 4-5.

4.1.7 Sediment Analytical Results

Sediment samples collected from the outflow of Reservoir No. 1 (SD-01 and a field duplicate) contained VOCs, SVOCs, one pesticide (endrin), TPH, and several metals. Concentrations of benzo(a)pyrene detected in these samples exceeded the I/C DEC. Concentrations of

TABLE 4-3
SUMMARY OF POSITIVE DETECTIONS IN SOIL/RESIDUAL MATERIAL SAMPLES
COLLECTED AT THE 75,000-GALLON UST
DRAFT BROWNFIELDS TARGETED SITE ASSESSMENT
INTERROYAL CORPORATION SITE
PLAINFIELD, CONNECTICUT

SAMPLE ID			IR-SO-B31-0002		IR-SO-DUP-04		IR-RS-01	
DATE SAMPLED			8/8/2000		8/8/2000		8/15/00	
QC IDENTIFIER			Field Dup. IR-SO-DUP-04		Field Dup. IR-SO-B31-0002		None	
DEPTH SAMPLED (ft bgs)			0.0-2.0		0.0-2.0		Nav	
	I/C DEC	GB PMC*						
Volatile Organic Compounds (ug/kg)								
Methyl Acetate	Nav	Nav	220	J		NA		NA
Semivolatile Organic Compounds (ug/kg)								
1,1'-Biphenyl	Nav	Nav	2700	J		NA		NA
2-Methylnaphthalene	2500000	56000	8500			NA		NA
Acenaphthene	2500000	84000	41000			NA		NA
Acenaphthylene	2500000	84000	860	J		NA		NA
Anthracene	2500000	400000	910	J		NA		NA
Benzo(a)anthracene	7800	1000	**3800**	J		NA		NA
Benzo(a)pyrene	1000	1000	**2500**	J		NA		NA
Benzo(b)fluoranthene	7800	1000	**1900**	J		NA		NA
Benzo(g,h,i)perylene	2500000	40000	1400	J		NA		NA
Benzo(k)fluoranthene	78000	1000	**1100**	J		NA		NA
bis(2-Ethylhexyl)phthalate	410000	11000	830	JEB		NA		NA
Chrysene	780000	960	**5000**	J		NA		NA
Dibenzofuran	2500000	5600	**18000**			NA		NA
Fluoranthene	2500000	56000	2800	J		NA		NA
Fluorene	2500000	56000	15000			NA		NA
Indeno(1,2,3-cd)pyrene	7800	9.6	**830**	J		NA		NA
Naphthalene	2500000	56000	2200	J		NA		NA
Phenanthrene	2500000	40000	3100	J		NA		NA
Pyrene	2500000	40000	11000			NA		NA
Pesticides/PCBs (ug/kg)								
4,4'-DDD	24000	29	26	J		NA		NA
4,4'-DDE	17000	21	6.6	J		NA		NA
alpha-Chlordane	2200	66	3.3	J		NA		NA
Aroclor-1248	10000	Nav	380	U		NA	1.0	U
Aroclor-1254	10000	Nav	380	U		NA	1.0	U
beta-BHC	3200	3.9	**140**			NA		NA
Endosulfan I	1200000	8400	4.9	J		NA		NA
Endosulfan II	1200000	8400	11	J		NA		NA
Endosulfan Sulfate	1200000	8400	6.3	J		NA		NA
Endrin Aldehyde	610000	Nav	62			NA		NA
Endrin Ketone	610000	Nav	15	J		NA		NA
gamma-BHC	610000	40	4.5	J		NA		NA
gamma-Chlordane	2200	66	5.5	J		NA		NA
Extractable TPH (mg/kg)								
Extractable TPH	2500	2500	**5400**	J	2200	J		NA
Total Metals (mg/kg)								
Aluminum	Nav	Nav	4190			NA		NA
Barium	140000	200	49.0			NA		NA
Calcium	Nav	Nav	2450			NA		NA
Chromium	100	10	**12.9**			NA		NA
Cobalt	2500	Nav	5.0			NA		NA
Iron	Nav	Nav	7680			NA		NA
Lead	1000	3	**33.7**			NA		NA
Magnesium	Nav	Nav	2690			NA		NA
Manganese	47000	Nav	113			NA		NA
Nickel	7500	20	13.2			NA		NA
Potassium	Nav	Nav	908			NA		NA
Vanadium	14000	10	**22.4**			NA		NA
Zinc	610000	1000	60.8			NA		NA

Notes:
I/C DEC = CTDEP Industrial/Commercial Direct Exposure criteria
GB PMC = CTDEP Pollutant Mobility criteria for GB groundwater
Bold type = criteria exceeded
U = Not detected
UJ = Detection limit approximate
J = Quantitation approximate
Nav = Not available
NA = Not analyzed
EB/TB = Analyte associated with equipment blank/trip blank contamination
* = PMC for metals are modified (multiplied by 20) to estimate the potential for pollutant mobility from total metals data.

TABLE 4-4
GROUNDWATER ANALYTICAL RESULTS - SUMMARY OF POSITIVE DETECTIONS
DRAFT BROWNFIELDS TARGETED SITE ASSESSMENT
INTERROYAL CORPORATION SITE
PLAINFIELD, CONNECTICUT

WELL ID			MW-4S		SDDW19		SDDW20		SDDW20		SDDW21	
SAMPLE ID			IR-GW-MW4S-01		IR-GW-SDDW19-01		IR-GW-SDDW20-01		IR-GW-DUP-01		IR-GW-SDDW21-01	
DATE SAMPLED			8/15/2000		8/15/2000		8/15/2000		8/15/2000		8/15/2000	
QC IDENTIFIER			None		None		Field Dup. IR-GW-DUP-01		Field Dup. IR-GW-SDDW20-01		None	
	I/C Vol.	**SWP**										
Volatile Organic Compounds (ug/l)												
1,1-Dichloroethane	50000	Nav	10	U	3.0	J	10	U	20	U	10	U
1,1-Dichloroethene	6	96	10	U	10	U	2.0	J	20	U	4.0	J
cis-1,2-Dichloroethene	Nav	Nav	10	U	2.0	J	260	*	260		1100	*
Ethylbenzene	50000	580000	10	U	4.0	J	10	U	20	U	10	U
Isopropylbenzene	Nav	Nav	10	U	10	U	10	U	20	U	1.0	J
Tetrachloroethene	3820	88	2.0	J	4.0	J	**100**		**96**		**390**	*
Total Xylenes	50000	Nav	10	U	32		10	U	20	U	10	U
trans-1,2-Dichloroethene	Nav	Nav	10	U	10	U	4.0	J	4.0	J	10	
Trichloroethene	540	2340	10	U	1.0	J	100		100		300	*
Vinyl Chloride	2	15750	10	U	10	U	**16**		**16**	J	**170**	*
Semivolatile Organic Compounds (ug/l)												
Butylbenzylphthalate	Nav	Nav	10	U	8.0	J	10	U	12	U	10	U
Extractable TPH (mg/l)												
Extractable TPH	Nav	Nav	0.30	U	0.30	U	0.30	U	0.30	U	0.40	
Total Metals (ug/l)												
Aluminum	Nav	Nav	137		4850		126		126		277	
Barium	Nav	Nav	4.3	U	117		29.5		29.9		31.7	
Calcium	Nav	Nav	11800		28100		11100		11400		24800	
Chromium	Nav	Nav	1.5	U	7.3	J	1.5	U	1.5	U	5.4	J
Cobalt	Nav	Nav	1.7	U	6.9		1.9	J	2.5	J	1.7	U
Copper	Nav	48	14.3	J	29.1	J	13.8	J	16.5	J	16.5	J
Iron	Nav	Nav	3450		7020		19200		19100		7080	
Lead	Nav	13	2.6	U	2.6	U	2.6	U	2.6	U	2.8	J
Magnesium	Nav	Nav	2890		4990		2300		2370		5700	
Manganese	Nav	Nav	106		698		582		587		806	
Potassium	Nav	Nav	3290		3200		1620		1610		3560	
Sodium	Nav	Nav	6270		8000		14300		13900		18500	
Thallium	Nav	63	7.8	U	7.8	U	7.8	U	7.8	U	10.1	
Vanadium	Nav	Nav	3.5	U	17.2		1.8	UJ	2.0	UJ	2.2	UJ
Zinc	Nav	123	15.9	J	21.3	J	12.3	J	16.3	J	10.7	J

Notes:
I/C Vol. = CTDEP Industrial/Commercial Volatility criteria
SWP = CTDEP Surface Water Protection criteria
Bold type = criteria exceeded
U = Not detected
UJ = Detection limit approximate
J = Quantitation approximate
Nav = Criterion not available
* = From dilution analysis

TABLE 4-5
SUMMARY OF POSITIVE DETECTIONS IN SURFICIAL SOIL SAMPLES
COLLECTED FROM TRANSFORMER ENCLOSURES
DRAFT BROWNFIELDS TARGETED SITE ASSESSMENT
INTERROYAL CORPORATION SITE
PLAINFIELD, CONNECTICUT

SAMPLE ID			IR-SS-TR1-000.5		IR-SS-TR2-000.5		IR-SS-TR3-000.5	
DATE SAMPLED			8/15/2000		8/15/2000		8/15/2000	
QC IDENTIFIER			None		None		None	
DEPTH SAMPLED (ft bgs)			0.0-0.5		0.0-0.5		0.0-0.5	
	I/C DEC	GB PMC						
Pesticides/PCBs (ug/kg)								
4,4'-DDD	24000	29	3.0	U	4.2		3.3	U
4,4'-DDT	17000	21	3.0		**23**		3.3	U
Aldrin	340	0.41	**62**	*	**6.4**		**2.9**	
Aroclor-1248	10000	Nav	930		32	U	91	
Aroclor-1254	10000	Nav	30	U	360		33	U
beta-BHC	3200	3.9	1.7		1.6	U	1.7	U
delta-BHC	910	1.1	**2.2**		1.6	U	1.7	U
Endosulfan II	1200000	8400	3.0	U	15		3.3	U
Endrin	610000	Nav	15		36		4.5	
Endrin Aldehyde	610000	Nav	7.8		3.2	U	3.3	U
gamma-Chlordane	2200	66	39	*	3.5		1.7	U
Extractable TPH (mg/kg)								
Extractable TPH	2500	2500	390	J	430		330	

Notes:

I/C DEC = CTDEP Industrial/Commercial Direct Exposure criteria
GB PMC = CTDEP Pollutant Mobility criteria for GB groundwater
Bold type = criteria exceeded
U = Not detected
EB/TB = Analyte associated with equipment blank/trip blank contamination
UJ = Detection limit approximate
J = Quantitation approximate
* = From dilution analysis
NA = Not analyzed
Nav = Criterion not available

benzo(a)pyrene, benzo(b)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene exceeded the GB PMC.

A sediment sample collected from the outflow of Reservoir No. 3 (SD-02) contained VOCs, SVOCs, pesticides, Aroclor 1248, TPH, and several metals. Concentrations of bis(2-ethylhexyl)phthalate and TPH detected in this sample exceeded the I/C DEC. Concentrations of bis(2-ethylhexyl)phthalate, di-n-octylphthalate, aldrin, and TPH exceeded the GB PMC. All other compounds were detected at levels below applicable regulatory standards. A summary of compounds detected in sediment samples collected during the BTSA are presented in Table 4-6.

4.1.8 Residual Material Sample Results

Laboratory analysis of the residual material sample (RS-01) collected from the 75,000-gallon storage tank located at the Site revealed that it does not contain PCBs. See Table 4-3 for the summary results.

4.2 Asbestos, Lead-Based Paint, and Contaminated Building Materials Survey

The following is a summary of the findings of the asbestos, lead-based paint, and contaminated building materials survey performed at the Site.

4.2.1 Asbestos Inspection

The presence of ACM was confirmed at a number of locations throughout the interior and exterior of the mill building. Interior components of the mill buildings that were determined to contain asbestos (greater than 1 percent asbestos) include pipe insulation and floor tiles within the R&D Building; pipe insulation, boiler insulation, roping, breaching, floor tile, sheetrock joint compound, tile mastic, and baseboard mastic throughout the basement and on each floor of the three-story portion; and pipe insulation, fire brick (from the auxiliary boiler), boiler roping, boiler breaching, motor packing material, floor tile, wall and ceiling panels, and other insulation throughout the one-story portion of the mill building. A summary of ACM quantities detected throughout the interior of the mill buildings is provided on Table 4-7, and in Appendix C.

TABLE 4-6
SUMMARY OF POSITIVE DETECTIONS IN RESERVOIR SEDIMENT SAMPLES
DRAFT BROWNFIELDS TARGETED SITE ASSESSMENT
INTERROYAL CORPORATION SITE
PLAINFIELD, CONNECTICUT

SAMPLE ID			IR-SD-01-000.5		IR-SD-DUP-01		IR-SD-02-000.5	
DATE SAMPLED			8/15/2000		8/15/2000		8/15/2000	
QC IDENTIFIER			Field Dup. IR-SD-DUP-01		Field Dup. IR-SD-01-000.5		None	
DEPTH SAMPLED (ft)			0.0-0.5		0.0-0.5		0.0-0.5	
	I/C DEC	GB PMC**						
Volatile Organic Compounds (ug/kg)								
Acetone	1000000	140000	350	J	870	J	830	J
Methyl Acetate	Nav	Nav	1200		3500		2300	J
Semivolatile Organic Compounds (ug/kg)								
4-Methylphenol	2500000	7000	39	J	330	U	190	J
Acenaphthene	2500000	84000	330	U	34	J	360	U
Acenaphthylene	2500000	84000	66	J	53	J	46	J
Anthracene	2500000	400000	130	J	160	J*	150000	U*
Benzo(a)anthracene	7800	1000	950	*	930	*	150000	U*
Benzo(a)pyrene	1000	1000	**1100**	J*	**1100**	J*	150000	UJ
Benzo(b)fluoranthene	7800	1000	**1900**	J*	**1800**	J*	150000	UJ
Benzo(g,h,i)perylene	2500000	40000	330	J*	340	J*	150000	UJ
Benzo(k)fluoranthene	78000	1000	810	J*	690	J*	150000	UJ
bis(2-Ethylhexyl)phthalate	410000	11000	650	J*	450	J*	**580000**	*
Carbazole	290000	360	82	J	130	J*	150000	U*
Chrysene	780000	960	**1300**	*	**1200**	*	150000	U*
Di-n-octylphthalate	2500000	20000	650	UJ	660	UJ	**27000**	J*
Dibenzo(a,h)anthracene	780	0.96	**110**	J*	**110**	J*	150000	UJ
Fluoranthene	2500000	56000	1500		2300	*	150000	U*
Fluorene	2500000	56000	61	J	54	J	360	U
Indeno(1,2,3-cd)pyrene	7800	9.6	**430**	J*	**430**	J*	150000	UJ
Phenanthrene	2500000	40000	950		1000	*	150000	U*
Phenol	2500000	800000	330	U	330	U	69	J
Pyrene	2500000	40000	2800	J*	2600	J*	150000	U*
Pesticides/PCBs (ug/kg)								
Aldrin	340	0.41	1.7	U	1.7	U	**2.0**	
Aroclor-1248	10000	Nav	33	U	33	U	45	
Endrin	610000	Nav	3.7	J	9.3	J	3.6	U
Extractable TPH (mg/kg)								
Extractable TPH	2500	2500	1000		1200		**5900**	
Total Metals (mg/kg)								
Aluminum	Nav	Nav	3970	J	6830	J	15800	J
Barium	140000	200	41.3		68.5		139	
Beryllium	2	0.8	0.14		0.23		0.56	
Cadmium	1000	1	0.65	U	1.0		**2.2**	J
Calcium	Nav	Nav	2840	J	5290	J	8190	J
Chromium	100	10	10.0	J	**17.0**	J	**27.8**	J
Cobalt	2500	Nav	4.0		5.8		14.5	
Copper	76000	260	17.2	J	29.3	J	36.8	J
Cyanide	41000	40	2.6		0.20	U	0.24	U
Iron	Nav	Nav	7410		11800		27200	
Lead	1000	3	**51.3**		**77.4**		**119**	
Magnesium	Nav	Nav	2080		3540		7030	
Manganese	47000	Nav	122		189		526	
Mercury	610	0.4	0.039	U	0.038	U	0.081	
Nickel	7500	20	6.9		11.6		**21.3**	
Selenium	10000	10	0.73	J	0.77	J		R
Silver	10000	7.2	0.64	J	1.1	J	2.5	J
Sodium	Nav	Nav	105	U	138	U	291	J
Thallium	160	1	0.70	J	**1.2**		0.59	U
Vanadium	14000	10	**14.2**		**24.1**		**33.5**	
Zinc	610000	1000	68.5		110		238	

Notes:
I/C DEC = CTDEP Industrial/Commercial Direct Exposure criteria
GB PMC = CTDEP Pollutant Mobility criteria for GB groundwater
Bold type = criteria exceeded
U = Not detected
UJ = Detection limit approximate
J = Quantitation approximate
Nav = Criterion not available
* = From dilution analysis
R= Rejected
** = PMC for metals are modified (multiplied by 20) to estimate the potential for pollutant mobility from total metals data.

TABLE 4-7
INTERIOR ASBESTOS-CONTAINING MATERIALS AND QUANTITIES
DRAFT BROWNFIELDS TARGETED SITE ASSESSMENT
INTERROYAL CORPORATION SITE
PLAINFIELD, CONNECTICUT

LOCATION	MATERIAL TYPE	% ASBESTOS	QUANTITY
R&D Building, Basement	Elbow insulation (mudded fitting)	25-30%	12 elbows
R&D Building, Basement	Pipe insulation	10-15%	200 LF
R&D Building, Basement	Pipe insulation/debris	10-15%	Throughout basement
R&D Building, Basement	9x9 floor tile (stored material)	Presumed	100 tiles
R&D Building, 1st Floor and Storage Area	9x9 floor tile (red)	Presumed	20 SF scattered debris and 75 SF in storage area
R&D Building (exterior trench)	Pipe insulation in trench	Presumed	50 LF
3-Story Building, boiler room	Main steam line pipe insulation – 18" line	25-30%	50 LF
3-Story Building, boiler room boilers	Boiler insulation (external)	10-15%	1,250 SF
3-Story Building, boiler	Boiler breeching insulation	3-5%	825 SF
3-Story Building, boiler	Steam line pipe insulation – 6" line	32-35%	25 LF
3-Story Building, boiler rooms west and south of boiler room	Steam line pipe insulation – 3" line	30-40%	270 LF
3-Story Building, boiler rooms west and south of boiler room	Elbow insulation (mudded fitting)	25-30%	18 fittings
3-Story Building, boiler room west of boiler room	Tank/breeching insulation	3-5%	425 SF
3-Story Building, basement (southeast quadrant)	Pipe insulation (aircell) including fittings	35-40%	75 LF
3-Story Building, basement (southeast quadrant)	Pipe insulation (mag)	5-15%	175 LF

TABLE 4-7 (cont.)
INTERIOR ASBESTOS-CONTAINING MATERIALS AND QUANTITIES
DRAFT BROWNFIELDS TARGETED SITE ASSESSMENT
INTERROYAL CORPORATION SITE
PLAINFIELD, CONNECTICUT
PAGE 2 OF 3

LOCATION	MATERIAL TYPE	% ASBESTOS	QUANTITY
3-Story Building, 2nd Floor (center riser)	Pipe insulation (mag)	5-15%	20 LF
3-Story Building, basement 1st floor adjacent to wall #167	Pipe insulation (aircell) including fittings	35-40%	150 LF
3-Story Building, 1st floor north central	Pipe insulation (aircell) including fittings	35-40%	25 LF
3-Story Building, 3rd floor	12x12 light green tile	1.5%	550 SF
3-Story Building, 3rd floor	12x12 light green tile mastic on wood	3-5%	550 SF
3-Story Building, 3rd floor (former office)	Sheetrock wallboard glue	5%	15 SF
3-Story Building, 3rd floor (former office)	Baseboard mastic	1-2%	60 LF
3-Story Building, shipping and receiving	Pipe insulation (aircell) including fittings	10-20%	390 LF
Fuel Shed	Transite	15-20%	125 SF
Fuel Shed Ceiling	Joint compound	5-7%	30 LF
1-Story Building, auxiliary boiler room – boiler	Beige fire brick	3-20%	80 SF
1-Story Building, auxiliary boiler room – boiler	Boiler roping	80-90%	50 LF
1-Story Building, auxiliary boiler room – boiler	Boiler breeching	30-40%	100 LF
1-Story Building, basement men's room at column 32A	Pipe wrap tape	5%	25 LF
1-Story Building, basement women's room at column 11A	Black tar roping	1-2%	140 LF
1-Story Building, basement between columns 30D and 33D	Black tar roping	1-2%	50 LF
1-Story Building, basement (throughout basement on floor and intact)	Pipe insulation (aircell) including fittings	3-5%	443 LF

TABLE 4-7 (cont.)
INTERIOR ASBESTOS-CONTAINING MATERIALS AND QUANTITIES
DRAFT BROWNFIELDS TARGETED SITE ASSESSMENT
INTERROYAL CORPORATION SITE
PLAINFIELD, CONNECTICUT

LOCATION	MATERIAL TYPE	% ASBESTOS	QUANTITY
1-Story Building, basement bonderizer near column 27G	Motor packing material	1%	15 SF
1-Story Building, basement near column 28I (intact and on floor)	Pipe insulation (mag)	30-40%	110 LF
1-Story Building, office area/basement	Pipe insulation (aircell) including fittings	3-5%	30 LF
1-Story Building, office area/basement	12x12 green/white floor tile	1.5%	700 SF
Office Building, 1st floor/basement	9x9 floor tile (brown)	1%	1,300 SF
1-Story Building	Brown 9x9 floor tile	5%	900 SF
1-Story Building, basement bonderizer near column 27G	Fan duct insulation	15%	50 SF
1-Story Building, basement bonderizer near column 27G	Wall and ceiling panels associated with bonderizer unit	25%	1,500 SF
1-Story Building, basement bonderizer near column 27G	Blower fan unit insulation	10%	75 SF
1-Story Building, basement bonderizer near column 27G	Bonderizer curtain strip	Presumed	2 LF
3-Story Building, main boiler room	Rope gasket	40%	2 boilers
All buildings	Asbestos coated wiring	Presumed	Unknown

Presumed = Material inaccessible and not sampled.
Presumed to be composed of ACM.

Exterior building components that were determined to contain greater than 1 percent asbestos included roof flashing, roof field, and tar paper from the three-story portion of the mill; and roof flashing, roof field, shingle flashing, and window glazing from the one-story section of the mill. A summary of ACM quantities detected throughout the exterior portions of the mill building is provided on Table 4-8 and in Appendix C.

4.2.2 Lead-Based Paint and Contaminated Building Materials Inspection

Lead-based paint screening indicated that lead is present on several painted surfaces throughout the interior and exterior of the mill buildings at concentrations equal to or greater than 1.0 mg/cm^2, the regulatory standard established by HUD and the State of Connecticut. External window and door frames at the R&D Building were coated with lead-based paint. Several interior walls, doors, stairways, and window sashes throughout the R&D Building were also coated with lead-based paint. Within the one-story section of the mill building, bathroom walls, doors, dryer duct supports, beams, and brick were coated with lead-based paint. Paint coating floors, walls, windows, beams, ceiling boards, support columns, and brick walls within the three-story portion of the mill building was determined to contain lead. Windows (both interior and exterior) and window systems in all sections of the building were also coated with lead-based paint. EnviroScience noted that in all sections of the building, the paint is mostly defective and heavily deteriorated due to water and moisture, and exposure to the weather. A summary of lead-based paint screening results is contained in Appendix C.

EnviroScience collected paint chip samples from limited locations to provide laboratory analysis of typical painted surfaces throughout the mill buildings. Paint chip sample results confirmed the presence of toxic concentrations of lead paint in all sections of the Site.

EnviroScience identified several fluorescent light fixtures and lamps that may contain hazardous materials. A summary of fixtures and lamps identified during the survey is included in Table 4-9 and in Appendix C.

EnviroScience collected five representative samples of building components for TCLP lead analysis during the January 2001 investigation. Four of the samples revealed that TCLP lead concentrations in building material samples was below the RCRA regulatory level of 5 ppm, but the fifth was well above this level (130 ppm). EnviroScience recommended in the draft report

TABLE 4-8
EXTERIOR ASBESTOS-CONTAINING MATERIALS AND QUANTITIES
DRAFT BROWNFIELDS TARGETED SITE ASSESSMENT
INTERROYAL CORPORATION SITE
PLAINFIELD, CONNECTICUT

LOCATION	MATERIAL TYPE	% ASBESTOS	QUANTITY
3-Story Building, south side	Roof flashing	1-5%	1,200 LF
3-Story Building, shipping and receiving	Tar paper under green shingle siding	1-2%	850 SF
3-Story Building, shipping and receiving	Roof field	4%	850 SF
Fuel Shed	Red roof shingles	7-10%	250 SF
Fuel Shed	Roof seam flashing	5-7%	40 LF
1-Story Building	Window glazing compound	5%	110 Windows
1-Story Building, roof south side (intact portion)	Roof field	3-5%	70,000 SF
1-Story Building, roof (south demo pile)	Roof field	2-3%	23,000 SF
1-Story Building (intact portion)	Roof perimeter flashing	1-2%	1,350 LF
Office Building	Roof perimeter flashing	10%	400 LF
1-Story roof intact portion – green roof shingle flashing	Shingle flashing	10%	8,000 SF
Between 1-Story and 3-Story Buildings	Soil	>1%	4,444
South End of 1-Story Building	Soil	>1%	2,222

TABLE 4-9
LOCATION AND QUANTITY OF
PCB/MERCURY-CONTAINING FIXTURES AND LAMPS
DRAFT BROWNFIELDS TARGETED SITE ASSESSMENT
INTERROYAL CORPORATION
PLAINFIELD, CONNECTICUT

Location	PCB-Containing Light Fixtures	Mercury-Containing Lamps
R&D Building	0	63
Main Boiler Room (Main Room)	7	11
Main Boiler Room (South Room)	8	8
3-Story Building Basement	19	19
3-Story Building First Floor	208	353
3-Story Building Second Floor	1	18
3-Story Building Third Floor	25	46
3-Story Building Ship/Receive Area	0	163
1-Story Building Auxiliary Boiler Room	7	7
1-Story Building Basement	205	85
1-Story Building First Floor	90	160
TOTAL	**664**	**933**

that additional TCLP samples be collected from the one-story building to more accurately characterize the toxicity of lead in building materials. Three additional TCLP samples collected in August 2001 contained less than 5 ppm lead, indicating that building materials throughout the mill would be classified as non-hazardous for disposal under RCRA regulations.

4.3 Environmental Sampling Inside the Mill Building

As discussed in Section 2.2.2, six soil samples, one sludge sample, one sample of aqueous residual material, five samples of wood, five samples of concrete, and one sample of hydraulic oil was collected from inside the mill building. The analytical results for soil, sludge, wood, concrete and hydraulic oil were compared to I/C DEC. Although this criteria does not apply to media other than soil, the comparison to sludge, wood, concrete, and oil analytical results was performed to gain a preliminary assessment of risk associated with exposure to these media. Soil samples collected from the basement floor of the three-story section of the mill building (3B-01, 3B-02, 3B-03, and 3B-04) contained low concentrations of several SVOCs, none exceeding applicable regulatory criteria. The soil sample collected from the rustproofing machine dragout trench (DT-01) contained a concentration of ETPH greater than the I/C DEC. Several VOCs were also detected in this sample, but at concentrations below applicable regulatory criteria. A summary of positive detections in soil samples collected from the interior of the mill building is provided in Table 4-10.

The sludge sample collected from the bonderizer sump (RSB-1-6) contained concentrations of ETPH, arsenic, and chromium above I/C DEC. The aqueous sample collected from the bonderizer sump (AQB-1-6) contained detectable concentrations of ETPH and several metals. Flashpoint analysis revealed that the sludge and aqueous material was not hazardous due to ignitability. A summary of positive detections in sludge/aqueous samples collected from the bonderizer sumps is provided in Table 4-11.

Several metals were detected in the five wood samples collected from the basement plating area (WD-01, WD-02, WD-03, WD-04, and WD-05). The concentration of chromium in one of the wood samples exceeded I/C DEC, a soil criteria that was used to assess the level of contamination in building material samples collected from the Site. Concentrations of arsenic, chromium, and lead detected in concrete samples (CO-01, CO-02, CO-03, CO-04, and CO-05)

TABLE 4-10
SUMMARY OF POSITIVE DETECTIONS IN SOIL SAMPLES
COLLECTED FROM INTERIOR OF THE MILL BUILDING
DRAFT BROWNFIELDS TARGETED SITE ASSESSMENT
INTERROYAL CORPORATION SITE
PLAINFIELD, CONNECTICUT

MATRIX			Soil		Soil		Soil		Soil		Soil	
SAMPLE ID			IR-SO-3B-01		IR-SO-3B-02		IR-SO-3B-03		IR-SO-3B-04		IR-SO-DT-01	
SAMPLE LOCATION			Basement of 3-Story		Basement of 3-Story		Basement of 3-Story		Basement of 3-Story		Dragout Trench	
DATE SAMPLED			2/5/2001		2/5/2001		2/5/2001		2/5/2001		2/5/2001	
QC IDENTIFIER			None		None		None		None		None	
	I/C DEC	**GB PMC***										
Volatile Organic Compounds (ug/kg)												
1,1,1-Trichloroethane	1000000	40000		NA		NA		NA		NA	290	
1,1-Dichloroethane	1000000	14000		NA		NA		NA		NA	61	J
Tetrachloroethene	110000	1000		NA		NA		NA		NA	220	
Trichloroethene	520000	1000		NA		NA		NA		NA	45	J
Semivolatile Organic Compounds (ug/kg)												
Acetophenone	Nav	Nav	37	J	340	U	330	U	320	U		NA
Benzo(b)fluoranthene	7800	1000	45	J	43	J	48	J	35	J		NA
Chrysene	780000	1000	41	J	340	U	76	J	320	U		NA
Fluoranthene	2500000	56000	47	J	47	J	53	J	37	J		NA
Phenanthrene	2500000	40000	320	U	35	J	49	J	320	U		NA
Pyrene	2500000	40000	56	J	79	J	69	J	59	J		NA
Extractable TPH (mg/kg)												
Extractable TPH	2500	2500		NA		NA		NA		NA	**20000**	
Total Metals (mg/kg)												
Arsenic	10	10		NA		NA		NA		NA	1.8	
Barium	140000	200		NA		NA		NA		NA	104	
Chromium	100	10		NA		NA		NA		NA	21.4	
Lead	1000	3		NA		NA		NA		NA	**12.1**	
Mercury	610	0.4		NA		NA		NA		NA	0.046	
Wet Chemistry Analysis												
pH (S.U.)	Nav	Nav		NA		NA		NA		NA	7.6	
Reactive Sulfide (mg/kg)	Nav	Nav		NA		NA		NA		NA	1.6	

Notes:
I/C DEC = CTDEP Industrial/Commercial Direct Exposure criteria
GB PMC = CTDEP Pollutant Mobility criteria for GB groundwater
Bold Type = Criteria Exceeded
U = Not detected
J = Quantitation approximate
NA = Not analyzed
Nav = Criterion not available
* = PMC for metals are modified (multiplied by 20) to estimate the pollutant mobility from total metals data.

TABLE 4-11
SUMMARY OF POSITIVE DETECTIONS IN SLUDGE/AQUEOUS SAMPLES
COLLECTED FROM THE BONDERIZER SUMPS
DRAFT BROWNFIELDS TARGETED SITE ASSESSMENT
INTERROYAL CORPORATION SITE
PLAINFIELD, CONNECTICUT

MATRIX			Sludge		Aqueous	
SAMPLE ID			IR-RSB-1-6		IR-AQB-1-6	
SAMPLE LOCATION			Bonderizer Sumps		Bonderizer Sumps	
DATE SAMPLED			2/5/2001		2/5/2001	
QC IDENTIFIER			None		None	
	I/C DEC	**GB PMC***				
Volatile Organic Compounds (ug/kg)						
1,2-Dichlorobenzene	1000000	3100	2500			NA
1,4-Dichlorobenzene	240000	15000	510	J		NA
2-Butanone	1000000	80000	340	J		NA
Methyl Acetate	Nav	Nav	3100			NA
Extractable TPH (mg/kg) or (mg/l)						
Extractable TPH	2500	2500	**44000**		3.2	
Total Metals (mg/kg)						
Arsenic	10	10	11.1		3	U
Barium	140000	200	1480		37.7	
Cadmium	1000	1	1.3		0.37	
Chromium	100	10	5140		**404**	
Lead	1000	3	376		**6.7**	
Mercury	610	0.4	1.0		0.15	U
Selenium	10000	10	2.5		5	U
Wet Chemistry Analysis						
pH (S.U.)	Nav	Nav	7.2			NA
Flashpoint	Nav	Nav		NA		NF
Reactive Sulfide (mg/kg)	Nav	Nav		NA		NA

Notes:
I/C DEC = CTDEP Industrial/Commercial Direct Exposure criteria (used to assess sludge analytical results only)
GB PMC = CTDEP Pollutant Mobility criteria for GB groundwater (used to assess sludge analytical results only)
Bold Type = Criteria Exceeded
U = Not detected
J = Quantitation approximate
NA = Not analyzed
NF = No flash
Nav = Criterion not available
* = PMC for metals are modified (multiplied by 20) to estimate the pollutant mobilty from total metals data.

also exceeded the I/C DEC. A summary of positive detections in wood and concrete samples collected from the basement plating area is provided in Table 4-12.

The sample of hydraulic oil collected from the hydraulic press did not contain PCBs. A summary of analytical results for this sample is provided in Table 4-13.

TABLE 4-12
SUMMARY OF POSITIVE DETECTIONS IN CONTAMINATED BUILDING MATERIAL SAMPLES
COLLECTED FROM THE BASEMENT PLATING AREA
DRAFT BROWNFIELDS TARGETED SITE ASSESSMENT
INTERROYAL CORPORATION SITE
PLAINFIELD, CONNECTICUT

MATRIX		Concrete		Concrete		Concrete		Concrete		Concrete		Wood		Wood		Wood		Wood		Wood	
SAMPLE ID		IR-CO-01		IR-CO-02		IR-CO-03		IR-CO-04		IR-CO-05		IR-WD-01		IR-WD-02		IR-WD-03		IR-WD-04		IR-WD-05	
DATE SAMPLED		2/5/2001		2/5/2001		2/5/2001		2/5/2001		2/5/2001		2/5/2001		2/5/2001		2/5/2001		2/5/2001		2/5/2001	
QC IDENTIFIER		None		None		None		None		None		None		None		None		None		None	
	I/C DEC																				
TAL Metals (mg/kg)																					
Arsenic	10	**13.4**		**10.3**		**17.0**		10.0		**11.2**		1.2		0.67	U	3.3		0.80		0.71	U
Barium	140000	3120		1530		523		3710		1530		31.3		22.9		81.4		47.6		45.6	
Cadmium	1000	0.073	U	0.069	U	0.062	U	26.7		0.066	U	2.0		1.2		0.46		1.8		1.6	
Chromium	100	**6320**		**2900**		**609**		**3980**		**2560**		38.3		57.1		**223**		36.9		29.5	
Cyanide	41000	0.32		2.5		5.9		5.5		1.6		4.9		3.2		34.2		5.9		5.7	
Lead	1000	**1670**		**828**		499		**1160**		**636**		171		287		274		136		89.3	
Mercury	610	4.1		2.1		0.55		4.5		2.5		3.6		1.6		1.2		3.0		1.2	
Selenium	10000	1.2	U	1.2	U	1.0	U	1.1	U	1.1	U	1.1	U	1.1	U	1.7		1.1	U	1.2	U

Notes:
I/C DEC = CTDEP Industrial/Commercial Direct Exposure criteria
Bold Type = Criteria Exceeded
U: Not detected
Nav: Criterion not available

TABLE 4-13
SUMMARY OF ANALYTICAL RESULTS FROM OIL SAMPLE
COLLECTED FROM HYDRAULIC PRESS
DRAFT BROWNFIELDS TARGETED SITE ASSESSMENT
INTERROYAL CORPORATION SITE
PLAINFIELD, CONNECTICUT

MATRIX		Hydraulic Oil	
SAMPLE ID		IR-OL-PR-01	
SAMPLE LOCATION		Hydraulic Press	
DATE SAMPLED		2/5/2001	
QC IDENTIFIER		None	
	I/C DEC		
Polychlorinated Biphenyls (ug/kg)			
Aroclor-1016	10000	1000	U
Aroclor-1221	10000	1000	U
Aroclor-1232	10000	1000	U
Aroclor-1242	10000	1000	U
Aroclor-1248	10000	1000	U
Aroclor-1254	10000	1000	U
Aroclor-1260	10000	1000	U

Notes:
I/C DEC = CTDEP Industrial/Commercial Direct Exposure criteria
U = Not detected

5.0 CONCLUSIONS AND RECOMMENDATIONS

This section provides a summary of conclusions and recommendations formulated by TtNUS based on analytical data available from this BTSA and through review of previous investigations at the Site. Changes to the recommendations presented in this section may be required if additional information on the nature and extent of contamination on the Site becomes available. The recommendations being made for this BTSA assume that all future land uses are industrial in nature with low frequency and intensity of use by children. Costs associated with implementing these recommendations are presented in Section 6.0.

5.1 Release Areas Outside the Mill Building

The following is a summary of release areas located outside the mill building that require additional investigations and/or remedial measures to meet applicable regulatory standards.

5.1.1 Fuel Oil AST Area

Soil and groundwater in the area south of the Fuel Oil ASTs is contaminated with VOCs, SVOCs, and TPH (ERT, 1988; ENSR, April 1990; ENSR, October 1991; Weston, 1999 and Berger, 1999). The vertical and horizontal limits of petroleum-contaminated soil were delineated by Berger (1999) who estimated that at least 1,500 cubic yards of petroleum-contaminated soil is present in this area. TtNUS recommends the excavation and disposal of approximately 500 cubic yards contaminated soil in the vadose zone near the Fuel Oil ASTs. In-situ treatment of contaminated soil in the saturated zone and contaminated groundwater is recommended in the remainder of the area impacted by this release. An innovative, relatively low cost method of in-situ treatment of the saturated zone soil and groundwater is injection of Oxygen Releasing Compound (ORC) directly into the contaminated area. ORC slowly releases oxygen to the soil surface environment and promotes natural biodegradation of petroleum in soil and groundwater.

5.1.2 Hexagonal Concrete Pads

Soil in the area south of the two hexagonal concrete pads is visibly contaminated with TPH. The vertical and horizontal limits of petroleum-contaminated soil in this area was delineated, and it was determined that at least 180 cubic yards of petroleum-contaminated soil is present

(Berger, 1999). TtNUS recommends excavation and disposal of contaminated soil in this area, and treatment of contaminated groundwater using ORC slurry.

5.1.3 Waste Paint Sludge Disposal Area

Soil samples collected from the paint sludge disposal area contained elevated concentrations of lead, zinc, and VOCs. An EP-Toxicity analysis on these soils was performed and determined that they were non-hazardous. TCLP and SPLP analysis of soil samples collected from this area by TtNUS indicate that samples collected from the 0 to 2-foot depth interval contained leachable concentrations of lead and chromium exceeding the GB PMC. However, these concentrations fall below concentrations that are characteristic of RCRA hazardous waste. Concentrations of total lead and total chromium detected at this depth interval exceeded the I/C DEC (ENSR, 1990 and Berger, 1999). TtNUS recommends that this soil be excavated and disposed of as a special solid waste. The volume of soil requiring removal has been estimated at 230 cubic yards (ENSR, 1991).

5.1.4 Boiler Blow Down Area

Soils within the boiler blow-down area are contaminated with TPH, chlorinated VOCs, and low concentrations of PCBs. It is estimated that approximately 35 cubic yards of contaminated soil are present (ENSR, April 1990). TtNUS recommends the excavation and disposal of contaminated soil in this area.

5.1.5 Former Drum Storage Area

Elevated concentrations of PCE were detected in soils collected from two test pits in the former drum storage area (ENSR, April 1990). The volume of VOC-contaminated soil in this area was estimated to be 35 cubic yards (ENSR, October 1991). TtNUS recommends the excavation and disposal of contaminated soil in this area.

5.1.6 Horse Brook and Reservoirs No. 1, 2, and 3

Sediments in the channel of Horse Brook south of the Site drainage culvert discharge were found to contain elevated concentrations of TPH, chlorinated VOCs, SVOCs, PCBs, and metals chromium, lead, zinc, and nickel (Weston, 1999 and Berger, 1999). Sediment samples collected from the three water storage reservoirs (Reservoirs No. 1, 2, and 3; located east of the mill building) contained concentrations of SVOCs and TPH exceeding the I/C DEC and GB PMC. Surface water samples collected from Horse Brook contained detectable concentrations of mercury and several VOCs (TtNUS, 2000; Weston, 1999).

Although it is apparent that these sediments should be removed and disposed of at an appropriate facility, additional sample data will be necessary to accurately estimate the volume of contaminated sediments that must be removed and to characterize the waste for disposal. Future investigations would include approximately 20 additional sediment samples for analysis of VOCs, TPH, SVOCs, PCBs, and metals.

5.1.7 Southern Portion of the Mill Building/Degreaser AST Area

TtNUS detected concentrations of chlorinated solvents exceeding I/C VC in SDDW21, which is located adjacent to the Degreaser AST. Previous investigations conducted by ENSR (1990) and Berger (1999) detected elevated concentrations of chlorinated solvents from MW-9S, located approximately 60 feet north of SDDW21 along the western side of the mill building. The source of this contamination is suspected to be in the vicinity of the degreaser AST or adjacent portions of the building's interior. A more detailed discussion of VOC contamination in groundwater in the vicinity of the Degreaser AST is provided in Section 5.2.7, with the summary and recommendations for the interior of the southern portion of the mill building.

5.1.8 The 75,000-gallon UST

TtNUS observed a thin layer of residual petroleum product remaining within this UST. A residual material sample collected from the bottom of the tank did not contain PCBs, however the tanks should be cleaned and residual product disposed of at an appropriate facility.

A soil sample collected by TtNUS from boring B31, which was placed immediately south of the UST, contained elevated concentrations of SVOCs, one pesticide, and TPH. Soil and groundwater in the area surrounding this UST appear to have been impacted by petroleum contamination. Moderate concentrations of TPH have been detected in a groundwater sample collected from a well located adjacent to this UST (ERT, 1988).

TtNUS recommends additional investigations of soils in the vicinity of the 75,000-gallon UST to determine the vertical and horizontal extent of contamination in this area, determine the volume of contaminated soil that needs to be removed, and characterize contaminated soils for proper disposal. Future investigations would include approximately 10 additional soil samples and three additional groundwater samples for TPH analysis.

5.1.9 Transformer Enclosures

Surficial (0 to 0.5-feet bgs) composite soil samples collected from the three transformer enclosures at the Site contained elevated concentrations of several pesticides, and detectable levels of PCBs. Additional investigations of surface soil should be conducted within the enclosures to determine the vertical extent of soil contamination, and at the perimeter of the enclosures to assess the lateral extent of contamination in these release areas. Future investigations should include up to 30 soil samples for pesticide/PCB analysis.

5.1.10 Former Toluene AST Area

As mentioned in Section 1.3.2.1, previous investigations in the former toluene AST area have determined that additional investigations and remedial actions are not required.

5.2 Release Areas Inside the Mill Building

The one-story section of the mill building has been partially demolished to create fire break areas. The remaining portions of the buildings are significantly deteriorated. As a result, access to the interior sections of the mill building that have been identified as release areas will not be possible until building demolition is complete. TtNUS strongly recommends that subsequent to demolition, the demolition contractor remove all debris from the building footprint so that future environmental investigations to accurately characterize the nature and extent of

contamination within the mill building footprint are not impaired. Failure to do so will result in considerable cost increases for any future investigations that may be undertaken in this area of the Site.

The following is a summary of release areas located inside the mill building that require additional investigations and/or remedial measures to meet applicable regulatory standards.

5.2.1 Asbestos and Lead-Based Paint Abatement

Prior to demolition, abatement of friable and non-friable asbestos must be performed throughout the various sections of the Site. During demolition, selective segregation or demolition of materials coated with lead-based paint must be performed in compliance with OSHA lead worker regulations (29 CFR 1926.62). Pre-demolition activities must also include the removal of other hazardous materials identified within the mill building, such as PCB-containing ballasts and mercury-containing lamps identified in Section 4.2 and in Appendix C. A brief summary of abatement recommendations is presented below, with a more detailed description of recommended abatement activities provided in Section 6.0 of the Asbestos, Lead-Based Paint, and Contaminated Building Materials Survey contained in Appendix C (EnviroScience, 2001).

5.2.1.1 R&D Building

The R&D Building was partially gutted during the initial pre-demolition activities. Both friable and non-friable asbestos has been identified within the building. It is recommended that removal of non-friable asbestos-containing floor tile be completed prior to demolition, including the small quantity of whole non-friable floor tile that was stored in a vault in the basement.

Friable asbestos identified in pipe insulation, fittings, and debris from the basement and crawl space of the R&D Building should also be removed prior to demolition. The basement floor was determined to be heavily contaminated with delaminated asbestos-containing pipe insulation debris, and removal and disposal of this debris is recommended. All asbestos-contaminated debris in the basement that can not be decontaminated should be disposed of as asbestos waste.

An underground trench with asbestos-containing friable pipe insulation was discovered between the R&D Building and the three-story section of the mill. The trench contains two steam lines covered with asbestos pipe insulation that is in poor condition. It is recommended that this trench be excavated and the pipe insulation be disposed of as asbestos waste.

Lead paint coated material should be segregated for separate bulk analysis and disposal. Lighting fixtures equipped with PCB-containing ballasts and mercury-containing lamps should be removed, dismantled, and the contaminated components properly disposed.

5.2.1.2 Three-Story Portion of the Mill Building

Limited pre-demolition activities have been performed in the 3-story section of the mill building. Friable asbestos identified in pipe insulation, fittings, soil and debris in the basement and crawl space of the three-story section of the building should be removed prior to building demolition. The earthen floors in the basement and crawl space areas were heavily contaminated with delaminated asbestos-containing pipe insulation. Removal and disposal of this insulation and the upper 2 inches of soil that contains asbestos are recommended. Additional debris identified in the basement, specifically adjacent to the boiler room, that has been contaminated with pipe insulation and can not be decontaminated should be disposed of as asbestos waste.

Removal of friable ACM within the boiler room should also be performed prior to demolition. Pipe insulation, boiler insulation, boiler breaching, and tank insulation was determined to contain ACM and should be removed prior to demolition. Boiler rope gasket material within the interior of the boilers also contains asbestos. TtNUS recommends that the boilers be demolished to allow for the removal of internal asbestos-containing materials. The concrete floor in the boiler room was contaminated by asbestos-containing pipe and boiler insulation. It is also recommended that this insulation and debris in the boiler room be removed and disposed of as asbestos waste.

All ACM pipe insulation located on the first and second floors of the 3-story section of the mill building should be removed prior to demolition. If materials cannot be reached due to the questionable structural condition of the floors, they should be left in place during demolition. During demolition, these areas must be kept wet and segregated from demolition debris, and

waste materials in the vicinity of the pipe insulation should be disposed of as asbestos-contaminated waste.

Removal of non-friable ACM throughout the interior of the three-story building should include non-friable sheetrock joint compound, baseboard mastic, and floor tile. Non-friable ACM located on the exterior portions of the three-story building includes roof flashing, the roof field, and tar paper covering the shipping and receiving sheds. If roof field materials cannot be safely removed due to the structural condition of the building, they can be left in place during demolition and segregated for disposal as asbestos-containing building materials.

5.2.1.3 One-Story Portion of the Mill Building

The north and south sections of the one-story building have been partially demolished. Debris piles remain in each area that contain roofing materials determined to contain asbestos. It is possible that asbestos-containing pipe insulation was present within the building during demolition. Asbestos bulk samples collected from soil in the North and South demolition material piles determined that this soil contained asbestos. Material in these piles should be segregated in order to remove asbestos-containing non-friable roofing materials and friable ACM prior to disposal or recycling. An alternative to segregating asbestos-containing material from this debris would be to dispose of all debris as asbestos waste.

The remaining section of the one-story building contains pipe insulation containing friable ACM that should be removed prior to demolition. A large amount of delaminated pipe insulation and debris on the concrete basement floor should be completely removed, bagged, and disposed of as asbestos-containing waste. Friable pipe insulation (including fittings), boiler interior insulation, boiler roping, boiler brick, boiler breaching, and tank insulation should also be removed and disposed of. Additional ACM identified in the one-story section of the mill building that should be removed prior to building demolition includes friable motor packing material, fan duct insulation, blower insulation, and wall/ceiling panels associated with the bonderizer dryer area in the basement; pipe wrapping from rest rooms in the building; friable pipe insulation and fittings from the office building space; non-friable floor tile from the basement and first floor; non-friable exterior window glazing compound; and non-friable exterior roofing field and shingle flashing.

5.2.2 Basement of the Three-Story Portion of the Mill Building

Soil samples collected from the northwest portion of the basement floor in the 3-story section of the mill building contained concentrations of SVOCs exceeding the I/C DEC (Berger, 1999). Samples collected by TtNUS in the central and eastern portions of the basement did not detect the presence of SVOCs above these criteria. TtNUS recommends that additional soil samples be collected from the northwest portion of the dirt floor in the basement following the demolition of the building in an attempt to delineate the extent of contamination. This additional investigation would include the collection and analysis of 10 surficial soil sample for SVOC analysis.

5.2.3 Boiler Room Drainage Sump

The sludge observed in the boiler room drainage sump appears visually contaminated with TPH, and is suspected to contain PCBs. No laboratory analysis has been performed to confirm the presence or absence of PCBs. PCBs were not detected in a sample of residual material collected from the UST that stored fuel for these boilers, and soil and groundwater samples collected from beneath the concrete floor of the sump did not contain detectable concentrations of TPH, VOCs, or PCBs (Berger, 1999). TtNUS recommends the collection and analysis of sludge samples from the boiler room drainage sump in order to characterize this waste and select an appropriate disposal method. Future investigations would include five sludge samples to be analyzed for TPH and PCBs, and would also include a visual estimate of the volume of sludge located in the sump.

5.2.4 Basement Plating Area

Soil samples collected from beneath the concrete floor in this area contained elevated concentrations of chromium, lead, nickel, and zinc. Groundwater samples collected from beneath the basement floor contained elevated concentrations of cadmium, nickel, and cyanide. Groundwater samples collected from monitoring wells located in the adjacent area outside the building contained elevated concentrations of chromium, zinc, and bis(2-ethylhexyl)phthalate (Berger, 1999). TtNUS recommends the collection of up to 10 soil samples (for RCRA 8 metals and cyanide analysis) from beneath the concrete floor to further delineate the vertical and horizontal extent of contamination.

Surficial concrete samples collected from the basement plating area during this BTSA indicate that concrete in the basement plating area contains concentrations of arsenic, chromium, and lead greater than CTDEP I/C DEC. Samples of wood beams on the ceiling of the Basement Plating Area revealed that this material is contaminated with chromium at concentrations exceeding the I/C DEC. TtNUS recommends the collection of additional samples of concrete and wood from the Basement Plating Area for analysis of RCRA 8 metals to identify contaminated concrete flooring and contaminated wood ceiling beams. Subsequent to characterization, TtNUS recommends that contaminated concrete and wood in this area be segregated during demolition of the mill buildings and disposed of at a licensed facility.

5.2.5 Bonderizer Sumps

Elevated concentrations of TPH and EP toxicity leachable (but non-hazardous) concentrations of barium and arsenic were detected in sludge from Bonderizer Unit No. 6, whereas sludge from Bonderizer Unit No. 1 was composed of 44 percent TPH. Cracks or holes may be present in the sumps that allow exchange between the sumps and groundwater (ENSR, April 1990). ENSR recommended removal and disposal of the water and sludge in the bonderizer sumps.

Additional laboratory analysis of sludge samples collected from the bonderizer sumps by TtNUS indicated the presence of elevated concentrations of petroleum hydrocarbons, arsenic, and chromium. Corrosivity analysis revealed that the sludge sample had a pH of 7.2. The aqueous residual material sample collected from the sump contained low concentrations of ETPH and metals.

Measurements of the sumps taken by TtNUS in February 2001 determined that they were approximately 92 feet long and 11.5 feet wide. Sludge depths over the length of the sumps were measured between 3 and 14 inches over the length of the sumps. Therefore, TtNUS estimated the volume of sludge to be 750 cubic feet (28 cubic yards) and the volume of liquid to be 6,300 gallons. TtNUS recommends that sludge and water be removed from the sumps.

5.2.6 Rust Proofing Machine Dragout Trench

Elevated concentrations of TCE, PCE, benzene, toluene, and xylenes were detected in soil samples collected from this area (ENSR, September 1990). Removal and disposal of VOC-contaminated soil was recommended; however, the volume of contaminated soil was not determined (ENSR, November 1990). Additional soil samples collected by TtNUS revealed the presence of low concentrations of VOCs and concentrations of ETPH exceeding CTDEP I/C DEC.

TtNUS measured the area of the trench to be approximately 66 feet long and 4 feet wide. TtNUS estimates that one foot of contaminated soil is present in the Dragout Trench, but there is no evidence that definitively identifies the vertical extent of contamination in this area. TtNUS recommends the advancement of three soil borings along the length of the Dragout Trench, and the collection of soil samples to determine the vertical extent of contamination. Samples would be analyzed for the presence of VOCs and TPH. Determination of the vertical extent of contamination would allow for the accurate estimation of the volume of soil that should be removed from the trench.

5.2.7 Southern Portion of the Mill Building

Elevated concentrations of several VOCs have been detected in groundwater samples collected from monitoring wells located in the Degreaser AST Area, beneath the southern portion of the mill building, and adjacent to the southeast corner of the mill building. The source and extent of soil and groundwater contamination in this area is not known. TtNUS was not able to collect soil or groundwater samples from beneath the building in this portion of the Site due to limited access caused by the deteriorated condition of the mill building. The passive soil gas survey performed during this BTSA suggests that the source of the VOCs is within the building's interior and that the contamination encompasses all three of these areas.

Additional investigations of the Site are recommended to provide a basis for selection and design of appropriate remedial measures and for accurate cost estimates for their implementation. Additional investigations would include a passive soil gas survey encompassing the suspected limits of VOC contamination in the southern portion of the Site. Soil gas modules would be installed in a grid designed to identify areas with VOC contamination that should be targeted for

subsurface soil and groundwater investigation. Approximately ten soil borings would be advanced in areas identified by the soil gas survey to contain high concentrations of organic vapors. Soil and groundwater samples would be collected from these borings for VOC analysis. Existing groundwater monitoring wells in this area of the Site would also be used to assess the extent of the groundwater contamination plume.

Performance of this investigation would be most practical after demolition of the mill building is completed. Building demolition would facilitate access of drill rigs to the southern section of the Site. However, in order to recognize this benefit, it is imperative that all demolition debris be removed from the Site after the building has been demolished. The presence of demolition debris on the ground surface during these investigations would severely inhibit sampling activities and increase the cost to conduct additional sampling and implement remedial measures.

Remediation of VOC contamination in the southern portion of the building is recommended subsequent to accurate delineation of the Southern VOC groundwater plume. In-situ remediation is recommended for this area due to the shallow depth to groundwater and the close proximity of the Pervel building. Mechanical/physical in-situ remediation methods include groundwater pump-and-treat and air sparging/soil vapor extraction (AS/SVE). An innovative technology that enhances natural attenuation of chlorinated VOCs is Hydrogen Release Compound (HRC™). HRC is a polylactate ester specially formulated for slow release of lactic acid upon hydration, and enhances the anaerobic degradation of contaminants in the saturated zone. HRC has been proven effective in treating PCE, TCE, DCE, and vinyl chloride—all of which are compounds or breakdown products of chlorinated VOCs that have been detected in groundwater at the Site.

The application of HRC to groundwater in this area of the Site could enhance the rate of VOC degradation in groundwater at the Site. HRC is delivered to the groundwater through injection or dispersion from borings or wells placed in target areas of the contaminant plume, or through dispersion in trenches excavated into the water table. Periodic groundwater monitoring would be required to assess the progress of remediation. Successful application of HRC can provide significant cost savings over ex situ groundwater treatment processes.

HRC application is generally one-half to two thirds less costly than more traditional pump-and-treat or AS/SVE system installation and operation. TtNUS has provided an order-of-magnitude

cost estimate for the installation and operation of an HRC application system in the southern portion of the Site (see Section 6.0). For the purposes of the cost estimate, it was assumed that the VOC groundwater plume encompassed both the east and west sides of the mill building, including the area within the footprint of the building. Design parameters for this preliminary cost estimate were based on field parameters measured and observed during this and previous environmental investigations at the Site, or estimated using typical design parameters provided by Regenesis, the manufacturer of HRC compound and creator of the design software. In order to determine the most appropriate remedial alternative for this area of the site, additional field sampling must be conducted to provide a more complete characterization of subsurface conditions and develop a more comprehensive site model.

6.0 PRELIMINARY COST ESTIMATES

TtNUS has developed preliminary order-of-magnitude cost estimates to implement the recommended measures to prepare the InterRoyal mill buildings for demolition, further assess the nature and extent of contamination at the Site, and perform post-demolition remedial actions to abate soil and groundwater contamination.

The first phase of recommended remedial actions includes those remedial measures necessary to prepare the mill buildings for demolition and include:

- Asbestos abatement - $498,000;
- OSHA compliance for lead-based paint - $5,000;
- Removal of PCB ballasts and mercury-containing lamps - $10,000;
- Contingency cost (10%) - $51,000; and
- Contract administration (15%) $85,000.

A summary of preliminary cost for implementation of these measures is provided in Table 6-1.

The second phase of remedial measures will take place subsequent to building demolition and the complete removal of demolition debris. These measures include additional environmental investigations and remedial actions to evaluate, and where necessary, remediate, soil and groundwater contamination on the Site and manage environmental risks to future site users. Post-demolition remedial recommendations include:

- Additional investigations in release areas located both inside and outside of the building footprint - $63,000;
- Excavation, removal, and disposal of contaminated soil from the fuel oil AST area, hexagonal concrete pads, waste paint sludge disposal area, boiler blow-down area, and former drum storage area - $189,000;
- Removal and disposal of residual oil in 75,000-gallon UST - $5,000;
- Removal and disposal of sludge in bonderizer sumps - $28,000;
- In-situ treatment (with HRC) of contaminated groundwater in southern portion of the Site using grid design throughout entire plume area - $342,000;

TABLE 6-1
PRELIMINARY COST ESTIMATES FOR RECOMMENDED PHASE I REMEDIAL MEASURES
PRIOR TO DEMOLITION OF MILL BUILDINGS
DRAFT BROWNFIELDS TARGETED SITE ASSESSMENT
INTERROYAL CORPORATION SITE
PLAINFIELD, CONNECTICUT

Recommended Measure	Preliminary Cost Estimate
Asbestos and Hazardous Material Abatement[1]	
• Estimated cost for abatement of asbestos-containing material throughout interior of mill buildings	$190,500
• Estimated cost for abatement of asbestos-containing material throughout mill building exterior	$307,500
• Disposal of PCB ballasts and mercury lamps	$10,000
• OSHA compliance for lead paint	$5,000
SUBTOTAL:	$513,000
• 10% contingency	$51,000
PROJECT TOTAL:	$564,000
• Contract administration and project monitoring (at 15% of project cost)	$85,000
ESTIMATED TOTAL PHASE I ABATEMENT COST:	**$649,000**

[1] See Appendix C, Tables 11, 12, and 13 for detailed cost estimate

In-situ treatment (with ORC) of petroleum-contaminated groundwater in the fuel oil AST area - $395,000.

A summary of estimated costs for Phase II remedial measures is presented in Table 6-2.

These preliminary order-of-magnitude cost estimates are intended for use in making decisions regarding further steps to take at the Site to evaluate and remediate environmental contamination. These recommendations and cost estimates may change if additional information on the nature and extent of contamination on the Site becomes available. In addition, these estimates should not be interpreted as accurate costs for procuring consulting or remedial services.

TABLE 6-2 (cont.)
PRELIMINARY COST ESTIMATES FOR RECOMMENDED PHASE II REMEDIAL MEASURES
DRAFT BROWNFIELDS TARGETED SITE ASSESSMENT
INTERROYAL CORPORATION SITE
PLAINFIELD, CONNECTICUT

Recommended Measure	Quantity	Unit	Unit Cost	Total Cost
ADDITIONAL INVESTIGATIONS				
Labor for preparation of sampling plan	40	HR	75	3,000
Horse Brook				
Sample analysis:				
VOCs (soil)	20	samples	100	2,000
ETPH (soil)	20	samples	80	1,600
SVOCs (soil)	20	samples	200	4,000
PCBs (soil)	20	samples	80	1,600
RCRA 8 Metals (soil)	20	samples	90	1,800
75,000-Gallon UST				
Sample analysis:				
ETPH (soil)	10	samples	80	800
ETPH (groundwater)	3	samples	85	255
Transformer Enclosures				
Sample analysis:				
Pesticides/PCBs (soil)	30	samples	80	2,400
Basement Portion of the Three-Story Building				
Sample analysis:				
SVOCs (soil)	10	samples	200	2,000
Boiler Room Drainage Sump				
Sample analysis:				
ETPH (sludge)	5	samples	80	400
PCBs (sludge)	5	samples	80	400
Basement Plating Area				
Sample analysis:				
RCRA 8 Metals (soil)	10	samples	90	900
Cyanide (soil)	10	samples	90	900
Rust Proofing Machine Dragout Trench				
Sample analysis:				
VOCs (soil)	10	samples	120	1,200
ETPH (soil)	10	samples	80	800
Southern Portion of Mill Building				
Sample analysis:				
VOCs (soil gas modules)	20	modules	205	4,100
VOCs (soil)	10	samples	100	1,000
VOCs (groundwater)	10	samples	100	1,000
Additional Investigations continued on next page				

TABLE 6-2 (cont.)
PRELIMINARY COST ESTIMATES FOR RECOMMENDED PHASE II REMEDIAL MEASURES
DRAFT BROWNFIELDS TARGETED SITE ASSESSMENT
INTERROYAL CORPORATION SITE
PLAINFIELD, CONNECTICUT

Recommended Measure	Quantity	Unit	Unit Cost	Total Cost
ADDITIONAL INVESTIGATIONS (continued)				
DPT Drilling Equipment Rental	5	day	2,000	10,000
Sampling Equipment Rental	1	each	1,000	1,000
Field labor for all investigations	200	hours	70	14,000
Labor for preparation of site investigation report	80	hours	75	6,000
Project management, specifications, and coordination	20	hours	75	1,500
Estimated Total Cost For Additional Investigations:				**$62,655**
EXCAVATION AND DISPOSAL OF CONTAMINATED SOIL				
(assume 1 CY soil = 1.5 tons soil)				
Labor for preparation of remedial action work plan	160	hours	75	12,000
Mobilization of labor, equipment, and supplies to Site	1	each	10,000	10,000
Fuel Oil AST Area				
Excavation, transportation, and disposal of 500 CY petroleum-contaminated soil at asphalt batch plant	750	tons	50	37,500
Confirmation samples (VOCs, SVOCs, ETPH)	20	samples	380	7,600
Waste characterization/acceptance samples	5	samples	400	2,000
Backfill and compaction (bulking factor = 1.15)	865	CY	20	17,300
Hexagonal Concrete Pads				
Excavation, transportation, and disposal of 180 CY of petroleum-contaminated soil at asphalt batch plant	270	tons	50	13,500
Confirmation samples (ETPH)	4	samples	80	320
Waste characterization/acceptance samples	2	samples	400	800
Backfill and compaction	210	CY	20	4,200
Waste Paint Sludge Disposal Area				
Excavation, transportation, and disposal of 230 CY of metals-contaminated soil as solid waste	350	tons	125	43,750
Confirmation samples (metals, VOC)	5	samples	200	1,000
Waste characterization/acceptance samples	3	samples	400	1,200
Backfill and compaction	270	CY	20	5,400
Boiler Blow Down Area				
Excavation, transportation, and disposal of 35 CY of VOC and petroleum-contaminated soil	55	tons	50	2,750
Confirmation samples (VOCs, ETPH)	2	samples	180	360
Waste characterization/acceptance samples	1	samples	400	400
Backfill and compaction	40	CY	20	800
Soil excavation costs continued on next page				

TABLE 6-2 (cont.)
PRELIMINARY COST ESTIMATES FOR RECOMMENDED PHASE II REMEDIAL MEASURES
DRAFT BROWNFIELDS TARGETED SITE ASSESSMENT
INTERROYAL CORPORATION SITE
PLAINFIELD, CONNECTICUT

Recommended Measure	Quantity	Unit	Unit Cost	Total Cost
EXCAVATION AND DISPOSAL OF CONTAMINATED SOIL (continued)				
Former Drum Storage Area				
Excavation, transportation, and disposal of 35 CY of VOC-contaminated soil at asphalt batch plant	55	tons	50	2,750
Confirmation samples (VOCs)	2	samples	100	200
Waste characterization/acceptance samples	1	samples	400	400
Backfill and compaction	40	CY	20	800
Field labor for oversight and sample collection	160	hours	75	12,000
Labor for project management, procurement, and coordination	24	hours	75	1,800
Demobilization of labor, equipment, and supplies	1	each	10,000	10,000
Estimated Cost for Excavation and Disposal of Soil:				**$188,830**
REMOVAL AND DISPOSAL OF RESIDUAL MATERIAL IN 75,000-GALLON UST				
Estimated cost to remove oil and clean tank, dispose of residual material and contaminated parts	1	each	5,000	**$5,000**
REMOVAL AND DISPOSAL OF SLUDGE IN BONDERIZER SUMPS				
Minimum charge for shipments requiring treatment	1	each	2,000	2,000
Waste characterization costs	1	each	750	750
Removal and disposal of sludge	5,600	gallons	2	11,200
Removal and disposal of aqueous residual mat'l	6,000	gallons	2	12,000
Transport sludge (approx. 5600 gallons)	100	miles	3	300
Transport aqueous residual mat'l (approx. 6000 gal)	100	miles	15	1,500
Estimated Cost for Removal and Disposal of Sludge:				**$27,750**
GROUNDWATER TREATMENT IN SOUTHERN PORTION OF THE SITE				
Using HRC Grid Design:				
Application well grid installation cost				$87,000
Oversight of grid installation	600	hours	75	$45,000
HRC material cost (per year of operation)				$200,000
Groundwater monitoring cost (per year of operation)				$10,000
Estimated Cost for Groundwater Treatment Using HRC:				**$342,000**

TABLE 6-2 (cont.)
PRELIMINARY COST ESTIMATES FOR RECOMMENDED PHASE II REMEDIAL MEASURES
DRAFT BROWNFIELDS TARGETED SITE ASSESSMENT
INTERROYAL CORPORATION SITE
PLAINFIELD, CONNECTICUT

Recommended Measure	Quantity	Unit	Unit Cost	Total Cost
IN-SITU TREATMENT OF PETROLEUM-CONTAMINATED SOIL AND GROUNDWATER				
Fuel Oil AST Area:				
Application well grid installation cost				$50,000
Oversight of grid installation	200	hours	75	$15,000
ORC material cost (per year of operation)				$320,000
Groundwater monitoring cost (per year of operation)				$10,000
Estimated Cost for Groundwater Treatment Using ORC:				**$395,000**
ESTIMATED TOTAL PHASE II ABATEMENT COST:				**$1,021,235**

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