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# NY STATE SUPERFUND STANDBY CONTRACT

## HOUDAILLE-MANZEL SITE

### City of Buffalo, Erie County

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WORK ASSIGNMENT NO. D002478-2  
SITE NO. 9-15-037

PREPARED FOR

VOL. I REPORT AND APPENDICES A-D



New York State  
Department of  
Environmental Conservation  
Albany, New York

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Division of Hazardous Waste Remediation  
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**PHASE I RI/FS SUMMARY REPORT FOR  
NEW YORK STATE SUPERFUND STANDBY CONTRACT**

**HOUDAILLE-MANZEL SITE  
CITY OF BUFFALO, ERIE COUNTY  
Work Assignment No. D002478-2  
Site No. 9-15-037**

**Prepared For**

**NEW YORK STATE  
DEPARTMENT OF ENVIRONMENTAL CONSERVATION  
DIVISION OF HAZARDOUS WASTE REMEDIATION**

**Prepared By**

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**MAY 1991**

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## SECTION 1

### INTRODUCTION

The Houdaille-Manzel Site is located at 315 Babcock Street less than one mile north of the Buffalo River in the city of Buffalo, Erie County, New York (see Figure 1.1) The company manufactured hydraulic pumps at this plant until it ceased operation in 1978. It was reported by a former employee that cutting oils and cooling compounds were dumped directly onto the ground in the area adjacent to the plant and under the Babcock Street Bridge. The area of disposal was less than one (1) acre upon which a total of approximately 3,850 gallons of waste was reportedly disposed (ECDEP, 1982a).

Since 1981, a number of soil samples have been taken at and near the site. Elevated levels of volatile organics, PCBs, copper and lead have been detected in the disposal area in addition to other areas around the property boundaries. One sample was determined to be a characteristic hazardous waste for lead.

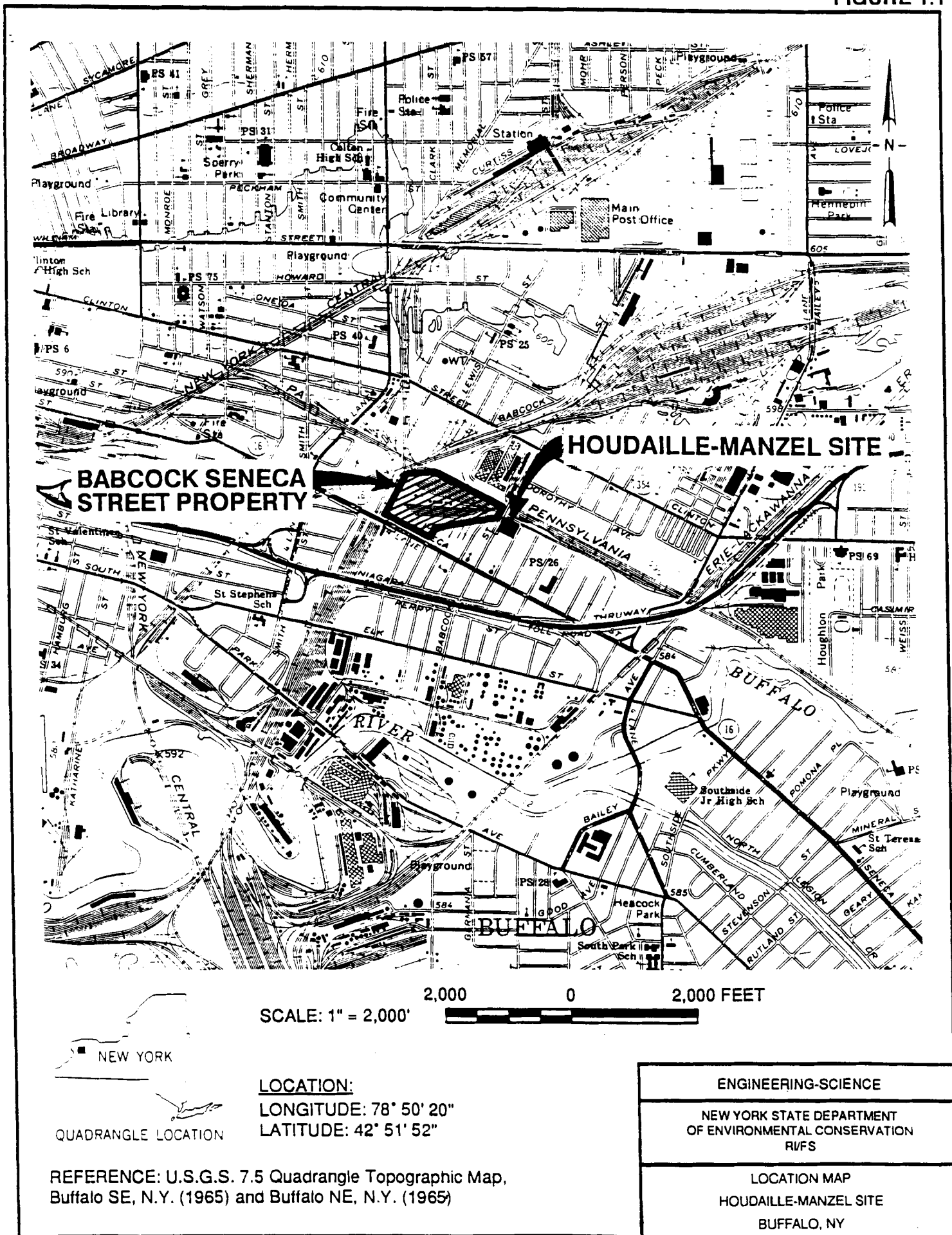
Although the potentially responsible party (PRP) for the site was offered the opportunity to conduct investigations, an agreement could not be reached (NYSDEC, 1990). Therefore, the investigations have been conducted by the New York State Department of Environmental Conservation (NYSDEC) Division of Hazardous Waste under the State Superfund. To accomplish this, a work assignment to conduct a Remedial Investigation, Feasibility Study at the Houdaille-Manzel Site (NYSDEC, 1990) was issued to Engineering-Science, Inc. under the State Superfund Standby Contract.

#### 1.1 PROJECT OBJECTIVES

The objectives of this RI/FS for the Houdaille-Manzel site are as follows:

- To define the extent of surface and subsurface contamination (i.e. groundwater and soils) associated with the reported disposal practices at the Houdaille-Manzel site;
- To perform a habitat based assessment;
- To collect additional information (e.g., human population characteristics, surrounding land uses, biota characteristics) from agencies and other sources needed to perform the risk assessment;
- To perform a risk assessment to evaluate impacts of the site on public health and the environment, characterizing the contaminant exposure pathways between the potential sources of contamination at the site and potential receptors;
- To identify applicable or relevant and appropriate standards, criteria and guidelines for remediation of the Houdaille-Manzel site; and

FIGURE 1.1



- To develop and evaluate a range of site remediation alternatives including, but not limited to, containment, material recycling, in-place treatment and removal followed by treatment.

## 1.2 SITE BACKGROUND

### 1.2.1 Site Description

The former Houdaille-Manzel Division plant is located at 315 Babcock Street in the City of Buffalo, Erie County, New York (Figure 1.1). The disposal area occupies approximately 1,750 square feet located primarily under the Babcock Street viaduct and at the end of Imson Street next to the plant (Figure 1.2). The site is located in an industrial/residential area of the city, and is bordered on the north by railroad tracks and industrial properties, on the west and southwest by a ball park owned by the Boys Club of Buffalo and a former railroad yard used for the repair of railroad cars (JEB 1988), and on the southeast by several residences. The adjacent property to the west was the subject of an environmental engineering study conducted by JEB Consultants for the Buffalo Urban Renewal Agency (JEB, 1988).

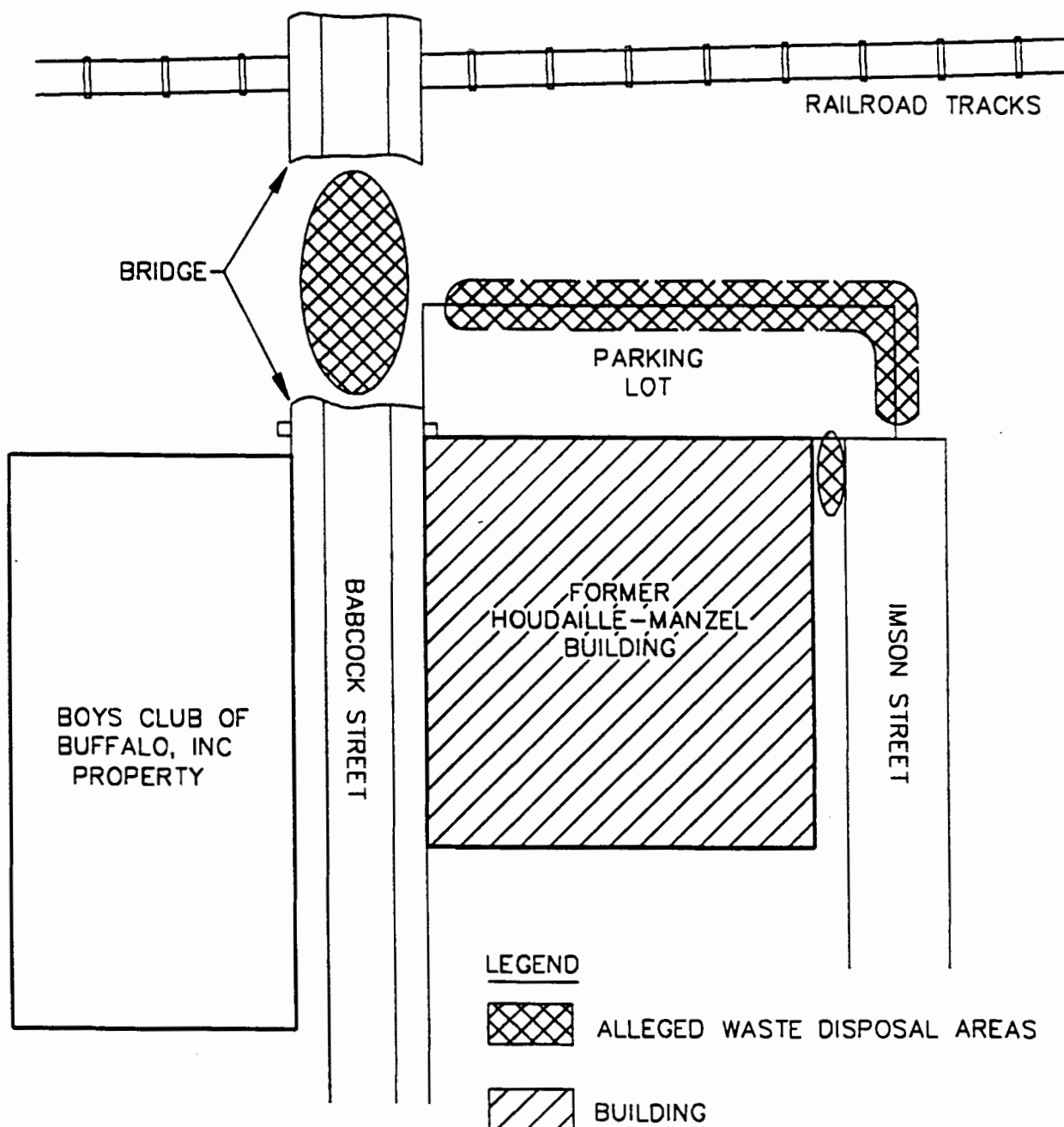
Most of the site is idle and currently covered by weeds and some small trees along the parking lot perimeter. There is a broken fence line installed along the outskirts of the parking lot. An attempt to restrict public access to the site was made by installation of periphery fence lines, but this fence was soon stolen.

### 1.2.2 Site History

Table 1.1 is detailed chronology summarizing the sequence of events at the Houdaille-Manzel site. The more relevant facts are briefly summarized in the following paragraphs. The Houdaille-Manzel plant manufactured hydraulic pumps for compressors and small engines until 1978 when operations were discontinued (ECDEP, 1982a). According to a complaint by a former employee in June 1981, waste solvents, cutting oils and cooling compounds were disposed to the north and east sides of the plant as shown on Figure 1.2. A reported quantity of four to five 55-gallon drums of waste material, per week, was disposed between 1968 and 1977 (ECDEP, 1981; ECDEP, 1982a). The total waste quantity was estimated to be 3,850 gallons (ECDEP, 1982a). Wastes were also allegedly spilled along the plant parking lot fence and poured into city sewers through floor drains (ECDEP, 1982a). In response to this complaint, Erie County DEP collected water and soil samples on June 16, and soil samples on August 19 and 27, 1981; October 6, 1982; and May 20, 1983. Soil samples have also been collected by the U.S. Geological Survey (August 6, 1982 and May 20, 1983), and NYSDEC (June 1, 1984). Ecology and Environment collected samples on May 23, 1983 at the request of Houdaille Industries. The analytical results from these samples are discussed in Section 4.

An August, 1981 ECDEP site inspection memo noted that Chapel Industries, a producer of hydraulic cylinders, occupied and rented a portion of the former Houdaille-Manzel building. At that time, Chapel had been at that location for approximately two years (ECDEP, 1982b). The inspection noted that no wastewater or solid waste problem existed at the facility, and that loss of cutting fluid should not produce a problem. A November, 1982 ECDEP site inspection noted that Secured

# ALLEGED WASTE DISPOSAL AREA



REFERENCE:  
FIGURE BASED ON A MAP BY C. O'CONNER,  
ECDEP 10/13/82 AND ES SITE VIST 3/8/90.

ENGINEERING-SCIENCE

New York State Department  
of Environmental Conservation  
RI/FS

HOUDAILLE-MANZEL SITE

**TABLE 1.1**  
**CHRONOLOGY OF HOUDAILLE-MANZEL SITE**

---

1968 to 1978	Houdaille-Manzel waste allegedly disposed of waste along parking lot and under Babcock Street Bridge.
1978	Houdaille-Manzel plant ended manufacturing of hydraulic pumps for compressors and small engines.
August 29, 1978	Erie County Department of Environment and Planning (ECDEP) Site Inspection - no immediate problems noted.
August 31, 1978	Materials forwarded to New York State Department of Environmental Conservation (NYSDEC).
June 10, 1981	ECDEP received call from former employee of Houdaille-Manzel reporting that various solvents were routinely dumped under the bridge during plant operation.
June 16, 1981	ECDEP conducted site inspection and collected three samples to be analyzed for toluene, benzene and xylene.
August 11, 1981	Laboratory results detected presence of benzene and possibly other organics.
August 12, 1981	ECDEP forwarded memorandum to NYSDEC asking that this site be given a high priority. Erie Country Health Department also notified of the site conditions.
August 19, 1981	ECDEP collected five additional samples of the soil at the site and analyzed in order to assess health effects of the site.
August 27, 1981	ECDEP collected one additional sample sixty feet west of the railroad bridge to be used as a control sample.

TABLE 1.1, CONTINUED

## CHRONOLOGY OF HOUDAILLE-MANZEL SITE

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September 4, 1981	New York State Health Department advised that additional information was needed and the data available did not constitute an alarming situation. They advised that the prudent public health position would be to limit exposure wherever possible. They recommended in this case that the area beneath the bridge where children play be cleaned up which could be as limited as covering the cinders with clean fill. The decision whether to cover could be made when conditions at the site are further defined.
October 9, 1981	Results received from the Erie County Laboratory on the second round of sampling indicating the presence of chloroform and PCBs. ECDEP discussed results with the Erie County Health Department and forwarded to NYSDEC for their action.
January 1982	ECDEP completed a site profile report and forwarded same to NYSDEC with recommendations for action.
April 12, 1982	Joan Loring of ECDEP wrote to John Spagnoli of NYSDEC and Dr. Thomas, the County Health Commissioner, following up on requests for action regarding Houdaille and asking for a meeting with them.
April 16, 1982	Response received from NYSDEC agreeing to a meeting during the week of April 26 to the 30.
July 6, 1982	A letter was sent from ECDEP to NYSDEC asking that the Babcock Street site be assigned to the Hazardous Waste Enforcement Units at the earliest possible date.
July 23, 1982	ECDEP received a letter from NYSDEC indicating that appropriate action was being taken by the County agencies and stating that NYSDEC enforcement action will be taken if property owners do not commit themselves to cleaning up the site.
August 6, 1982	USGS drilled four wells on the site.



TABLE 1.1, CONTINUED

## CHRONOLOGY OF HOUDAILLE-MANZEL SITE

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September 21, 1982	Two soil samples were collected at the request of NYSDEC for carbon tetrachloride analysis.
September 27, 1982	ECDEP collected three samples from the Boys Club playfield and reported no evidence of aromatics to the Boy's Club Director.
September 29, 1982	Area of known dumping covered with 6-12 inches of soil at direction of the County Health Department.
October 1, 1982	ECDEP inspection to further outline area of suspected disposal.
October 6, 1982	ECDEP collected 16 soil samples to help understand extent of dumping, plus Draeger air sampling.
October 21, 1982	Partial testing results received on October 6, 1982 samples.
October 25, 1982	Erie County Health Dept. sent letter to New York State Dept. of Health (Ron Tramontano) reporting some analytical results and requesting advice.
October 27, 1982	Buffalo Sewer Authority reported no significant materials in sewers. ECDEP did Draeger tests for benzene and chloroform which were negative.
October 29, 1982	Boy's Club playground sample results sent to the Erie County Health Department.  Six additional soil samples collected by ECDEP.
November 3, 1982	ECDEP received a complaint from Judie Phillips re: past dumping in alley on south side of old Houdaille Building.
November 8, 1982	ECDEP investigated - alley was asphalt and no sampling done - no problem evident.
November 15, 1982	Laboratory results of tests on samples collected October 6 received from County Laboratory. Results forwarded to County Health Department for their evaluation and interpretation.

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TABLE 1.1, CONTINUED

## CHRONOLOGY OF HOUDAILLE-MANZEL SITE

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May 20, 1983	Head space analyses of 12 samples done with HNu by NYSDEC. Fourteen soil samples collected for laboratory analysis. Representatives of NYSDEC, USGS, Ecology & Environment (E&E), and the NY State Attorney General's Office present.
September 6, 1983	Phase I Summary Report submitted to NYSDEC by Recra Research, Inc.
April 3, 1984	Site inspection by ECDEP. Fence and warning signs torn down. Signs of persistent use.
April 13, 1984	Additional sample requested by Erie County Deputy Health Commissioner, Dave Barry.
April 23, 1984	Sample collected from disposal area under bridge by ECDEP.
July 23, 1986	Memo from Ahmad Tayybi, NYSDEC, to John Tygert, NYSDEC, raising concerns about soil removal activities proposed by E&E.
July 23, 1986	Letter from John Tygert, NYSDEC Sanitary Engineer, to Paul Mazurkiewicz, Ecology and Environment marked "This letter was not sent out". Requires excavation of 20' x 25' x 3' under the bridge and capping with compacted clay.
April 1, 1987	Letter from Glen Bailey, attorney, NYSDEC Division of Environmental Enforcement, to Rick Kennedy, attorney with law firm of Hodgson, Russ, Andrews, Woods & Goodyear (Hodgson et al.), requesting meeting to discuss modified proposal for remedial activities prepared by E&E.
April 8, 1987	Memo from John Tygert, NYSDEC Region 9, to Glen Bailey, NYSDEC attorney, confirming discussion of July 1986 regarding Remedial Action Work Plan prepared by E&E.
May 4, 1987	Memo from Ahmad Tayybi, NYSDEC, to John Tygert, NYSDEC, regarding meeting with Jim Moras, NYSDEC Albany who requested confirmatory sampling.

TABLE 1.1, CONTINUED

## CHRONOLOGY OF HOUDAILLE-MANZEL SITE

July 24, 1987	Letter to Glen Bailey, NYSDEC attorney, from Rick Kennedy, attorney with Hodgson, et al. Propositions put forth by NYSDEC on April 1, 1987 not acceptable. Alternative proposed.
August 6, 1987	Meeting between representatives of NYSDEC (Region 9 and Albany), E&E, and Hodgson, et al.
August 27, 1987	Summary memo for August 6, 1987 meeting. NYSDEC required additional sample, collection and addressing of organic contamination. Recommended that Houdaille-Manzel be required to submit revised scope of work by September 21, 1987.
February 24, 1988	Meeting summary. Reps from E&E, NYSDEC, Hodgson, et al. present. NYSDEC expressed concern that plan insufficient.
March 23, 1988	Letter from Glen Bailey, NYSDEC, to Rick Kennedy, et al. expressing NYSDEC position that proposal by Houdaille not sufficient to address NYSDEC concerns. NYSDEC plans to conduct additional sampling.
June 23, 1988	Memo from Glen Bailey, NYSDEC, to Joe Ryan, NYSDEC Division of Environmental Enforcement field unit leader. NYSDEC developing field sampling plans. Final negotiations to be conducted with PRPs.
June 29, 1989	Letter from Glen Bailey, NYSDEC, to Rick Kennedy, Hodgson, et al. Formal notice to Houdaille of NYSDEC intent to conduct RI/FS. Houdaille offered opportunity to conduct RI/FS.
January 12, 1990	Memo from Michael O'Toole, NYSDEC Dir. of Div. of Hazardous Waste Remediation, to David Markell, NYSDEC, Director of Div. of Environmental Enforcement. Houdaille-Manzel site assigned to Bureau of Western Remedial Action to perform fund-financed RI/FS. PRPs will be given opportunity to perform necessary remedial work.

**TABLE 1.1, CONTINUED****CHRONOLOGY OF HOUDAILLE-MANZEL SITE**

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January 25, 1990	Memo from James Moras, NYSDEC, Remedial Action Section, Albany, to Philip Hulbert, Bureau of Real Property, requesting assistance in preparing information for RI/FS to be done by NYSDEC.
February 21, 1990	Work assignment No. D002478-2 issued to Engineering-Science to perform RI/FS under Standby Contract.

Adhesives, Inc. was located in the Houdaille-Manzel building. Secured Adhesives used a sump pump to remove water which leaked into the building at the floor/wall interface. The discharge water was noted to have an oily sheen (ECDEP, 1982c). The referenced did not indicate where the water was discharged to.

Houdaille Industries proposed a remediation program for a portion of the site (prepared by Houdaille's Consultant, Ecology & Environment, Inc.), to the NYSDEC in 1986. The proposed program was judged by the NYSDEC to be too limited in scope to address the full extent of contamination at the site. Several meetings were held with representatives of NYSDEC, Houdaille Industries, Ecology & Environment, Inc. and the law firm of Hodgson, Ross, Andrews, Woods and Goodyear (representing Houdaille Industries) between 1986 and 1988 to discuss the remediation program but the parties involved were not able to reach an agreement. As a result, NYSDEC formally undertook this Remedial Investigation/Feasibility Study (RI/FS) in January 1990.

### **1.2.3 Previous Investigations**

#### **1.2.3.1 Soil and Waste Material**

##### **Soil Sampling**

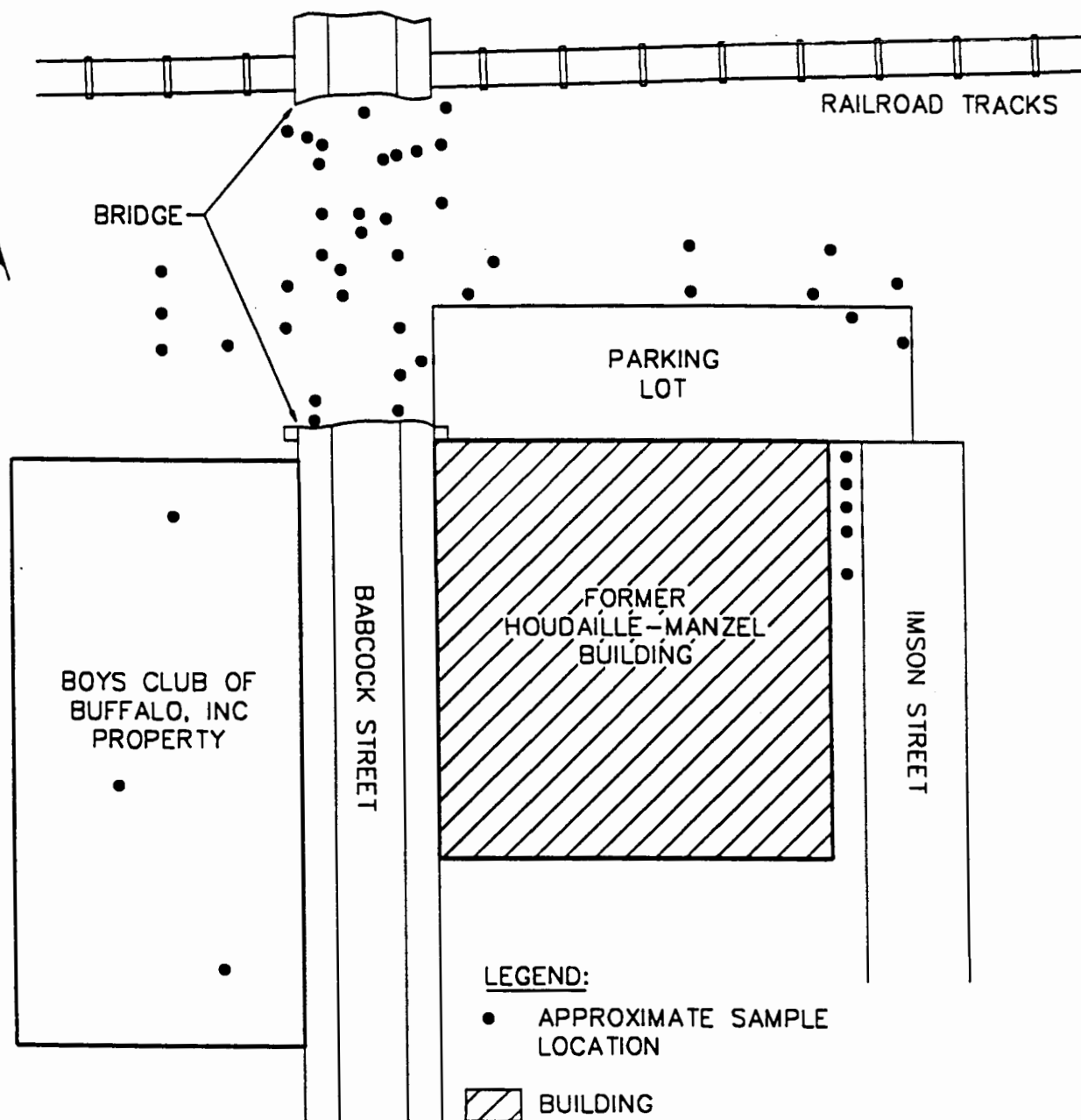
Between 1981 and 1988 over 70 soil samples were collected at the site by the Erie County Department of Environment and Planning (ECDEP), United States Geological Survey (USGS), New York State Department of Environmental Conservation (NYSDEC), Ecology and Environment, Inc. (E&E). Additional samples were collected on a neighboring property by JEB Consultants (JEB). The approximate location of samples obtained during the various soil sampling events are shown on Figure 1.3, and the analytical results are summarized on Tables 1.2 and 1.3. The most commonly found contaminants at the site were PCBs, lead, copper, and benzene, toluene, ethylbenzene, and xylenes (BTEX).

PCBs were detected in soil under the Babcock Street bridge at levels up to 38 ppm and between the former plant and Imson Street at levels up to 25 ppm (Figure 1.4). Lead was detected in soil under the Babcock Street bridge at levels up to 2,000 ppm, and between the former plant and Imson Street at levels up to 2,990 ppm (Figure 1.5). Copper was detected in soil between the former plant and Imson Street at levels up to 8,400 ppm (Figure 1.6). Benzene, toluene, ethylbenzene, and xylenes, or combinations thereof (BTEX) were detected in soil under the Babcock Street bridge at levels up to 56 ppm, and between the former plant and Imson Street at levels up to 54 ppm (Figure 1.7).

The soil samples indicate that the alleged disposal areas under the Babcock Street Bridge, along the parking lot and between the former plant and Imson Street show elevated levels of PCBs, lead, copper, and BTEX, as well as several other organic compounds.

FIGURE 1.3

# APPROXIMATE SAMPLE LOCATIONS



REFERENCE:  
FIGURE BASED ON A MAP BY C. O'CONNER,  
ECDEP 10/13/82 AND ES SITE VST 3/8/90.

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New York State Department  
of Environmental Conservation  
RI/FS

HOUDAILLE-MANZEL SITE

TABLE 1.2(a)  
HOUDAILLE-MANZEL  
SOIL SAMPLE ANALYTICAL DATA SUMMARY  
ANALYTE (ppm)

DATE \ SAMPLE SAMPLED \ BY	SAMPLE NO.	CARBON TETRACHLORIDE	CHLORO- FORM	TRI- CHLOROETHENE	TETRA- CHLOROETHENE	BENZENE	ETHYL- BENZENE	TOLUEN	XYLENE	PAH	PCB	COMMENTS:
6/16/81 \	1		311.4			ND		ND	ND		0.31	
	2		265.9			ND		ND	ND		38.1	
	3		265.9			ND		ND	ND		2.7	
	4		291.9			ND		ND	ND		1.43	
	5		253.0			ND		ND	ND		0.33	
	6		425.5			ND		ND	ND		1.9	
	7		ND			56		ND	ND			
8/6/82 \ USGS	1							10		176		Samples also analyzed for Priority Pollutants and Non - Priority Pollutants. (See Table 1.3)
	2							29		678		
	3							24		700		
	4							20		1,053		
9/21/82 \ DEP	1					ND		ND	ND			Samples from Boys Club Field.
	2					D		D	D			
	1					ND		ND	ND		0.1	
9/27/82 \ DEP	2					ND		ND	ND		0.06	
	3					ND		ND	ND		0.2	
	1					ND		ND	ND		25	
	2					ND		ND	ND		4.2	
10/6/82 \ DEP	3					ND		ND	ND		3.6	
	4					ND		ND	ND		5.4	

FOOTNOTES:

--: tested for and reported not present

D: analyte detected but level not reported

ND: none detected - concentration below detection limit

NR: not reported

A blank space indicates no test was conducted for that parameter

DATA SOURCES:

DEP: Erie County Department of Environment and Planning

USGS: United States Geological Survey

DEC: New York State Department of Environmental Conservation

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10/6/82 \ DEP	5					ND		ND	ND		2.2	
	6					ND		ND	ND		2.9	
	7					ND		ND	ND		2.5	
	8					ND		ND	ND		2.2	
	9					21		ND	ND		1.8	
	10					ND		ND	ND		2.2	
	11					ND		ND	ND		2.1	
	12					ND		ND	ND		1.2	
	13					ND		ND	ND		1.4	
	14					ND		ND	ND		2.6	
	15					ND		ND	ND		2.3	
	16					ND		ND	ND		2.6	
	1A(2)		ND			ND		ND	ND			
	6(2)		ND			ND		ND	ND			
	6A(2)		ND			ND		ND	ND			
10/29/82 \ DEP	7A(2)		ND			ND		ND	ND			
	8A(2)		ND			ND		ND	ND			
	16A(2)		ND			ND		ND	ND			
	1	-	-	-	0.4	-	-	-	-		-	Samples also analyzed for 30 organic compounds.
5/20/83 \ DEP	2	-	-	-	-	-	-	-	-		-	

FOOTNOTES:

-: tested for and reported not present

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ANALYTE (ppm)

DATE \ SAMPLE SAMPLED \ BY	SAMPLE NO.	CARBON TETRACHLORIDE	CHLORO- FORM	TRI- CHLOROETHENE	TETRA- CHLOROETHENE	BENZENE	ETHYL- BENZENE	TOLUEN	XYLENE	PAH	PCB	COMMENTS:
5/20/83 \ DEP	3	-	-	-	-	-	-	-	-	-	-	
	4	-	-	-	-	-	-	-	-	-	-	
	6	-	-	-	-	-	-	-	0.08	-	-	
	7	-	-	-	-	-	-	-	-	-	-	
	8	-	-	-	-	-	-	-	2.4	-	-	
	9	-	0.02	-	-	0.09	-	-	-	-	-	
	10	-	0.2	-	-	1.1	12	1.0	40	-	<5*	
	11	-	0.02	-	-	-	-	-	1.05	-	0.85	
	12	ND	0.03	0.25	-	0.8	1.0	0.4	3	-	-	
	13	ND	0.04	0.1	0.02	0.2	-	0.2	0.14	-	1.1	
	14	ND	0.02	-	-	0.05	-	-	0.1	-	0.14	
	1		ND			ND	ND	ND			ND	
	2		ND			ND	ND	ND			ND	
	3		ND			ND	ND	ND			ND	
5/23/83 \ E&E	4		ND			ND	ND	ND			ND	
	5		ND			ND	ND	ND			ND	
	6		ND			ND	ND	ND			ND	
	7		ND			ND	ND	ND			ND	
	8		ND			ND	ND	ND			ND	
	9		ND			ND	ND	ND			4.77	

FOOTNOTES:

-: tested for and reported not present

D: analyte detected but level not reported

ND: none detected - concentration below detection limit

NR: not reported

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TABLE 1.2(a)  
HOUDAILLE-MANZEL  
SOIL SAMPLE ANALYTICAL DATA SUMMARY  
ANALYTE (ppm)

DATE \ SAMPLE SAMPLED \ BY	SAMPLE NO.	CARBON TETRACHLORIDE	CHLORO- FORM	TRI- CHLOROETHENE	TETRA- CHLOROETHENE	BENZENE	ETHYL- BENZENE	TOLUEN	XYLENE	PAH	PCB	COMMENTS:
5/23/83 \ E&E	10		ND			ND	ND	ND			<0.23	
	11		ND			ND	ND	ND			11.5	
	12		ND			ND	ND	ND			5.77	
	13		ND			ND	ND	ND			1.26	
	14		ND			ND	ND	ND			1.44	
6/1/84 \ DEC	1											
	2											
	3											
	4											
	5											
5/24/88 \ JEB	SS5		0.3			ND	ND	0.18	ND		0.5	Oil and Grease: 210 ppm Phenol: 2.61 ppm Cyanide: 2.8 ppm

FOOTNOTES:

-: tested for and reported not present

D: analyte detected but level not reported

ND: none detected - concentration below detection limit

NR: not reported

A blank space indicates no test was conducted for that parameter

DATA SOURCES:

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E&E: Ecology and Environment Inc.

JEB: JEB Consultants

TABLE 1.2(b)  
HOUDAILLE-MANZEL  
SOIL SAMPLE ANALYTICAL DATA SUMMARY  
ANALYTE (ppm)

DATE \ SAMPLED SAMPLED \ BY	SAMPLE NO.	Avg. Range in Soils (NYS) (ppm)	ARSENIC 0.1 to 100 (2)	BARIUM 10 to 500 (2)	CADMIUM 0.01 to 7 (1)	CHROMIUM 1 to 2000 (2)	COPPER 1 TO 700 (2)	IRON 100 TO >100,00	LEAD <10 TO 700 (2)	MERCURY 0.02 TO 0.6 (2)	NICKEL <5 TO 7000 (2)	SELENIUM <0.1 TO 5 (2)	SILVER 0.1 TO 5 (3)
6/16/81 \													
8/19/81 \ DEP		NO SAMPLES	ANALYZED	FOR METALS									
8/27/81 \	1						2	620	-		-		
8/6/82 \ USGS	2						-	67	-		-		
5/20/83 \	3						100	1,600	10		-		
	4						-	1,800	20		-		
9/21/82 \ DEP	1						3.1						
	2						2.5						
10/6/82 \ DEP		NO SAMPLES	ANALYZED	FOR METALS									
	1A(2)						ND						
	6(2)						0.4						
10/29/82 \ DEP	6A(2)						ND						
	7A(2)						1.0						
	8A(2)						0.9						
	16A(2)						0.8						
	1						78	30,000	2,000				
	2						200	40,000	340				
	3						200	60,000	900				
	4						220	84,000	1,200				
	6						92	50,000	380				
	7						NR	NR	NR				
5/20/83 \ DEP	8						160	180,000	540				
	9						220	96,000	1,500				
	10						5,800	160,000	1,200				
	11						4,200	52,000	860				
	12						8,400	46,000	2,000				

ENDNOTES:

-: tested for and reported not present  
D: analyte detected but level not reported  
ND: none detected - concentration below detection limit  
NR: not reported  
\*: EP Toxicity Metals Test  
A blank space indicates no test was conducted for that parameter

DATA SOURCE:

DEP: Erie County Department of Environment and Planning  
USGS: United States Geological Survey  
DEC: New York State Department of Environmental Conservation  
E&E: Ecology and Environment Inc.  
JEB: JEB Consultants

REFERENCES:

(1) Booz, Allen, & Hamilton, 1983.  
(2) USGS Paper 1270, 1984.  
(3) USEPA, 1980.

TABLE 1.2(b)  
 HOUDAILLE-MANZEL  
 SOIL SAMPLE ANALYTICAL DATA SUMMARY  
 ANALYTE (ppm)

DATE \ SAMPLED SAMPLED \ BY	SAMPLE NO.	Avg. Range in Soils (NYS) (ppm)	ARSENIC	BARIUM	CADMIUM	CHROMIUM	COPPER	IRON	LEAD	MERCURY	NICKEL	SELENIUM	SILVER
			0.1 to 100 (2)	10 to 500 (2)	0.01 to 7 (1)	1 to 2000 (2)	1 TO 700 (2)	100 TO >100,00	<10 TO 700 (2)	0.02 TO 0.6 (2)	<5 TO 7000 (2)	<0.1 TO 5 (2)	0.1 TO 5 (3)
5/20/83 \ DEP  5/23/83 \ E&E	13						1,200	190,000	3,400				
	14						900	96,000	2,800				
	1		9.46		ND	30.6	30.2		27.4	0.565	31.2		
	2		11.4		1.4	21.1	67.2		130	0.34	23.0		
	3		10.2		ND	37.1	36.1		30.5	ND	31.7		
	4		6.02		ND	35.8	30.4		28.7	ND	29.2		
	5		6.17		ND	19.8	18.0		26.1	ND	12.8		
	6		10.0		ND	30.1	33.5		100	0.345	21.2		
	7		14.4		2.45	16.5	46.7		124	ND	19.0		
	8		15.4		1.29	64.6	199		887	ND	33.7		
	9		20.6		96.5	266	1,530		2,760	<2.5	273		
	10		5.83		ND	12.4	31.7		81.3	0.56	6.48		
	11		10.9		10.2	386	2,590		2,990	ND	702		
	12		8.26		5.63	97.9	323		1,000	ND	61		
6/1/84 \ DEC	13		9.4		5.57	129	259		1,310	ND	60.7		
	14		23		8.95	141	393		1,120	0.643	118		
	1*		0.002	1.4	<0.02	0.04			5.2	<0.0005		0.005	0.02
	2*		0.24	1.2	0.02	0.09			4.2	<0.0005		0.033	0.04
	3*		0.006	2	<0.02	0.04			0.9	<0.0005		0.012	0.02
5/24/88 \ JEB	4*		<0.002	0.8	<0.02	0.03			2.5	<0.0005		0.003	0.02
	5*		<0.002	3.8	12	0.02			1.5	<0.0005		0.012	0.04
	SS5		21.4	23	ND	6.94	91.3	35,900	1,440	0.19	25.1	5.6	24

ENDNOTES:

-: tested for and reported not present  
 D: analyte detected but level not reported  
 ND: none detected - concentration below detection limit  
 NR: not reported  
 \*: EP Toxicity Metals Test  
 A blank space indicates no test was conducted for that parameter

DATA SOURCE:

DEP: Erie County Department of Environment and Planning  
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REFERENCES:

(1) Booz, Allen, & Hamilton, 1983.  
 (2) USGS Paper 1270, 1984.  
 (3) USEPA, 1980.

**TABLE 1.3**  
**RESULTS OF USGS SAMPLING (USGS, 1983)**

	<u>Sample number and depth below land surface (ft)</u>			
	1	2	3	4
First Sampling (08-06-82)	(4.0)	(3.0)	(3.0)	(2.5)
<u>Inorganic Constituents<sup>(1)</sup></u>				
Copper	2,000	--	100,000 <sup>(2)</sup>	--
Iron	620,000	67,000	1,600,000	1,800,000
Lead	--	--	10,000	20,000
Nickel	--	--	--	--
<hr/>				
	<u>Sample number</u> <u>(depths are same as in first sampling)</u>			
Second Sampling (05-20-83)	1A	2A	3A	4A
<u>Organic Compounds<sup>(1)</sup></u>				
Priority pollutants				
Methylene chloride	380	--	--	210
Tetrachloroethene	560	--	--	--
Toluene	10	29	24	20
Trichloroethene	LT	--	--	--
Acenaphthene	--	--	--	1,400
Fluoranthene	30,000	650	2,300	9,500
Naphthalene	4,000	370	1,400	2,400
Di-n-butyl phthalate	6,000	--	--	--
Benzo(a)anthracene	14,000	370	1,900	3,300
Benzo(a)pyrene	18,000	280	2,800	1,900
Chrysene	10,000	370	1,900	3,300
Acenaphthalene	16,000	LT	--	4,300
Anthracene	4,000	LT	LT	2,400
Benzo(ghi)perylene	18,000	LT	2,800	LT
Fluorene	--	--	--	1,900
Phenanthrene	12,000	750	1,900	10,000
Indeno(1,2,3-cd)pyrene	16,000	LT	2,800	1,400
Pyrene	28,000	560	LT	6,200
delta-BHC	--	LT	--	--
Benzo(b)fluoranthene	--	--	3,300	2,400
Benzo(k)fluoranthene	--	--	3,300	2,400

TABLE 1.3, CONTINUED

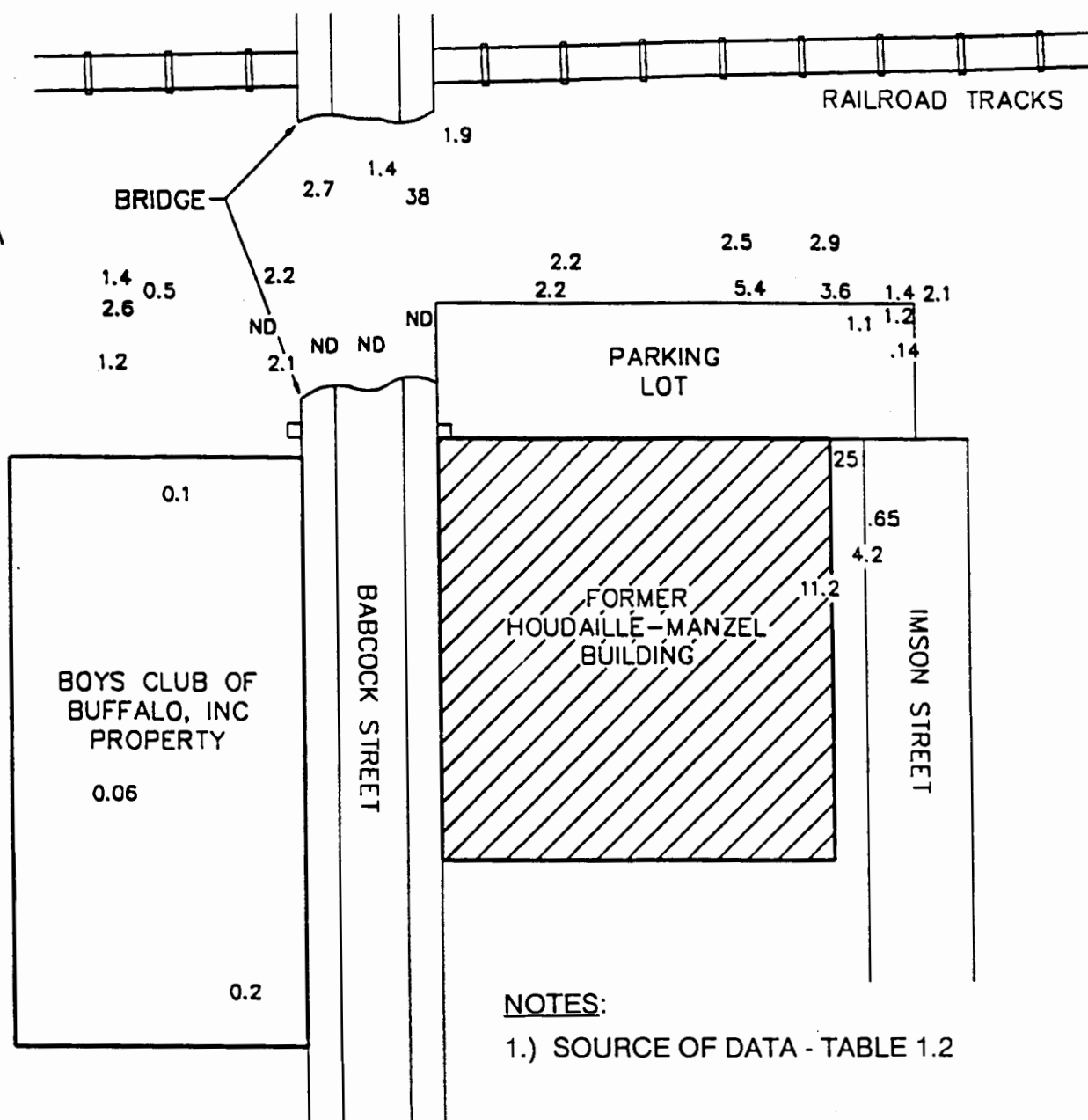
## RESULTS OF USGS SAMPLING (USGS, 1983)

Second Sampling (05-20-83)	(Sample number)			
	1A (4.0)	2A (3.0)	3A (3.0)	4A (2.5)
Nonpriority pollutants				
Acetone	190	--	--	--
Dibenzofuran	--	170	LT	1,900
Fluorotrichloromethane	50	18	16	46
2-Methylnaphthalene	--	280	LT	LT
1-Methylnaphthanene <sup>(3)</sup>	--	350,000	--	--
1,8-Dimethylnaphthalene <sup>(3)</sup>	--	325,000	--	--
Benzo(j)fluoranthene <sup>(3)</sup>	--	--	700,000	1,000,000

- (1) Concentrations are in ug/kg; dashes indicate that constituent or compound was not found, LT indicates it was found but below the quantifiable detection limit.
- (2) Exceeds concentrations in samples taken from undisturbed soils in the Buffalo area. Undisturbed soils were not analyzed for iron.
- (3) Tentative identification based on comparison with the National Bureau of Standards (NBS) library. No external standard was available. Concentration reported is semiquantitative and is based only on an internal standard. GC/MS spectra were examined and interpreted by GC/MS analysts.

FIGURE 1.4

# PCB CONCENTRATIONS (ppm) IN SOIL SAMPLES

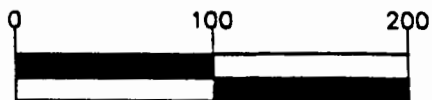


## NOTES:

1.) SOURCE OF DATA - TABLE 1.2

REFERENCE:  
FIGURE BASED ON MAP BY C. O'CONNER,  
ECDEP 10/13/82 AND ES SITE VISIT 3/8/90.

## GRAPHIC SCALE



APPROXIMATE SCALE: 1"=100'

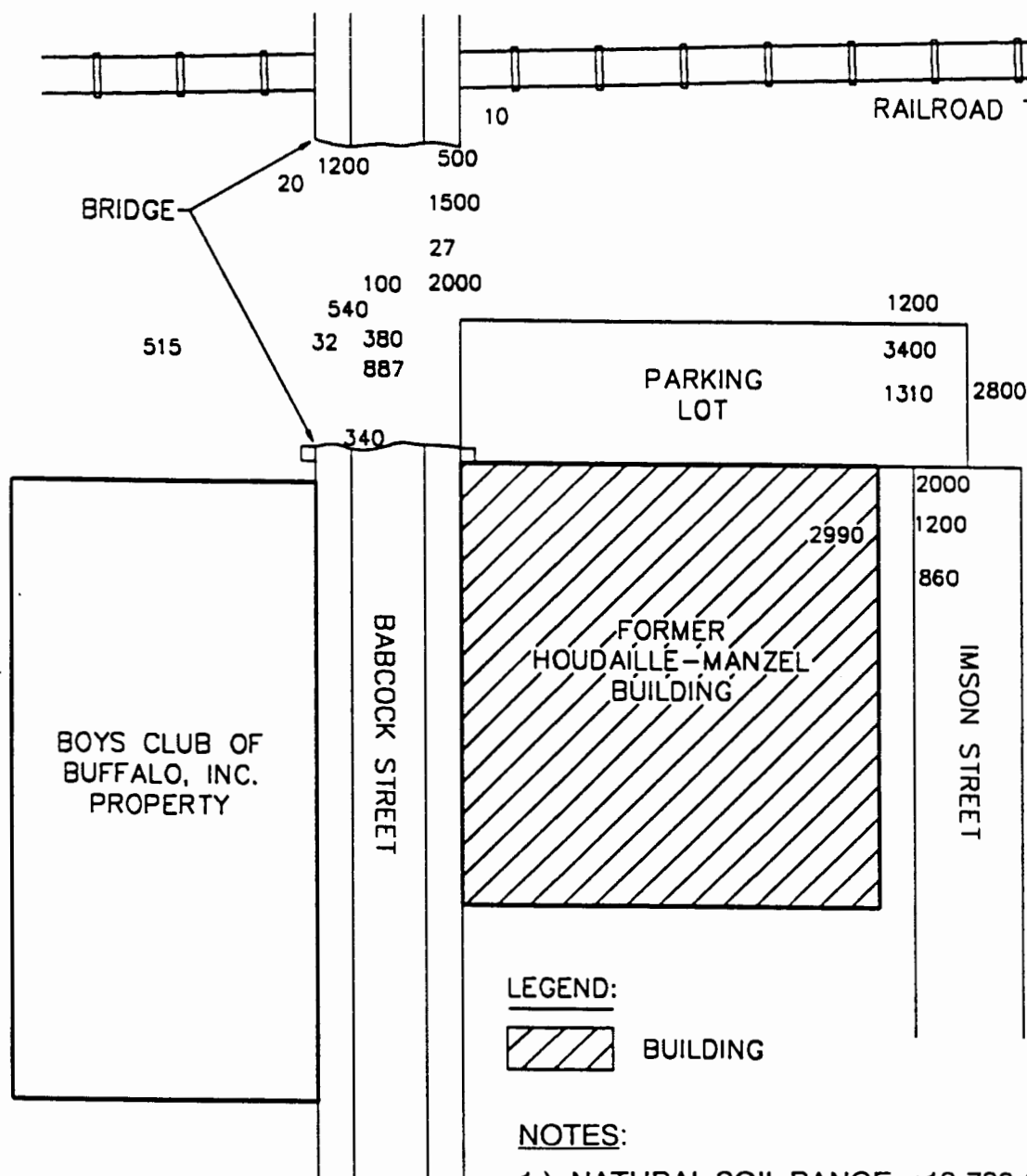
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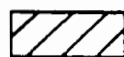
HOUDAILLE-MANZEL SITE

FIGURE 1.5

# LEAD CONCENTRATIONS (ppm) IN SOIL SAMPLES



## LEGEND:



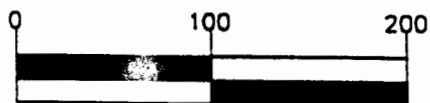
BUILDING

## NOTES:

- 1.) NATURAL SOIL RANGE < 10-700 (USGS, 1984)
- 2.) SOURCE OF DATA - TABLE 1.2

REFERENCE:  
FIGURE BASED ON MAP BY C. O'CONNER,  
ECDEP 10/13/82 AND ES SITE VISIT 3/8/90.

## GRAPHIC SCALE



APPROXIMATE SCALE 1"=100'

ENGINEERING-SCIENCE

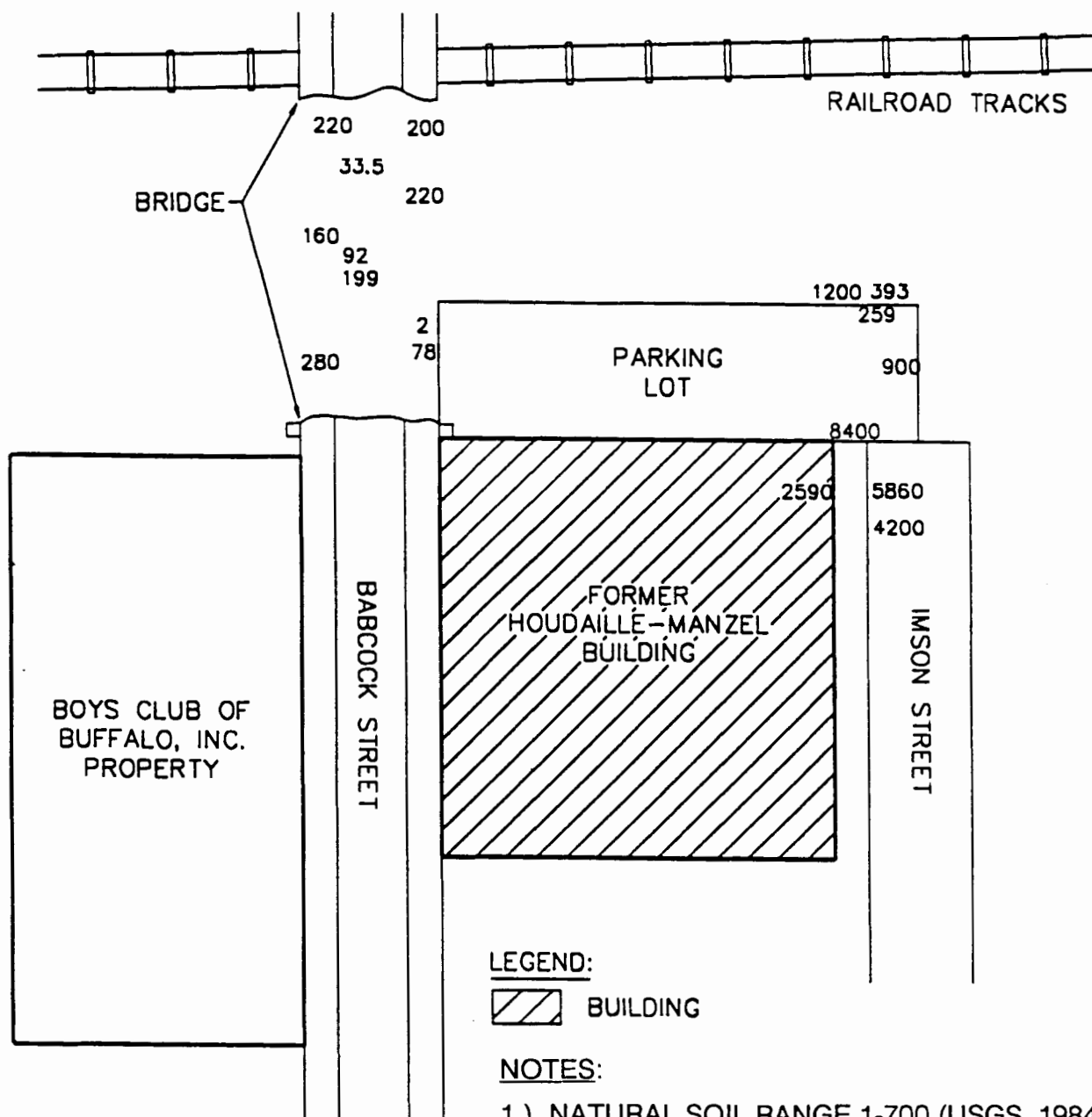
New York State Department  
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HOUDAILLE-MANZEL SITE

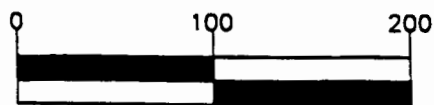


FIGURE 1.6

# COPPER CONCENTRATIONS (ppm) IN SOIL SAMPLES



GRAPHIC SCALE



APPROXIMATE SCALE: 1"=100'

REFERENCE:  
 FIGURE BASED ON MAP BY C. C'ONNER,  
 ECDEP 10/13/82 AND ES SITE VIST 3/8/80.

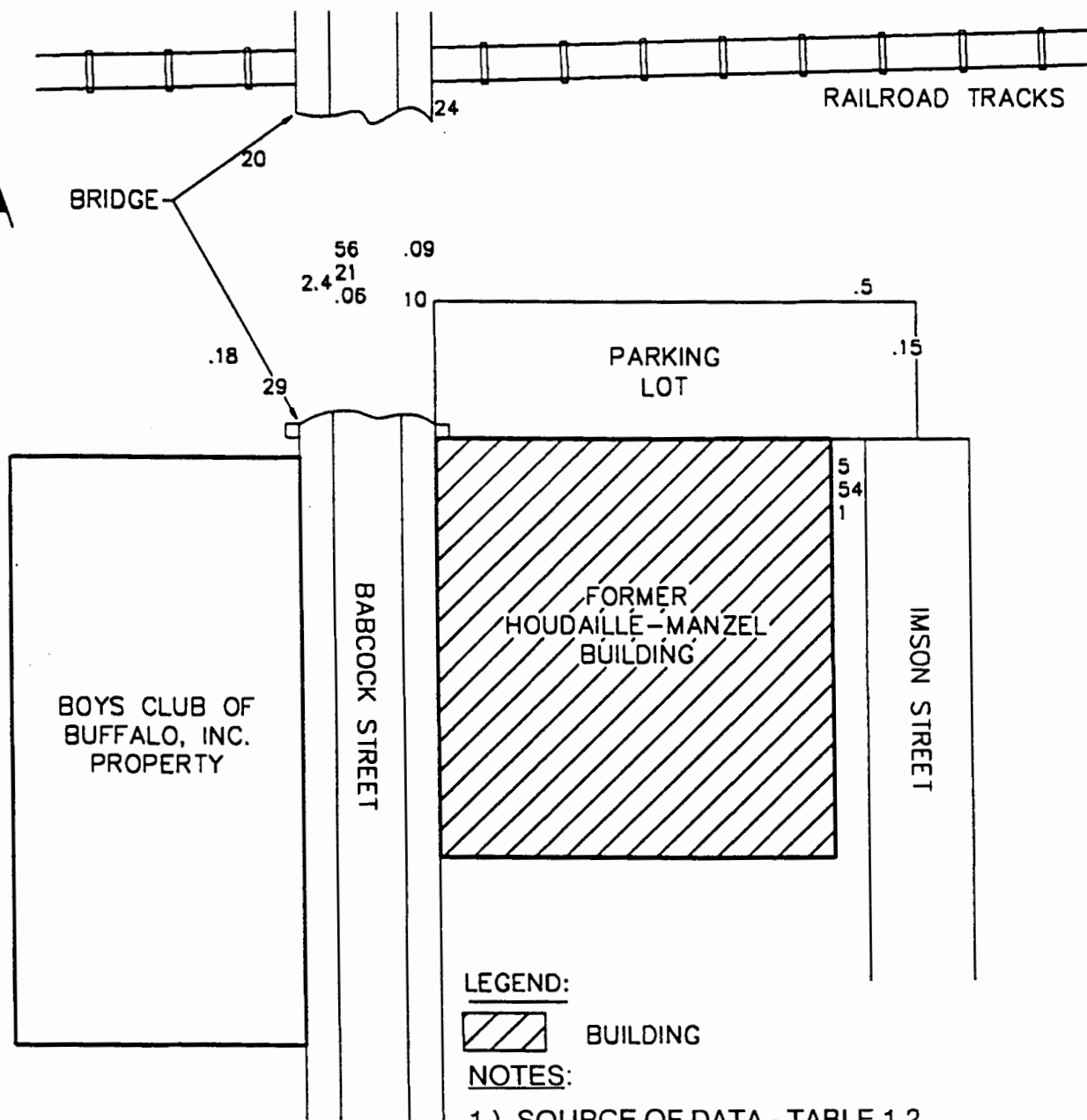
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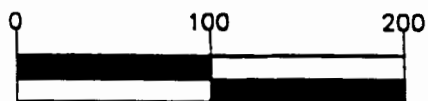
HOUDAILLE-MANZEL SITE

FIGURE 1.7

# BTEX CONCENTRATIONS (ppm) IN SOIL SAMPLES



GRAPHIC SCALE



APPROXIMATE SCALE: 1"=100'

REFERENCE:  
FIGURE BASED ON MAP BY C. O'CONNERS.  
ECDEP 10/13/82 AND ES SITE VIST 3/8/90.

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RI/FS

HOUDAILLE-MANZEL SITE

### 1.2.3.2 Groundwater and Surface Water Sampling

#### Groundwater Sampling

No groundwater samples have been previously collected from the Houdaille-Manzel site. One sample (TP/MW-4) was collected from the fill material above the clay layer for the neighboring Seneca-Babcock Street property 50 feet west of the Babcock Street Bridge. However the well produced only enough sample volume for priority pollutant volatile organic analysis. The priority pollutant volatile organic analysis detected no priority pollutants at 10 ppb or less in TP/MW-4 (JEB, 1988). Other groundwater samples from the Seneca-Babcock Street property in similar fill material contained elevated levels of oil and grease, iron, and lead and one contained a cyanide concentration at the groundwater quality standard value (0.2 ppm).

#### Surface Water Sampling

Surface water was sampled during the first site sampling in 1981 by the ECDEP. The results of the ECDEP sample analysis indicated toluene, benzene and xylene were not present with a detection limit of 0.35 ppm however it was reported that "other organics present in the ppm range" (ECDEP, 1981).

The Buffalo Sewer Authority sampled the Babcock Street sewer on October 8, 1982, which was in close proximity to the site. One downstream sample contained PCB (1242) at .001 to .002 ppm (Buffalo Sewer Authority, 1982).

### 1.2.3.3 Air Monitoring

#### Available Air Quality and Meteorological Data

Screening of air quality at the Houdaille-Manzel site was performed at various times in conjunction with soil samplings by the Erie County Department of Environment and Planning and NYSDEC. Air quality was tested in the bore holes during two separate sampling events using Draeger tubes and an HNU photoionizer calibrated for detection of benzene.

The results of the HNU testing are shown on Table 1.4. The results of all Draeger tests for hydrocarbons conducted during a sampling event on October 6, 1982, with one exception were negative. The air in the bore holes at the time of testing contained less than 3 mg hydrocarbons, 5 ppm carbon tetrachloride and 5 ppm toluene (ECDEP, 1982d).

## 1.3 ORGANIZATION OF THIS REPORT

This Phase I RI/FS report is based on requirements specified in Work Assignment D-002478-2 and Division Technical and Administrative Guidance Memorandum HWR-89-4025. The report includes the following:

- A review of current site conditions, site history, and results of previous investigations (Section 1).

TABLE 1.4

## HOUDAILLE-MANZEL DIVISION SITE

Measurement of Volatile Organics  
In Samples Collected on May 20, 1983 (ECDEP, 1983)

Site Number	Background Reading On H-Nu, ppm	Reading on H-Nu With Probe in Boring, ppm
1	.2	.5
2	0	.2
3	0	0
4	.2	.4
6	.4	7
7	0	.2
8	0	15-16
9	0	0
10	0	25-30
11	.4	14
12	.4	6

RECRA 1983

- Description of RI/FS field investigations (Section 2) in conformance with the Work Assignment. The investigations include site screening, soil boring/monitoring well installation and quality assurance and quality control.
- Description of site physical characteristics (Section 3) including surface and subsurface conditions and a habitat characterization.
- Evaluation of nature and extent of contamination (Section 4).
- Baseline risk assessment (Section 5).
- Phase I remedial investigation summary and conclusions (Section 6).
- Proposed remedial objectives (Section 7.1). Identification and screening of remedial technologies applicable to the media of interest (Section 7.2). Identification and discussion of applicable or relevant and Appropriate NYS Standards, Criteria and Guidelines (Section 7.3). Development of remedial alternatives (Section 7.4).

In keeping with the NYSDEC's phased approach to RI/FS studies, this Phase I report is being prepared to include the results of the Phase I field investigation and development of remedial alternatives.

Subsequent revisions will be made as follows:

- Phase II Report - Add the preliminary screening of Remedial Alternatives and the results of the Phase II field investigation (if required). This initial screening is conducted in accordance with NYS Department of Environmental Conservation, Division of Hazardous Waste Remediation, Technical and Administrative Guidance Memorandum for the Selection of Remedial Actions at Inactive Hazardous Waste Sites (TAGM-HWR-90-4030)(Section 8).
- Phase III Report - Add the detailed analysis of remedial alternatives. Detailed evaluation of remedial alternatives developed in Section 9 using TAGM-HWR-90-4030 (Section 9).
- RI/FS Report - Add the recommended remedy including discussion of the Recommended Remedial Action for the Houdaille-Manzel Site including a Design Conceptual Plan for Implementation (Section 10) and conceptual design plan for implementation.

## SECTION 2

### FIELD INVESTIGATION METHODS

The objectives of the Houdaille-Manzel Site Field Investigation were to provide additional data on the presence and extent of volatile organic, cyanide, PCB, copper and lead contamination at the project site. The information from this field investigation and data from other investigations (Section 1.2.3) are used to assess the need for and the scope of remedial actions at the Houdaille-Manzel site. All work was performed in accordance with the NYSDEC approved Work Plan, QA/QC Plan and Health and Safety Plan (ES, May 1990), with the exception of test pits which were not anticipated in the Work Plan.

The purpose of this section is to describe the field methods that were used for the Houdaille-Manzel Site Field Investigation.

Field activities were initiated by Engineering-Science on August 9, 1990, and were completed 9 weeks later on October 12, 1990. Field activities for this investigation consisted of soil vapor survey, lead/copper field screening, PCB field screening test pits and soil boring/monitoring well installation, and soil, sewer sediment, and groundwater sampling.

#### 2.1 PHASE I SITE SCREENING

The primary objectives of the site screening activities were to identify the limits of contamination and to establish the optimum sampling locations for the remaining site characterization activities. The samples collected during the remainder of the Phase I site characterization program were located to provide a laboratory confirmation of these field screening results and will form the basis for the Phase II Field Investigation and Phase I Feasibility Study.

##### 2.1.1 Site Reconnaissance

The site reconnaissance was made on August 9 and 10, 1990 (immediately after approval of the work plan) to plan the site activities, locate utilities, locate work areas, take samples required to establish standards for PCB, copper and lead screening and contact site owners.

The on-site utilities were identified for on-site health and safety and to prevent damage to underground utilities during drilling. Public and privately-owned utilities were located by contacting responsible agencies by phone so their underground utilities could be marked at the site. Based on this evaluation, it was concluded that the utilities running under the Babcock Street Bridge were too numerous and too close together to allow test borings. As a result, testpits were excavated under the bridge.

The remaining work areas on the site were located based on access, utilities, owner's usage, drainage, and areas of known contamination. Property owners were contacted by NYSDEC to inform them of the activities and schedule.

### 2.1.2 Calibration Sample Collection

During the site visit, hand borings were attempted at the site to collect soil samples and investigate the possible presence of a shallow water table. The soil samples were collected at various locations and depths to establish a range of soil types and contamination concentrations at the site. The 15 samples were also tested for cyanide, since it had been found at a neighboring property.

Thirty soil samples were collected with a hand or bucket auger at the site. The first 15 soil samples were collected for PCBs and cyanide analyses as well as for lead/copper screening. The second 15 soil samples were collected for the lead/copper screening only. The first soil samples were split and a portion of each was taken to RECRA's laboratory to be analyzed for PCBs and cyanide the day they were collected. The remaining portion, and the second batch of 15 soil samples were sieved and dried at ES's Syracuse office and shipped to OEI for lead and copper screening. Based on the XRF screening, OEI selected 15 of the 30 soil samples for laboratory analysis for calibration of XRF. During soil sampling groundwater was encountered at two locations, the depth to groundwater was measured by a temporary well point at 27 and 49 inches. The depth to groundwater was important in determining practicality of and the method to be used in the soil vapor survey.

All samples were collected with decontaminated equipment and all sampling personnel followed the health and safety plan for personal protection and monitoring.

### 2.1.3 Site Survey/Grid Layout

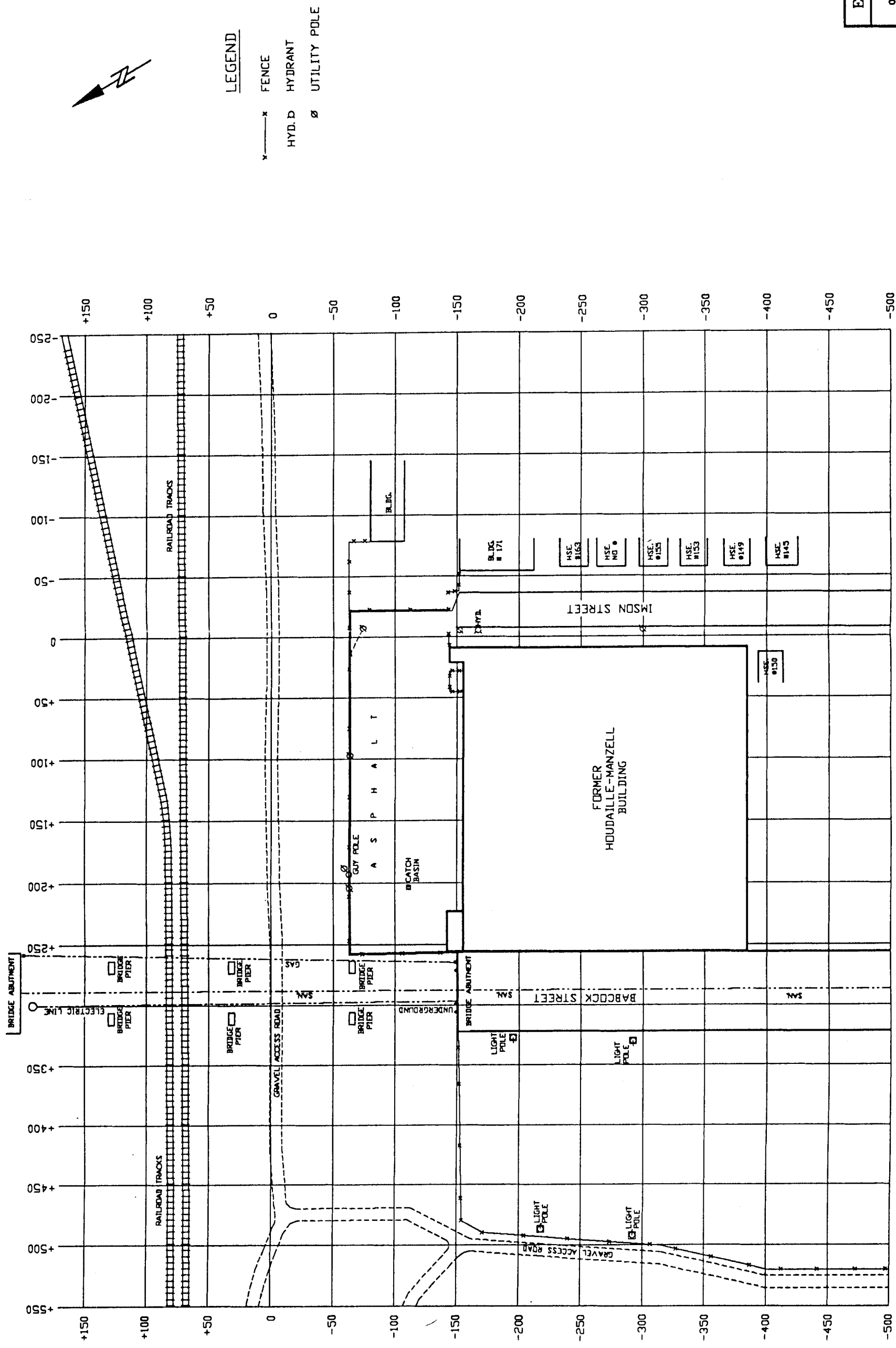
ES laid out and staked a 50' by 50' grid covering the site as shown on Figure 2.1. The grid was used to locate soil gas sampling points, soil sample locations, metal detector survey locations, test pit and boring locations. The grid was located from a permanent utility pole to assure grid points can be relocated.

A site survey was conducted by a Modi Associates NYS licensed land surveyor. A map was prepared showing the locations and appropriate elevations (e.g., ground surface, top of monitoring well casing, and top of protective well casing) for each boring, monitoring well, and other key points as determined by ES and NYSDEC (Figure 2.1). Vertical control and elevations to the nearest 0.01 foot were established for the ground surface at each well and the top of each monitoring well casing. Elevations were determined relative to a local specific datum point. Horizontal control for exploratory boring, monitoring wells, and sampling points were located by ties (location and distance) relative to one another and the specified datum point.

### 2.1.4 Metal Detector Survey

A metal detector survey was conducted to locate any previously unidentified underground utilities and possible buried drums or tanks. Each grid line was walked with a magnetic and cable locator model MAC-51B prior to any subsurface investigation. The locator was tested at locations of known underground utilities prior to testing the grid to assure it was working properly.

FIGURE 2.1



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**FIGURE 2.1**  
**HOUDAILLE-MANZEL SITE**  
**SITE MAP**

A horizontal scale bar with markings at 0, 40, 80, and 120 feet. The word "SCALE" is written vertically above the bar.



Buried utilities under the bridge and possible buried railroad track segments were detected.

### **2.1.5 Soil Vapor Survey**

The soil vapor survey was conducted the week of September 10, 1990. The objective of the soil vapor survey (SVS) was to determine whether contamination plumes of volatile organic compounds are present and to optimize the placement of monitoring wells and soil samples within any identified contamination plumes and soil. The SVS centered on the two known contaminated areas, under the bridge and at the end of Imson Street, in an attempt to determine the limits and magnitude of the BTEX contamination. These surveys covered 39 of the grid points as shown on Figure 2.2. During the SVS the soil conditions including the depth to water were often identified from water encountered in driving the probe.

#### **Soil Vapor Survey Methodology**

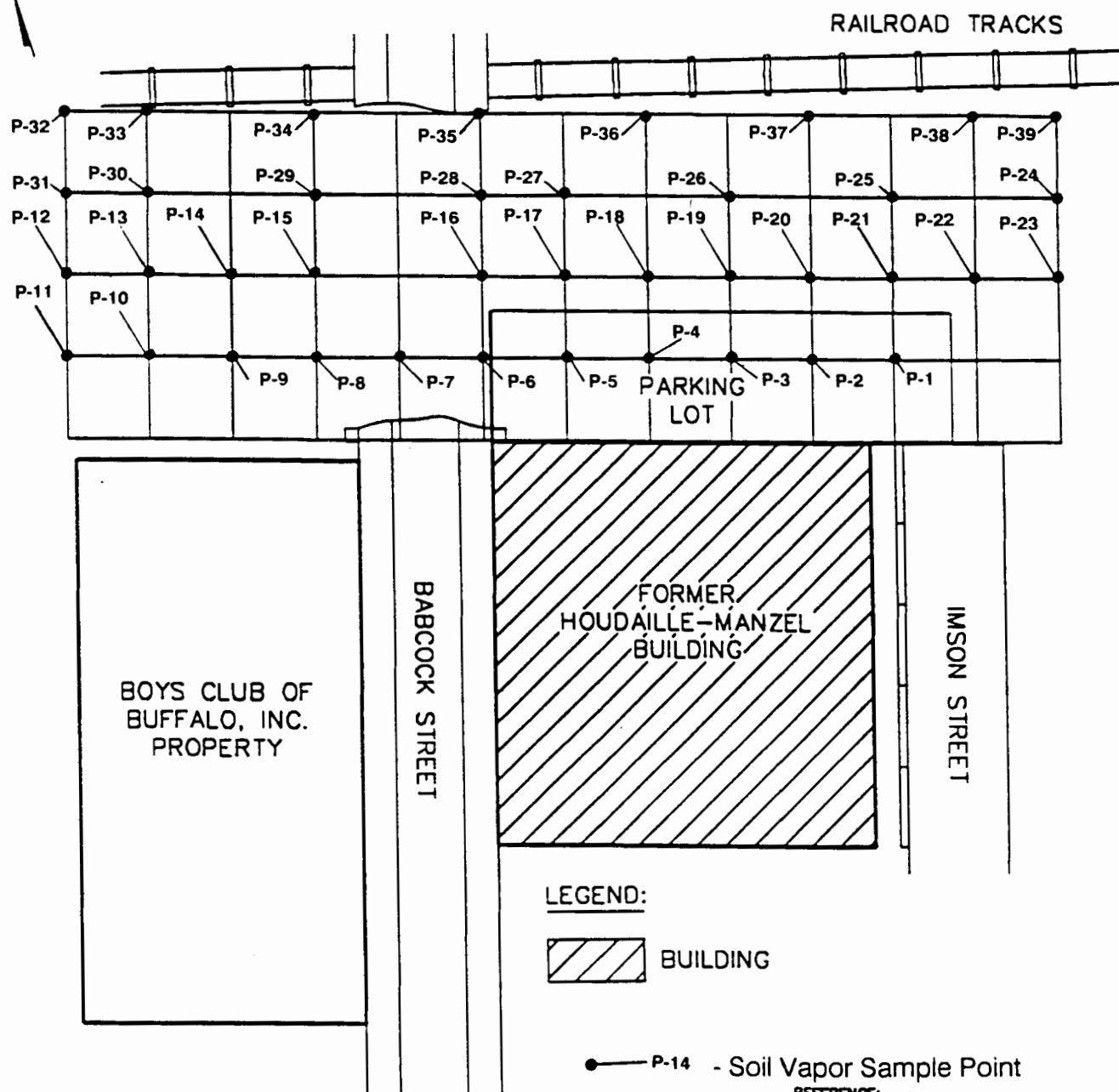
A soil vapor survey utilizes analyses of volatile organic gases collected from the pores of a soil matrix as an indicator of soil or groundwater contamination in the vicinity of the sampled point. The distribution of contaminants in the gas phase contained in the pore space of soils has been shown to correspond with the distribution of contamination in groundwater and may indicate the presence of contaminant sources in the unsaturated zone. Soil vapor surveys are particularly well suited for detection of volatile organic compounds such as solvents and petroleum products. This allows for definition of the contaminant plume to better locate monitoring wells.

#### **Soil Gas Sample Collection**

The soil gas sampling apparatus consisted of a hollow, vented, stainless steel probe attached to a 3 foot length of stainless steel pipe. Soil gases were collected at each sampling point by driving the probe and pipe, with a demolition hammer, to a depth of approximately 2 to 3 feet below grade. Samples in the parking lot were collected after drilling a hole through the asphalt using an asphalt cutter. Following installation, the probe was connected to a vacuum pump, using TYGON™ tubing, and purged for 20 to 30 seconds to remove ambient air from the system. Following purging, the probe and tubing were connected to a one-liter Tedlar™ bag contained in a vacuum chamber. The vacuum pump was connected to the chamber, the chamber was sealed, and the vacuum pump started. The vacuum pump created a vacuum inside the sealed chamber, which, in turn, created a vacuum on the outside of the Tedlar bag within it, causing the bag to fill. After the Tedlar bag was filled, the vacuum pump was shut off, and the bag was subsequently removed from the sample train and labeled with sample point location, date and time of collection. The samples were analyzed by gas chromatography using a Photovac 10S50 chromatograph within two to three hours of collection.

Following the collection of a soil gas sample, the sample train was disconnected from the probe and purged with the vacuum pump for several minutes to remove residual soil gasses from the sample train. The collection probes were subsequently removed with a truck jack and decontaminated with an Alconox wash; potable water

# Soil Vapor Survey



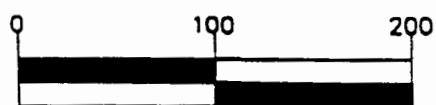
## LEGEND:



● P-14 - Soil Vapor Sample Point

REFERENCE:  
FIGURE BASED ON MAP BY C. O'CONNER,  
ECDEP 10/13/82 AND ES SITE VISIT 3/8/90.

## GRAPHIC SCALE



APPROXIMATE SCALE: 1"=100'

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HOUDAILLE-MANZEL SITE

FIGURE 2.2

rinse; methanol rinse, distilled water rinse, and air drying and purging. The sample train was cleaned daily or more often if necessary by washing with Alconox detergent, rinsing with potable and distilled water and air drying.

### **Field Analytical Methods/Gas Chromatography**

The 1-liter Tedlar bags used for sample collection are made of an analytically clean, nonporous polymer designed for high-purity gas sampling. Each bag is equipped with a cut-off valve for connection to the sample collection apparatus, and a septum for sample withdrawal. Soil gas samples were withdrawn with a gas-tight syringe and then injected into the Photovac portable PID/GC.

Soil vapor samples were analyzed using a Photovac 10S50 Portable Gas Chromatograph (GC) with a photoionization detector (PID) equipped with a 10.6 electron volt (eV) bulb, a 9-meter capillary column (CPSiL-19CB), a 1-meter precolumn/backflush system, and an isothermal oven. The PID is capable of detecting fuel hydrocarbons and chlorinated solvents in concentrations less than 10 parts per billion (ppb).

### **Calibration**

Initial calibration of the gas chromatograph (GC) was accomplished with a commercially prepared standard gas (Scott Specialty gas, blend 3, custom can mix 5) which contained known concentrations of benzene, toluene, ethylbenzene and o-xylene (BTEX). Following the initial calibration, a 3-point calibration was conducted using an 11.4 ppm benzene standard which was diluted to concentrations of 5.7 ppm and 1.14 ppm, respectively. The purpose of the initial 3-point calibration was to check the accuracy of the GC at various calibrant concentrations. The 3-point calibration was conducted only at the start of the survey. Daily calibrations using the BTEX calibration standard were conducted at the beginning and end of each day and at approximately two hour intervals during use.

### **QA/QC**

Quality assurance and quality control for the survey included analyses during start-up of an instrument blank, a syringe blank and a sample train decontamination blank. The instrument blank was a no-injection analysis with only the high purity (ultra zero grade) air flowing through the detector and was used to gauge instrument stability, flow balances and column contamination. The syringe blank was an injection of ultra zero grade air and was a check of syringe decontamination. Background air quality at the field analysis site was also checked by injecting ambient air blanks. The sample train blank was used to measure possible contamination of the sample train and to indicate ambient air conditions. QA/QC samples (syringe blanks, calibrations, instrument blank decon blank) and duplicate samples were taken approximately every tenth sample unless the data suggested that a more frequent interval was required.

### **Sample Analysis**

Compounds contained in the calibration gas (Benzene, toluene, ethylbenzene, and o-xylene) were identified and quantified directly by the GC based on stored

library data. Compounds not in the calibration gas which were detected by the GC exhibit different retention times from those in the standard gas. These compounds are tentatively identified, if possible, from retention time tables published by Photovac for the GC and from ES retention time data. In addition, the tentatively identified compounds may, if possible, be tentatively quantified, based on both the ES library of relative response factors and the response factors generated by the calibration standards. Because of inherent inaccuracies in this methodology, identification of a compound by this method will be tentative, and the reported concentration is an estimate.

### **Field Survey Conditions**

The Soil Vapor Survey proposed in the work plan included collecting soil gas samples from two depths (approximately two and four feet) at each grid point. However, because of the shallow groundwater conditions (approximately two to three feet) only shallow soil gas samples from approximately two feet could be collected. Also the depth to clay along Imson Street was approximately one foot which prevented soil gas sampling in that area. Therefore, 39 gas samples were collected and analyzed instead of the 75 samples estimated in the work plan. Therefore, soil gas samples spacing in these areas was increased to 100 feet instead of the 50 feet spacing proposed in the Work Plan.

### **2.1.6 Lead/Copper Screening**

The objectives of the lead/copper screening were to determine the extent of metal contamination at the site, optimize the placement of soil samples within the identified contaminated soil, and map the limits of contamination. The previous sampling detected elevated levels of lead (2,990 ppm) and copper (8,400 ppm) at the end of Imson Street and some elevated levels of lead (2,000 ppm) under the Babcock Street Bridge.

### **Lead/Copper Screening Methodology**

The X-MET 880 x-ray fluorescence (XRF) analyzer was used to screen levels of lead and copper in surface and subsurface soils. During the reconnaissance site visit 30 soil samples were sieved, dried and analyzed with the XRF instrument to determine which samples to use to obtain a good range for XRF calibration. The 15 soil samples selected for XRF calibration were sent to Recra Environmental Laboratories, Inc. for copper and lead analysis. These soil samples were used to provide a range of concentrations from which a multi-point calibration curve was generated. Comparison of lab results and X-MET screening also indicated if materials were present which could interfere or cause widely inaccurate readings. These samples were used throughout the study as field calibration samples.

### **X-Ray Fluorescence Spectroscopy**

The X-Ray fluorescence spectroscopy (XRF) is an analytical technique which allows for both qualitative and quantitative analysis of a sample's elemental composition. In XRF analysis, primary x-rays illuminate a sample. These x-rays cause elements in the sample to emit characteristic energy in discrete wavelengths from elements contained in the sample. From the energy, or wavelength, of these

fluorescent x-rays a qualitative analysis can be made. From the number of x-rays at a given energy a quantitative analysis is possible. XRF analyses have been field tested for over 10 years in a variety of analytical applications. The U.S. Environmental Protection Agency (EPA) currently uses XRF for screening of hazardous waste sites for metals.

### **Field Sample Collection**

Soil samples were collected at various depths within the fill material from 63 selected points on the 50 foot grid. These samples were dried and representative portions placed in a container for XRF field analysis. The soil samples collected during the SVS were analyzed by XRF to identify specific areas for further investigations. The results of the XRF for lead analysis were plotted on a map of the 50- by 50-foot grid to locate the elevated areas (Figure 2.3) and copper (Figure 2.4).

The XRF was subsequently taken to the site and surface measurements were made on the 50-foot grid. The measurements were concentrated in areas of known contamination and elevated readings of lead and copper. All readings were recorded in the field book and plotted on the 50-foot grid. Four field grid points read by XRF analysis did not correlate with laboratory results, therefore, no further field readings were taken.

### **Sample Analysis QA/QC**

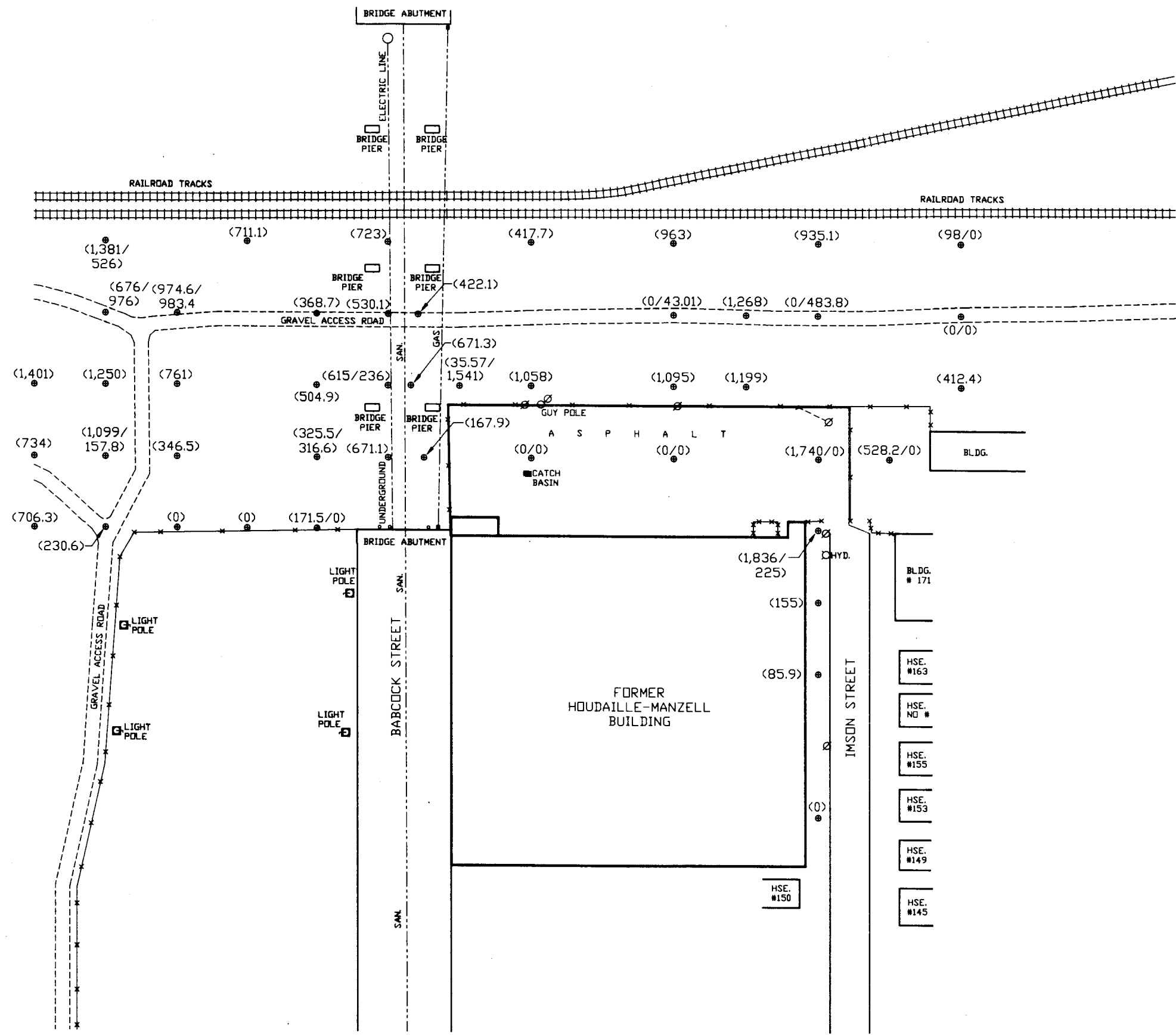
Quality assurance and quality control for the lead/copper survey included using the fifteen reconnaissance samples as standards. Calibration and sample measurement procedures followed manufacturer's specifications and were also based on results of laboratory analysis for the initial fifteen samples discussed above. The technician operating the XRF had extensive field experience using this equipment.

#### **2.1.7 PCB Field Screening**

The PCB screening was to determine the extent of possible PCB contamination at the site and optimize the placement of soil samples within identified contaminated areas. The field test for PCBs used the Clor-N-Soil test kit which is a simple method to test any soil for PCBs and other chlorinated organic compounds for 1 to over 50 ppm. The previous sampling detected PCBs from the end of Imson Street to west of the Babcock Street Bridge, at levels less than 50 ppm.

Soil samples were collected at various depths from 47 selected points on the 50-foot grid for PCB screening (Figure 2.5). Usually an attempt was made to collect two samples at each point, one shallow from the surface to about one to two feet, and a second sample above the clay layer. However, due to difficulty in digging and shallow depth of the clay layer in some parts of the site, fewer samples were tested than planned. Fifty-eight soil samples were tested for PCBs using the Clor-N-Soil test kit in the field screening.

The field test for PCBs used the Clor-N-Soil test kit which is a simple method to test any type of soil for PCBs and other chlorinated organic compounds. Positive



LEGEND

- x—x FENCE
- HYD. D HYDRANT
- Ø UTILITY POLE

LEAD ANALYSIS

- ppm PARTS PER MILLION
- (155) ONE SAMPLE
- (615/236) SAMPLES AT TWO DEPTHS ( SHALLOW/DEEP )

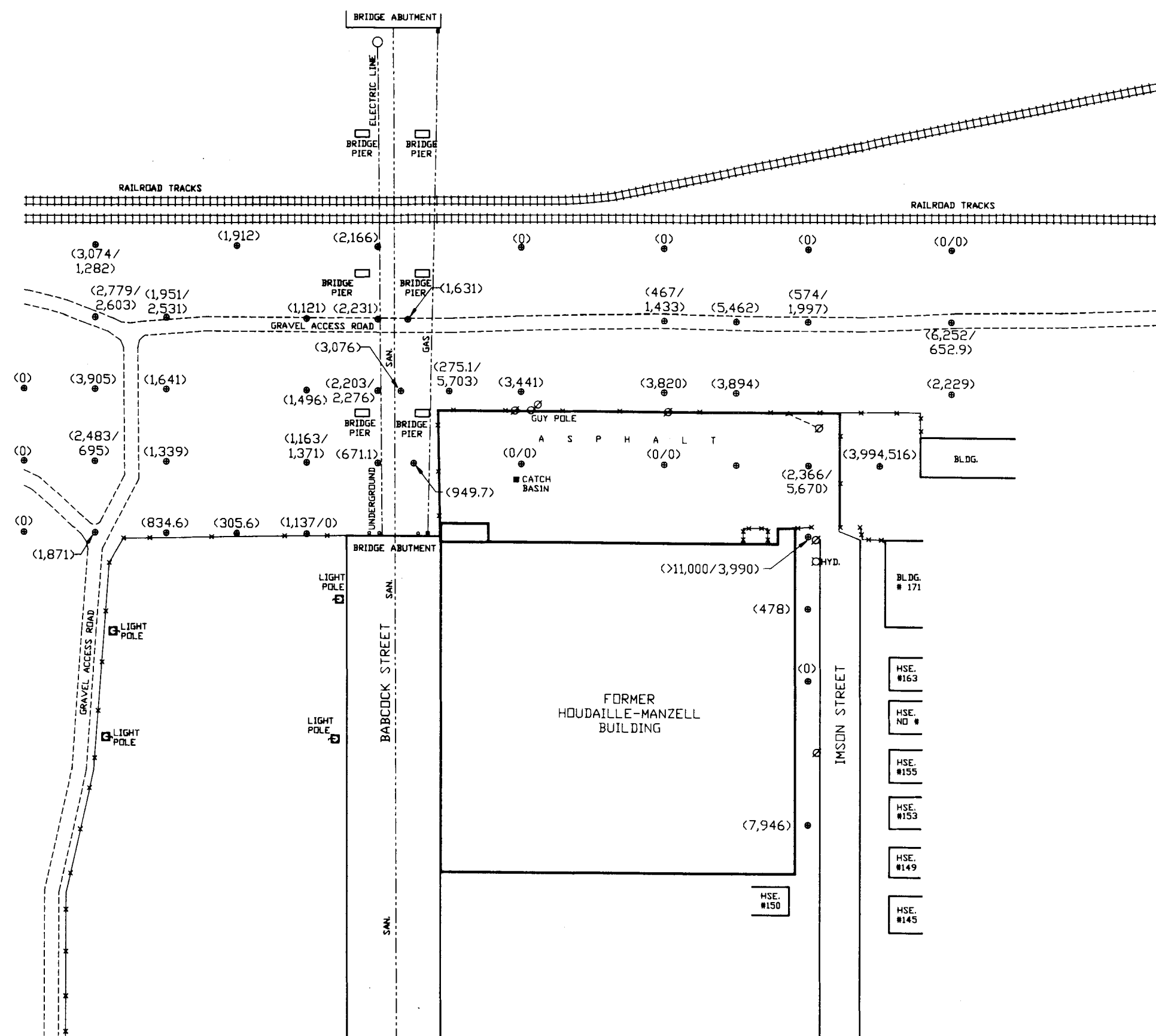
SCALE



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FIGURE 2.3  
HOUDAILLE-MANZELL SITE  
LEAD XRF SURVEY RESULTS



### LEGEND

x——x FENCE  
HYD. D HYDRANT  
Ø UTILITY POLE

COPPER ANALYSIS

(ppm) PARTS PER MILLION

(2,229) ONE SAMPLE

( $>11,000/3,990$ ) SAMPLES AT TWO DEPTHS

**SCALE**

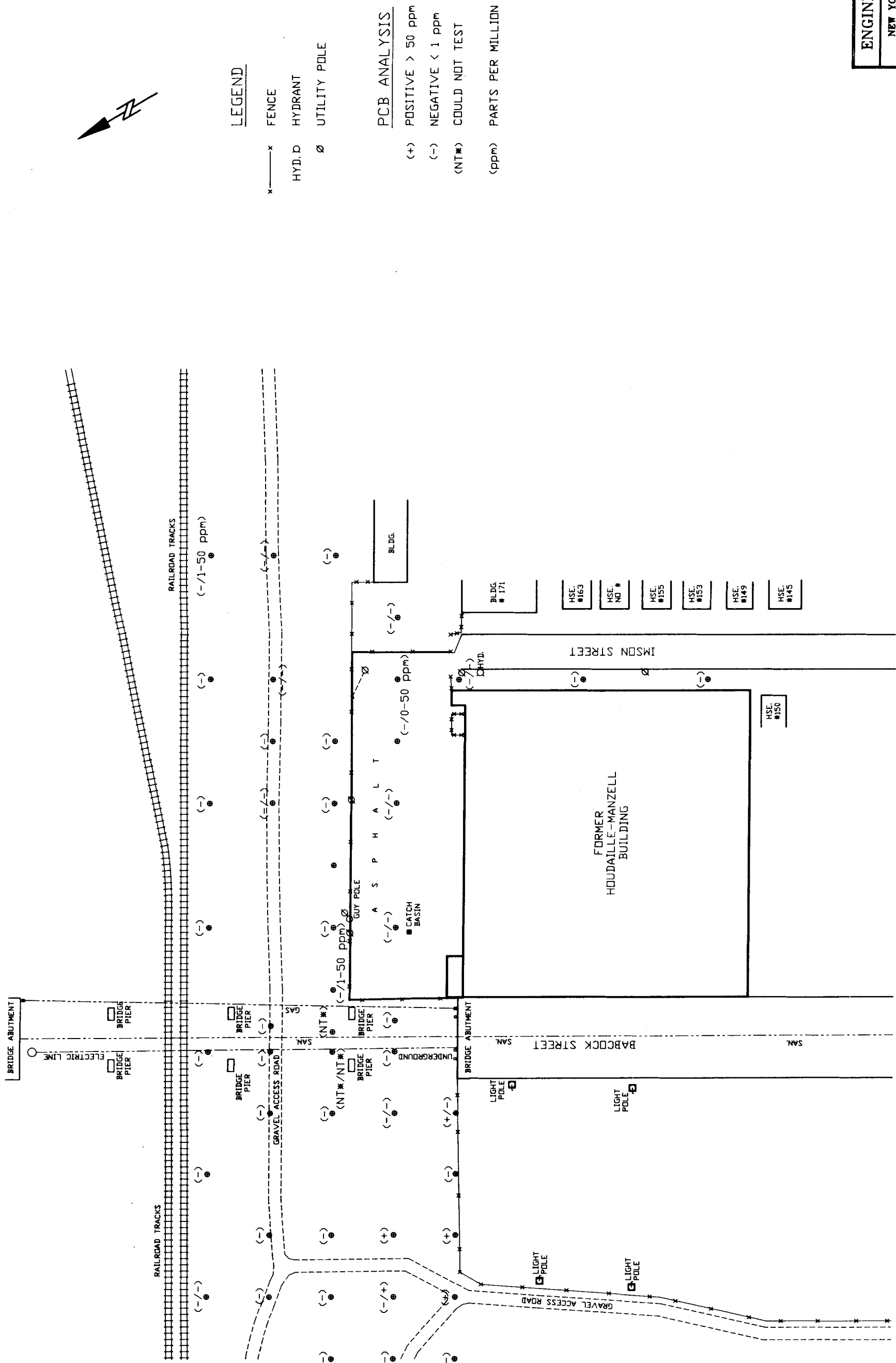


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FIGURE 2.4  
HOUDAILLE-MANZEL SITE  
COPPER XRF SURVEY

FIGURE 2.5



LEGEND

- FENCE
- HYD. D
- Ø

PCB ANALYSIS

- (+) POSITIVE > 50 ppm
- (-) NEGATIVE < 1 ppm
- (NT\*) COULD NOT TEST
- (ppm) PARTS PER MILLION



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FIGURE 2.5 HOUDAILLE-MANZEL SITE FIELD PCB SURVEY RESULTS



results with the Chlor-N-Soil test in areas where the soil vapor survey results are negative or very low indicates the possible presence of PCBs. These locations were targets for further soil sample collection and analysis.

Quality assurance and quality control plan for the PCB field screening relied on the fifteen reconnaissance samples as standards. However, none of the 15 reconnaissance samples contained significant levels of PCBs to be measured by the Chlor-N-Soil test kits.

## **2.2 PHASE I FIELD INVESTIGATION**

### **2.2.1 Soil Borings**

Four borings were drilled on October 2 and October 3, 1990 to determine the extent of the fill, sample the underlying clay layer and collect soil samples for analysis, and for installation of monitoring wells. The boring locations are shown on Figure 2.6. The borings were drilled by Empire Soils Investigation, Inc., under a contract with ES, and were observed by an ES geologist.

The borings were drilled using a truck-mounted drilling rig, and advanced with a 4.25-inch inner diameter (ID) hollow stem flight auger. Continuous split spoon samples were collected until the clay layer was penetrated. One boring penetrated the clay layer seven feet. The borings range in depth from 8 to 16 feet. All samples were screened with a photoionization detector (PID) and six samples were selected for laboratory analysis based on previous investigations, PID readings, and visual inspection.

All split spoon sampling was conducted in accordance with ASTM Specification D-1586-84 for standard penetration test and split barrel sampling. Four representative Shelby tube samples of the clay layer were collected and sent to R&R International, Inc. for laboratory permeability analysis by the triaxial method (EPA 9100) from each of the borings.

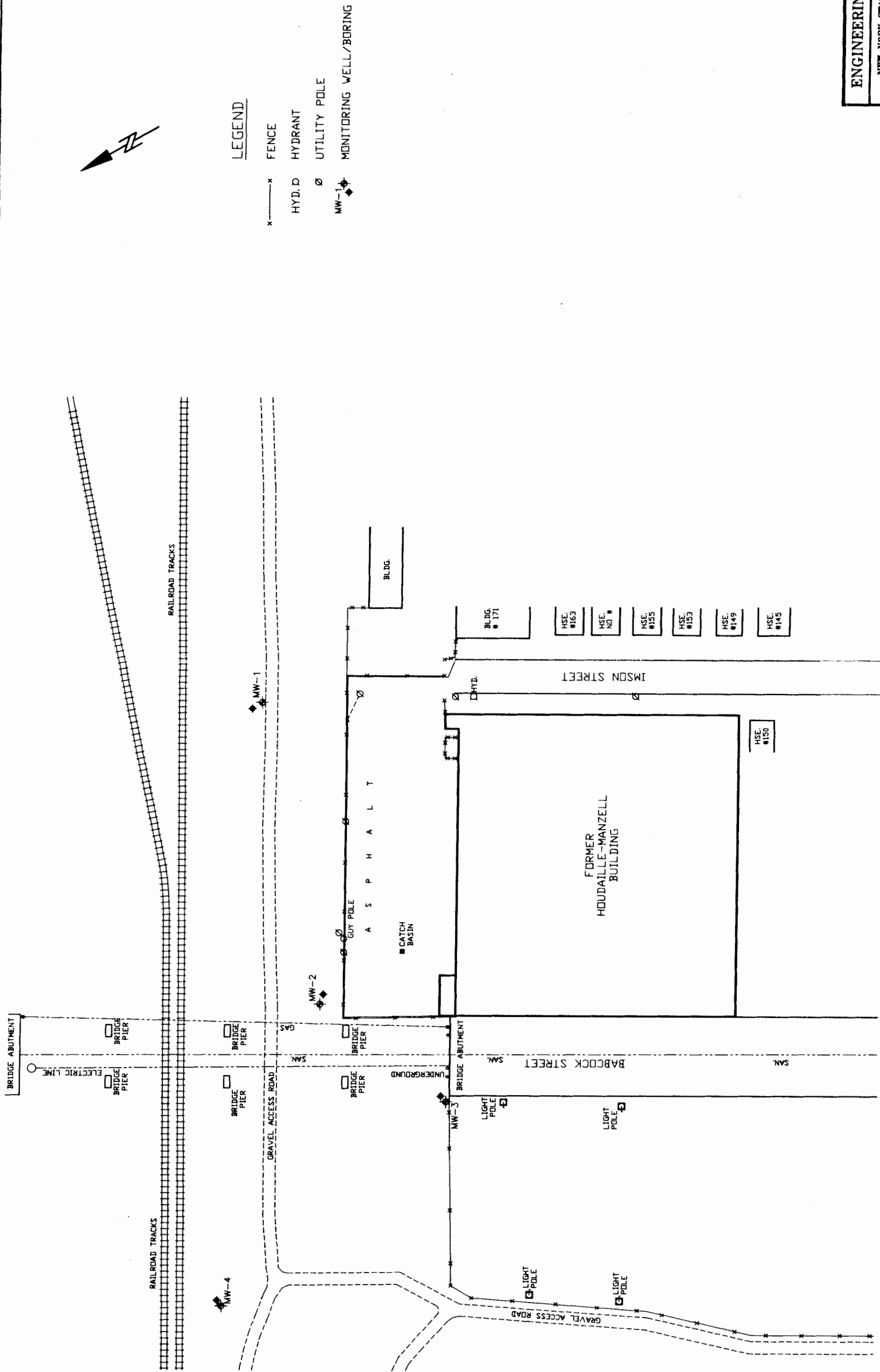
The ES field geologist logged borehole geology in the field logbook and prepared boring logs (Appendix D). The field geologist oversaw decontamination of the drilling equipment at the start of the project, between each boring and at the conclusion of the site investigation. All cuttings and washings were contained in drums at the site. Equipment was decontaminated per Appendix A.1, Section A.1.2 of the Work Plan

### **2.2.2 Well Installation/Development**

Four monitoring wells were installed next to the four borings drilled in the shallow aquifer that is present in the fill above the clay layer. The objective of these monitoring wells was to sample the groundwater in the shallow aquifer.

The monitoring wells are made of two-inch diameter threaded stainless steel, flush-joint casing with screens. The typical monitoring well construction is shown on Figure 2.7. The screen slot openings are 0.010 inches. The wells are four to nine feet deep with two feet of screen. The top of the casing extends to approximately two feet above ground surface. The annulus around the outside of the screen was backfilled with a silica sand. A bentonite pellet seal was placed above the sand

FIGURE 2.6



LEGEND

- x — FENCE
- HYD. D HYDRANT
- Ø UTILITY POLE
- MW-1 ♦ MONITORING WELL/BORING

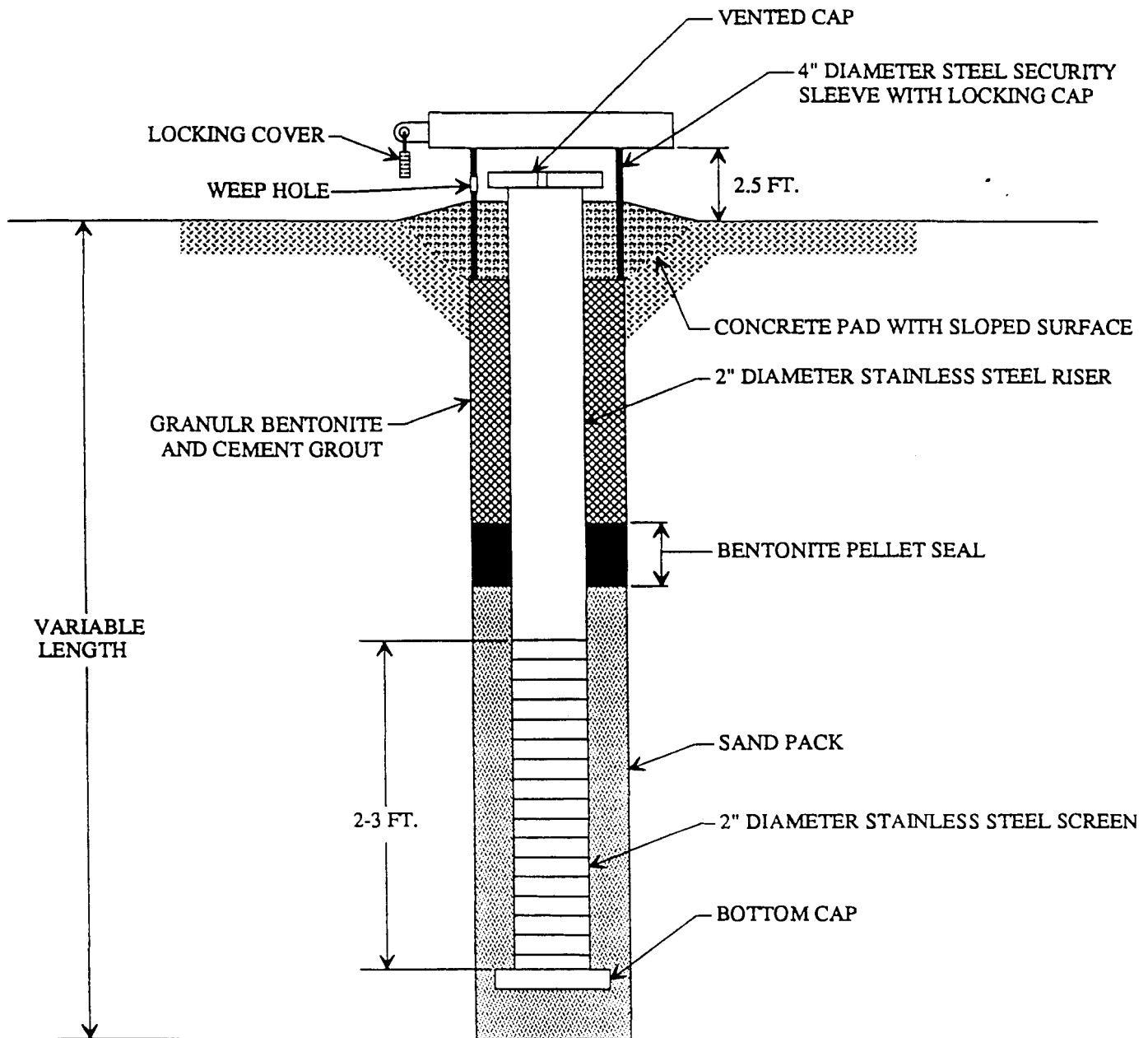


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FIGURE 2.6  
HOUDAILLE-MANZELL SITE  
SOIL BORINGS AND  
MONITORING WELLS

# TYPICAL MONITORING WELL CONSTRUCTION



NOT TO SCALE

pack. The seal was allowed to hydrate before placement of grout above the seal. Each monitoring well has a vented cap and a four-inch diameter, steel casing with a hinged locking cap placed over the monitoring well. The protective casing extends approximately two feet above the ground surface and is cemented in place. The cement seal or pad is sloped to channel water away from the well. A weep hole was drilled at the base of the protective casing to allow any water between the inner and outer casing to drain. All monitoring well installations were overseen by the field geologist and recorded in the field book.

Monitoring wells were bailed to remove sediment from well screen and sand pack. Development water was contained in 55-gallon drums and stored in a designated area on-site. The monitoring well development was overseen by the ES geologist and recorded in the field book. ES has attempted to develop the wells so that the water in the well is reasonably free of sediment (to 50 NTU). However, due to the shallow nature of the wells and limited productivity all wells remained somewhat cloudy (over 50 NTU).

### **2.2.3 Soil Sample Collection**

The objective of the soil sampling was to obtain representative soil samples without external contamination.

In addition to the soil samples that were collected with a split spoon sampler during the test borings, selected surface samples and subsurface samples were collected with bucket or hand augers and, on a few occasions, with test pits. Test pits were used for collection of several soil samples under the Babcock Street viaduct because the hand or bucket auger could not penetrate into the soil and because the underground utilities and the height of the viaduct prohibited any boring attempt. Soil samples for volatile organic analyses were placed immediately into appropriate containers and were compacted in order to minimize head space and pore space. The remaining soil was thoroughly mixed and placed in sample bottles. Sample tools were decontaminated after each sample was collected. Sample descriptions and location were recorded in the field book. Forty-seven soil samples, including six boring samples and two sewer sediment samples, were collected for laboratory analysis. The soil samples were placed in a laboratory cooler and shipped overnight to the laboratory.

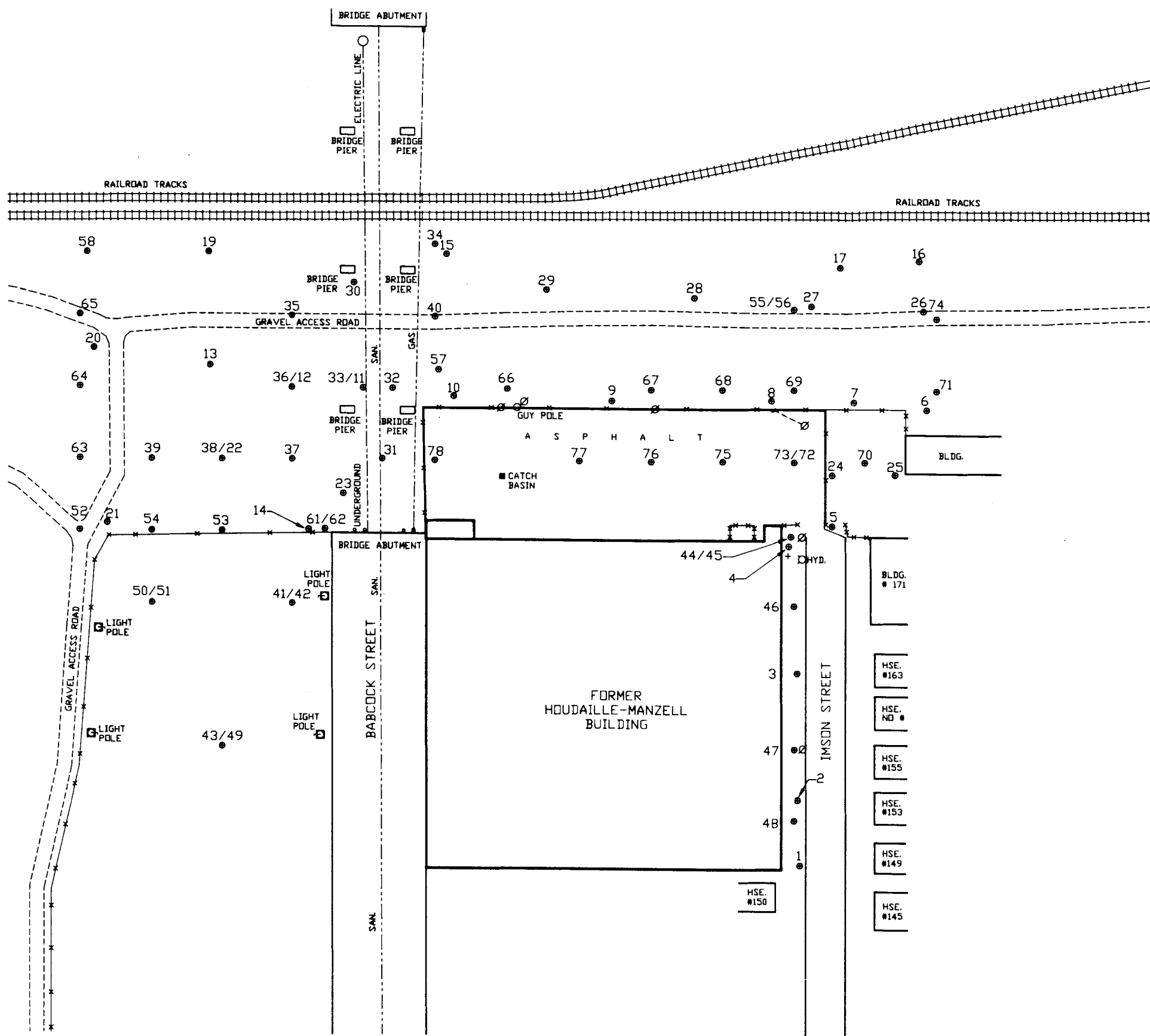
### **2.2.4 Groundwater Sample Collection**

The objective of the groundwater sample collection was to obtain a representative groundwater sample without external contamination. Monitoring well groundwater sampling consisted of three procedures; well evacuation, sample collection, and analytical field tests.

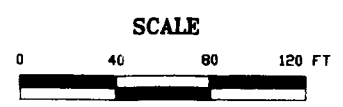
Sampling procedures were in accordance with the most recent NYSDEC guidelines and/or regulations, per QA Plan developed for this project (ES, 1990).

Prior to sampling a monitoring well, the static water level was measured from the rim of the stainless steel well with a Slope Model 51453 electric water level indicator to the nearest 0.01 foot and recorded. The wells were then evacuated to assure that the water in the well was truly representative of the groundwater. All well data

FIGURE 2.8



- LEGEND
- x—x FENCE
  - HYD. D HYDRANT
  - Ø UTILITY POLE
  - 68 NUMBERED SAMPLING POINT



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HOUDAILLE-MANZEL SITE SOIL SAMPLE LOCATIONS

were recorded on the field sampling records included in Appendix D. Evacuation was accomplished by using dedicated polyethylene bailers.

Groundwater samples were collected according to the procedure summarized on Table 2.1. Samples were also collected using dedicated polyethylene disposable bailers with a ball check valve at the lower end. Incorporation of a check valve onto the bailer assures that a sample is representative of the depth to which the bailer is lowered. All samples were removed from a depth just above the well screen.

Prior to filling the sample bottles, a 250-milliliter glass beaker was filled with groundwater and immediately analyzed for temperature (°F), specific conductance (umhos/cm), and pH. Specific conductance and pH were measured by precalibrated electronic probes. Temperature was measured by thermometer.

The upgradient well (MW-1) was sampled first. A quality assurance wash blank was collected and sent with each sample shipment (four).

### **2.2.5 Soil and Groundwater Sample Analysis**

Sample analyses were performed by RECRA Environmental, Inc. (RECRA) using the NYSDEC Analytical Services Protocols (ASP), September 1989 (Chemical parameters), and R&R International (physical parameters). RECRA is approved by the New York State Department of Health ELAP in all categories of solid and hazardous waste. Field parameters not covered by ASP procedures as well as the physical analyses of soil samples were conducted using standard approved procedures that are specified in Appendix A.2 of the Work Plan. Sample custody, laboratory procedures and other quality assurance/quality control (QA/QC) requirements were followed as specified in Appendix A.2 of the Work Plan.

Data received from the laboratory were validated by a third party data validator, Janet Hall of ES' Detroit, Michigan office, using EPA Guidelines (EPA, 1988a, 1988b) and the DEC Data Validation Scope of Work which is a part of the Work Assignment. Before samples were discarded, QA/QC results, sample custody records, sample holding times and any corrective action were assessed. Any concerns about the use of the laboratory data for engineering evaluation or risk assessment purposes were documented.

### **2.2.6 Habitat Based Assessment**

The habitat based assessment made in November 1990 consisted primarily of a site reconnaissance and a records search at the NYSDEC regional office. This characterization was performed in accordance with step IA of a draft TAGM (DEC, December 1989) supplied to ES by NYSDEC.

TABLE 2.1

**SAMPLING PROCEDURE FOR MONITORING WELLS**

1. Initial static water level recorded with an electric contact probe accurate to the nearest 0.01 foot.
2. Sampling device (bailer) and electric contact probe decontaminated.
  - Sampling device (bailer) and probe are Alconox detergent/water washed, rinsed with tap water, rinsed with methanol and finally rinsed with distilled water.
  - Solvent and distilled water rinses are collected into a large funnel which empties into a 5-gallon container.
3. Sampling device (bailer) lowered into well.
  - Disposal bailer constructed of stainless steel, PVC, polyethylene, or Teflon.
  - Disposal bailer lowered by dedicated polypropylene line.
4. Atmospheric blank is opened when appropriate.
5. Sample taken.
  - Sample is poured slowly from the open end of the bailer and the sample bottle tilted so that aeration and turbulence are minimized.
  - Duplicate sample is collected when appropriate.
6. Samples are capped, labelled, and placed in ice filled coolers provided by the laboratory.
7. Atmospheric blank is capped.
8. All equipment is cleaned with successive rinses of detergent/water, tap water, methanol, and distilled water.
  - Dedicated line and bailer are disposed of, or left at well site.
9. Equipment/Wash Blanks are collected when appropriate.
10. Chain-of-Custody forms are completed in triplicate.
  - The original and one of the copies is put into a zip-lock bag and placed into the cooler. The original will be returned following sample analysis.
  - The second copy is kept on file.
11. Cooler is sealed with strapping tape and chain-of-custody seals to assure integrity and to prevent tampering of samples.

## SECTION 3

### PHYSICAL CHARACTERISTICS OF THE SITE

#### 3.1 SURFACE FEATURES

The Houdaille-Manzel site is a relatively flat industrial/residential area. The site is occupied by the former Houdaille-Manzel building, an elevated portion of Babcock Street at the south, and Imson Street at the southeast. The Babcock Street viaduct extends from the northeast corner of the former Houdaille-Manzel one-story building over the remaining project site to beyond the railroad tracks at the north. A 280' x 75' asphalt paved parking lot is located to the north of the building and Imson Street. Much of the northern and southwestern area is free of above-ground structures and covered by grass, weeds or bushes (Figure 3.1).

#### 3.2 CLIMATE

The Houdaille-Manzel site is located in a relatively cold region of the United States. The monthly average temperature ranges from 24 to 70°F, with coldest months of December through March at monthly average temperature below 32°F. The annual precipitation is 36 inches with most of it consisting of snow.

#### 3.3 LOCAL LAND USE

Land use near the project site is classified as industrial/residential. The site is bordered by the Conrail railroad tracks, on the north, by private residences to the south and southeast, by the Buffalo Boys Club to the southwest and a former railway repair yard to the west. North of the Conrail railroad, the land is used for both industrial and residential buildings. Two large railway yards are located approximately 0.5 mile to 1.5 miles north of the site. Approximately one-quarter mile south, a major highway, Route 190, runs approximately east-west. The Buffalo River runs approximately 0.75 mile south of the site. Throughout the vicinity, both large and small industrial plants spread between the residential areas, railways and the highway.

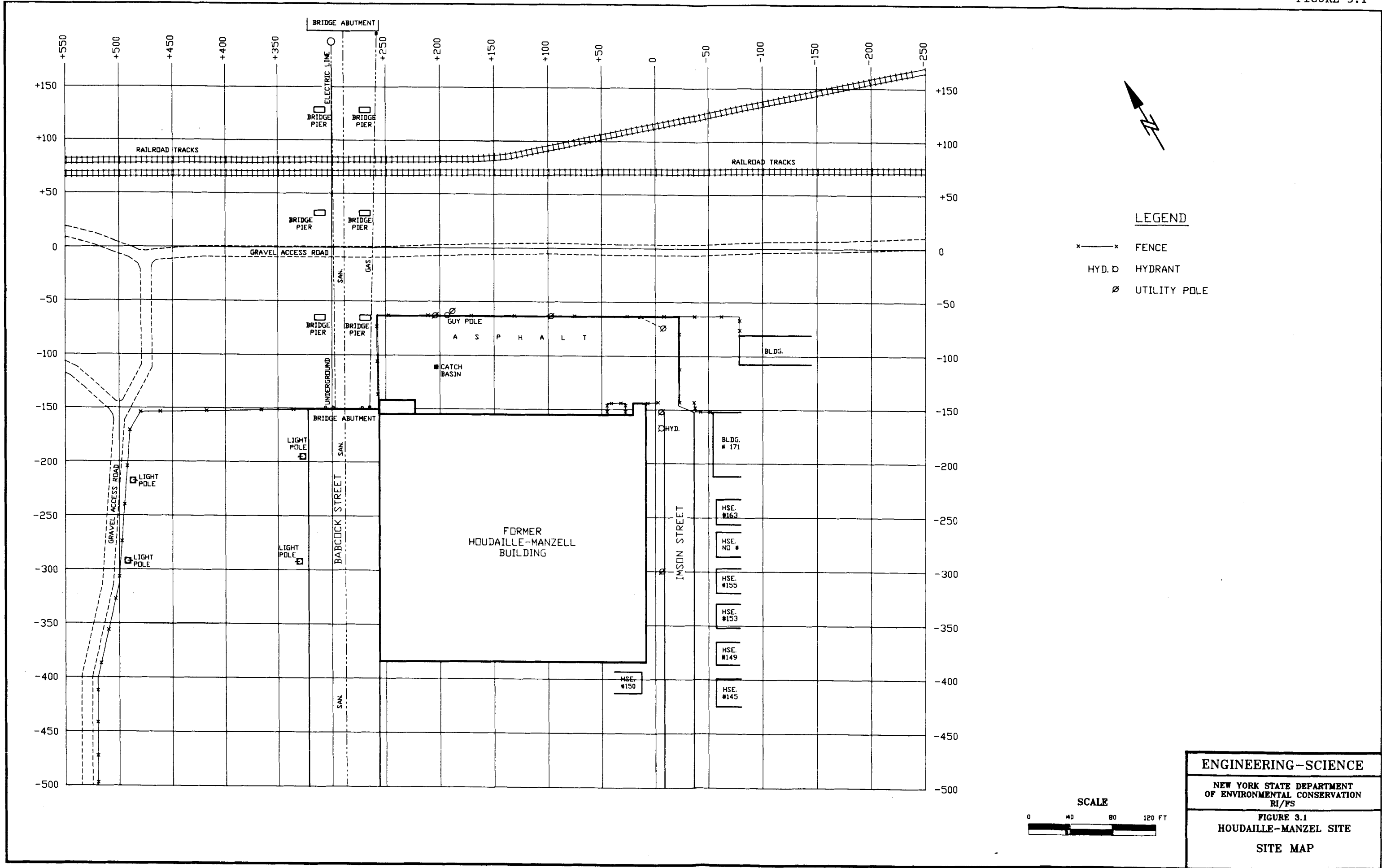
#### 3.4 SOILS

The soil survey of Erie County identified the area in which the site is located as "urban land." This designated map unit includes mostly building and fill areas. The natural soils/unconsolidated deposits underlying this map unit in the area of the site reportedly consist of interbedded glacial clay, silt, and fine sand which are underlain by limestone bedrock at a depth of 20 (USGS, 1983) to 55 feet (ES, 1989).

Based on the recent subsurface investigation for this project, the surficial soils are 1.0 to 9.0 feet of sandy to gravelly fill over more than seven feet of low permeability clay. The full extent of the clay layer was not penetrated by the test borings.



FIGURE 3.1



### 3.5 GEOLOGY AND HYDROGEOLOGY

The area lies within the Erie-Ontario Lowlands physiographic province. This physiographic province has very low topographic relief and is typical of a former lakebed. The site is within the Lake Erie Plain which is oriented east-west and is six to twelve miles wide. The Lake Erie Plain is bordered on the north by the Onondaga escarpment and on the south by the maturely dissected Allegheny plateau. The Lake Erie Plain was covered by glacial lakes ancestral to present day Lake Erie (JEB, 1988).

Based on this and previous subsurface investigations, the upper groundwater system underlying the site and surrounding area consists of a perched water bearing zone within fill material, an aquiclude formed by the glacial lake bottom silt and clay, and a confined bedrock aquifer (ES, 1989). The surficial material at the site consists of topsoil mixed with up to nine feet of fill. The fill was placed along former railroad tracks which once crossed the site.

Based on groundwater data collected during sampling, the groundwater flow is toward the southwest. However there is a significant drop of nearly three feet in the water table under the Babcock Street Bridge (Appendix C). This sudden drop in the water table is probably due to the presence of a large old brick sewer line which crosses the site under the Babcock Street Bridge. The sewer line is several feet below the surface at the site and is flowing to the south.

The seasonal perched water bearing zone is recharged during the winter and spring seasons via snow melt and rainfall. During the drier summer and fall seasons, the perched water bearing zone may not exist. Preferential water movement within this zone would be in the horizontal direction, towards adjacent water bodies (i.e. marshes, ponds, drainage ditches and streams). Vertical migration of water, when the perched zone exists, would be less than the horizontal movement because of the extremely low permeability of the underlying silt and clay ( $2 \times 10^{-8}$  at six feet deep to  $6 \times 10^{-8}$  at 12 feet deep). The overall infiltration through the glacial sediments into the bedrock aquifer is very small.

Groundwater flow direction within the limestone bedrock aquifer, although not definitively known in the vicinity of the site, is believed to be towards the south discharging into the Buffalo River (JEB, 1988 and ES, 1989).

During site investigations by the USGS in August, 1982 and August, 1983 no perched groundwater was found at the site above the lake clay (USGS, 1983). The USGS report indicated that the most likely groundwater flow would be southward toward the Buffalo River. During the JEB site investigation on the neighboring property it was found that the perched water table decreased rapidly between well installation in May 1988 and sampling in June 1988. JEB concluded that the perched water bearing zone is seasonal and horizontal flow direction within the perched zone is controlled by surface topography and fill/clay interface. JEB also concluded, where surface ponding or drainage ditches were observed, discharge from the adjacent perched water bearing zone would be into these areas (JEB, 1988). During this investigation in the fall of 1990 frequent heavy rains kept the perched water table in place.

The topography of the site is relatively flat and there are no streams, drainage ditches, or wetlands on or near the disposal site. The closest surface water to the site is the Buffalo River which is approximately 4,000 feet to the south. The disposal area is not within the Buffalo River's 100 year flood plain. There is no runoff or leachate leaving the site which would directly enter a surface water body. Any runoff from the site would enter the sewer system (ECDEP, 1982a).

### **3.6 HABITAT BASED ASSESSMENT - DESCRIPTION OF EXISTING ENVIRONMENT**

The following characterization describes the existing fish and wildlife habitats and values associated with the actual Houdaille-Manzel site and adjacent off-site areas potentially influenced by the site. The characterization follows the guidance and recommendations presented by the Division Technical and Administrative Guidance Memorandum: Habitat Based Assessment, Guidance Document for Conducting Environmental Risk Assessments at Hazardous Waste Sites (draft dated December 28, 1989). The characterization was developed relying on field reconnaissance of the actual site, and the entire area within a 2.0 mile radius of the site. The field information was incorporated with environmental information retrieved from NYSDEC Region 9 office in Buffalo, New York. Field inspections of terrestrial, wetland, and aquatic habitats were conducted November 7 to November 9, 1990. Aquatic habitats were observed on the closest major waterway, which was the Buffalo River, and were extended downstream to the river's confluence with Lake Erie. This distance was approximately 5.3 miles (about 28,000 feet) starting at the confluence of the Buffalo River and Cazenovia Creek, and extending downstream to the river's confluence with Lake Erie. This reach was the total downstream reach available to characterize before the river merged with Lake Erie.

The following habitat-based description is organized according to onsite and off-site characteristics. The onsite characteristics are described first.

#### **3.6.1 Site Characteristics**

The existing 1,750 sq. ft. site apparently consists of a former railroad right-of-way area that was abandoned and allowed to become overgrown with an assortment of grasses, herbaceous forbs, woody shrubs, and saplings characteristic of vacant urban lots. The dominant plant species are typical of those associated with abandoned urban lands where active vegetation maintenance has been discontinued. Site abandonment allows the site to evolve through secondary plant succession. The site is surrounded by a complex of residential neighborhoods to the north and active and inactive industrial complexes to the east, west, and south.

##### **3.6.1.1 Cover Types**

The entire site consists of a single cover type. This type would be considered either an urban or developed cover type. Within this general category, the site could be described as vacant or a disturbed area. Predominant vegetation is a mixture of grasses and herbs that covers approximately 90 to 95 percent of the site. Dominant herb species include several species of goldenrod, yarrow, Queen Anne's lace, dandelion, wild lettuce, sow thistle, ragweed, horseweed, field bindweed,

plantain, vervain, red clover, and lambsquarters. Dominant grasses included crabgrass, foxtail, three awn grasses, Johnson grass, and several species of panicum and knotgrass. Woody species include small shrubs and immature trees including staghorn sumac, royal paulownia, chokecherry, and American elm. Woody plants are not extensively developed onsite; rather they are scattered throughout the site as individual plants or as small groups of plants. Collectively, woody plants occupy perhaps 5 to 10 percent of the total area of the site.

#### **3.6.1.2 Habitat Types**

The site provides one terrestrial habitat type that can best be described as urban habitat. Typical wildlife inhabitants of this simplified type are pigeons, house sparrows, starlings, brown and Norway rats, mice, cottontail rabbits, cats, and various species of songbirds that are typically associated with urban environments. Neither this habitat type nor the associated wildlife species are generally considered significant resources requiring special planning considerations. On a relative scale, this site would be considered to offer poor or marginal wildlife habitat because of its small size, nature of surrounding land uses, vegetation composition and location. The habitat has been affected by the deposition of assorted trash and other domestic solid wastes.

#### **3.6.1.3 Special Resources**

The site does not support any wetland habitats; regulated streams, lakes, or other waterways; endangered, threatened, special-concern species or their supporting habitats; or other significant habitats. This conclusion is based on site observations and on mapped resources shown on NYS National Heritage map series depicting the features listed above.

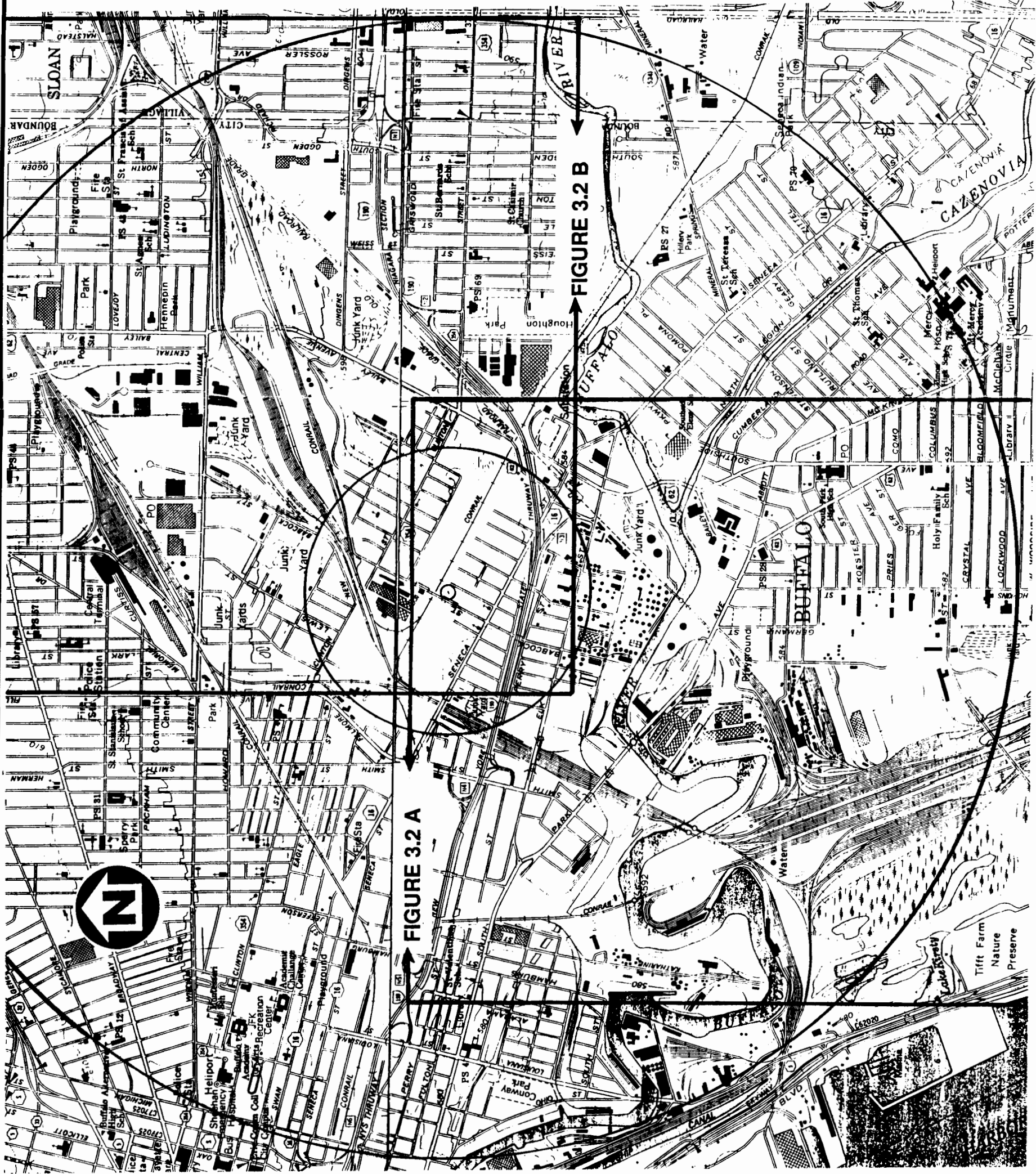
### **3.6.2 Off-Site Characteristics**

Cover types and associated fish and wildlife populations are described within a 0.5-mile radius of the site, while significant habitats; wetlands; regulated streams and lakes; and other significant environmental resources are described within a 2-mile radius of the site. Special aquatic resources are characterized for the Buffalo River downstream for about 5.3 river miles west of the site before the river joins with Lake Erie. Figure 3.2 shows the locations of wetlands within the 0.5- and 2-mile zones. Locations of regulated streams and significant coastal wildlife habitat are shown in Figure 3.3. A cover type map is presented in Figure 3.4 for the 0.5-mile-radius area.

#### **3.6.2.1 Cover Types**

Two major cover types occur within a 0.5-mile radius of the site. Both types are the results of historical urban development activities. The two types are urban residential and industrial developments. These two types are characterized by high-intensity, high-density developments which have removed or replaced natural communities. Both offer no fish habitat and very limited wildlife habitat, except for wildlife species adapted to and tolerant of urban environmental settings, such as those described in Section 3.6.1.

FIGURE 3.2

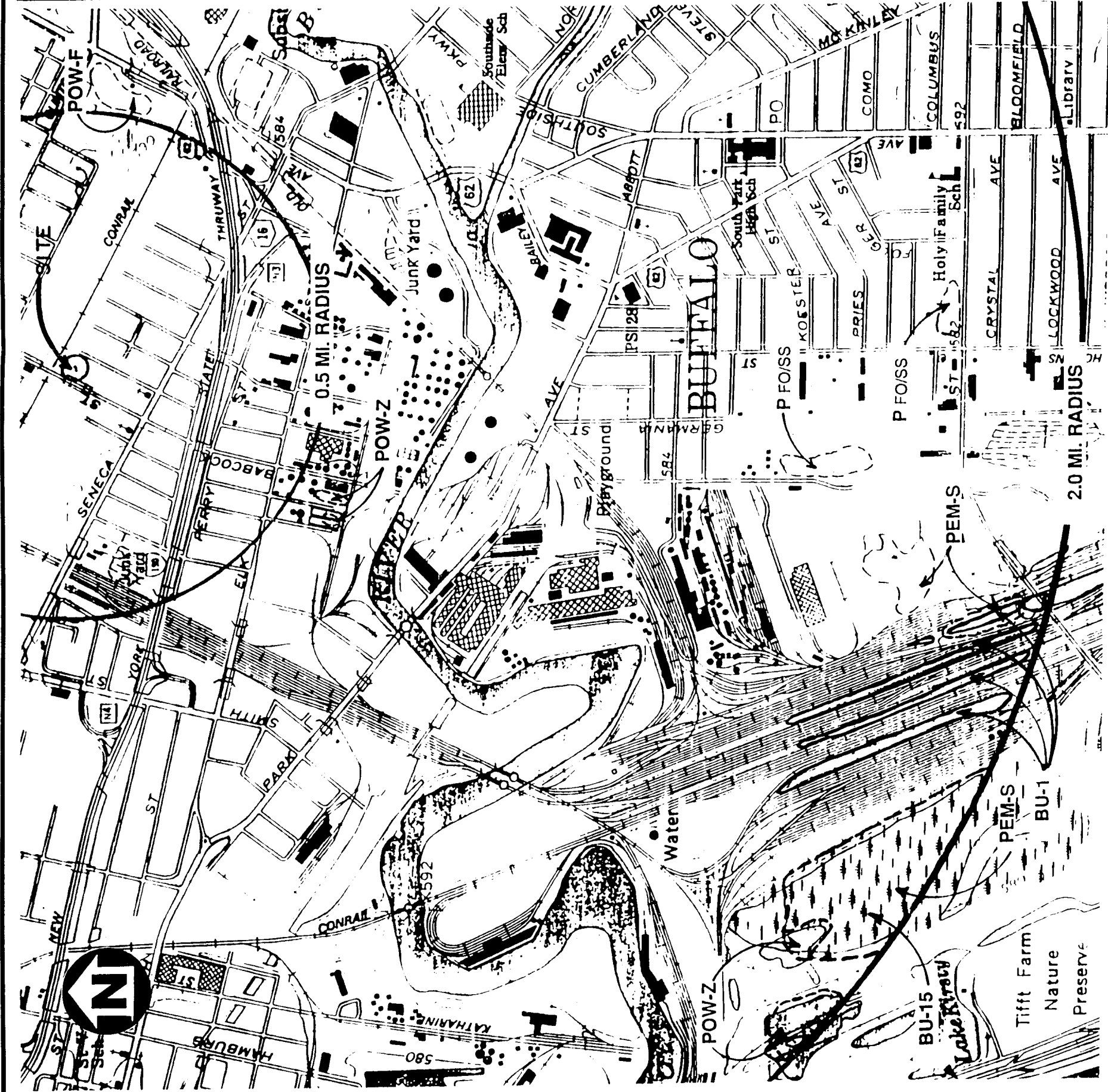


SOURCE: NYSDEC COASTAL MANAGEMENT  
PROGRAM MAP NO.5 JANUARY, 1981



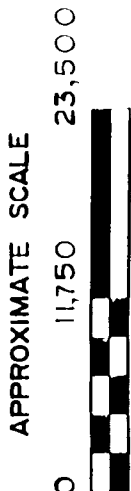
# HOUDAILLE-MANZEL SITE WETLANDS LOCATION MAP

FIGURE 3.2 A



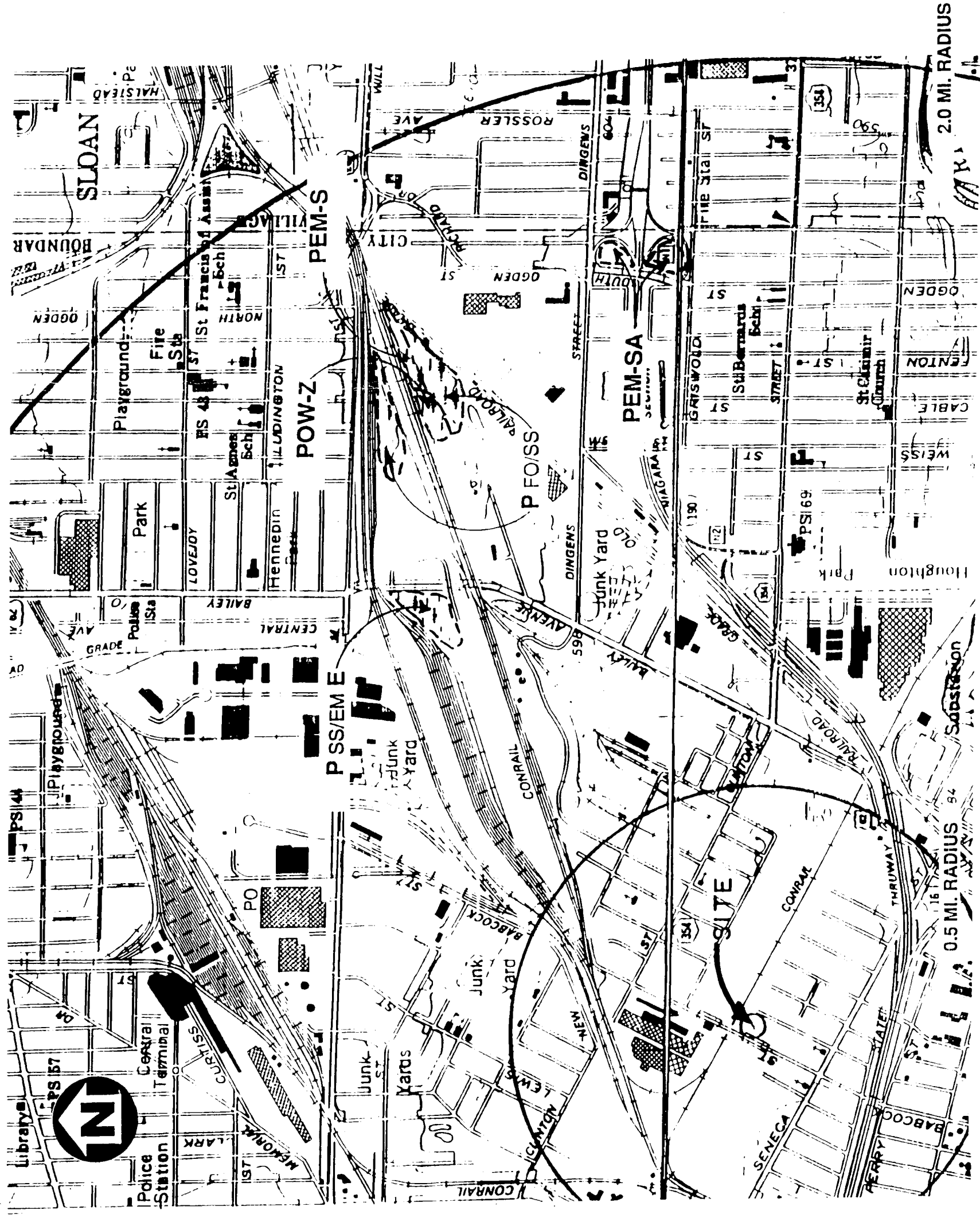
**LEGEND**

- BU-1
- POW-F
- PEM-S
- PFO/SS
- DEC WETLANDS
- U.S. FISH & WILDLIFE SERVICE WETLANDS







**HOUDAILLE-MANZEL SITE  
WETLANDS LOCATION MAP**





**HOUDAILLE-MANZEL SITE  
WETLANDS LOCATION MAP**

## LEGEND

BU-1	POW-F	PEM-S	PFO/SS
			

DEC WETLANDS  
U.S. FISH & WILDLIFE  
SERVICE WETLANDS

APPROXIMATE SCALE	
0	23,500
	11,750

FIGURE 3.3

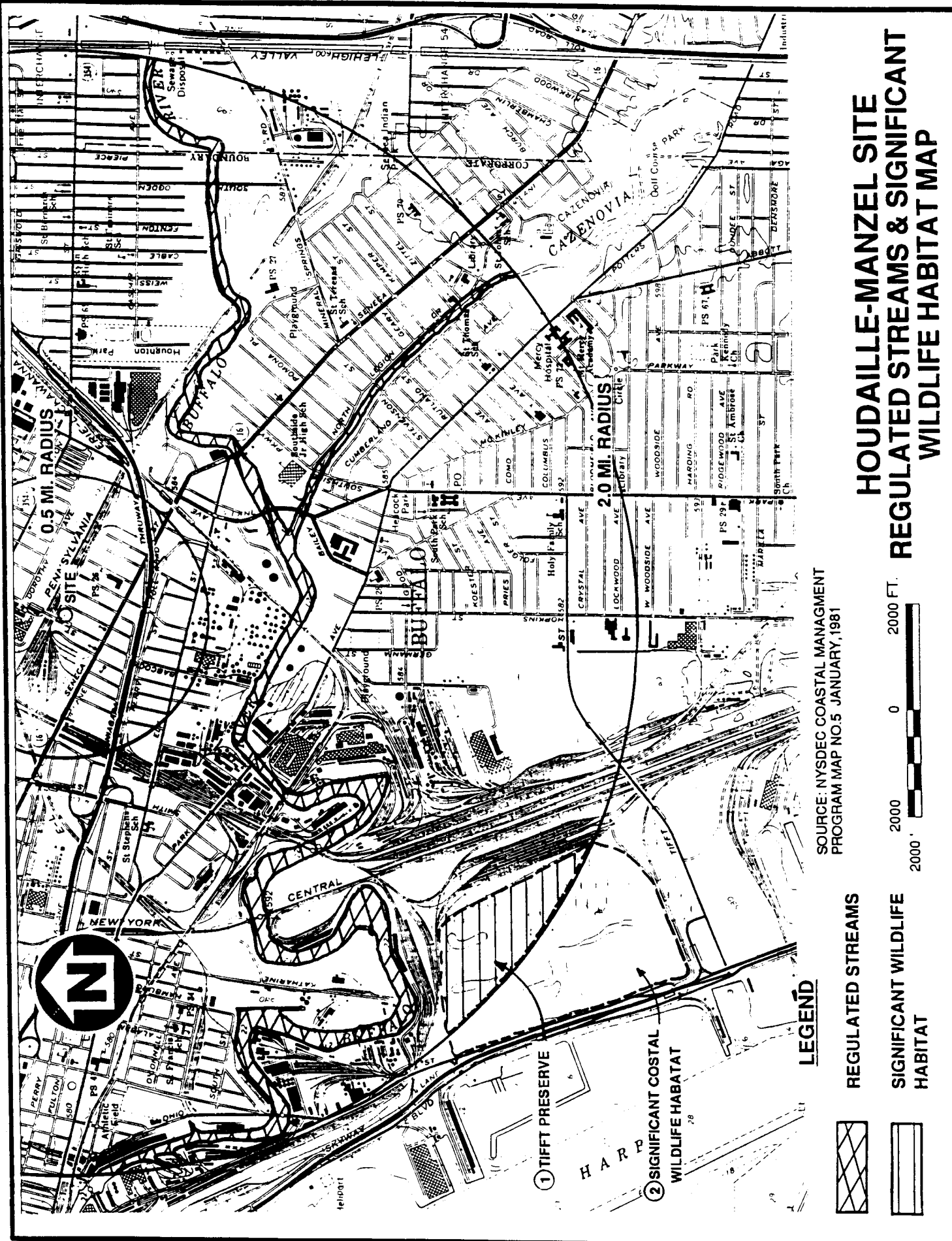
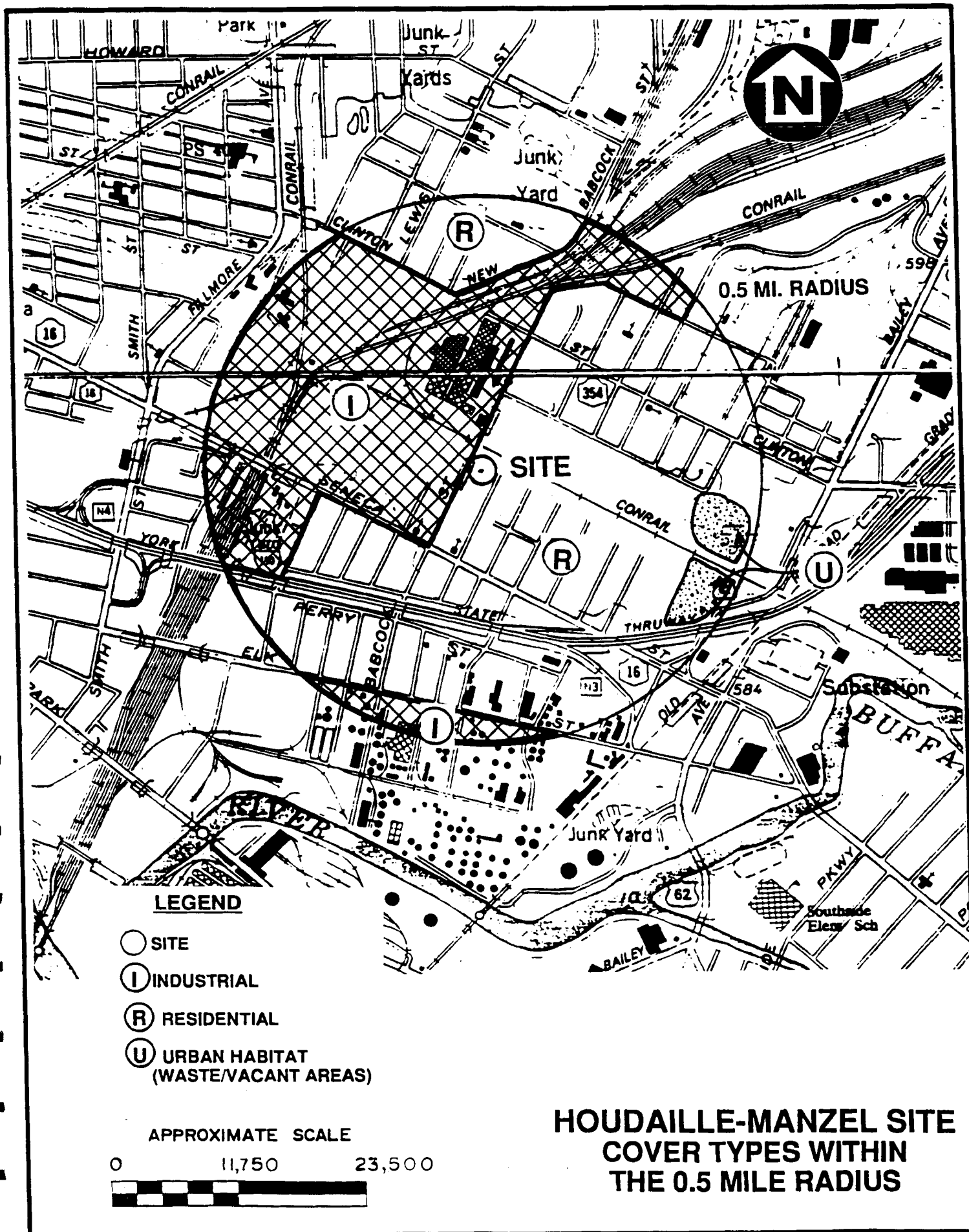




FIGURE 3.4



Vacant, overgrown or small undeveloped parcels of land, such as the Houdaille-Manzel site are scattered throughout these two types and generally occur at a scale too small to accurately map. Many of these waste or undeveloped tracts are associated with the railroad or railyard rights-of-way. There were no permanent ponds, lakes or creeks located within this zone, so characterization of fish populations and resources are not relevant.

Vegetation and wildlife characteristics of the waste or undeveloped lands within this area are very similar to those described for the site. However, given that a larger variety of site conditions are involved because the area is larger, a more diverse assemblage of plant and animal species would be present. The basic urban character of these locations would be the same. The NYSDEC Natural Heritage Maps (1989) did not indicate the presence of significant wildlife populations or habitats within the 0.5-mile radius.

### **3.6.2.2 Special Resources**

Special resources occurring within a 2-mile radius of the site include sections of regulated streams (Buffalo River and Cazenovia Creek); the Tifft Nature Preserve, which is also designated a significant coastal wildlife habitat; and wetlands designated by either the NYSDEC or the U.S. Fish and Wildlife Service's National Wetland Inventory mapping. There were no designated critical habitats or areas supporting endangered or threatened species use within the 2-mile radius area. Characteristics of each of these special resources are as follows.

#### **3.6.2.2.1 Regulated Freshwater Streams**

Segments of the Buffalo River and Cazenovia Creek occur within the 2-mile boundary of the site. Both are considered regulated freshwater streams that support fish populations. The closest approach of the Buffalo River to the site is about 0.8 miles south of the site. Cazenovia Creek joins the Buffalo River about 0.8 miles south of the site and enters from the south shore of the river. There are no known direct surface water pathways or tributaries leading from the site to either of these streams.

Aquatic life in the Buffalo River segment that occurs within two miles of the site has been impaired by degraded water and sediment quality of the river (New York State Department of Environmental Conservation, 1989). The Buffalo River and its sediments have been polluted by past industrial and municipal discharges and waste disposal. Fishing and aquatic life survival have been impaired by PCBs, chlordane, and polynuclear aromatic hydrocarbons (PAHs). Fish and wildlife habitats have been degraded by navigational dredging of the river and by bulk-heading and other shoreline alterations. Low dissolved oxygen and pesticides are suspected causes of additional aquatic life degradation (NYSDEC, 1989e). Common fish species in the river include the brown bullhead, white sucker, pumpkinseed sunfish, carp, several species of shiners, and gizzard shad. More than 20 species of fish have been collected from either the river or the Buffalo Ship Channel (NYSDEC, 1989e). Environmental conditions of the river apparently favor the greater abundance of species tolerant of degraded conditions, such as carp and brown bullhead. Further details of the aquatic community are presented in NYSDEC, 1989e.

Cazenovia Creek flows into the Buffalo River from the southeast with an average annual flow of about 150 million gallons per day, compared to the Buffalo River's average annual flow of 365 million gallons per day. Cazenovia Creek receives combined sewer overflow discharges from combined relief sewers in the lower mile before joining the Buffalo River. Upstream of this segment, the stream receives discharges from three municipalities and three industrial facilities. These conditions suggest degraded stream water quality and sediment conditions and impaired aquatic life, although such conditions were not as concisely discussed as were Buffalo River conditions.

Aquatic life communities of the creek would be significantly buffered from any potential hydrologic pathways or influences of the site by the presence of the Buffalo River between the site and the creek. The river would function as a substantial hydrologic barrier to any contaminant movement south of its channel.

#### 3.6.2.2.2 Significant Wildlife Habitats

The Tift Nature Preserve is the only designated significant wildlife habitat located within the 2-mile radius zone. The NYSDEC Coastal Management Program maps (Map Number 5, dated January 1981) also designates the preserve as a significant coastal wildlife habitat area. Only about 40 percent of the preserve lies within the 2-mile radius zone. The preserve's 264-acre area contains a mixture of freshwater ponds (6), wetlands, wooded swamps, and grasslands established atop of reclaimed municipal and industrial waste disposal area. Numerous waterfowl, songbirds, and other wildlife species are associated with this area. The preserve lies south of the Buffalo River and is administered by the Buffalo Museum of Science. Between 24,500 and 28,800 visitor days of use were received in 1989. Primary visitor uses include nature study, environmental education, bird-watching, fishing, photography, snowshoeing, and walking.

#### 3.6.2.2.3 Wetlands

Freshwater wetlands have been designated by both the NYSDEC and the USFWS within the 2-mile zone but beyond the 0.5-mile zone. The greatest concentration of mapped wetlands occur south of the Buffalo River in association with Tift Preserve and with the vacant lands and borrow areas associated with railroad yards and tracks north of Tift Street and west of Hopkins Street. Wetlands are shown in Figure 3.2. Herbaceous wetlands are dominated primarily by either cattail, phragmites (giant reed), or sedges and bulrushes. Forested wetlands are dominated primarily by red and silver maples, cottonwood, American elm, basswood, and speckled alder. Some of the herbaceous and wooded wetlands contain open standing water, while others are completely overgrown with plants. These characteristics affect wildlife uses and attractiveness.

Portions of two NYSDEC regulated wetlands occur within the 2-mile zone. Wetland BU-1 involves a complex of multiple sites on the Republic Steel property that are rated as Class 1 wetlands. The total acreage is estimated at about 50 acres of which about 35 percent (17.5 acres) occurs within the 2-mile zone. Wetland BU-15 is rated a Class 1 wetland and involves about a 95-acre wetland on Tift Preserve, about 50 percent (47.5 acres) of this wetland lies within the 2.0-mile zone.

#### 3.6.2.2.4 Threatened and Endangered Species

There are no known occurrences of federal or state-designated threatened or endangered species or their designated critical habitats within either the 0.5-mile or 2.0-mile radius zones (NYSDEC Natural Heritage maps, 1989).

#### 3.6.2.3 Other Resources and Habitats

The remaining areas between the 0.5-mile and 2-mile zones include predominantly the residential, urban, industrial, and business sectors of the Buffalo metropolitan area. There are scattered vacant or undeveloped lots that possess remnant woodland stands of cottonwood, elm, basswood, maple, and American elm. These areas offer some habitat for small mammals, songbirds, and urban or residential-associated species such as raccoon, skunks, and rabbits. These areas occur primarily south of the site and the Buffalo River, either in association with city parks (e.g., Cazenovia Park) or with the railroad yards distributed extensively throughout the area.

None of these areas appeared to possess physical, vegetation, and land use characteristics that would encourage extensive wildlife use or cause the areas to be considered significant wildlife resource or habitat areas.

#### 3.6.3 Summary

Available NYSDEC National Heritage and environmental resource file information suggest that the Houdaille-Manzel site and the area within 0.5 miles of the site do not support fish, wildlife, or vegetation populations or habitats considered to be of significant value or a special resource. Resources considered include wetlands; regulated streams or lakes; threatened or endangered species; and wild or scenic rivers. These findings were supported by observations made during a field reconnaissance conducted by an experienced senior ecologist.

Segments of the Buffalo River and Cazenovia Creek, both considered regulated streams, occur with a 2.0 mile radius of the site. Both streams support a fishery considered to be impaired by degraded water quality and habitats resulting from upstream industrial and municipal discharges. NYSDEC Class 1 regulated wetlands and Clean Water Act jurisdictional wetlands also occur beyond the 0.5 mile radius but within the 2.0 mile radius. All the NYSDEC regulated (2 areas) and many of the jurisdictional wetlands are located about 1.5 miles south of the site and south of the Buffalo River. Sections of the Tift Preserve, also designated a significant coastal wildlife habitat, occur at the outer edge of the 2.0 mile radius and south of the Buffalo River. The preserve supports wetland and other important fish and wildlife habitats. Threatened and endangered species and supporting critical habitats are not known to occur within the 2.0 mile zone. It is unlikely that chemical wastes at the site or future remedial action activities would adversely affect significant or special resources for several reasons. These include the small volume of wastes involved, the absence of direct surface water linkages to streams or ponds containing fish, the long distance (0.8 miles) between the site and the nearest water body supporting aquatic life (Buffalo River), and the presence of most special resources, including the Tift Preserve, south of the Buffalo River. The river acts as

a significant barrier to surface and groundwater moving beyond its hydrologic influence.

The predominant cover type of the site and the area within a 0.5 mile radius is considered urban development. The actual site is an overgrown vacant lot that supports an assemblage of grasses, herbs, and small shrubs or saplings characteristic of abandoned urban land. Wildlife inhabitants include bird and mammal species that are typically associated with abandoned urban environments. The site is considered to offer poor or marginal urban wildlife habitat because of its small size, nature of surrounding urban residential and industrial land uses. Chemical wastes and anticipated remedial actions are not considered likely to adversely affect any significant, high or moderate value fish or wildlife populations or habitats on site or in the site's near vicinity because such resources are absent.

## SECTION 4

### NATURE AND EXTENT OF CONTAMINATION

This section summarizes the results of the previous investigations and compares them with the results of this recent investigation. The section is broken down into four subsections, the first of which summarizes the Phase I Site Screening results. The other three subsections, summarize the subsequent field investigations, compare the results with previous investigations, and attempt to establish the limits and extent of the contamination at the site in that order.

#### 4.1 PHASE 1 SITE SCREENING RESULTS

##### 4.1.1 Soil Vapor Survey Results

A soil vapor survey was conducted as part of the Phase I Site Screening to determine whether contaminated plumes of volatile organic compounds are present and to optimize the placement of monitoring wells and soil samples within any identified contamination plumes and soil. The survey centered around two known contaminated areas, the area under the Babcock Street bridge and the area at the end of Imson Street to determine the extent of BTEX contamination in these two areas. The results of the soil vapor survey are presented in Table 4.1.

The results for the soil vapor survey indicate no real BTEX detection pattern. Positive results were scattered and did not often occur at adjacent sampling points. In addition, there was no consistency in the appearance of individual compounds from one sample to the next. The overall range for BTEX ran from non-detect to 1.472 ppm.

The benzene concentrations detected ranged from 9 ppb to 572 ppb. Benzene was detected at only five locations (points 2, 3, 24, 26 and 37), all in the eastern half of the grid but widely spread out. Figure 4.1 illustrates the spatial relationship of these detects.

Toluene was detected in twenty-five samples throughout the grid with concentrations ranging from 4 to 902 ppb. The detects were spread over a large area and rarely occur at adjacent sample points. This indicates that there is not a single potential source area, but contamination is randomly scattered throughout the site. Toluene was detected at points 1 through 10, 18 through 20, 23 through 31, 35, 37 and 39 (Figure 4.1). It should be noted that toluene was detected at every point benzene was found, but there are many points where a singular contaminant was detected.

Ethylbenzene was detected at only four points (10, 33, 37 and 39) at levels ranging from 4 ppb to 7 ppb. Xylenes were found only at points 35 and 39 at 363 ppb and 29 ppb respectively.

The only pattern that emerges from these BTEX results is that the majority of the hits occurred in the eastern half of the grid, although widely scattered in that

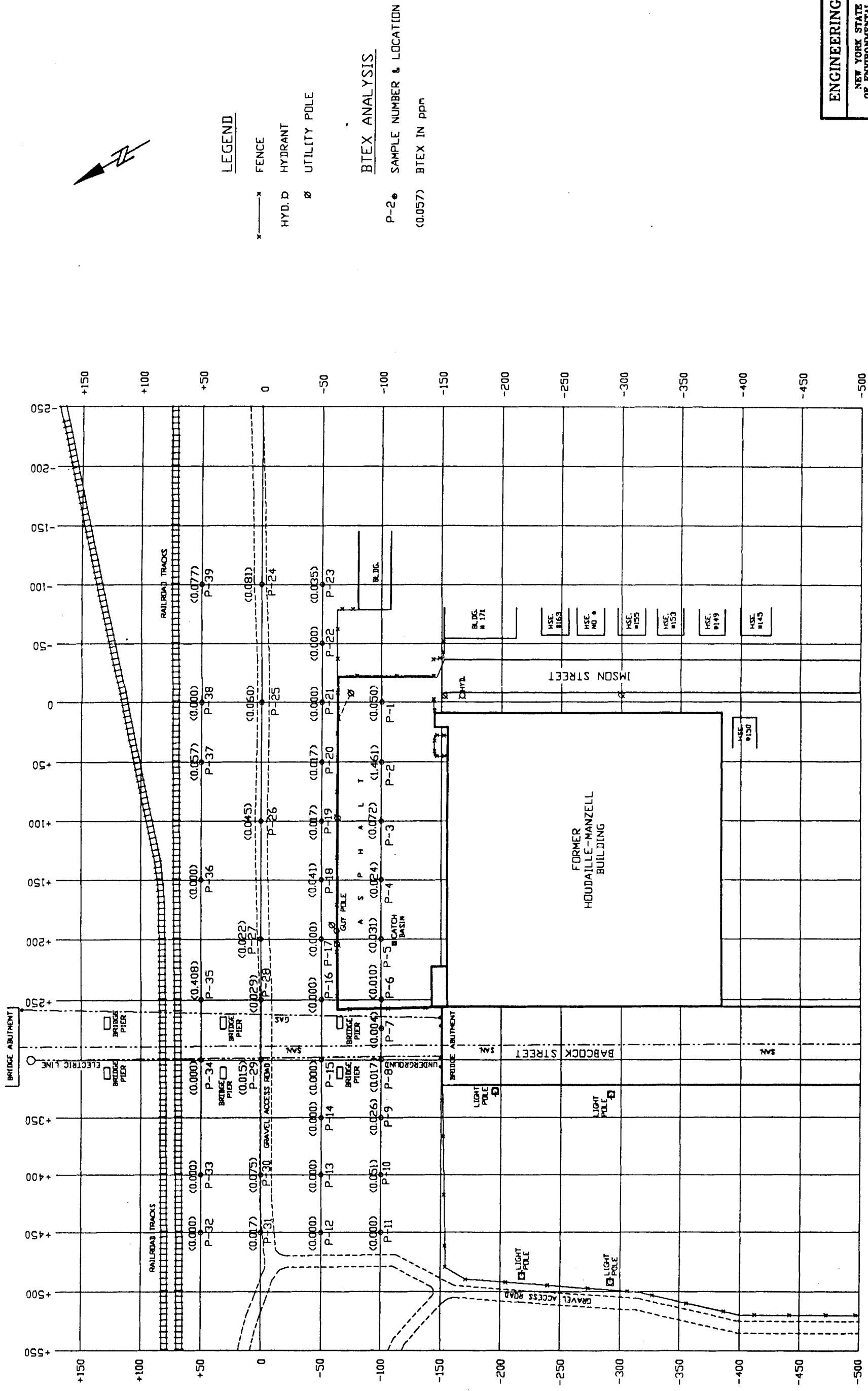
TABLE 4.1  
HOUDAILLE-MANZEL  
SOIL VAPOR SURVEY  
SAMPLE CONCENTRATIONS (ppm)

SAMPLE ID	BENZENE	TOLUENE	ETHYLBENZENE	XYLENES	TOTAL BTEX	# UNKNOWNNS
P-1	ND	0.050	ND	ND	0.050	3
P-2	0.559	0.902	ND	ND	1.461	15
P-2 DUP	0.572	0.900	ND	ND	1.472	15
P-3	0.009	0.063	ND	ND	0.072	10
P-4	ND	0.024	ND	ND	0.024	4
P-5	ND	0.031	ND	ND	0.031	2
P-6	ND	0.010	ND	ND	0.010	8
P-7	ND	0.004	ND	ND	0.004	5
P-8	ND	0.017	ND	ND	0.017	3
P-9	ND	0.026	ND	ND	0.026	2
P-10	ND	0.045	0.006	ND	0.051	7
P-10 DUP	ND	0.192	ND	ND	0.192	5
P-11	ND	ND	ND	ND	0.000	2
P-12	ND	ND	ND	ND	0.000	2
P-13	ND	ND	ND	ND	0.000	4
P-14	ND	ND	ND	ND	0.000	2
P-15	ND	ND	ND	ND	0.000	1
P-16	ND	ND	ND	ND	0.000	3
P-17	ND	ND	ND	ND	0.000	1
P-17 DUP	ND	ND	ND	ND	0.000	1
P-18	ND	0.041	ND	ND	0.041	4
P-19	ND	0.017	ND	ND	0.017	2
P-20	ND	0.017	ND	ND	0.017	1
P-21	ND	ND	ND	ND	0.000	1
P-22	ND	ND	ND	ND	0.000	1
P-23	ND	0.035	ND	ND	0.035	2
P-24	0.060	0.021	ND	ND	0.081	2
P-25	ND	0.060	ND	ND	0.060	3
P-26	0.019	0.026	ND	ND	0.045	4
P-26 DUP	ND	0.029	ND	ND	0.029	4
P-27	ND	0.022	ND	ND	0.022	4
P-28	ND	0.029	ND	ND	0.029	2
P-29	ND	0.015	ND	ND	0.015	3
P-30	ND	0.075	ND	ND	0.075	4
P-31	ND	0.017	ND	ND	0.017	9
P-32	ND	ND	ND	ND	0.000	2
P-33	ND	ND	ND	ND	0.000	2
P-33 DUP	ND	ND	0.007	ND	0.007	4
P-34	ND	ND	ND	ND	0.000	4
P-35	ND	0.045	ND	0.363	0.408	4
P-36	ND	ND	ND	ND	0.000	2
P-37	0.032	0.021	0.004	ND	0.057	1
P-38	ND	ND	ND	ND	0.000	1
P-39	ND	0.042	0.006	0.029	0.077	1

NOTE: All data in parts per million (ppm)

ND = Not detected

FIGURE 4.1



## ENGINEERING-SCIENCE

NEW YORK STATE DEPARTMENT  
OF ENVIRONMENTAL CONSERVATION  
RI/FS

**FIGURE 4.1**  
**HOUDAILLE-MANZEL SITE**  
**SOIL VAPOR SURVEY**

A horizontal scale bar with four segments. The first segment is labeled '0', the second '40', the third '80', and the fourth '120 FT'.



area. As a result, it appears the contamination does not seem to be emanating from a central point.

Some other tentatively identified compounds which were detected during the soil vapor survey include: vinyl chloride (16 detects), methylene chloride (4 detects), 1,1,1-trichloroethane (4 detects), trichloroethylene (2 detects) and tetrachloroethylene (4 detects). It is important to note that grid points 2 and 3 in the soil vapor survey seem to have the most contaminants present. As a result, this area was identified for soil samples during the Phase I field investigation. The numbered grid points are shown on Figure 4.1 while the tables containing the concentrations and locations described in this section can be found in Table 4.1.

#### **4.1.2 Lead/Copper XRF Screening Results**

The average concentrations in a typical soil for lead and copper range from < 10 to 700 ppm and 1 to 700 ppm respectively (USGS, 1984). Copper levels at the site routinely exceeded the average concentrations of copper in typical soil. The copper XRF concentrations in the soil ranged from 0 to >11,000 ppm. Of the approximately 63 soil samples taken, the copper XRF concentrations detected in the samples exceeded the levels of copper (up to 700 ppm) in a typical soil for 41 of the samples.

Lead levels at the site exceeded the average lead concentration in typical soil (700 ppm) for 21 of the approximately 63 soil samples with XRF concentrations ranging from 0 to 1,836 ppm.

The areas where the XFR detects seem to be spatially grouped together in terms of location within the grid, are also the areas where the highest concentrations are located. These areas are under the Babcock Street bridge overpass, the end of Imson Street, as well as the asphalt parking lot and the lot's periphery. All of the data discussed in this section can be found in Table 4.2.

#### **4.1.3 PCB Field Screening Results**

During the field screening test there were only eight detects for PCBs out of the approximately sixty samples tested. Three were estimated to be in the range from 0 - 50 ppm, and the other five are listed only as positive detects (>50 ppm). The eight detects are once again spaced far apart having points where no PCBs were detected between them. This is significant because it points to the fact that there is no central source or location from which the PCBs seem to be emanating.

### **4.2 PHASE 1 FIELD INVESTIGATION RESULTS**

#### **4.2.1 Laboratory Soil Results**

The laboratory soil results are summarized in Table 4.3. Copper concentrations ranged from non-detect to 32,500 ppm. Lead was detected at concentrations ranging from non-detect to 8,120 ppm. Mercury concentrations ranged from non-detect to 3 ppm. PCBs were also detected with aroclor 1242 concentrations ranging from non-detect to 390 ppb, aroclor 1254 (non-detect to 300 ppb) and aroclor 1260 (non-detect to 2900 ppb). Volatiles of note that were detected were toluene and

Table 4.2  
 HOUDAILLE-MANZEL  
 NYSDEC STANDBY SITE # 9-15-037  
 SITE SCREENING DATA  
 PCB, COPPER, LEAD, AND BTEX ANALYSES

SAMPLE I.D. NUMBER (X,Y)	SAMPLE DEPTH (FEET)	PCB ANALYSIS (1)	COPPER ANALYSIS (PPM)	LEAD ANALYSIS (PPM)	BTEX ANALYSIS (PPM)	SOIL TYPE (2)	COMMENTS
-350,0	2.0	-	7,946.0	0.0	NT	Br C/S	
-250,0	1.0	-	0.0	85.9	NT	Br C/S	
-200,0	1.0	NT	478.0	155.0	NT	Br C/S	Clay at 1 foot
-150,0	1.0	-	>11,000	1,836.0	NT	Br C/S	Oil layer at 8 inches
-150,0	1.5	-	3,990.0	225.0	NT	FILL	Clay at 1.5 feet
-150,350	2.0	+	1,137.0	171.5	NT	FILL	
-150,350	4.0	-	0.0	0.0	NT	FILL	Clay at 4 feet
-150,400	2.0	-	305.6	0.0	NT	FILL	Very rocky
-150,450	1.0	+	834.6	0.0	NT	FILL	
-150,500	1.5	+	1,871.0	230.6	NT	FILL	
-150,550	2.0	-	0.0	706.3	NT	FILL	XMET Surface: Cu=0, Pb=443 ppm
-100,-50	1.0	-	3,994.0	528.2	NT	FILL	Wet at 6 inches
-100,-50	2.0	-	516.0	0.0	NT	CLAY	
-100,0	.75	0-50 ppm	2,366.0	1,740.0	NT	FILL	
-100,0	1.5	-	5,670.0	0.0	0.050	Br S/G	Parking lot
-100,50	2.5	NT	NT	NT	1.461		
-100,100	2.0	-	0.0	0.0	0.072	FILL	
-100,100	4.0	-	0.0	0.0	NT	FILL	
-100,150	2.5	NT	NT	NT	0.024		
-100,200	2.0	-	0.0	0.0	0.031	FILL	
-100,200	4.0	-	0.0	0.0	NT	FILL	
-100,250	2.5	NT	NT	NT	0.010		
-100,275	2.0	-	949.7	167.9	NT	FILL & Gr S/G	
-100,300	1.0	-	813.9	671.1	0.004	FILL	

Table 4.2 (CON'T.)  
 HOUDAILLE-MANZEL  
 NYSDEC STANDBY SITE # 9-15-037  
 SITE SCREENING DATA  
 PCB, COPPER, LEAD, AND BTEX ANALYSES

SAMPLE I.D. NUMBER (X,Y)	SAMPLE DEPTH (FEET)	PCB ANALYSIS (1)	COPPER ANALYSIS (PPM)	LEAD ANALYSIS (PPM)	BTEX ANALYSIS (PPM)	SOIL TYPE (2)	COMMENTS
-100,350	2.0	-	1,163.0	325.5	0.017	FILL	
-100,350	6.5	-	1,371.0	316.6	NT	FILL	Clay at 5.5 feet
-100,400	2.0	NT	NT	NT	0.026		
-100,450	1.0	+	1,339.0	346.5	0.192	GRAVEL FILL	Water at 6 inches, refusal at 1 foot
-100,500	2.0	-	2,483.0	1,099.0	0.000	FILL	Oily sheen on water
-100,500	4.0	+	695.0	157.8	NT	FILL	Clay at 4.5 feet
-100,550	2.0	-	0.0	734.0	NT	FILL	XMET Surface: Cu=0, Pb=501 ppm
-50,-100	2.0	-	2,229.0	412.4	0.081	FILL	
-50,-50	1.5	NT	NT	NT	0.000		
-50,0	2.0	NT	NT	NT	0.000		
-50,50	2.0	-	3,894.0	1,199.0	0.017	FILL	Water at 6 inches
-50,100	2.0	-	3,820.0	1,095.0	0.017	FILL	
-50,150	2.5	NT	NT	NT	0.041		
-50,200	2.0	-	3,441.0	1,058.0	0.000	FILL	
-50,250	0.0	-	275.1	35.6	0.000	FILL	Oily sheen
-50,250	1.5	1-50 ppm	5,703.0	1,541.0	0.000	FILL	Oily sheen
-50,284	2.0	NT*	3,076.0	671.3	NT	FILL	Strong oil odor, hole PID = 12 ppm
-50,300	1.0	NT*	2,203.0	615.0	NT	FILL	Strong oil odor
-50,300	2.0	NT*	2,276.0	236.0	NT	FILL	
-50,350	2.0	-	1,496.0	504.9	NT	FILL	
-50,400	2.0	NT	NT	NT	0.000		
-50,450	0.0	-	1,641.0	761.0	0.000	FILL	
-50,500	1.0	-	3,905.0	1,250.0	0.000	FILL	
-50,550	1.0	-	0.0	1,401.0	NT	FILL	XMET Surface: Cu=0, Pb=1, 296 ppm

Table 4.2 (CON'T.)  
 HOUDAILLE-MANZEL  
 NYSDEC STANDBY SITE # 9-15-037  
 SITE SCREENING DATA  
 PCB, COPPER, LEAD, AND BTEX ANALYSES

SAMPLE I.D. NUMBER (X,Y)	SAMPLE DEPTH (FEET)	PCB ANALYSIS (1)	COPPER ANALYSIS (PPM)	LEAD ANALYSIS (PPM)	BTEX ANALYSIS (PPM)	SOIL TYPE (2)	COMMENTS
0,-100	2.0	-	6,252.0	0.0	NT	FILL	
0,-100	4.5	-	652.9	0.0	0.081	Br S/G	Clay at 4.5 feet
0,0	2.0	-	574.0	0.0	0.060	Br S/G	
0,0	4.0	-	1,997.0	483.8	NT	Br S/G	Clay at 6.5 feet
0,50	2.0	-	5,462.0	1,268.0	NT	FILL	
0,100	2.0	-	467	0.0	0.045	FILL & Br S/G	
0,100	3.5	-	1,433.0	43.0	NT	Br S/G	Refusal at 3.5 feet
0,200	2.0	NT	NT	NT	0.022		
0,250	2.0	NT	NT	NT	0.024		
0,279	2.0	-	1,631.0	422.1	NT	FILL	
0,300	2.0	-	2,231.0	530.1	NT	FILL	Hole PID = 1 ppm
0,350	2.0	-	1,121.0	368.7	0.015	FILL	
0,450	2.0	-	1,951.0	974.6	0.075	FILL	
0,450	3.0	-	2,531.0	983.4	NT	FILL	
0,500	1.5	-	2,779.0	676.0	0.017	FILL	
0,500	2.5	-	2,603.0	976.0	NT	FILL	
50,-100	2.0	-	0.0	98.0	0.077	FILL	Water at 2 feet
50,-100	4.0	1-50 ppm	0.0	0.0	NT	FILL	Clay at 4 feet
50,0	2.0	-	0.0	935.1	0.000	FILL	Refusal at 2 feet
50,50	2.5	NT	NT	NT	0.057		
50,100	2.0	-	0.0	963.0	NT	FILL	
50,150	2.0	NT	NT	NT	0.000		
50,200	2.5	-	0.0	417.7	NT	FILL	
50,250	2.5	NT	NT	NT	0.408		

Table 4.2 (CON'T.)  
 HOUDAILLE-MANZEL  
 NYSDEC STANDBY SITE # 9-15-037  
 SITE SCREENING DATA  
 PCB, COPPER, LEAD, AND BTEX ANALYSES

SAMPLE I.D. NUMBER (X,Y)	SAMPLE DEPTH (FEET)	PCB ANALYSIS (1)	COPPER ANALYSIS (PPM)	LEAD ANALYSIS (PPM)	BTEX ANALYSIS (PPM)	SOIL TYPE (2)	COMMENTS
50,300	1.5	-	2,166.0	723.0	NT	FILL	
50,350	2.5	NT	NT	NT	0.000		
50,400	2.0	-	1,912.0	711.1	NT	FILL	
50,450	2.5	NT	NT	NT	0.000		
50,500	2.0	-	3,074.0	1,381.0	0.000	FILL	
50,500	4.0	-	1,282.0	526.0	NT	FILL & CLAY	

(1) PCB ANALYSIS NOTATION

+ = positive

- = negative

NT = not tested

NT\* = could not test due to high oil content

(2) SOIL TYPE NOTATION

FILL = black sand, silt, and gravel (in varying amounts)

Br C/S = brown clay and silt

Br S/G = brown sand and gravel

Gr = gray sand and gravel

Table 4.3  
Analytical Results  
Soil Samples

Analyte	SO-1	SO-2	SO-3	SO-4	SO-5	SO-6	SO-7	SO-8	SO-9	SO-10	SO-11	SO-12	SO-13	SO-14	SO-15	SO-20	SO-23	SO-24
Inorganics																		
Aluminum (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Antimony (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Beryllium (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calcium (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chromium (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cobalt (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper (ppm)	-	208 J	4420 J	11100 J	2140 J	189 J	276 J	-	-	208 J	72.2 J	422 J	-	-	69.7 J	221 J	236 J	217 J
Cyanide (ppm)	0.72	0.82	0.51 U	2.8	1.3	1	1.8	1	0.76	0.73	0.45 U	0.93	0.76	6	0.9	-	-	-
Iron (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lead (ppm)	-	842	2560	1340	994	250	276	-	-	842	297	751	-	-	268	574	3920	566
Magnesium (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Manganese (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mercury (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potassium (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silver (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sodium (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PCBs																		
Aroclor 1242 (ppb)	41 U	420 U	50 U	58 U	42 U	47 U	49 U	43 U	44 U	48 U	45 U	45 U	44 U	41 U	43 U	-	-	-
Aroclor 1254 (ppb)	83 U	840 U	300	120 U	84 U	94 U	98 U	86 U	89 U	97 U	89 U	89 U	88 U	82 U	86 U	-	-	-
Aroclor 1260 (ppb)	280	2900	100 U	120 U	84 U	94 U	98 U	86 U	89 U	97 U	89 U	430	88 U	82 U	86 U	-	-	-
VOCs																		
1,1,1-Trichloroethane (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-Methyl-2-Pentanone (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Acetone (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbon Disulfide (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloroform (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Methyl ethyl ketone (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 4.3 (CON'T.)  
Analytical Results  
Soil Samples

Analyte	SO-1	SO-2	SO-3	SO-4	SO-5	SO-6	SO-7	SO-8	SO-9	SO-10	SO-11	SO-12	SO-13	SO-14	SO-15	SO-20	SO-23	SO-24
Methylene Chloride (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tetrachloroethylene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Toluene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trichloroethylene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Xylenes (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Semi-volatile Organics																		
2-Methylnaphthalene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Naphthalene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Acenaphthene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Acenaphthylene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Anthracene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benz(a)anthracene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benz(a)pyrene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benz(b)fluoranthene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benz(g,h,i)perylene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benz(k)fluoranthene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzoic Acid (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bis(2-ethylhexyl)phthalate (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chrysene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dibenzo(a,h)anthracene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dibenzofuran (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Di-n-butyl phthalate (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fluoranthene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fluorene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Indeno(1,2,3-cd)pyrene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phenanthrene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pyrene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EP Toxicity - Metals																		
Total Barium (ug/l)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Cadmium (ug/l)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Chromium (ug/l)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Lead (ug/l)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Mercury (ug/l)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

U = Not detected  
J = Estimated Value  
B = Blank  
R = Rejected Data

Table 4.3 (CON'T.)

## Analytical Results

## Soil Samples

Analyte	SO-25	SO-30	SO-31	SO-32	SO-33	SO-34	SO-35	SO-36	SO-37	SO-38	SO-39	SO-40	SO-41	SO-42	SO-43	SO-44	SO-45	SO-46
<b>Inorganics</b>																		
Aluminum (ppm)	-	-	9020 J	-	4690 J	-	-	-	-	-	-	-	-	-	-	5650 J	-	-
Antimony (ppm)	-	-	3.7 B J	-	1.8 B J	-	-	-	-	-	-	-	-	-	-	9.8 B J	-	-
Arsenic (ppm)	-	-	89 J	-	20.1	-	-	-	-	-	-	-	-	-	-	64.8	-	-
Barium (ppm)	-	-	186	-	86.2	-	-	-	-	-	-	-	-	-	-	373	-	-
Beryllium (ppm)	-	-	1.9	-	0.6 U	-	-	-	-	-	-	-	-	-	-	0.71	-	-
Cadmium (ppm)	-	-	81.8 J	-	32.7 J	-	-	-	-	-	-	-	-	-	-	80 J	-	-
Calcium (ppm)	-	-	7040 B J	-	7700 B	-	-	-	-	-	-	-	-	-	-	10100 J	-	-
Chromium (ppm)	-	-	45.4	-	21.5	-	-	-	-	-	-	-	-	-	-	115	-	-
Cobalt (ppm)	-	-	33.2	-	12.6	-	-	-	-	-	-	-	-	-	-	20.5	-	-
Copper (ppm)	2610 J	15.2 J	524	34.9	109	-	-	-	-	-	-	-	-	-	-	7210	-	2070
Cyanide (ppm)	-	-	0.79	-	0.87	-	-	-	-	-	-	-	-	-	-	3.9	-	-
Iron (ppm)	-	-	166000	-	58000	-	-	-	-	-	-	-	-	-	-	123000	-	-
Lead (ppm)	8120	4.8	1040 J	55.7 J	409 J	-	-	-	-	-	-	-	-	-	-	2080 J	-	536
Magnesium (ppm)	-	-	1670	-	1810	-	-	-	-	-	-	-	-	-	-	1800	-	-
Manganese (ppm)	-	-	977	-	534	-	-	-	-	-	-	-	-	-	-	1070	-	-
Mercury (ppm)	-	-	0.46 J	-	0.16 J	-	-	-	-	-	-	-	-	-	-	1.2 J	-	-
Nickel (ppm)	-	-	81.3	-	29	-	-	-	-	-	-	-	-	-	-	161	-	-
Potassium (ppm)	-	-	1290	-	641	-	-	-	-	-	-	-	-	-	-	794	-	-
Selenium (ppm)	-	-	7.9 R	-	0.59 R	-	-	-	-	-	-	-	-	-	-	1.4 R	-	-
Silver (ppm)	-	-	2.2	-	0.95 B	-	-	-	-	-	-	-	-	-	-	3.1	-	-
Sodium (ppm)	-	-	406 B	-	638	-	-	-	-	-	-	-	-	-	-	386 B	-	-
Thallium (ppm)	-	-	1.4 B J	-	0.71 U J	-	-	-	-	-	-	-	-	-	-	0.85 U	-	-
Vanadium (ppm)	-	-	39.5	-	20.7	-	-	-	-	-	-	-	-	-	-	47.7	-	-
Zinc (ppm)	-	-	851 J	-	174 J	-	-	-	-	-	-	-	-	-	-	2860 J	-	-
<b>PCBs</b>																		
Aroclor 1242 (ppb)	-	-	64 U	230 U	480 U J	-	-	-	-	47 U	50 U	-	46 U	51 U	48 U	54 U	-	46 U
Aroclor 1254 (ppb)	-	-	130 U	460 U	960 U J	-	-	-	-	93 U	99 U	-	93 U	102 U	95 U	240	-	15 J
Aroclor 1260 (ppb)	-	-	130 U	460 U	960 U J	-	-	-	-	93 U	99 U	-	93 U	102 U	95 U	110 U	-	92 U
<b>VOCs</b>																		
1,1,1-Trichloroethane (ppb)	-	-	21 B J	5 U J	6 U J	5 U	6 U J	6 U J	6 U J	-	6 U	6 U J	-	-	-	7 U	-	-
4-Methyl-2-Pentanone (ppb)	-	-	12 U J	11 U J	12 U J	11 U	57 J	11 U J	12 U J	-	12 U	11 U J	-	-	-	14 U J	-	-
Acetone (ppb)	-	-	17 U J	120 B	71 U J	9 U J	12 U J	11 U J	48 U J	-	76 B	9 U J	-	-	-	26 U J	-	-
Benzene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbon Disulfide (ppb)	-	-	6 U J	5 U	6 U J	5 U	6 U J	6 U J	6 U J	-	8	6 U J	-	-	-	7 U	-	-
Chloroform (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Methyl ethyl ketone (ppb)	-	-	12 U J	11 U J	10 U J	11 U	12 U J	11 U J	12 U J	-	12 J	11 U J	-	-	-	14 U	-	-



Table 4.3 (CONT.)

## Analytical Results

## Soil Samples

Analyte	SO-25	SO-30	SO-31	SO-32	SO-33	SO-34	SO-35	SO-36	SO-37	SO-38	SO-39	SO-40	SO-41	SO-42	SO-43	SO-44	SO-45	SO-46
Methylene Chloride (ppb)	-	-	2 U J	5 U	2 U J	5 U	8 U J	1 U J	4 U J	-	6 U	6 U J	-	-	-	14 B	-	-
Tetrachloroethylene (ppb)	-	-	6 U J	21 J	5 U J	5 U	8 U J	6 U J	8 U J	-	6 U	6 U J	-	-	-	7 U J	-	-
Toluene (ppb)	-	-	6 U J	1 U J	11 J	5 U	8 U J	1 U J	1 U J	-	0.7 J	8 U J	-	-	-	7 U J	-	-
Trichloroethylene (ppb)	-	-	6 U J	1 U J	7 U J	5 U	8 U J	6 U J	6 U J	-	6 U	6 U J	-	-	-	7 U	-	-
Xylenes (ppb)	-	-	6 U J	5 U J	25 J	5 U	6 U J	6 U J	6 U J	-	6 U	6 U J	-	-	-	7 U J	-	-
<b>Semi-volatile Organics</b>																		
2-Methylnaphthalene (ppb)	-	-	380 J	-	15000 U	-	-	-	-	-	-	-	-	-	-	550 J	-	-
Naphthalene (ppb)	-	-	350 J	-	15000 U	-	-	-	-	-	-	-	-	-	-	1500 J	-	-
Acenaphthene (ppb)	-	-	1600 U	-	15000 U	-	-	-	-	-	-	-	-	-	-	2700	-	-
Acenaphthylene (ppb)	-	-	1600 U	-	15000 U	-	-	-	-	-	-	-	-	-	-	830 J	-	-
Anthracene (ppb)	-	-	250 J	-	15000 U	-	-	-	-	-	-	-	-	-	-	5000	-	-
Benzo(a)anthracene (ppb)	-	-	1600	-	15000 U	-	-	-	-	-	-	-	-	-	-	17000	-	-
Benzo(a)pyrene (ppb)	-	-	220 J	-	15000 U	-	-	-	-	-	-	-	-	-	-	12000	-	-
Benzo(b)fluoranthene (ppb)	-	-	1700	-	15000 U	-	-	-	-	-	-	-	-	-	-	27000	-	-
Benzo(g,h,i)perylene (ppb)	-	-	780 J	-	15000 U	-	-	-	-	-	-	-	-	-	-	4900	-	-
Benzo(k)fluoranthene (ppb)	-	-	710 J	-	15000 U	-	-	-	-	-	-	-	-	-	-	7100	-	-
Benzoic Acid (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bis(2-ethylhexyl)phthalate (ppb)	-	-	250 J	-	1600 J	-	-	-	-	-	-	-	-	-	-	1800 U	-	-
Chrysene (ppb)	-	-	1400 J	-	2000 J	-	-	-	-	-	-	-	-	-	-	13000	-	-
Dibenz(a,h)anthracene (ppb)	-	-	160 J	-	15000 U	-	-	-	-	-	-	-	-	-	-	1400 J	-	-
Dibenzofuran (ppb)	-	-	210 J	-	15000 U	-	-	-	-	-	-	-	-	-	-	1500 J	-	-
Di-n-butyl phthalate (ppb)	-	-	1600 U	-	15000 U	-	-	-	-	-	-	-	-	-	-	5400	-	-
Fluoranthene (ppb)	-	-	2500	-	2600 J	-	-	-	-	-	-	-	-	-	-	7000 D	-	-
Fluorene (ppb)	-	-	1600 U	-	15000 U	-	-	-	-	-	-	-	-	-	-	2700	-	-
Indeno(1,2,3-cd)pyrene (ppb)	-	-	860 J	-	15000 U	-	-	-	-	-	-	-	-	-	-	5900	-	-
Phenanthrene (ppb)	-	-	1800	-	1800 J	-	-	-	-	-	-	-	-	-	-	22000	-	-
Pyrene (ppb)	-	-	3300	-	3100 J	-	-	-	-	-	-	-	-	-	-	6000 D	-	-
<b>EP Toxicity - Metals</b>																		
Total Barium (ug/l)	-	-	170 B	400	-	-	-	-	-	-	-	-	-	-	-	940	600	-
Total Cadmium (ug/l)	-	-	5 U	5 U	-	-	-	-	-	-	-	-	-	-	-	43	25	-
Total Chromium (ug/l)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Lead (ug/l)	-	-	60	50	-	-	-	-	-	-	-	-	-	-	-	160	160	-
Total Mercury (ug/l)	-	-	0.3	0.2	-	-	-	-	-	-	-	-	-	-	-	0.2 U	0.2 U	-

U = Not detected

J = Estimated Value

B = Blank

R = Rejected Data

Table 4.3 (CON'T.)  
Analytical Results  
Soil Samples

Analyte	SO-47	SO-48	SO-49	SO-50	SO-51	SO-52	SO-53	SO-54	SO-55	SO-56	SO-57	SO-58	SO-59*	SO-60*	SO-61	SO-62	SO-63	SO-64
<b>Inorganics</b>																		
Aluminum (ppm)	-	-	-	-	-	-	-	-	-	-	9470 J	-	-	-	13400 J	9830 J	-	-
Antimony (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic (ppm)	-	-	-	-	-	-	-	-	-	-	11.4 J	-	-	-	16.9	19.6	-	-
Barium (ppm)	-	-	-	-	-	-	-	-	-	-	88.7 J	-	-	-	141 J	157 J	-	-
Beryllium (ppm)	-	-	-	-	-	-	-	-	-	-	0.59 U	-	-	-	1.2	1.2	-	-
Cadmium (ppm)	-	-	-	-	-	-	-	-	-	-	2.7	-	-	-	2.6	.32	-	-
Calcium (ppm)	-	-	-	-	-	-	-	-	-	-	22200 J	-	-	-	29500	45000 J	-	-
Chromium (ppm)	-	-	-	-	-	-	-	-	-	-	10.2	-	-	-	12.7	8.8	-	-
Cobalt (ppm)	-	-	-	-	-	-	-	-	-	-	8.5	-	-	-	7.6	10.8	-	-
Copper (ppm)	2020	4060	-	-	-	-	-	-	28.9	122	24 J	40.6	116	146	150 J	128 J	12.8 B J	58.9 J
Cyanide (ppm)	-	-	-	-	-	-	-	-	-	-	0.49	-	-	-	1.1	3.5	-	-
Iron (ppm)	-	-	-	-	-	-	-	-	-	-	25100 J	-	-	-	22800	54100	-	-
Lead (ppm)	584	1830	-	-	-	-	-	-	21.9	326	37.9 J	45.2	753	525	183 J	148 J	18.9 J	55.4 J
Magnesium (ppm)	-	-	-	-	-	-	-	-	-	-	6020	-	-	-	3860	5590	-	-
Manganese (ppm)	-	-	-	-	-	-	-	-	-	-	311 J	-	-	-	618 J	843 J	-	-
Mercury (ppm)	-	-	-	-	-	-	-	-	-	-	0.1 U	-	-	-	2.2	0.63	-	-
Nickel (ppm)	-	-	-	-	-	-	-	-	-	-	22.1	-	-	-	27.2	33	-	-
Potassium (ppm)	-	-	-	-	-	-	-	-	-	-	1210	-	-	-	1100	939	-	-
Selenium (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silver (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sodium (ppm)	-	-	-	-	-	-	-	-	-	-	385 B	-	-	-	315 B	292 B	-	-
Thallium (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium (ppm)	-	-	-	-	-	-	-	-	-	-	33.2 J	-	-	-	24	25.3 J	-	-
Zinc (ppm)	-	-	-	-	-	-	-	-	-	-	55 J	-	-	-	342	244 J	-	-
<b>PCBs</b>																		
Aroclor 1242 (ppb)	46 U	52 U	47 U	54 U	240 U	51 U	51 U	48 U	-	-	47 U	-	390	260	48 U	48 U	47 U	-
Aroclor 1254 (ppb)	49 J	100 U	94 U	34 J	480 U	100 U	100 U	96 U	-	-	94 U	-	140 J	85 J	96 U	96 U	93 U	-
Aroclor 1260 (ppb)	92 U	100 U	94 U	110 U	480 U	100 U	100 U	96 U	-	-	94 U	-	400	390 U	96 U	96 U	93 U	-
<b>VOCs</b>																		
1,1,1-Trichloroethane (ppb)	-	27 U J	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-Methyl-2-Pentanone (ppb)	-	55 U J	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Acetone (ppb)	-	55 U J	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbon Disulfide (ppb)	-	27 U J	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloroform (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Methyl ethyl ketone (ppb)	-	55 U J	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 4.3 (CONT.)

## Analytical Results

## Soil Samples

Analyte	SO-47	SO-48	SO-49	SO-50	SO-51	SO-52	SO-53	SO-54	SO-55	SO-56	SO-57	SO-58	SO-59*	SO-60*	SO-61	SO-62	SO-63	SO-64
Methylene Chloride (ppb)	-	7 B U J	-	-	-	-	-	-	-	-	1 J	-	-	-	3 J	8 J	-	-
Tetrachloroethylene (ppb)	-	27 U J	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Toluene (ppb)	-	9 U J	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trichloroethylene (ppb)	-	41 J	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Xylenes (ppb)	-	27 U J	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>Semi-volatile Organics</b>																		
2-Methylnaphthalene (ppb)	-	-	-	-	-	-	-	-	-	-	1400 U	-	-	-	210 J	170 J	-	-
Naphthalene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Acenaphthene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Acenaphthylene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Anthracene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(a)anthracene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(a)pyrene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(b)fluoranthene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(g,h,i)perylene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(k)fluoranthene (ppb)	-	-	-	-	-	-	-	-	-	-	1400 U	-	-	-	290 J	1600 U	-	-
Benzoic Acid (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bis(2-ethylhexyl)phthalate (ppb)	-	-	-	-	-	-	-	-	-	-	170 J	-	-	-	1600 U	85 J	-	-
Chrysene (ppb)	-	-	-	-	-	-	-	-	-	-	1400 U	-	-	-	260 J	1600 U	-	-
Dibenzo(a,h)anthracene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dibenzofuran (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Di-n-butyl phthalate (ppb)	-	-	-	-	-	-	-	-	-	-	2600	-	-	-	1600 U	1600 U	-	-
Fluoranthene (ppb)	-	-	-	-	-	-	-	-	-	-	1400 U	-	-	-	270 J	160 J	-	-
Fluorene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Indeno(1,2,3-cd)pyrene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phenanthrene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pyrene (ppb)	-	-	-	-	-	-	-	-	-	-	1400 U	-	-	-	300 J	190 J	-	-
<b>EP Toxicity - Metals</b>																		
Total Barium (ug/l)	-	-	-	-	-	-	-	-	-	-	-	190 B	-	-	5 U	-	-	-
Total Cadmium (ug/l)	-	-	-	-	-	-	-	-	-	-	-	5 U	-	-	5 U	-	-	-
Total Chromium (ug/l)	-	-	-	-	-	-	-	-	-	-	-	10 U	-	-	10 U	-	-	-
Total Lead (ug/l)	-	-	-	-	-	-	-	-	-	-	-	50 U	-	-	50	-	-	-
Total Mercury (ug/l)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

\* Sewer Sediment Sample

U = Not detected

J = Estimated Value

B = Blank

R = Rejected Data

Table 4.3 (CON'T.)  
Analytical Results  
Soil Samples

Analyte	SO-65	SO-66	SO-67	SO-68	SO-69	SO-70	SO-71	SO-72	SO-73	SO-74	SO-75	SO-76	SO-77	SO-78
<b>Inorganics</b>														
Aluminum (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Antimony (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Beryllium (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calcium (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chromium (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cobalt (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper (ppm)	109 J	110 J	89.8 J	92.2 J	32500 J	154	11.6	8.1	27.7	-	-	-	-	-
Cyanide (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lead (ppm)	175 J	215 J	134 J	6.1 U J	3490 J	135	28.6	19.8	21.2	-	-	-	-	-
Magnesium (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Manganese (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mercury (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potassium (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silver (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sodium (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc (ppm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>PCBs</b>														
Aroclor 1242 (ppb)	-	52 U	-	50 U	-	-	48 U	49 U	-	-	-	-	-	-
Aroclor 1254 (ppb)	-	100 U	-	100 U	-	-	96 U	98 U	-	-	-	-	-	-
Aroclor 1260 (ppb)	-	100 U	-	100 U	-	-	96 U	98 U	-	-	-	-	-	-
<b>VOCs</b>														
1,1,1-Trichloroethane (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-Methyl-2-Pentanone (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Acetone (ppb)	-	-	-	-	-	-	12 U J	22 J	-	38 J	59 J	84 J	33 J	7 U
Benzene (ppb)	-	-	-	-	-	-	6 U	6 U	-	1 J	6 U	7 U	-	-
Carbon Disulfide (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloroform (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Methyl ethyl ketone (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Sample 4.5 (CON-14),  
Analytical Results  
Soil Samples

Analyte	SO-65	SO-66	SO-67	SO-68	SO-69	SO-70	SO-71	SO-72	SO-73	SO-74	SO-75	SO-76	SO-77	SO-78
Methylene Chloride (ppb)	5 J	-	-	-	-	-	-	6 UR	6 UR	-	0.7 JR	6 UR	3 JR	0.9 JR
Tetrachloroethylene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Toluene (ppb)	-	-	-	-	-	-	-	6 U	6 U	-	0.8 J	6 U J	7 U J	7 U J
Trichloroethylene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Xylenes (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Semi-volatile Organics														
2-Methylnaphthalene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Naphthalene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Acenaphthene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Acenaphthylene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Anthracene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(a)anthracene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(a)pyrene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(b)fluoranthene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(g,h,i)perylene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(k)fluoranthene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzoic Acid (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bis(2-ethylhexyl)phthalate (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chrysene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dibenzo(a,h)anthracene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dibenzofuran (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Di-n-butyl phthalate (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fluoranthene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fluorene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Indeno(1,2,3-cd)pyrene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phenanthrene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pyrene (ppb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EP Toxicity - Metals														
Total Barium (ug/l)	-	-	-	-	-	1590	-	-	-	-	-	-	-	-
Total Cadmium (ug/l)	-	-	-	-	-	19	-	-	-	-	-	-	-	-
Total Chromium (ug/l)	-	-	-	-	-	58	-	-	-	-	-	-	-	-
Total Lead (ug/l)	-	-	-	-	-	360	-	-	-	-	-	-	-	-
Total Mercury (ug/l)	-	-	-	-	-	-	-	-	-	-	-	-	-	-

U = Not detected  
J = Estimated Value  
B = Blank  
R = Rejected Data

Table 4.3 (CON'T.)  
Analytical Results  
Groundwater Samples

Analyte	WASHBLANK	MW-1	MW-2	MW-3	MW-4	MW-5 DUP
<b>Inorganics</b>						
Aluminum (ppm)	54 B J	7930 J	9250 J	-	-	5350 J
Antimony (ppm)	-	-	-	-	-	-
Arsenic (ppm)	5 U J	5 U J	10 J	-	-	5 U J
Barium (ppm)	50 U	148 B	167 B	-	-	120B
Beryllium (ppm)	-	-	-	-	-	-
Cadmium (ppm)	5 U	10	8	-	-	8
Calcium (ppm)	260 B J	60000	386 B J	-	-	204000 J
Chromium (ppm)	10 U J	16 J	44 J	-	-	15 J
Cobalt (ppm)	20 U	20 U	22 B	-	-	20 U
Copper (ppm)	10 U	45 J	163 J	41 J	41 J	47 J
Cyanide (ppm)	-	-	-	-	-	-
Iron (ppm)	34 B J	36700 J	39000 J	-	-	29700 J
Lead (ppm)	3 B J	43 J	430 J	48 J	11 J	41 J
Magnesium (ppm)	300 R	25900 J	44000 J	-	-	24800 J
Manganese (ppm)	5U	2520	5160	-	-	2360
Mercury (ppm)	0.2 U J	0.4 J	3 J	-	-	0.2 U J
Nickel (ppm)	40 U J	120 J	390 J	-	-	100 J
Potassium (ppm)	300 R	8830 J	14500 J	-	-	8730 J
Selenium (ppm)	-	-	-	-	-	-
Silver (ppm)	-	-	-	-	-	-
Sodium (ppm)	605 B J	57800	80000 J	-	-	58300 J
Thallium (ppm)	-	-	-	-	-	-
Vanadium (ppm)	-	-	-	-	-	-
Zinc (ppm)	10 U J	179 J	284 J	-	-	135 J
<b>PCBs</b>						
Aroclor 1242 (ppb)	-	-	-	-	-	-
Aroclor 1254 (ppb)	-	-	-	-	-	-
Aroclor 1260 (ppb)	-	-	-	-	-	-
<b>VOCs</b>						
1,1,1-Trichloroethane (ppb)	-	-	-	-	-	-
4-Methyl-2-Pentanone (ppb)	-	-	-	-	-	-
Acetone (ppb)	10 B	7 B J	10 U	20 B	22 B	10 U
Benzene (ppb)	5 U	5 U	5 U	5	5 U	5 U
Carbon Disulfide (ppb)	-	-	-	-	-	-
Chloroform (ppb)	3 J	5 U	5 U	0.6 J	5 U	5 U
Methyl ethyl ketone (ppb)	-	-	-	-	-	-
Methylene Chloride (ppb)	-	-	-	-	-	-

Table 4.3 (CON'T.)  
Analytical Results  
Groundwater Samples

Analyte	WASHBLANK	MW-1	MW-2	MW-3	MW-4	MW-5 DUP
Tetrachloroethylene (ppb)	-	-	-	-	-	-
Toluene (ppb)	0.5 B J	0.6 B J	0.7 J	0.9 B J	1 B J	0.8 B J
Trichloroethylene (ppb)	-	-	-	-	-	-
Xylenes (ppb)	-	-	-	-	-	-
Semi-volatile Organics						
2-Methylnaphthalene (ppb)	-	-	-	-	-	-
Naphthalene (ppb)	-	-	-	-	-	-
Acenaphthene (ppb)	-	-	-	-	-	-
Acenaphthylene (ppb)	-	-	-	-	-	-
Anthracene (ppb)	-	-	-	-	-	-
Benzo(a)anthracene (ppb)	-	-	-	-	-	-
Benzo(a)pyrene (ppb)	-	-	-	-	-	-
Benzo(b)fluoranthene (ppb)	-	-	-	-	-	-
Benzo(g,h,i)perylene (ppb)	-	-	-	-	-	-
Benzo(k)fluoranthene (ppb)	-	-	-	-	-	-
Benzoic Acid (ppb)	50 U	62 U	3 J	-	-	52 U
Bis(2-ethylhexyl)phthalate (ppb)	-	-	-	-	-	-
Chrysene (ppb)	-	-	-	-	-	-
Dibenzo(a,h)anthracene (ppb)	-	-	-	-	-	-
Dibenzofuran (ppb)	-	-	-	-	-	-
Di-n-butyl phthalate (ppb)	-	-	-	-	-	-
Fluoranthene (ppb)	-	-	-	-	-	-
Fluorene (ppb)	-	-	-	-	-	-
Indeno(1,2,3-cd)pyrene (ppb)	-	-	-	-	-	-
Phenanthrene (ppb)	-	-	-	-	-	-
Pyrene (ppb)	-	-	-	-	-	-
EP Toxicity - Metals						
Total Barium (ug/l)	-	-	-	-	-	-
Total Cadmium (ug/l)	-	-	-	-	-	-
Total Chromium (ug/l)	-	-	-	-	-	-
Total Lead (ug/l)	-	-	-	-	-	-
Total Mercury (ug/l)	-	-	-	-	-	-

U = Not detected

J = Estimated Value

B = Blank

R = Rejected Data

\*\* - MW-5 is a duplicate sample of

xylene, ranging from non-detect to 11 ppb for toluene and non-detect to 25 ppb for xylene.

#### **4.2.2 Laboratory vs. XRF Results**

A total of 63 samples were collected for XRF lead and copper analysis. These 63 samples were dried and sieved prior to analysis to remove the larger particles (greater than #40 sieve), and very small particles (less than #200 sieve). The sieving of the sample is to provide a uniform sample for analysis. Unfortunately, as the site was covered with fill there was very little uniformity in the samples collected. After sieving the sample quantities were reduced by 50% to 90%. The varying sample quantity may have been the cause of differences observed between values obtained from the XRF and the laboratory results.

Comparing XRF lead results with the laboratory lead results found that the XRF results were significantly higher than the analytical results for samples with analytical lead concentrations between 28 ppm and 2000 ppm. The samples analyzed at over 2000 ppm lead also gave the highest XRF lead readings. Most of the samples (3 out of 4) with less than 30 ppm lead read zero on the XRF. Therefore, the XRF was successful in locating the highly contaminated lead areas and the low background lead levels at the site. However, the XRF data did not provide a quantitative correlation with analytical results that would be useful for mapping of the limits of contamination.

Comparing the XRF copper results with the analytical results found that the XRF readings were generally higher than laboratory results. Very highly contaminated copper levels (by lab analyses) were detected with the XRF. However, there were also several false positives (high XRF results which had low corresponding lab results). As a result, the XRF was not as useful for copper screening.

#### **4.2.3 Laboratory vs. Clor-N-Soil Results**

Several positive Clor-N-Soil results were not confirmed by laboratory analyses, particularly positive results indicating over 50 ppm PCBs west of the Babcock Street bridge and north of the Boy's Club Field. These positive PCB results may be attributable to road salt from the Babcock Street bridge. However, it should also be noted that all but one of the PCB levels detected at the site by laboratory analysis were less than 0.5 ppm which is below the level of detection by the Clor-N-Soil test kit.

#### **4.2.4 EP Toxicity Results**

EP Toxicity Tests were conducted for inorganics to further supplement information on the extent and nature of contamination at the site. None of the samples tested exceeded the maximum concentration per 6NYCRR Part 371. The results of the EP Toxicity Test are summarized in Table 4.4.

#### **4.2.5 Groundwater Analysis**

Groundwater samples were collected during the first round of sampling on October 11, 1990 at all 4 monitoring wells installed by Engineering-Science. These



TABLE 4.4  
HOUDAILLE-MANZEL  
EP TOXICITY  
SAMPLE CONCENTRATIONS (ppm)

CONTAMINANT	STANDARD	31	32	44	45	58	61	70
ARSENIC	5.000	0.005	0.005	U	U	U	U	U
BARIUM	100.000	0.170	0.400	0.940	0.600	0.190	U	1.590
CADMIUM	1.000	U	U	0.043	0.025	U	U	0.019
CHROMIUM	5.000	U	U	U	U	U	U	0.058
LEAD	5.000	0.060	0.050	0.160	0.160	U	0.050	0.360
MERCURY	0.200	0.0003	U	U	U	U	U	U
SELENIUM	1.000	U	0.005	0.005	0.005	0.005	U	U
SILVER	5.000	U	U	U	U	U	U	U

NOTE: All data in parts per million (ppm)

U = Not detected

samples were analyzed for PCBs, metals, and volatile and semi-volatile organics. Analytical results are presented in Table 4.5, and laboratory data summary sheets are provided in Appendix E. Metals were detected in all 4 monitoring wells. No PCBs, or semi-volatile organics were reported above the detection limits.

The TCL metals analysis detected 17 metals in samples from MW-1 and MW-2 including iron at a concentration of 36,700 ppb which is above both the NYS Class GA groundwater standard and Maximum Contaminant Level (MCL) limit of 300 ppb. The following contaminants were also detected at levels at or above the standards in MW-1; cadmium at 10 ppb (equals both standards), lead at 43 ppb which is above the Class GA groundwater standard of 25 ppb, manganese at 2,520 ppb which exceeds the GA standard and MCL of 300 ppb and sodium at 57,800 ppb which is above MCL of 20,000 ppb. The MW-2 groundwater metals analysis found iron at 39,000 ppb, lead at 430 ppb, manganese at 5,160 ppb, and mercury at 3 ppb.

The groundwater analysis of MW-3 and MW-4 detected both copper and lead, with lead at 48 ppb which exceeds only the GA standard of 25 ppb.

Low levels of chloroform, acetone and toluene were detected in some well samples. These same contaminants were also detected in the wash blank, indicating that the samples were contaminated by the specific compounds in the laboratory.

Due to limited upgradient groundwater sampling locations and limited analytical data, it is difficult to determine the source and extent of groundwater contamination at the project site.

Based on the groundwater levels of November 12, 1990 the groundwater flow is toward the southwest. However, it appears that the sewer line which crosses the site under the Babcock Street bridge, is intercepting the shallow groundwater from the site. The flow direction at the site appears to be from MW-1 toward MW-2 which is nearer the sewer line. The contaminant levels of six metals (arsenic, chromium, copper, lead, mercury and nickel) in MW-2 are more than three times greater than MW-1 which may indicate a release of these contaminants from the site.

#### **4.2.6 Air Contamination**

Screening of air quality at the Houdaille-Manzel site was performed at various times in conjunction with soil samplings by the Erie County Department of Environmental Planning and NYSDEC. Air quality was tested in boreholes during two separate sampling events using Draeger tubes and an HNU photoionizer calibrated for detection of benzene.

The results of all Draeger tests for hydrocarbons conducted during a sampling event on October 6, 1982, with one exception were negative. The air in the holes at the time of testing contained less than 3 mg hydrocarbons, 5 ppm carbon tetrachloride and 5 ppm toluene (ECDEP, 1982). The ambient concentrations above the ground surface would be much lower (Brehn 1983).

During the ES site visit on March 8, 1990, a photoionization detector (PID) was used to screen ambient air at the site. Surface readings ranged from 0 to 0.5 ppm which are below the detection level of one ppm for the PID.

TABLE 4.5  
 HOUDAILLE-MANZEL  
 CLP INORGANICS ANALYSIS (WATER)  
 SAMPLE CONCENTRATIONS (ppb)

CONTAMINANT	GA	MCL	WASH BLANK	MW-1	MW-2	MW-3	MW-4	MW-5 DUP
INORGANICS								
ALUMINUM	NS	NS	54.00 B	7930.00 J	9250.00 J			5350.00 J
ARSENIC	25	50	5.00 J	5.00 J	10.00 J			5.00 J
BARIUM	1000	1000	50.00 U	148.00 B	167.00 B			120.00 B
CADMIUM	10	10	5.00 U	10.00	8.00			8.00
CALCIUM	NS	NS	260.00 B	160000.00 J	386.00 B			204000.00 J
CHROMIUM	NS	50	10.00 J	16.00 J	44.00 J			15.00 J
COBALT	NS	NS	20.00 U	20.00 J	22.00 B			20.00
COPPER	1000	1000	10.00 U	45.00 J	163.00 J	41.00 J	41.00 J	47.00 J
IRON	300	300	34.00 B	36700.00 J	39000.00 J			29700.00 J
LEAD	25	50	3.00 J	43.00 J	430.00 J	48.00 J	11.00 J	41.00 J
MAGNESIUM	NS	NS	300.00 R	25900.00 J	44000.00 J			24800.00 J
MANGANESE	300	300	5.00 U	2520.00	5160.00			2360.00
MERCURY	2	2	0.20 J	0.40 J	3.00 J			0.20 J
NICKEL	NS	700	40.00 J	120.00 J	390.00 J			100.00 J
POTASSIUM	NS	NS	300.00 R	8830.00 J	14500.00 J			8730.00 J
SODIUM	NS	20000	605.00 J	57800.00 J	80000.00 J			58300.00 J
ZINC	500	300	10.00 J	179.00 J	284.00 J			135.00 J
SEMIVOLATILE ORGANICS								
BENZOIC ACID			50.00 U	62.00 U	3.00			52.00 U
VOLATILE ORGANICS								
ACETONE			10.00 B	7.00 B	10.00 U	20.00 B	22.00 B	10.00 U
CHLOROFORM			3.00 J	5.00 U	5.00 U	0.60 J	5.00 U	5.00 U
TOLUENE			0.50 B	0.60 B	0.70 J	0.90 B	1.00 B	0.80 B

U = Not detected

\*\* - MW-5 is a duplicate sample of MW-1

B = Blank

J = Estimated value

R = Rejected data

In this recent remedial investigation, soil vapor samples taken from various locations throughout the project site were analyzed using a Photovac 10S50 Portable Gas Chromatograph (GC) with a photoionization detector (PID). The results of the GC analysis are shown in Table 4.1. The surface PID readings taken throughout the field investigation range from 0 to 79 ppm. However, only two of the 39 readings were above 0.4 ppm and those were in an area of old railroad ties.

#### **4.3 COMPARISON WITH RESULTS OF PREVIOUS INVESTIGATIONS**

The Phase I investigation at the Houdaille-Manzel site provided additional data to provide a clearer picture as to the nature and extent of the contamination. In comparing the results of this investigation to the previous investigations, the most notable observation is the difference of PCBs detected in the source material which fell from a high concentration in the previous investigations of 38.1 ppm to only 2.9 ppm in the recent investigation. The comparisons are summarized in Tables 4.6 and 4.7.

Since 1981, over 150 soil samples have been taken from test pits, test borings, surface samples and hand augering locations at depths varying from 0 to 16 feet on the project site. Two sewer sediment samples were also collected. These samples were analyzed for various contaminant compounds including PCBs, metals and organics. The analytical results for those compounds detected are summarized in Table 4.8. The most commonly found contaminants in previous investigations were PCBs, lead, copper and some volatile and semi-volatile organics.

In these previous investigations, PCBs were detected in soil under the Babcock Street bridge at levels up to 38 ppm (DEP 8/19/81) and between the former plant and Imson Street at levels up to 25 ppm (DEP 10/6/82) (Figure 4.2). However, during the more recent investigation, the maximum level of PCBs detected was 2.9 ppm (SO-2) at a depth of 0 to 6 inches along Imson Street. PCBs were also detected in one sample near the Babcock Street Bridge at a concentration of 0.43 ppm (SO-50) at a depth of 0 to 6 inches. In the adjacent Boys Club Field PCBs were detected at 0.034 ppm (in the northwest corner) at a depth of 0 to 24 inches. Both sewer sediment samples detected PCBs at 0.345 ppm (SO-60) upgradient of the site and 0.530 ppm (SO-59) downgradient of the site. A possible explanation for this reduction in PCB concentrations is natural or biological degradation and/or removal by groundwater. New York State Department of Environmental Conservation (NYSDEC) regulations (6NYCRR Part 371, Section 371.4(c)) consider all solid wastes containing > 50 ppm of PCBs a listed hazardous waste. Soil samples obtained to date indicate a maximum soil contamination level below 50 ppm.

Lead was detected in soil under the Babcock Street bridge at levels up to 2,000 ppm in the previous investigations and 3,920 ppm (SO-23) in this investigation. Lead was also detected between the former plant and Imson Street at levels up to 2,990 ppm in the previous investigations and 8,120 ppm (SO-25) in this investigation (Figure 4.3). Information from the United States Geological Survey indicates that the normal range for lead in soil is <10-700 ppm (USGS, 1984). This site is located

**Table 4.6**  
**SUMMARY OF PREVIOUS SOURCE MATERIAL ANALYTICAL RESULTS**  
**HOUDAILLE-MANZEL SITE (DETECTED PARAMETERS ONLY)**

Analyte	Range of Concentrations in Soil Samples	Unit	Avg. Range of Concentrations in a Typical Soil	Unit
<u>Inorganic Constituents:</u>				
Arsenic	<0.002-23	ppm	0.1-100	ppm
Barium	0.8-23	ppm	10-500	ppm
Cadmium	ND-96.5	ppm	0.01-7	ppm
Chromium	0.02-386	ppm	1-2000	ppm
Copper	ND-8,400	ppm	1-700	ppm
Iron	67-190,000	ppm	100->100,000	ppm
Lead	ND-3,400	ppm	<10-700	ppm
Mercury	ND-<2.5	ppm	0.02-0.6	ppm
Nickel	ND-702	ppm	<5-7000	ppm
Selenium	0.003-5.6	ppm	<0.1-5	ppm
Silver	0.02-24	ppm	0.1-5	ppm
<u>PCBs</u>	ND-38.1	ppm		ppm
<u>Organic Constituents:</u>				
Acenaphthalene	ND-16.0	ppm		
Acenaphthene	ND-1.4	ppm		
Acetone	ND-0.19	ppm		
Anthracene	ND-4.0	ppm		
Benzene	ND-21.0	ppm		
Benzo(a)anthracene	0.37-14.0	ppm		
Benzo(a)pyrene	0.28-18.0	ppm		
Benzo(b)fluoranthene	2.4-3.3	ppm		
Benzo(k)fluoranthene	2.4-3.3	ppm		
Benzo(j)fluoranthene	700-1000	ppm		
Benzo(g,h,i)perylene	ND-18.0	ppm		
Carbontetrachloride	ND	ppm		
Chloroform	ND-425.5	ppm		
Chrysene	0.37-10.0	ppm		
Delta-BHC	ND	ppm		
Dibenzofuran	ND-1.9	ppm		
1,8-Dimethylnaphthalene	ND-325.0	ppm		
Di-n-butyl phthalate	ND-6.0	ppm		
Ethybenze	ND-12.0	ppm		
Fluranthene	0.65-30.0	ppm		
Fluorene	ND-1.9	ppm		
Fluorotrichloromethane	ND-1.9	ppm		
Indeno(1,2,3-cd)pyrene	ND-16.0	ppm		
Methylene chloride	ND-0.38	ppm		
1-Methylnaphthanene	ND-350.0	ppm		
2-Methylnaphthalene	ND-0.28	ppm		
Naphthalene	0.37-4.0	ppm		
PAHs (Total)	176-1053	ppm		
Phenanthrene	0.75-12.0	ppm		
Pyrene	ND-28.0	ppm		
Tetrachloroethene	ND-0.56	ppm		
Toluene	ND-29.0	ppm		
Trichloroethene	ND-0.25	ppm		
Xylene	ND-40.0	ppm		

**NOTES:**

ND - Not Detectable

Table 4.7 SUMMARY OF RECENT SOURCE MATERIAL ANALYTICAL RESULTS HOUDAILLE-MANZEL SITE (DETECTED PARAMETERS ONLY)				
Analyte	Range of Concentrations in Soil Samples	Unit	Range of Concentrations in EP Toxicity Test	Unit
<u>Inorganic Constituents:</u>				
Aluminum	4690-13,400	ppm	ND	ppb
Antimony	ND-9.8B	ppm	N/A	ppb
Arsenic	ND-89.0	ppm	N/A	ppb
Barium	86.2-373.0	ppm	ND-1,590	ppb
Beryllium	ND-1.9	ppm	N/A	ppb
Cadmium	2.6-81.8	ppm	ND-43	ppb
Calcium	70,40B-45,000	ppm	N/A	ppb
Cobalt	7.6-33.2	ppm	N/A	ppb
Copper	8.1-32,500	ppm	N/A	ppb
Chromium	8.8-115	ppm	ND-58.0	ppb
Cyanide	ND-3.9	ppm	N/A	ppb
Iron	22,800-166,000	ppm	N/A	ppb
Lead	ND-8,120	ppm	ND-360	ppb
Magnesium	55.7-5,590	ppm	N/A	ppb
Manganese	534-1,800	ppm	N/A	ppb
Mercury	0.16-2.2	ppm	ND-0.30	ppb
Nickel	27.2-161	ppm	N/A	ppb
Potassium	641-1,290	ppm	N/A	ppb
Selenium	ND	ppm	ND	ppb
Silver	ND-3.1	ppm	ND	ppb
Sodium	2,928-638	ppm	N/A	ppb
Thallium	ND-1.48	ppm	N/A	ppb
Vanadium	20.7-47.7	ppm	N/A	ppb
Zinc	174-2,860	ppm	N/A	ppb

NOTES:

ND - Not Detectable

N/A - Not Available

B - Analyte Found in Blank as well as Sample

J - Estimated Value

Table 4.7 (Continued) SUMMARY OF RECENT SOURCE MATERIAL ANALYTICAL RESULTS HOUDAILLE-MANZEL SITE (DETECTED PARAMETERS ONLY)		
Analyte	Range of Concentrations in Soil Samples	Unit
PCBs	ND-2900	ppb
<u>Volatile Organics:</u>		
Acetone	ND-120B	ppb
Carbon Disulfide	ND-8	ppb
Chlorobenzene	ND-0.8J	ppb
Ethylbenzene	ND-2J	ppb
4-Methyl-2-Pentanone	ND-57	ppb
Methyl Ethyl Ketone	ND-12J	ppb
Methylene Chloride	ND-14B	ppb
Tetrachloroethylene	ND-21	ppb
Toluene	ND-11J	ppb
1,1,1-Trichloroethane	ND-218	ppb
Trichloroethylene	ND-41	ppb
<u>Semi-volatile Organics:</u>		
2-Methylnaphthalene	ND-550J	ppb
Naphthalene	ND-1,500J	ppb
Acenaphthylene	ND-2,700J	ppb
Anthracene	ND-5,000J	ppb
Benzo(a)anthracene	ND-17,000	ppb
Benzo(a)pyrene	ND-12,000	ppb
Benzo(b)fluoranthene	ND-27,000	ppb
Benzo(g,h,i)perylene	ND-4,900	ppb
Benzo(k)fluoranthene	ND-7,100	ppb
Bis(2-ethylhexyl)phthalate	ND-250J	ppb
Chrysene	14,000-13,000	ppb
Di-n-butyl phthalate	ND-5,400	ppb
Dibenzo(a,h)anthracene	ND-1,400	ppb
Dibenzofuran	ND-1,500J	ppb
Fluoranthene	160J-33,000E	ppb
Fluorene	ND-2,700	ppb
Indeno(1,2,3-cd)pyrene	ND-5,900	ppb
Phenanthrene	260J-22,000	ppb
Pyrene	190J-35,000E	ppb

NOTES:

ND - Not Detectable

N/A - Not Available

B - Analyte Found in Blank as well as Sample

J - Estimated Value

Table 4.8  
Houdaille-Manzel  
Summary of Laboratory Detects

Analyte	Range of Contaminants Soil	Range of Contaminants Water
<b>Inorganics</b>		
Aluminum (ppm)	4690 J – 13400 J	54 BJ – 9250 J
Antimony (ppm)	1.8 BJ – 9.8 BJ	-
Arsenic (ppm)	11.4 – 89 J	U – 10 J
Barium (ppm)	86.2 – 373	U – 167 B
Beryllium (ppm)	U – 1.9	-
Cadmium (ppm)	0.32 – 81.8 J	U 10
Calcium (ppm)	7040 BJ – 45000 J	260 BJ – 204000 J
Chromium (ppm)	8.8 – 115	U – 44 J
Cobalt (ppm)	7.6 – 33.2	U – 22 B
Copper (ppm)	8.1 – 32500 J	U – 163 J
Cyanide (ppm)	U – 6	-
Iron (ppm)	22800 – 166000	34 BJ – 39000 J
Lead (ppm)	4.8 – 8120	3 BJ – 430 J
Magnesium (ppm)	1670 – 6020	300 R – 44000 J
Manganese (ppm)	311 J – 1070	U – 5160
Mercury (ppm)	U – 2.2	U – 3 J
Nickel (ppm)	22.1 – 161	U – 390 J
Potassium (ppm)	641 – 1290	300 R – 14500 J
Selenium (ppm)	0.59 R – 7.9 R	-
Silver (ppm)	0.95 B – 3.1	-
Sodium (ppm)	292 B – 638	605 BJ – 80000 J
Thallium (ppm)	0.71 UJ – 1.4 BJ	-
Vanadium (ppm)	20.7 – 47.7	-
Zinc (ppm)	55 J – 2860 J	U – 284 J
<b>PCBs</b>		
Aroclor 1016 (ppb)	U	-



Table 4.8 (cont'd)  
Houdaille-Manzel  
Summary of Laboratory Detects

Analyte	Range of Contaminants Soil	Range of Contaminants Water
Aroclor 1221 (ppb)	U	-
Aroclor 1232 (ppb)	U	-
Aroclor 1242 (ppb)	U - 390	-
Aroclor 1248 (ppb)	U	-
Aroclor 1254 (ppb)	U - 300	-
Aroclor 1260 (ppb)	U - 2900	-
VOCs		
1,1,1-Trichloroethane (ppb)	U - 21 BJ	-
4-Methyl-2-Pentanone (ppb)	U - 57 J	-
Acetone (ppb)	U - 120 B	U - 22 B
Benzene (ppb)	U - 1 J	U - 5
Carbon Disulfide (ppb)	U - 8	-
Chloroform (ppb)	-	U - 3 J
Methyl ethyl ketone (ppb)	U - 12 J	-
Methylene Chloride (ppb)	U - 14 B	-
Tetrachloroethylene (ppb)	U - 21 J	-
Toluene (ppb)	U - 11 J	0.5 BJ - 1 BJ
Trichloroethylene (ppb)	U - 41 J	-
Xylenes (ppb)	U - 25 J	-
Semi-volatile Organics		
2-Methylnaphthalene (ppb)	U - 550 J	-
Naphthalene (ppb)	U - 1500 J	-
Acenaphthene (ppb)	U - 2700	-
Acenaphthylene (ppb)	U - 830 J	-
Anthracene (ppb)	U - 5000	-
Benzo(a)anthracene (ppb)	U - 17000	-

Table 4.8 (cont'd)  
Houdaille-Manzel  
Summary of Laboratory Detects

Analyte	Range of Contaminants Soil	Range of Contaminants Water
Benzo(a)pyrene (ppb)	U - 12000	-
Benzo(b)fluoranthene (ppb)	U - 27000	-
Benzo(g,h,i)perylene (ppb)	U - 4900	-
Benzo(k)fluoranthene (ppb)	U - 7100	-
Benzoic Acid (ppb)	-	U - 3 J
Bis(2-ethylhexyl)phthalate (ppb)	85 J - 1600 J	-
Chrysene (ppb)	U - 13000	-
Dibenzo(a,h)anthracene (ppb)	U - 1400 J	-
Dibenzofuran (ppb)	U - 1500 J	-
Di-n-butyl phthalate (ppb)	U - 5400	-
Fluoranthene (ppb)	160 J - 47000 DJ	-
Fluorene (ppb)	U - 2700	-
Indeno(1,2,3-cd)pyrene (ppb)	U - 5900	-
Phenanthrene (ppb)	U - 22000	-
Pyrene (ppb)	U - 36000 DJ	-
EP Toxicity - Metals		
Total Barium (ug/l)	U - 1590	-
Total Cadmium (ug/l)	U - 43	-
Total Chromium (ug/l)	U - 58	-
Total Lead (ug/l)	U - 360	-
Total Mercury (ug/l)	U - 0.3	-

U = Not detected

J = Estimated Value

B = Blank

R = Rejected Data

FIGURE 4.2

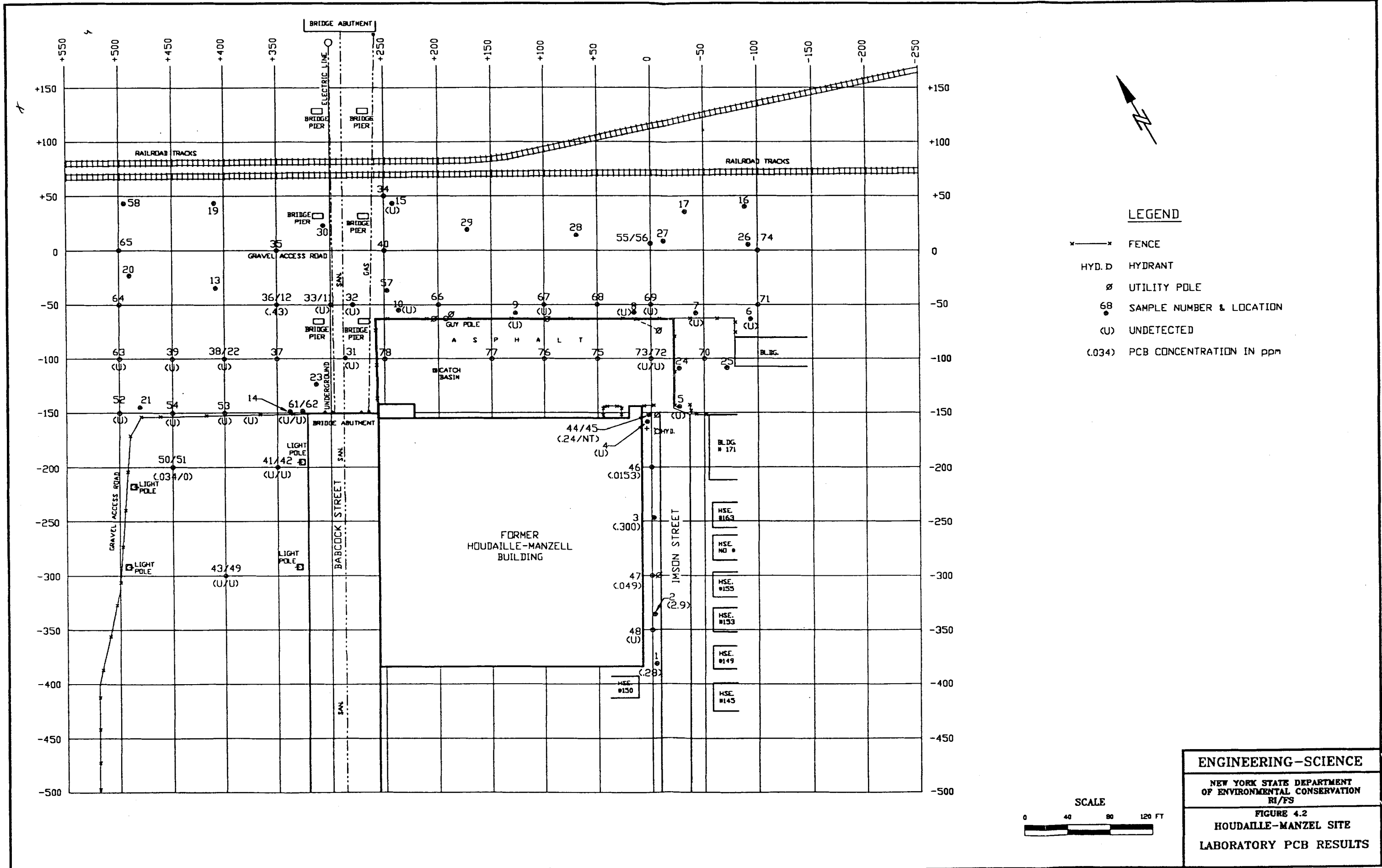
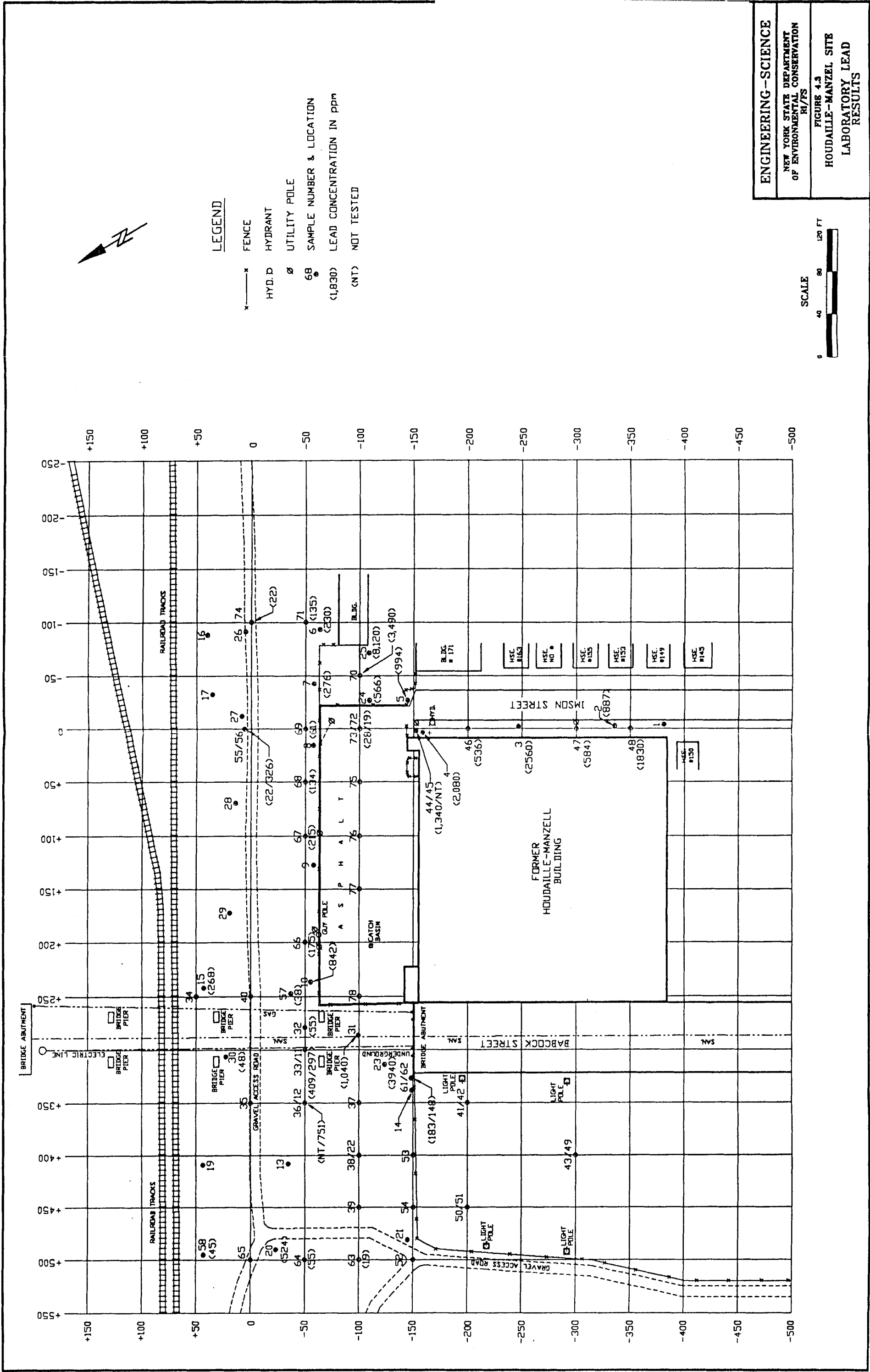


FIGURE 4.3



in a heavily industrialized area, close to a major highway, and scrap metal was found at some locations on site. As a result of the proximity to the highway, background lead levels may be somewhat higher than the normal range in soil. However, lead is considered a significant contaminant at the site.

Five soil samples were tested for EP Toxicity in the previous investigations (DEC 1/6/84), and only one sample from under the Babcock Street bridge indicated lead levels high enough to be classified as a hazardous waste per 6NYCRR Part 371, Section 371.3(e). Seven more soil samples were tested for EP Toxicity in the more recent investigation, and none of them indicated levels of lead or other metals high enough to be classified as a hazardous waste (Tables 4.4 and 4.8). An earlier internal NYSDEC communication offered the opinion that "overall, the soil samples do not exhibit the characteristics of EP Toxicity" (NYSDEC, 1984). This has been confirmed by the recent investigation.

Copper was detected in soil between the former plant and Imson Street at levels up to 8,400 ppm in the previous investigations and 32,500 ppm (SO-70) in the recent investigation (Figure 4.4). During the recent ES sampling in the yard at the end of Imson Street, copper was detected at the previously mentioned level of 32,500 ppm. The soil in the yard contained many pieces of weathered scrap metal which may have contributed to the elevated concentrations. Information from the USGS indicates that the normal range for copper in soil is 1 to 700 ppm (USGS, 1984). Several soil samples obtained under the Babcock Street bridge also contained copper at levels exceeding this normal range. Copper is also considered a significant contaminant at the site, but is not listed as a hazardous waste per NYSDEC regulations 6NYCRR Part 371.

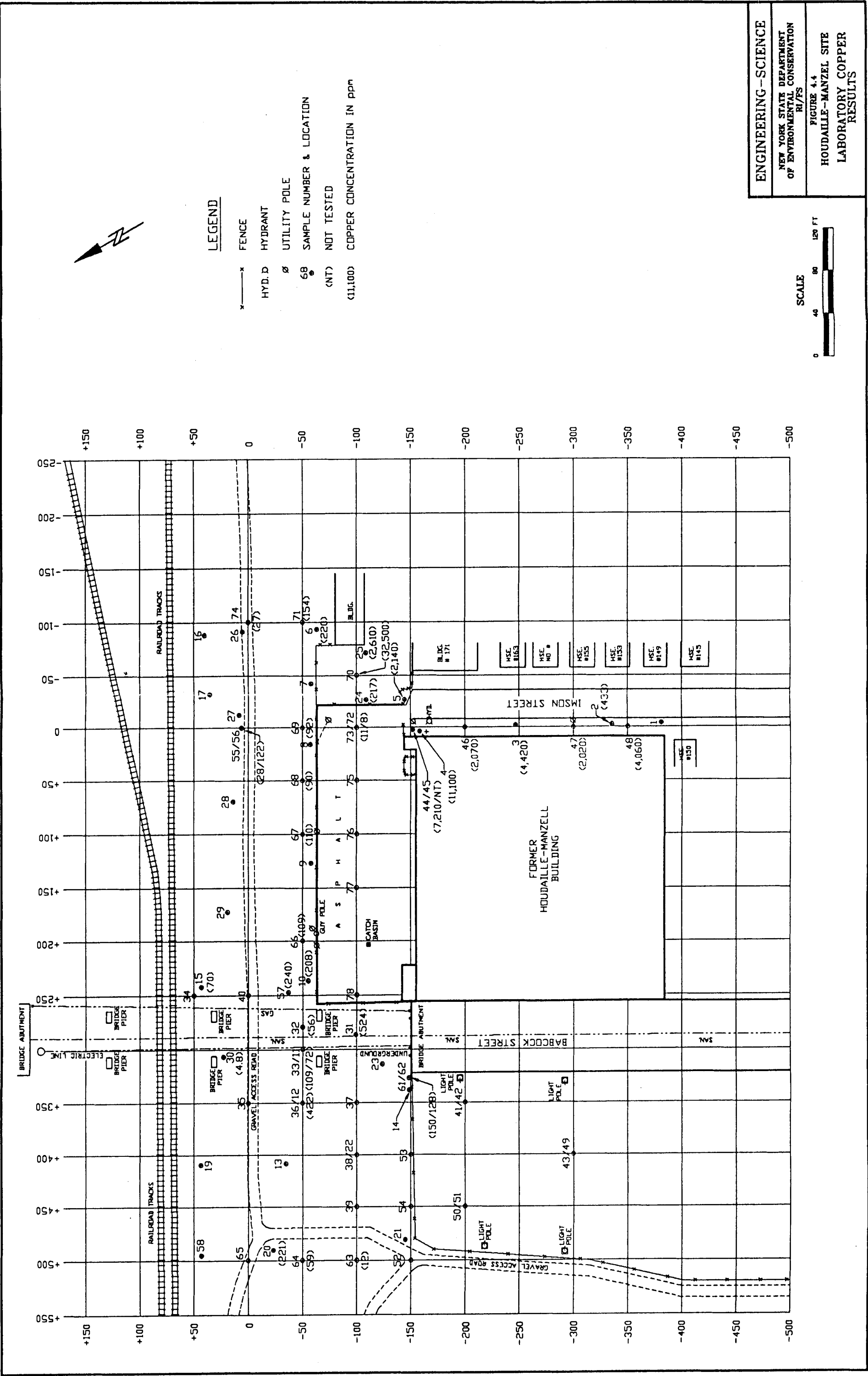
Benzene, toluene, ethylbenzene, and xylenes, or combinations thereof (BTEX) were detected in soil under the Babcock Street bridge at levels up to 56 ppm, and between the former plant and Imson Street at levels up to 54 ppm in the previous investigations (Figure 4.5). Much lower concentrations of the same contaminants < 1.472 ppm were detected in the recent investigation (Table 4.1). This reduction may also be the result of the possible natural or biological degradation.

Low levels of other inorganics, including arsenic, cyanide, iron and nickel, and organics, including organic priority pollutants, were detected in soil samples in both the previous and recent investigations. In general, the concentrations of organic contaminants are lower in the recent investigation, which is another indication of existence of the possible natural or biological degradation.

#### **4.3.1 Site Vicinity Contamination**

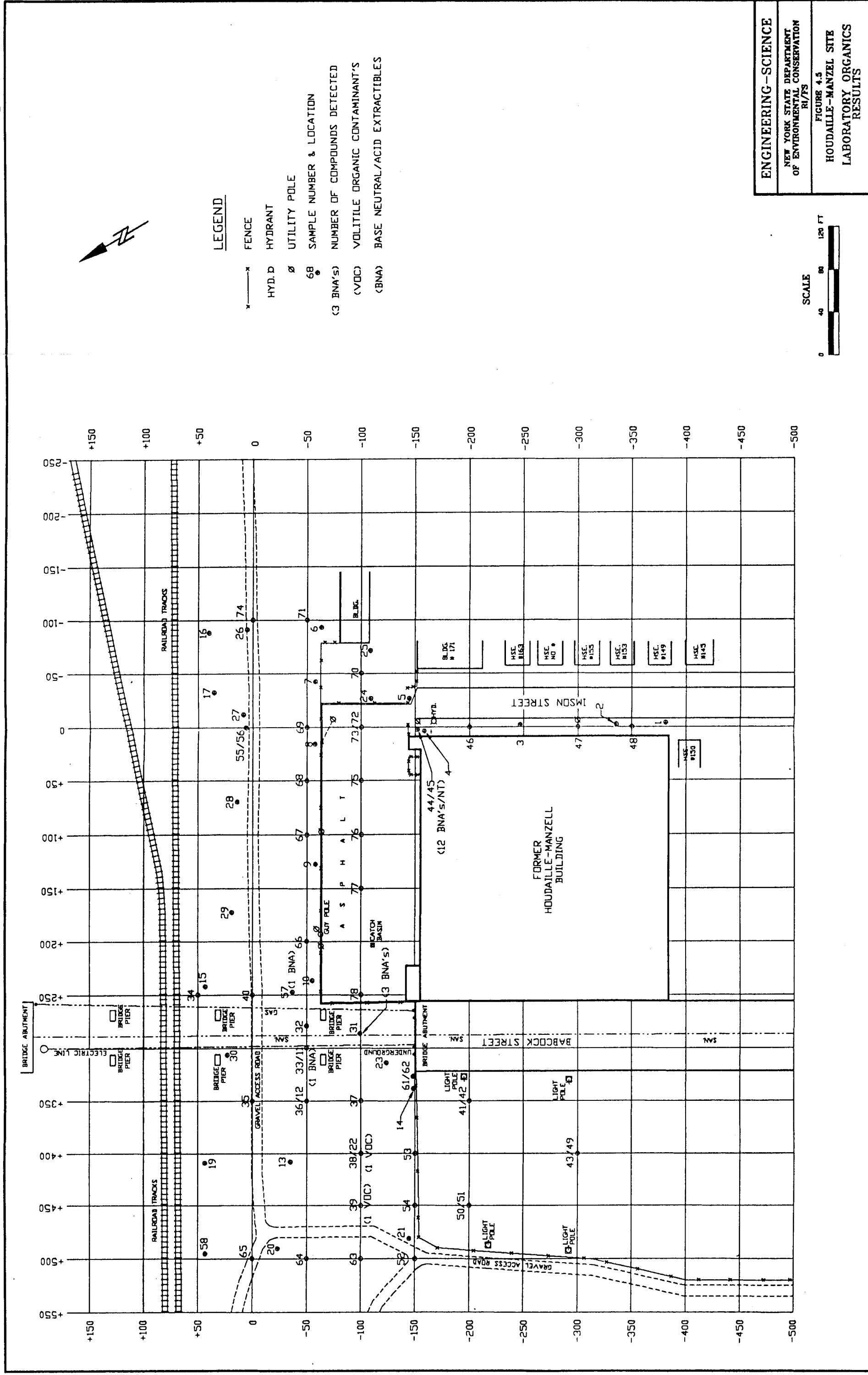
There are no available site vicinity contamination data other than that for the Seneca-Babcock Street site adjacent to the Houdaille-Manzel site to the west. The environmental engineering report of 1988 for the Seneca-Babcock Street site concluded, "The analytical data from this environmental investigation does not indicate that the Seneca-Babcock Street site should be designated as a hazardous waste site. The surficial materials, the materials from the test pits, and the limited perched groundwater samples do not indicate the presence of a significant environmental problem of the fill material at the site, except for a small mound at

FIGURE 4.4



DATE: 1/1/78

FIGURE 4.5



the south of the site." The report also indicated that the Houdaille-Manzel site as a "potential" contamination source which did not appear to have affected the Seneca-Babcock Street site.

Data obtained from the soil vapor survey performed for the Phase I remedial investigation did not indicate elevated VOC concentration along the site perimeter. Data received from the soil vapor survey would also lend support to the conclusion that the Houdaille-Manzel site has not contributed to site vicinity contamination.

#### 4.4 EXTENT OF CONTAMINATION

The primary contamination at the Houdaille-Manzel site is considered to be the heavy metal (lead - copper) contamination of the soil. Contamination of groundwater samples indicate that contamination may be migrating in the perched groundwater table which exists at the site for a limited amount of time during the year. This water table is isolated from deeper aquifers by the relatively impermeable clay underlying the site.

None of the results obtained from the investigations is sufficient to cause the soil or groundwater to be classified as a characteristic hazardous waste. There are concentrations that exceed average concentrations in a typical soil and they have been listed previously in this report.

The contaminants of concern at the site are heavy metals and PCBs, which have been discussed in previous sections of this report. Lead is the primary contaminant of concern at the site, with concentrations exceeding average concentrations for a typical soil, yet the EP Toxicity results were not high enough to require listing the soil as a hazardous waste.



## SECTION 5

### PRELIMINARY BASELINE RISK ASSESSMENT

#### 5.1 OBJECTIVE AND METHODS

The objective of this section is twofold; 1) to evaluate, to the extent possible, risks associated with the Houdaille-Manzel Site under current unremediated conditions; and 2) to identify additional data needed to complete the quantitative assessment. This assessment was conducted in accordance with EPA guidance including:

U.S. EPA Risk Assessment Guidance for Superfund: Vol. I. Human Health Evaluation Manual (Part A) (EPA, 1989);

U.S. EPA Exposure Factors Handbook (EPA, 1990a)

U.S. EPA HEAST (Health Effects Assessment Summary Tables) (EPA, 1990b).

Since additional data are necessary before a quantitative risk assessment can be completed, this evaluation focuses on data evaluation, exposure assessment, and toxicity assessment. A quantitative evaluation will be completed when the additional data have been collected.

#### 5.2 DATA EVALUATION

The data used in this assessment was collected by Engineering-Science during recent field investigations. Analytical results were reviewed and validated by a qualified chemist. Analytical results collected in previous investigations were not used in the assessment due to a lack of QA information.

#### 5.3 CONTAMINANTS OF CONCERN

Contaminants were detected in soils, groundwater and sewer sediments at the Houdaille-Manzel site. The detected compounds along with their averages, standard deviations, and upper 95% confidence limits are given in Table 5.1 (surface soils), Table 5.2 (soils deeper than 2 feet), and Table 5.3 (groundwater). Aroclor 1254 was detected in sediment samples taken from the sewer system both upstream and downstream of the site.

Inorganic compounds were listed for soils only if detected concentrations exceeded typical concentrations in soils for the Buffalo area. Typical concentrations are given in Table 5.4. In addition, results of the preliminary screening tests for lead, etc., in soils were not considered in this evaluation due to the numerous manipulations of the samples prior to laboratory analysis. Inorganics in groundwater were listed if their maximum concentrations exceeded those detected in the upgradient well.

Average concentrations were calculated for each listed chemical using all detected concentrations along with 1/2 the detection limit for "non-detects". Upper

TABLE 5.1  
SURFACE SOIL (TOP 2 FT) DATA SUMMARY

PARAMETER	RANGE OF SAMPLE QUANTITATION LIMITS a/ (mg/kg)	RANGE OF DETECTED CONCENTRATION (mg/kg)	DETECTION FREQUENCY	AVERAGE CONCENTRATION (mg/kg)	STANDARD DEVIATION (mg/kg)	UPPER 95% CONFIDENCE INTERVAL b/ (mg/kg)	DATA QUALIFIERS c/
2-methylnaphthalene		0.550-0.380	2/2	0.465	0.085	0.550	J
acenaphthene	0.800	2.7	1/2	1.750	0.950	2.700	U
acenaphthylene	1.6	0.830	1/2	0.815	0.015	0.83	J
anthracene		0.25-5	1/2	2.625	2.375	2.625	J
antimony		3.7-9.8	2/2	6.750	3.050	9.800	B
Aroclor 1254	0.0820-0.840	0.015-0.300	5/22	0.107	0.146	0.172	J,U
Aroclor 1260	0.82-0.130	0.280-2.900	3/22	0.206	0.595	0.470	U
benzo(a)anthracene		1.6-17	2/2	9.300	7.700	17.000	
benzo(a)pyrene		0.220-12.000	2/2	6.110	5.890	12.000	J
benzo(b)fluoranthene		1.7-27	2/2	14.350	12.650	27.000	
benzo(g,h,i)perylene		4.9-0.780	2/2	2.840	2.060	4.900	J
benzo(k)fluoranthene		0.710-7.100	2/2	3.905	3.195	7.100	J
bis(2-ethylhexyl)phthalate	1.9	0.250	1/2	0.575	0.325	0.250	U,J
cadmium		80-81.8	2/2	80.900	0.900	81.800	J
chromium		45.4-115	2/2	80.200	34.800	115.000	
chrysene		1.400-13.000	2/2	7.200	5.800	13.000	J
cobalt		20.5-33.2	2/2	26.850	6.350	33.200	
copper		524-32500	6/6	8064.000	11129.458	19745.550	J
cyanide	0.45-0.51	0.72-6	14/16	1.431	1.485	2.222	U
dibenz(a,h)anthracene		0.160-1.400	2/2	0.780	0.620	1.400	J
dibenzofuran		0.210-1.500	2/2	0.855	0.645	1.500	J
di-n-butyl phthalate	1.6	5.4	1/2	3.100	2.300	5.400	U

a/ No values are given if compound was detected in all samples

b/ 95% CL = mean + t(s/sqrt n), where t is a value taken from Student's T distribution  
(alpha = 0.025 in each tail, n-1 df), s = standard deviation, sqrt = square root,  
n = sample size. NOTE: WHEN N=2, 95% CL = MAXIMUM DETECTED VALUE.

c/ J = Estimated value less than the CRDL but greater than the IDL

B = Estimated value less than the CRDL but greater than the IDL

U = Not Detected

TABLE 5.1  
SURFACE SOIL (TOP 2 FT) DATA SUMMARY

PARAMETER	RANGE OF SAMPLE QUANTITATION LIMITS a/ (mg/kg)	RANGE OF DETECTED CONCENTRATION (mg/kg)	DETECTION FREQUENCY	AVERAGE CONCENTRATION (mg/kg)	STANDARD DEVIATION (mg/kg)	UPPER 95% CONFIDENCE INTERVAL b/ (mg/kg)	DATA QUALIFIERS c/
fluorene	1.6	2.7	1/2	13.900	13.100	2.700	U
fluoranthene		2.5-470	2/2	236.250	470.000	470.000	J
indeno(1,2,3-cd)pyrene		0.86-5.9	2/2	3.380	0.860	5.900	J
lead		536-3490	6/6	1593.333	1027.382	2487.132	J
manganese		977-1070	2/2	1023.500	46.500	1070.000	
naphthalene		.350-1.5	2/2	0.925	0.575	1.500	J
nickel		81.3-161	2/2	121.150	39.850	161.000	
phenanthrene		1.8-22	2/2	11.900	10.100	22.000	
pyrene		3.3-360	2/2	181.650	178.350	360.000	J
selenium		1.4-7.9	2/2	4.650	3.250	7.9	R
silver		2.2-3.1	2/2	2.650	0.450	3.100	
zinc		851-2860	2/2	1855.500	1004.500	2860.000	J

a/ No values are given if compound was detected in all samples

b/ 95% CL = mean + t(s/sqrt n), where t is a value taken from Student's T distribution

(alpha = 0.025 in each tail, n-1 df), s = standard deviation, sqrt = square root,

n = sample size. NOTE: WHEN N=2, 95% CL = MAXIMUM DETECTED VALUE.

c/ J = Estimated value less than the CRDL but greater than the IDL

B = Estimated value less than the CRDL but greater than the IDL

U = Not Detected

TABLE 5.2  
DEEP SOIL (>2 FT) DATA SUMMARY

PARAMETER	RANGE OF SAMPLE QUANTITATION LIMITS a/ (mg/kg)	RANGE OF DETECTED CONCENTRATION (mg/kg)	DETECTION FREQUENCY	AVERAGE CONCENTRATION (mg/kg)	STANDARD DEVIATION (mg/kg)	UPPER 95% CONFIDENCE INTERVAL b/ (mg/kg)	DATA QUALIFIERS c/
2-methylnaphthalene	1.4-15	0.17-7.5	2/4	2.145	3.099	7.075	U,J
Aroclor 1254	0.093-0.96	ND	0/19	NA	NA	NA	U
Aroclor 1260	0.093-0.96	ND	0/19	NA	NA	NA	U
benzo(b)fluoranthene	1.6-15	0.29	1/3	2.863	3.285	11.025	U
bis(2-ethylhexyl)phthalate	1.6	0.85-16	3/4	4.464	6.688	15.104	U,J
cadmium		2.6-32.7	4/4	10.300	12.935	30.879	J
carbon disulfide	0.005-0.007	8	1/14	3.393	1.298	4.142	U,J
chrysene	1.6	0.26-2	2/3	1.020	0.727	2.827	U,J
cobalt		7.6-12.6	4/4	9.875	1.959	12.991	
copper		8.1-150	20/20	78.675	49.883	102.021	B,J,U
cyanide	0.45-0.51	0.49-3.5	5/5	1.552	1.063	2.775	
di-n-butyl phthalate	1.6-15	2.6	1/4	2.925	2.742	7.287	U
fluoranthene	1.6	0.16-2.6	3/3	1.010	1.125	3.805	J
lead	6.1	18.9-753	20/21	177.286	195.674	266.357	J,U
manganese		311-843	4/4	576.500	190.421	879.460	J
methylene chloride	0.0007-0.0067	0.0007-0.008	7/15	0.263	0.765	0.686	U,R,J
nickel		22.1-33	4/4	27.825	3.916	34.055	
phenanthrene	1.6	0.26-1.8	3/3	0.810	0.701	2.553	J
pyrene	1.6	.19-3.1	3/3	1.197	1.347	4.542	J
zinc		55-342	4/4	203.750	104.576	370.131	J

a/ No values are given if compound was detected in all samples

b/ 95% CL = mean + t(s/sqrt n), where t is a value taken from Student's T distribution  
(alpha = 0.025 in each tail, n-1 df), s = standard deviation, sqrt = square root,  
n = sample size.

c/ J = Estimated value less than the CRDL but greater than the IDL

B = Estimated value less than the CRDL but greater than the IDL

U = Not Detected

TABLE 5.3  
GROUNDWATER DATA SUMMARY

PARAMETER	RANGE OF SAMPLE QUANTITATION LIMITS a/ (mg/kg)	RANGE OF DETECTED CONCENTRATION (mg/kg)	DETECTION FREQUENCY	AVERAGE CONCENTRATION (mg/kg)	STANDARD DEVIATION (mg/kg)	UPPER 95% CONFIDENCE INTERVAL b/ (mg/kg)	DATA QUALIFIERS c/
aluminum		5.35-9.25	3/3	7.503	1.612	11.509	J
arsenic	0.005	0.01	1/3	0.005	0.004	0.014	U,J
barium	0.05	0.12-0.167	3/3	0.145	0.019	0.193	B
cadmium	0.005	0.008-0.010	3/3	0.009	0.001	0.011	
chromium	0.010	0.015-0.044	3/3	0.025	0.013	0.058	J
cobalt	0.020	0.022	1/3	0.014	0.006	0.028	B
copper	0.010	0.041-0.163	5/5	0.067	0.048	0.127	J
iron		29.7-39	3/3	35.133	3.955	44.959	J
lead		0.011-0.430	5/5	0.115	0.158	0.311	J
magnesium		24.8-44.0	3/3	31.567	8.803	53.437	J
manganese		2.36-5.160	3/3	3.347	1.284	6.536	
mercury	0.0002	0.0004-0.003	2/3	0.001	0.001	0.004	J
nickel		0.1-0.39	3/3	0.203	0.132	0.532	J
zinc		0.135-0.284	3/3	0.199	0.063	0.355	J

a/ No values are given if compound was detected in all samples

b/ 95% CL = mean + t(s/sqrt n), where t is a value taken from Student's T distribution

(alpha = 0.025 in each tail, n-1 df), s = standard deviation, sqrt = square root,

n = sample size. NOTE: WHEN N=2, 95% CL = MAXIMUM DETECTED VALUE

c/ J = Estimated value less than the CRDL but greater than the IDL

B = Estimated value less than the CRDL but greater than the IDL

U = Not Detected

**TABLE 5.4**  
**TYPICAL CONCENTRATIONS OF INORGANIC COMPOUNDS IN SOILS**

<u>USGS</u>	Geometric Mean For <u>Eastern U.S. (ppm)</u>	<u>Buffalo (ppm)</u>
Aluminum	33,000	30,000
Antimony	0.52	< 1
Arsenic	4.8	16-100
Barium	290	300
Beryllium	0.55	1-1.5
Cadmium	--	--
Chromium	33	30
Cobalt	5.9	7
Copper	13	15
Iron	14000	30000
Lead	14	30-700
Magnesium	2100	5000-7000
Manganese	260	700
Mercury	0.081	0.2-5.1
Nickel	11	15
Selenium	0.30	0.5
Silver	--	--
Thalium	7.7	--
Vanadium	43	30-50
Zinc	40	45

Source: USGS, 1984

95% confidence limits on the mean were calculated using Student's T distribution with  $\alpha = 0.025$  in each tail and  $n-1$  degrees of freedom.

#### 5.4 TOXICITY ASSESSMENT

Toxicity assessment is a two-step process whereby the potential hazards associated with route-specific exposure to a given chemical are 1) identified by reviewing relevant human and animal studies; and 2) quantified through analysis of dose-response relationships. U.S EPA has conducted numerous toxicity assessments which have undergone extensive review within the scientific community. EPA toxicity assessments and the resultant toxicity values will be used in the baseline evaluation to evaluate both carcinogenic and noncarcinogenic risks associated with each chemical of concern and route of exposure.

EPA toxicity values which are used in this assessment include:

- Chronic RfDs (noncarcinogenic effects, oral exposure)
- Chronic RfCs (noncarcinogenic effects, inhalation exposure)
- Carcinogenic Slope Factors (oral exposure)
- Carcinogenic unit risks (inhalation exposure)

The chronic RfD or RfC for a compound is ideally based on studies where either animal or human populations were exposed to a given compound by a given route of exposure for the major portion of the lifespan (referred to as a chronic study). The RfD is derived by determining dose-specific effect levels from all the available quantitative studies, and applying uncertainty factors to the most appropriate effect level in order to determine a value for humans. RfCs are derived by determining concentration-specific effect levels from all of the available literature and transforming the most appropriate concentration to a human RfC. Transformation usually entails converting an animal concentration to a continuous 24-hour exposure, transforming the exposure-adjusted value to account for differences in animal and human inhalation, and then dividing the adjusted human concentration by uncertainty factors to arrive at an RfC.

RfDs are reported as doses in mg of chemical per kilogram body weight per day (mg/kg/day). RfCs are reported as concentrations in mg of chemical per cubic meter of air (mg/m<sup>3</sup>).

RfDs and RfCs represent thresholds for toxicity. They are derived such that human lifetime exposure to a given chemical via a given route at a dose or concentration at or below the RfD or RfC, respectively, should not result in adverse health effects, even for the most sensitive members of the population.

Carcinogenic slope factors and unit risks are route-specific values derived only for compounds which have been shown to cause an increased incidence of tumors in either human or animal studies. Slope factors and unit risks are upper 95% confidence limits on lifetime risk and are determined by low-dose extrapolation from human or animal studies. When an animal study is used, the final slope factor has been adjusted to account for extrapolation of animal data to humans. If the

studies used to derive the slope factor were conducted for less-than the lifespan of the test organism, the final slope factor has been adjusted to reflect risk associated with lifetime exposure. Slope factors are reported as risk per dose  $(\text{mg/kg/day})^{-1}$ . Unit risks are reported in units of risk per concentration  $(\text{ug/m}^3)^{-1}$  or  $(\text{ug/l})^{-1}$ .

The available EPA RfDs, RfCs, carcinogenic slope factors and unit risks used in this assessment are presented in Tables 5.5 and 5.6 along with other relevant toxicity information. Unless noted otherwise in the Tables, these values were obtained from EPA's Fourth quarter HEAST (EPA Health Effects Assessment Summary Table, FY-1990 September, 1990b)

It should be noted that EPA has not derived toxicity values for all routes of exposure. Most of the available toxicity values are for oral exposure, and many inhalation values are available. No values are currently available for dermal exposure. This is due to the lack of scientific studies available to quantify dermal toxicity and carcinogenic potential for a vast majority of priority pollutants. In addition, until recently, scientists have assumed that dermal exposures were minimal in comparison with oral exposure.

In the absence of dermal reference toxicity values, EPA has suggested (EPA, 1989a) that in some cases it may be possible to modify an oral reference toxicity value (RfD or slope factor) to reflect dermal absorption. This requires that the toxic endpoints observed are the same for both oral and dermal exposure, and that one have quantitative estimates of both dermal and oral absorption of the compound. Hence, estimate of dermal risk are usually based on assumed values and should be viewed as tentative at best.

## 5.5 HUMAN EXPOSURE

The Houdaille-Manzel site is located in an industrial/residential area of Buffalo, less than one mile North of the Buffalo River. There are residences to the East of the site along Imson Street and a Boy's Club to the West of the site. The primary exposure pathways associated with the site are those involving contaminated soils.

Contaminated soils were detected in the Boy's Club field, beneath the Babcock Street Bridge, and along Imson Street. Soils beneath the bridge are covered by hardpack clay and are underlain by an old brick road. The Boy's Club field is grass-covered except for a bare spot in the middle of the field which measures approximately 30 x 30 feet. Volatile and semivolatile organic compounds were detected in soils beneath the clay under the bridge and directly off the northeast corner of the building next to Imson Street. Copper and lead were detected in high concentrations along Imson Street and in the yard off the northeast corner of the building. Lead was also detected under the Imson Street Bridge beneath the clay cover. PCBs were detected all along Imson street, at one location West of the Babcock Street Bridge, and in one of three surface samples taken from the Boy's Club field.

Since children are known to play beneath the bridge, along Imson Street and in the Boy's Club Field, oral, dermal and inhalation exposure to contaminants detected in surface soils is possible. The adult residents who live in the area could also be



TABLE 5.5  
TOXICITY VALUES FOR THE EVALUATION OF POTENTIAL NONCARCINOGENIC EFFECTS

Chemical	CHRONIC TOXICITY VALUE		CRITICAL EFFECT	
	RfC (mg/m3)	RfD (mg/kg/day)	INHALATION	ORAL
2-methylnaphthalene	ND	ND	NA	ND
acenaphthene	ND	6.0E-02	NA	Hepatotoxicity
acenaphthylene	ND	ND	NA	ND
anthracene	ND	3.0E-01	NA	No Effect
antimony	ND	4.0E-04	NA	Blood chemistry, lifespan
Aroclor 1254	ND	7.0E-06	NA	Liver lesions
Aroclor 1260	ND	7.0E-06	NA	Liver lesions
benzo(a)anthracene	ND	ND	NA	NA
benzo(a)pyrene	ND	ND	NA	NA
benzo(b)fluoranthene	ND	ND	NA	NA
benzo(g,h,i)perylene	ND	ND	NA	NA
benzo(k)fluoranthene	ND	ND	NA	NA
bis(2-ethylhexyl)phthalate	ND	2.0E-02	NA	Liver damage
Cadmium (food)	ND	1.0E-03	NA	Renal Damage
carbon disulfide	1.0E-02	1.0E-01	NA	Fetotoxicity, teratogenicity
chromium (hexavalent)	ND	5.0E-03	NA	Hepatotoxicity
chrysene	ND	ND	NA	NA
cobalt	ND	ND	NA	NA
copper	ND	ND	NA	NA
cyanide	ND	2.0E-02	NA	Thyroid and nerve damage
dibenz(a,h)anthracene	ND	ND	NA	NA
dibenzofuran	ND	ND	NA	NA
di-n-butyl phthalate	ND	1.0E-01	NA	Mortality
fluoranthene	ND	4.0E-02	NA	Neuropathy, Liver, Blood Changes
fluorene	ND	4.0E-02	NA	Decreased RBC count

Source: U.S. EPA HEAST (Health Effects Assessment Summary Tables) Fourth Quarter, FY-1990.

RBC = Red Blood Cell

CNS = Central Nervous System

ND = No Data

NA = Not Applicable

TABLE 5.5  
TOXICITY VALUES FOR THE EVALUATION OF POTENTIAL NONCARCINOGENIC EFFECTS

Chemical	CHRONIC TOXICITY VALUE		CRITICAL EFFECT	
	RfC (mg/m3)	RfD (mg/kg/day)	INHALATION	ORAL
indeno(1,2,3-cd)pyrene	ND	ND	NA	NA
Lead	ND	ND	CNS Effects	CNS Effects
manganese	4.0E-04	1.0E-01	CNS Effects	CNS Effects
methylene chloride	3.0E+00	6.0E-02	NA	Liver Toxicity
naphthalene	ND	4.0E-03	NA	Ocular and internal lesions
nickel	ND	2.0E-02	NA	Body and organ weights
phenanthrene	ND	ND	NA	NA
pyrene	ND	3.0E-02	NA	Renal Effects
selenium	ND	3.0E-03	NA	Hair and nail loss; dermatitis
Silver	ND	3.0E-03	NA	Argyria
Thallium (chloride)	ND	8.0E-05	NA	Increased Liver Enzymes
zinc	ND	2.0E-01	NA	Anemia

Source: U.S. EPA HEAST (Health Effects Assessment Summary Tables) Fourth Quarter, FY-1990.

RBC = Red Blood Cell  
CNS = Central Nervous System  
ND = No Data  
NA = Not Applicable

TABLE 5.6  
TOXICITY VALUES FOR THE EVALUATION OF POTENTIAL CARCINOGENIC EFFECTS

Chemical	Inhalation Unit Risk 1/(ug/m <sup>3</sup> )	Oral Slope Factor 1/(mg/kg/day)	Weight-of-Evidence Classification a/		Tumor Site	
			Inhalation	Oral	Inhalation	Oral
2-methylnaphthalene	NA	NA	D	D	NA	NA
acenaphthene	NA	NA	D	D	NA	NA
acenaphthylene	NA	NA	D	D	NA	NA
anthracene	NA	NA	D	D	NA	NA
antimony	NA	NA	D	D	NA	NA
Aroclor 1254	ND	7.7E+00	B2	B2	NA	Liver
Aroclor 1260	ND	7.7E+00	B2	B2	NA	Liver
benzo(a)anthracene	ND	3.1E+00	B2	B2	NA	NA
benzo(a)pyrene	ND	1.2E+01	B2	B2	Respiratory Tract	Stomach
benzo(b)fluoranthene	ND	1.2E+01	B2	B2	NA	NA
benzo(g,h,i)perylene	NA	NA	D	D	NA	NA
benzo(k)fluoranthene	ND	1.2E+01	B2	B2	NA	NA
bis(2-ethylhexyl)phthalate	NA	1.4E-02	B2	B2	NA	Liver
cadmium	1.8E-03	NA	B1	ND	Respiratory Tract	NA
carbon disulfide	NA	NA	D	D	NA	NA
chromium (hexavalent)	1.2E-02	NA	A	D	Lung	NA
chrysene	ND	ND	B2	B2	NA	NA
cobalt	ND	ND	D	D	NA	NA
copper	NA	NA	D	D	NA	NA
cyanide	NA	NA	D	D	NA	NA
dibenz(a,h)anthracene	ND	4.9E+01	B2	B2	NA	NA
dibenzofuran	NA	NA	D	D	NA	NA
di-n-butyl phthalate	NA	NA	D	D	NA	NA
fluoranthene	NA	NA	D	D	NA	NA

ND = No Data

NA = Not applicable

a/ A=Human Carcinogen; B=Probable Human Carcinogen (B1-limited evidence in humans; B2-insufficient evidence in humans but sufficient evidence in animals) C=Possible Human Carcinogen (limited evidence); D=No evidence of carcinogenicity

Source: U.S. EPA Health Effects Assessment Summary Tables. Fourth Quarter, FY-1990.

TABLE 5.6  
TOXICITY VALUES FOR THE EVALUATION OF POTENTIAL CARCINOGENIC EFFECTS

Chemical	Inhalation Unit Risk 1/(ug/m3)	Oral Slope Factor 1/(mg/kg/day)	Weight-of-Evidence Classification a/		Tumor Site	
			Inhalation	Oral	Inhalation	Oral
fluorene	NA	NA	D	D	NA	NA
indeno(1,2,3-cd)pyrene	ND	1.2E+01	B2	B2	NA	NA
lead	ND	ND	B2	B2	NA	NA
manganese	NA	NA	D	D	NA	NA
methylene chloride	4.1E-06	7.5E-03	B2	B2	Lung, Liver	Liver
naphthalene	NA	NA	D	D	NA	NA
nickel	2.4E-04	NA	A	D	Respiratory Tract	NA
phenanthrene	NA	NA	D	D	NA	NA
pyrene	NA	NA	D	D	NA	NA
selenium	ND	ND	B2	B2	Liver	Lung
silver	NA	NA	D	D	NA	NA
thallium	NA	NA	D	D	NA	NA
zinc	NA	NA	D	D	NA	NA

ND = No Data

NA = Not applicable

a/ A=Human Carcinogen; B=Probable Human Carcinogen (B1-limited evidence in humans;  
B2-insufficient evidence in humans but sufficient evidence in animals) C=Possible Human  
Carcinogen (limited evidence); D=No evidence of carcinogenicity

Source: U.S. EPA Health Effects Assessment Summary Tables. Fourth Quarter, FY-1990.

exposed by all routes of exposure. Exposure to the contaminants detected in deeper or covered soils is also possible in the future if those soils become exposed as a result of construction activities or erosion of the clay surface material under the bridge.

Inorganic compounds were the only potential contaminants detected in groundwater. Exposure via groundwater associated with the Houdaille-Manzel site is not likely to be a problem. The perched aquifer beneath the site is intermittently dry and is not suitable for development as a drinking water source. There are currently no wells in this aquifer. Contamination in shallow groundwater is unlikely to reach the underlying bedrock aquifer due to the presence of a clay layer between the aquifers. There are currently no drinking water wells in the bedrock aquifer either on site or downgradient of the site.

During seasons where the water table is high, there is the possibility of exposure to groundwater which might be present in flooded basements. Exposures via dermal contact or inhalation are unlikely to occur due to the limited duration of contact and the absence of groundwater contamination which is volatile (inhalation) or able to penetrate the skin.

Shallow groundwater beneath the site flows to the southwest/west and discharges to the sewer system beneath the Babcock Street bridge. Any run-off from the site also drains into the sewer system. It should be noted that PCBs were detected in sewer sediments taken both above and below the site. Water in the sewer is ultimately discharged to the Buffalo River. Exposure to contaminants discharged via the sewer system into the river is highly unlikely due to the large volume of mixing both in the sewer system and in the river. Furthermore, the river in the vicinity of the site is not currently used for drinking water or for any recreational purposes.

Air pathways are not likely to be significant at the Houdaille-Manzel site. The primary contaminants detected in soils are not volatile (PCBs, metals), and fugitive dust emissions are retarded for the most part by vegetative cover, clay (under the bridge) and pavement. Recent air monitoring with a photoionization detector during field investigations yielded negligible readings of VOCs (0-0.5 ppm) in the breathing zone. However, since dust could be raised during play, inhalation of semi-volatile and non-volatile contaminants (PCBs, copper, lead) suspended in dust could occur along Imson Street and in the Boy's Club field.

A matrix of both current and hypothetical exposure scenarios for the site is presented in Table 5.7.

## 5.6 QUANTIFICATION OF HUMAN EXPOSURE

The main pathways of concern at the Houdaille-Manzel site are those involving inhalation, incidental ingestion, and dermal contact with PCBs, lead and copper in surface soils along Imson Street and in the Boy's Club field. Since only three surface samples were taken in the Boy's Club field, it is not possible to quantify exposure with any degree of confidence. Additionally, the fact that contaminants were detected on site all along Imson Street raises concerns that contaminants could

TABLE 5.7

**MATRIX OF POTENTIAL EXPOSURE PATHWAYS  
HOUDAILLE-MANZEL SITE, BUFFALO, NY**

Transport Medium	Release Source and Mechanism	Primary Exposure Points	Potential Receptors	Primary Exposure Route(s)	Probability of Pathway Completion
<u>Current Use</u>					
Air	Contaminated soils/volatilization	The site and surrounding areas	Workers, nearby residents, trespassers, children	inhalation, dermal	v. low. Recent air monitoring in the breathing zone with a photoionization detector yielded readings of 0-0.5 ppm VOCs.
	Contaminated soils/fugitive dust generation	the site and surrounding area	Workers, nearby residents, trespassers, children	Inhalation, dermal	Low-Moderate, surface soils are contaminated with PCBs and metals. Soil erosion is possible at the Boys Club Field (bare spots) and along Imson St. The area under the bridge is covered by 6-12" of hard-pack clay.
	Contaminated soils/site leaching	Water supply wells	Nearby residents	Oral, dermal, inhalation	None. The perched aquifer beneath the site is not a drinking water source. The bedrock aquifer is not likely to be contaminated due to separation from the perched aquifer by a clay layer. The shallow groundwater is thought to flow across the site and into the sewer system beneath the Babcock St. bridge.

TABLE 5.7 (CONTINUED)

**MATRIX OF POTENTIAL EXPOSURE PATHWAYS  
HOUDAILLE-MANZEL SITE, BUFFALO, NY**

Transport Medium	Release Source and Mechanism	Primary Exposure Points	Potential Receptors	Primary Exposure Route(s)	Probability of Pathway Completion
		Groundwater collected in residential basements	Nearby residents	Dermal, inhalation	Low-None. No VOCs were detected in groundwater. Metals are essentially not absorbed across the skin. Any flooding which might occur would be transient.
Soils	Contaminated soils, groundwater, surface water/site leaching, runoff, tracking	Site surface soils, Boys Club field	Workers, nearby residents, trespassers, children	Oral, dermal	Moderate. Although some contaminated areas are covered by clay (under the bridge) or vegetated, exposure could occur via exposed areas at the Boys Club Field and along Imson St.
Surface Water	Contaminated soils, groundwater/surface runoff tracking	Sewer discharge to Buffalo River	Recreational users	Oral, dermal	Unlikely. The river is not used for drinking water or recreation.
<u>Future Use</u>					
Air	Contaminated soils/volatilization	The site and surrounding area	Workers, nearby residents, trespassers, children	Inhalation, dermal	v. low. Current monitoring indicates that air pathways are not likely to significantly contribute to exposure.
	Contaminated soil/fugitive dust generation	Site and surrounding area	As above	Inhalation, dermal	Moderate. Both surface soils and deeper soils are contaminated with PCBs and metals. If deeper soils are exposed via construction or if surface soils become uncovered, exposure could occur.

**TABLE 5.7 (CONTINUED)**

**MATRIX OF POTENTIAL EXPOSURE PATHWAYS  
HOUDAILLE-MANZEL SITE, BUFFALO, NY**

Transport Medium	Release Source and Mechanism	Primary Exposure Points	Potential Receptors	Primary Exposure Route(s)	Probability of Pathway Completion
Groundwater	Contaminated soils/site leaching	Water supply wells	Well users	Oral, dermal inhalation	None. The perched aquifer is not suitable for use as a drinking water source. Contamination of the bedrock aquifer is precluded by a clay layer and by the fact that the shallow groundwater beneath the site flows into the sewer system. No VOCs were detected in shallow groundwater.
Soils	Contaminated soil, groundwater, surface water/site leaching, runoff, tracking	Site surface soils, Boys Club field soils, deep soils (> 2 ft.)	Workers, nearby residents, trespassers, children	Oral, dermal	Moderate. Exposure is possible if vegetation is removed from the Boys Club Field, if the clay layer under the bridge is removed, or if deeper soils become exposed as a result of construction activities.
Surface water	Contaminated soils, groundwater/surface runoff, groundwater seepage	Sewer discharge to Buffalo River	Recreational users, drinking water	Oral, dermal	Highly unlikely. The Buffalo River in the vicinity of Houdaille-Manzel is not used recreationally or for water. This is not likely to change.



also be detected in soils at the residences across the street. Thus, exposures will not be quantified until additional air monitoring and surface soil sampling is conducted.

Surface soil samples should be taken from the Boy's Club field along a uniform grid, and from each of the residential lawns across from the site on Imson Street. These samples should be analyzed for PCBs, lead and copper. Air monitoring should also be conducted during soil sampling activities. Air concentrations can be modeled from the measured surface soil concentrations in order to estimate potential releases which may fall below the limits of detection during actual air monitoring or vary depending on meteorological conditions.

## 5.7 ENVIRONMENTAL EXPOSURE

Since the site is located in an industrial area, most of the impacts on wildlife have already occurred as a result of urbanization. The only surface water in the vicinity of the site is the Buffalo River which lies within one mile to the South. As discussed in previous sections, runoff from the site flows into the Sewer system and is ultimately discharged to the Buffalo River. PCBs (Aroclors 1242, 1254 and 1260) were detected in sewer sediments both above and below the site. The concentration detected below the site (930 ppb) was higher than that detected above the site (735 ppb), indicating that PCBs may be released from the site. If released to the River, these sediments could have an adverse impact on life in and around the River. PCBs are known to bioaccumulate and to have adverse effects upon avian, terrestrial and aquatic organisms.

## 5.8 CHARACTERIZATION OF HUMAN RISK

Risks associated with soil and air exposure pathways will be quantified when the additional surface soil sampling and the associated air monitoring have been completed. Both carcinogenic and noncarcinogenic risks will be quantified by the following methods. It is anticipated that incidental ingestion of PCBs in soils by children will drive the risk assessment.

**Noncarcinogenic Effects.** To characterize the overall potential for noncarcinogenic effects associated with exposure to multiple chemicals, EPA has developed a Hazard Index (HI) approach. This approach assumes that simultaneous sub-threshold chronic exposures to multiple chemicals are additive and could result in an adverse health effect. The Hazard Index is calculated as follows:

$$\text{HAZARD INDEX} = E_1/RF_1 + E_2/RF_2 + \dots E_i/RF_i$$

Where:  $E_i$  = Exposure intake (CDI) or concentration for the  $i$ th toxicant

$Rf_i$  = Reference Dose or Reference Concentration for the  $i$ th toxicant

The term is referred to as the Hazard Quotient.

It should be noted that in this assessment, Exposure Intake is taken to mean "chronic" exposure. Chronic exposure is defined as exposure which occurs over the majority of a lifespan. For a human being, chronic exposure is considered to include exposures of at least seven years duration.

Calculation of a Hazard Index in excess of unity indicates the potential for adverse health effects. Indices greater than one will be generated anytime intake for any of the chemicals of concern exceeds its RfD or RfC. However, given a sufficient number of chemicals under consideration, it is also possible to generate a Hazard Index greater than one even if none of the individual chemical intakes exceed their respective RfDs or RfCs.

Hazard Indices will be calculated for each of the soil and air pathways associated with the site.

**Carcinogenic Effects.** Carcinogenic risk is expressed as a probability of developing cancer as a result of lifetime exposure. For a given chemical and route of exposure, carcinogenic risk is calculated as follows:

$$\text{ORAL RISK} = \text{EXPOSURE INTAKE} \times \text{CARCINOGENIC SLOPE FACTOR}$$

$$\text{Inhalation Risk} = \text{Exposure Concentration} \times \text{Unit Risk.}$$

For exposures to multiple carcinogens, EPA assumes that the risk associated with multiple exposures is equivalent to the sum of their individual risks.

Risks will be calculated for each of the soil and air pathways associated with the site.

EPA's acceptable target range for carcinogenic risk associated with Superfund sites is one-in-ten-thousand ( $10^{-4}$ ) to one-in-one-million ( $10^{-6}$ ).

## 5.9 CONCLUSIONS

A number of chemicals were detected in the soils and the perched groundwater associated with the Houdaille-Manzel Site. Of these, PCBs and lead are expected to be of greatest concern with respect to impacts on public health.

The primary routes of exposure associated with the site include oral, dermal, and perhaps inhalation exposure to PCBs, copper and lead from soils around the building and in the Boy's Club Field. Potential receptors include workers, nearby residents, and children who play at the Boy's Club.

Currently, the greatest PCB, copper and lead concentrations have been detected along Imson Street. However, until the extent of contamination in the Boy's Club Field and in the yards along Imson Street have been characterized adequately, it is not reasonable to do a quantitative risk assessment. A quantitative assessment will be conducted when additional soil samples have been collected from these areas, and analyzed for copper, lead and PCBs. Risks associated with potential airborne particulates containing copper, lead and PCBs will also be assessed upon completion of air monitoring, soil sampling and subsequent air modeling. The greatest risks are anticipated to be associated with incidental ingestion by children of lead and PCBs in surface soils.

## SECTION 6

### PHASE I REMEDIAL INVESTIGATION SUMMARY AND RECOMMENDATION

#### 6.1 SUMMARY

The Phase I Remedial Investigation for the Houdaille-Manzel site consisted of site screening and detailed soil and groundwater sampling and analysis. In the site screening, field testing including the QA/QC soil sampling, soil vapor survey, lead/copper screening and PCB screening was performed to identify the approximate limits of contamination. Based on these contamination limits, 10 test pits, 4 test borings/monitoring wells were made/installed and 47 soil and 4 groundwater samples were collected and analyzed in the laboratory. The soil samples included both surface and shallow subsurface samples taken from test borings, test pits, and bucket and hand augerings. The groundwater samples were taken from each monitoring well. These samples were analyzed for metals, PCBs, and volatile and semi-volatile organics.

Copper and lead were detected at levels above normal concentrations in the soil samples. PCBs were detected in one soil sample at concentrations greater than 1 ppm but less than 3 ppm. Low levels of volatile and semi-volatile organics were detected in the soil samples. Cadmium, iron, lead, manganese and mercury were detected in groundwater samples at levels at or exceeding the Standards, Criteria and Guidelines (SCGs) (Section 7.3). No PCBs, volatile and semi-volatile organics were detected in the groundwater samples.

#### 6.2 CONCLUSIONS AND RECOMMENDATIONS

##### 6.2.1 Conclusions

The analytical data from this and previous environmental investigations does not indicate that the soils at the Houdaille-Manzel site should be designated as characteristic hazardous waste, but the groundwater is contaminated by several heavy metals at concentrations exceeding the Standards, Criteria and Guidelines (Section 7.3). The surficial and shallow subsurficial soil samples do not indicate the presence of a significant environmental problem of the fill material at the site, except for above normal concentrations of copper and lead in some samples. However, the sampling results did not provide sufficient information for a health risk assessment in the ballfield and at the residences along Imson Street. In addition, the source and areal extent of the groundwater contamination can not be well defined based on the available data.

##### 6.2.2 Recommendations

As indicated in Section 6.2.1 the available data do not support classification of the soils at the site as characteristic hazardous waste per 6NYCRR Part 371. Although, other additional data from adjacent properties is also required to fully

assess the risks to human health from the site, the Phase II RI effort will be limited to obtaining on-site data, in an effort to confirm the presence of hazardous waste at the site. Should the Phase II RI Investigation confirm the presence of hazardous waste at the site, off-site sampling on the ball field, and neighboring properties is recommended.

### **Groundwater**

Additional groundwater monitoring at the site would be needed in order to determine the extent of groundwater contamination. This would include performing one complete round of groundwater sampling for PCBs and metals analysis. Both filtered and unfiltered samples will be analyzed for metals. The analytical results will provide the needed basis for the Feasibility Study to determine if groundwater remediation is necessary and, if so, develop and evaluate the remedial action alternatives for groundwater remediation.

Groundwater levels will be measured at least once during the Phase II Investigation to confirm the seasonal changes of water table observed in previous investigations. The water level of each well will be measured as described in the Field Sampling Plan in Appendix A of the Work Plan. The water levels will be recorded in the field book for later assessment.

### **Soil Samples**

To further ensure that the site does not contain hazardous wastes, seven additional surficial soil samples from the vicinity of the existing lead "hot" spots are recommended, which includes four samples from the vicinity of Sample No. 23 and three samples from the vicinity of Samples No. 25 and 70 (Figures 6.1 and 6.2). These seven soil samples will be analyzed for lead and possibly lead EP Toxicity (based on lead concentration of the soil samples).

Three additional surficial soil samples are recommended to the east of Sample No. 25 for lead analysis. This will provide the information to delineate the east extent of elevated lead contamination (Figure 6.2).

All of the above soil sampling locations will not be marked with stakes or surveyed but will be recorded in the field book and sketched so that these locations can be added to the site map.

FIGURE 6.1

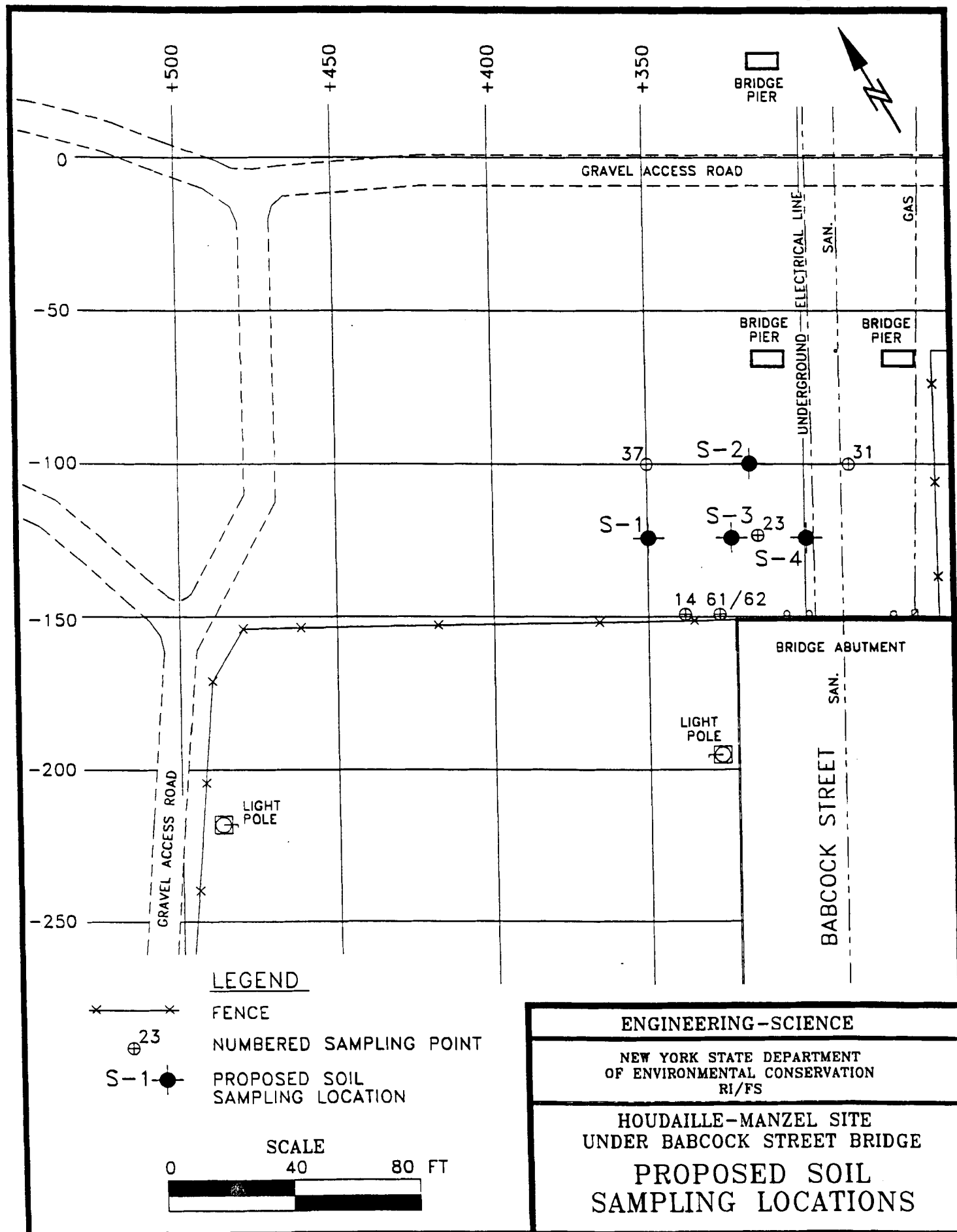
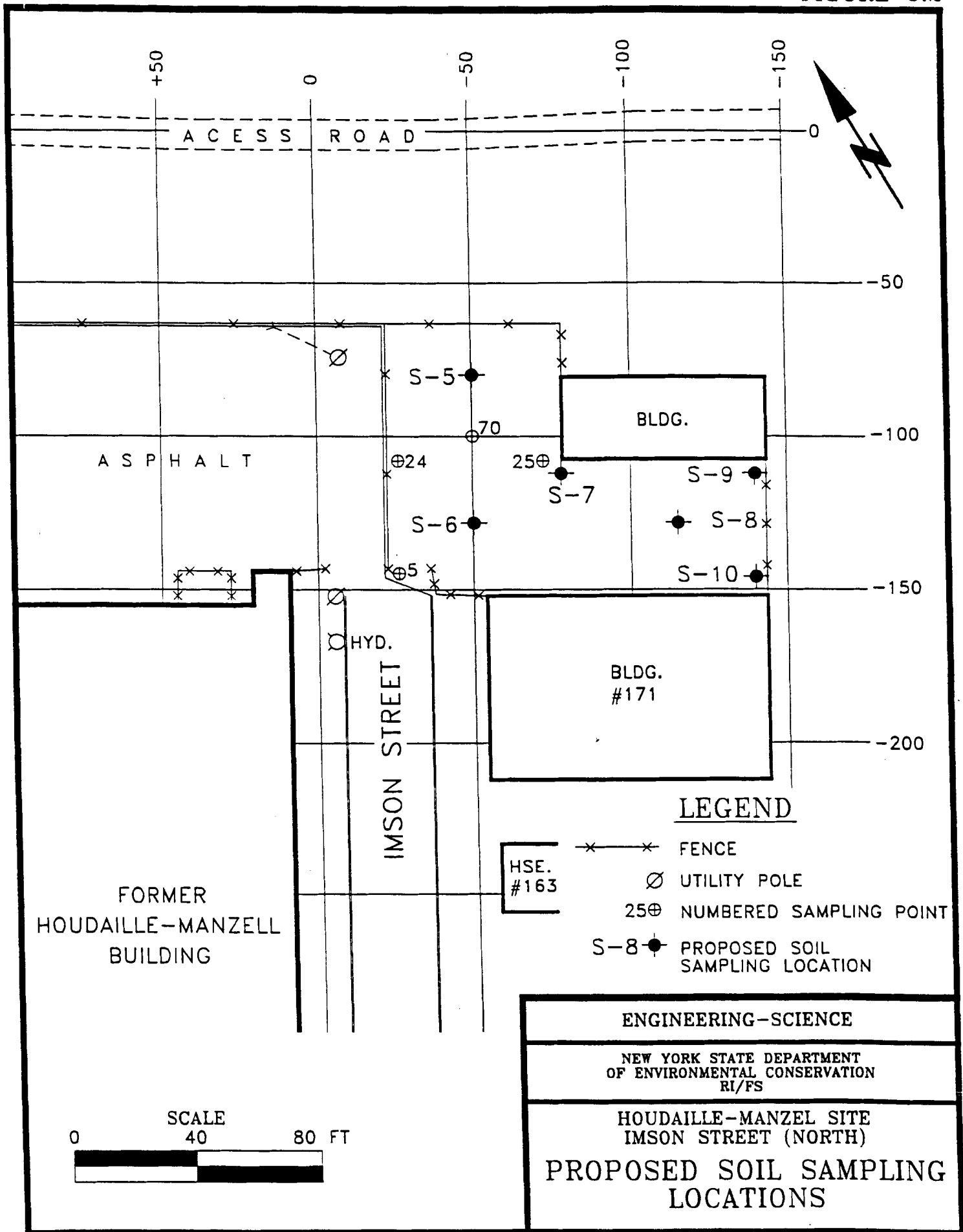


FIGURE 6.2



## SECTION 7

### DEVELOPMENT OF REMEDIAL ALTERNATIVES

The purposes of this section are to identify remedial objectives, to identify and screen appropriate waste remediation technologies, and to develop remedial alternatives potentially applicable at the Houdaille-Manzel site.

#### 7.1 REMEDIAL OBJECTIVES

Three factors are particularly important in determination of the remedial objectives: site characteristics and extent of contamination (Sections 3 and 4), risk assessment (Section 5) and the New York State Standards, Criteria and Guidelines (SCGs).

In considering the site characteristics and the extent of contamination presented in Sections 3 and 4, respectively, several overriding factors are evident:

1. The Houdaille site contains an estimated 6,000 cubic yards of material with lead concentrations over 500 ppm. Most of these materials are within the surficial 2 foot depth.
2. The primary contaminants in soils at the Houdaille-Manzel site are lead, other heavy metals, and low levels of PCBs. PCBs were detected only in one sample at a concentration greater than 1 ppm (2.9 ppm). The primary contaminants in the shallow perched aquifer are lead and low levels of other heavy metals.
3. Using the maximum PCB contamination detected in this investigation (2.9 ppm) for the risk assessment, calculations would probably result in a cancer risk which falls within EPA's acceptable range. However, this one sample does exceed EPA's recommended Soil Action Level for PCB contaminated sites (USEPA, 1990c).
4. The Risk Assessment in Section 5 indicated that the primary risks are inhalation of fugitive dust and ingestion of soils contaminated with PCBs and metals.
5. Remediation options for the Houdaille-Manzel site will focus on lead and PCBs. The levels of other contaminants present at the sites and their impacts on public health or the environment are secondary relative to the levels and impacts of lead and PCBs.

Potentially applicable SCGs for the Houdaille-Manzel site are described in detail in Section 7.3. The SCGs define the action level for lead at 500-1000 ppm in soils and 25 ppm in groundwater.

Based on the available information on site characteristics, the risk assessment and the SCGs, the remedial objectives can be defined as:

1. To prevent lead, other heavy metal and PCB contamination in the surficial soils from migrating via the airborne pathway;
2. To prevent lead and other heavy metal contamination in the perched groundwater.

## **7.2 IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGIES**

In accordance with USEPA and NYSDEC RI/FS guidance, treatment technologies and process options that are applicable to general response actions are identified, evaluated and screened using the criteria of effectiveness and implementability. The evaluation focuses on several aspects including: handling estimated volumes or areas, meeting the remedial action objectives, potential impact to human health during implementation, and how proven and reliable the process is. Implementability encompasses both technical and administrative feasibility of implementing a technology or process.

### **7.2.1 Soils**

General response actions potentially feasible to satisfy the remedial action objectives identified in Section 7.1 for soils at the Houdaille-Manzel site include no action, source control (i.e. in-place containment), and excavation followed by treatment and/or disposal. Within each response category, there may be more than one technology available, and within each technology there may be more than one process option available. The technologies and process options screened for source control, excavation, treatment and disposal are presented in Table 7.1.

The extent of PCB contamination determined to date is very limited with only one sample having a concentration >1 ppm. ES believes that, in the absence of additional contamination, it is not appropriate to consider on-site treatment technologies for PCB remediation at this time. As a result, this Phase I FS report will concentrate on treatment technologies suitable for lead contaminated soils. If the results of the Phase II Remedial Investigation indicate more wide-spread PCB contamination at higher levels, treatment technologies for PCBs will be evaluated in the Phase II Feasibility Study.

The No Action, capping, excavation, and disposal technologies are all carried forward to Section 7.3 for alternatives development, these are all proven solid waste remedial technologies (USEPA, 1985). The various treatment technologies for solid wastes evaluated under the treatment response action are thermal, chemical or biological treatment methods. A brief discussion of the initial evaluation follows.

#### **7.2.1.1 Thermal Treatment Technologies**

Thermal treatment technologies are widely used and readily available in the marketplace for the treatment of organic contaminants such as PCBs in solid waste streams. However, thermal treatment technologies have been screened from further consideration at this stage because of their inability to treat heavy metals. Should the results of the Phase II Investigation indicate the need to evaluate



**TABLE 7.1**

**IDENTIFICATION EVALUATION AND SCREENINGS OF REMEDIAL TECHNOLOGY TYPES FOR LEAD CONTAMINATED SOILS  
HOUDAILLE-MANZEL SITE, BUFFALO, NY**

General Response Action	Technology Type	Process Options	Description	Effectiveness	Implementability
No Action	None	Not applicable	No Action.	Does not achieve remedial action objectives.	Not acceptable to public regulatory agencies.
Source Control	Capping	Clay and Topsoil Cap	Compacted clay with layer of topsoil and vegetation.	Effective for non- hazardous waste.	Easily implemented, restricts future land use.
Source Removal	Excavation	Excavation	Physical removal of waste soils using conventional earth moving equipment.	Effective; site disturbance may result in environmental impact; sediment and erosion control, run-on and run- off control required.	Implementable.
Disposal	Disposal	Off-site Landfill	Waste materials are buried in an area designed to receive the wastes. Materials may be drummed or disposed of in bulk form.	Effective, but does not destroy wastes.	Implementable.
Treatment	Thermal Treatment	Incineration, In-Situ Vitrification X°Trax, etc.	Combustion/oxidation of waste materials at high temperatures.	Not effective on lead contaminated soils.	Potentially implementable.

**TABLE 7.1 (CONTINUED)**

**IDENTIFICATION EVALUATION AND SCREENINGS OF REMEDIAL TECHNOLOGY TYPES FOR LEAD CONTAMINATED SOILS  
HOUDAILLE-MANZEL SITE, BUFFALO, NY**

General Response Action	Technology Type	Process Options	Description	Effectiveness	Implementability
Treatment (Continued)	Chemical Treatment	Soil Washing	Extraction of contaminants from soil matrices using a liquid medium (water, acids, bases, chelating agents) in above-ground systems.	Effective for heavy metal removal.	Implementable.
		Stabilization (Chemical Fixation)	Process to mix chemical wastes with materials (e.g., cement, lime kiln dust, fly ash, or proprietary agents) to immobilize waste constituents.	Not effective at meeting remedial objectives. Would not reduce potential for dust emissions.	Potentially implementable.
		In-situ Soil Flushing	Use of water and/or in-situ surfactants to enhance elutriation of organic or inorganic contaminants for soil.	Effective for heavy metal removal.	May be difficult to implement because it does not work well with mixtures of contaminants. May lead to further contamination.
		Reduction-Oxidation	Reduction-Oxidation reactions between the waste components and added reactants to destroy hazardous components or convert the hazardous components to less hazardous forms.	Effective as a special soil washing process to remove heavy metals.	Potentially implementable.

**TABLE 7.1 (CONTINUED)**

**IDENTIFICATION EVALUATION AND SCREENINGS OF REMEDIAL TECHNOLOGY TYPES FOR LEAD CONTAMINATED SOILS  
HOUDAILLE-MANZEL SITE, BUFFALO, NY**

<b>General Response Action</b>	<b>Technology Type</b>	<b>Process Options</b>	<b>Description</b>	<b>Effectiveness</b>	<b>Implementability</b>
<b>Treatment (Continued)</b>	<b>Biological Treatment</b>	<b>Biological Reactors, In- situ Biodegradation</b>	<b>Treatment of waste by enhancing growth of microbes that biodegrade waste constituents.</b>	<b>Not effective for heavy metal removal.</b>	<b>Not feasible.</b>

separate treatment technologies for PCB remediation, this technology will be re-evaluated.

#### **7.2.1.2 Chemical Treatment Technologies**

Chemical treatment technologies evaluated in this Feasibility Study for the fill soils are soil washing, in-situ soil flushing, chemical stabilization and chemical reduction-oxidation.

##### **Soil Washing/Flushing**

Soil washing and in-situ soil flushing require the percolation of extractant solvents through wastes for possible waste recovery or for solubilization of adsorbed compounds. The difference between washing and flushing is that soil is excavated for soil washing, and left in place for soil flushing. Soil washing can remove both organic and inorganic contaminants. However, variability of waste types can make formulation of a suitable washing fluid difficult; for example, solvents and metals may be difficult to remove simultaneously. In addition, large volumes of washing solutions that are difficult or expensive to treat can be generated (Kunze and Gee, 1989). For applications where only one type of contamination such as heavy metals is present, this can be an effective technology. Therefore, soil washing has been retained as an applicable process option since the primary soil contaminants being considered in the Phase I RI are heavy metals.

Soil flushing is soil washing performed in-situ. The success of the soil flushing process is very dependent on the existence of homogeneous hydrogeologic conditions consisting of coarse materials with high permeabilities. The waste materials being addressed in this Feasibility Study consist of only a few feet of sandy fill of moderate permeability. The potential also exists for soil flushing to generate some soil and groundwater contamination from the flushing fluid itself (USEPA, 1986). Based on these technical concerns, the soil flushing processes are eliminated from further consideration.

##### **Chemical Stabilization**

Chemical stabilization treats contaminated soils and waste deposits by immobilizing the contaminants and reducing the leachability. Stabilization can be performed in-situ or in tanks or containers. In-situ stabilization is achieved by a deep soil mixing technique, utilizing mixing paddles and augers. By using this treatment method a wide range of treatment agents, including solvents, precipitating and neutralizing chemicals, and stabilizing agents, can be delivered directly to the waste source. These treatment agents can be used to treat many types of contaminants, including petroleum hydrocarbons, chlorinated hydrocarbons, metals, PCBs, and radionuclides.

This technology has been used for treatment of CERCLA waste (USEPA, 1988). A pilot test has been demonstrated to successfully treat PCB contaminated soils under the USEPA Superfund Innovative Technology Evaluation. Stabilization would reduce the potential for leaching and therefore reduces potential for migration through the groundwater pathway. However, based on the EP Toxicity data obtained to date, the leachability of the contaminants at the site is already

within regulatory limits. As a result limited benefit would be obtained by stabilizing the soils. In addition, this type of immobilization would not significantly reduce the exposure risks associated with dust described in Section 6. As a result of these considerations, this technology was eliminated from further consideration.

### **Chemical Reduction Oxidation**

The chemical reduction-oxidation (redox) process is employed to destroy hazardous components or convert the hazardous components of the waste stream to less hazardous forms. Redox processes are based on reduction-oxidation reactions between the waste components and added reactants in which the oxidation state of one reactant is raised while that of another is lowered.

Redox has been used to treat mercury-, silver-, and lead-contaminated wastes. Common reducing agents include alkali metals (sodium, potassium) sulfur dioxide, sulfite salts, ferrous sulfate, iron, aluminum, zinc, and sodium borohydrides.

The chemical redox treatment process consists of initial pH adjustment, addition of redox agents, mixing, and treatment to remove or precipitate the reduced or oxidized products.

The chemical redox process generates a solids/liquids effluent that requires further treatment. If the reduced hazardous components are still in a soluble form under system conditions, chemical precipitation methods must be employed to convert these components to an insoluble form. Following reduction and/or precipitation, the solids must be separated from the liquid by filtration, settling, or evaporation. Leach tests should be conducted on the residual solids to determine the need for stabilization before the final disposal. The liquid effluent should be analyzed before discharge to ensure regulatory compliance.

From the above description, it can be concluded that in general the redox is a special soil washing process, especially when treating lead contaminated soils as the toxicity of lead can not be changed by reduction or oxidation. Therefore, the redox will not be retained as an independent process option.

#### **7.2.1.4 Biological Treatment Technologies**

Two processes using biological degradation for treatment of soils, biological reactors and in-situ biological degradation were considered and were eliminated for further consideration because of their inability to treat heavy metals.

### **7.2.2 Groundwater and Filtrate**

The technologies screened for treatment of groundwater and filtrate generated from soil treatment at the site are presented in Table 7.2. The primary constituents expected to be treated are heavy metals including lead.

#### **7.2.2.1 Groundwater Recovery and Containment Technologies**

Technologies identified and screened for collection and containment of groundwater are outlined in the beginning of Table 7.2. Subsurface collection trenches are applicable where the contaminated groundwater is shallow (generally less than 25 feet). Hydraulically, a collection trench is equivalent to a line of

**TABLE 7.2**

**IDENTIFICATION AND SCREENING OF TECHNOLOGY TYPES FOR GROUNDWATER AND FILTRATE  
HOUDAILLE-MANZEL SITE, BUFFALO, NY**

General Response Action	Remedial Technology Type	Process Options	Description	Effectiveness	Implementability
No Action	None	None	No Action	Does not achieve remedial action objectives.	May not be acceptable to government or public.
Collection	Collection	Extraction Wells	Groundwater collection wells suitable for deep systems where trenches are not cost effective.	Not effective for groundwater collection at shallow depths.	Proven technology and readily implementable.
		Subsurface Collection Trench	Used to intercept contaminated groundwater in shallow zones.	Effective for downgradient groundwater collection at shallow depths.	Proven technology and readily implementable at shallow depth (generally less than 25-feet).
Source Control	Barrier	Slurry Wall	Impervious clay wall installed below ground surface to isolate a waste zone from the ambient groundwater.	Effective for isolating a waste zone.	Proven technology and readily implementable.
Treatment	Physical Treatment	Filtration	Used to remove suspended particles from wastewater via filtering through a fine-textured matrix.	Effective as a pretreatment process.	Proven technology and readily implementable.

**TABLE 7.2 (CONTINUED)**

**IDENTIFICATION AND SCREENING OF TECHNOLOGY TYPES FOR GROUNDWATER AND FILTRATE  
HOUDAILLE-MANZEL SITE, BUFFALO, NY**

General Response Action	Remedial Technology Type	Process Options	Description	Effectiveness	Implementability
Treatment (Continued)	Chemical Treatment	pH Adjustment	Process of adding acid or caustic to water as pretreatment step to adjust pH to between 5 and 9.	Effective as a pretreatment.	Proven and implementable.
		Chemical Precipitation	Removal of metals from aqueous solution by adding a precipitating agent to alter the chemical equilibrium relationships affecting the solubility of inorganic species.	Very effective for metal removal.	Proven and implementable.
		Ion Exchange	Removal of metals from aqueous solution by exchanging metallic ions with mobile ions in a resin.	Effective for metal removal.	Proven and implementable.
		Reverse Osmosis	Creating a gradient to force flow from more concentrated region through a semi-permeable membrane to a less concentrated region.	Not effective in practice.	Potentially implementable.

**TABLE 7.2 (CONTINUED)**

**IDENTIFICATION AND SCREENING OF TECHNOLOGY TYPES FOR GROUNDWATER AND FILTRATE  
HOUDAILLE-MANZEL SITE, BUFFALO, NY**

7-10

General Response Action	Remedial Technology Type	Process Options	Description	Effectiveness	Implementability
Treatment (Continued)	Chemical Treatment (Continued)	Reduction-Oxidation	The chemical transformation of reactants in which the oxidation state of one reactant is raised while the other is lowered to create sedimentation.	Effective as a special chemical precipitation process.	Proven and implementable.
	Biological Oxidation	Biological Oxidation • Activated Sludge • Anaerobic Filters • Trickling Filters • Anaerobic Lagoons • Stabilization Ponds	Represents various biological treatment methods.	Not effective.	Not implementable.
	Discharge	Off-Site Discharge	Discharge to POTW via SPDES permitted outfall following treatment.	Effective if treated.	Implementable.
		Off-Site Treatment	Water transported off-site to treatment facility.	Effective for treating various aqueous streams.	Proven and implementable.



recovery wells. Subsurface collection trenches can be installed via conventional means whereby the trench is excavated utilizing wheel or track mounted backhoes with staged placement of drain pipe and filter stone in sections. Automated trenching devices are available that excavate, place pipe, and backfill the trench in one continuous process. For these reasons, subsurface collection trenches are a potentially applicable process option.

Extraction wells are utilized to collect groundwater from depths greater than the possible effective depth of a collection trench, or where trenches are not cost effective. Since the project site does not have a contaminated deep aquifer, extraction wells have been eliminated from further consideration.

Subsurface barriers include a range of technologies that are used as low permeability cut-off walls or diversions to impede, contain, divert, or capture groundwater flow. Subsurface barriers include, but are not limited to, slurry walls, grouted barriers, and sheet piling walls. For the containment of soluble compounds in groundwater, keyed-in barriers are most often employed in which the barrier is constructed to tie vertically into an existing low permeability base layer that can provide a "bottom" to the containment. Often, subsurface barriers are used with hydraulic gradient controls such as dewatering and leachate collection as an additional measure of containment. The type of subsurface barrier most often used at wastes sites is the slurry wall because of its low permeability and ease of installation. The barriers are retained as an applicable containment process option.

#### **7.2.2.2 Aqueous Waste Stream Treatment For Organic Compounds**

Aqueous waste stream treatment for organic compounds is not considered in this Phase I report since the data obtained indicates that the groundwater at the project site does not contain elevated levels of organic compounds. Should the results of the Phase II investigation warrant it, this technology will be reconsidered in the Phase II report.

#### **7.2.2.3 Aqueous Waste Stream Treatment For Inorganic Compounds**

##### **Chemical Precipitation for Lead Removal**

In the precipitation process, lead is normally precipitated as the carbonate,  $\text{PbCO}_3$  or hydroxide,  $\text{Pb(OH)}_2$ . The lead form precipitated depends upon the amount of carbonate in or added to the wastewater, and the treatment pH. Many wastes are typically low in carbonate, and the precipitation treatment of these wastewaters would normally yield lead hydroxide unless supplemental carbonate was added. Lead carbonate precipitate is more crystalline than is lead hydroxide, resulting in desirable settling and sludge-dewatering characteristics. In addition, at intermediate pH, lead carbonate is normally more insoluble than is lead hydroxide. Optimum carbonate level for lead carbonate precipitation is reported at 200 mg/l as equivalent calcium carbonate. A large excess of carbonate, or treatment pH above 9.0, may yield less effective precipitation treatment, however. Optimum pH range for lead carbonate precipitation is pH 7.5-9.0 (Patterson, 1985). Sulfide precipitation has also been used to remove lead. The sulfide is added in the form of

a water-soluble sulfide reagent such as sodium sulfide ( $\text{Na}_2\text{S}$ ). Optimum pH for sulfide precipitation is as high as possible (USEPA, 1980).

Chemical precipitation can also remove other metallic contaminants at the same time while removing lead. This process has been retained for further consideration.

### **Ion Exchange**

In the ion exchange process, heavy metallic ions are removed and replaced with mobile ions such as sodium, from a resin. Once the resin has all of its mobile ions replaced with the metallic ions, the resin is removed from service and backwashed with a chloride solution (e.g. sodium chloride) or other acid/base regenerant. This removes the metals in the form of soluble chlorides and at the same time restores the resin to its original condition. The ion exchange process option has been retained for further consideration. The result of this process is treated water stream, and a concentrated waste stream which may require further treatment/disposal.

### **Filtration**

Filtration is a physical process using fine-textured matrix to filter out coarse particles suspended in wastewater. Filtration is normally used as part of other treatment processes.

### **Reverse Osmosis**

When two solutions having different solute concentrations are separated by a semipermeable membrane, a difference in chemical potential will exist across the membrane. Water will tend to diffuse through the membrane from the lower-concentration (higher-potential) side to the higher-concentration (lower-potential) side. In a system having a finite volume, flow continues until the pressure difference balances the chemical potential difference. This balancing pressure difference is termed the *osmotic pressure* and is a function of the solute characteristics and concentration and temperature. If a pressure gradient opposite in direction and greater than the osmotic pressure is imposed across the membrane, flow from the more concentrated to the less concentrated region will occur and is termed *reverse osmosis*. Reverse osmosis has not been widely used to remove heavy metals. Chemical precipitation and ion exchange are considered much more effective. Therefore, the reverse osmosis has been eliminated from further consideration.

### **Chemical Reduction-Oxidation (Redox)**

In the redox process, chemical oxidants such as chlorine and hydrogen peroxide are used to change the valence state of contaminants resulting in precipitation of insoluble products from wastewater (Tchobanoglous and Schroeder, 1985). It is actually a special type of chemical precipitation and is therefore eliminated from further consideration as an independent process option.

### 7.3 APPLICABLE OR RELEVANT AND APPROPRIATE NEW YORK STATE STANDARDS, CRITERIA AND GUIDELINES

A primary objective of the feasibility study is to identify and recommend the most environmentally sound remedial actions which will achieve and maintain applicable Federal and State air, soil, surface water, and/or groundwater quality standards. Guidelines may also be applicable where standards do not exist.

Section 121 of the Superfund Amendments and Reauthorization Act (SARA) establishes clean-up criteria for Superfund sites. Subsection (d)(2)(A) of Section 121 stipulates that clean-up should achieve applicable or relevant and appropriate regulations (ARARs) standards under Federal or State laws.

Since New York State does not have ARARs in its statutes, the acronym ARARs is replaced with New York State Standards, Criteria, and Guidelines (SCGs) as presented in NYSDEC TAGM HWR-90-4030 Revised (1990). SCGs also include those Federal standards which are more stringent than the State standards. The NYSDEC has identified three types of SCGs: 1) chemical-specific, 2) action-specific and 3) location specific. The standards and guidelines for these three types of SCGs are presented in the following. The SCGs provided in this section will be considered in more detail during the detailed analysis of alternatives (Section 9). Compliance with SCGs is one of the seven evaluation criteria considered in the detailed analysis.

#### 7.3.1 Chemical-Specific SCGs

Chemical-specific standards, criteria and guidelines set limits on the allowable concentrations of hazardous substances in various media. Chemical-specific SCGs values for the indicator parameters (most commonly found) at the Houdaille-Manzel site are presented in Table 7.3 for surface water quality, groundwater quality, drinking water and air quality. The following chemical-specific SCGs values were considered: New York State Surface Water Quality Standards for Class B streams (Buffalo River) and Class D streams, New York State Groundwater Quality Standards or Maximum Contaminant Levels (MCLs), Safe Drinking Water Act MCLs and Maximum Contaminant Level Goals (MCLGs), Federal Ambient Water Quality Criteria, National Ambient Air Quality Standards (NAAQS) and New York State ambient air guidelines.

Additional guidance values for the indicator parameters at the site are presented in Table 7.4 for SPDES discharges and soil/sediment quality.

Threshold values for Toxicity Concentration Leaching Procedure (TCLP) results are provided on Table 7.5. These threshold values would serve as chemical-specific SCGs relevant to the land disposal restrictions (40 CFR 261), as well as guidance values relative to the leachability of contaminants from solid wastes.

#### 7.3.2 Action-Specific SCGs

Action-specific standards, criteria and guidelines address the implementation of specific remedial alternatives for the site. For example, there are restrictions on the proper treatment, storage and disposal of wastes generated during site restoration

**TABLE 7.3**  
**CHEMICAL-SPECIFIC STANDARDS, CRITERIA AND GUIDELINES FOR SURFACE WATER**  
**QUALITY, GROUNDWATER QUALITY, DRINKING WATER, AND AIR QUALITY**

Indicator Parameter	NYS Surface Water Quality Standard <sup>(1)</sup>		NYS Groundwater Quality Standard or MCL <sup>(1)</sup> (ug/L)	Ambient Water Quality Criteria <sup>(2)</sup>		NYS Air Guidelines <sup>(3)</sup> (ug/m <sup>3</sup> )
	Class B (ug/L)	Class D (ug/L)		Drinking Water & Organisms (ug/L)	Drinking Water Only (ug/L)	
PCBs	0.01	0.01	0.1	7.9E-S	0.0126	1.67(1.19)
Aluminum	100	NS	NS	NS	NS	NS
Arsenic	190	360	25	0.0022	0.0025	0.67
Barium	NS	NS	1000	1000	1000	NS
Cadmium	0.95 <sup>(4)</sup>	3.05 <sup>(4)</sup>	10	10	10	2.0 (dust and salts)
Calcium	NS	NS	NS	NS	NS	NS
Chromium (Cr+6)	11	16	50	50	50	0.167
Cobalt	5	110(G)	NS	NS	NS	NS
Copper	9.77 <sup>(4)</sup>	14.36 <sup>(4)</sup>	200	170	179	NS
Iron	300	300	300	300	300	NS
Lead	2.43 <sup>(4)</sup>	62.28 <sup>(4)</sup>	25	50	50	NS
Magnesium	NS	NS	35000(G)	NS	35000	NS
Manganese	NS	NS	300	50	50	NS
Mercury	0.2(G)	0.2(G)	2	NS	2	NS
Nickel	80.67 <sup>(4)</sup>	1556.73 <sup>(4)</sup>	NS	80.67 <sup>(4)</sup>	NS	NS
Potassium	NS	NS	NS	NS	NS	NS
Sodium	NS	NS	20,000	NS	NS	NS
Zinc	30	266.96 <sup>(4)</sup>	300	5000	5000	NS

## Notes:

G - Guidance Value; ND - Not Detectable; NS - No Standard or Guidance Value.

- (1) Source: NYSDEC, 1987. Division of Water Technical and Operational Guidance Series (1.1.1): Ambient Water Quality Standards and Guidance Values; and NYSDOH, Part 5 of State Sanitary Code (revised Dec., 1988). The lower value is presented.
- (2) Source: EPA Water Quality Criteria; Availability of Documents, FR Vol. 50 No. 145, (July 19, 1985) and FR Vol. 45 No. 231, (Nov. 28, 1980); USEPA Safe Drinking Water Act, Maximum Contaminant Levels, 40 CFR, Parts 141 and 143. The lower value is presented.
- (3) Current recommended "AAL" (Acceptable Ambient Level) as listed in NYSDEC Division of Air Resources New York State Air Guide - 1, Guidelines for the Control of Toxic Ambient Air Contaminants. (Proposed values are presented in parentheses.)
- (4) Based on a typical hardness of 80 ppm.

TABLE 7.4

**CHEMICAL-SPECIFIC GUIDANCE VALUES FOR INDICATOR PARAMETERS  
FOR SPDES DISCHARGES AND SOIL QUALITY**

Parameter	Media	Limiting Value	Units	Reference
Lead	Soil	500-1000	mg/kg	(1)
PCBs	SPDES Discharge	ND	ug/L	(2), (3)
	Soil	10.0	mg/kg	(4)
	Soil	25.0	mg/kg	(5)
	Soil	50.0	mg/kg	(6)
	Soil	10 to 25	mg/kg	(7)
	Soil	1	mg/kg	(8)

## References:

- (1) USEPA Interim Guidance on Establishing Soil Lead Cleanup Levels at Superfund Sites, Directive No. 1 OSWER 9355.4-02, September 7, 1989.
- (2) 6 NYCRR Parts 750 through 757 in particular NYSDEC Division of Water "TOGS 1.1.1" entitled "Ambient Water Quality Standards and Guidance Values" and "TOGS 1.3.4 a" Best Professional Judgement (BPJ) Methodologies for the determination of effluent limits for SPDES permits.
- (3) PCBs must be non-detectable in the effluent using USEPA laboratory method No. 608.
- (4) Current USEPA TSCA PCB spill cleanup guideline for non-restricted access areas. This is also consistent with current NYSDEC and NYSDOH guidelines for cleanup at other PCB contaminated sites across New York State.
- (5) Current USEPA TSCA PCB spill cleanup guideline for areas with restricted access.
- (6) New York Codes, Rules, and Regulations defining PCB soils with over 50 ppm PCBs as hazardous wastes in 6NYCRR Part 371.4(e).
- (7) U.S. EPA PCB Guidance (August 1990) concentrations at which treatment or containment of soils should be considered for industrial land use.
- (8) Recommended action level for residential land use. USEPA Guidance on Remedial Actions for Superfund Sites with PCB Contamination (USEPA, 1990c). This guideline concentration does not imply that action must be taken at a Superfund Site, rather it indicates the area over which some action should be considered once it has been determined that action is necessary to provide protection of human health and the environment.

**TABLE 7.5**  
**TCLP THRESHOLD VALUES**  
**FOR WASTES OR SOILS**

Parameter	Units	March 1990 Final Rule <sup>(1)</sup>
<b>Leachable Metals</b>		
Arsenic	mg/l	5.0
Barium	mg/l	100.0
Cadmium	mg/l	1.0
Chromium	mg/l	5.0
Lead	mg/l	5.0
Mercury	mg/l	0.2
Selenium	mg/l	1.0
Silver	mg/l	5.0
<b>Acid Extractables</b>		
Pentachlorophenol	ug/l	100,000
2,4,5-Trichlorophenol	ug/l	400,000
2,4,6-Tri-Chlorophenol	ug/l	2,000
o-Cresol	ug/l	200,000
m-Cresol	ug/l	200,000
p-Cresol	ug/l	200,000
Total Cresol <sup>(2)</sup>	ug/l	200,000
<b>Base Neutrals</b>		
1,4-Dichlorobenzene	ug/l	7,500
2,4-Dinitrotoluene	ug/l	130
Hexachlorobenzene	ug/l	130
Hexachloro-1,3-butadiene	ug/l	500
Hexachloroethane	ug/l	3,000
Nitrobenzene	ug/l	2,000
Pyridine	ug/l	5,000

(1) Final Rule - March 29, 1990; Federal Register, Volume 55, No. 61, Parts 261, 264, 265, 268, 271 and 302.

(2) Use total cresols concentration if o-, m-, and p-cresols cannot be differentiated.

**TABLE 7.5 (CONTINUED)**  
**TCLP THRESHOLD VALUES**  
**FOR WASTES OR SOILS**

<b>Parameter</b>	<b>Units</b>	<b>March 1990 Final Rule (1)</b>
<b>Volatiles</b>		
Methylethyl ketone	ug/l	200,000
Benzene	ug/l	500
Carbon Tetrachloride	ug/l	500
Chlorobenzene	ug/l	100,000
1,2-Dichloroethane	ug/l	500
1,1-Dichloroethylene	ug/l	700
Tetrachloroethylene	ug/l	700
Trichloroethylene	ug/l	500
Vinyl Chloride	ug/l	200

(1) Final Rule - March 29, 1990; Federal Register, Volume 55, No. 61, Parts 261, 264, 265, 268, 271 and 302.

NS - No Standard

activities. Potential action-specific SCGs applied to the FS and site actions at the Houdaille-Manzel site are summarized in Table 7.6.

### **7.3.3 Location-Specific SCGs**

Location-specific standards or guidelines address requirements for certain types of activities based on site characteristics. Such SCGs can include, for example, permitting requirements for incineration work in designated areas. In general the Houdaille-Manzel site automatically satisfies all of the location specific SCGs based on anticipated activities at the site (e.g., excavation) and site characteristics (e.g., no drinking water, no wetland).

## **7.4 DEVELOPMENT OF REMEDIAL ACTION ALTERNATIVES**

### **7.4.1 Formulation of Alternatives**

In this section, potentially applicable technologies retained for further evaluation in Section 7.2 are combined to form remedial action alternatives for the Houdaille-Manzel site. Based on the remedial objectives identified in Section 7.1, three types or categories of alternatives have been proposed for the soil remediation: 1) no action, 2) source control (i.e. in-place containment), and 3) excavation followed by treatment and/or disposal. Individual alternatives are then developed using the applicable technologies remaining after the preliminary screening in Section 7.2.

The remedial options for groundwater management also use the potentially applicable technologies retained from Section 7.2. The types of remedial options considered for groundwater management include (1) no action, (2) in-place containment, and (3) recovery by collection trench and treatment.

Table 7.7 presents the applicable waste soil, groundwater and filtrate remedial technologies from Section 7.2 retained for evaluation for the Houdaille-Manzel site. For soils with lead greater than 500 ppm, alternatives that include capping, soil washing, and landfilling are developed in this Phase I Feasibility Study. For less contaminated soils, no action is recommended. Alternatives developed for the Houdaille-Manzel site are presented in Table 7.8. Groundwater and filtrate management options are presented in Table 7.9.



**TABLE 7.6**  
**POTENTIAL ACTION SPECIFIC SCGs/ARARs FOR**  
**HOUDAILLE-MANZEL SITE, BUFFALO, NY**

Site Action	Potential SCGs/ARARs
No Action	<p data-bbox="740 470 1331 683">Resource Conservation and Recovery Act ("RCRA") Groundwater Protection Requirements require installation of groundwater monitoring system if RCRA hazardous wastes are left in place, 40 CFR 264.90-264.109.</p> <p data-bbox="740 704 1414 810">Safe Drinking Water Act ("SDWA") Maximum Contaminant Levels ("MCLs"), 42 USC 300(f) et seq.</p> <p data-bbox="740 832 1389 938">Federal Water Quality Criteria ("FWQC") of Clean Water Act ("CWA") for Aquatic Life, 33 USC 1251 et seq. (See Table 7.3).</p> <p data-bbox="740 959 1414 1098">New York's regulations require a groundwater monitoring system to monitor releases from Solid Waste Management Units, 6 NYCRR 373-2.6 and 373-2.11 through 2.11 through 2.14.</p> <p data-bbox="740 1119 1405 1257">New York's regulations establish groundwater standards specified to protect ground waters for drinking water purposes, 6 NYCRR 703 (See Table 7.3).</p> <p data-bbox="740 1278 1397 1417">New York's regulations establish surface water standards specified for protection of drinking water and aquatic life, 6 NYCRR 701 and 702 (See Table 7.3).</p> <p data-bbox="740 1438 1405 1544">New York State Surface Water Guidance and Standards for toxic pollutants are established in the Division of Water Document TOGS 1.1.1.</p>

**TABLE 7.6, CONTINUED  
POTENTIAL ACTION SPECIFIC SCGs/ARARs FOR  
HOUDAILLE-MANZEL SITE, BUFFALO, NY**

Site Action	Potential SCGs/ARARs
No Action (Continued)	<p>OSHA regulations are established in 29 CFR 1910 for employers and employees engaged in hazardous site operations. These regulations specify requirements for medical surveillance, personnel protection, training and other health and safety issues.</p>
Capping	<p>Toxic Substances Control Act (TSCA) establishes storage and disposal requirements for PCBs (40 CFR 761).</p> <p>RCRA Regulations governing capping of surface impoundments, waste piles and landfills, 40 CFR 264.228(a), 264.258(b), and 264.310(a); requirements for permeability, installation, and maintenance of cover, elimination of free liquids or solidification, run-on and run-off damage control.</p> <p>RCRA post-closure care and groundwater monitoring, 40 CFR Subpart 264.90-264.109.</p> <p>New York's regulations establish closure and post-closure procedures and regulations in 6 NYCRR 373-2.</p> <p>New York's regulations establish criteria for caps for Solid Waste Management Facilities in 6 NYCRR 360.</p> <p>Toxic Substances Control Act (TSCA) establishes storage and disposal requirements for PCBs (40 CFR 761).</p> <p>OSHA regulations are established in 29 CFR 1910 for employers and employees engaged in hazardous site operations. These regulations specify requirements for medical surveillance, personnel protection, training and other health and safety issues.</p>

**TABLE 7.6, CONTINUED**  
**POTENTIAL ACTION SPECIFIC SCGs/ARARs FOR**  
**HOUDAILLE-MANZEL SITE, BUFFALO, NY**

Site Action	Potential SCGs/ARARs
Placement in Off-Site Landfill	<p>New York's regulations regarding transporting and manifesting wastes are outlined in 6 NYCRR 373-2.5. New York's regulations establish closure and post-closure regulations in 6 NYCRR 373-2.</p> <p>RCRA land disposal restrictions (LDRs) for disposal of solid wastes, established under the Hazardous and Solid Waste Amendments (HSWA).</p> <p>OSHA regulations are established in 29 CFR 1910 for employers and employees engaged in hazardous site operations. These regulations specify requirements for medical surveillance, personnel protection, training and other health and safety issues.</p>
On-Site Soil Washing, Chemical Precipitation and Ion Exchange	<p>State Pollution Discharge Elimination System establishes site-specific effluent discharge limitations.</p> <p>OSHA regulations are established in 29 CFR 1910 for employers and employees engaged in hazardous site operations. These regulations specify requirements for medical surveillance, personnel protection, training and other health and safety issues.</p>
Groundwater Filtrate/Collection/Treatment	<p>Safe Drinking Water Act, Maximum Contaminant Levels (MCLs), 42 USC 300 (f).</p> <p>New York's regulations establish groundwater standards specified to protect ground waters for drinking water purposes, 6 NYCRR 703.</p> <p>New York's regulations establish surface water standards specified for protection of drinking water and aquatic life, 6 NYCRR 701 and 702.</p> <p>New York State Surface Water Guidance and Standards for toxic pollutants are established in the Division of Water Document TOGs 1.1.1.</p>

**TABLE 7.6, CONTINUED**  
**POTENTIAL ACTION SPECIFIC SCGs/ARARs FOR**  
**HOUDAILLE-MANZEL SITE, BUFFALO, NY**

Site Action	Potential SCGs/ARARs
Ambient Air Emissions (Applicable for remedial activities that may generate air emissions.)	<p>6 NYCRR 373, 617, 257, and 201 stipulate air emissions guidelines. Part 617 is the State Environmental Quality Review Act (SEQRA) which requires an environmental and risk assessment for emissions anticipated for all remedial actions. Part 201 stipulates guidelines for emission points such as air strippers, etc. that might be associated with on-site water treatment activities.</p> <p>Clean Air Act, including National Ambient Air Quality Standards (40 CFR 50), sets national primary and secondary standards for six constituents.</p> <p>National Emission Standards for Hazardous Air Pollutants (40 CFR 61) regulate any air pollutant which causes or contributes to an increased mortality or serious illness. Currently these air standards have been applied to 8 air pollutants. Potentially applicable during implementation of remedial actions.</p>

TABLE 7.7

**POTENTIALLY APPLICABLE REMEDIAL TECHNOLOGIES FOR  
THE HOUDAILLE-MANZEL SITE**

Material Classification	Retained Technologies	Areas
Soil with lead greater than 500 ppm	<ul style="list-style-type: none"> <li>• <u>No Action</u></li> <li>• Clay and Topsoil Cap</li> <li>• Excavation</li> <li>• Soil Washing<sup>(1)</sup></li> <li>• Off-Site Landfilling</li> </ul>	<ul style="list-style-type: none"> <li>• Under the Babcock Street Bridge</li> <li>• Between the former Houdaille-Manzel plant and Imson Street</li> </ul>
Soil with lead less than 500 ppm	<ul style="list-style-type: none"> <li>• No Action</li> </ul>	<ul style="list-style-type: none"> <li>• All remaining locations other than the above two places</li> </ul>
Groundwater and Filtrate	<ul style="list-style-type: none"> <li>• <u>No Action</u></li> <li>• Slurry Wall</li> <li>• Chemical Precipitation</li> <li>• Ion Exchange</li> <li>• Off-Site Disposal (Treatment)</li> </ul>	

## Notes:

- <sup>(1)</sup> Residal solids following treatment would be land disposed of on-site unless treatment does not reduce lead levels to below 500 ppm.

**TABLE 7.8**  
**REMEDIAL ALTERNATIVES DEVELOPED FOR**  
**THE HOUDAILLE-MANZEL SITE**

Alternative	Description
1	No Action with Long-Term Monitoring
2	Capping/Groundwater Management
3	Excavation/Soil Washing/Land Disposal of Residuals/Groundwater Management
4	Excavation/Off-Site landfilling/Groundwater Management

**TABLE 7.9**  
**GROUNDWATER MANAGEMENT OPTIONS DEVELOPED FOR**  
**THE HOUDAILLE-MANZEL SITE**

Options	Description
I	No Action
II	Install Slurry Wall/Capping
III	Install Collection Trench/Groundwater Recovery/On-Site Treatment
IV	Install Collection Trench/Groundwater Recovery/Off-site Treatment

**APPENDIX A**  
**REFERENCES**



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**APPENDIX B**  
**LIST OF PREPARERS**

**APPENDIX B****LIST OF PREPARERS**

The Phase I Remedial Investigation/Feasibility Study Report for the Houdaille-Manzel Site in Buffalo, New York was prepared by the New York State Department of Environmental Conservation (NYSDEC) with consultant assistance from Engineering-Science, Inc. (ES) of Syracuse, New York. The names and qualifications of the ES project team members who prepared this report are presented in Table B.1.

Table B.2 lists other personnel involved in the project.

**TABLE B.1****SUMMARY OF PREPARER QUALIFICATIONS**

Name	Responsibility	Qualifications
K. F. Whittaker, Ph.D., P.E.	Technical Director	Ph.D. Civil/Environmental Engineer, Associate. 14 years experience in management and technical direction of hazardous waste projects with emphasis on RI/FS and remedial design projects.
W.G. Christopher, P.E.	Program Manager	M.E. Environmental Engineering; Syracuse Operations Manager/Senior Associate. 14 years experience including management of preliminary site assessments, site and remedial investigations, feasibility studies, remedial action plans, and design of hazardous waste remediation projects.
P.M. Petrone, P.E.	Project Manager	M.S. and B.S. Chemical Engineering. Over 17 years experience in process and project engineering which includes design of, specifications for and startup of industrial and low-level radioactive waste disposal projects. Other projects included responsibility for all phases of process design, capital cost estimates, compliance with QA Program requirements, economic evaluations, technology evaluations, feasibility studies, operating manuals, process technical audits, and process startups.
J.P. McAuliffe, P.E.	FS Task Leader	M.S. and B.S. Civil/Environmental Engineering, Associate. Over 9 years of engineering experience involving a broad range of hazardous waste. Projects including RI/FS, remedial design and construction oversight.
W.D. Lilley, C.P.G.	RI Task Leader	Investigations and data interpretation, a large percentage of which has been developed on remedial and site investigations projects conducted throughout New York State.

TABLE B.1

## SUMMARY OF PREPARER QUALIFICATIONS

Name	Responsibility	Qualifications
W. Xia	Geotechnical Engineer	M.S. Civil (Geotechnical) Engineering, B.S. Engineering Geology and Hydrogeology; 3 years experience including hazardous waste remedial investigations, feasibility studies, remediation design, seepage and groundwater engineering analysis, foundation subsurface investigation and analysis, and slope and underground excavation stability analysis.
C.R. Averill	Environmental Engineer	B.S. Environmental Science/Engineering. 1 year experience in a variety of engineering projects including remedial investigations, feasibility studies, and treatability studies.
M.J. Schumacher	Project Geologist	M.S. Geology and B.A. on Geology and Environmental Science. 5 years experience in field investigations including drill rig supervision, well installation and development, soil gas surveys, geophysical surveys, field sampling, and groundwater contamination assessments.
J. Hall	Data Validation	M.S. Environmental and Industrial Health, B.S. Chemistry, 3 years experience in environmental laboratory supervision, training, NYSDEC, EPA and ASTM QA/QC protocols, analytical instrumentation and health and safety.
B.D. Snyder	Ecologist	M.S. Wildlife Biology, B.S. Biology. Extensive wetland research, planning, inventory, and institutional involvement for more than 15 years of professional experience. Responsibilities have involved project management and providing technical expertise in wetland inventory, mapping, classification, characterizations, impact analyses, system modeling, restoration, mitigation, and resource management throughout the nation.

**TABLE B.2**  
**WASTE SITE INVESTIGATIVE PROGRAM**  
**ADDITIONAL SITE PERSONNEL**

Name	Organization	Title
C. Torell	ES	Assistant Scientist
N. Smith	ES	Geologist
T. Weibezahl	ES	Environmental Scientist
T. Abrams	ES	Environmental Scientist
J. Moras	NYSDEC	Project Manager
P. Concannon	NYSDEC	Geologist
G. Sutton, P.E.	NYSDEC	Engineer
C. Allen	NYSDEC	Section Chief
G. Momberger	NYSDEC	Chemist



**APPENDIX C**  
**SITE WELLS POTENTIOMETRIC MAP AND CROSS SECTIONS**

D:\ST117\ST117005.DWG

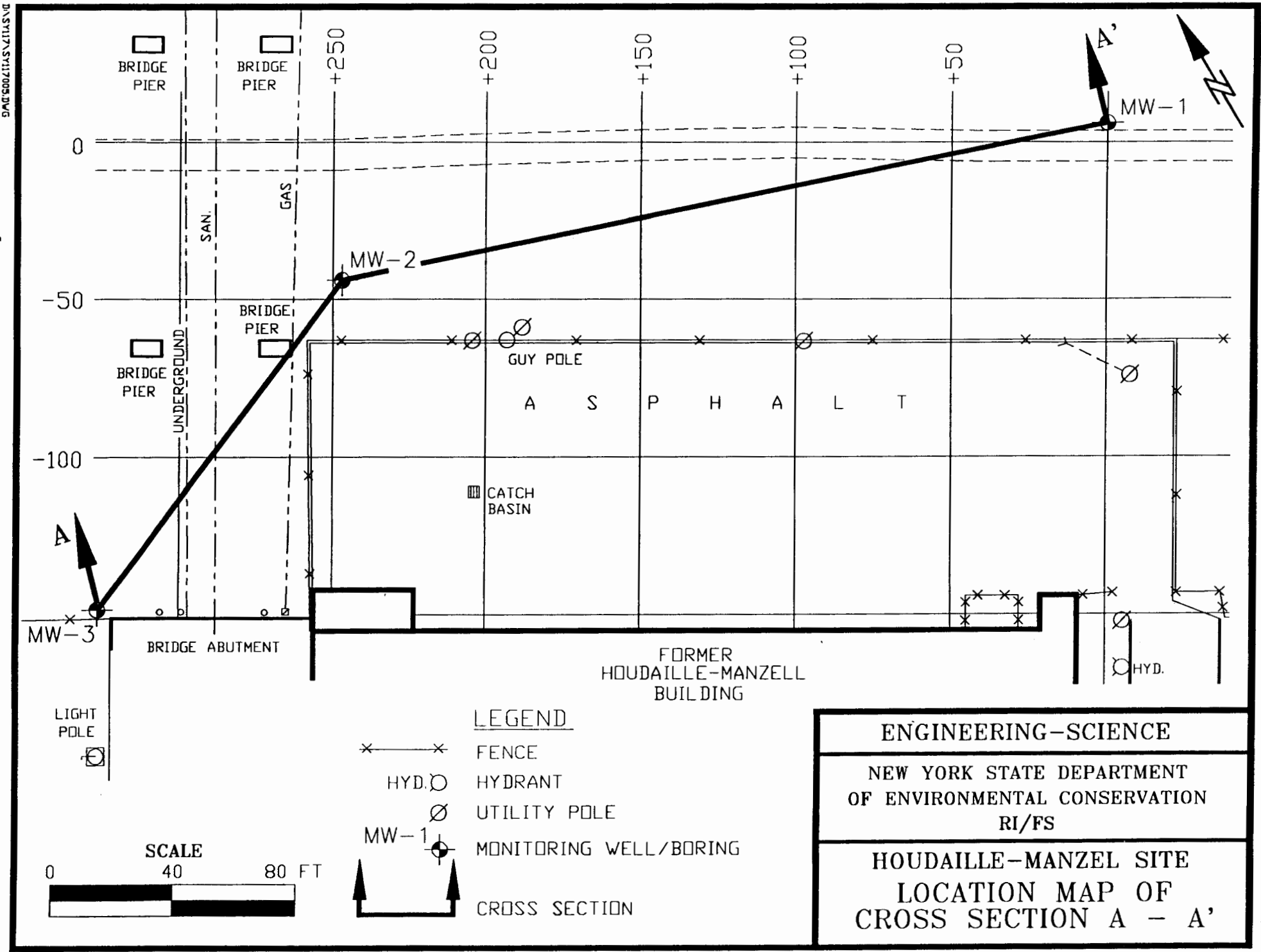
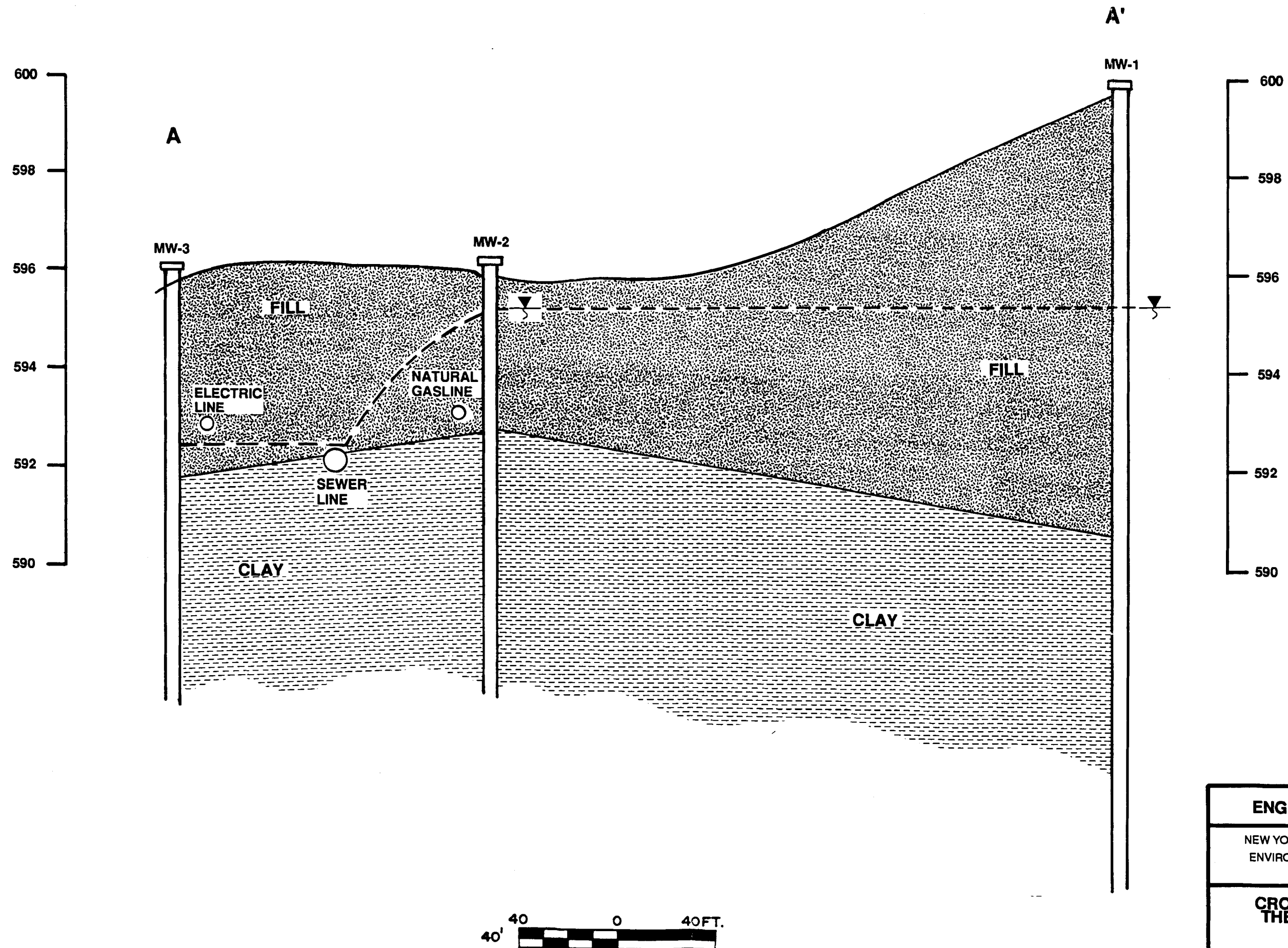


FIGURE 1 APPENDIX C



ENGINEERING-SCIENCE

NEW YORK STATE DEPARTMENT OF  
ENVIRONMENTAL CONSERVATION  
RI/FS

CROSS SECTION WITH  
THE GROUNDWATER  
LEVEL

**APPENDIX D**  
**MONITORING WELLS/BORING AND GROUNDWATER SAMPLE LOGS**

**TABLE D-1**  
**WATER LEVEL DATA**  
**HOUDAILLE-MANZEL SITE**

Well ID	Ground Surface Elevation (Feet)*	Top of PVC Well Pipe Elevation (Feet)*	Well Screen Interval Elevation (Feet)*	Water Level Data Date: 10/12/90	
				Depth to Water Level (Feet)**	Water Level Elevation (Feet)*
MW-1	599.67	602.08	590.67 to 594.67	6.69	595.39
MW-2	595.65	599.59	591.65 to 594.35	4.36	595.23
MW-3	595.85	598.61	590.85 to 593.35	6.41	592.20
MW-4	595.28	598.07	590.28 to 592.78	5.75	592.32

\* Feet above mean sea level.

\*\* Water level depth from top of PVC well pipe in feet.

**APPENDIX D.1**  
**MONITORING WELL/BORING LOGS**

Contractor: Empire Soil Inc  
Driller: Ken Fuller  
Inspector: W. O. Willey  
Rig Type: CME4S  
Drilling Method: 4.25 ID HSA

# ENGINEERING-SCIENCE DRILLING RECORD

BORING NO. MW-1  
Sheet 1 of 1  
Location: North east  
end at 0,0

## WATER LEVEL MEASUREMENTS

MP Top of Casing  
DTW from MP 10.43 7.15  
Time 7:40 8:18  
Date 10/3 10/4

Weather Sunny 50°

Date/Time Start 10/2/90 - 8:00 am

Date/Time Finish 10/2/90 - 1:00 pm

Plot Plan  
See Site Plan

Photovac	Sample	Sample	%	SPT
Reading	I.D.	Depth	Recovery	
0.0	SS-1		20	11
		1		24
				29
		2		24
25.4	SS-2		30	15
		3		9
				9
		4		8
12	SS-3		50	5
		5		5
				8
		6		5
3.5	SS-4		30	5
		7		6
				6
		8		9
0	SS-5		50	3
		9		6
				3
		10		12
30	SS-6		50	5
		11		7
				14
		12		20
			75	20
		13		5
				↓
13	SS-7		80	8
		15		10
				16
		16		21
		17		
		18		
		19		
		20		

## FIELD IDENTIFICATION OF MATERIAL

Black sand, some gravel (dry) (Fill)  
Brown sand, some gravel (moist) (Fill)  
Black sand and Brown sand (moist) (Fill)  
Black sand and gravel (moist to wet) (Fill)  
Black sand and gravel (wet)  
Brown silt and clay, trace gray fine sand (moist) (Stiff)  
16' (Stiff Fe Silt)

Boring terminated at 16'

WELL		COMMENTS
CONSTRUCTION		
1	2" Stainless Steel Risor	Bentinite Cement Grout
2		
3		
4		
5	2" SS Screen	Sand
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

Homa-50  
55-2-4  
Pb, Cu  
Homa-50  
56-4-6  
Pb, Cu

Shelby  
Tube  
12-14'

SPT - STANDARD PENETRATION TEST CAL - CALIBRATION BZ - BREATHING ZONE  
SS - SPLIT SPOON A - AUGER CUTTINGS C - CORED BH - BOREHOLE

SUMMARY Black and Brown Sand and Gravel  
Fill to 9.0 then Brown Silt and Clay

## WELL INSTALLATION CHECKLIST

Site Name: Houdaille Manzel  
 Site Number: 9-15-037  
 Job Number: SY 117.02  
 Boring Number: MW 7

Date: 10/2/90  
 By: W.D. Lilly

Depth of Hole: 9' Comments  
 Diameter of Hole: 8"

All Materials Inspected Prior to Installation?

Yes X No     

## Screen

Material: Stainless Steel  
 Slot Size: #10  
 Length: 2'  
 Threaded: Yes X No     

## Riser Pipe

Material: Stainless Steel  
 Total Length of Well - Screen Length = 9'  
 Threaded: Yes X No     

## End Cap

Material: Stainless Steel  
 Threaded: Yes X No     

All Joints Teflon Taped? Yes      No X

Total Length Of Well Casing (Includes screen and stick-up) 11'

## Sand Pack

Type/Size: Fine sand  
 Amount (Calculated): 200  
 Amount (Actual): 200  
 Installed with Tremie: Yes X No     

## Bentonite Seal(s):

Type/Size: Pellet  
 Amount (Calculated): 50  
 Amount (Actual): 50  
 Installed with Tremie: Yes X No     

Secondary Seal(s) Used: Yes      No X

Explain:       
      
    

Bentonite allowed to swell at least 30 minutes? Yes X No



## WELL INSTALLATION CHECKLIST (cont'd)

## Grout/Cement

Mixture (#Cement/#Bentonite): 100/5  
 Mixture (Gal. water/#dry mix): 5/100  
 Amount (Calculated) 200  
 Amount (Actual) 200  
 Installed with TREMIE: Yes      No X

Locking Protective Casing Installed? Yes X No       
 Locked immediately after installation: Yes X No       
 Grout sloped at surface to allow run-off: Yes X No       
 Drain hole drilled prior to development: Yes      No X  
 Stick-up: 2'

Any Foreign Objects Lost in the Well: Yes      No X

If Yes:

- (1) What was lost  
 (2) Depth  
 (3) Stage of well installation  
 (4) Was object retrieved: Yes      No       
 (All or part/how)

Well Capped: Yes X No     

Well Identified: Yes X No     

## Disposal of Cuttings

Left in Pile:       
 Spread out:      (Hnu reading:      ppm)  
 Containerized: Drummed  
 Other:     

## Disposal of Fluids:

Run off on ground surface:       
 Containerized: Drummed  
 Other:     

    D. L. Kelley      
 Engineering-Science  
 Representative

10/2/90  
 Date

		20	
--	--	----	--

PROJECT NO. SY 117.02

Date/Time Finish 10/2/40 - 4:00 pm

Bridge near-50, 25c

See S.F. Plan

Brown Silt and Clay (mudstone)  
(stiff)

8'	Boring terminated at 8'
----	-------------------------

0

Shelby  
Tube  
6-8'

SUMMARY Brown sand Fill to 3.0'  
then Brown Silt and Clay.

## WELL INSTALLATION CHECKLIST

Site Name: Houdaille Manzel  
 Site Number: 9-15-037  
 Job Number: SY 117.02  
 Boring Number: MW-2

Date: 10/2/90  
 By: W D Killey

Depth of Hole: 4' Comments

Diameter of Hole: 8"

All Materials Inspected Prior to Installation?

Yes X No     

## Screen

Material: Stainless Steel  
 Slot Size: #10  
 Length: 2'  
 Threaded: Yes X No     

## Riser Pipe

Material: Stainless Steel  
 Total Length of Well - Screen Length = 6'  
 Threaded: Yes X No     

## End Cap

Material: Stainless Steel  
 Threaded: Yes X No     

All Joints Teflon Taped? Yes      No X

Total Length Of Well Casing (Includes screen and stick-up) 8'

## Sand Pack

Type/Size: Fine sand  
 Amount (Calculated): 100  
 Amount (Actual): 100  
 Installed with Tremie: Yes X No     

## Bentonite Seal(s):

Type/Size: Pellets  
 Amount (Calculated): 25#  
 Amount (Actual): 20#  
 Installed with Tremie: Yes X No       
 Secondary Seal(s) Used: Yes      No X

Explain:       
      
    

Bentonite allowed to swell at least 30 minutes? Yes X No

## WELL INSTALLATION CHECKLIST (cont'd)

## Grout/Cement

Mixture (#Cement/#Bentonite): 100/5  
 Mixture (Gal. water/#dry mix): 5/100  
 Amount (Calculated) 100  
 Amount (Actual) 100  
 Installed with TREMIE: Yes      No X

Locking Protective Casing Installed? Yes X No       
 Locked immediately after installation: Yes X No       
 Grout sloped at surface to allow run-off: Yes X No       
 Drain hole drilled prior to development: Yes      No X  
 Stick-up: 4'

Any Foreign Objects Lost in the Well: Yes      No X

## If Yes:

- (1) What was lost  
 (2) Depth  
 (3) Stage of well installation  
 (4) Was object retrieved: Yes      No       
 (All or part/how)

Well Capped: Yes X No     

Well Identified: Yes X No     

## Disposal of Cuttings

Left in Pile:       
 Spread out:      (Hnu reading:      ppm)  
 Containerized: Dumped  
 Other:     

## Disposal of Fluids:

Run off on ground surface:       
 Containerized: Dumped  
 Other:     

[Signature]  
 Engineering-Science  
 Representative

10/2/90  
 Date

Contractor: Empire Soil Inc.  
Driller: Ken Fuller  
Inspector: W. D. Lilley  
Rig Type: CM E 45  
Drilling Method: 4.25 I D HSA

# ENGINEERING-SCIENCE DRILLING RECORD

BORING NO. MW-3  
Sheet 1 of 1  
Location: West of  
Bridge - 150, 350

## WATER LEVEL MEASUREMENTS

MP TOC  
DTW from MP 6.82  
Time 8:10  
Date 10/4

PROJECT NAME Houdaille - Manzel  
PROJECT NO. SY11702  
Weather Sunny 60°  
Date/Time Start 10/3/90 12:44 pm  
Date/Time Finish 10/3/90 2:30 pm

Plot Plan  
See Site Plan

Photovac	Sample	Sample	%	SPT
Reading	I.D.	Depth	Recovery	
5.4	SS-1		50	2
		1		2
				3
		2		2
11.6	SS-2		50	5
		3		5
				4
		4		3
8.0	SS-3		50	2
		5		3
				5
		6		5
				0
		7		0
				0
		8		↓ I
		9		
		10		
		11		
		12		
		13		
		14		
		15		
		16		
		17		
		18		
		19		
		20		

## FIELD IDENTIFICATION OF MATERIAL

Black sand, some Gravel (moist)  
(Fill)  
  
Black and brown sand, little Gravel  
(moist to wet)  
(Fill)  
4.0

Brown Silt and Clay (moist)

Boring terminated at 8'

WELL		COMMENTS
CONSTRUCTION		
1 Cement		HOMA-50-61 2-4 and HOMA-50 62-24/120 TCL
2 Brackish	2" Shelby Steel Pipe	
3		
4 Sand	2" Shelby Steel Screen	
5		
6		Shelby Tube 6-8'
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

SPT - STANDARD PENETRATION TEST CAL - CALIBRATION BZ - BREATHING ZONE  
SS - SPLIT SPOON A - AUGER CUTTINGS C - CORED BH - BOREHOLE

SUMMARY Black to Brown sand Fill &  
4.0 then Brown silt and clay

## WELL INSTALLATION CHECKLIST

Site Name: Houdaille Manzel  
Site Number: 9-15-037  
Job Number: 54117.02  
Boring Number: MW-3

Date: 10/3/90  
By: W D Litley

Depth of Hole: 5' Comments

Diameter of Hole: 8 4

**All Materials Inspected Prior to Installation?**

Yes   X   No       

## Screen

Material: Stainless Steel  
Slot Size: #10  
Length: 2'  
Threaded: Yes ☒ No ☐

### Riser Pipe

Material: Stainless Steel  
Total Length of Well - Screen Length = 5  
Threaded: Yes ☒ No ☐

### End Cap

Material: Stainless Steel  
Threaded: Yes X No     

All Joints Teflon Taped? Yes \_\_\_\_\_ No X

**Total Length Of Well Casing (includes screen and stick-up)**

### Sand Pack

Type/Size: 5 vac ss-2  
 Amount (Calculated): 100  
 Amount (Actual): 100  
 Installed with Tremie: Yes x No     

**Bentonite Seal(s):**

Type/Size: pellets  
Amount (Calculated): 25  
Amount (Actual): 25  
Installed with Tremie: Yes X No \_\_\_\_\_  
Secondary Seal(s) Used: Yes \_\_\_\_\_ No X

Explain: \_\_\_\_\_

Bentonite allowed to swell at least 30 minutes? Yes ☒ No ☐

## WELL INSTALLATION CHECKLIST (cont'd)

## Grout/Cement

Mixture (#Cement/#Bentonite): 100/5Mixture (Gal. water/#dry mix): 5/100Amount (Calculated) 100Amount (Actual) 100Installed with TREMIE: Yes      No XLocking Protective Casing Installed? Yes X No     Locked immediately after installation: Yes X No     Grout sloped at surface to allow run-off: Yes X No     Drain hole drilled prior to development: Yes      No XStick-up: 2'Any Foreign Objects Lost in the Well: Yes      No X

If Yes:

(1) What was lost

(2) Depth

(3) Stage of well installation

(4) Was object retrieved: Yes      No     

(All or part/how)

Well Capped: Yes X No     Well Identified: Yes X No     

## Disposal of Cuttings

Left in Pile:     Spread out:      (Hnu reading:      ppm)Containerized: DrummedOther:     

## Disposal of Fluids:

Run off on ground surface:     Containerized: DrummedOther:     

W. L. Lee  
 Engineering-Science  
 Representative

10/3/90  
 Date

Contractor: Empire So. ls. Inc.Driller: Ken FulkerInspector: W. D. LilleyRig Type: CMG 45

Drilling Method:

ENGINEERING-SCIENCE  
DRILLING RECORDBORING NO. MW-4Sheet 1 of 1Location: West endSite near 50,500PROJECT NAME Houdenville - MayzelPROJECT NO. SY11702Weather Sunny 55'Date/Time Start 10/3/90 9:40 amDate/Time Finish 10/3/90 11:40 am

Plot Plan

See Site Plan

## WATER LEVEL MEASUREMENTS

MP 733 TOC 8:10DTW from MP 8:10Time 10/4Date 10/4

Photovac Sample Sample % SPT

Reading I.D. Depths Recovery

6.0 SS-1 50 6

1 17

2 27

12.4 SS-2 40 23

3 27

4 28

5 17

5.1 SS-3 5 3

5 7

6 7

8 10

8.7 SS-4 10

7 11

8 15

9 15

10 10

11 10

12 10

13 10

14 10

15 10

16 10

17 10

18 10

19 10

20 10

## FIELD IDENTIFICATION OF MATERIAL

Black sand, some gravel (moist)  
(Fill)Black and brown sand, some gravel  
(moist) (Fill)

4.0'

Brown Silt and Clay (moist)

(Stiff to soft)

10'

Boring terminated at 10'

## WELL

## CONSTRUCTION

## COMMENTS

1 Cement

2 Breaker

3 2" Stainless Steel Screen

4 Sand

5 2" Stainless Steel Screen

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

HOMA-50-  
58-2-4/1.45  
PbCu, EPTorNo  
Recovery  
on First  
AttemptShelby  
Tube  
8-10'

SPT - STANDARD PENETRATION TEST CAL - CALIBRATION BZ - BREATHING ZONE

SS - SPLIT SPOON A - AUGER CUTTINGS C - CORED BH - BOREHOLE

SUMMARY Black and brown sand some gravel  
Fill to 4.0' then Brown Silt and Clay



## WELL INSTALLATION CHECKLIST

Site Name: Houdville Manzel  
 Site Number: 9-15-037  
 Job Number: 54117.02  
 Boring Number: MW-4

Date: 10/3/90  
 By: W. D. Hilley

Depth of Hole: 5' Comments

Diameter of Hole: 8"

All Materials Inspected Prior to Installation?

Yes X No     

## Screen

Material: Stainless Steel  
 Slot Size: 0.0  
 Length: 2'  
 Threaded: Yes X No     

## Riser Pipe

Material: Stainless Steel  
 Total Length of Well - Screen Length = 5'  
 Threaded: Yes X No     

## End Cap

Material: Stainless Steel  
 Threaded: Yes X No     

All Joints Teflon Taped? Yes      No X

Total Length Of Well Casing (Includes screen and stick-up)

## Sand Pack

Type/Size: 7' Fine sand  
 Amount (Calculated): 100  
 Amount (Actual): 100  
 Installed with Tremie: Yes X No     

## Bentonite Seal(s):

Type/Size: Pellet  
 Amount (Calculated): 25"  
 Amount (Actual): 25"  
 Installed with Tremie: Yes X No     

Secondary Seal(s) Used: Yes      No X

Explain:     

Bentonite allowed to swell at least 30 minutes? Yes X No

## WELL INSTALLATION CHECKLIST (cont'd)

## Grout/Cement

Mixture (#Cement/#Bentonite): 100/5  
 Mixture (Gal. water/#dry mix): 5/100  
 Amount (Calculated) 100  
 Amount (Actual) 100  
 Installed with TREMIE: Yes    No X

Locking Protective Casing Installed? Yes X No     
 Locked immediately after installation: Yes X No     
 Grout sloped at surface to allow run-off: Yes X No     
 Drain hole drilled prior to development: Yes    No X  
 Stick-up: 2'

Any Foreign Objects Lost in the Well: Yes    No X

If Yes:

- (1) What was lost:     
 (2) Depth:     
 (3) Stage of well installation:     
 (4) Was object retrieved: Yes    No     
 (All or part/how):

Well Capped: Yes X No   

Well Identified: Yes X No   

## Disposal of Cuttings

Left in Pile:     
 Spread out:    (Hnu reading:    ppm)  
 Containerized: Drummed  
 Other:   

## Disposal of Fluids:

Run off on ground surface:     
 Containerized: Drummed  
 Other:   

Whitley  
 Engineering-Science  
 Representative

10/3/90  
 Date

**APPENDIX D.2**  
**GROUNDWATER SAMPLING LOGS**

## WELL SAMPLING RECORD

Site Number S9117.02  
 Site Name Houdaille-Manzel Well MW-1 Date 10/11/90  
 Samplers: W D. Lilley of Engineering Science  
Chris Towell of Engineering Science  
 Initial Static Water Level (from top of well protective casing) 6.58'

## Evacuation:

Using: Submersible \_\_\_\_\_ Centrifugal \_\_\_\_\_ 2" Casing 4.5 ft. of water x .16 = .755 gals  
 Airlift \_\_\_\_\_ Positive Displacement \_\_\_\_\_ 3" Casing: \_\_\_\_\_ ft. of water x .36 = \_\_\_\_\_ gals  
 Bailed X Times 4" Casing: \_\_\_\_\_ ft. of water x .65 = \_\_\_\_\_ gals

Depth to intake from top of protective well casing ~~6.58~~ #11.30'

Volume of water removed 2.3 Gals. (> 3 Well Volumes)

Sampling: Time 2:45 \_\_\_\_\_ a.m.  
 \_\_\_\_\_ p.m.

Bailer Type: Stainless Steel \_\_\_\_\_  
 Teflon \_\_\_\_\_

From Pos. Dis. Discharge Tube \_\_\_\_\_  
 Other Polyethylene Bailer \_\_\_\_\_

No. of Bottles  
 Filled

I.D. No.

Analyses

Trip Blank \_\_\_\_\_

Field Blank - Wash / Atmospheric (circle one) \_\_\_\_\_

Groundwater Sample \_\_\_\_\_

Physical Appearance and Odor \_\_\_\_\_

Cloudy yellow

18 HOMA-GW FULL TCL + U<sub>3</sub>/MSO  
MW-1

Refrigerate: \_\_\_\_\_

Date: 10/11/90 Time 2:45

## Field Tests:

Temperature (C/F) 15°C

pH 6.82

Spec. Conduc (umhos/cm) 836

Weather Cloudy 50°

Comments \_\_\_\_\_

## WELL SAMPLING RECORD

Site Number SY117.02  
 Site Name Howdellmanzel Well MW-2 Date 10/11/90  
 Samplers: W. D. Lilly of Engineering Science  
C. R. Torell of Engineering Science  
 Initial Static Water Level (from top of well protective casing) 4.25'

## Evacuation:

Using: Submersible \_\_\_\_\_ Centrifugal \_\_\_\_\_ 2" Casing: 3.54 ft. of water x .16 = 0.56 gals  
 Airlift \_\_\_\_\_ Positive Displacement \_\_\_\_\_ 3" Casing: \_\_\_\_\_ ft. of water x .36 = \_\_\_\_\_ gals  
 Bailed X \_\_\_\_\_ Times 4" Casing: \_\_\_\_\_ ft. of water x .65 = \_\_\_\_\_ gals

Depth to intake from top of protective well casing 7.79'

Volume of water removed 1.7 Gals. (> 3 Well Volumes)

Sampling: Time 3:25 \_\_\_\_\_ a.m.  
 \_\_\_\_\_ p.m.

Bailer Type: Stainless Steel \_\_\_\_\_  
 Teflon \_\_\_\_\_

From Pos. Dis. Discharge Tube \_\_\_\_\_  
 Other Polyethylene Bailer \_\_\_\_\_

No. of Bottles  
 Filled

I.D. No.

Analyses

Trip Blank \_\_\_\_\_

Field Blank - Wash / Atmospheric (circle one) \_\_\_\_\_

Groundwater Sample \_\_\_\_\_

6 110mH Full TCL  
GW - MW-2

Physical Appearance and Odor Clear

Refrigerate: \_\_\_\_\_

Date: 10/11/90 Time 3:25 pm

## Field Tests:

Temperature (C/F) 14.5° C  
 pH 6.84  
 Spec. Conduc (umhos/cm) 1072

Weather Cloudy 50°

Comments \_\_\_\_\_

## WELL SAMPLING RECORD

Site Number SY1702  
 Site Name Aloudville Manzel Well MW-3 Date 10/11/90  
 Samplers: W. D. Lilley of Engineering Science  
Chris Towell of Engineering Science  
 Initial Static Water Level (from top of well protective casing) 6.94'

## Evacuation:

Using: Submersible \_\_\_\_\_ Centrifugal \_\_\_\_\_ 2" Casing: 41 ft. of water x .16 = .065 gals  
 Airlift \_\_\_\_\_ Positive Displacement \_\_\_\_\_ 3" Casing: \_\_\_\_\_ ft. of water x .36 = \_\_\_\_\_ gals  
 Bailed X \_\_\_\_\_ Times 4" Casing: \_\_\_\_\_ ft. of water x .65 = \_\_\_\_\_ gals

Depth to intake from top of protective well casing 7.35'

Volume of water removed .2 Gals. (> 3 Well Volumes)

Sampling: Time 3:35 X a.m.  
 \_\_\_\_\_ p.m.

Bailer Type: Stainless Steel \_\_\_\_\_  
 Teflon \_\_\_\_\_

From Pos. Dis. Discharge Tube \_\_\_\_\_  
 Other Polyethylene Bailer X

No. of Bottles Filled	I.D. No.	Analyses
<u>1</u>	<u>Hamib-Gow</u>	<u>VOA</u>
	<u>MW-3</u>	

Trip Blank \_\_\_\_\_

Field Blank - Wash / Atmospheric (circle one) \_\_\_\_\_

Groundwater Sample \_\_\_\_\_

Physical Appearance and Odor Clear

Refrigerate: \_\_\_\_\_

Date: 10/11/90 Time 3:35 a

## Field Tests:

Temperature (C/F)	<u>14.5</u>	<u>14 °C</u>
pH	<u>6.8</u>	<u>7.26</u>
Spec. Conduc (umhos/cm)		<u>498</u>

Weather Cloudy 50°

Comments PCB & Pb Cu to be collected for marrow

## WELL SAMPLING RECORD

Site Number 5411702  
 Site Name Houderille manzel Well MW-4 Date 10/11/90  
 Samplers: W. D. Lilley of Engineering Science  
Chris Torell of Engineering Science  
 Initial Static Water Level (from top of well protective casing) 4.05'

## Evacuation:

Using: Submersible \_\_\_\_\_ Centrifugal \_\_\_\_\_ 2" Casing: 3.28 ft. of water x .16 = .52 gals  
 Airlift \_\_\_\_\_ Positive Displacement \_\_\_\_\_ 3" Casing: \_\_\_\_\_ ft. of water x .36 = \_\_\_\_\_ gals  
 Bailed X \_\_\_\_\_ Times 4" Casing: \_\_\_\_\_ ft. of water x .65 = \_\_\_\_\_ gals

Depth to intake from top of protective well casing 7.33'

Volume of water removed 1.6 Gals. (> 3 Well Volumes)

Sampling: Time 3:40 \_\_\_\_\_ a.m.  
 \_\_\_\_\_ p.m.

Bailer Type: Stainless Steel \_\_\_\_\_  
 Teflon \_\_\_\_\_

From Pos. Dis. Discharge Tube \_\_\_\_\_  
 Other Polyethylene Bailer

No. of Bottles  
 Filled

I.D. No.

Analyses

Trip Blank \_\_\_\_\_

Field Blank - Wash / Atmospheric (circle one) \_\_\_\_\_

Groundwater Sample \_\_\_\_\_

4

HOMMA-GW  
MW-4

PCB, VOA, Pb, Cu

Physical Appearance and Odor Cloudy

Refrigerate: Date: 10/11/90 Time 3:40

## Field Tests:

Temperature (C/F) 16°C  
 pH 6.88  
 Spec. Conduc (umhos/cm) 1410

Weather Cloudy, 50°

Comments - Pb, Cu Bottle Filled at 4:30.