Foth & Van Dyke

Waste/Energy Division

Report

VOC GROUNDWATER INVESTIGATION

WAUSAU ENERGY CORPORATION

Wausau, Wisconsin

SCOPE I.D. #: 86 W 18

December 1986

Foth & Van Dyke and Associates Inc.
2737 S. Ridge Road
P. O. Box 11997
Green Bay, Wisconsin 54307-1997
414/497-0902

Rec'd 1/15/87

VOC GROUNDWATER INVESTIGATION

AT THE

FORMER WAUSAU ENERGY FACILITY

IN

WAUSAU, WISCONSIN

Prepared for:

WAUSAU ENERGY CORPORATION

Prepared by:

FOTH & VAN DYKE and Associates, Inc.

December, 1986

FOTH & VAN DYKE

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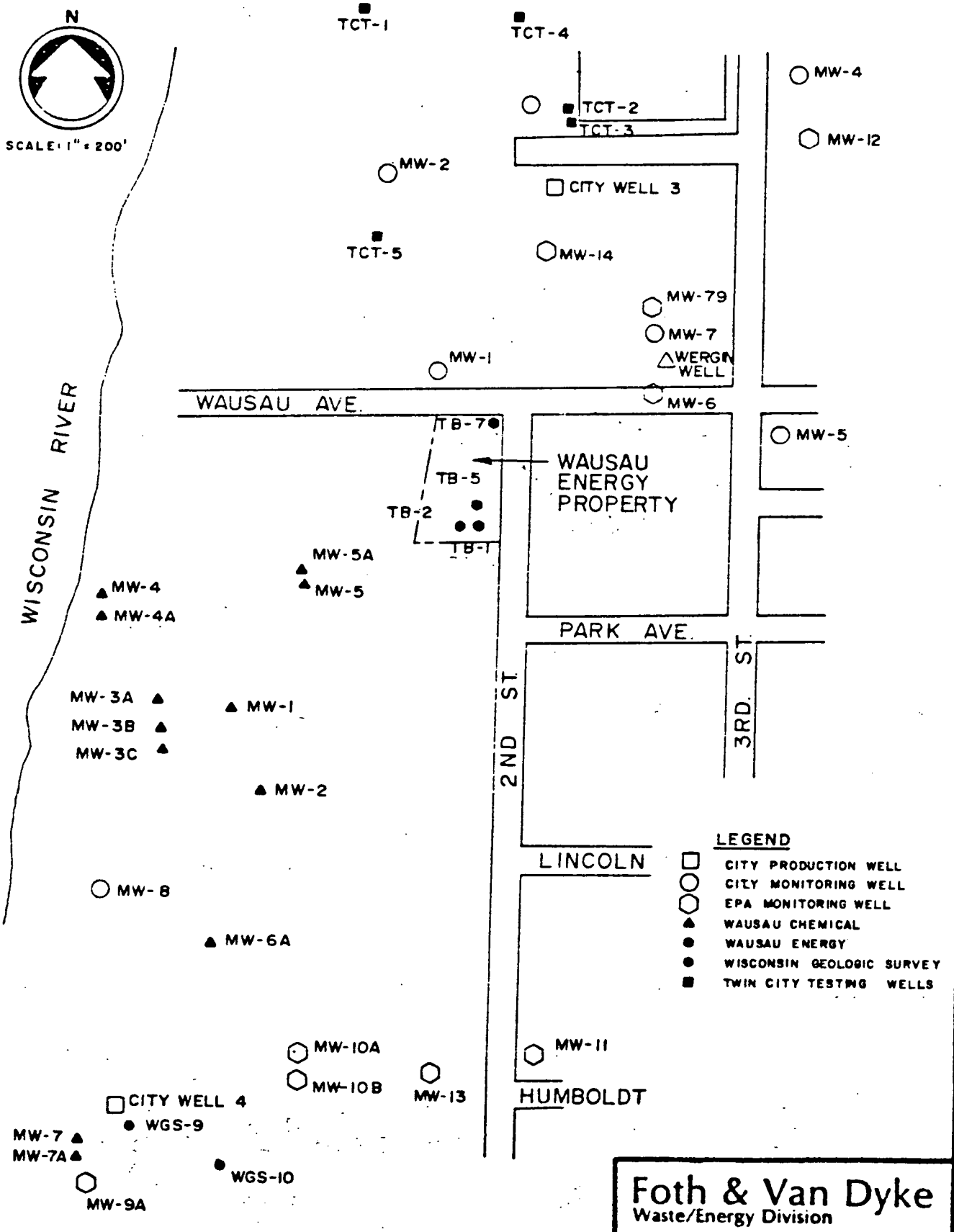
1.0 INTRODUCTION

This report summarizes the volatile organic compound (VOC) investigation that Foth & Van Dyke has conducted for the Wausau Energy Corporation in Wausau, Wisconsin. The U. S. Environmental Protection Agency (USEPA) has named Wausau Energy a Potentially Responsible Party (PRP) in the Wausau Groundwater Superfund case, presumably as a contributor to the VOC contamination of City of Wausau Wells No. 3 and 4 (see Figure No. 1-1). The goal of this study was to determine the responsibility of Wausau Energy, if any, for this VOC contamination.

FIGURE NO. 1-1

MONITORING WELL LOCATIONS IN THE VICINITY OF WAUSAU ENERGY



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2.0 BACKGROUND INFORMATION

The Wausau Energy property was used in the past as a petroleum bulk storage and distribution center. Tanks were located to the south of the building (see Figure No. 2-1), and a trailer, used for the licensed collection of drummed waste oils, was occasionally parked on the north side of the building. The tanks and piping were drained, dismantled, and removed off-site during the summer of 1984 and the site is currently inactive.

During the early 1980's, VOC contamination was discovered in City Well No. 3 and a non-potable supply well owned by the Wergin Construction Company (see Figure No. 1-1 for location). According to available data, dichloroethylene (DCE) values ranged from 3 to 110 ug/l, trichloroethylene (TCE) values from 2 to 210 ug/l, and tetrachloroethylene (PCE) values from 0.6 to 100 ug/l in samples collected from Well No. 3. These concentrations are above groundwater quality Enforcement Standards (State of Wisconsin NR-140). As of November 1984, however, PCE and DCE that previously occurred at high concentrations, had diminished to trace levels, while TCE concentrations have generally remained in the 100-200 ug/l range. In the Wergin Construction Company Well, DCE values ranged from 7 to 2090 ug/l, TCE values ranged from 4 to 230 ug/l, and PCE values ranged from 45 to 800 ug/l. As of November 1984, concentrations have also been declining in this well. Previous studies in the region (Weston, 1985 and Foth & Van Dyke, 1986) have determined that City Well No. 3 and the Wergin Well are downgradient from the Wausau Energy property.

The Wisconsin Department of Natural Resources (WDNR) collected a surface soil sample in the fall of 1985 from the point indicated on Figure No. 2-1. VOC analytical results indicated the presence of PCE which the USEPA considered to be sufficient evidence to include Wausau Energy on its PRP list for the Wausau groundwater CERCLA case.

Wausau Energy, in an effort to further confirm the extent of contamination, conducted eight soil borings, four of which were converted into monitoring wells. This work was done on February 18, 1986 and boring locations are given on Figure No. 2-2 (labeled TB-1 through TB-8). Soil boring logs, monitoring well construction details, and soil sample analytical results are provided in Appendix A.

Soil VOC results indicated the presence of toluene, benzene, xylene, and ethylbenzene in TB-1, TB-2, TB-3, and TB-4. These components are, among other things, constituents of fuels once contained on the site. When present in this combination, they usually indicate the presence of gasoline. PCE (8.6 ug/g) was found only in TB-7 at the four foot depth. No other VOCs were detected in the other samples analyzed.

Foth & Van Dyke was subsequently retained to determine the extent of VOC contamination on the Wausau Energy property. The occasional parking of the trailer containing drummed waste oils on the north side of the building was a concern as a possible past source of VOC contamination.

FIGURE NO. 2-1

WAUSAU ENERGY PROPERTY - APRIL 26, 1974

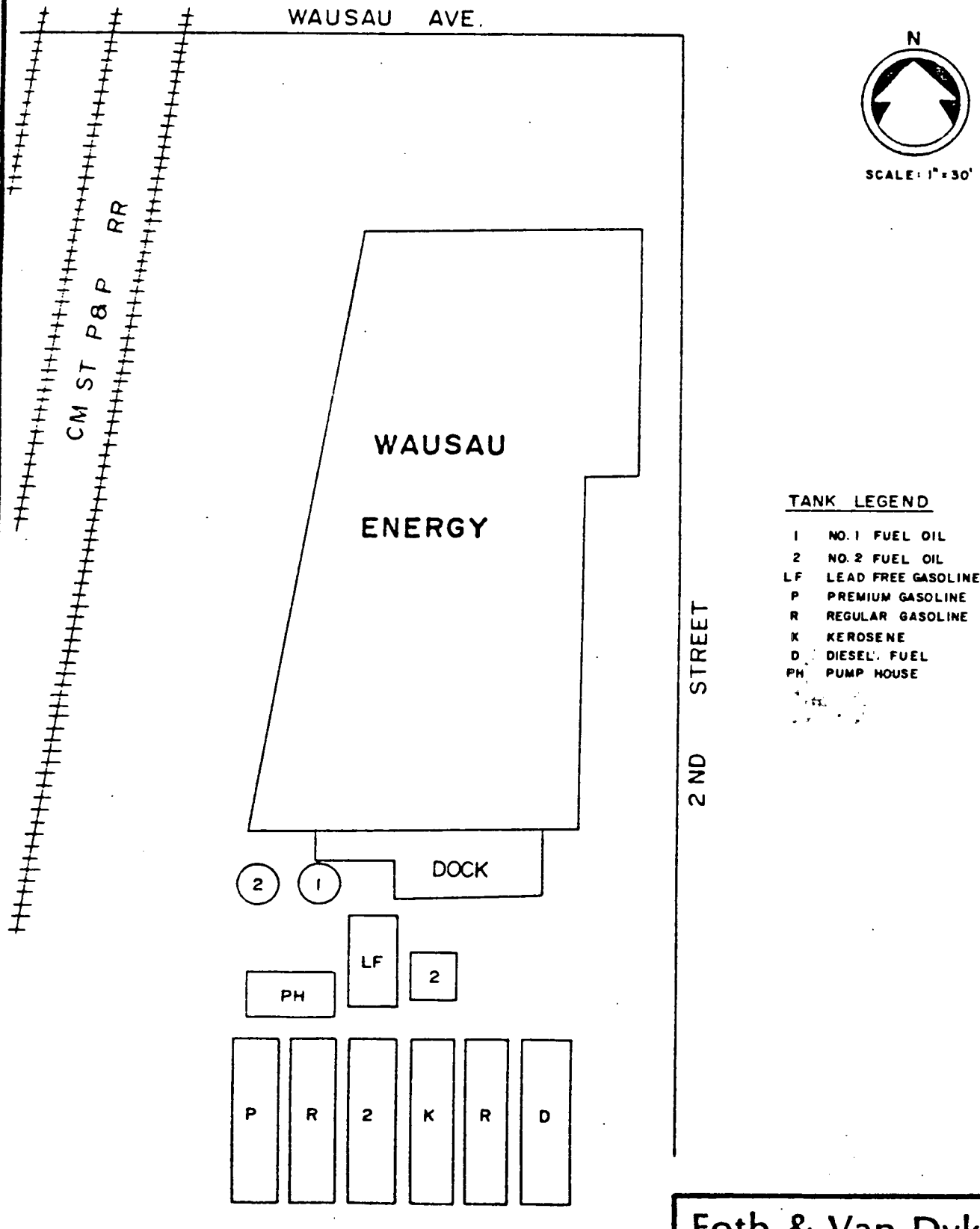

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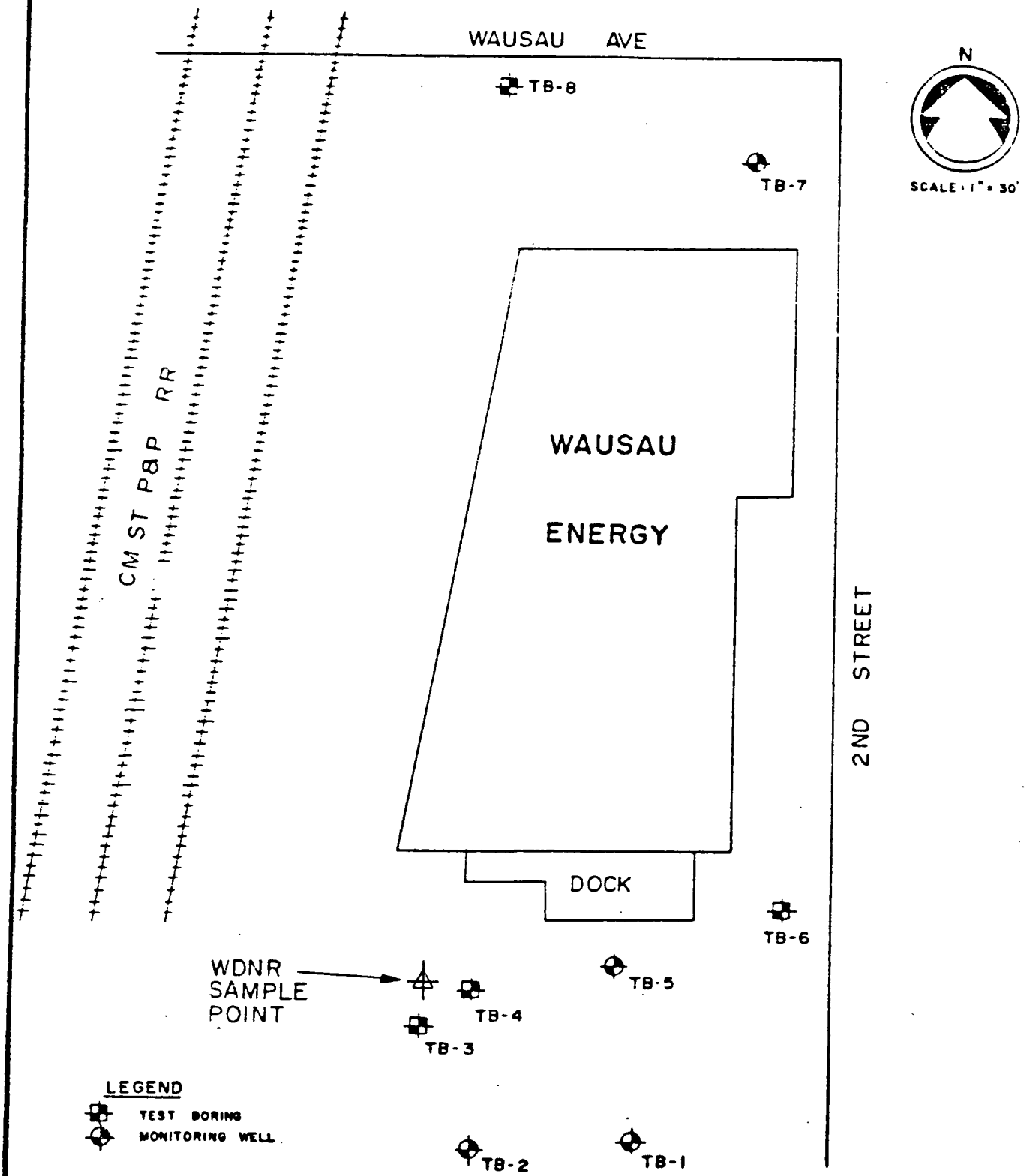
FIGURE NO. 2-2

SOIL BORING AND MONITORING WELL LOCATIONS AT WAUSAU ENERGY — FEBRUARY, 1986



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3.0 ADDITIONAL SOIL AND GROUNDWATER ANALYSIS

On April 21, 1986, groundwater samples were collected from Wausau Energy's monitoring wells, City of Wausau MW-1, and USEPA MW-14 (see Figure No. 1-1 for location). Groundwater was approximately 13 feet below the ground surface. Using a hand auger rinsed with deionized water, hexane, and again with deionized water, soil samples were collected from HA-1, HA-2, and HA-3 (see Figure No. 3-1) and analyzed for Priority Pollutant VOCs. Samples were taken at the surface and four foot depth. The results are provided in Appendix B.

On May 1, 1986, five more soil borings were conducted on site. These borings were labeled TB-101 to TB-105 and are indicated on Figure No. 3-2. TB-101 and TB-102 were positioned near the WDNR sampling point. Samples were taken at the depth intervals of 0-2 feet, 4-6 feet, 8-10 feet, and 12-14 feet in these two borings. TB-103, TB-104, and TB-105 were drilled close to HA-3, HA-2, and HA-1, respectively. Samples were taken at the depth intervals of 7-9 feet, 9-11 feet, and 12-13.5 feet in these three borings. Samples were analyzed for Priority Pollutant VOCs; in addition, samples from TB-103, TB-104, and TB-105 were analyzed for Total Organic Carbon (TOC). Results are provided in Appendix C.

FIGURE NO. 3-1

SOIL BORING AND MONITORING WELL LOCATIONS AT WAUSAU ENERGY — APRIL 21, 1986

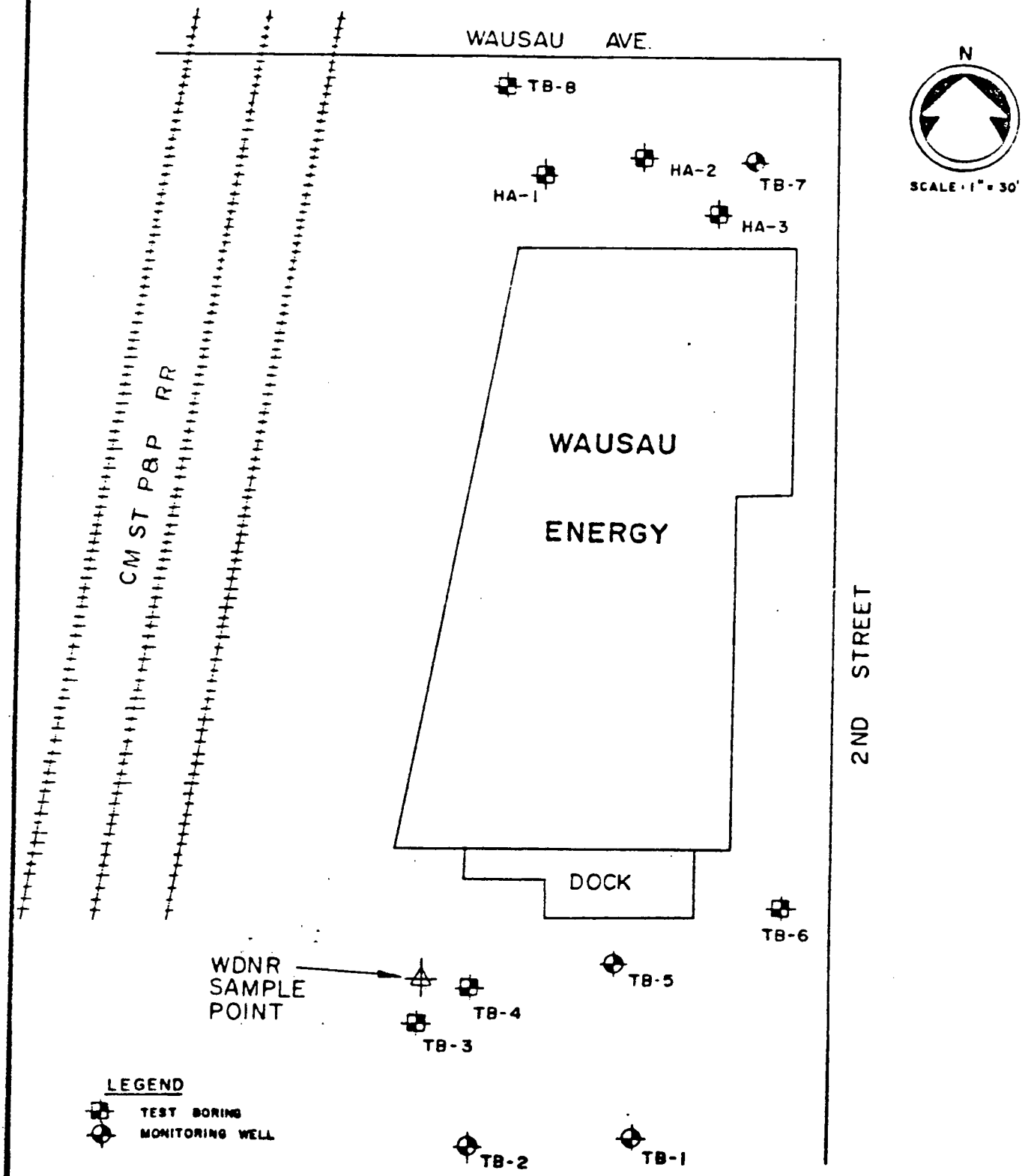

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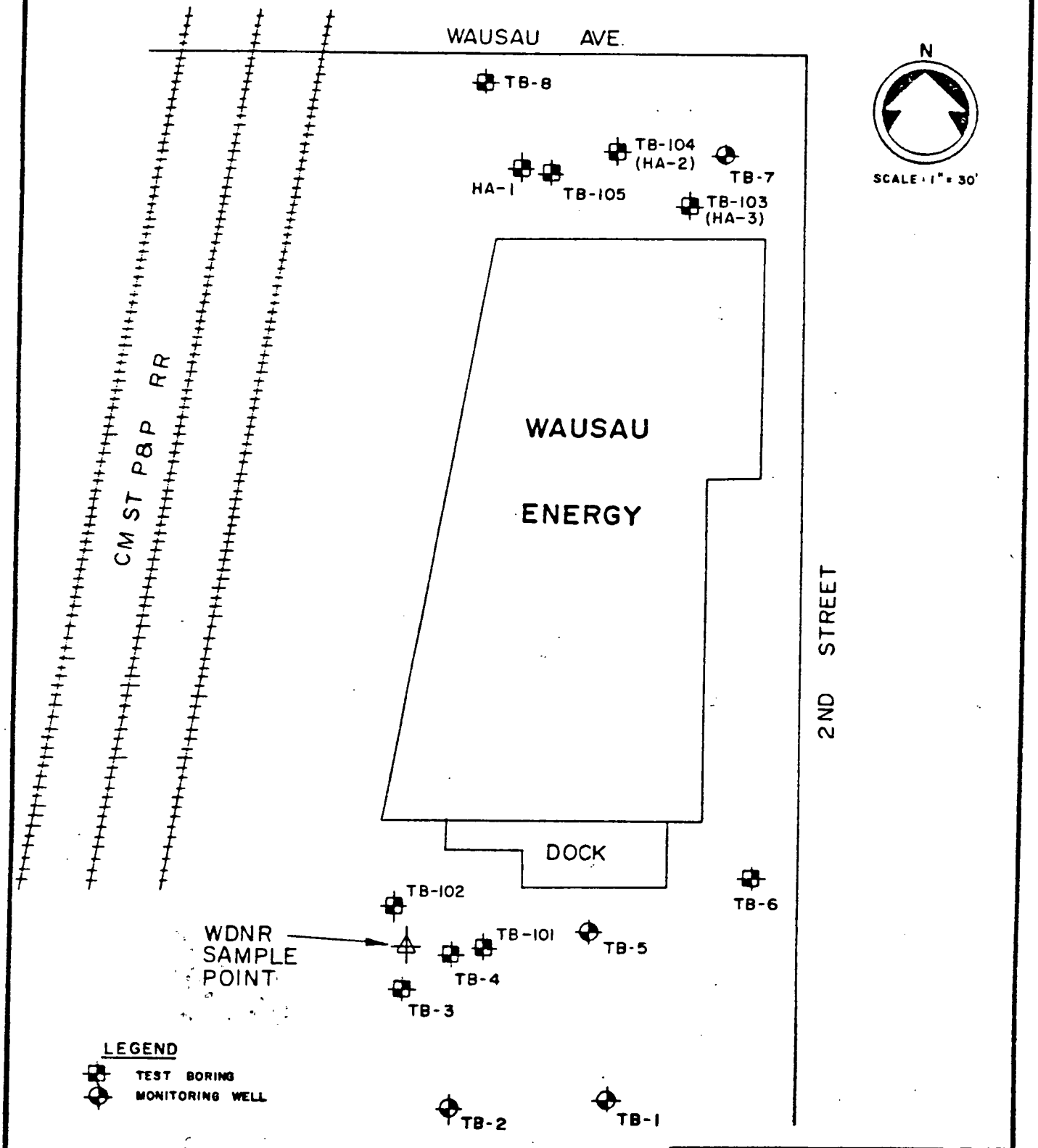
FIGURE NO. 3-2

SOIL BORING AND MONITORING WELL LOCATIONS AT WAUSAU ENERGY — MAY 1, 1986



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4.0 DISCUSSION OF VOC CONTAMINATION

Besides the petroleum constituents (i.e.. toluene, benzene, ethylbenzene, and xylene) which were detected in TB-101 and TB-102, PCE was the only other VOC detected in the soil samples. Its presence was limited to the borings north of the Wausau Energy building. Its presence south of the main building, as found in the WDNR sample, was not confirmed by this investigation. PCE was the only chlorinated VOC contaminant which was detected in the unsaturated soils at Wausau Energy which was also detected in City Well No. 3. The major and long term contaminant at City Well No. 3, TCE, was not found in any of the Wausau Energy soil samples.

Figure No. 4-1 summarizes the analytical results for PCE and TOC for samples collected on the north side of the Wausau Energy building. It is seen that PCE is not detectable in a layer of soil 9 to 11 feet deep. One hypothesis which can be made from these data is that the PCE contaminated oil, originating from the ground surface on the north side of the building, did not percolate below a depth of nine feet. The PCE contained in the deeper samples just above the water table in the 12 to 13.5 foot soil layer may have originated from groundwater passing through these soils at times past when the water table was somewhat higher (at the time of sampling, the water table occurred at approximately 13 feet below the land surface during a relatively dry spring season).

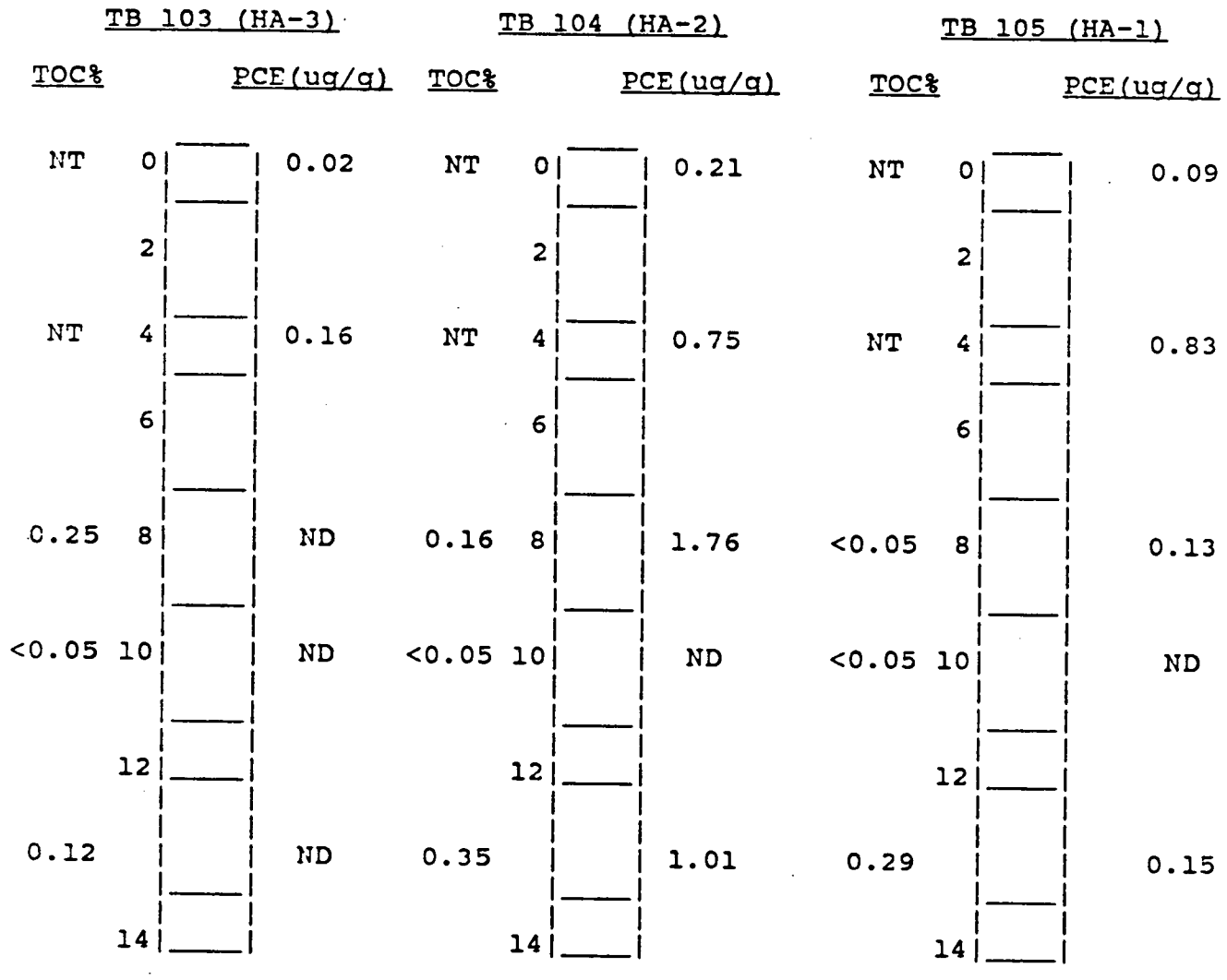
Research indicates that VOCs tend to adsorb and become concentrated in a soil's organic matter, the amount of which in a soil is measured by the parameter, total organic carbon (TOC). The hypothesis, that the absence of VOCs in the 9-11 foot soil layer means that no VOCs passed through the layer, can neither be confirmed nor denied since no TOC was detected in the layer either. An alternative hypothesis would be that the VOC front may have passed through the 9-11 foot soil layer with minimal, non-detectable adsorption taking place, entered the underlying soils, and possibly contributed a minor amount of PCE to the groundwater beneath the site.

Dr. Robert Griffin, a VOC adsorption and transport expert with the Illinois State Geologic Survey, concurred with the inability to select between the two above hypotheses. Dr. Griffin did state, however, that even though evidence does not exist to make such a choice, the Wausau Energy soil contamination is relatively small. Something on the order of one pint of PCE solvent is apparently responsible for the on-site PCE soil concentrations.

In our opinion, there are VOC sources yet to be found in the area. This must be done if Wausau Energy's interests are to be protected in this matter. Chief among these is the TCE source at City Well No. 3 which has contributed concentrations of 100-200 ug/l for at least four years, while the concentrations of PCE have fallen to the barely detectable range. Such consistent TCE readings cannot possibly be the result of a one time slug flow of contaminant, as seems to have been the case with the PCE. Somewhere, probably within a 1000 feet of City Well No. 3, there is a continuing source of TCE contamination.

FIGURE 4-1

SOIL PCE AND TOC SUMMARY



NT = Not Tested

ND = Not Detected

5.0 CONCLUSIONS

The lack of organic matter (i.e., TOC) in the 9-11 foot soil layer makes it impossible to select between the two plausible hypotheses. One hypothesis holds that no PCE migrated downward from the surface any deeper than 9 feet. Under this hypothesis, PCE found in the soil sample taken at 13 feet got there by being contaminated from the contaminated water table which fluctuates up and down through that zone. The alternative hypothesis holds that PCE did migrate from the surface to the water table. The explanation as to why it was not detected in the 9-11 foot soil sample would be that the sample did not contain any detectable TOC, which would be the medium that would have adsorbed most of the PCE.

Notwithstanding this uncertainty, however, there is little doubt that the amount of PCE spilled on site was quite small, probably the equivalent of one pint. Therefore, the contribution of PCE to the groundwater beneath the Wausau Energy property is a *de minimis* contribution, at most, to the Wausau Groundwater Superfund site.

APPENDIX A

Boring Logs and Analytical Results

Field Activity of February 18, 1986

EXPLORATION TECHNOLOGY INC.

Exploration Drilling and Sampling — Diamond Rock Coring — Off Shore Drilling

1402 Emil Street P.O. Box 9404 Madison, WI 53715
Madison, WI (608) 258-9550 Milwaukee, WI (414) 224-6177

February 27, 1986

Ronald J. Ganim
Amoco Oil Company
P.O. Box 5910-A
Chicago, IL 60680

David E. Stewart
DeWitt-Sundby, Attorneys
Suite 120 Teton Wood
6515 Grand Teton Plaza
Madison, WI 53719

Re: Soil Sampling and Monitoring Well Installation
at Wausau Energy Property on Second Street
in Wausau, Wisconsin

Gentlemen:

We have completed soil borings, sampling and well installation for the referenced site in Wausau, Wisconsin. The work was performed under the direction of Mr. Dennis Beckmann of Amoco Oil.

If you have any questions or require furtner assistance, please feel free to call.

Sincerely,

EXPLORATION TECHNOLOGY INC.

Thomas F. Bendorf
Director of Marketing

TFB/mem

EXPLORATION TECHNOLOGY INC.

LOG OF TEST BORING

Project: Wausau Energy & Amoco Oil
2nd & Bridge Street
Location: Wausau, Wisconsin

Boring No. TB-1
Surface Elevation
Job No. 811078
Sheet 1 of 1

1402 EMIL STREET • P.O. BOX 9404, MADISON, WIS. 53718 • TEL. (608) 258-9550

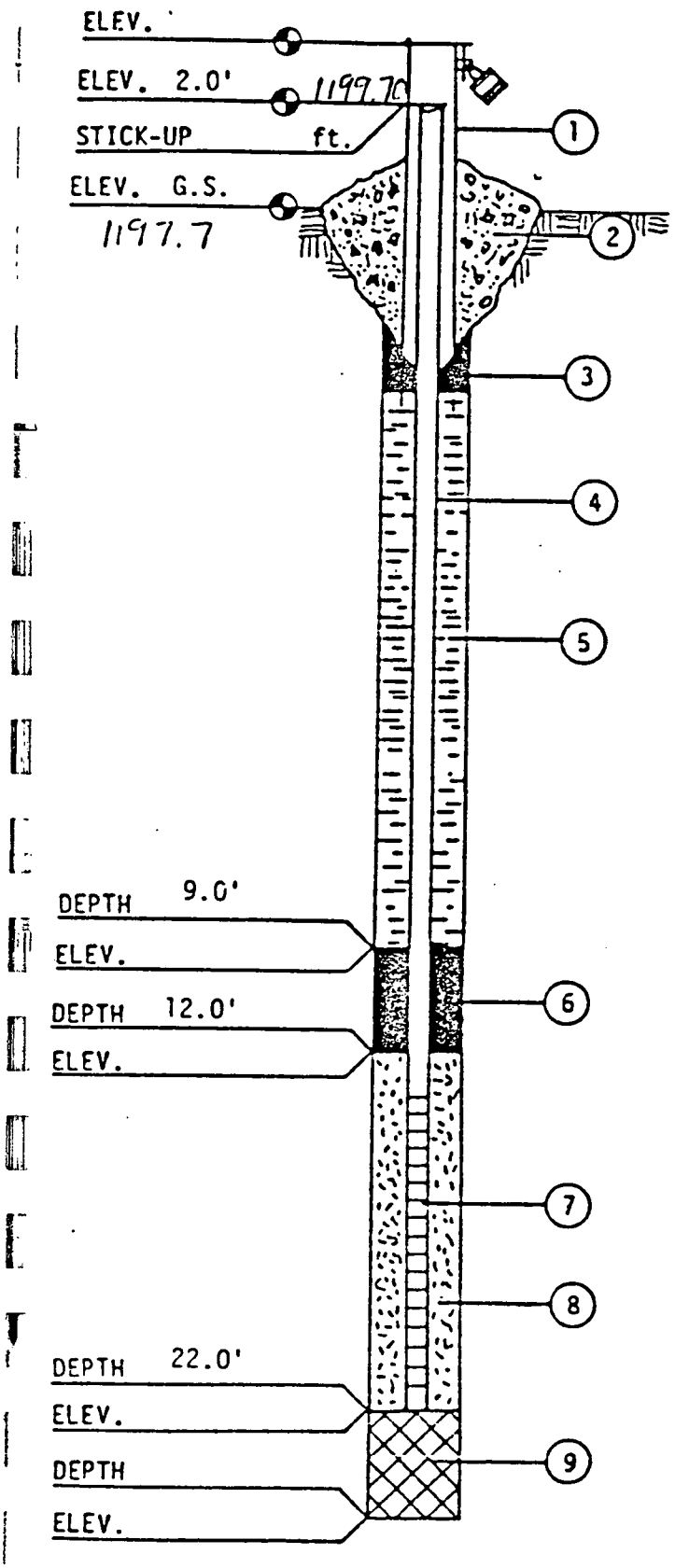
SAMPLE No.	Type	Recovery ↓	Moisture ↓	N	Depth	VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES qu	W	LL	PL	D
1	SS	.5'	D	9		Red to Brown Very Coarse to Fine SAND with Gravel					
2	SS	.9'	D	46	5	Brown Very Coarse to Fine SAND with Gravel & Silt					
					10	Red to Brown Very Coarse to Fine SAND with Gravel					
3	SS	.7'	W	46	15	Gray to Brown Coarse to Fine SAND					
					20	End Boring at 22'					
					25						
					30						
					35						
					40						

WATER LEVEL OBSERVATIONS

While Drilling
Upon Completion of Drilling
Time After Drilling: 1/4 hour
Depth to Water: 17.0'
Depth to Cave In: 8.0'

GENERAL NOTES

Start 2/18/86 Complete 2/18/86
Crew Chief LE Rig 750
Drilling Method



EXPLORATION TECHNOLOGY INC.

MONITORING WELL CONSTRUCTION INFORMATION

JOB NO. 811078

BORING/WELL NO. TB-1

DATE 2/18/86

CHIEF/UNIT Larry/750

1. PROTECTIVE CASING (YES) NO
   LOCKING (YES) NO
2. CONCRETE SEAL (YES) NO
3. TYPE OF SURFACE SEAL (IF INSTALLED) Bentonite
4. SOLID PIPE TYPE PVC
   SOLID PIPE LENGTH 12.0 ft.
   JOINT TYPE SLIP/GLUED (THREADED)
5. TYPE OF BACKFILL Sand
   HOW INSTALLED - TREMIE (FROM SURFACE)
6. TYPE OF LOWER SEAL (IF INSTALLED) Bentonite
7. SCREEN TYPE PVC
   SCREEN LENGTH
   SLOT-SIZE 0.010" LENGTH 10.0 ft.
   SCREEN DIAMETER 2.0 in.
8. TYPE OF BACKFILL AROUND SCREEN Sand
9. TYPE OF BACKFILL -
10. DRILLING METHOD Hollow Stem Auger
11. ADDITIVES USED (IF ANY) -

WATER LEVEL 14.5' DATE 2/18/86

*ALL DEPTHS MEASURED FROM GROUND SURFACE.

EXPLORATION TECHNOLOGY INC.

LOG OF TEST BORING

Project: Wausau Energy & Amoco Oil
2nd & Bridge Street
Location: Wausau, Wisconsin

Boring No. TB-2
Surface Elevation
Job No. 811078
Sheet 1 of 1

1402 EMIL STREET • P.O. BOX 9404, MADISON, WIS. 53715 • TEL. (608) 258-9550

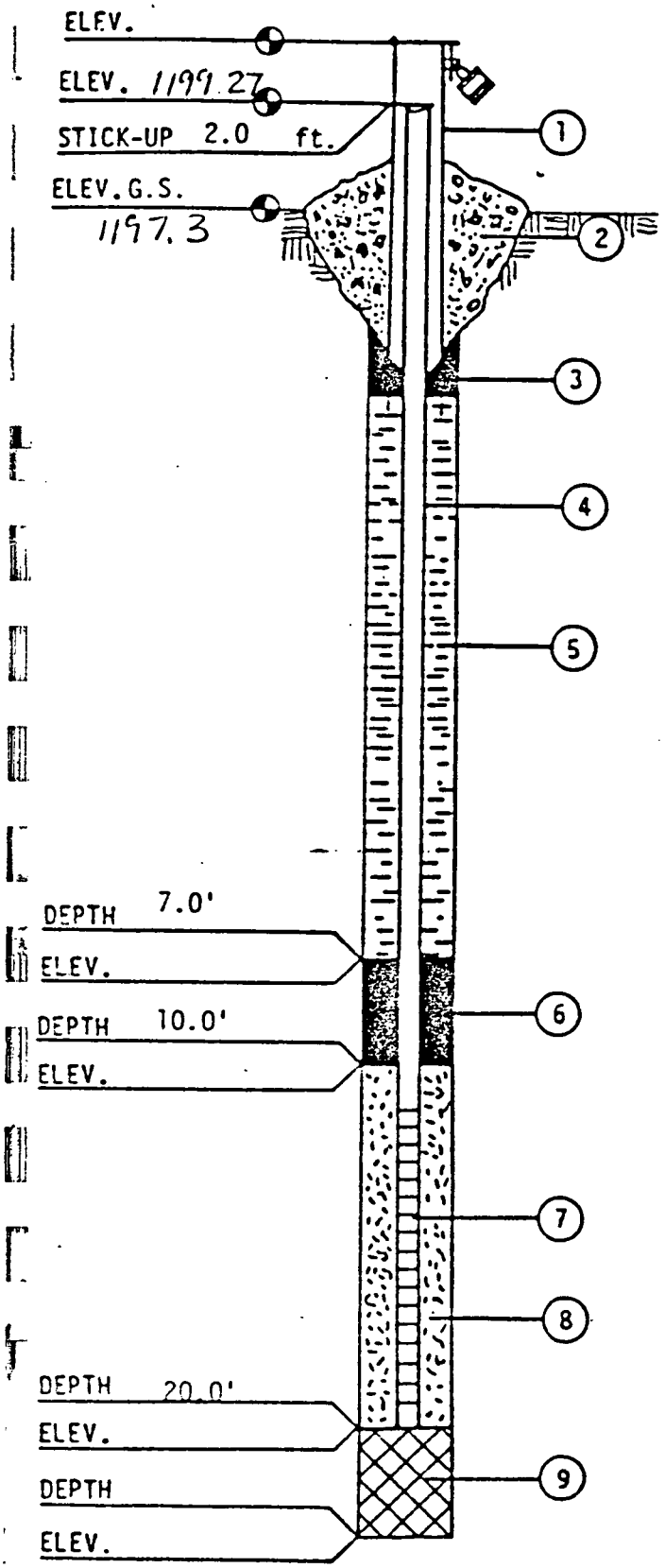
SAMPLE No.	Type	Recovery	Moisture	N	Depth	VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES qu	W	LL	PL	D
1	SS	.7'	M	34	5	Red to Brown Medium to Fine SAND with Gravel and Silt					
2	SS	12'	M	54	10	Red to Brown Very Coarse to Fine SAND with Gravel					
3	SS	.8'	W	100	15	Gray to Brown Coarse to Fine SAND					
					20	End Boring at 20' Well set at 20.0'					
					25						
					30						
					35						
					40						

WATER LEVEL OBSERVATIONS

While Drilling
Upon Completion of Drilling
Time After Drilling 1/4 hour
Depth to Water 15.0'
Depth to Cave In 10.0'

GENERAL NOTES

Start 2/18/86 Complete 2/18/86
Crew Chief L.E. Rig 750
Drilling Method



EXPLORATION TECHNOLOGY INC.

MONITORING WELL CONSTRUCTION INFORMATION

JOB NO. 811078

BORING/WELL NO. TB-2

DATE 2/18/86

CHIEF/UNIT LE/750

1. PROTECTIVE CASING (YES) NO
   LOCKING (YES) NO
2. CONCRETE SEAL (YES) NO
3. TYPE OF SURFACE SEAL (IF INSTALLED)
   Bentonite
4. SOLID PIPE TYPE PVC
   SOLID PIPE LENGTH 10.0 ft.
   JOINT TYPE SLIP/GLUED (THREADED)
5. TYPE OF BACKFILL Sand
   HOW INSTALLED - TREMIE (FROM SURFACE)
6. TYPE OF LOWER SEAL (IF INSTALLED)
   Bentonite
7. SCREEN TYPE PVC
   SCREEN LENGTH
   SLOT-SIZE 0.010" LENGTH 10.0 ft.
   SCREEN DIAMETER in.
8. TYPE OF BACKFILL AROUND SCREEN
   Sand
9. TYPE OF BACKFILL -
10. DRILLING METHOD Hollow Stem Auger
11. ADDITIVES USED (IF ANY)
    -

WATER LEVEL 14.5' DATE 2/18/86

*ALL DEPTHS MEASURED FROM GROUND SURFACE.

EXPLORATION TECHNOLOGY INC.

LOG OF TEST BORING

Project: Wausau Energy & Amoco Oil
2nd & Bridge Street
Location: Wausau, Wisconsin

Boring No. TB-3
Surface Elevation
Job No. 811078
Sheet 1 of 1

1402 EARL STREET • P.O. BOX 9404, MADISON, WIS. 53715 • TEL. (608) 258-9550

SAMPLE No.	Type	Recovery	Moisture	N	Depth	VISUAL CLASSIFICATION and Remarks
1	SS	.9'	M	5		Red to Brown Very Coarse to Fine SAND with Silt and Gravel
2	SS	12"	M	38	5	Red to Brown Very Coarse to Fine SAND with Gravel
3	SS	1.1'	W	30	10	Gray to Brown Coarse to Fine SAND
					15	End Boring at 16.5'
					20	
					25	
					30	
					35	
					40	

SOIL PROPERTIES

q_u	W	LL	PL	D

WATER LEVEL OBSERVATIONS

While Drilling
Upon Completion of Drilling
Time After Drilling: 1/4 hour
Depth to Water: 15.0'
Depth to Cave In: 7.0'

GENERAL NOTES

Start 2/18/86 Complete 2/18/86
Crew Chief LE. Rig 750
Drilling Method

EXPLORATION TECHNOLOGY INC.

LOG OF TEST BORING

Project: Wausau Energy & Amoco Oil
2nd & Bridge Street
Location: Wausau, Wisconsin

Boring No. TB-4
Surface Elevation
Job No. 811078
Sheet 1 of 1

1402 EMIL STREET • P.O. BOX 9404, MADISON, WIS. 53715 • TEL. (608) 258-9550

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type	↓	↓	N	Depth		q_u	W	LL	PL	D
1	SS	1.1'	M	17		Red to Brown Coarse to Fine SAND with Gravel and Silt					
2	SS	1.0'	M	39	5	Red to Brown Very Coarse to Fine SAND with Gravel					
3	SS	.8'	W	26	10	Gray to Brown Coarse to Fine SAND					
					15	End Boring at 16.5'					
					20						
					25						
					30						
					35						
					40						

WATER LEVEL OBSERVATIONS

While Drilling
Upon Completion of Drilling
Time After Drilling 1/4 hour
Depth to Water 15.0'
Depth to Cave In 9.3'

GENERAL NOTES

Start 2/18/86 Complete 2/18/86
Crew Chief LE Rig 750
Drilling Method

EXPLORATION TECHNOLOGY INC.

LOG OF TEST BORING

Project: Wausau Energy & Amoco Oil
2nd & Bridge Street
Location: Wausau, Wisconsin

Boring No. TB-5
Surface Elevation
Job No. 811078
Sheet 1 of 1

1402 EMIL STREET • P.O. BOX 8404, MADISON, WIS. 53716 • TEL. (608) 258-9550

SAMPLE No.	Type	Recovery	Moisture	N	Depth	VISUAL CLASSIFICATION and Remarks
1	SS	.4'	M	8		Red to Brown Very Coarse to Fine SAND with Gravel, Some Silt
2	SS	1.1'	M	41	5	Red to Brown Very Coarse to Fine SAND with Gravel
3	SS	1.0'	W	29	10	Gray to Brown Very Coarse to Fine SAND
					15	End Boring at 20.5'
					20	Well set at 20.5'
					25	
					30	
					35	
					40	

SOIL PROPERTIES

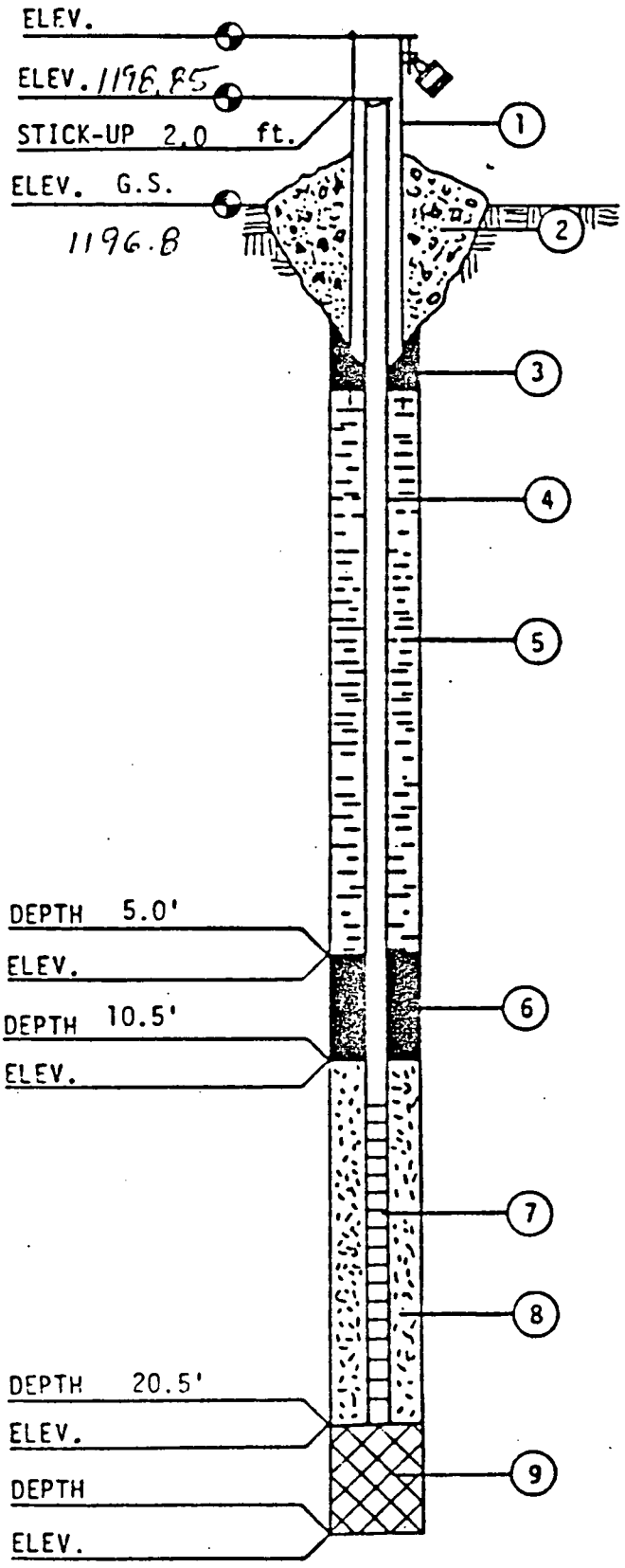
qp	W	LL	PL	D

WATER LEVEL OBSERVATIONS

While Drilling
Upon Completion of Drilling
Time After Drilling: 1/4 hour
Depth to Water: 14.0'
Depth to Cave In: 8.0'

GENERAL NOTES

Start: 2/18/86 Complete: 2/18/86
Crew Chief: LE Rig: 750
Drilling Method:



EXPLORATION TECHNOLOGY INC.

MONITORING WELL CONSTRUCTION INFORMATION

JOB NO. 811078

BORING/WELL NO. TB-5

DATE 2/18/86

CHIEF/UNIT LE/750

1. PROTECTIVE CASING (YES) NO
   LOCKING (YES) NO
2. CONCRETE SEAL (YES) NO
3. TYPE OF SURFACE SEAL (IF INSTALLED)
   Bentonite
4. SOLID PIPE TYPE PVC
   SOLID PIPE LENGTH 10.0 ft.
   JOINT TYPE SLIP/GLUED (THREADED)
5. TYPE OF BACKFILL Sand
   HOW INSTALLED - TREMIE (FROM SURFACE)
6. TYPE OF LOWER SEAL (IF INSTALLED)
   Bentonite
7. SCREEN TYPE PVC
   SCREEN LENGTH
   SLOT-SIZE 0.010" LENGTH 10.0 ft.
   SCREEN DIAMETER 2.0 in.
8. TYPE OF BACKFILL AROUND SCREEN
   Sand
9. TYPE OF BACKFILL -
10. DRILLING METHOD Hollow Stem Auger
11. ADDITIVES USED (IF ANY)
    -

WATER LEVEL 14.0' DATE 2/18/86

*ALL DEPTHS MEASURED FROM GROUND SURFACE.

EXPLORATION TECHNOLOGY INC.

LOG OF TEST BORING

Project: Wausau Energy & Amoco Oil
2nd. & Bridge Streets
Location: Wausau, Wisconsin

Boring No.: TB-6
Surface Elevation:
Job No.: 811078
Sheet: 1 of 1

1402 EMIL STREET • P.O. BOX 9404, MADISON, WIS. 53715 • TEL. (608) 258-9550

SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
	Recovery		Moisture								
No.	Type	↓	↓	N	Depth		qu	W	LL	PL	D
						.2' ASPHALT					
1	SS	1.3'	D	27		Red-Brown Coarse to Fine SAND with Gravel, Occasional Cobbles					
2	SS	1.0'	D	100	5						
					10						
3	SS	1.4'	W	35	15	Gray Coarse to Fine SAND with Gravel (Tip of Spoon)					
					20	End Boring at 17.0'					
					25						
					30						
					35						
					40						

WATER LEVEL OBSERVATIONS

While Drilling: 15.5'
Upon Completion of Drilling:
Time After Drilling: 1/4 hour
Depth to Water: 15.2'
Depth to Cave In: 7.3'

GENERAL NOTES

Start: 2/18/86 Complete: 2/18/86
Crew Chief: MP Rig: 45-C
Drilling Method:

EXPLORATION TECHNOLOGY INC.

LOG OF TEST BORING

Project: Wausau Energy & Amoco Oil
2nd & Bridge Street
Location: Wausau, Wisconsin

Boring No. TB-7
Surface Elevation
Job No. 811078
Sheet 1 of 1

1402 EMIL STREET • P.O. BOX 9404, MADISON, WIS. 53715 • TEL. (608) 258-9550

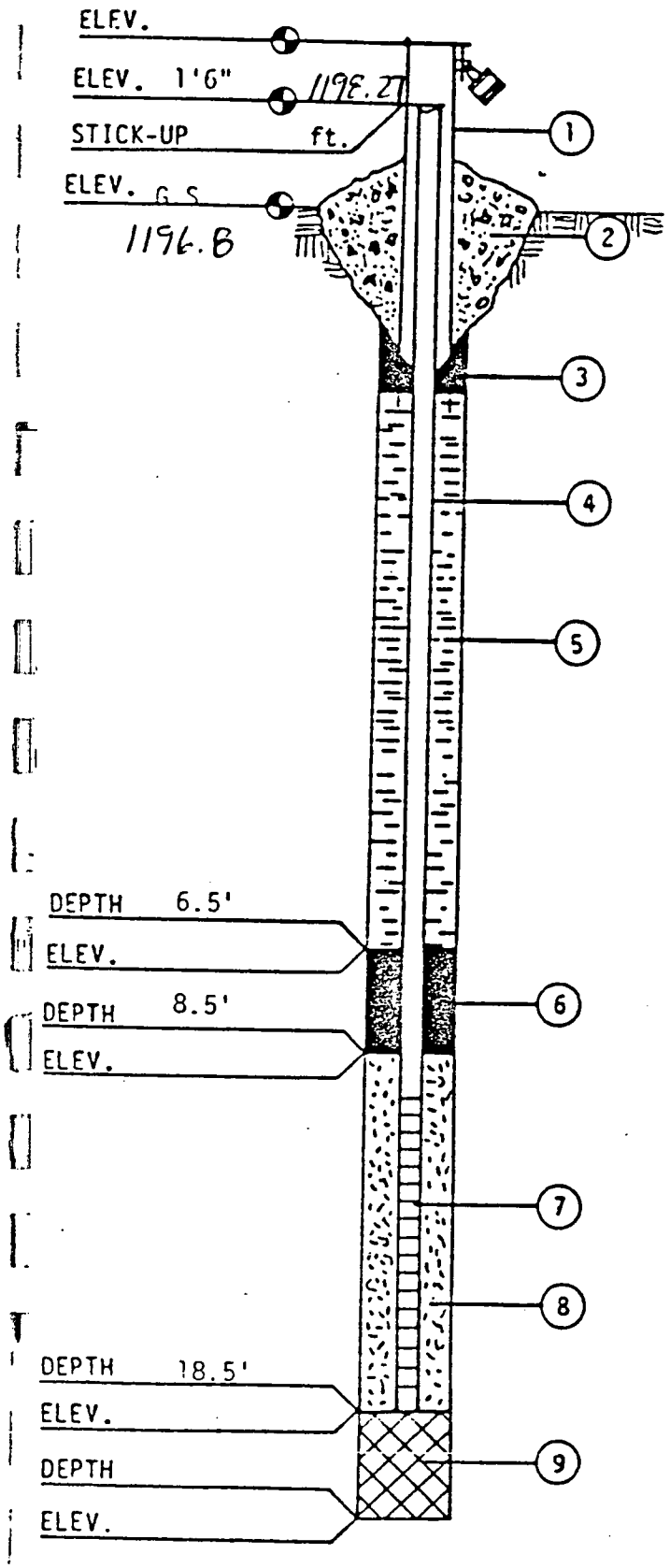
SAMPLE						VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES				
Recovery			Moisture								
No.	Type			N	Depth		qp	W	LL	PL	D
						.3' Granite					
1	SS	.2'	D	100		Red-Brown Coarse to Fine SAND with Gravel, Occasional Cobble					
2	SS	1.7'	M	37	5	Pounding on Rock					
						Dark Brown Coarse to Fine SAND with Some Silt, Trace Organics 4.0-4.5'					
3	SS	.5'	M	79	10						
4	SS	1.5'	W	22	15	Brown Coarse to Fine SAND, Trace Gravel					
					20	End Boring at 18.5'					
						Well at 18.5'					
					25						
					30						
					35						
					40						

WATER LEVEL OBSERVATIONS

While Drilling 13.5'
Upon Completion of Drilling
Time After Drilling 1/4 hour
Depth to Water 13.5'
Depth to Cave In

GENERAL NOTES

Start 2/18/86 Complete 2/18/86
Crew Chief MP Rig 45-C
Drilling Method



EXPLORATION TECHNOLOGY INC.

MONITORING WELL CONSTRUCTION INFORMATION

JOB NO. 811078

BORING/WELL NO. TB-7

DATE 2/18/86

CHIEF/UNIT MP/750

1. PROTECTIVE CASING (YES) NO

   LOCKING (YES) NO

2. CONCRETE SEAL (YES) NO

3. TYPE OF SURFACE SEAL (IF INSTALLED)
   Bentonite

4. SOLID PIPE TYPE PVC

   SOLID PIPE LENGTH 10.0 ft.

   JOINT TYPE SLIP/GLUED (THREADED)

5. TYPE OF BACKFILL Sand

   HOW INSTALLED - TREMIE (FROM SURFACE)

6. TYPE OF LOWER SEAL (IF INSTALLED)
   Bentonite

7. SCREEN TYPE PVC

   SCREEN LENGTH

   SLOT-SIZE 0.010" LENGTH 10.0 ft.

   SCREEN DIAMETER 2.0 in.

8. TYPE OF BACKFILL AROUND SCREEN
   Sand

9. TYPE OF BACKFILL -

10. DRILLING METHOD Hollow Stem Auger

11. ADDITIVES USED (IF ANY)
    -

WATER LEVEL 13.5' DATE 2/18/86

*ALL DEPTHS MEASURED FROM GROUND SURFACE.

EXPLORATION TECHNOLOGY INC.

LOG OF TEST BORING

Project: Wausau Energy & Amoco Oil
2nd & Bridge Street
Location: Wausau, Wisconsin

Boring No.: TB-8
Surface Elevation:
Job No.: 811078
Sheet: 1 of 1

1402 EMIL STREET • P.O. BOX 9404, MADISON, WIS. 53715 • TEL (608) 258-9550

SAMPLE No.	Type	Recovery ↓	Moisture ↓	N	Depth	VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES qp	W	LL	PL	D
						.3' GRANITE					
						Red Brown Coarse to Fine SAND with Gravel, Occasional Cobble					
1	SS	.5'	D	27	5						
2	SS	.4'	M	100		Black Medium to Fine Silty SAND with Some Gravel 3.0-3.5'					
					10						
					15						
3	SS	1.1'	W	29							
					20	End Boring at 17.0'					
						*Brown Coarse to Fine SAND, Trace Gravel					
					25						
					30						
					35						
					40						

WATER LEVEL OBSERVATIONS

While Drilling: 14.5'
Upon Completion of Drilling:
Time After Drilling: 1/4 hour
Depth to Water: 14.2'
Depth to Cave In:

GENERAL NOTES

Start: 2/18/86 Complete: 2/18/86
Crew Chief: MP Rig: 45-C
Drilling Method:

ZIMPRO INC.
ENVIRONMENTAL & ENERGY SYSTEMS

March 7, 1986

DeWitt, Sundby, Huggett, Schumacher & Morgan, S.C.
Attorneys at Law
Suite 120 Teton Wood
6515 Grand Teton Plaza
Madison, WI 53719

Attn: David Stewart

Re: Wausau Energy/Amoco VOC Analysis

Attached are the analytical results for samples submitted February 18 & 19, 1986 for volatile organics (VOC) analysis under the above mentioned project.

The soil samples were extracted with methanol. An aliquot of the extract was then added to a specific amount of reagent water and analyzed according to EPA Method 601, modified to use PID (9.5 eV) and Hall detectors in series. The results for the soil samples are expressed in ug/g (ppm) based on the dry weight of sample used. The results for the water samples are expressed in ug/l (ppb).

Samples TB1-3, TB2-1, TB3-1, TB3-3, and TB4-3 exhibited an interference problem. The samples had a strong fuel oil type odor. As previously discussed, the compounds contained in fuel oil can not be identified by this analytical method, but can interfere with it if they are at a high enough level. The problem occurred around toluene and ethylbenzene. The extract of sample TB4-3 was, at your request, also analyzed by EPA Method 624, a gas chromatographic/mass spectrometer (GC/MS) method, to confirm presence or absence of toluene and ethylbenzene. A qualitative identification is given on benzene, m-xylene and o & p-xylene. Quantitative results are given on toluene and ethylbenzene (Table 6). Further GC/MS work would have to be done to accurately identify the remaining contaminants present.

MILITARY ROAD
ROTHSCHILD, WISCONSIN 54474
TELEPHONE (715) 359-7211 TELEX 29-0495

The chain of custody record is also enclosed. If you have any questions, please call.

Sincerely,

ZIMPRO INC.

Mary C. Christie Heuser /ls

Mary C. Christie Heuser
Instrumentation Chemist

MCCH/ls

cc: Ronald J. Ganim

ZIMPRO
ENVIRONMENTAL & ENERGY SYSTEMS

Table 1
Wausau Energy/Amoco
VOC Analysis (ug/g)

	Detection Limit	TB1-1	TB1-2	TB1-3	TB2-1	TB2-2	TB2-3
enzene	0.6	X	X	X	X	X	X
Bromoform	1.5	X	X	X	X	X	X
Bromomethane	3.0	X	X	X	X	X	X
arbon Tetrachloride	0.3	X	X	X	X	X	X
hlorobenzene	0.3	X	X	X	X	X	X
Chloroethane	3.0	X	X	X	X	X	X
Chloroethylvinyl Ether	6.0	X	X	X	X	X	X
hloroform	0.3	X	X	X	X	X	X
Chloromethane	18.0	X	X	X	X	X	X
bromochloromethane	0.3	X	X	X	X	X	X
2-Dichlorobenzene	0.9	X	X	X	X	X	X
1,3-Dichlorobenzene	0.9	X	X	X	X	X	X
1,4-Dichlorobenzene	0.9	X	X	X	X	X	X
chlorobromomethane	0.3	X	X	X	X	X	X
1,1-Dichloroethane	0.3	X	X	X	X	X	X
1,2-Dichloroethane	0.9	X	X	X	X	X	X
1-Dichloroethylene	1.5	X	X	X	X	X	X
2-Dichloroethylene	0.9	X	X	X	X	X	X
Dichloromethane	0.6	X	X	X	X	X	X
1,2-Dichloropropane	1.5	X	X	X	X	X	X
s-1,3-Dichloropropene	0.9	X	X	X	X	X	X
ans-1,3-Dichloropropene	3.0	X	X	X	X	X	X
Ethylbenzene	0.6	X	X	Intf.	Intf.	X	X
1,2,2-Tetrachloroethane	0.3	X	X	X	X	X	X
trachloroethylene	0.3	X	X	X	X	X	X
Toluene	0.3	X	X	Intf.	Intf.	X	X
1,1-Trichloroethane	0.3	X	X	X	X	X	X
1,2-Trichloroethane	0.3	X	X	X	X	X	X
Trichloroethylene	0.3	X	X	X	X	X	X
Vinyl Chloride	1.5	X	X	X	X	X	X
Xylene	1.5	X	X	34.8	11.6	X	X
& p-Xylene (as o-Xylene)	1.5	X	X	86.1	37.8	2.3	X
mpro Analytical No.		16518	16519	16520	16521	16522	16523

X = Analyzed but not detected

tf. = Interference

ZIMPRO
ENVIRONMENTAL & ENERGY SYSTEMS

Table 2
Wausau Energy/Amoco
VOC Analysis (ug/g)

	Detection Limit	TB4-1	TB5-1	TB5-3	TB6-1	TB6-3
Benzene	0.6	X	X	X	X	X
Bromoform	1.5	X	X	X	X	X
Bromomethane	3.0	X	X	X	X	X
Carbon Tetrachloride	0.3	X	X	X	X	X
Chlorobenzene	0.3	X	X	X	X	X
Chloroethane	3.0	X	X	X	X	X
2-Chloroethylvinyl Ether	6.0	X	X	X	X	X
Chloroform	0.3	X	X	X	X	X
Chloromethane	18.0	X	X	X	X	X
Dibromochloromethane	0.3	X	X	X	X	X
1,2-Dichlorobenzene	0.9	X	X	X	X	X
1,3-Dichlorobenzene	0.9	X	X	X	X	X
1,4-Dichlorobenzene	0.9	X	X	X	X	X
Dichlorobromomethane	0.3	X	X	X	X	X
1,1-Dichloroethane	0.3	X	X	X	X	X
1,2-Dichloroethane	0.9	X	X	X	X	X
1,1-Dichloroethylene	1.5	X	X	X	X	X
1,2-Dichloroethylene	0.9	X	X	X	X	X
Dichloromethane	0.6	X	X	X	X	X
1,2-Dichloropropane	1.5	X	X	X	X	X
cis-1,3-Dichloropropene	0.9	X	X	X	X	X
trans-1,3-Dichloropropene	3.0	X	X	X	X	X
Ethylbenzene	0.6	X	X	X	X	X
1,1,2,2-Tetrachloroethane	0.3	X	X	X	X	X
Tetrachloroethylene	0.3	X	X	X	X	X
Toluene	0.3	X	X	X	X	X
1,1,1-Trichloroethane	0.3	X	X	X	X	X
1,1,2-Trichloroethane	0.3	X	X	X	X	X
Trichloroethylene	0.3	X	X	X	X	X
Vinyl Chloride	1.5	X	X	X	X	X
m-Xylene	1.5	X	X	X	X	X
o & p-Xylene (as o-Xylene)	1.5	X	X	X	X	X
Zimpro Analytical No.		16574	16577	16579	16580	16582

X = Analyzed but not detected

ZIMPRO
ENVIRONMENTAL & ENERGY SYSTEMS

Table 3
Wausau Energy/Amoco
VOC Analysis (ug/g)

	Detection Limit	TB7-2	TB7-3	TB7-4	TB8-1	TB8-3
Benzene	0.6	X	X	X	X	X
Bromoform	1.5	X	X	X	X	X
Bromomethane	3.0	X	X	X	X	X
Carbon Tetrachloride	0.3	X	X	X	X	X
Chlorobenzene	0.3	X	X	X	X	X
Chloroethane	3.0	X	X	X	X	X
2-Chloroethylvinyl Ether	6.0	X	X	X	X	X
Chloroform	0.3	X	X	X	X	X
Chloromethane	18.0	X	X	X	X	X
Dibromochloromethane	0.3	X	X	X	X	X
1,2-Dichlorobenzene	0.9	X	X	X	X	X
1,3-Dichlorobenzene	0.9	X	X	X	X	X
1,4-Dichlorobenzene	0.9	X	X	X	X	X
Dichlorobromomethane	0.3	X	X	X	X	X
1,1-Dichloroethane	0.3	X	X	X	X	X
1,2-Dichloroethane	0.9	X	X	X	X	X
1,1-Dichloroethylene	1.5	X	X	X	X	X
1,2-Dichloroethylene	0.9	X	X	X	X	X
Dichloromethane	0.6	X	X	X	X	X
1,2-Dichloropropane	1.5	X	X	X	X	X
cis-1,3-Dichloropropene	0.9	X	X	X	X	X
trans-1,3-Dichloropropene	3.0	X	X	X	X	X
Ethylbenzene	0.6	X	X	X	X	X
1,1,2,2-Tetrachloroethane	0.3	X	X	X	X	X
Tetrachloroethylene	0.3	8.6	X	X	X	X
Toluene	0.3	X	X	X	X	X
1,1,1-Trichloroethane	0.3	X	X	X	X	X
1,1,2-Trichloroethane	0.3	X	X	X	X	X
Trichloroethylene	0.3	X	X	X	X	X
Vinyl Chloride	1.5	X	X	X	X	X
m-Xylene	1.5	X	X	X	X	X
o & p-Xylene (as o-Xylene)	1.5	X	X	X	X	X
Zimpro Analytical No.		16524	16525	16526	16583	16585

X = Analyzed but not detected

ZIMPRO
ENVIRONMENTAL & ENERGY SYSTEMS

Table 4
Wausau Energy/Amoco
VOC Analysis (ug/g)

	Detection Limit	TB3-1	TB3-3	TB4-3
Benzene	1.8	X	X	11.5
Bromoform	4.5	X	X	X
Bromomethane	9.0	X	X	X
Carbon Tetrachloride	0.9	X	X	X
Chlorobenzene	0.9	X	X	X
Chloroethane	9.0	X	X	X
2-Chloroethylvinyl Ether	18.0	X	X	X
Chloroform	0.9	X	X	X
Chloromethane	54.0	X	X	X
Dibromochloromethane	0.9	X	X	X
1,2-Dichlorobenzene	2.7	X	X	X
1,3-Dichlorobenzene	2.7	X	X	X
1,4-Dichlorobenzene	2.7	X	X	X
Dichlorobromomethane	0.9	X	X	X
1,1-Dichloroethane	0.9	X	X	X
1,2-Dichloroethane	2.7	X	X	X
1,1-Dichloroethylene	4.5	X	X	X
1,2-Dichloroethylene	2.7	X	X	X
Dichloromethane	1.8	X	X	X
1,2-Dichloropropane	4.5	X	X	X
cis-1,3-Dichloropropene	2.7	X	X	X
trans-1,3-Dichloropropene	9.0	X	X	X
Ethylbenzene	1.8	Intf.	Intf.	Intf.
1,1,2,2-Tetrachloroethane	0.9	X	X	X
Tetrachloroethylene	0.9	X	X	X
Toluene	0.9	Intf.	Intf.	Intf.
1,1,1-Trichloroethane	0.9	X	X	X
1,1,2-Trichloroethane	0.9	X	X	X
Trichloroethylene	0.9	X	X	X
Vinyl Chloride	4.5	X	X	X
m-Xylene	4.5	55.0	115.	163.
o & p-Xylene (as o-Xylene)	4.5	250.	175.	294.
Zimpro Analytical No.		16571	16573	16576

X = Analyzed but not detected

Intf. = Interference

ZIMPRO
ENVIRONMENTAL & ENERGY SYSTEMS

Table 5
Wausau Energy/Amoco
VOC Analysis (ug/l)

	Detection Limit	Distilled Water	Tap Water	Trip Blank
Benzene	0.2	X	X	X
Bromoform	0.5	X	X	X
Bromomethane	1.0	X	X	X
Carbon Tetrachloride	0.1	X	X	X
Chlorobenzene	0.1	X	X	X
Chloroethane	1.0	X	X	X
2-Chloroethylvinyl Ether	2.0	X	X	X
Chloroform	0.1	X	X	X
Chloromethane	6.0	X	X	X
Dibromochloromethane	0.1	X	X	X
1,2-Dichlorobenzene	0.3	X	X	X
1,3-Dichlorobenzene	0.3	X	X	X
1,4-Dichlorobenzene	0.3	X	X	X
Dichlorobromomethane	0.1	X	X	X
1,1-Dichloroethane	0.1	X	X	X
1,2-Dichloroethane	0.3	X	X	X
1,1-Dichloroethylene	0.5	X	X	X
1,2-Dichloroethylene	0.3	X	X	X
Dichloromethane	0.2	0.9	X	X
1,2-Dichloropropane	0.5	X	X	X
cis-1,3-Dichloropropene	0.3	X	X	X
trans-1,3-Dichloropropene	1.0	X	X	X
Ethylbenzene	0.2	X	X	X
1,1,2,2-Tetrachloroethane	0.1	X	X	X
Tetrachloroethylene	0.1	0.2	X	X
Toluene	0.1	X	0.4	X
1,1,1-Trichloroethane	0.1	0.3	0.3	0.3
1,1,2-Trichloroethane	0.1	X	X	X
Trichloroethylene	0.1	X	X	X
Vinyl Chloride	0.5	X	X	X
m-Xylene	0.5	X	X	X
o & p-Xylene (as o-Xylene)	0.5	X	2.0	X
Zimpro Analytical No.		16586	16587	16588

X = Analyzed but not detected

ZIMPRO
ENVIRONMENTAL & ENERGY SYSTEMS

Table 6

Wausau Energy/Amoco
GC/MS VOC Analysis (ug/g)

	TB4-3	Detection Limit
Benzene	Positive	-
Ethylbenzene	35.2	7.6
Toluene	X	7.6
m-Xylene	Positive	-
o & p-Xylene	Positive	-
Analytical No.	16576	

CHAIN OF CUSTODY RECORD

PROJ. NO. | PROJECT NAME: Wausau Energy

SAMPLERS: (Signature)

STA. NO	DATE	TIME	COMP	GRAB	STATION LOCATION	NO OF CONTAINERS	REMARKS: Empire Analytical No.
	2/18				TB8 Sample 1		Winbond 16583
					" " 2		16584
					" " 3		16585
					TB5 " 1		16577
					" " 2		16578
					TB6 " 3		16582
					4 " 3		16576
					6 " 1		16580
					6 " 2		16581
					4 " 2		16575
					4 " 1		16574
					3 " 2		16572
					3 " 1		16571
					3 " 3		16573
					5 " 3		16579

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
[signature]	2/19/96 1330	Mary C. Christe Heiser			
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks	

Distribution: Original Accompanies Shipment, Copy to Coordinator Field Files

CHAIN OF CUSTODY RECORD

PROJ NO | PROJECT NAME: Wausau Energy

SAMPLERS (Signature):

STA. NO	DATE	TIME	COMP	GRAB	STATION LOCATION	NO OF CONTAINERS	REMARKS
	2/18				Water Sample Tap		Empro Analytical No.
					Top		16588
					Distilled		16587
							16586

Relinquished by (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
[signature]	2-19-86 1320	Mary C Christie Hess			
Relinquished by (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks	

Distribution: Original Accompanies Shipment, Copy to Coordinator Field Files

CHAIN OF CUSTODY RECORD

PROJ NO | PROJECT NAME: Wausau Energy

SAMPLERS. (Signature): Thomas Benkoff

STA. NO	DATE	TIME	COMP	GRAB	STATION LOCATION	NO OF CONTAINERS	VOC's	REMARKS: Zimpro Analytical No.
	2/18				TB 1 Sample 1			16518
	"				TB 2 " 2			16519
	"				TB 3 " 3			16520
	"				TB 7 Sample 2			16524
	"				TB 7 " 3			16525
	"				TB 7 " 4			16526
	"				TB 2 " 1			16521
	"				TB 2 " 2			16522
	"				TB 2 " 3			16523

Relinquished by (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Thomas Benkoff	2/18 1:00 pm	Mary C Christie Hewes			
Relinquished by (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks	

Distribution: Original Accompanies Shipment, Copy to Coordinator Field Files

APPENDIX B

Analytical Results

Field Activity of April 21, 1986

ZIMPRO
ENVIRONMENTAL & ENERGY SYSTEMS

April 30, 1986

Fred Doran
Foth & VanDyke Engineers, Inc.
2737 S. Ridge Rd.
P.O. Box 11997
Green Bay, WI 54307-1997

Dear Mr. Doran:

Attached are the VOC results for samples taken April 21, 1986 at the Wausau Energy site. The analysis was done by EPA Method 601 with PID (9.5 eV) and Hall detectors in series. The soil samples were extracted with methanol prior to analysis via EPA Method 601. The results for the soil samples are expressed in ug/g or ppm based on the dry weight of the sample.

If you have any questions, please call.

Sincerely,

ZIMPRO INC.

Mary C. Christie Heuser

Mary C. Christie Heuser
Instrumentation Chemist

MCCH/ls

cc: J.W. Barr
J.R. Salkowski

MILITARY ROAD
ROTHSCHILD, WISCONSIN 54474

ZIMPRO
ENVIRONMENTAL & ENERGY SYSTEMS

Foth & Van Dyke
Wausau Energy
VOC Analysis (ug/l)

	Detection Limit	TB-1 4-21-86	TB-2 4-21-86
Benzene	2.0	5.0	243.
Bromoform	5.0	X	X
Bromomethane	10.0	X	X
Carbon Tetrachloride	1.0	X	X
Chlorobenzene	1.0	X	X
Chloroethane	10.0	X	X
2-Chloroethylvinyl Ether	20.0	X	X
Chloroform	1.0	X	X
Chloromethane	60.0	X	X
Dibromochloromethane	1.0	X	X
1,2-Dichlorobenzene	3.0	X	X
1,3-Dichlorobenzene	3.0	X	X
1,4-Dichlorobenzene	3.0	X	X
Dichlorobromomethane	1.0	X	X
1,1-Dichloroethane	1.0	X	X
1,2-Dichloroethane	3.0	6.0	X
1,1-Dichloroethylene	5.0	X	X
1,2-Dichloroethylene	3.0	X	X
Dichloromethane	2.0	X	X
1,2-Dichloropropane	5.0	X	X
cis-1,3-Dichloropropene	3.0	X	X
trans-1,3-Dichloropropene	10.0	X	X
Ethylbenzene	2.0	X	38.
1,1,2,2-Tetrachloroethane	1.0	X	X
Tetrachloroethylene	1.0	130.	51.
Toluene	1.0	X	23.
1,1,1-Trichloroethane	1.0	X	X
1,1,2-Trichloroethane	1.0	X	X
Trichloroethylene	1.0	7.0	2.0
Vinyl Chloride	5.0	X	X
Trichlorofluoromethane	2.0	X	X
Dichlorodifluoromethane	20.0	X	X
m-Xylene	5.0	X	29.
o & p-Xylene (as o-Xylene)	5.0	7.0	457.
Zimpro Analytical No.		17757	17758

X = Analyzed but not detected

ZIMPRO
ENVIRONMENTAL & ENERGY SYSTEMS

Foth & Van Dyke
Wausau Energy
VOC Analysis (ug/l)

TB 5

	Detection Limit	4-21-86
Benzene	5.0	1,048.
Bromoform	12.5	X
Bromomethane	25.0	X
Carbon Tetrachloride	2.5	X
Chlorobenzene	2.5	X
Chloroethane	25.0	X
2-Chloroethylvinyl Ether	50.0	X
Chloroform	2.5	X
Chloromethane	150.0	X
Dibromochloromethane	2.5	X
1,2-Dichlorobenzene	7.5	X
1,3-Dichlorobenzene	7.5	X
1,4-Dichlorobenzene	7.5	X
Dichlorobromomethane	2.5	X
1,1-Dichloroethane	2.5	X
1,2-Dichloroethane	7.5	X
1,1-Dichloroethylene	12.5	X
1,2-Dichloroethylene	7.5	X
Dichloromethane	5.0	X
1,2-Dichloropropane	12.5	X
cis-1,3-Dichloropropene	7.5	X
trans-1,3-Dichloropropene	25.0	X
Ethylbenzene	5.0	1,150.
1,1,2,2-Tetrachloroethane	2.5	X
Tetrachloroethylene	2.5	7.5
Toluene	2.5	2,150.
1,1,1-Trichloroethane	2.5	X
1,1,2-Trichloroethane	2.5	X
Trichloroethylene	2.5	7.5
Vinyl Chloride	12.5	X
Trichlorofluoromethane	5.0	X
Dichlorodifluoromethane	50.0	X
m-Xylene	12.5	1,298.
o & p-Xylene (as o-Xylene)	12.5	2,975.
Zimpro Analytical No.		17759

X = Analyzed but not detected

ZIMPRO
ENVIRONMENTAL & ENERGY SYSTEMS

Foth & Van Dyke
Wausau Energy
VOC Analysis (ug/l)

TB-7

	Detection Limit	4-21-86
Benzene	1.0	X
Bromoform	2.5	X
Bromomethane	5.0	X
Carbon Tetrachloride	0.5	X
Chlorobenzene	0.5	X
Chloroethane	5.0	X
2-Chloroethylvinyl Ether	10.0	X
Chloroform	0.5	X
Chloromethane	30.0	X
Dibromochloromethane	0.5	X
1,2-Dichlorobenzene	1.5	X
1,3-Dichlorobenzene	1.5	X
1,4-Dichlorobenzene	1.5	X
Dichlorobromomethane	0.5	X
1,1-Dichloroethane	0.5	X
1,2-Dichloroethane	1.5	X
1,1-Dichloroethylene	2.5	X
1,2-Dichloroethylene	1.5	X
Dichloromethane	1.0	X
1,2-Dichloropropane	2.5	X
cis-1,3-Dichloropropene	1.5	X
trans-1,3-Dichloropropene	5.0	X
Ethylbenzene	1.0	X
1,1,2,2-Tetrachloroethane	0.5	X
Tetrachloroethylene	0.5	132.
Toluene	0.5	X
1,1,1-Trichloroethane	0.5	2.4
1,1,2-Trichloroethane	0.5	X
Trichloroethylene	0.5	9.9
Vinyl Chloride	2.5	X
Trichlorofluoromethane	1.0	X
Dichlorodifluoromethane	10.0	X
Zimpro Analytical No.		17760

X = Analyzed but not detected

ZIMPRO
ENVIRONMENTAL & ENERGY SYSTEMS

Foth & Van Dyke
Wausau Energy
VOC Analysis (ug/l)

	Detection Limit	City MW-1 4-21-86	EPA-14 4-21-86
Benzene	0.2	X	X
Bromoform	0.5	X	X
Bromomethane	1.0	X	X
Carbon Tetrachloride	0.1	X	X
Chlorobenzene	0.1	X	X
Chloroethane	1.0	X	X
2-Chloroethylvinyl Ether	2.0	X	X
Chloroform	0.1	X	X
Chloromethane	6.0	X	X
Dibromochloromethane	0.1	X	X
1,2-Dichlorobenzene	0.3	X	X
1,3-Dichlorobenzene	0.3	X	X
1,4-Dichlorobenzene	0.3	X	X
Dichlorobromomethane	0.1	X	X
1,1-Dichloroethane	0.1	X	X
1,2-Dichloroethane	0.3	X	X
1,1-Dichloroethylene	0.5	X	X
1,2-Dichloroethylene	0.3	X	X
Dichloromethane	0.2	X	X
1,2-Dichloropropane	0.5	X	X
cis-1,3-Dichloropropene	0.3	X	X
trans-1,3-Dichloropropene	1.0	X	X
Ethylbenzene	0.2	X	X
1,1,2,2-Tetrachloroethane	0.1	X	X
Tetrachloroethylene	0.1	X	X
Toluene	0.1	X	X
1,1,1-Trichloroethane	0.1	X	X
1,1,2-Trichloroethane	0.1	X	X
Trichloroethylene	0.1	X	X
Vinyl Chloride	0.5	X	X
Trichlorofluoromethane	0.2	X	X
Dichlorofluoromethane	2.0	X	X
m-Xylene	0.5	X	X
o & p-Xylene (as o-Xylene)	0.5	X	X
Zimpro Analytical No.		17761	17762

X = Analyzed but not detected

APPENDIX C

Analytical Results

Field Activity of May 1, 1986

ZIMPRO

ENVIRONMENTAL & ENERGY SYSTEMS

May 16, 1986

Fred Doran
Foth & VanDyke Engineers, Inc.
2737 S. Ridge Rd.
P.O. Box 11997
Green Bay, WI 54307-1997

Dear Mr. Doran:

Attached are the results for the soil samples taken May 1, 1986 at the Wausau Energy site. The analysis was done in the same manner described in my April 30, 1986 report to you. Also included are results for duplicate analyses and a spike analysis. The compounds used for the spike were added to the methanol extract of sample TB-104-A.

If you have any questions, please call.

Sincerely,

ZIMPRO INC.

Mary C. Christie Heuser

Mary C. Christie Heuser
Instrumentation Chemist

MCCH/ls

cc: J.W. Barr
J.R. Salkowski

ZIMPRO
ENVIRONMENTAL & ENERGY SYSTEMS

Foth & Van Dyke
Wausau Energy
VOC Analysis (ug/l)

	Detection Limit	F & VD Trip Blank	WTD Rinse Water
Benzene	0.2	X	X
Bromoform	0.5	X	X
Bromomethane	1.0	X	X
Carbon Tetrachloride	0.1	X	X
Chlorobenzene	0.1	X	X
Chloroethane	1.0	X	X
2-Chloroethylvinyl Ether	2.0	X	X
Chloroform	0.1	X	X
Chloromethane	6.0	X	X
Dibromochloromethane	0.1	X	X
1,2-Dichlorobenzene	0.3	X	X
1,3-Dichlorobenzene	0.3	X	X
1,4-Dichlorobenzene	0.3	X	X
Dichlorobromomethane	0.1	X	X
1,1-Dichloroethane	0.1	X	X
1,2-Dichloroethane	0.3	X	X
1,1-Dichloroethylene	0.5	X	X
1,2-Dichloroethylene	0.3	X	X
Dichloromethane	0.2	0.8	X
1,2-Dichloropropane	0.5	X	X
cis-1,3-Dichloropropene	0.3	X	X
trans-1,3-Dichloropropene	1.0	X	X
Ethylbenzene	0.2	X	X
1,1,2,2-Tetrachloroethane	0.1	X	X
Tetrachloroethylene	0.1	X	X
Toluene	0.1	0.5	X
1,1,1-Trichloroethane	0.1	X	X
1,1,2-Trichloroethane	0.1	X	X
Trichloroethylene	0.1	X	X
Vinyl Chloride	0.5	X	X
Trichlorofluoromethane	0.2	X	X
Dichlorofluoromethane	2.0	X	X
m-Xylene	0.5	X	X
o & p-Xylene (as o-Xylene)	0.5	X	X
Zimpro Analytical No.		18107	18108

X = Analyzed but not detected

ZIMPRO
ENVIRONMENTAL & ENERGY SYSTEMS

Foth & VanDyke
Wausau Energy
VOC Analysis (ug/g)

	Detection Limit	SURFACE TB-101-A	4' TB-101-B	8' TB-101-C	SURFACE TB-102-A	7-9' TB-103-A
Benzene	0.10	X	X	X	X	X
Bromoform	0.10	X	X	X	X	X
Bromomethane	0.30	X	X	X	X	X
Carbon Tetrachloride	0.03	X	X	X	X	X
Chlorobenzene	0.03	X	X	X	X	X
Chloroethane	0.30	X	X	X	X	X
2-Chloroethylvinyl Ether	0.60	X	X	X	X	X
Chloroform	0.03	X	X	X	X	X
Chloromethane	1.5	X	X	X	X	X
Dibromochloromethane	0.03	X	X	X	X	X
1,2-Dichlorobenzene	0.08	X	X	X	X	X
1,3-Dichlorobenzene	0.08	X	X	X	X	X
1,4-Dichlorobenzene	0.08	X	X	X	X	X
Dichlorobromomethane	0.03	X	X	X	X	X
1,1-Dichloroethane	0.03	X	X	X	X	X
1,2-Dichloroethane	0.20	X	X	X	X	X
1,1-Dichloroethylene	0.80	X	X	X	X	X
1,2-Dichloroethylene	0.08	X	X	X	X	X
Dichloromethane	0.40	X	X	X	X	X
1,2-Dichloropropane	0.10	X	X	X	X	X
cis-1,3-Dichloropropene	0.08	X	X	X	X	X
trans-1,3-Dichloropropene	0.30	X	X	X	X	X
Ethylbenzene	0.05	X	X	X	X	X
1,1,2,2-Tetrachloroethane	0.03	X	X	X	X	X
Tetrachloroethylene	0.03	X	X	X	X	X
Toluene	0.05	0.1	X	X	X	X
1,1,1-Trichloroethane	0.10	X	X	X	X	X
1,1,2-Trichloroethane	0.05	X	X	X	X	X
Trichloroethylene	0.05	X	X	X	X	X
Vinyl Chloride	0.30	X	X	X	X	X
Trichlorofluoromethane	0.05	X	X	X	X	X
Dichlorodifluoromethane	0.60	X	X	X	X	X
o-Xylene	0.20	X	X	X	X	X
m & p-Xylene (as o-Xylene)	0.20	0.2	X	X	X	X
TOC (%)	0.05	NT	NT	NT	NT	0.25
Zimpro Analytical No.		18109	18110	18111	18113	18117

X = Analyzed but not detected

T = NOT TESTED

ZIMPRO
ENVIRONMENTAL & ENERGY SYSTEMS

Foth & VanDyke
Wausau Energy
VOC Analysis (ug/g)

	Detection Limit	9-11' TB-103-B	12-13.5' TB-103-C	7-9' TB-104-A	9-11' TB-104-B	12-13.5' TB-104-C
Benzene	0.10	X	X	X	X	X
Bromoform	0.10	X	X	X	X	X
Bromomethane	0.30	X	X	X	X	X
Carbon Tetrachloride	0.03	X	X	X	X	X
Chlorobenzene	0.03	X	X	X	X	X
Chloroethane	0.30	X	X	X	X	X
2-Chloroethylvinyl Ether	0.60	X	X	X	X	X
Chloroform	0.03	X	X	X	X	X
Chloromethane	1.5	X	X	X	X	X
Dibromochloromethane	0.03	X	X	X	X	X
1,2-Dichlorobenzene	0.08	X	X	X	X	X
1,3-Dichlorobenzene	0.08	X	X	X	X	X
1,4-Dichlorobenzene	0.08	X	X	X	X	X
Dichlorobromomethane	0.03	X	X	X	X	X
1,1-Dichloroethane	0.03	X	X	X	X	X
1,2-Dichloroethane	0.20	X	X	X	X	X
1,1-Dichloroethylene	0.80	X	X	X	X	X
1,2-Dichloroethylene	0.08	X	X	X	X	X
Dichloromethane	0.40	X	X	X	X	X
1,2-Dichloropropane	0.10	X	X	X	X	X
cis-1,3-Dichloropropene	0.08	X	X	X	X	X
trans-1,3-Dichloropropene	0.30	X	X	X	X	X
Ethylbenzene	0.05	X	X	X	X	X
1,1,2,2-Tetrachloroethane	0.03	X	X	X	X	X
Tetrachloroethylene	0.03	X	X	1.76	X	1.01
Toluene	0.05	X	X	X	0.06	X
1,1,1-Trichloroethane	0.10	X	X	X	X	X
1,1,2-Trichloroethane	0.05	X	X	X	X	X
Trichloroethylene	0.05	X	X	X	X	X
Vinyl Chloride	0.30	X	X	X	X	X
Trichlorofluoromethane	0.05	X	X	X	X	X
Dichlorodifluoromethane	0.60	X	X	X	X	X
m-Xylene	0.20	X	X	X	X	X
o & p-Xylene (as o-Xylene)	0.20	X	X	X	X	X
TOC (%)	0.05	X	0.12	0.16	X	0.35
Zimpro Analytical No.		18118	18119	18120	18121	18122

X = Analyzed but not detected

ZIMPRO
ENVIRONMENTAL & ENERGY SYSTEMS

Foth & VanDyke
Wausau Energy
VOC Analysis (ug/g)

	Detection Limit	7-9' TB-105-A	7-9' TB-105-A Duplicate	9-11' TB-105-B	12-13.5' TB-105-C
Benzene	0.10	X	X	X	X
Bromoform	0.10	X	X	X	X
romomethane	0.30	X	X	X	X
arbon Tetrachloride	0.03	X	X	X	X
Chlorobenzene	0.03	X	X	X	X
hloroethane	0.30	X	X	X	X
-Chloroethylvinyl Ether	0.60	X	X	X	X
Chloroform	0.03	X	X	X	X
hloromethane	1.5	X	X	X	X
ibromochloromethane	0.03	X	X	X	X
1,2-Dichlorobenzene	0.08	X	X	X	X
1,3-Dichlorobenzene	0.08	X	X	X	X
,4-Dichlorobenzene	0.08	X	X	X	X
ichlorobromomethane	0.03	X	X	X	X
1,1-Dichloroethane	0.03	X	X	X	X
,2-Dichloroethane	0.20	X	X	X	X
,1-Dichloroethylene	0.80	X	X	X	X
1,2-Dichloroethylene	0.08	X	X	X	X
ichloromethane	0.40	X	X	X	X
,2-Dichloropropane	0.10	X	X	X	X
cis-1,3-Dichloropropene	0.08	X	X	X	X
trans-1,3-Dichloropropene	0.30	X	X	X	X
thylbenzene	0.05	X	X	X	X
,1,2,2-Tetrachloroethane	0.03	X	X	X	X
Tetrachloroethylene	0.03	0.13	0.11	X	0.15
oluene	0.05	X	X	X	X
,1,1-Trichloroethane	0.10	X	X	X	X
1,1,2-Trichloroethane	0.05	X	X	X	X
richloroethylene	0.05	X	X	X	X
inyl Chloride	0.30	X	X	X	X
richlorofluoromethane	0.05	X	X	X	X
Dichlorodifluoromethane	0.60	X	X	X	X
-Xylene	0.20	X	X	X	X
& p-Xylene (as o-Xylene)	0.20	X	X	X	X
TOC (%)	0.05	X	NT	X	0.29
impro Analytical No.		18123	18123	18124	18125

X = Analyzed but not detected

NT = Not Tested

ZIMPRO
ENVIRONMENTAL & ENERGY SYSTEMS

Foth & VanDyke
Wausau Energy
VOC Analysis (ug/g)

	Detection Limit	12' TB-101-D	4' TB-102-B	4' TB-102-B Duplicate	6' TB-102-C	12' TB-102-D
Benzene	0.4	X	X	X	X	X
Bromoform	1.0	X	X	X	X	X
Bromomethane	2.0	X	X	X	X	X
Carbon Tetrachloride	0.2	X	X	X	X	X
Chlorobenzene	0.2	X	X	X	X	X
Chloroethane	2.0	X	X	X	X	X
2-Chloroethylvinyl Ether	4.0	X	X	X	X	X
Chloroform	0.6	X	X	X	X	X
Chloromethane	12.0	X	X	X	X	X
Dibromochloromethane	0.2	X	X	X	X	X
1,2-Dichlorobenzene	0.6	X	X	X	X	X
1,3-Dichlorobenzene	0.6	X	X	X	X	X
1,4-Dichlorobenzene	0.6	X	X	X	X	X
Dichlorobromomethane	0.2	X	X	X	X	X
1,1-Dichloroethane	0.2	X	X	X	X	X
1,2-Dichloroethane	0.6	X	X	X	X	X
1,1-Dichloroethylene	3.5	X	X	X	X	X
1,2-Dichloroethylene	0.6	X	X	X	X	X
Dichloromethane	0.4	X	X	X	X	X
1,2-Dichloropropane	1.0	X	X	X	X	X
cis-1,3-Dichloropropene	0.6	X	X	X	X	X
trans-1,3-Dichloropropene	2.0	X	X	X	X	X
Ethylbenzene	0.4	Intf.	Intf.	Intf.	Intf.	Intf.
1,1,2,2-Tetrachloroethane	0.2	X	X	X	X	X
Tetrachloroethylene	0.2	X	X	X	X	X
Toluene	0.2	Intf.	Intf.	Intf.	Intf.	Intf.
1,1,1-Trichloroethane	0.4	X	X	X	X	X
1,1,2-Trichloroethane	0.2	X	X	X	X	X
Trichloroethylene	0.2	X	X	X	X	X
Vinyl Chloride	2.0	X	X	X	X	X
Trichlorofluoromethane	0.4	X	X	X	X	X
Dichlorodifluoromethane	4.0	X	X	X	X	X
m-Xylene	1.0	Intf.	Intf.	Intf.	Intf.	Intf.
o & p-Xylene (as o-Xylene)	1.0	Intf.	Intf.	Intf.	Intf.	Intf.
Zimpro Analytical No.		18112	18114	18114	18115	18116

X = Analyzed but not detected

Intf. = Interference

ZIMPRO
ENVIRONMENTAL & ENERGY SYSTEMS

Foth & Van Dyke
VOC Analysis (ug/l)

	Amount Spiked (ug/l)	% Recovery
Carbon Tetrachloride	40.	129.
Chlorobenzene	40.	116.
Chloroform	40.	123.
1,1-Dichloroethane	40.	120.
Dichloromethane	40.	117.
1,2-Dichloropropane	40.	116.
Tetrachloroethylene	40.	118.
Trichloroethylene	40.	130.

Sample used for spike TB-104-A
Analytical No. 18120

Foth & Van Dyke
Green Bay, Wisconsin

CLIENT: Wausau Energy DATE: 5-1-86
PROJECT: _____ BY: B. Possin
PROJECT NO.: _____ PAGE NO.: ____ OF ____
COMPUTED BY: _____ DATE: _____ REVIEWED BY: _____ DATE: _____
CHECKED BY: _____ DATE: _____ APPROVED BY: _____ DATE: _____

Chain of Custody Log

Samples Taken 5-1-86 by Foth & Van Dyke (B. Possin, F. Doran).

Sample I.D.	Container	Analytical Parameters	Sample Type	Lab #
TB-101-A1 } one sample	40 ml VOC	Priority Pollutant VOCs	soil	18109
TB-101-A2 }				
TB-101-B1 } one sample			soil	18110
TB-101-B2 }				
TB-101-C1 } one sample			soil	18111
TB-101-C2 }				
TB-101-D1 } one sample			soil	18112
TB-101-D2 }				
Trip Blank #1 } one sample			water	18107
Trip Blank #2 }				
WTD Rinse Water #1 } one sample			water	18108
WTD Rinse Water #2 }				
TB-102-A1 }			soil	18113
" " -A2 }				
TB-102-B1 }			soil	18114
" " -B2 }				
TB-102-C1 }			soil	18115
" " -C2 }				
TB-102-D1 }			soil	18116
" " D2 }				
TB-103-A1 }			soil	18117
" " A2 }				
TB-103 B1 }			soil	18118
" " B2 }				

Relinquished by: F&VD Date: 5-1-86 Time: 3:53pm
Received by: James W Barr Date: 5-1-86 Time: 3:54 PM
Relinquished by: _____ Date: _____ Time: _____
Received by: _____ Date: _____ Time: _____

Foth & Van Dyke

Green Bay, Wisconsin

CLIENT: Wausau Energy DATE: 5-1-86

PROJECT: _____ BY: B. Possin

PROJECT NO.: _____ PAGE NO.: ____ OF ____

COMPUTED BY: _____ DATE: _____ REVIEWED BY: _____ DATE: _____

CHECKED BY: _____ DATE: _____ APPROVED BY: _____ DATE: _____

Chain of Custody Log

Samples Taken 5-1-86 by Foth & Van Dyke (B. Possin & F. Atkins)

Sample I.D.	Container	Analytical Parameters	Sample Type	Zap Analysis
TB-103-C1 } one sample TB-103-C2 }	40 ml VOA	Priority Pollutant VOCs	Soil	18119
TB-104-A1 } one sample " " A2 }			Soil	18120
" " B1 } one sample " " B2 }			Soil	18121
" " C1 } one sample " " C2 }			Soil	18122
TB-105-A1 } one sample " " A2 }			Soil	18123
" " B1 } one sample " " B2 }			Soil	18124
" " C1 } one sample " " C2 }			Soil	18125

Relinquished by: _____ Date: 5-1-86 Time: 3:53PM

Received by: _____ Date: 5-1-86 Time: 3:54pm

Relinquished by: _____ Date: _____ Time: _____

Received by: _____ Date: _____ Time: _____

ZIMPRO
ENVIRONMENTAL & ENERGY SYSTEMS

June 3, 1986

Mr. Fred Dorn
Foth & VanDyke Engineers, Inc.
P.O. Box 11997
2737 Ridge Road
Green Bay, WI 54303-1997

Re: Wausau Energy Project

Attached are the analytical results for for TOC of the select soil samples collected May 1, 1986. Analysis of TOC was by a gasometric procedure. Results are reported as percent of dry solids.

If you have any questions about the results, please call.

Sincerely,

ZIMPRO INC.

James R. Salkowski
Analytical Laboratory Supervisor

JRS/ls

cc: J.W. Barr

MILITARY ROAD
ROTHSCHILD, WISCONSIN 54474
TELEPHONE [illegible] TELEX [illegible]

ZIMPRO
ENVIRONMENTAL & ENERGY SYSTEMS

Foth & VanDyke Engineers Inc.

Sample	Total Organic Carbon, % of Dry Weight	Analytical No.
103-A	0.26	18117
103-B	<0.05	18118
103-C	0.12	18119
104-A	0.17	18120
104-B	<0.05	18121
104-C	0.36	18122
105-A	<0.05	18123
105-B	<0.05	18124
105-C	0.30	18125