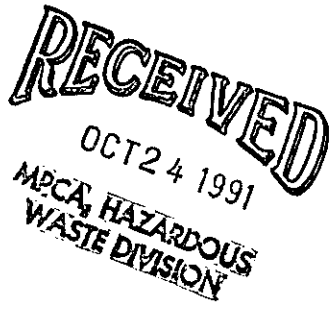
Engineers
Architects
Planners
Scientists

Foth & Van Dyke

10340 Viking Drive, Suite 100
Eden Prairie, MN 55344
612/942-0396
FAX: 612/942-0865

October 23, 1991

91W43



Mr. John R. Moeger
Tanks and Spills Section
Hazardous Waste Division
Minnesota Pollution Control Agency
520 Lafayette Road
Saint Paul, Minnesota 55155

Dear Mr. Moeger:

RE: Supplemental Remedial Investigation
Waste Management of Minnesota, Inc.
Savage, Minnesota
Leak # 0990

On behalf of Waste Management of Minnesota, Inc. Foth & Van Dyke is pleased to address the comments in the Minnesota Pollution Control Agency (MPCA) letter dated July 11, 1990, subsequent discussions and actions on the site. The location of the above referenced site is shown in Figure 1. A copy of the MPCA letter is provided in Attachment A.

COMMENT NO. 1

The first comment addressed the underground storage tank (UST #1) located beneath the on-site building. The MPCA requested an investigation to show the location of the tank, and either the extent of a release from Tank #1, or that no release from UST #1 had occurred.

As previously reported, the underground storage tank was abandoned in place in 1986 by filling it with sand. The location of the tank is shown in Figure 2.

Based upon our agreed to work plan (verbal communication, March 15, 1991), three soil borings were advanced around the tank basin into the water table using hollow stem auger drilling methods on August 1, 1991. The drilling was completed by American Engineering Testing, Inc. of St. Paul, Minnesota. The locations of the soil borings are shown in Figure 2. After soil sample collection, the soil borings were abandoned in accordance with the Minnesota Department of Health (MDH) Water Well Construction Code, Chapter 4725.

Soils samples were collected using standard split-barrel sampling procedures (ASTM 1586). The soils were described and classified using the Unified Soil Classification System. Soil color was described using Munsell Soil Color Notation. Field logs were maintained for each boring by a Foth & Van Dyke geologist and by the driller. Drilling logs are provided in Attachment B.

The drill rig, augers, and other tools, were decontaminated by steam-cleaning before being brought to the site and between borings. The split-barrel sampler was decontaminated between sampling events using a trisodium phosphate and clean water wash solution followed by a clean water rinse.

Soil samples were collected at 2.5-foot intervals during the placement of the soil borings into the water table. Immediately upon sampler retrieval, the soil samples were field screened in accordance with MPCA guidelines, for the presence of ionizable organic

vapors with a Photovac MicroTIP. The MicroTIP was calibrated according to manufacturer's specifications prior to use on site. Soil screening was performed in accordance with the MPCA "Jar Headspace Screening Procedures." Headspace readings are presented on the soil boring logs in Attachment B and are summarized in Table 1.

Soil samples were selected for laboratory analysis based on MicroTIP readings, proximity to the underground storage tank and field observations. Soil samples collected from borings B-1, B-2 and B-3 were analyzed for hydrocarbon parameters comprised of benzene, ethylbenzene, toluene, xylene (BETX); total hydrocarbons (THC) as gasoline and fuel oil; and total lead. The soil samples were collected during drilling on August 1, 1991. Upon collection, the samples were thermally preserved and transported under chain-of-custody procedures to Pace Laboratories, Inc. of Minneapolis, Minnesota. The results are presented in Attachment C and are summarized in Table 2. In boring B-1, the only detected parameter in the soil sample collected from the interval 2.0' to 3.5' was lead at 16 milligrams per kilogram (mg/kg) or parts per million (ppm). The soil sample collected from the interval 2.0' to 3.5' in boring B-2 had detected levels of lead (28 mg/kg), THC as gasoline (1.2 mg/kg), and THC as fuel oil #2 (150 mg/kg). In addition, the sample collected from the 4.5' to 6.5' interval in boring B-2 had a detected level of lead of 24 mg/kg. In boring B-3 the sample collected from 4.5' to 6.5' had detected levels of lead (12 mg/kg), xylene (0.14 mg/kg), THC as gasoline (16 mg/kg), and total petroleum hydrocarbons (58 mg/kg).

COMMENT 2

Comment No. 2 of the MPCA letter requested a map showing the location of the on-site well (unique number 207947). The location of the private well within the on-site building is shown in Figure 2. The well has been capped and is under 18 pounds of pressure according to Waste Management personnel. Therefore, the private well has not been sampled. This was previously reported to the MPCA along with groundwater sampling analysis results from the June 1991 sampling event. The pressure within the well would indicate artesian conditions within the Prairie du Chien aquifer.

COMMENT 3

The location of monitoring well MW-2 is the subject of Comment No. 3 of the MPCA letter. Depth to groundwater measurements were collected from the site wells on July 18, 1991. These measurements and the resulting groundwater elevations are provided in Table 3. Groundwater elevations indicate a northeasterly groundwater flow direction under a hydraulic gradient of 0.019 feet/foot. A water table contour map is provided in Figure 3. As shown in Figure 3, monitoring well MW-2 is clearly downgradient of UST #2. This has been verified by field measurements. Site photos were previously submitted to the MPCA showing MW-2.

Groundwater samples were collected from monitoring wells MW-1, MW-2, MW-3, and MW-4 in August 1989, February 1990, May 1990, August, 1990 and December, 1990. Monitoring well MW-2 was also sampled in June 1991. A summary of all of the detected parameters in the site monitoring wells is provided in Attachment D. Detected levels of benzene have decreased to the MDH Recommended Allowable Limit (RAL) of 10 ug/L in monitoring well MW-2. Other detected levels of petroleum related parameters in monitoring well MW-2 are well below their respective RALs. Results from monitoring wells MW-1, MW-3 and MW-4 have not shown any detections at or above the RALs for any analyzed parameter.

COMMENT 4

The installation of an additional monitoring well located off-site is not warranted in our opinion. As discussed in the previous paragraph, groundwater impacts have decreased to or below the RALs. This fact indicates that soil excavation during the removal of UST #2 was effective in reducing the source of contamination.

Placement of an additional well also poses problems in that a well directly downgradient from MW-2 (east of the Waste Management property) may not reflect groundwater impacts from the Waste Management site but unknown sources. A petroleum release has occurred to the northeast at the Valley Oil site. Groundwater dewatering in 1990 during retanking at the Valley Oil site impacted the water level in MW-4. Other impacts to the groundwater flow system in the vicinity of MW-2 may have occurred, thereby reducing the effectiveness of any addition off-site monitoring well for determining groundwater quality.

COMMENT 5

The location of test pit TP-2, as shown on Figure No. 2-2 of the March 1990 report, is misleading. Due to the scale, TP-2 is not correctly illustrated. The actual location is east of the UST #2 excavation and slightly upgradient of MW-2. Soil samples collected from test pit TP-2 were collected at the water table, approximately 7 feet below the ground surface. The detected levels of petroleum related parameters may be indicative of an upgradient source. If the soils were still impacting the groundwater in the location of TP-2, MW-2 should also be impacted. This is not the case.

We do not believe additional borings will result in data which materially affects the existing conditions of the site.

DISCUSSION FOR UST #1 AREA

Laboratory results of the soil samples collected from the soil borings around UST #1 do show some soil containing detected levels of lead, xylene, THC as gasoline, THC as fuel oil #2, and TPH. Detected levels of lead (12-28 ppm) in the soils are below background levels of 75 - 100 ppm (Linday, 1979) for soils in this region. Experience has shown that low soil concentration of xylene rarely constitute a problem to the public health and the environment since this level of contamination is not sufficient to contaminate underlying groundwater to levels in excess of the MDH RAL. The area of contamination is also covered by a building which should impede recharge and petroleum contamination which may have resulted from this tank. No evidence was found of a high level release from this tank.

DISCUSSION FOR UST #2 AREA

No additional soil borings are warranted near the area where UST #2 was located. Over 100 cubic yards of contaminated soil were removed from this excavation and remediated. The significant decrease in contamination levels at MW-2 shows the remaining soils are likely not causing a groundwater impact. Shallow groundwater at this site also contributed to the final volume of soil removed from the site. Moreover, part of the area has been paved through the construction of a new fueling island. We believe the soils have been remediated to the level where they are not impacting the groundwater.

The issue of an additional monitoring well is covered under comment 4. Based upon the analytical results from MW-2 and activities in the immediate area, an additional monitoring well is not warranted off-site.

CONCLUSIONS

The following are conclusions of the site assessment performed at the WMMI Savage facility:

1. Three soil borings were advanced around UST #1 on August 1, 1991. Laboratory analysis of soil samples collected from the borings had low detected levels of petroleum related parameters.

2. Depth to groundwater measurements were collected from the site monitoring wells on July 18, 1991. Groundwater elevations indicate a northeasterly groundwater flow direction similar to the one described in the March 1990 report submitted by Foth & Van Dyke. As shown in Figure 3, monitoring well MW-2 is clearly downgradient of where UST #2 was located.

3. Migration of any contamination associated with UST #1 would be impeded by the building located above UST #1.

4. Detected levels of benzene in monitoring well MW-2 have decreased to the RAL (10 ug/L).

RECOMMENDATIONS

As the detected levels of petroleum related parameters have decreased to or below the RALs in the site monitoring wells, Foth & Van Dyke recommends no additional investigative work be completed at the site.

If you have any questions or need any additional information during your review please do not hesitate to contact us at (612) 942-0396.

Sincerely,

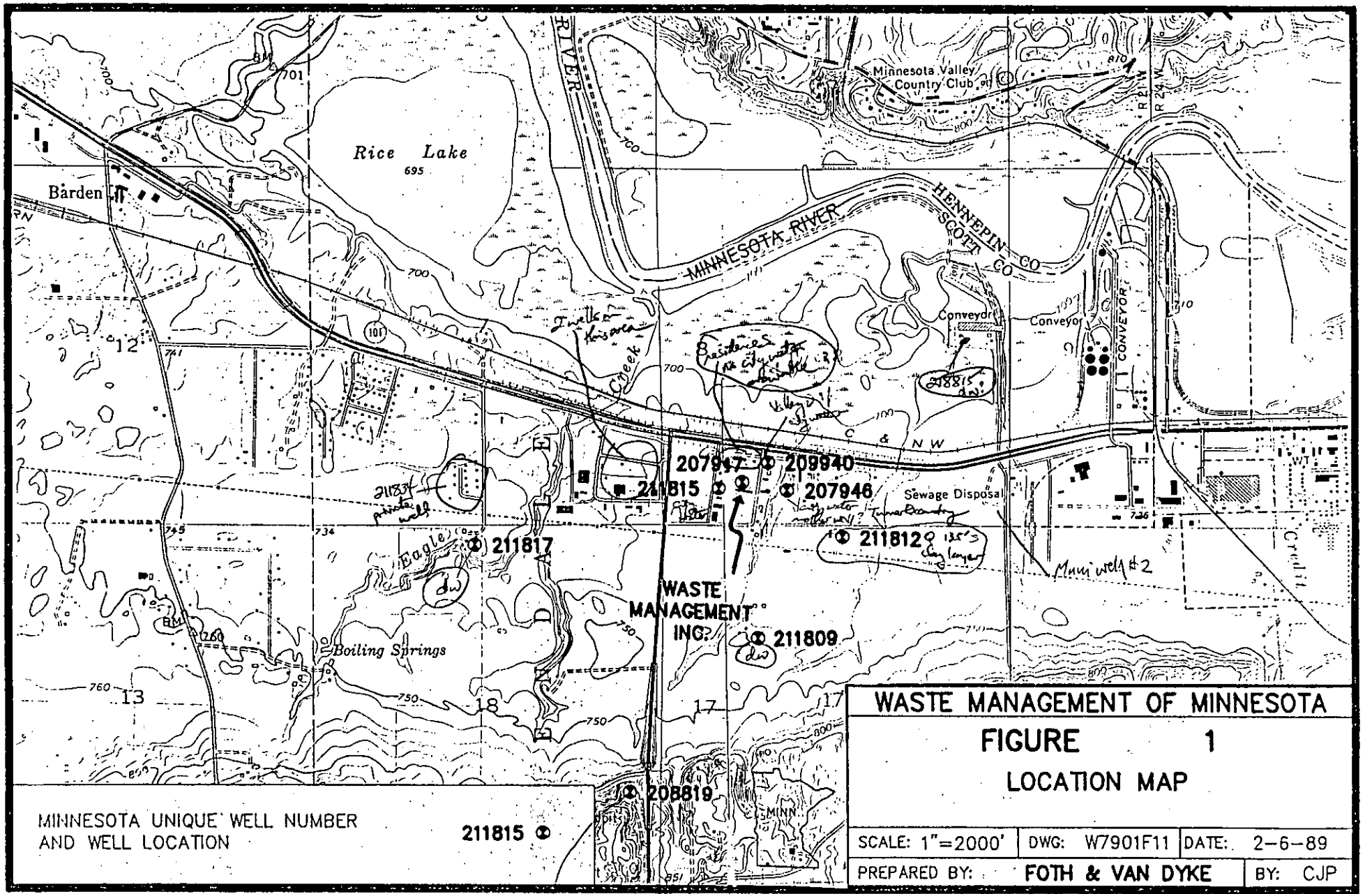
FOTH & VAN DYKE

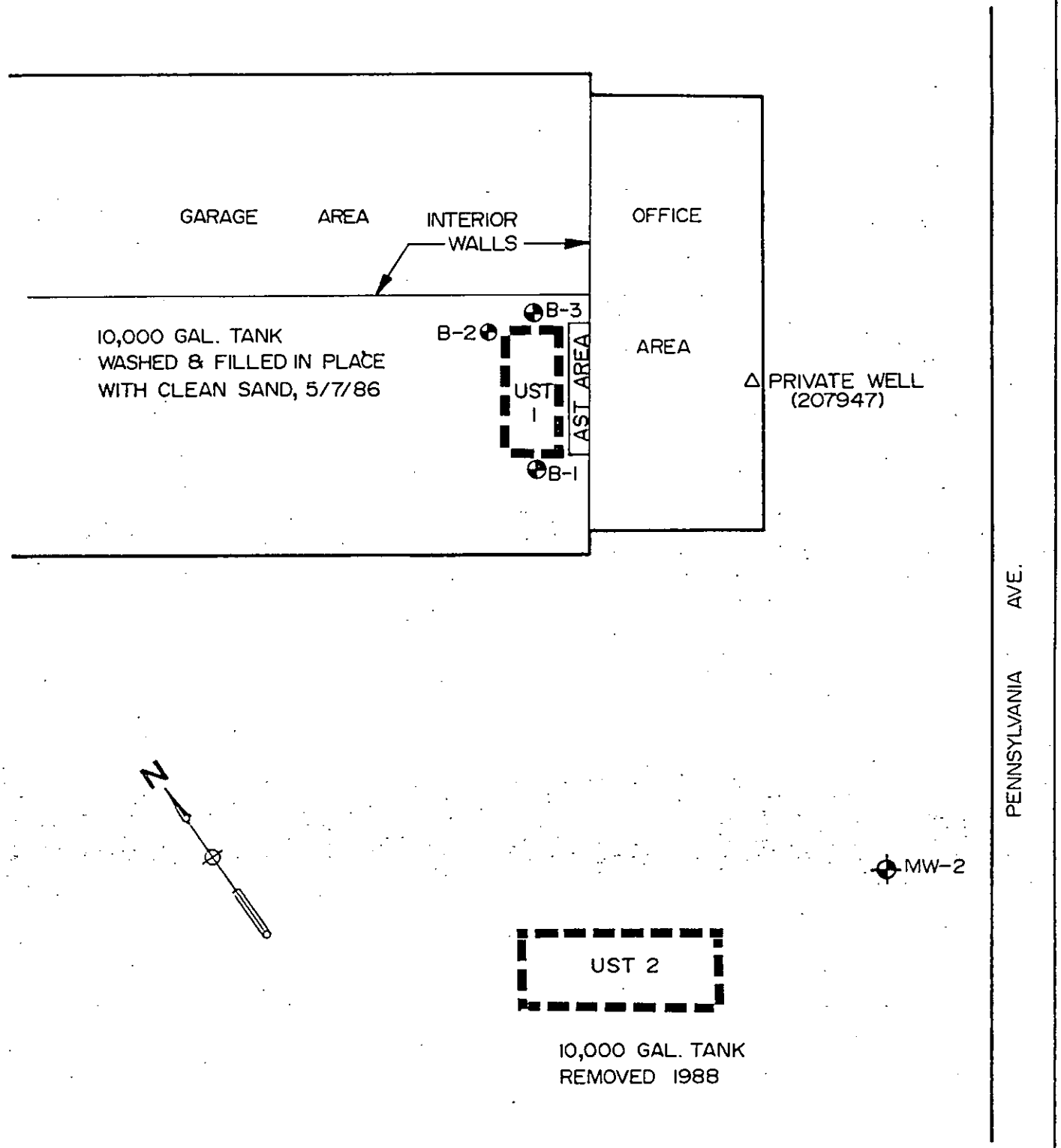
Allison L. Dennen
Project Geologist

Craig L. Johanesen
Associate

ALD\CLJ:jmk

cc: Bruce Weaver, Waste Management of Minnesota - Anoka
Mike Berkopec, Waste Management of Minnesota - Savage


Rice Lake
695
Barden
RIVER
Minnesota Valley Country Club
MINNESOTA RIVER
HENNEPIN CO
SCOTT CO
Conveyor
CONVEYOR
Creek
C & NW
207917
209940
211815
207946
Sewage Disposal
211812
211817
Eagle
WASTE MANAGEMENT INC?
211809
Boiling Springs
208819
MINN.
MINNESOTA UNIQUE WELL NUMBER AND WELL LOCATION
211815
WASTE MANAGEMENT OF MINNESOTA
FIGURE 1
LOCATION MAP
SCALE: 1"=2000'
DWG: W7901F11
DATE: 2-6-89
PREPARED BY: FOTH & VAN DYKE
BY: CJP



LEGEND

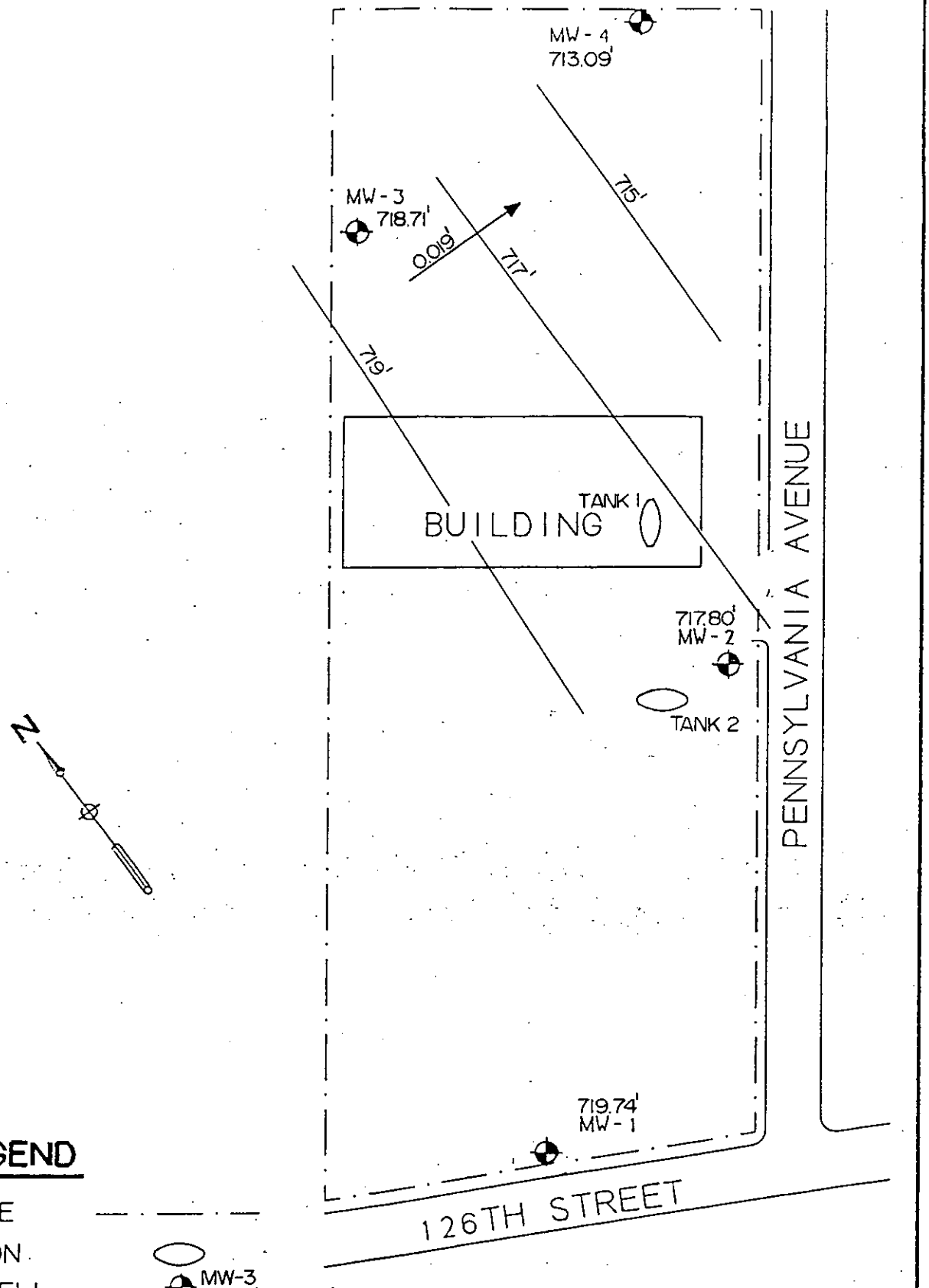
B-1	SOIL BORING
MW-2	MONITORING WELL
▬ ▬ ▬	UST BOUNDARY
△	PRIVATE WELL

WASTE MANAGEMENT OF MINNESOTA

FIGURE 2

SITE MAP
SAVAGE, MINNESOTA

Scale: 1" = 30'	Date: 9/27/91
Prepared by: Foth & Van Dyke	By: MWB



LEGEND

PROPERTY LINE

TANK LOCATION

MONITORING WELL
GROUNDWATER ELEVATION — MW-3 718.71'

WATER TABLE CONTOUR — 719'

GROUNDWATER FLOW DIRECTION/HYDRAULIC GRADIENT — 0.019'

GW ELEVATIONS BASED ON DEPTH TO GW MEASUREMENTS COLLECTED ON JULY 18, 1991

WASTE MANAGEMENT OF MINNESOTA

FIGURE 3

MONITORING WELL LOCATIONS AND WATER TABLE CONTOUR MAP
SAVAGE, MINNESOTA

SCALE: 1" = 100'	DWG. NO:	DATE: 9/30/91
PREPARED BY: FOTH & VAN DYKE		BY: ALD

TABLE 1

Summary of Headspace Readings
Waste Management of Minnesota, Inc.
Savage, Minnesota
August 1, 1991

Boring ID	Depth (feet)	USCS Classification	Headspace Readings (ppm)
B-1	1.0-2.0	SP/GP	1752
	2.0-3.5	SC	---*
	4.5-6.0	CL	0.0
	7.0-8.5	CL	0.0*
B-2	1.0-2.5	SP	9999
	2.0-3.5	SP	---*
	4.5-6.5	SP	561*
B-3	0.5-2.0	SP	0.0
	3.0-4.5	CL	0.0
	4.5-6.5	SM	2566*

* - laboratory sample collected
USCS - Unified Soil Classification System
ppm - parts per million
--- - no head space reading taken. All of sample dedicated to laboratory.

TABLE 2

Summary of Laboratory Analysis - Soil Borings
Waste Management of Minnesota, Inc.
Savage, Minnesota
August 1, 1991

Parameter	B-1 2.0'-3.5'	B-1 7.0'-8.5'	B-2 2.0'-3.5'	B-2 4.5'-6.5'	B-3 4.5'-6.5'	MDL
Lead	16	ND	28	24	12	10
Benzene	ND	ND	ND	ND	ND	0.12
Toluene	ND	ND	ND	ND	ND	0.12
Ethylbenzene	ND	ND	ND	ND	ND	0.12
Xylene	ND	ND	ND	ND	0.14	0.12
THC as Gasoline	ND	ND	1.2	ND	16	1.0
THC as Fuel Oil #1	ND	ND	ND	ND	ND	3.3
THC as Fuel Oil #2	ND	ND	150	ND	ND	3.3
TPH	ND	ND	ND	ND	58	3.3

All values are in milligrams per kilogram (mg/kg) or parts per million (ppm).
ND - Not detected at or above the Method Detection Limit (MDL).
THC - Total Hydrocarbons
TPH - Total Petroleum Hydrocarbons

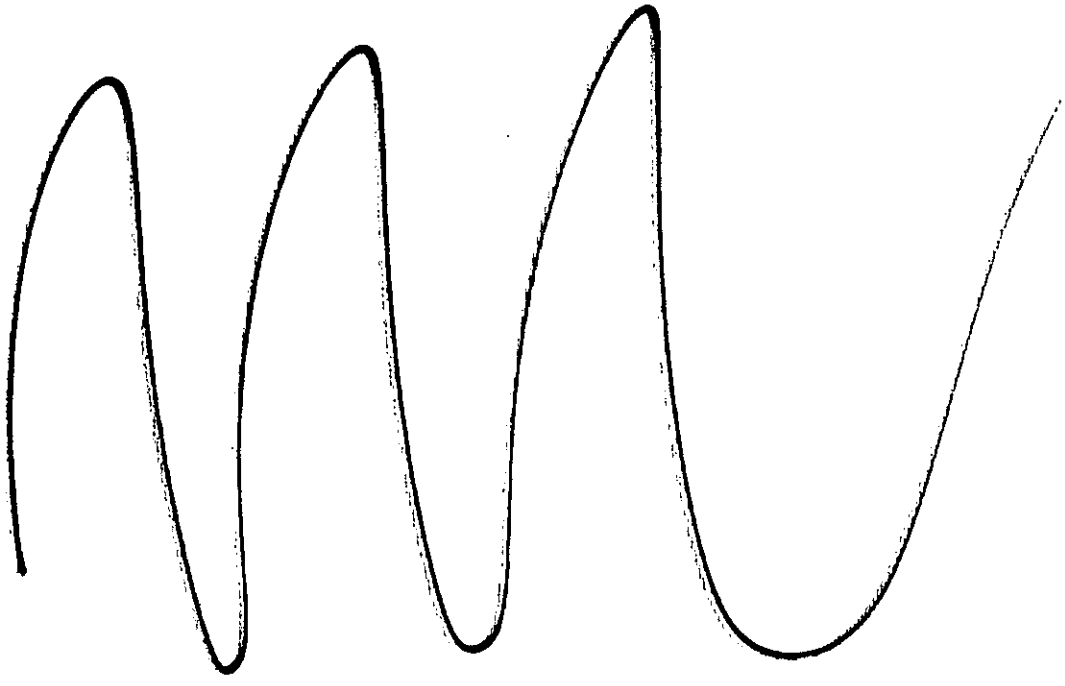
TABLE 3

Summary of Groundwater Elevations
Waste Management of Minnesota, Inc.
Savage, Minnesota
July 18, 1991

Monitoring Well ID	Top of Casing Elevation (feet)	Depth to Groundwater (feet)	Groundwater Elevation (feet)
MW-1	732.16	12.42	719.74
MW-2	726.24	8.44	717.80
MW-3	724.46	5.75	718.71
MW-4	721.77	8.68	713.09

ATTACHMENT A

MPCA Comment Letter
July 11, 1990



Minnesota Pollution Control Agency
520 Lafayette Road, Saint Paul, Minnesota 55155
Telephone (612) 296-6300

Celebrate MINNESOTA 1990

Mr. Mike Berkopec
Waste Management, Inc
12448 Pennsylvania Avenue
Savage, Minnesota 55378

July 11, 1990

Dear Mr. Berkopec:

RE: Remedial Investigation Report;
Remedial Investigation Report, Phase II
Site: Waste Management, Savage
Site ID: LEAK00000990

The Minnesota Pollution Control Agency (MPCA) staff has completed its review of the above-captioned reports and offer the following comments for your consideration.

1. Neither report on this site discusses UST #1 in any detail, except that it is beneath the on-site building. Since the tank has been abandoned in place, the investigation must show the location of the tank, and either the extent of the release from UST #1, or that no release from UST #1 has taken place. This point was discussed at a meeting between MPCA and Foth & Van Dyke on January 24, 1990.

2. The report does not mention the conditions of the on-site well (unique number 207947) during the Phase II work. According to the March 1989, report, this well is cased to 38 feet, with a total depth of 53 feet (open hole in the Prairie du Chien). An opportunity may have been missed to demonstrate Foth & Van Dyke's hypothesized upward vertical ground water flow at the site, which could have been done by installing a shallow monitoring well in the same location (assuming hydrogeologic connection between the Prairie du chien and the unconsolidated materials above). Such an analysis would also depend upon the location of the on-site deep case, the deep well should have been inspected and (depending upon its location) sampled during the Phase II work. At a minimum, a map showing the well's location should be provided.

3. The location of monitoring well MW-2 is ambiguous with respect to the UST #2 excavation, as shown on Figures 2-2 and 4-1 of the March 1990, report. This is a critical point since MW-2 is cross-gradient of the excavation as shown on Figure 2-2, and downgradient as shown on Figure 4-1. This problem needs to be addressed by Foth & Van Dyke. The problem of properly constructed maps was discussed at the meeting between MPCA and Foth & Van Dyke on January 24, 1990.

4. The monitoring wells are situated such that it is not possible to effectively evaluate ground water flow direction in the central portion of the site, where former UST #2 was located. This may have been necessary due to on-site constraints, but this is not discussed in the report. Flow direction as determined by wells MW-2, MW-3 and MW-4 has a significant eastward component, which suggests ground water contaminants from the UST #2 basin (and perhaps from the UST #1 basin, depending on its location; see comment #1 above) may be moving off-site towards the east. The ground water sample collected from TP-2 had significantly high concentrations of BETX and TPH/G, and Figure 4-1 of the March 1990, report shows TP-2 within approximately 50 feet of the property boundary. Therefore at least one monitoring well is necessary off-site to the east.

5. The report apparently considers the soil investigation closed since there is no discussion of soil quality and no soil Hnu headspace or laboratory analytical work was done during Phase II. However, though about 100 cubic yards of contaminated soils were removed with UST #2, test pit TP-2 to the northeast showed significant concentrations of TPH/FO (2,200 ppm). Soils contaminated to this extent are not normally left in place without remediation, especially close to the downgradient property, as these are. The soil remedial investigation is therefore still incomplete, and a CAD for soils will be necessary.

Please let me know how and when you wish to proceed by providing me with a schedule for installing and sampling the additional well(s), as well as a soil remediation plan. If I can be of further assistance please call me at 612/643-3425.

Sincerely,

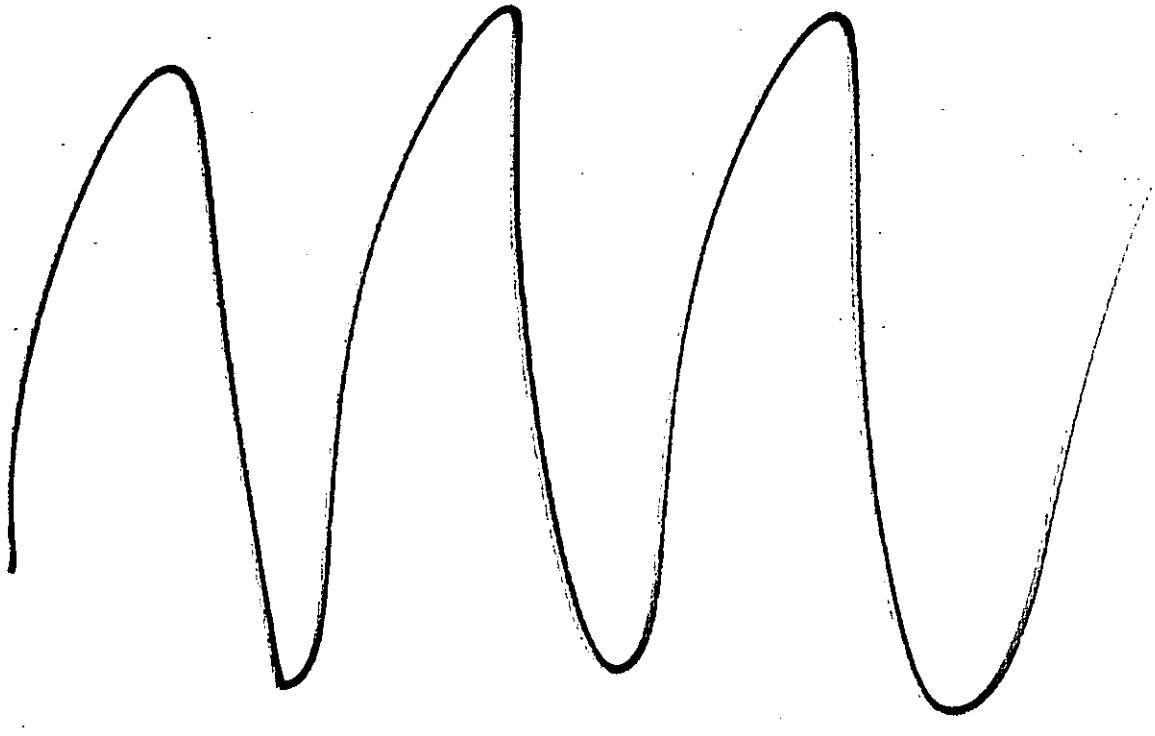
John R. Moeger
Project Leader
Tanks and Spills Section
Hazardous Waste Division

JRM:baj

cc: Fred J. Doran, Foth & Van Dyke
Richard Pager, Waste Management, Inc.
Craig L. Johanesen, Foth & Van Dyke
James C. Fahrbach, Foth & Van Dyke

ATTACHMENT B

Soil Boring Logs
Foth & Van Dyke
American Engineering Testing, Inc.



FOTH & VAN DYKE

Client: Waste Management of Minnesota
Project: Savage, Minnesota
Prepared by: ALD
Checked by: FJD

Scope I.D.: 91W43
Page: 1 of 1
Date: 10/6/91
Date: 10/10/91

REPORT - LOG OF TEST BORING

Test Boring No.: B-1
Location: south of UST #1
Boring Depth: 8.5'
Surface Elevation:

Start Date: 8/1/91
Completion Date: 8/1/91
Logged by: ALD

MSL ELEV	DEPTH FR LND SURF	SAMP DEPTH INTERVAL	TYPE	#	N	REC (ft)	DESCRIPTION OF MATERIAL	CLASS	LABORATORY TESTS	DRILLING AND SAMPLING NOTES
0.0	--0	0.0-0.5					concrete			
		0.5-1.0	grab	1	--	---	brownish yellow (10YR 6/6) poorly graded SAND & GRAVEL, medium to coarse, loose, dry	SP-GP		
		1.0-2.0	SB	2	28	0.5	as above			TIP = 1752 ppm
0.0	-- 2.5	2.0-3.5	SB	3	16	1.0	black (10YR 2/1) sandy CLAY, slightly friable, organic rich, slightly plastic, dry, strong odor	SC	laboratory sample collected	All of sample dedicated to laboratory
		4.5-6.0	SB	4	4	1.0	yellowish brown (10YR 5/6) lean CLAY, sandy, plastic, moist at 5.9' brown (10YR 5/3) poorly graded SAND, trace of clay, medium, wet	CL		TIP = 0.0 ppm
0.0	-- 5.0									
		7.0-8.5	SB	5	16	1.3	as above	SP	laboratory sample collected	TIP = 0.0 ppm
0.0	-- 7.5						at 8.0' light gray (10YR 6/1) poorly graded SAND, trace of clay, medium, wet			
							End of boring			
0.0	-- 10.0						Backfilled with bentonite to 6.0' depth bgs, then bentonite and cuttings to surface			
0.0	-- 12.5									
0.0	-- 15.0									
0.0	-- 17.5									
0.0	-- 20.0									
0.0	-- 22.5									
0.0	-- 25.0									
0.0	-- 27.5									

DRILLING METHOD: 2.50" ID Hollow Stem Augers
DRILLING CONTRACTOR: American Engineering Testing, Inc.

DEPTH TO WATER -
AT COMPLETION: 6.3' bgs
LATER TIME/DEPTH: -----

FOTH & VAN DYKE

Client: Waste Management of Minnesota
Project: Savage, Minnesota
Prepared by: ALD
Checked by: FJD

Scope I.D.: 91W43
Page: 1 of 1
Date: 10/6/91
Date: 10/10/91

REPORT - LOG OF TEST BORING

Start Date: 8/1/91
Completion Date: 8/1/91
Logged by: ALD

Test Boring No.: B-2
Location: Northwest of tank #1
Boring Depth: 6.5'
Surface Elevation:

MSL ELEV	DEPTH FR LND SURF	SAMP DEPTH INTERVAL	TYPE	#	N	REC (ft)	DESCRIPTION OF MATERIAL	CLASS	LABORATORY TESTS	DRILLING AND SAMPLING NOTES
0.0	--0	0.0-1.0					concrete			
		1.0-2.5	SB	1	8	1.0	yellowish brown (10YR 5/4) poorly graded SAND with gravel, medium to coarse, loose, dry			TIP = 9999 ppm
0.0	-- 2.5	2.0-3.5	SB	2	8	0.8	as above	SP	laboratory sample collected	All of sample dedicated to laboratory
		4.5-6.5	SB	3	4	1.0	as above			
0.0	-- 5.0						at 6.2' very dark gray (10YR 3/1) poorly graded SAND, medium to coarse, wet to saturated		laboratory sample collected	TIP = 561 ppm
0.0	-- 7.5						End of boring Backfilled with neat cement grout			
0.0	-- 10.0									
0.0	-- 12.5									
0.0	-- 15.0									
0.0	-- 17.5									
0.0	-- 20.0									
0.0	-- 22.5									
0.0	-- 25.0									
0.0	-- 27.5									

DRILLING METHOD: 2.50" ID Hollow Stem Augers
DRILLING CONTRACTOR: American Engineering Testing, Inc.

DEPTH TO WATER -
AT COMPLETION: 6' bgs
LATER TIME/DEPTH: -----

FOTH & VAN DYKE

Client: Waste Management of Minnesota
Project: Savage, Minnesota
Prepared by: ALD
Checked by: EJD

Scope I.D.: 91W43
Page: 1 of 1
Date: 10/6/91
Date: 10/10/91

REPORT - LOG OF TEST BORING

Start Date: 8/1/91
Completion Date: 8/1/91
Logged by: ALD

Test Boring No.: B-3
Location: north of UST #1
Boring Depth: 6.5'
Surface Elevation:

MSL ELEV	DEPTH FR LND SURF	SAMP DEPTH INTERVAL	TYPE	#	N	REC (ft)	DESCRIPTION OF MATERIAL	CLASS	LABORATORY TESTS	DRILLING AND SAMPLING NOTES
0.0	--0	0.0-0.5					concrete			
	-	0.5-2.0	SB	1	17	0.8	yellowish brown (10YR 5/6) poorly graded SAND, with gravel, medium to coarse, loose, dry	SP		TIP = 0.0 ppm
	-	2.0-4.0	SB	2	--	0.0	no recovery			
0.0	-- 2.5									
	-	3.0-4.5	SB	3	6	0.9	black (10YR 2/1) lean CLAY, trace of sand, plastic, cohesive, slightly dense, dry	CL		TIP = 0.0 ppm
	-	4.5-6.5	SB	4	6	1.5	dark yellowish brown (10YR 3/4) lean CLAY, trace of sand, plastic, cohesive			
0.0	-- 5.0									
	-						at 6.0' light gray silty SAND, fine, petroleum odor, wet to saturated	SM	laboratory sample collected	TIP = 2566 ppm
0.0	-- 7.5						End of boring Backfilled with neat cement grout			
0.0	-- 10.0									
0.0	-- 12.5									
0.0	-- 15.0									
0.0	-- 17.5									
0.0	-- 20.0									
0.0	-- 22.5									
0.0	-- 25.0									
0.0	-- 27.5									

DRILLING METHOD: 2.50" ID Hollow Stem Augers
DRILLING CONTRACTOR: American Engineering Testing, Inc.

DEPTH TO WATER -
AT COMPLETION: 5.2' bgs
LATER TIME/DEPTH: ------

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: 91-872 LOG OF BORING NO. 1 (p. 1 of 1)

PROJECT: WASTE MANAGEMENT, INC., 12448 PENNSYLVANIA AVENUE; SAVAGE, MN

DEPTH IN FEET	SURFACE ELEVATION: MATERIAL DESCRIPTION	GEOLOGY	BPF	MC	SAMPLE TYPE	REC. IN.	FIELD & LABORATORY TESTS WC	DEN	LL	PL	%-200
1	5" Concrete, 6" Base			M	SS	6					
2											
3			6	M	SS	14					
4											
5	Poorly graded sand, fine to medium grained, loose, brown (SP)	FILL	4	M/W	SS	12					
6											
7											
8			16	W	SS	18					
	END OF BORING										

DEPTH: DRILLING METHOD

0-7' 2.25" HSA

BORING COMPLETED: 8/1/91

CC: DA CA: MM Rig: 7

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
8/1/91	9:20	8.5	7.0	6.9		6.3.

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: 91-872 LOG OF BORING NO. 2 (p. 1 of 1)

PROJECT: WASTE MANAGEMENT, INC., 12448 PENNSYLVANIA AVENUE; SAVAGE, MN

DEPTH IN FEET	SURFACE ELEVATION: MATERIAL DESCRIPTION	GEOLOGY	BPF	MC	SAMPLE TYPE	REC. IN.	FIELD & LABORATORY TESTS WC	DEN	LL	PL	%-200
1	10" Concrete, 8" Base		8	M	SS	11					
2											
3			8	M	SS	12					
4	Poorly graded sand, fine to medium grained, loose, brown (SP)	FILL									
5			4	W	SS	14					
6	END OF BORING										

DEPTH: DRILLING METHOD	WATER LEVEL MEASUREMENTS						
	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
0-4.5' 2.25" HSA	8/1/91	10:35	6.5	4.5	5.5		WET
BORING COMPLETED: 8/1/91							
CC: DA CA: MM Rig: 7							

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: 91-872 LOG OF BORING NO. 3 (p. 1 of 1)

PROJECT: WASTE MANAGEMENT, INC., 12448 PENNSYLVANIA AVENUE; SAVAGE, MN

DEPTH IN FEET	SURFACE ELEVATION: MATERIAL DESCRIPTION	GEOLOGY	BPF	MC	SAMPLE TYPE	REC. IN.	FIELD & LABORATORY TESTS WC	DEN	LL	PL	%-200
1	6" Concrete, 6" Base		17	M	SS	13					
2											
3			6	M	SS	11					
4	Poorly graded sand, fine to medium grained, loose, brown (SP)	FILL									
5			6	W	SS	20					
6											
	END OF BORING										

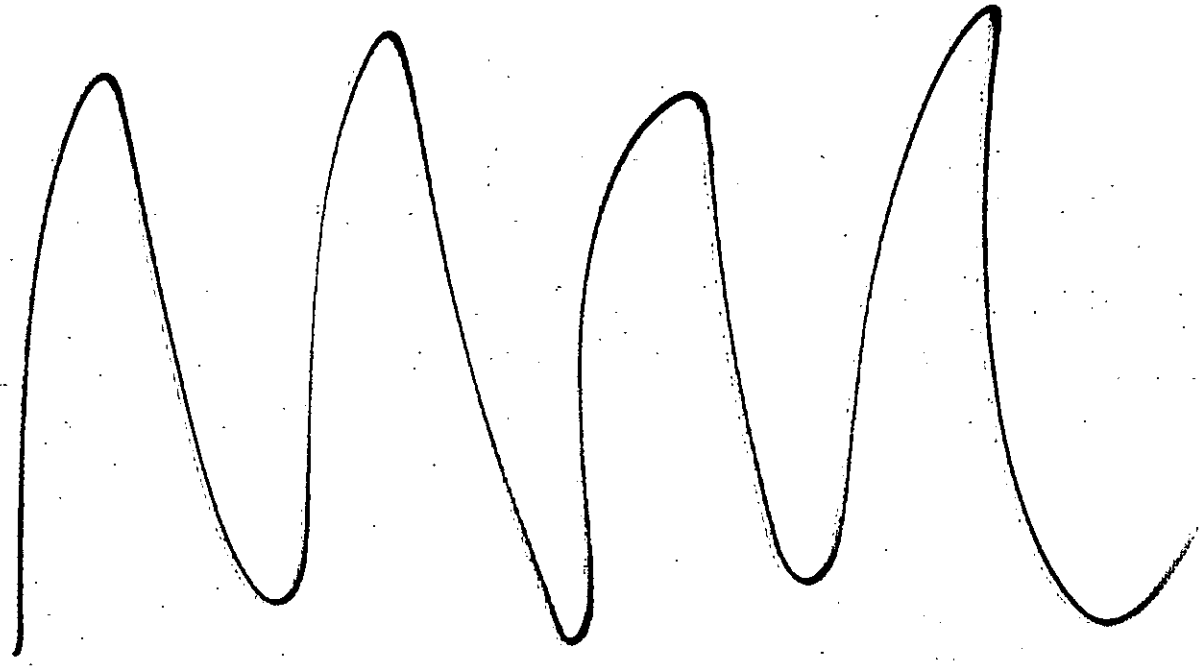
DEPTH: DRILLING METHOD	WATER LEVEL MEASUREMENTS						
	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
0-4.5' 2.25" HSA	8/1/91	11:37	6.0	4.5	5.2		WET
BORING COMPLETED: 8/1/91							
CC: DA CA: MM Rig: 7							

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

4/90

ATTACHMENT C

Laboratory Analysis - Soils
August 1, 1991



pace
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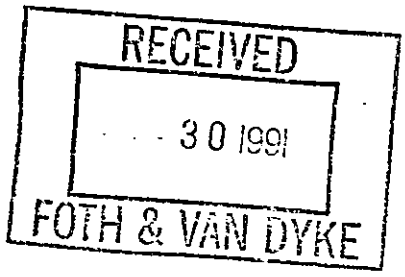
THE ASSURANCE OF QUALITY

REPORT OF LABORATORY ANALYSIS

August 27, 1991



Ms. Allison Dennon
Foth & Van Dyke & Associates
10340 Viking Drive
Suite 100
Eden Prairie, MN 55344

RE: PACE Project No. 910801.523
91W43

Dear Ms. Dennon:

Enclosed is the report of laboratory analyses for samples received August 01, 1991.

If you have any questions concerning this report, please feel free to contact us.

Sincerely,

R. Lorraine Vokaty

R. Lorraine Vokaty
Project Manager

Enclosures

1710 Douglas Drive North
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

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THE ASSURANCE OF QUALITY

REPORT OF LABORATORY ANALYSIS

Foth & Van Dyke & Associates
10340 Viking Drive
Suite 100
Eden Prairie, MN 55344

August 27, 1991
PACE Project Number: 910801523

Attn: Ms. Allison Dennon

91W43

Parameter	Units	MDL	10 0272167 08/01/91 08/01/91 B-1 2.0-3.5	10 0272175 08/01/91 08/01/91 B-1 7.0-8.5	10 0272183 08/01/91 08/01/91 B-2 2-2 2.0-3.5
PACE Sample Number:					
Date Collected:					
Date Received:					
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Lead	mg/kg	10	16	ND	28
ORGANIC ANALYSIS					
VOLATILE PETROLEUM RELATED CMPDS IN SOIL					
Date Analyzed			08/13/91	08/13/91	08/13/91
Benzene	mg/kg	0.12	ND	ND	ND
Toluene	mg/kg	0.12	ND	ND	ND
Ethyl benzene	mg/kg	0.12	ND	ND	ND
Xylene	mg/kg	0.12	ND	ND	ND
Total Hydrocarbons as gasoline	mg/kg	1.0	ND	ND	1.2
HEXANE EXTRACT PETROLEUM PRODUCTS SOIL					
Date Analyzed			B 08/21/91	B 08/21/91	B 08/22/91
Date Extracted			ND	ND	ND
Fuel oil #1	mg/kg	3.3	ND	ND	ND
Fuel oil #2	mg/kg	3.3	ND	ND	150
Total Petroleum Hydrocarbons	mg/kg	3.3	ND	ND	ND

MDL Method Detection Limit
ND Not detected at or above the MDL.

1710 Douglas Drive North
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

REPORT OF LABORATORY ANALYSIS

Ms. Allison Dennon
Page 2

August 27, 1991
PACE Project Number: 910801523

91W43

Parameter	Units	MDL	10 0272191 08/01/91 08/01/91 B-2 2-3 4.5-6.5	10 0272205 08/01/91 08/01/91 B-3 3-3 4.5-6.5
PACE Sample Number:				
Date Collected:				
Date Received:				
INORGANIC ANALYSIS				
INDIVIDUAL PARAMETERS				
Lead	mg/kg	10	24	12
ORGANIC ANALYSIS				
VOLATILE PETROLEUM RELATED CMPDS IN SOIL				
Date Analyzed			08/13/91	8/13/91
Benzene	mg/kg	0.12	ND	ND LS
Toluene	mg/kg	0.12	ND	ND
Ethyl benzene	mg/kg	0.12	ND	ND
Xylene	mg/kg	0.12	ND	0.14
Total Hydrocarbons as gasoline	mg/kg	1.0	ND	16 HB
HEXANE EXTRACT PETROLEUM PRODUCTS SOIL				
Date Analyzed			B 08/22/91	B 08/22/91
Date Extracted			ND	ND
Fuel oil #1	mg/kg	3.3	ND	ND
Fuel oil #2	mg/kg	3.3	ND	ND
Total Petroleum Hydrocarbons	mg/kg	3.3	ND	58

MDL Method Detection Limit
ND Not detected at or above the MDL.
LS Low surrogate recovery was confirmed as a matrix effect by a second analysis.
HB High boiling point hydrocarbons are present in sample.

1710 Douglas Drive North
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

These data have been reviewed and are approved for release.

Starla Enger
Inorganic Chemistry Manager

Liesa Shanahan
Organic Chemistry Manager

1710 Douglas Drive North
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

pace INCORPORATED
THE ASSURANCE OF QUALITY

17370

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client ~~F.T.H. & Van Dyke~~
Address ~~[illegible] Viking Drive #100~~
~~[illegible], MN 55344~~
Phone ~~[illegible]-941-[illegible]~~

Report To: ~~Allison Deming~~
Bill To: ~~F.T.H. & Van Dyke~~
P.O. # / Billing Reference ~~91043~~
Project Name / No. ~~91043~~

Pace Client No. 150115
Pace Project Manager [illegible]
Pace Project No. 9109615[illegible]
*Requested Due Date:

Sampled By (PRINT): Allison Deming
Sampler Signature: Allison Deming
Date Sampled: 8/1/91

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	UNPRESERVED	H_2SO_4	HNO_3	VOA	Acetone Rinse		BETX	THC as gas	THC as fuel	Total Lead	REMARKS
1	91043 B-1 20-35'	9:05	soil	272167	3	X				X		X	X	X	X	
2	91043 B-1 7.0-8.5'	9:20	soil	175	3	X				X		X	X	X	X	
3	91043 B-2 2.2' 20-35'	9:30	soil	183	3	X				X		X	X	X	X	
4	91043 B-2 2.3 45-65'	10:40	soil	191	3	X				X		X	X	X	X	
5	91043 B-3 3.3 45-65'	11:57	soil	205	3	X				X		X	X	X	X	
6																
7																
8																Temp 15°C

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	RETURNED / DATE

Additional Comments

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
	Allison Deming F&VD	Armstrong	8/1/91	14:00
		[illegible] Pace	8/1/91	15:[illegible]

SEE REVERSE SIDE FOR INSTRUCTIONS

ATTACHMENT D

Summary of Detected Parameters
Laboratory Analysis - June 1991

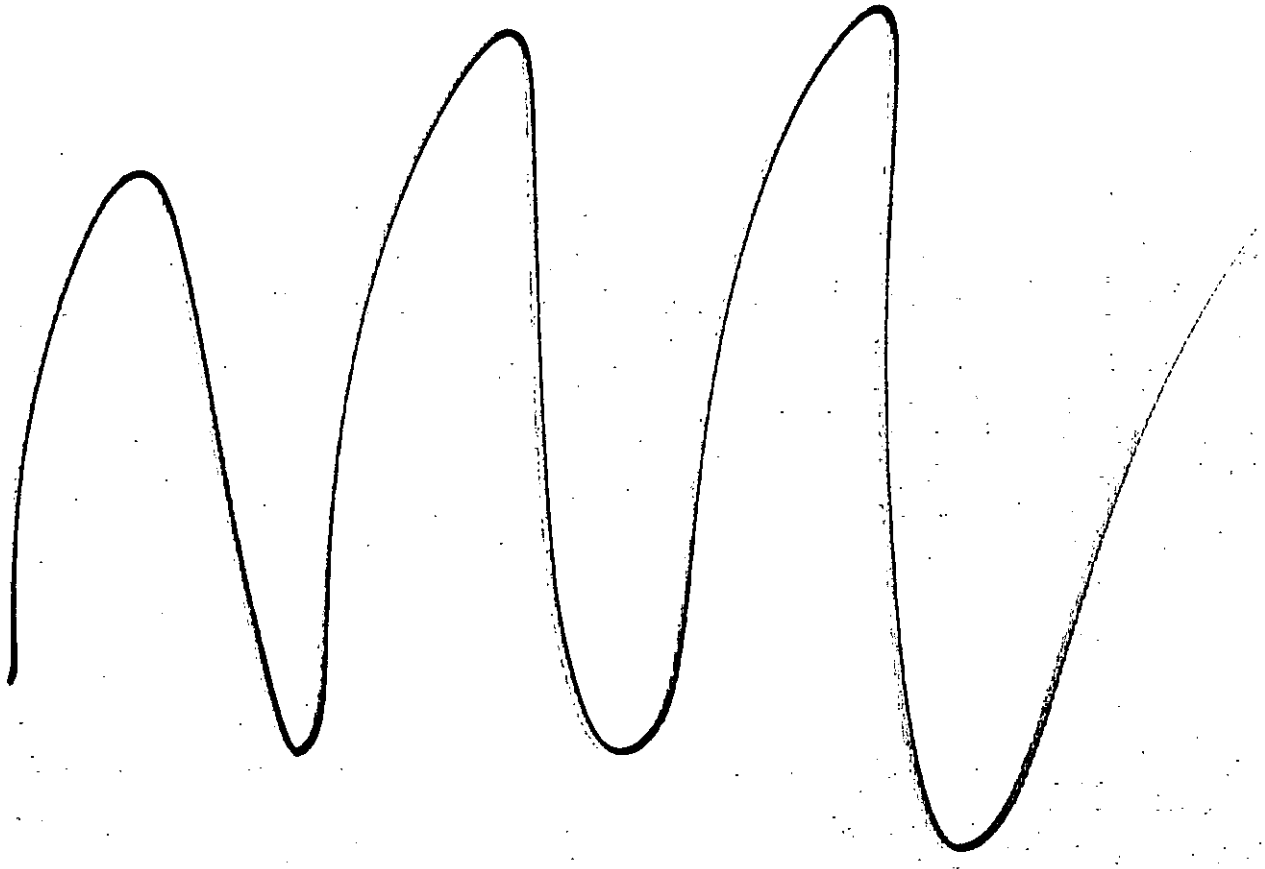

TABLE D-1

Monitoring Well MW-1
Summary of Detected Parameters
Waste Mangement, Inc.
Savage, Minnesota

	MW-1						
	8/15/89-8/16/89	2/16/90	5/30/90	8/27/90	12/19/90	6/5/91	RAL
Lead (mg/L)	0.003	ND	ND	ND	ND	NT	0.020

All values are in milligrams per liter (mg/L) or parts per million (ppm).
NT - not tested
ND - not detected at or above the method detection limit (MDL)
RAL - Minnesota Department of Health (MDH) Recommended Allowable Limit

TABLE D-2

Monitoring Well MW-2
Summary of Detected Parameters
Waste Management, Inc.
Savage, Minnesota

	8/15/89-8/16/89	2/16/90	5/30/90	8/27/90	12/19/90	6/5/91	RAL
1,1 Dichloroethane (ug/L)	1.4	NT	ND	NT	NT	NT	70.0
1,2 Dichloroethane (ug/L)	0.3	NT	0.6	NT	NT	NT	4.0
1,1,1 Trichloroethane (ug/L)	1.0	NT	ND	NT	NT	NT	600.0
Trichloroethane (ug/L)	ND	NT	2	NT	NT	NT	30.0
Tetrachloroethylene (ug/L)	0.4	NT	ND	NT	NT	NT	2.0
1,1-Dichloroethene (ug/L)	ND	NT	1	NT	NT	NT	6.0
Lead (mg/L)	0.014	ND	ND	NT	NT	NT	0.02
Benzene (ug/L)	ND	14	ND	73	15	10	10
Xylene (ug/L)	ND	6	ND	130	37	96	10,000
Toluene (ug/L)	ND	ND	1	13	5	1.5	1,000
Ethylbenzene (ug/L)	ND	ND	ND	28	9	21	700
THC as Gasoline (mg/L)	ND	ND	ND	0.30	0.17	830	NS

All values are in micrograms per liter (ug/L) or parts per billion (ppb) except for lead and THC as gasoline values which are in milligrams per liter (mg/L) or parts per millin (ppm).

NT - not tested
ND - not detected at or above the method detection limit (MDL)
NS - no standard established
RAL - Minnesota Department of Health (MDH) Recommended Allowable Limit

91W43

TABLE D-3

Monitoring Well MW-3
Summary of Detected Parameters
Waste Management, Inc.
Savage, Minnesota

	8/15/89-8/16/89	2/16/90	5/30/90	8/27/90	12/19/90	6/5/91	RAL
1,1 Dichloroethane (ug/L)	0.5	NT	ND	NT	NT	NT	70.0
1,2 Dichloroethane (ug/L)	1.1	NT	ND	NT	NT	NT	6.0
Trichloroethylene (ug/L)	1.4	NT	ND	NT	NT	NT	30.0
Tetrachloroethylene (ug/L)	1.0	NT	ND	NT	NT	NT	7.0
Lead (mg/L)	0.003	ND	ND	0.009	ND	NT	0.02

All values are in micrograms per liter (ug/L) or parts per billion (ppb) except for lead which is in milligrams per liter (mg/L) or parts per million (ppm).
NT - not tested
ND - not detected at or above the method detection limit (MDL)
NS - no standard established

TABLE D-4

Monitoring Well MW-4
Summary of Detected Parameters
Waste Management, Inc.
Savage, Minnesota

	8/15/89-8/16/89	2/16/90	5/30/90	8/27/90	12/19/90	6/5/91	RAL
1,1 Dichloroethane (ug/L)	0.6	NT	ND	NT	NT	NT	70.0
1,2 Dichloroethylene, trans, (ug/L)	1.9	NT	ND	NT	NT	NT	100
Tetrahydrofuran (ug/L)	9.5	NT	ND	NT	NT	NT	100.0
Benzene (ug/L)	2.3	ND	ND	ND	ND	NT	10
Lead (mg/L)	0.022	ND	ND	0.007	ND	NT	0.020

All values are in micrograms per liter (ug/L) or parts per billion (ppb) except for lead values which are in milligrams per liter (mg/L) or parts per million (ppm).
NT - not tested
ND - not detected at or above the method detection limit (MDL)
NS - no standard established
RAL - Minnesota Department of Health (MDH) Recommended Allowable Limit

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THE ASSURANCE OF QUALITY

REPORT OF LABORATORY ANALYSIS

July 02, 1991

Mr. Craig Johanesen
Foth & Van Dyke & Associates
10340 Viking Drive
Suite 100
Eden Prairie, MN 55344

Scope I.D. 91W43
File #

RE: PACE Project No. 910606.503
90W56

Dear Mr. Johanesen:

Enclosed is the report of laboratory analyses for samples received June 06, 1991.

If you have any questions concerning this report, please feel free to contact us.

Sincerely,

Karen Reilly

for R. Lorraine Vokaty
Project Manager

Enclosures

1710 Douglas Drive North
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

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THE ASSURANCE OF QUALITY

REPORT OF LABORATORY ANALYSIS

Foth & Van Dyke & Associates
10340 Viking Drive
Suite 100
Eden Prairie, MN 55344

July 02, 1991
PACE Project Number: 910606503

Attn: Mr. Craig Johanesen

90W56

Parameter	Units	MDL		
PACE Sample Number:			10 0203882	10 0203890
Date Collected:			06/05/91	06/05/91
Date Received:			06/06/91	06/06/91
			MW-2	Trip Blank
INORGANIC ANALYSIS				
INDIVIDUAL PARAMETERS				
Lead, Dissolved	mg/L	0.1	ND	-
ORGANIC ANALYSIS				
VOLATILE PETROLEUM RELATED COMPOUNDS				
Date Analyzed			E 06/12/91	E 06/12/91
Benzene	ug/L	1.0	10	ND
Toluene	ug/L	1.0	1.5	ND
Ethylbenzene	ug/L	1.0	21	ND
Xylenes	ug/L	2.0	96	ND
Total hydrocarbons as gasoline	ug/L	10	830	ND
HEXANE EXTRACTION FOR PETROLEUM PRODUCTS				
Date Analyzed			B 06/15/91	-
Date Extracted			06/07/91	-
Fuel Oil #1	mg/L	0.10	ND	-
Fuel Oil #2	mg/L	0.10	ND	-

MDL Method Detection Limit
ND Not detected at or above the MDL.

1710 Douglas Drive North
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

REPORT OF LABORATORY ANALYSIS

July 02, 1991
PACE Project Number: 910606503

90W56

These data have been reviewed and are approved for release.

Starla Enger
Inorganic Chemistry Manager

Liesa Shanahan
Organic Chemistry Manager

1710 Douglas Drive North
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

pace INCORPORATED
THE ASSURANCE OF QUALITY

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: FOTH & VAN DYKE
Address: 10340 VIKING DR. SUITE 100
EDEN PRAIRIE, MN 55344
Phone: 942-0396

Report To: CRAIG JOHANESEN
Bill To: FOTH & VAN DYKE
P.O. # / Billing Reference: 90W56
Project Name / No.: 90W56

Pace Client No.: 150401
Pace Project Manager: RLV
Pace Project No.: 9166065O3
*Requested Due Date: 6-7

Sampled By (PRINT): MICHAEL BLUMA
Sampler Signature: [signature]
Date Sampled: 6/5/91

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA			ANALYSES REQUEST: BETX	THC as GAS	THC or FUEL OIL	DIS LEAD	REMARKS
1	MW-2	10:00	WATER	20388.2	5	1		1	3			X	X	X	X	
2	TRIP BLANK		WATER	20389.0	2				2			X				
3																
4																
5																
6																
7																
8																

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	SHIPMENT METHOD RETURNED / DATE	ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
					[signature] F&VD	[signature]	6/5	11:30

Additional Comments

SEE REVERSE SIDE FOR INSTRUCTIONS

RLV

ATE: 6/06/91
6:54 AM

P A C E
MINNESOTA REGION

PAGE: 1

Sample and Analysis Data Entry Form - New Sample(s)

Foth & Van Dyke & Associates
Mr. Craig Johanesen
10340 Viking Drive
Suite 100
Eden Prairie, MN. 55344

Client No : 150401
: Client Contact
: Address

612-942-0396 : Telephone No

Project No: 910606.503 Due Date: 7/04/91 Client P.O. No:
Project Manager: RLV Project Name: 90W56
Manager's Name: R. Lorraine Vokaty
Project Type: A Analytical
QC Level: A Report Style: S
Desc:

Sample No: 10 020388.2 Collected Date: 6/05/91 Collected By: CLIENT
Lab Rec'd Date: 6/06/91 Checked-In By: MKR Priority: 4
Due Date: 6/27/91 Sample Desc: MW-2
Bottle Types: GV GV GV GS MLI
Comnt: Matrix: WATER

Analysis Abbr:	Name:
THCRTEX	VOLATILE PETROLEUM RELATED COMPOUNDS
HEX EX	HEXANE EXTRACTION FOR PETROLEUM PRODUCTS
MET-DIG-N	Metals Digestion
PB-D	Lead, Dissolved

Sample No: 10 020389.0 Collected Date: 6/05/91 Collected By: CLIENT
Lab Rec'd Date: 6/06/91 Checked-In By: MKR Priority: 4
Due Date: 6/27/91 Sample Desc: Trip Blank
Bottle Types: GV GV
Comnt: Matrix: WATER

Analysis Abbr:	Name:
THCRTEX	VOLATILE PETROLEUM RELATED COMPOUNDS

RECEIVED
JUN 13 1991
FOTH & VAN DYKE

PACE, Inc. reserves the right to return all samples at its discretion.

26572

ace INCORPORATED
THE ASSURANCE OF QUALITY

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: FOTH & VAN DYKE
Address: 10340 VIKING DR. SUITE 100
EDEN PRAIRIE, MN 55344
Phone: 942-0396

Report To: CRAIG JOHANESEN
Bill To: FOTH & VAN DYKE
P.O. # / Billing Reference: 90W56
Project Name / No.: 90W56

Pace Client No.: 150401
Pace Project Manager: RLV
Pace Project No.: 916606503
*Requested Due Date: 6/7

Sampled By (PRINT): MICHAEL BLUMA
Sampler Signature:
Date Sampled: 6/5/91

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA		ANALYSES REQUEST: BETX	THC as GAS	THC as FUEL OIL	DIS LEAD	REMARKS
1	MW-2	10:00	WATER	20388.1	5	1		1	3		X	X	X	X	
2	TRIP BLANK		WATER	20389.0	2				2		X				
3															
4															
5															
6															
7															
8															

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	SHIPMENT METHOD RETURNED / DATE

Additional Comments:

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
	F&VD		6/5	11:30

SEE REVERSE SIDE FOR INSTRUCTIONS