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CON 12-15
DOC# 35689

WATER RESOURCES SPECIALISTS

September 1, 1988

Mr. John Metcalfe
State of Iowa Department of Natural Resources
Field Evaluation and Emergency Response Bureau
Wallace State Office Building
Des Moines, Iowa 50319

Re: Kaneb-Milford, Iowa Terminal Report

Dear Mr. Metcalfe:

Please find the enclosed Environmental Assessment and Plan of Action for the groundwater remediation project at the Kaneb-Milford, Iowa Terminal.

If you have any questions regarding the report, please contact Mr. Mack Brown at your earliest convenience.

Sincerely,

A handwritten signature in cursive script that reads 'Max L. Trimmell'.

Max L. Trimmell
Project Coordinator

MLT:cdj

Enclosure

~~RECEIVED~~

~~OCT 3 1988~~

~~IOWA DEPARTMENT OF
NATURAL RESOURCES~~



**ENGINEERING
ENTERPRISES, INC.**

WATER RESOURCES SPECIALISTS

1225 West Main

Norman, Oklahoma 73069

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FAX: (405) 366-8722

September 1, 1988

Mr. Mack Brown
Vice President of Engineering and Operations
Kaneb Pipeline Company
100 North Broadway
Suite 550
Wichita, KS 67202

Re: Investigative Report and Plan of Action for Groundwater
Remediation at the Milford, Iowa Terminal.

Dear Mr. Brown:

Attached is the investigative report and Plan of Action for the Milford Terminal groundwater remediation project. The second phase of field investigation performed by others, has been incorporated into the report as Appendix A.

Based on the present hydraulic and analytic evaluation, the site containment, groundwater treatment, and surface discharge are meeting the requirements of the State of Iowa.

If you have any questions regarding the report, please contact us at your earliest convenience.

Sincerely,

Max L. Trimmell, Civil Engineer
Project Coordinator

Duane Winegardner, Hydrogeologist
Senior Project Coordinator

MLT&DW:kh

Enclosure

~~RECEIVED~~

~~OCT 8 1988~~

~~IOWA DEPARTMENT OF
NATURAL RESOURCES~~

Norman, Oklahoma

Long Beach, California

Philadelphia, Pennsylvania

INTRODUCTION

Authorization

On July 8, 1988, Kaneb Pipeline Company authorized Engineering Enterprises, Inc. (EEI) to prepare recommendations for and implement immediate aquifer remediation action at the Kaneb Milford, Iowa Terminal. A gasoline spill had impacted the soils and groundwater around a storage tank, thereby requiring the remedial effort.

Objective

The immediate objective of the remediation effort was to establish hydraulic containment of this dissolved hydrocarbon plume which had been delineated in the groundwater beneath the terminal. Subsequent objectives have included the development of a Plan of Action to address the long term treatment and clean-up of the affected soils and groundwater.

Background

Two field investigations have been conducted at the Milford Terminal by another consultant prior to EEI. A preliminary investigation was initiated on May 2, 1988 and additional investigation activities were conducted on May 31, 1988. These investigations were conducted by Groundwater Technology, Inc. (GTI).

A Preliminary Environmental Assessment report was submitted by Kaneb on June 3, 1988, which documented the preliminary field investigation. Results of the second field investigation prepared by GTI are presented in Appendix A.

Engineering Enterprises, Inc. has since acted upon the results of the GTI field investigations and subsequent field data which has been acquired by Kaneb personnel. Groundwater pumping has been initiated at MW#5 to create a cone of depression beneath the terminal. Hydraulic containment of the dissolved hydrocarbon plume has been established based on the piezometric surface map prepared from the August 23, 1988 well gauging data. Additional remedial actions are proposed in the Plan of Action to address the balance of the environmental concerns.

PLAN OF ACTION

Problem Statement

A dissolved hydrocarbon contamination plume has been delineated in the groundwater. The BTEX contaminant plume prepared from the June 6, 1988 data is presented in Appendix A as Figure 3. The depth and direction of groundwater movement within the plume boundaries, prior to the pumping of MW#5, can be derived from Figure 2, the Groundwater Flow Direction Map also in Appendix A. The combination of Figures 2 and 3 indicate that the plume movement is toward the southwest. The highest BTEX concentrations have been reported from water samples retrieved

from MW#7 and MW#5 of 1400 and 620 ppb, respectively. The BTEX plume map suggests the zero line of contamination is on Kaneb property.

Hydraulic Containment

The pumping of MW#5 was initiated on July 19, 1988. Since that time, pumping has been regulated between 20 and 40 gpm. The most recent well gauging data of August 23, 1988 was used to prepare the piezometric surface map presented as Plate 1. This map suggests that hydraulic containment of the BTEX plume has been established.

Perimeter Monitoring

Monitoring well gaugings are presently being conducted by Kaneb personnel on a weekday basis. Hydrocarbon detection paste is being applied to a steel measuring tape to test for the presence of free product floating upon the groundwater. No free product has been detected during any of the well gaugings.

The monitoring well gaugings are presently being converted to groundwater elevations on a weekday basis. These elevations are then used periodically to prepare piezometric surface maps from which hydraulic control of the BTEX plume can be demonstrated.

Water sampling will be performed on MW#3, MW#4 and MW#6 every three months (quarterly) for subsequent BTEX analyses. This will provide assurance that the dissolved hydrocarbon plume

is being contained on Kanab property. The pumping well MW#5 will be tested monthly to demonstrate surface discharge compliance.

Groundwater Remediation

The pump and treat system which has been installed at MW#5 is presently demonstrating hydraulic containment of the BTEX plume and effective treatment of the dissolved hydrocarbons prior to surface discharge (benzene 130 ppb to <2.0; xylene 500 to <5.0 ppb). This system consists of an electric submersible water pump connected to a temporary air stripping tower, which will remain operational until a permanent system is installed. The influent and effluent stream is presently being evaluated to determine if extended treatment is necessary to meet surface discharge standards. (i.e.: the present influent quality is approaching surface discharge standards.)

The water table elevation prior to pumping has fallen about five feet since the first well gaugings that were performed in May 1988. The severe drought conditions have obviously impacted the groundwater depth. The water table is expected to rise once again this Fall if seasonal rain and snowfall resume. The pumping system is sized to handle up to 80 gpm. Once water levels begin to rise, the water pumping rate can be increased, thereby creating a steeper cone of depression. This should then accelerate the remediation process, by increasing the flow of velocities toward MW#5 and subsequent dissolved contaminant removal.

Soil Remediation

The concentrations of BTEX within the soil matrix will be reduced by a combination of natural and artificial means. Recently, Kaneb has installed external ventilators on each monitoring well to exhaust BTEX vapors from the subsurface. These wind operated devices are actuated by wind current which causes the turbine to rotate. A vacuum is created within the turbine that is replaced by an upward draft which produces exhaust. Given the prevalent wind of the Milford area, the ventilators should be active the majority of time. Field observations will be made to examine the ventilator BTEX removal efficiency.

Seasonal precipitation which will percolate through the subsurface will release additional BTEX into the groundwater. This contribution is expected to decline significantly as the removal of BTEX continues through subsurface ventilation and the natural release of BTEX by percolation.

Naturally occurring bacteria in the subsurface will also aid in the reduction of BTEX. Biodegradation is as at the fore front of soil remediation technology and could provide an effective means for BTEX removal in the near future.

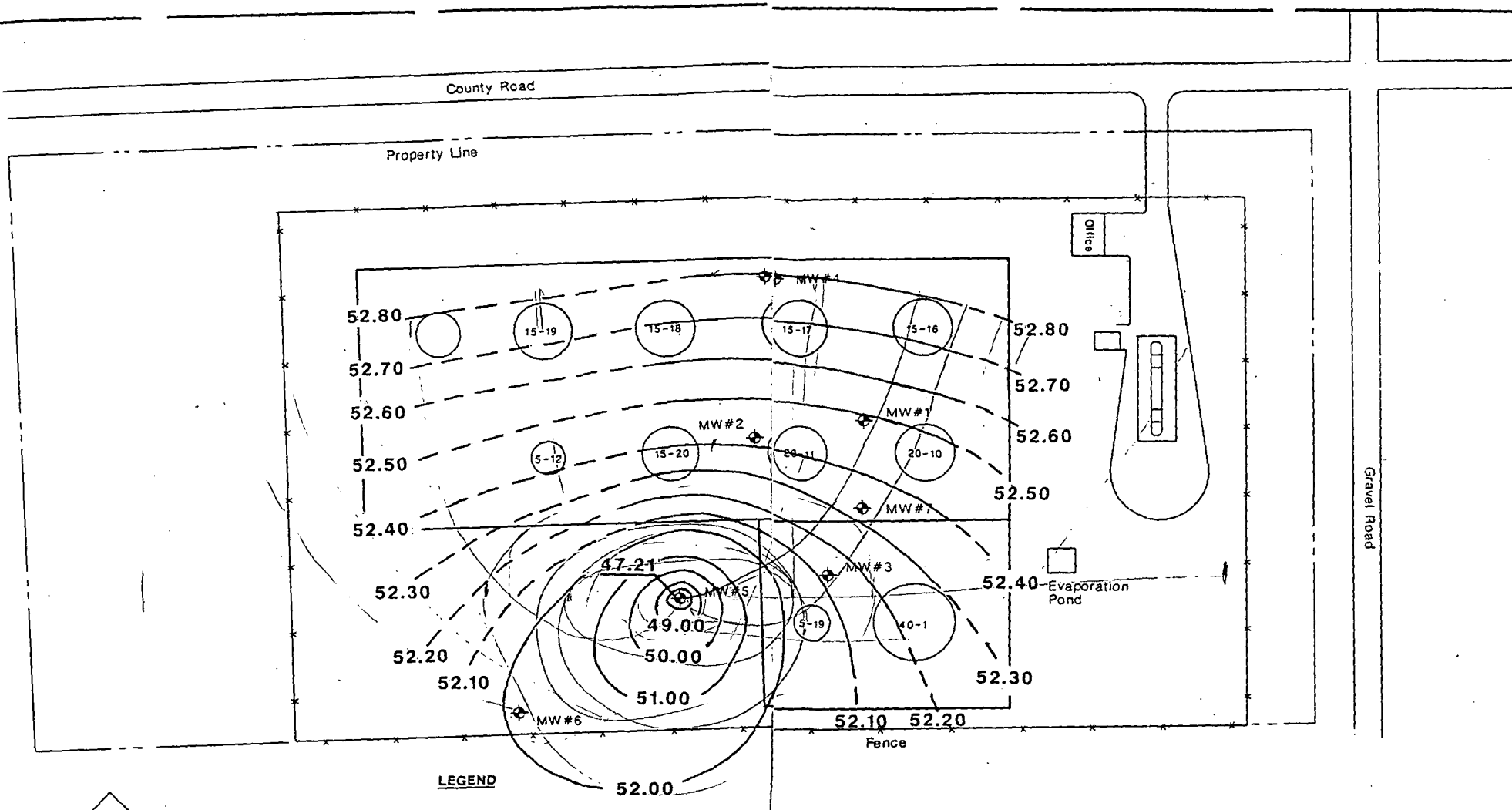
Conclusions

The basic remediation actions which are under way at the Milford terminal have accomplished the immediate remediation objectives. Hydraulic containment has been achieved to prevent the hydrocarbon plume from migrating off-site. The discharge

water from the pump and treat system are presently complying with surface discharge standards. Additionally, soil ventilation has been undertaken at the existing monitoring well sites.

A monitoring program consisting of well gauging, piezometric surface mapping, water sampling and BTEX analysis has been established to document the progress of the remediation effort.

The monitoring program should be the basis for compliance monitoring. The need for additional remedial actions should not be necessary as long as the monitoring indicates diminishing hydrocarbon plume concentrations and containment of the reduced plume.



LEGEND

◆ Monitor Well

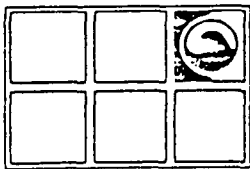
NOTES: MW#5 Pumping Rate ~ 40 GPM
Well Gauging Data from 8-23-88

KANEB PIPE LINE COMPANY
Milford, Iowa
PIEZOMETRIC SURFACE MAP AUGUST 23, 1988

NO.	REVISION	DATE	PROJECT NO. 502.317.00
		DATE	8/9/88
		DESIGNED	
		DRAWN	RGB
		CHECKED	BF
		APPROVED	
		SCALE	1" = 100'

EEL ENGINEERING ENTERPRISES, INC.
WATER RESOURCES SPECIALISTS

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Norman, Oklahoma 73069 Telex 333668 (ENG ENT INC)



GROUNDWATER
TECHNOLOGY, INC.

902 W. Second, Wichita, KS 67203 (316) 262-4407

Fax: (316) 262-2713

ENVIRONMENTAL
ASSESSMENT REPORT #2
FOR A TERMINAL LOCATED
BY KANEB PIPELINE IN MILFORD, IOWA

Prepared For:

Mac Brown
Kaneb Pipeline Co.

Prepared By:

Jim March
Geologist II
Groundwater Technology, Inc.
23933 Research Drive
Farmington Hills, MI 48024

Reviewed By:

Laura D. Perisse
Laura Perisse
Hydrogeologist
Groundwater Technology, Inc.
23933 Research Drive
Farmington Hills, MI 48024

REC'D

JUL 07 88

**KANEB PIPE
LINE CO.**

*Hand
delivered
@ 17:10 HRS*

1.0 Introduction

On April 25, 1988, a tank overfill at the Milford Terminal of the Kaneb Pipeline Company (Kaneb) in Milford, Iowa resulted in the loss of leaded gasoline inventory estimated at 20,000 gallons. At the request of Kaneb, Groundwater Technology, Inc. (GTI) performed a cursory environmental site investigation about the spill area. Based upon the results of the initial site assessment, Kaneb retained GTI to further define the extent and degree of subsurface contamination resulting from the spill.

2.0

On May 2, 1988 GTI was mobilized to the Milford terminal to perform an emergency response site investigation as a result of a gasoline spill. GTI's initial investigation involved drilling three monitor wells and collecting soil and water samples. The soil samples were analyzed for hydrocarbon contamination with a Model PI101 portable photionization analyzer manufactured by HNU. Groundwater samples were analyzed for benzene, toluene, ethylbenzene and xylene (BTEX) contamination. The results of the initial investigation showed contamination of both soils and groundwater at the site.

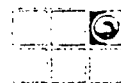


Figure 1 shows the locations of the monitor wells drilled and installed for the initial investigation (MW-1 - MW-3). All results of this initial investigation can be found in the report titled "A Preliminary Environmental Assessment Report, Milford-Kaneb Pipeline Company", dated May 25, 1988.

3.0 Field Investigation

GTI returned to the site to conduct additional field activities on May 31, 1988. For the investigation activities highlighted in this report, four monitor wells were drilled to a depth of 62' utilizing a cable tool drill rig. Figure 1 shows the location of the four monitor wells (MW 4 through MW 7). 42' of four inch PVC casing with 20 feet of size 0.02 factory slotted well screen was installed in each 8 inch diameter borehole. The screened portion of the well comprised the bottom 20' of the hole. A plug was placed on the bottom of each well screen. The annulus of each well was gravel backfilled from total depth to 3' above the well screen. A bentonite seal was then placed above the gravel pack to ground level to prevent surficial contamination. Each well head extended approximately 3 feet above ground level and was secured with a protective locking cap.

COUNTY RD. "B"

PROPERTY LINE

FENCE

OFFICE
BLDG.

GRAVEL RD.



0 25 50 100



SCALE IN FEET

LEGEND

● = MONITOR WELL

10-34

15-19

15-18

13-17

15-16

5-18

15-20

10-11

20-10

MW#5

MW#3

5-19

40-1

MW#6

MW#2

MW#1

MW#7

EVAPORATION
POND

KANEB PIPE LINE COMPANY
KANEB PIPE LINE CO. MILFORD, IOWA.

SCALE: 1" = 100'

DATE: 5-8-88

DRAWN BY: RHW

REV. 6-15-88

GROUNDWATER TECHNOLOGY, INC.

SITE MAP

DRAWING NO.

FIG. 1

4.0 Sampling and Testing

After drilling completion, each monitor well was developed by pumping with a Gould 1/2 horsepower submersible pump. Over 150 gallons of water was pumped from each well prior to collecting groundwater samples. Water samples were collected utilizing a stainless steel sampler on June 6, 1988. The water samples were transferred to sterilized EPA approved, 40 ml. septum glass vials, acidified to a PH of 2.0, placed on ice in a cooler and shipped to GTI Laboratories for analysis of BTEX per the EPA modified 602 method.

Prior to each development and sampling activity, the equipment was thoroughly decontaminated by rinsing with clean water and alconox washing solution.

5.0 Geology and Hydrogeology

The subsurface stratigraphy encountered at the Milford site consists of coarse grained sands, gravels and cobbles deposited from a glacial fluvial origin, overlain by a thin (less than 1 foot), sandy, clayey topsoil. The sands and gravels are interbedded with occasional clay lenses (less than 2" thick) and conglomeratic zones of cobbles and boulders. Well logs were constructed for each monitor well (MW-4 - MW-7) and are included in Appendix A.

The aquifer identified in the site area is unconfined and consists of coarse grained sands and gravels. The depth to groundwater was measured to the top for the casing in each well using an electronic interface probe manufactured by Oil Recovery Systems. Accuracy of the probe is to within 0.005 feet. An elevation survey was performed at the site to determine the top of casing (TOC) elevations relative to a permanent benchmark. Water table elevations were then calculated from the survey data and a groundwater flow direction map was constructed (See Figure 2). Table 1 shows the survey data and water table elevation calculations.

The direction of groundwater flow is towards the south-southwest with a hydraulic gradient of approximately 0.002 feet/foot (Figure 2).

6.0 Results of Investigation

Soil samples were not collected for this investigation because cable tool drilling operations yield soil samples of little analytical value.

Groundwater samples were collected on June 6, 1988 from the four monitor wells drilled and installed for this investigation and

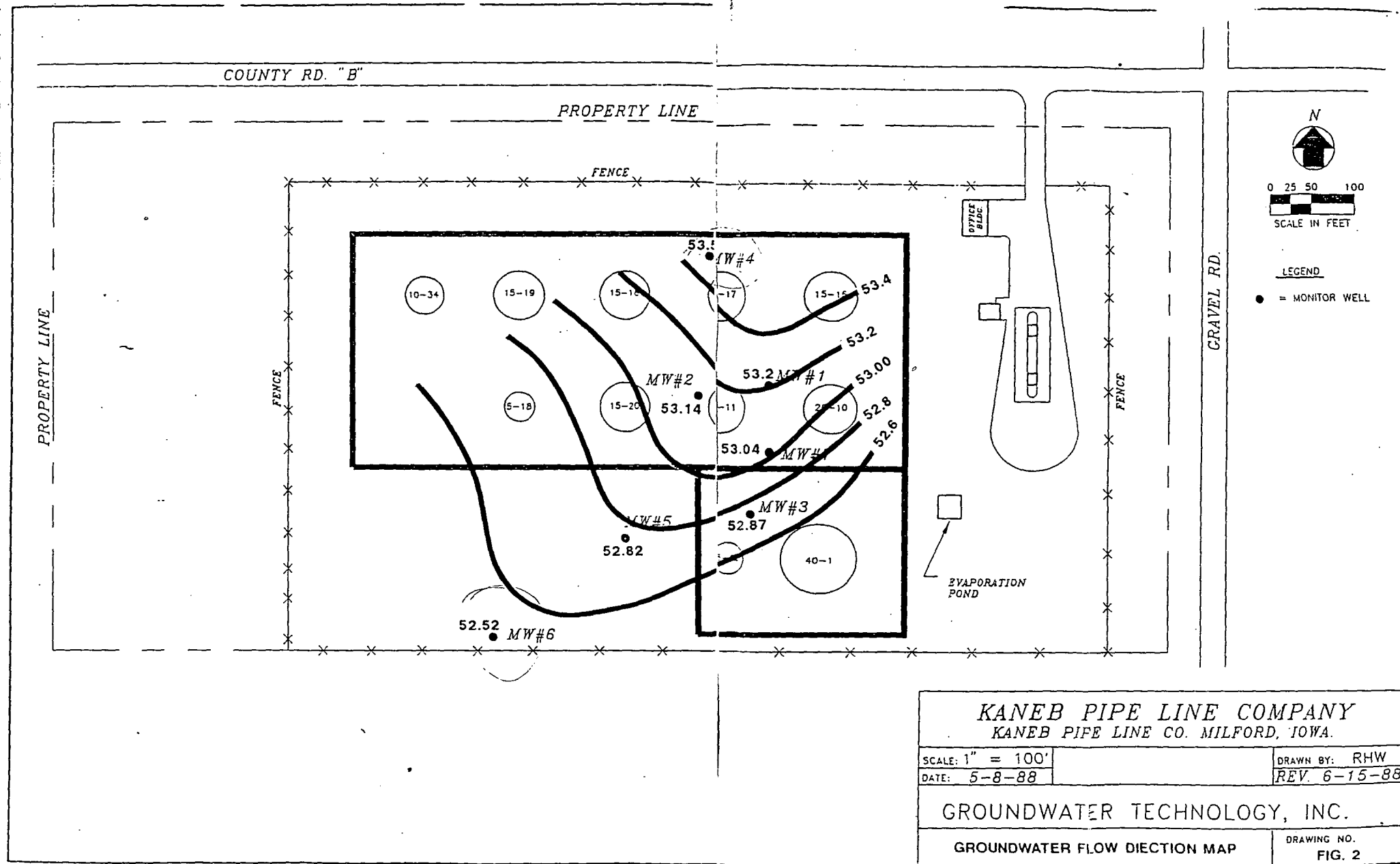


TABLE I
MILFORD TERMINAL-SURVEY DATA

STATION	BS	FS	ELEVATION	LOCATION
#1	3.23		100.00	*BM
		0.20	103.03	MW #1 TOC
		0.46	102.77	MW #4 TOC
		0.69	102.54	MW #2 TOC
		0.08	103.15	MW #7 TOC
		0.60	102.63	MW #3 TOC
#2	3.26		100.00	BM
		0.96	102.40	MW #5 TOC
		2.06	101.30	MW #6 TOC

*BM IS BENCHMARK AT SITE. BENCHMARK IS THE TOP OF A GRAY PUMP COVER ON THE WEST SIDE TO TANK 20-10.

WATER TABLE ELEVATIONS

MW#	TOC ELEVATION	DEPTH TO WATER	WATER TABLE ELEVATIONS
1	103.03	49.83	53.20
2	102.54	49.40	53.14
3	102.63	49.76	52.87
4	102.77	49.27	53.50-
5	102.40	49.58	52.82
6	101.30	48.78	52.52-
7	103.15	50.11	53.04

53.50
52.52

.98

TABLE II
KANEB
MILFORD TERMINAL - ANALYTICAL SUMMARY
MILFORD, IOWA

ANALYTE	MW#1		MW#2		MW#3		MW#4		MW#5		MW#6		MW#7	
	5/7	6/6	5/7	6/6	5/7	6/6	5/7	6/6	5/7	6/6	5/7	6/6	5/7	6/6
Benzene	3	9.6	57	28	ND	.3	--	ND	--	270	--	ND	--	610
Toluene	12	6.1	62	25	ND	.8	--	ND	--	270	--	ND	--	670
Ethyl- benzene	ND	ND	3	39	ND	ND	--	ND	--	5	--	ND	--	15
Xylenes	ND	ND	13	4	ND	ND	--	ND	--	73	--	ND	--	52
Total BTEX	15	16	140	57	ND	1.1	--	ND	--	620	--	ND	--	1400
Misc.Hydro carbons (C4-C12)	1900	620	2100	770	1200	440	--	15	--	1000	--	ND	--	1900
Total Pet- roleum as Gasoline	1900	820	2200	1200	1200	590	--	ND	--	2300	--	ND	--	4500

from the three previously installed monitor wells. Table 2 is a summary of the analytical results for the water samples taken from the seven monitor wells at the site. Also included in Table 2 are the analytical results from the previous round of sampling (5-7-88) performed by GTI. Note that MW #5 which is outside of the spill area contains the second highest BTEX contamination level, 620 ppb.

Figure 3 represents a total BTEX contaminant plume map of the site. Note that the highest groundwater contamination is located to the south of tank 20-11(1200-1400 ppb total BTEX).

COUNTY RD. "B"

PROPERTY LINE

FENCE

OFFICE
BLDG.

GRAVEL RD.



0 25 50 100



SCALE IN FEET

LEGEND

● = MONITOR WELL

FENCE

FENCE

EVAPORATION
POND

KANEB PIPE LINE COMPANY
KANEB PIPE LINE CO. MILFORD, IOWA.

SCALE: 1" = 100'

DATE: 6-7-88

DRAWN BY: RHW

REV. 6-15-88

GROUNDWATER TECHNOLOGY, INC.

BTEX CONTAMINANT PLUME

DRAWING NO.
FIG. 3

GROUNDWATER TECHNOLOGY, INC.

OIL RECOVERY SYSTEMS

Well Number MW#4

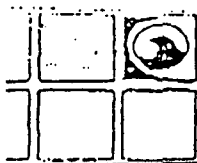
Drilling Log

Project Kaneb, Milford Owner Kaneb Pipe Line Co.
 Location Milford, Iowa Project Number 421-459-8970
 Date Drilled 5/31/88 Total Depth of Hole 62' Diameter 8"
 Surface Elevation _____ Water Level, Initial _____ 24-hrs. _____
 Screen: Dia. 4" Length 20' Slot Size 0.02
 Casing: Dia. 4" Length 42' Type PVC
 Drilling Company Middendorf Drill Drilling Method Cable Tool
 Driller Craig Middendorf Log by Ken Wallace

Sketch Map

Notes

Depth (Feet)	Well Construction	Notes	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
0		0-6"			Gray, Silt, little clay
3		6"-5'			Light brown, medium grained, sand and gravel
6		5'-9'			Light brown, coarse grained, poorly sorted Sand
9		Casing			Conglomerate
12		9'-19'			Light brown, coarse grained, poorly sorted, Sand
15					
18		19'-20'			Reddish brown, damp, Clay
21		Gravel			
24		20'-38'			Light brown, Conglomerate
27					
30					
33					
36					
39					
42					
45					
48		Sand			
51		38'-62'			Light brown, wet, fine to medium grained Sand and Gravel
54		Screen			
57					
60					
63					



GROUNDWATER
TECHNOLOGY, INC.
OIL RECOVERY SYSTEMS

Well Number MW#5

Drilling Log

Project Kaneb-Milford Owner Kaneb Pipeline Co.

Location Milford, Iowa Permit Number 421-459-8970

Date Drilled 6/1/88 Total Depth of Hole 62' Diameter 8"

Surface Elevation _____ Water Level, Initial _____ 24-hrs. _____

Screen: Dia. 4" Length 20' Slot Size 0.020

Casing: Dia. 4" Length 42' Type PVC

Drilling Company Middendorf & Dwyer Drilling Method Cable Tool

Driller Craig Middendorf Log by Ken Wallace

Sketch Map

Notes

Depth (Feet)	Well Construction	Notes	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
0		0-2.5'			Black to gray, sandy, Silt, little clay.
3		2.5'-6'			Light brown, coarse grained, Sand and Gravel
6		6'-9'			Light brown, coarse grained, poorly sorted, Sand Conglomerate.
9					
12					
15					
18		9'-24'			Light brown, coarse grained, poorly sorted Sand and Gravel
21					*Strong Hydrocarbon Odor
24					
27		24'-28'			Light brown, Conglomerate
30		28'-31'			*Strong Hydrocarbon Odor
33					Brown, slightly moist Clay
36					
39					
42		31'-62'			Light brown, wet, fine to coarse grained, Sand and Gravel
45					
48					
51					
54					
57					
60					
63					

Well Number MW#6

Project Kaneb - Milford Owner Kaneb Pipe Line Co.

Location Milford, Iowa Project Number 421-459-8970

Date Drilled 6/3/88 Total Depth of Hole 62' Diameter 8"

Surface Elevation _____ Water Level, Initial _____ -24-hrs. _____

Screen: Dia. 4" Length 20' Slot Size 0.020

Casing: Dia. 4" Length 42' Type PVC

Drilling Company Middendorf Drlg. Drilling Method Cable Tool

Driller Craig Middendorf Log by Ken Wallace

Sketch Map

Notes

Depth (Feet)	Well Construction	Notes	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
0		0-1.5'			Black, Silt, little clay and sand
3		1.5'-8'			Light brown, coarse grained, poorly, sorted, Sand Conglomerate
6					Light brown, medium to coarse grained, poorly sorted Sand
9		8'-19' <i>Casing</i>			
12					
15					
18		19'-25' <i>Gravel</i>			Light brown, Conglomerate
21					
24					
27					
30					
33					
36		25'-62'			Light brown, fine to coarse grained, poorly sorted Sand and Gravel.
39					
42					
45					
48		<i>sand</i>			
51					
54		<i>screen</i>			
57					
60					
63					

**GROUNDWATER
TECHNOLOGY, INC.**
OIL RECOVERY SYSTEMS

Well Number MW#7

Drilling Log

Project Kaneb-Milford Owner Kaneb Pipeline Co.
Location Milford, Iowa Project Number 421-459-8970
Date Drilled 6/3/88 Total Depth of Hole 62' Diameter 8"
Surface Elevation _____ Water Level, Initial _____ 24-hrs. _____
Screen: Dia. 4" Length 20' Slot Size 0.020
Casing: Dia. 4" Length 42' Type PVC
Drilling Company Middendorf Drig. Drilling Method Cable Tool
Driller Craig Middendorf Log by Ken Wallace

Sketch Map

Notes

Depth (Feet)	Well Construction	Notes	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
0		0-1'			Gray, sandy Silt, little clay
3					
6		1'-9'			Light brown, coarse grained, poorly sorted, Sand
9		Casing			Conglomerate.
12					
15					
18		9'-24'			Light brown, medium to coarse grained, poorly sorted
21		Gravel			Sand
24		24'-27'			Light brown, Conglomerate
27					
30					
33					
36		27'-62'			Light brown, fine to coarse grained, poorly sorted,
39					Sand and Gravel
42					
45		Sand			
48					
51					
54		Screen			
57					
60					
63					