

## *Hydrostratigraphic Database of West-Central Wisconsin*

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<b>Site:</b>	Cenex Station, Forest, Farmers Union Cooperative Oil Company
<b>Location:</b>	Forest, St. Croix County, Wisconsin
<b>Aquifer evaluated:</b>	Prairie du Chien

### ***File includes excerpts from:***

Foth & Van Dyke, 1989, Petroleum Release Site Assessment Report, Cenex Station, Forest, Wisconsin, on file at Wisconsin Department of Natural Resources.

- Text with figures
- Boring Logs

Foth & Van Dyke, 1994, Letter Report: Groundwater Monitoring, Laboratory Analytical Results, Cenex Station, Forest, Wisconsin, on file at Wisconsin Department of Natural Resources.

- Text
- Table: Groundwater elevations

03-56-000153

Foth & Van Dyke

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R E P O R T

Petroleum Release Site Assessment Report  
Cenex Station  
Forest, Wisconsin

Scope I.D.: 88F19

*Farmer's Union Cooperative Oil Company  
New Richmond, Wisconsin*

June 1989



# Foth & Van Dyke

6474 City West Parkway  
Eden Prairie, Minnesota 55344  
612/942-0396  
FAX: 612/944-7840

August 3, 1989

Mr. William Evans  
District Hydrogeologist  
Western District Headquarters  
Wisconsin Dept. of Natural Resources  
1300 West Claremont Avenue  
Call Box 4001  
Eau Claire, WI 54702-4001

Dear Mr. Williams:

RE: Petroleum Discharge Site Assessment  
Cenex Station  
Forest, Wisconsin

On behalf of the New Richmond Farmer's Union Cooperative Oil Company, Foth and Van Dyke is pleased to submit two copies of the report entitled, "Petroleum Release Site Assessment Report, Cenex Station - Forest, Wisconsin."

Please contact either Craig Johanesen or myself at (612) 942-0396 if you have any questions during review of this report.

Sincerely,

FOTH & VAN DYKE

*Kathy A. Dittman*  
Kathy A. Dittman  
Project Engineer

*Craig L. Johanesen/KAD*  
Craig L. Johanesen  
Manager, Division Office

KAD:kad  
89F19



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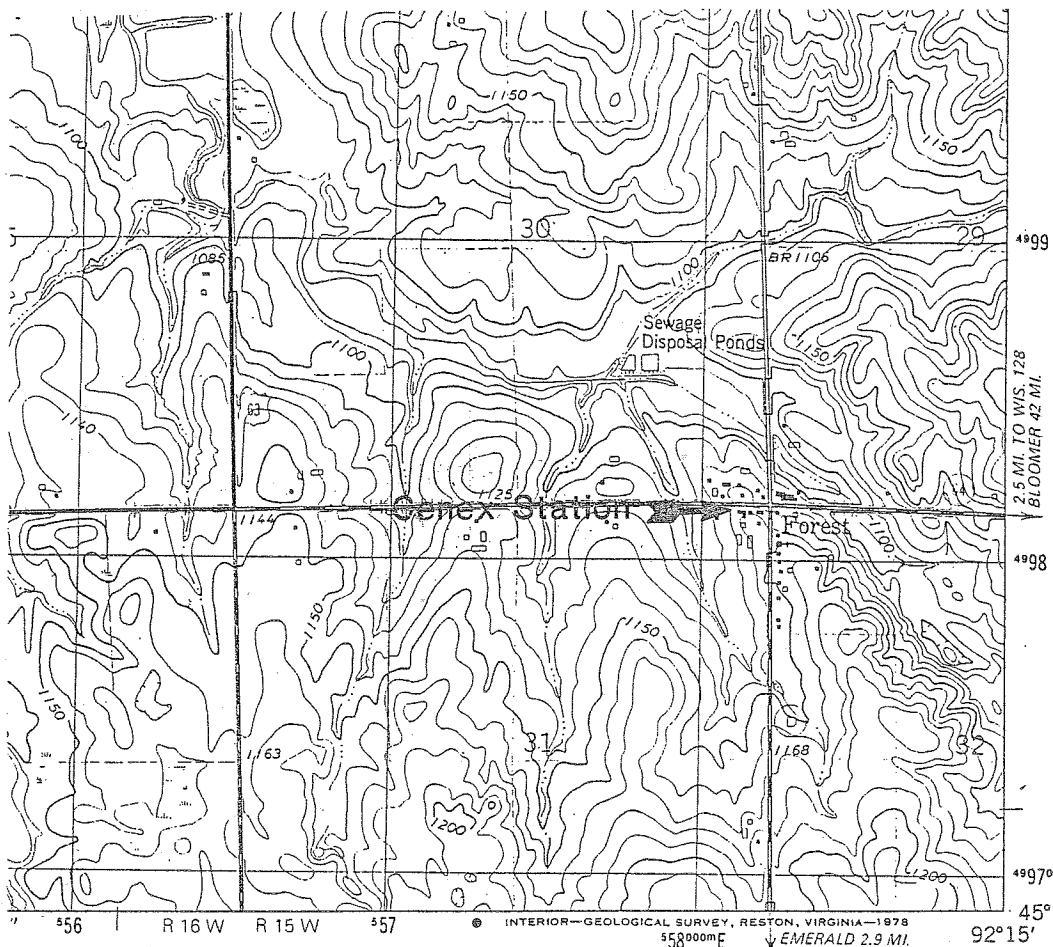
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#### ROAD CLASSIFICATION

Primary highway, hard surface \_\_\_\_\_ Light-duty road, hard or improved surface \_\_\_\_\_  
 Secondary highway, hard surface \_\_\_\_\_ Unimproved road \_\_\_\_\_  
 ( ) Interstate Route ( ) U. S. Route ( ) State Route



#### FOREST, WIS.

NE/4 DEER PARK 15' QUADRANGLE  
 N4507.5—W9215/7.5

1975

AMS 2574 III NE—SERIES V861



FOREST CENEX		
FIGURE NO. 1-1		
GENERAL LOCATION MAP		
SCALE: 1" = 2000'	DWG: 88F1901	DATE: MAY 89
PREPARED BY:	FOTH & VAN DYKE	BY: KAD

### 3.0 SITE DEFINITION

#### 3.1 Geologic Definition

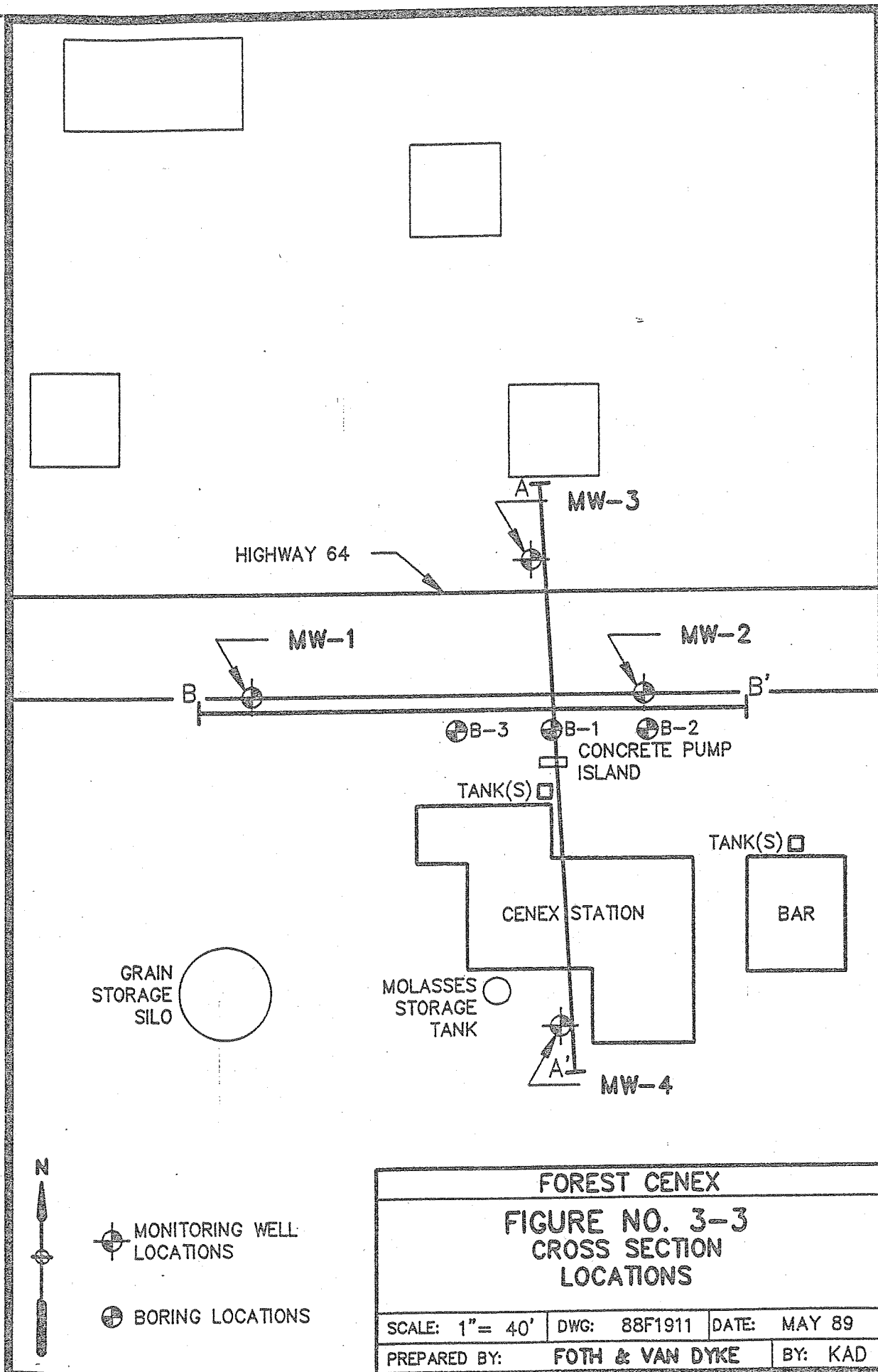
##### 3.1.1 Surface Sediments

Surface sediments encountered during drilling consist of unconsolidated glacial deposits. The glacial deposits consist of ground moraine sediments which were deposited under glacial ice and consist of unsorted rock debris ranging in size from clay to boulders. The moraine deposits on this site are primarily red-brown clays with sand and sand lenses deposited by the early Wisconsinian or pre-Wisconsinian glaciers (Borman, 1976).

Geological cross sections showing site geology are located in Figure Nos. 3-1 and 3-2. Cross section locations are shown in Figure No. 3-3. Geological information is located in Appendix A.

##### 3.1.2 Bedrock

Bedrock encountered on site consists of weathered shales and weakly consolidated sandstones overlying a harder bedrock which is probably a dolomite or sandy dolomite based on limited geological information from the area. The shales and sandstones are remnants of the St. Peter Sandstone. The dolomite/sandy dolomite bedrock is part of the Prairie du Chien Group (Borman, 1976). Based on information gathered during drilling, significant voids and fractures are present in the bedrock.





### 3.2 Hydrogeologic Definition

#### 3.2.1 Bedrock Aquifer

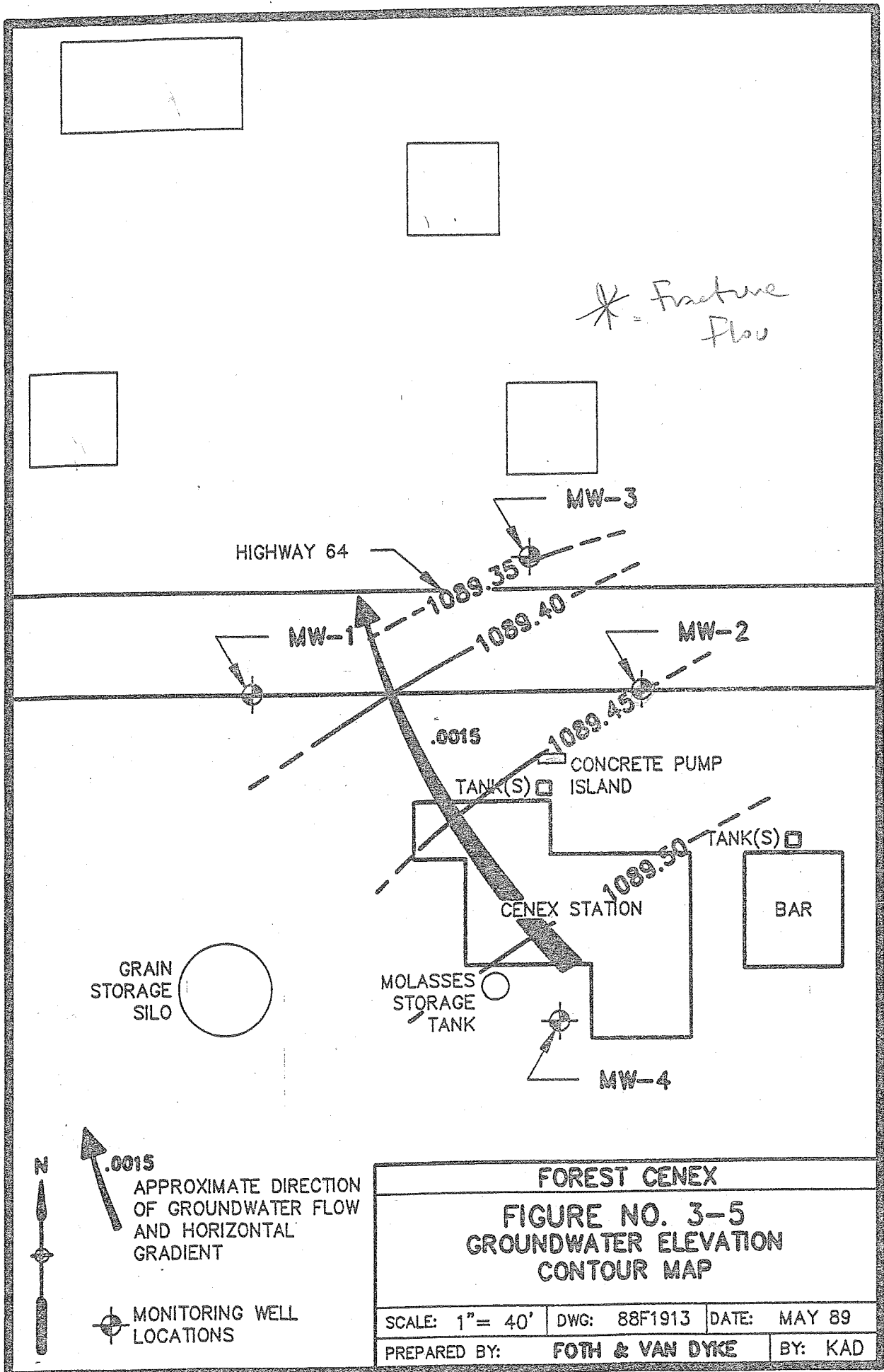
The water table is located within the Prairie du Chien Group, approximately 45 feet from ground surface. Four monitoring wells were installed to document the depth to water. Monitoring well location are shown in Figure No. 3-4. Additional information can be found in Appendices A and B.

All of the private, residential wells in the immediate area appear to be completed in the Prairie du Chien which is the primary aquifer for most of St. Croix County. The Prairie du Chien Group, in conjunction with Cambrian sandstones, is a continuous aquifer over the county (Borman, 1976). Residential wells logs are located in Appendix C.

A groundwater contour map is shown in Figure No. 3-5. Based on Figure No. 3-5 and information from U.S. Geological Survey publication HA-451, the direction of flow is to the northwest. Groundwater data was collected on June 1, 1989. The horizontal gradient is 0.0015.

#### 3.3 Potential Spill Pathways

Sewer laterals and utility conduits are unlikely migration pathways for the contamination associated with the spill at the Cenex Station. The sewer is located upgradient of the spill,



Foth & Van Dyke & Associates, Inc.

LOG OF TEST BORING NO.: MW-1

CLIENT: New Richmond Farmer's Union Cooperative Oil Company  
PROJECT: Forest Cenex Station  
PROJECT NUMBER: 88F19  
LOCATION: Forest, Wisconsin

SURFACE ELEVATION: 1131.9

BORING DEPTH: 51.9

DATE: 04/04/89

MSL ELEV	DEPTH FR LND SURF	SAMP DEPTH INTERVAL	TYPE	#	N	REC (ft)	DESCRIPTION OF MATERIAL	CLASS	LABORATORY TESTS	DRILLING AND SAMPLING NOTES
1131.9	-0.0	0 - 2	SS	1	37	1.6	Asphalt	GP SM		
1129.4	-2.5	2.5 - 4.5	SS	2	29	1.0	Limestone frags and silt, road bed - Fill; Bottom .2' is br SILT, tr sand and gravel	SC		
1126.9	-5.0	5 - 7	SS	3	47	.6	Red br clayey fgr-cgr SAND, tr fgr gravel, dense, plastic when wet, mottled			
1124.4	-7.5	7.5 - 9.5	SS	4	20	1.1	Same as above			
1121.9	-10.0	10 - 12	SS	5	8	.9	Same as above			
1119.4	-12.5	12.5 - 14.5	SS	6	42	0	No recovery - rock in sampler tip			
1116.9	-15.0	15 - 17	SS	7	26	1.2	Top .5' - Same as above Bottom .7' is grey/tan mottled silty CLAY, dense, plastic, tr mgr sand, laminated(bl and br)	CL (SH)	Collect lab sample from 15-17 feet	Hit bedrock at 15.5 feet
1114.4	-17.5	17.5 - 19.5	SS	8	8	1.4	Top 1.0' - Same as above; next .4' is grey/br fgr-mgr SAND, well rounded, loose, dry	SP (SS)		
1111.9	-20.0	20 - 22	SS	9	6	1.2	Top 1.0' is grey fgr-mgr SAND, loose, well rounded; next .4' is same as above only red/br; bottom .2' is grey fgr-cgr SAND with subang quartzite frags, well rounded sand		Collect lab sample from 20-22 feet	
1109.4	-22.5	22.5 - 24.5	SS	10	64	1.4	Grey/br fgr-cgr SAND with subang quartzite frags, loose, dry, well rounded quartz grains			
1106.9	-25.0	25 - 27	SS	11	18	1.2	Top .6' - Same as above; bottom .6' is br to orange/br SILT, tr fgr-mgr sand, laminated, a few shaly laminations	SM (ST)		
1104.4	-27.5									

DRILLING DATA

START DATE: 04/04/89 @ 7:45  
COMPLETION DATE: 04/04/89 @ 15:00  
LOGGED BY: KAD  
DRILLING METHOD: HSA and rotary w/ water  
DRILLING CONTRACTOR: Wisconsin Test Drilling

WATER LEVEL INFORMATION

DEPTH AT COMPLETION: 41.44' BGS  
LATER TIME/DEPTH: 41.00' BGS @ 15:20  
LATER TIME/DEPTH: 41.00' BGS @ 16:00  
CAVE IN DEPTH: NA  
DRILLING LOSSES: No return at all

Foth & Van Dyke & Associates, Inc.

LOG OF TEST BORING NO.: MW-1										SURFACE ELEVATION: 1131.9	
CLIENT: New Richmond Farmer's Union Cooperative Oil Company PROJECT: Forest Cenex Station PROJECT NUMBER: 88F19 LOCATION: Forest, Wisconsin										BORING DEPTH: 51.9	
										DATE: 04/04/89	
MSL ELEV	DEPTH LND SURF	SAMP DEPTH INTERVAL	TYPE	#	N	REC (ft)	DESCRIPTION OF MATERIAL	CLASS	LABORATORY TESTS	DRILLING AND SAMPLING NOTES	
1104.4	--27.5	27.5-29.5	SS	12	95	1.1	Top .5' is dk br/orange SILT with fgr-mgr sand, loose, laminated, dry; Bottom .6' is grey/green SILT tr consolidated siltstone, laminated	SH (ST)	Lab sample collect from 27.5-29.5 feet		
1101.9	--30.0	30 - 32	SS	13	26	1.0	Top .3' is grey fgr SAND, unconsolidated to partially consolidated; next .4' is dk br to orange SILT w/ fgr-cgr sand, partially cemented, well rounded	SP (SS) SH (ST)			
1099.4	--32.5	32.5-34.5	SS	14	100	.5	Grey/br SILT with limestone frags, some clayey laminations			Split spoon refusal - switch to rotary drilling	
1096.9	--35.0						---?---?---?---?---?---?---?---?---? No return of water - unable to visually identify bedrock beyond 35 feet - probably dolomite based on limited geological information for the area				
1094.4	--37.5										
1091.9	--40.0										
1089.4	--42.5									At 42.5 - 43.5 bit slowly sinks	
1086.9	--45.0										
1084.4	--47.5										
1081.9	--50.0										
1079.4	--52.5						End of Boring at 51.9				
1076.9	--55.0										

DRILLING DATA		WATER LEVEL INFORMATION	
START DATE: 04/04/89	COMPLETION DATE: 04/04/89	DEPTH AT COMPLETION: 41.44' BGS	LATER TIME/DEPTH: 41.00' BGS @ 15:20'
LOGGED BY: KAD	DRILLING METHOD: HSA and rotary w/ water	LATER TIME/DEPTH: 41.00' BGS @ 16:00'	CAVE IN DEPTH: NA
DRILLING CONTRACTOR: Wisconsin Test Drilling		DRILLING LOSSES: No return at all	

Foth & Van Dyke & Associates, Inc.

LOG OF TEST BORING NO.: MW-2										SURFACE ELEVATION: 1133.2	
CLIENT: New Richmond Farmer's Union Cooperative Oil Company PROJECT: Forest Cenex Station PROJECT NUMBER: 88F19 LOCATION: Forest, Wisconsin										BORING DEPTH: 51.8	
										DATE: 03/29/89	
MSL ELEV	DEPTH LND SURF	SAMP INTERVAL	DEPTH INTERVAL	TYPE	#	N	REC (ft)	DESCRIPTION OF MATERIAL	CLASS	LABORATORY TESTS	DRILLING AND SAMPLING NOTES
1133.2	--0.0	0 - 2		SS	1	38	1.3	Top 6" is asphalt, rest of sample is yel br SILT with limestone frags, tr clay - Fill under road	SM		
1130.7	--2.5	2 - 4		SS	2	80	1.8	Red br clayey fgr-cgr SAND, stiff, hard, plastic when wet, mottled	SC		
1128.2	--5.0	4 - 6		SS	3	46	1.9	Same as above			
1125.7	--7.5	6 - 8		SS	4	33	1.2	Same as above w/ tr gravel			
1123.2	--10.0	8 - 10		SS	5	20	2.0	Same as above, some sand laminations, mgr, well rounded, clean, loose			
1120.7	--12.5	10 - 12		SS	6	20	1.8	Same as above			
1118.2	--15.0	12 - 14		SS	7	22	1.5	Same as above			
1115.7	--17.5	14 - 16		SS	8	56	1.7	Grey/br to grey/red mottled silty CLAY, stiff, plastic, Fe-stained, unconsolidated bedrock	CL (SH)		Hit bedrock at 15.0 feet
1113.2	--20.0	16 - 18		SS	9	10	1.8	Same as above		Collect lab sample from 16-18 feet	
1110.7	--22.5	18 - 20		SS	10	18	2.0	Same as above			
1108.2	--25.0	20 - 22		SS	11	43	1.7	Grey red br mottled silty fgr SAND, soft; 23.5-24.0 - br mgr SAND, loose, well rounded, clean	SM (SS)		
1105.7	--27.5	22 - 24		SS	12	25	1.7	Grey red/br mottled silty fgr SAND, soft, unconsolidated		Collect lab sample from 22-24 feet	Slight fuel smell at this depth
		24 - 26		SS	13	39	1.4	Same as above only coarser SAND with Fe-staining			
		26 - 28		SS	14	20	1.5	Dk grey to lt grey mgr SAND, well rounded, some consolidated frags	SP (SS)		

DRILLING DATA		WATER LEVEL INFORMATION	
START DATE: 03/28/89 @ 10:00	COMPLETION DATE: 03/29/89 @ 11:15	DEPTH AT COMPLETION: 43.45' BGS	LATER TIME/DEPTH: 43.40' BGS @ 12:20
LOGGED BY: KAD	DRILLING METHOD: HSA and rotary w/ water	LATER TIME/DEPTH: 43.40' BGS @ 13:00	CAVE IN DEPTH: NA
DRILLING CONTRACTOR: Wisconsin Test Drilling		DRILLING LOSSES: No return at all	

Foth & Van Dyke & Associates, Inc.

LOG OF TEST BORING NO.: MW-2

CLIENT: New Richmond Farmer's Union Cooperative Oil Company  
PROJECT: Forest Cenex Station  
PROJECT NUMBER: 88F19  
LOCATION: Forest, Wisconsin

SURFACE ELEVATION: 1133.2

BORING DEPTH: 51.8

DATE: 03/29/89

MSL ELEV	DEPTH LND SURF	SAMP DEPTH INTERVAL	TYPE	#	N	REC (ft)	DESCRIPTION OF MATERIAL	CLASS	LABORATORY TESTS	DRILLING AND SAMPLING NOTES
1105.7	--27.5						Dk grey to lt grey well-rounded mgr SAND, partially consolidated, finer grained towards bottom of sample	SP (SS)	Lab sample collected from 28-30 feet	
		28 - 30	SS	15	69	1.0				
1103.2	--30.0						Grey yellow/white silty fgr "SAND" w/ glauconite, partially consolidated dolomite/limestone frags	DL-LS		
		30 - 32	SS	16	142	.5				
1100.7	--32.5						Same as above			
		32 - 34	SS	17	113	.4				
1098.2	--35.0						No return of water - unable to visually identify bedrock beyond 35 feet - probably dolomite based on limited geological information for the area		Switch to rotary drilling	Fracture in rock bit drops 1 foot
1095.7	--37.5									
1093.2	--40.0									
1090.7	--42.5									Fracture in rock bit drops 6 inches
1088.2	--45.0									
1085.7	--47.5									
1083.2	--50.0									
1080.7	--52.5						End of Boring at 51.8 feet			
1078.2	--55.0									

DRILLING DATA

START DATE: 03/28/89 @ 10:00  
COMPLETION DATE: 03/29/89 @ 11:15  
LOGGED BY: KAD  
DRILLING METHOD: HSA and rotary w/ water  
DRILLING CONTRACTOR: Wisconsin Test Drilling

WATER LEVEL INFORMATION

DEPTH AT COMPLETION: 43.45' BGS  
LATER TIME/DEPTH: 43.40' BGS @ 12:20  
LATER TIME/DEPTH: 43.40' BGS @ 13:00  
CAVE IN DEPTH: NA  
DRILLING LOSSES: No return at all

Foth & Van Dyke & Associates, Inc.

LOG OF TEST BORING NO.: MW-3

CLIENT: New Richmond Farmer's Union Cooperative Oil Company  
PROJECT: Forest Cenex Station  
PROJECT NUMBER: 88F19  
LOCATION: Forest, Wisconsin

SURFACE ELEVATION: 1133.3

BORING DEPTH: 52.4

DATE: 03/30/89

NSL ELEV	DEPTH FR LND SURF	SAMP DEPTH INTERVAL	TYPE	#	N	REC (ft)	DESCRIPTION OF MATERIAL	CLASS	LABORATORY TESTS	DRILLING AND SAMPLING NOTES
1133.3	-0.0						Top .5' is dk br organic sandy	CL		
		0 - 2	SS	1	5	1.3	CLAY to clayey SAND, mgr, v plastic, damp - TOPSOIL; rest is red/br clayey mgr SAND, plastic, soft	SC		
1130.8	-2.5									
		2.5 - 4.5	SS	2	27	1.8	Red/br clayey mgr-cgr SAND, tr fgr gravel, plastic, soft - TILL			
1128.3	-5.0									
		5 - 7	SS	3	14	1.6	Same as above			
1125.8	-7.5									
		7.5 - 9.5	SS	4	9	1.8	Same as above			
1123.3	-10.0									
		10 - 12	SS	5	14	2.0	Top 1.5' - same as above Bottom .5' is red/br fgr-cgr SAND, tr silt and clay, loose, damp, angular	SP		
1120.8	-12.5									
		12.5-14.5	SS	6	42	2.0	Top .5' is red/br clayey SAND; next 1.3' is red/br fgr-cgr SAND, tr clay and silt, loose; bottom .2' is grey/tan mottled CLAY, tr silt, v plastic, dense	SC SP		
1118.3	-15.0									
		15 - 17	SS	7	27	1.9	Grey/tan mottled CLAY, tr silt, v plastic, dense, dry	CL (SH)	Lab sample collected from 15-17 feet	
1115.8	-17.5									
		17.5-19.5	SS	8	34	1.8	Same as above w/ 1/2" to 1" grey mgr SAND lenses, loose			
1113.3	-20.0									
		20 - 22	SS	9	42	1.8	Grey/white mgr SAND, well rounded, loose, unconsolidated, black laminations	SP (SS)	Lab sample collected from 20-22 feet	
1110.8	-22.5									
		22.5-24.5	SS	10	36	1.6	Grey/tan mottled CLAY w/ silt, plastic, with sand laminations, mgr, well rounded, loose, dry	CL (SH)		
1108.3	-25.0									
		25 - 27	SS	11	45	1.4	Grey/tan fgr-cgr SAND, unconsolidated, laminated, well rounded, some quartzite frags, sandstone	SP (SS)		
1105.8	-27.5									

unconsolidated  
Sandstone

DRILLING DATA

START DATE: 03/30/89 @ 6:30  
COMPLETION DATE: 03/30/89 @ 15:10  
LOGGED BY: KAD  
DRILLING METHOD: HSA and rotary w/ water  
DRILLING CONTRACTOR: Wisconsin Test Drilling

WATER LEVEL INFORMATION

DEPTH AT COMPLETION: 43.30' BGS  
LATER TIME/DEPTH: 43.30' BGS @ 15:10  
LATER TIME/DEPTH: NA  
CAVE IN DEPTH: NA  
DRILLING LOSSES: No return at all

Foth & Van Dyke & Associates, Inc.

LOG OF TEST BORING NO.: MW-3										SURFACE ELEVATION: 1133.3	
CLIENT: New Richmond Farmer's Union Cooperative Oil Company PROJECT: Forest Cenex Station PROJECT NUMBER: 88F19 LOCATION: Forest, Wisconsin										BORING DEPTH: 52.4	
										DATE: 03/30/89	
MSL ELEV	DEPTH LND SURF	SAMP INTERVAL	DEPTH INTERVAL	TYPE	#	N	REC (ft)	DESCRIPTION OF MATERIAL	CLASS	LABORATORY TESTS	DRILLING AND SAMPLING NOTES
1105.8	--27.5							Top 1.3' is same as above, @ 29.3'		Lab sample	
		27.5-29.5		SS	12	124	1.5	grey/tan dolomite or limestone, partially consolidated to fractured, hard	LS-DL	collected from 27.5-29.5 feet	
1103.3	--30.0										
		30 - 32		SS	13	100	.2	Same as above			
1100.8	--32.5							No return of water - bedrock is probably dolomite			Switch to rotary Bit drops @ 34.5' water disappears
1098.3	--35.0										<i>= fracture?</i>
1095.8	--37.5										
1093.3	--40.0										
1090.8	--42.5										
1088.3	--45.0										
1085.8	--47.5										
1083.3	--50.0										
1080.8	--52.5							End of Boring @ 52.4 feet			
1078.3	--55.0										

DRILLING DATA		WATER LEVEL INFORMATION	
START DATE: 03/30/89 @ 6:30	COMPLETION DATE: 03/30/89 @ 15:10	DEPTH AT COMPLETION: 43.40' BGS	LATER TIME/DEPTH: 43.40' BGS @ 15:10
LOGGED BY: KAD	DRILLING METHOD: HSA and rotary w/ water	CAVE IN DEPTH: NA	DRILLING LOSSES: No return at all
DRILLING CONTRACTOR: Wisconsin Test Drilling			



Foth & Van Dyke & Associates, Inc.

LOG OF TEST BORING NO.: MW-4

CLIENT: New Richmond Farmer's Union Cooperative Oil Company  
PROJECT: Forest Cenex Station  
PROJECT NUMBER: 88F19  
LOCATION: Forest, Wisconsin

SURFACE ELEVATION: 1135.2

BORING DEPTH: 54.0

DATE: 03/31/89

MSL ELEV	DEPTH LND SURF	SAMP DEPTH INTERVAL	TYPE	#	N	REC (ft)	DESCRIPTION OF MATERIAL	CLASS	LABORATORY TESTS	DRILLING AND SAMPLING NOTES
1135.2	--0.0						Top .5' is dk br organic sandy CLAY, next 1.3' is red/br clayey	CL		TIP is not
		0 - 2	SS	1	9	1.8	fgr-cgr SAND, tr gravel, plastic, soft	SC		working - no gas or fuel smell to any of the samples
1132.7	--2.5						Red/br mottled clayey fgr-cgr SAND tr gravel, plastic, soft			
		2.5 - 4.5	SS	2	30	.8				
1130.2	--5.0						Same as above			
		5 - 7	SS	3	33	2.0				
1127.7	--7.5						Same as above			
		7.5 - 9.5	SS	4	36	1.8				
1125.2	--10.0						Same as above			
		10 - 12	SS	5	31	1.8				
1122.7	--12.5						Same as above			
		12.5-14.5	SS	6	38	2.0				
1120.2	--15.0						Same as above			
		15 - 17	SS	7	34	2.0				
1117.7	--17.5						Same as above			
		17.5-19.5	SS	8	37	1.8				
1115.2	--20.0						Same as above			
		20 - 22	SS	9	31	1.9				
1112.7	--22.5						Grey/br mottled CLAY, tr silt, plastic, stiff	CL (SH)	Lab sample collected from 22.5-24.5 feet	
		22.5-24.5	SS	10	26	2.0				
1110.2	--25.0						Top 1.0' is grey/br mottled CLAY with silt, tr sand, plastic; rest is grey/tan fgr-cgr SAND w/ silt. loose	SM (SS)		
		25 - 27	SS	11	25	1.6				
1107.7	--27.5									

DRILLING DATA

START DATE: 03/31/89 @ 6:30  
COMPLETION DATE: 04/03/89 @ 13:30  
LOGGED BY: KAD  
DRILLING METHOD: HSA and rotary w/ water  
DRILLING CONTRACTOR: Wisconsin

WATER LEVEL INFORMATION

DEPTH AT COMPLETION: 42.7' BGS  
LATER TIME/DEPTH: 44.6' BGS - 4/3/89  
LATER TIME/DEPTH: NA  
CAVE IN DEPTH: 3 feet  
DRILLING LOSSES: No return at all

Foth & Van Dyke & Associates, Inc.

LOG OF TEST BORING NO.: HW-4

CLIENT: New Richmond Farmer's Union Cooperative Oil Company  
PROJECT: Forest Cenex Station  
PROJECT NUMBER: 88F19  
LOCATION: Forest, Wisconsin

SURFACE ELEVATION: 1135.2

BORING DEPTH: 54.0

DATE: 03/31/89

MSL ELEV	DEPTH FROM LND SURF	SAMP DEPTH INTERVAL	TYPE	#	N	REC (ft)	DESCRIPTION OF MATERIAL	CLASS	LABORATORY TESTS	DRILLING AND SAMPLING NOTES
1107.7	--27.5									
		27.5-29.5	SS	12	45	1.8	Same as above exc clayey sand layers (1/2" or less), well rounded	SC (SS)	Lab sample collected from 27.5-29.5 feet	TIP not working - no fuel or gas smell to any of the samples
1105.2	--30.0									
		30 - 32	SS	13	25	1.8	Same as above w/ Fe-stained 2" layer of quartzite frags in a clay matrix			
1102.7	--32.5									
		32.5-34.5	SS	14	16	1.9	Top 1.5' is yellow/orange/grey laminated mgr SAND w/ clay laminations, loose, well rounded; rest is grey/br mottled, CLAY, tr silt, dense, stiff, plastic	CL (SH)		
1100.2	--35.0									
		35 - 37	SS	15	33	2.0	Yellow/br to grey fgr-cgr SAND, laminated, well rounded, loose; rest is bl/green and br laminated fat CLAY (shale) v plastic, stiff	SC (SS)	Lab sample collected from 35-37 feet	
1097.7	--37.5									
		37.5-39.5	SS	16	44	1.6	Top .8' is br/tan silty fgr SAND, unconsolidated; rest is green/grey and br mottled CLAY w/ silt, fine black lines running thruout, shaly	CL (SH)		
1095.2	--40.0									
							No return of water - actual sample of bedrock not observed beyond 40 feet - probably same as above but may be dolomite			
1092.7	--42.5									
							---?---?---?---?---?---?---?---			
1090.2	--45.0									
1087.7	--47.5									
							Didn't log cuttings.			
1085.2	--50.0									
							No return?			
1082.7	--52.5									
1080.2	--55.0						End of Boring @ 54.0 feet			

DRILLING DATA

START DATE: 03/31/89 @ 6:30  
COMPLETION DATE: 04/03/89 @ 13:30  
LOGGED BY: KAD  
DRILLING METHOD: HSA and rotary w/ water  
DRILLING CONTRACTOR: Wisconsin Test Drilling

WATER LEVEL INFORMATION

DEPTH AT COMPLETION: 42.7' BGS  
LATER TIME/DEPTH: 44.6' BGS - 4/3/89  
LATER TIME/DEPTH: NA  
CAVE IN DEPTH: 3 feet  
DRILLING LOSSES: No return at all

Foth & Van Dyke

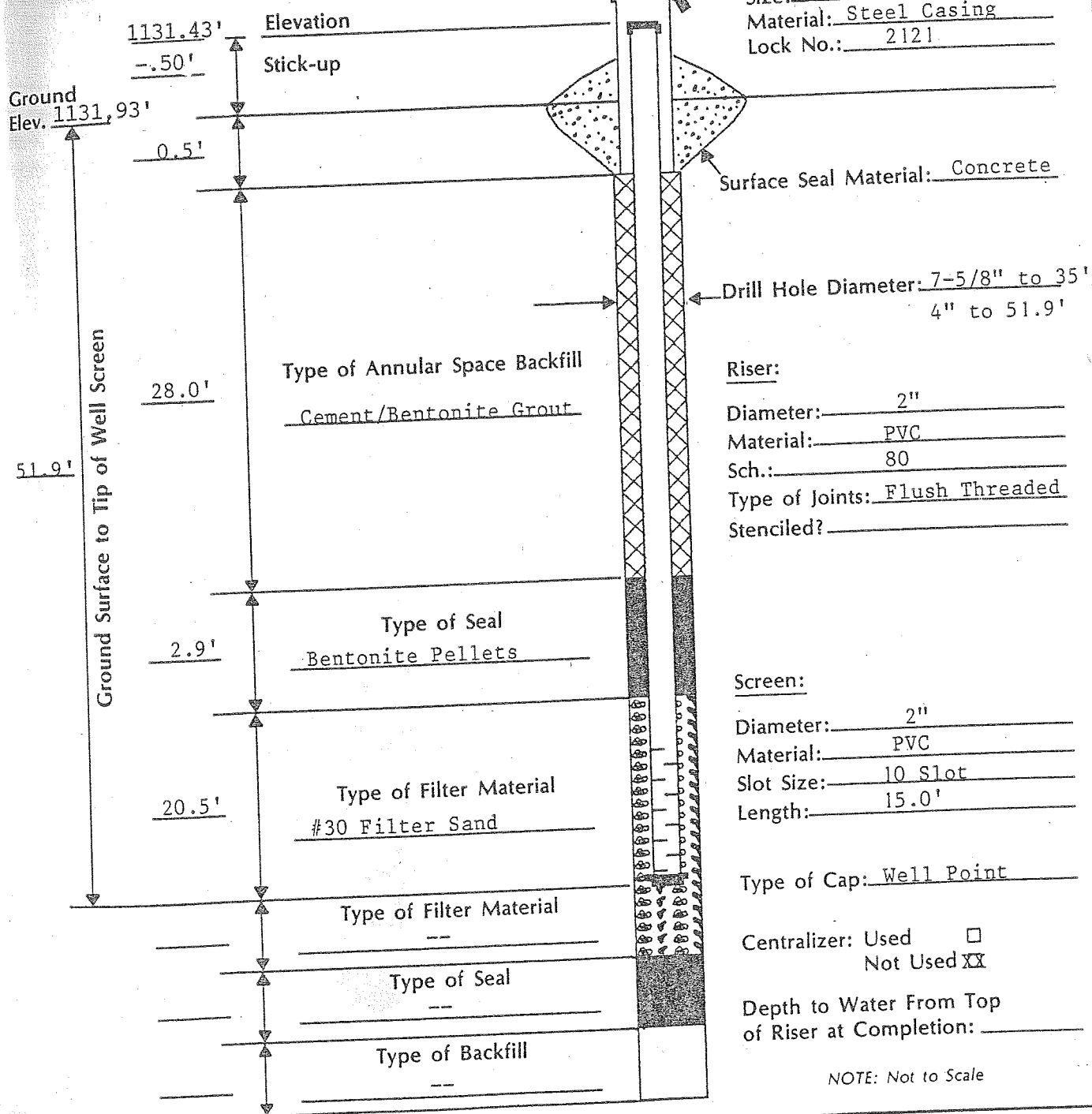
Client: Farmer's Union Coop Oil Co. Scope I.D.: 88F19  
Project: Cenex Page: \_\_\_\_\_  
Prepared by: KAD Date: 4/14/89  
Checked by: KAD Date: 5/24/89

## MONITORING WELL CONSTRUCTION DIAGRAM

Driller: Wisconsin Test Drilling  
Drilling Method: HSA to 35', w/Water Rotary to 51.9'  
\*Coordinates: 10197.460 N, 1631.672 E

Well No.: MW-1  
Date Installed: 4/4/89

Protector Pipe:  
Size: 4" I.D.  
Material: Steel Casing  
Lock No.: 2121



Foth & Van Dyke

Client: Farmer's Union Coop Oil Co. Scope I.D.: 88F19  
Project: Cenex Page: \_\_\_\_\_  
Prepared by: KAD Date: 4/14/89  
Checked by: KAD Date: 5/24/89

## MONITORING WELL CONSTRUCTION DIAGRAM

Driller: Wisconsin Test Drilling

Well No: MW-2

Drilling Method: HSA to 34', w/Water Rotary to 51.8'

Date Installed: 3/29/89

\* Coordinates: 10194.379 N, 1747.473 E

Protector Pipe:

Size: 4" I.D.

Material: Steel Casing

Lock No.: 2121

Elevation  
1132.76'  
Stick-up  
- .40'  
Ground Elev. 1133.16'  
0.5'

Surface Seal Material: Concrete

Drill Hole Diameter: 7-5/8" to 34'  
4" to 51.8'

Ground Surface to Tip of Well Screen  
51.8'

32.3'  
Type of Annular Space Backfill  
Cement/Bentonite Grout

Riser:

Diameter: 2"

Material: PVC

Sch.: 80

Type of Joints: Flush Threaded  
Stenciled? \_\_\_\_\_

2.2'  
Type of Seal  
Bentonite Pellets

Screen:

Diameter: 2"

Material: PVC

Slot Size: 10 Slot

Length: 15'

16.8'  
Type of Filter Material  
#30 Filter Sand

Type of Cap: Well Point

Centralizer: Used ☐  
Not Used ☒ XX

Depth to Water From Top  
of Riser at Completion: \_\_\_\_\_

Type of Filter Material  
---

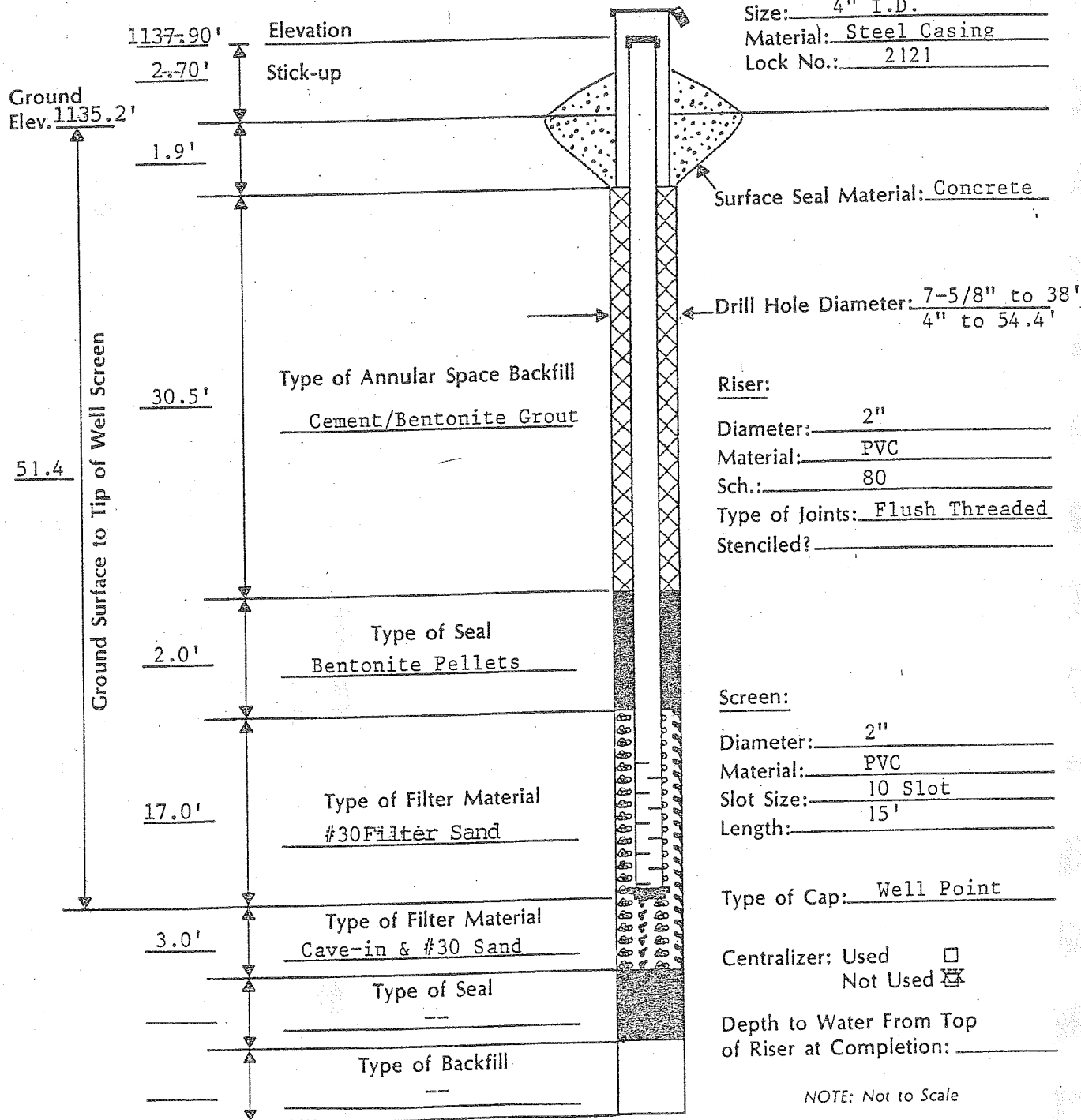
Type of Seal  
---

Type of Backfill  
---

NOTE: Not to Scale

Client: Farmer's Union Coop Oil Co. Scope I.D.: 88F19  
Project: Cenex Page: \_\_\_\_\_  
Prepared by: LDA Date: 5/8/89  
Checked by: KAD Date: 5/24/89

Driller: Wisconsin Test Drilling Well No: MW-4  
Drilling Method: HSA to 38', w/Water Rotary to 54.4' Date Installed: 3/31/89  
\* Coordinates: 10094.903 N, 1721.154 E Protector Pipe:



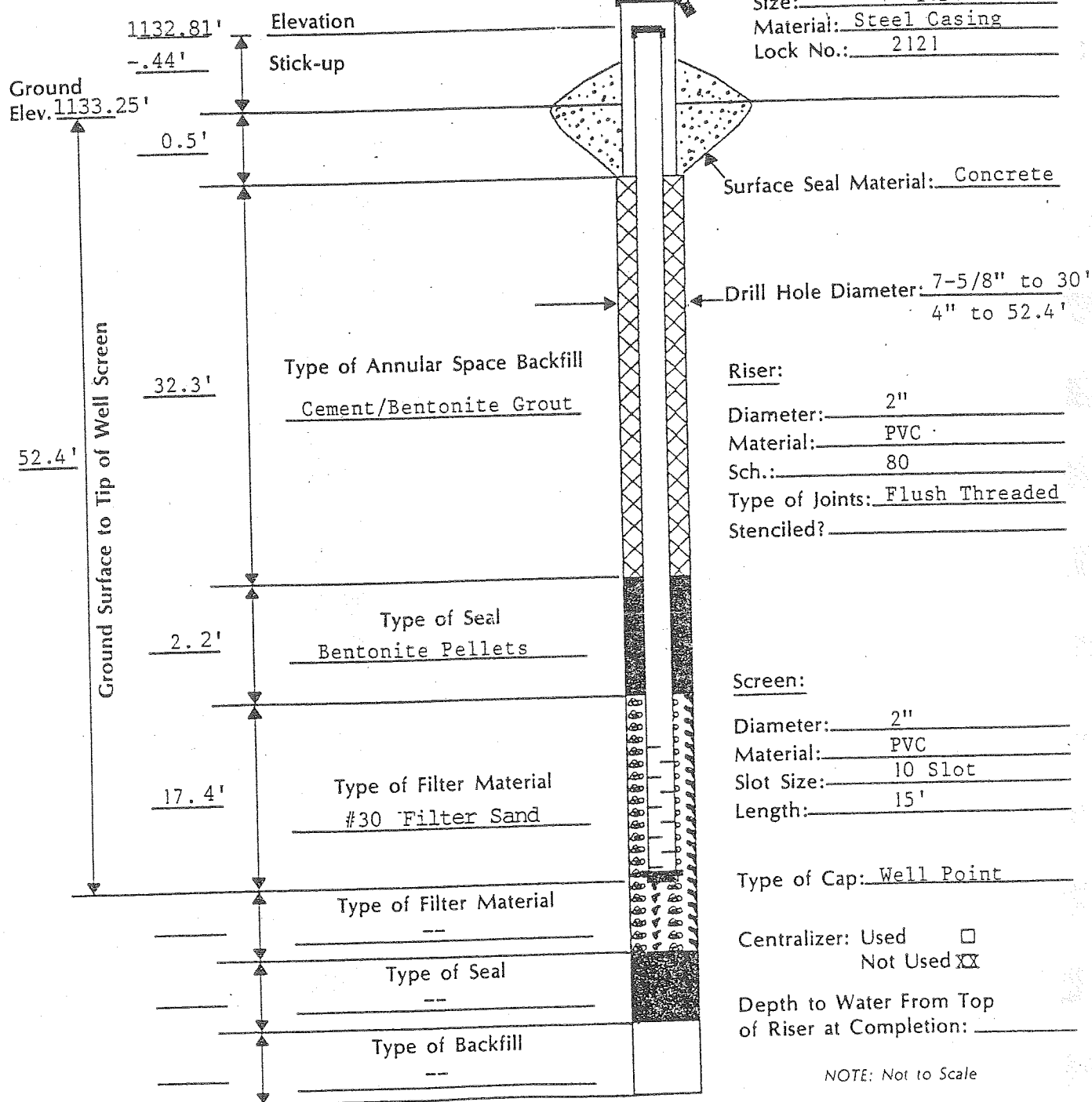
NOTE: Not to Scale

# Foth & Van Dyke

Client: Farmer's Union Coop Oil Co. Scope I.D.: 88F19  
 Project: Cenex Page: \_\_\_\_\_  
 Prepared by: KAD Date: 4/14/89  
 Checked by: KAD Date: 5/24/89

## MONITORING WELL CONSTRUCTION DIAGRAM

Driller: Wisconsin Test Drilling Well No: MW-3  
 Drilling Method: HSA to 30', w/Water Rotary to 52.4' Date Installed: 3/30/89  
 Coordinates: 10231.913 N, 1714.441 E



File

# Foth & Van Dyke

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

October 10, 1994

Mr. Patrick Collins  
Wisconsin Department of Natural Resources  
990 Hillcrest, Suite 104  
Baldwin, Wisconsin 54002

Dear Mr. Collins:

RE: Groundwater Monitoring  
Laboratory Analytical Results  
Cenex Station - Forest, Wisconsin

RECEIVED

OCT 11 1994

Baldwin DNR

## Introduction

## Authorization

This report has been prepared and is being submitted pursuant to the general requirements of Wisconsin Statute 144.76 which pertains to the discharge of hazardous substances. This statute is the primary impetus for the assessment and remediation of petroleum product underground storage tanks (UST) in the State of Wisconsin.

## Purpose

The purpose of this report is to update the Wisconsin Department of Natural Resources (WDNR) on the groundwater monitoring activities that have been conducted in relationship to the petroleum release at the Cenex Station located in Forest, Wisconsin. A site location map is presented as Figure 1. The work reported herein was conducted in accordance with the WDNR Groundwater Sampling Procedures and UST guidelines.

## Scope

The work reported herein was conducted in accordance with the "Annual Report Groundwater Monitoring, Cenex Station, Forest, Wisconsin," Foth & Van Dyke, July 1993, and the subsequent comment letter of January 10, 1994, from the WDNR. The scope of work for this project included the collection of groundwater measurements and water samples for water quality analysis. An evaluation of the water quality analytical results, in comparison to Wisconsin water quality standards, Wisconsin Administrative Code, DNR Chapter NR 140, has also been completed.

## Groundwater Elevations

Depth to groundwater measurements were collected on September 13, 1994, from the six groundwater monitoring wells (MW-1, MW-2, MW-3, MW-4, MW-5, and MW-6) constructed on and adjacent to the Cenex site. Well locations are presented on Figure 2. The measurements and calculated groundwater elevations are summarized in Table 1. A groundwater contour map has been constructed based on the groundwater data for this date. The groundwater contour map is presented as Figure 2.

Mr. Patrick Collins  
Wisconsin Department of Natural Resources  
October 10, 1994  
Page 2

## Groundwater Quality

Groundwater samples were collected for laboratory analysis, from Monitoring Wells MW-2, MW-3, MW-5, and MW-6, and two residential wells (RW-1, and RW-4) on and adjacent to the Cenex site. Groundwater samples were analyzed for the petroleum related volatile organic compounds (PVOCs); benzene, toluene, ethylbenzene, xylenes (BTEX), 1,3,5 and 1,2,4-trimethylbenzene, and methyl tert-butyl ether (MTBE), (MW-3, MW-5, MW-6, RW-4), and volatile organic compound (VOCs), Wisconsin list 8021 (RW-1 and MW-2). A summary of the laboratory analytical results for September 1994 are presented in Table 2. The laboratory report, chain-of-custody, and field forms are presented in Attachment 1. Summaries of laboratory analytical results from previous sampling events, at this site, are presented in Attachment 2.

Review of laboratory analytical report indicates the presence of several VOCs in the groundwater sample collected from Monitoring Well MW-2. Benzene, detected at a concentration of 99 micrograms per liter (ug/L), 1,2-dibromomethane (15 ug/L), 1,2-dichloroethane (43 ug/L), naphthalene (340 ug/L), and xylenes (320/830 ug/L) have exceeded their respective Enforcement Standards (ES).

PVOC's were not detected at or above the method detection limit in Monitoring Wells MW-3, MW-5, MW-6, and Residential Well RW-4. Water samples collected for laboratory analysis from the Residential Well RW-1 did not detect the presence of VOCs at or above the method detection limit.

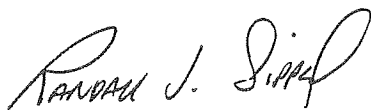
## Closing Comments

The next groundwater monitoring event is scheduled for March 1995. Groundwater monitoring for that event will include the same wells.

Should you have any questions or comments during your review, please feel free to contact our office at (612) 942-0396.

Sincerely,

Foth & Van Dyke



Randall J. Sippel  
Project Hydrogeologist

RJS:jse

cc: Mr. Larry Weisenbeck, Farmers Union Coop.



Table 1

Groundwater Elevations  
Farmer's Union Co-op  
Cenex Station, Forest, WI  
September 6, 1994

MW ID	TOC ELEV	GW DEPTH	GW ELEV
MW-1	1131.83	40.49	1091.34
MW-2	1133.07	42.11	1090.96
MW-3	1132.81	41.24	1091.57
MW-4	1137.90	NA	#VALUE!
MW-5	1134.69	43.43	1091.26
MW-6	1128.93	37.56	1091.37