Foth & Van Dyke

REPORT

Remedial Investigation
Hedlund DX
Falun, Wisconsin

Scope ID: 90S81

Gerald Hedlund
Grantsburg, Wisconsin

May 1991

Foth & Van Dyke

10340 Viking Drive, Suite 100
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Engineers
Architects
Planners
Scientists

May 13, 1991

Mr. Mick Michaelsen
Wisconsin Department of Natural Resources
Box 397
Cumberland, WI 54829

90S81

Dear Mr. Michaelsen:

RE: Remedial Investigation, Hedlund DX
Falun, Wisconsin

On behalf of Gerald Hedlund, Foth & Van Dyke and Associates, Incorporated, is submitting two copies of the report entitled "Remedial Investigation, Hedlund DX, Falun, Wisconsin."

The report documents tank ownership and use, tank removal, site activities and the remedial investigation. Based on the results of the field and laboratory investigation a recommendation for remediation action is made for the site.

Please contact us at (612) 942-0396 if you have any questions during your review process.

Sincerely,

FOTH & VAN DYKE

Randall J. Sippel
Project Geologist

Fred J. Doran, P.E.
Division Manager

RJS/FJD:jmk

DISTRIBUTION LIST

No. of Copies	Sent To
2	Mr. Mick Michaelsen Wisconsin Department of Natural Resources Box 397 Cumberland, WI 54829
1	Mr. Gerald Hedlund 116 West St. George Avenue Grantsburg, WI 54840
1	Mr. John Stoessel P.O. Box 1341 Superior, WI 54880

REMEDIAL INVESTIGATION
HEDLUND DX
FALUN, WISCONSIN

Prepared for:

GERALD HEDLUND

Prepared by:

FOTH & VAN DYKE and Associates, Inc.
10340 Viking Drive
Suite 100
Eden Prairie, Minnesota 55344

MAY 1991

REUSE OF DOCUMENTS

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1.0 INTRODUCTION

On December 19 and 20, 1990 an environmental investigation was completed at the former Hedlund DX service station in Falun, Wisconsin. The investigation was authorized by Mr. Gerald Hedlund, owner of the property.

The purpose of the environmental investigation was to determine the extent and impact on soil and groundwater at the site, from past petroleum releases. The investigation involved the installation of three groundwater monitoring wells, the collection and analysis of soil and groundwater samples and determination of groundwater flow direction.

The investigation confirmed the presence of petroleum related compounds. Soil and groundwater remediation are recommended for this site.

2.0 BACKGROUND INFORMATION

2.1 Site Location

The site is located in Falun, Wisconsin, approximately 500 feet east of the intersection of County Road W and Highway 70. It occupies an area less than one acre immediately north of Highway 70. The site is in the northwest quarter of the northwest quarter of section 19, Township 38 north, Range 18 west. A site location map is presented in Figure 2-1. A site map is presented in Figure 2-2.

2.2 General Site Activities

Hedlund DX was a retail gas station and automotive service center which began operation at this site in the 1920's. The business operated in this capacity from the 1920's through 1984. The underground storage tanks and pumps were removed from the site in 1988. The site has since been abandoned.

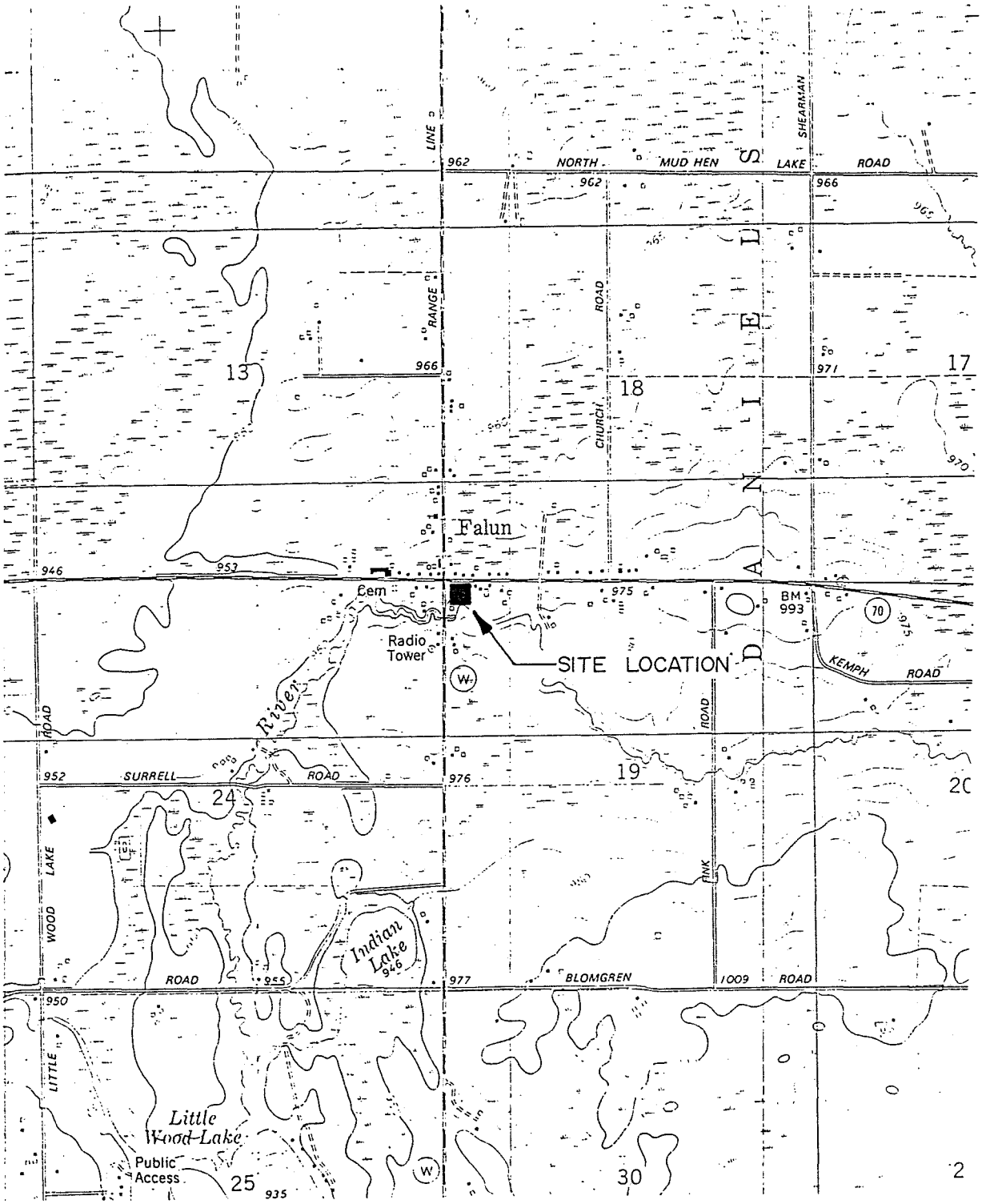
2.3 Potential Contaminant Sources

According to information available, two underground storage tanks were located at this site. The first tank was a 1000-gallon capacity tank located on the east side of the property adjacent to the building. The second tank was a 500-gallon capacity tank locate on the west side of the property. Both underground storage tanks contain leaded and unleaded gasoline.

2.4 Hydrogeologic Overview

2.4.1 Surfacial Deposits

Quaternary age glacial drift deposits are characteristic of the area geology. End moraine, comprised of till and stratified sand and gravel deposits occur at this site. The glacial drift in this region is commonly 200-300 feet thick.



N

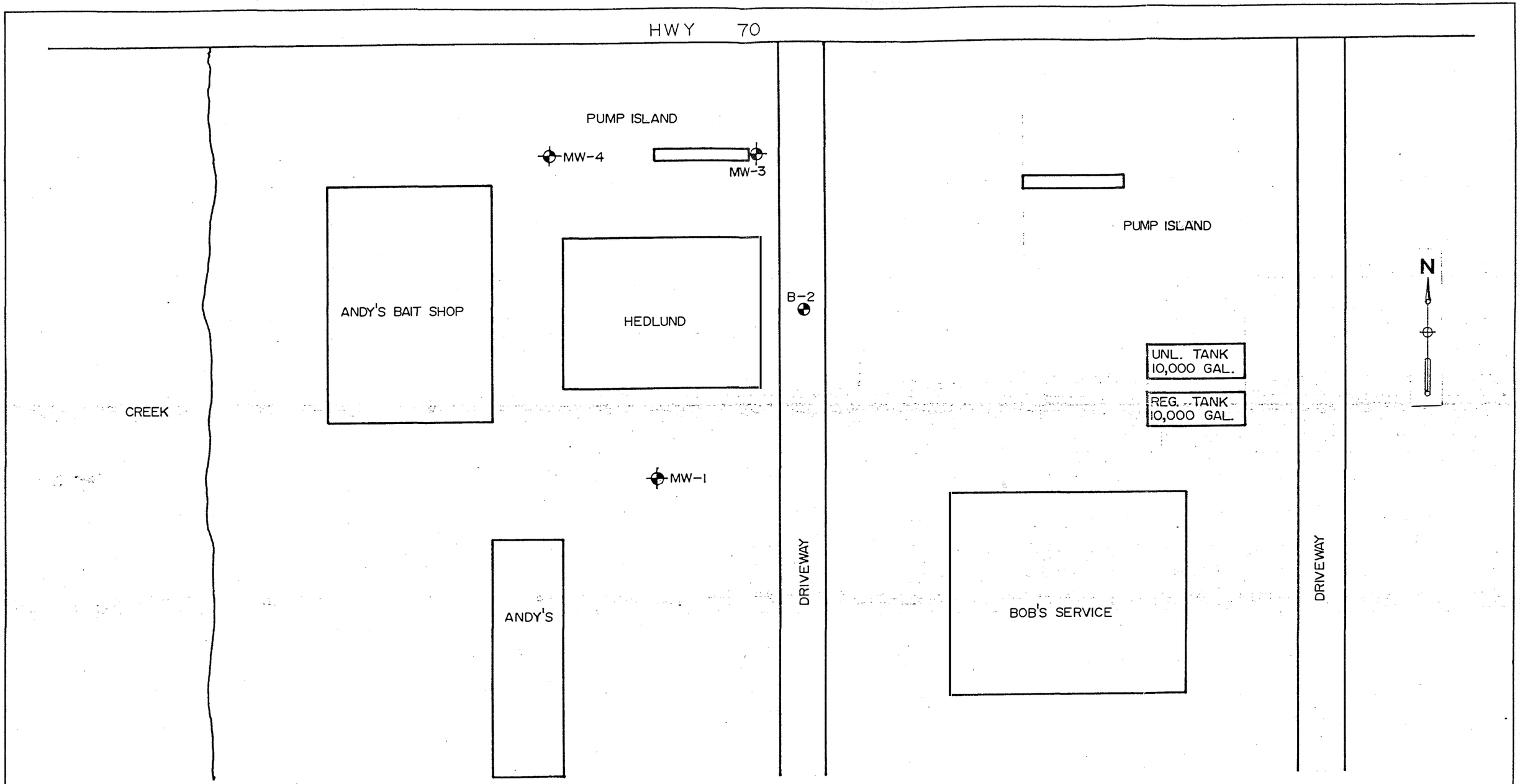
SOURCE: FALIN, WIS
7.5' QUADRANGLE

HEDLUND DX FALUN, WI

FIGURE 2-1

SITE LOCATION MAP

Scale: 1" = 24,000	Date: 2/6/91
Prepared by: Foth & Van Dyke	By: RJS



HEDLUND DX FALUN, WI

FIGURE 2-2

SITE MAP

Scale: 1" = 20'	Date: 2/6/91
Prepared by: Foth & Van Dyke	By: RJS

90S81

The water table in the area is shallow, usually less than 20 feet below the land surface, near surface ground water flow is to west/southwest. Based on information from "Water Resources of Wisconsin - St. Croix River Basin, Hydrologic Investigation Atlas HA - 451", regional groundwater flow is to the northwest, to the St. Croix River. It is likely that the Wood River, located south of the site is influencing local groundwater flow.

2.4.2. Bedrock

The bedrock in this area consist of Cambrian sandstone, including the Jordan Sandstone, St. Lawrence Formation and Franconia, Galesville, Eau Claire and Mount Simon Sandstone. These bedrock formations can be up to 800 feet thick. The Cambrian sandstone is underlain by Precambrian sandstone.

3.0 PROJECT RESULTS

3.1 Summary of Project Activities

3.1.1 Soil Borings

Soil borings were completed at the site by WTD Environmental Drilling of Minneapolis, Minnesota, using a Diedrich D-50 drilling rig and hollow steam auger drilling methods. The drilling rig and equipment were steam cleaned prior to use on-site and between borings. A total of four boring (B-1 through B-4) were completed on site. Boring locations are shown on Figure 2-2. Boring locations were determined by the proximity to the tanks, presence of utilities and accessed to the drilling rig. Soil borings were advanced to a maximum depth of 25 feet below grade (B-2). Soil boring logs are presented in Appendix A.

Soil samples were collected at 2.5 feet intervals, using a two inch diameter split-barrel sampler, in accordance with ASTM (1586) methods. All samples were logged and classified by a Foth & Van Dyke geologist using ASTM D2488-84, "Standard Practices for Description and Identification of Soils. Munsell color notation was used to describe soil color.

3.1.2 Decontamination

The drilling rig, augers and tools were decontaminated by steam-cleaning, prior to being brought to the site. Drilling tools, auger and downhole equipment were steamed between borings.
The split-barrel sampler was decontaminated between sampling events by washing with a trisodium phosphate and water solutions followed by a deionized water rinse.

3.1.3 Groundwater Monitoring Wells

Three groundwater monitoring wells were constructed in borings B-1, B-3 and B-4. After soil samples were collected to the desired depths, a monitoring well was then constructed in the borehole. All wells were constructed with a 10 foot (0.010 inch slot width) screen to intersect the water table. Wells were constructed using two-inch diameter polyvinyl chloride (PVC) screens flush threaded to PVC riser pipe. The annular space was backfilled

with a medium grained filter sand (Red Flint filter sand #30) to at least one foot above the screen, followed by one foot of fine grained sand (Red Flint filter sand #45).

Bentonite pellets (Wyo-Ben Inc, Enviro Plug) were placed above the sand packs. A steel, four-inch diameter, locking protective casing was set in concrete over the well casing at Monitoring Well MW-1. The concrete base was sloped to promote run-off and prevent infiltration of surface water.

Monitoring wells MW-3 and MW-4, were constructed with monitoring well protective vaults set in concrete slightly above the surface grade. Monitoring well construction diagrams are presented in Appendix B.

3.1.4 Well Development

Monitoring wells were developed by surging and purging the well with a PVC hand bailer in accordance with NR 141. Because of the slow recovery rates, wells were surged then purged until dry. This cycle was repeated until at least 10 well volumes of groundwater was removed. Monitoring well development forms are located in Appendix C.

3.1.5 Ground Water Sampling

Ground water samples were collected from the three monitoring wells constructed on site. The monitoring wells were sampled after well development using a laboratory cleaned bailer for each well. A second round of groundwater samples were collected on March 21, 1991. Sampling was conducted in accordance with Wisconsin Department of Natural Resources: Groundwater Sampling Procedures.

3.1.6 Aquifer Response Test

Aquifer Response test were performed in order to estimate the hydraulic conductivity within the water table aquifer. In each well, qroundwater drawdown was accomplished during the test by purging the well with a hand bailer. A Well Wizard water level indicator was used to record water level recovery. The Bouwer and Rice method (1976) was used to analyzed the data and obtain the hydraulic conductivity estimate for each well.

Hydraulic conductivities within the water table aquifer are summarized in Table 3-1. Calculated hydraulic conductivities are typical for the soil type found across this site.

Groundwater velocity was calculated using Darcy's law;

$$V = \frac{ki}{n}$$

Where V = groundwater velocity

K = average hydraulic conductivity 7.13×10^{-6} ft/sec

i = groundwater gradient, 0.011 feet/foot

n = soil porosity, 50%

The calculated groundwater velocity for this site is 5 ft/year. Field data, calculations, and a description of the Bouwer and Rice Method are provided in Appendix D.

3.2 Site Geology

Soil borings advanced on the site to depths of 15 to 25 feet indicate a soil profile of primarily glacial till. The till is underlain by outwash sand and gravel, encountered in boring B-2. Gray to grayish-brown, lean clay was the dominant soil type encountered in the upper 10 feet, of the site. The clay was underlain by reddish brown poorly graded sand. Groundwater was encountered in all four of the borings at a depth of approximately four feet below the ground surface.

3.3 Site Hydrogeology

Water level measurements from the three monitoring wells indicates a depth to the near surface groundwater approximately four feet below ground surface. Table 3-2 summarizes groundwater elevation information. A groundwater contour map, Figure 3-1, indicates a general groundwater flow direction to the southwest across the site. The average hydraulic gradient calculated for the area covered by MW-1, MW-3 and MW-4 is 0.011 feet/foot.

TABLE 3-1

Hydraulic Conductivity
Hedlund DX
Falun, Wisconsin

Monitoring Well I.D.	Hydraulic Conductivity
MW-1	2.3×10^{-4}
MW-3	2.1×10^{-4}
MW-4	2.0×10^{-4}

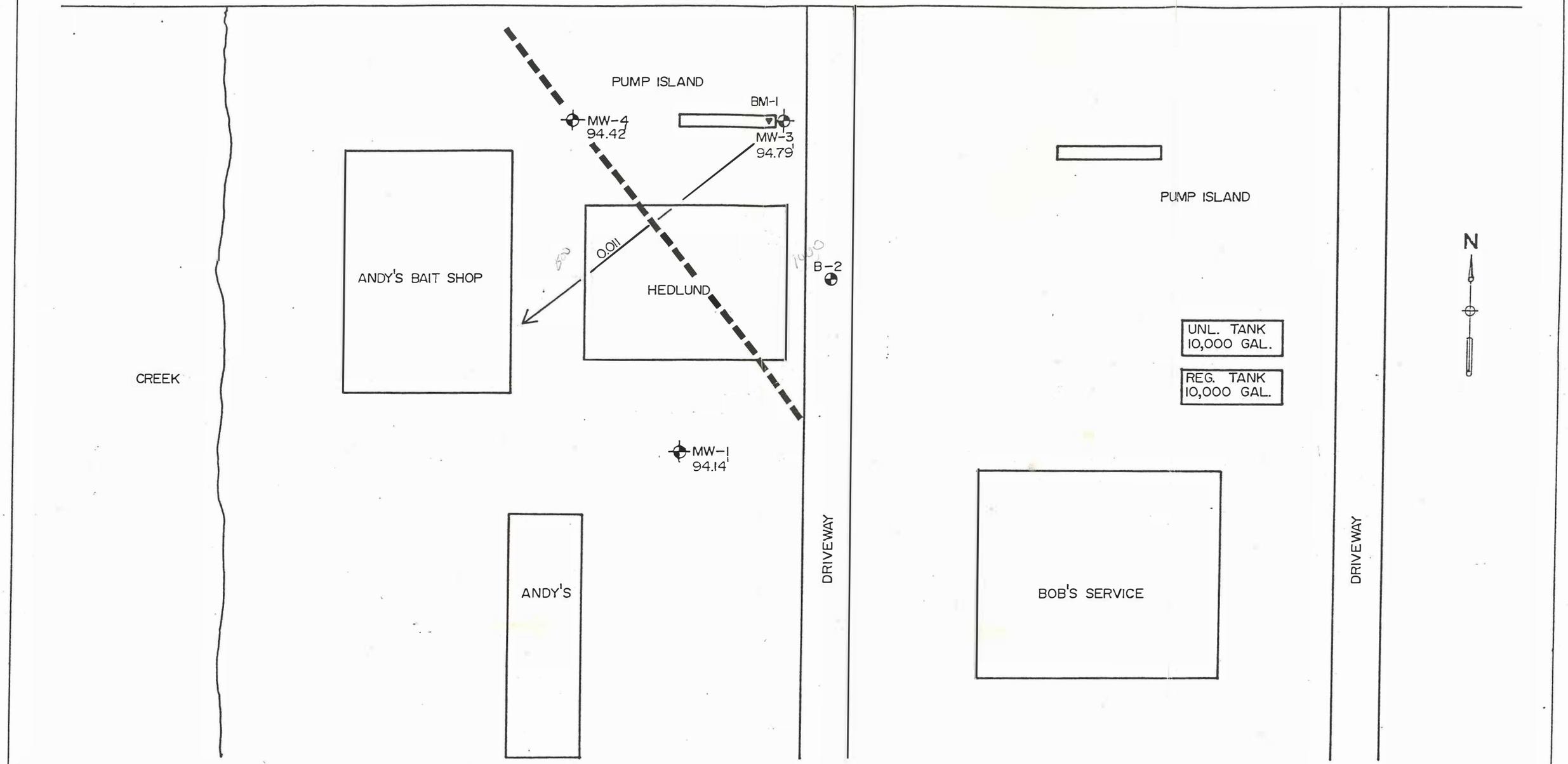
cm/s = centimeters per second

TABLE 3-2

Groundwater Elevation Summary
Hedlund DX
Falun, Wisconsin

Monitoring Well	Date	Top of Riser # Elev (ft)	Depth Ground-Water (ft)	Well Depth (ft)	Ground-Water Elev (ft)
MW-1	1/12/91	100.91	6.77	16.33	94.14
MW-3	1/12/91	98.48	3.69	3.33	94.79
MW-4	1/12/91	97.96	3.54	13.42	94.42

* Elevation referenced to a temporary benchmark of 100.00 feet in elevation, on January 12, 1991, top of the northwest corner of the pump island.



LEGEND

- BM-1 (100')
- MW-4 94.42 — MONITORING WELL GROUNDWATER ELEVATION
- B-2 — SOIL BORING
- GROUNDWATER CONTOUR LINE
- 0.011 — GROUNDWATER FLOW DIRECTION/ HYDRAULIC GRADIENT

HEDLUND DX FALUN, WI

FIGURE 3-1

GROUNDWATER CONTOUR MAP

Scale: 1" = 20'	Date: 2/6/91
Prepared by: Foth & Van Dyke	By: RJS

90S81

3.4 Soil Screening Results

Soil samples were collected at 2.5 feet intervals as the borings were advanced and field screened for the presence of organic vapors using jar headspace screening methods and a Photovac MicroTIP.

The MicroTIP was calibrated before use in accordance with the manufacture's specifications. Soil headspace readings are summarized in Table 3-3. Organic vapors were detected above background levels (10 parts per million) in soil samples collected from three of the four borings.

3.5 Laboratory Results

3.5.1 Soils

One soil sample from each boring was selected and submitted for laboratory analysis. Based on field screening results, soil samples #12, 23, 33 and 43 were analyzed for benzene, toluene, ethylbenzene, xylenes (BTEX), methyl tert-butyl ether (MTBE), total hydrocarbons (THC) as gasoline, and lead.

Laboratory analysis of the soil samples detected the presence of BTEX and THC as gasoline in samples 33 and 43 from borings 3 and 4 respectively. THC as gasoline was also detected in sample 12 from boring 1. Laboratory results are summarized in Table 3-4. Laboratory analysis results are presented in Appendix E.

3.5.2 Groundwater

Laboratory analysis of water samples collected from the monitoring wells, MW-1, MW-3 and MW-4 on December 20, 1990 and March 21, 1991 detected petroleum hydrocarbons in MW-3 and MW-4. Laboratory results are summarized in Table 3-5. Laboratory analysis results are presented in Appendix E.

TABLE 3-3

Jar Headspace Summary
Hedlund DX
Falun, Wisconsin

Location	Date	Soil Sample Numbers	Soil Sample Depth (ft)	Soil Type	Headspace Reading (ppm)
B-1	12/19/90	11	2.5 - 4.5	CL	28.3
		12	5.0 - 7.0	CL	NA
		13	7.5 - 9.5	CL	4.4
		14	10.0 - 12.0	CL	8.9
		15	12.5 - 14.5	SP	3.8
B-2	12/19/90	21	2.5 - 4.5	CL	9.6
		22	5.0 - 7.0	CL	10.2
		23	9.5 - 9.5	CL	5.7
		24	10.0 - 11.0	CL	7.6
		24a	11.0 - 12.0	CL	8.4
		25	12.5 - 14.5	SP	5.5
		26	15.0 - 17.0	SP	4.3
		27	17.5 - 19.0	SP	3.3
		27a	19.0 - 19.5	SC-CL	3.2
		28	20.0 - 22.0	SC-CL	3.4
		29	22.5 - 24.5	SC-SP	0.5
B-3	12/20/90	31	2.5 - 3.5	SP	2003
		31a	3.5 - 4.5	CL	2149
		32	5.0 - 7.0	CL	2076
		33	9.5 - 9.5	CL	2288
		34	10.0 - 12.0	CL	2516

TABLE 3-3 (Cont.)

Location	Date	Soil Sample Numbers	Soil Sample Depth (ft)	Soil Type	Headspace Reading (ppm)
		35	12.5 - 14.5	SP	159
B-4	12/20/90	41	2.5 - 4.5	SC	2020
		42	5.0 - 7.0	SC	NA
		43	7.5 - 9.5	CL	1499
		44	10.0 - 12.0	CL	337
		45	12.5 - 13.5	CL	55.7
		45a	13.5 - 14.5	SP	46.6

ppm = parts per million
NA = no sample taken

TABLE 3 - 4

Laboratory Analysis Results
Soil Samples
December 19 and 20, 1990

Hedlund DX
Falun, Wisconsin

Sample Location	Benzene mg/kg	Toluene mg/kg	Ethyl Benzene mg/kg	Xylenes mg/kg	THC as Gas mg/kg	MTBE mg/kg	Lead mg/kg
B-1, #12	<0.12	<0.12	<0.12	<0.12	2.3	<0.12	17
B-2, #23	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	18
B-3, #33	1.2	5.3	1.5	3.5	46	<0.12	18
B-4, #43	2.2	0.40	0.17	0.95	19	<0.16	15

mg/kg = milligrams per kilogram = parts per million

TABLE 3 - 5

Laboratory Analysis Results
Groundwater Samples

Hedlund DX
Falun Wisconsin

Sample Location	Benzene ug/L		Toluene ug/L		Ethyl benzene ug/L		Xylenes ug/L		MTBE ug/L		THC as gas ug/L		Lead ug/L	
(E.S.)	5		343		1360		620		-		-			
(P.A.L)	0.067		68.6		272		124		-		-		20	
	12/31/90	3/21/91	12/20/90	3/21/91	12/20/90	3/21/91	12/20/90	3/21/91	12/20/90	3/21/91	12/20/90	3/21/91	12/20/90	3/21/91
MW-1	<1	<1	1	<1	<1	1.0	<3	9.3	<4	<4	60	78	200	<1
MW-3	6	1,700	26	890	9	450	49	1,600	<4	88	870	27,000	<1	<1
MW-4	<1	6,900	<1 1	2,000	<1	1,600	<1	7,800	<4	<4	70	120,000	400	40

ug/l = micrograms per liter = parts per billion
ES = Wisconsin Administration Code NR140, Enforcement Standard
PAL = Wisconsin Administration Code NR140, Preventive Action Limit

4.0 DISCUSSION

4.1 Petroleum Tank Release

A source of the petroleum hydrocarbon contamination detected on-site was likely the two gasoline underground storage tanks removed from the Hedlund property in 1988. Field observations and laboratory analytical data indicated gasoline contamination of the soil in the area of the former tanks and the former pump island. High MicroTIP readings were recorded from soil samples screened during the field investigation. Field observations noted a distinct petroleum-like odor from soil samples collected from borings B-3 and B-4.

4.2 Potential Impacts of Release

4.2.1 Soil Contamination

Field screening of soil samples recorded elevated MicroTIP readings in samples collected from borings B-3 and B-4. The most significant readings were noted in samples collected at and above the water table.

Laboratory analysis did detect BTEX and lead in samples submitted from B-3 and B-4. Lead concentrations detected were 18 mg/kg and 15 mg/kg, respectively. Typical lead concentrations in soils range from 2 to 200 ppm (from W.L. Linday, 1979, Chemical Equilibrium in Soil).

4.2.2 Groundwater Contamination

Laboratory analysis of groundwater samples collected on December 20, 1990 and March 21, 1991, indicates groundwater has been impacted by a petroleum release. This is based on two sampling events in which elevated concentrations of BTEX and THC as gasoline have been detected in MW-3 and MW-4.

Concentrations of BTEX in MW-3 and MW-4 have exceeded the Wisconsin Administration code NR 140, Exceedence Standard or the Preventive Action Limit for BTEX.

5.0 CONCLUSIONS

The following are conclusions of the environmental investigation performed at the Hedlund property:

1) Three groundwater monitoring wells (MW-1, MW-3 and MW-4) were constructed on December 19 and 20, 1990.

2) Field observations and analytical testing on soil samples collected from B-3 and B-4 indicates the soil has been impacted by a petroleum release.

3) Groundwater flow beneath the site is to the west/southwest toward a nearby stream. The hydraulic gradient is 0.011 feet/foot.

4) Groundwater samples were collected for laboratory analysis for BTEX, MTBE, THC as gasoline and lead on December 20, 1990 and March 21, 1991.

5) Laboratory analysis of groundwater detected BTEX and THC as gasoline in samples collected from all monitoring wells on site. Concentrations of BTEX exceeds the Wisconsin Administration code NR 140 Enforcement Standard or the Preventative Action Limit for BTEX. Lead was detected in MW-1 and MW-4 above the E.P.A Maximum Contaminant Level (MCL) of 20 ug/l for lead.

6.0 CORRECTIVE ACTION PLAN (CAP)

6.1 CAP Alternatives

The primary objective of the CAP presented in this report is to improve the groundwater quality in the immediate area of the Hedlund property. A secondary objective of this CAP is to remove soil in the unsaturated zone impacted by the petroleum release.

The corrective action alternatives considered included the following:

- no action
- soil removal with groundwater extraction and treatment
- bioremediation of the groundwater

Since elevated levels of BTEX have been measured in MW-3 and MW-4, that exceed the Wisconsin Administrative Code NR140, Enforcement Standards, the no action alternative is not considered acceptable.

The groundwater extraction alternative in combination with soil removal is considered an appropriate CAP. Groundwater would be pumped from a well constructed into the glacial till, on the site, and treated by air stripping and carbon adsorption, in series, and then discharge to a near by tributary of the Wood River. The air stripping - carbon adsorption in series treatment is necessary to reduce the estimated contaminant concentrations to acceptable levels for surface water discharge. The typical pump and treat option, however, will not address the present contamination in the unsaturated soils. Removing the impacted soil to the groundwater level (approximately four feet below grade) from the most highly contaminated area would prevent future contaminants from leaching from the soil into the groundwater.

Bioremediation is also considered an acceptable alternative instead of soil removal. Contaminated groundwater would be extracted. After treatment the water would then be discharged to the nearby tributary. Nutrients would be added to a portion of the treated water and would then be recharged to the groundwater through the contaminated unsaturated soils. The effectiveness of bioremediation at this site is questionable due to high clay content of the soils in the unsaturated zone and upper portion of the aquifer. Due to the high groundwater table, freezing of water in the piping of the system will be a

problem in the cold weather. Several shallow sandpoint wells exists in the area which access drinking water from the same portion of the aquifer in which bioremediation would occur. Therefore, bioremediation is not recommended at this site. The no-action CAP or the groundwater extraction and treatment CAP are recommended for this site.

7.0 RECOMMENDATIONS

A petroleum release has caused a groundwater impact at this site. Because the levels of contamination exceed the PALs or ES and because the aquifer is used for drink water purposes, Foth & Van Dyke recommends that the pump and treatment - soil removal CAP be implemented to remediate the groundwater in this area and remove petroleum impacted soil (where possible) from the site.

APPENDIX A

Field Logs of Test Borings

FOTH & VAN DYKE

Client: J. Stoessel
Project: Hedlund DX, Falun, WI.
Prepared by: RJS
Checked by:

Scope I.D.: 90S81
Page: 1
Date: 2/18/91
Date:

REPORT - LOG OF TEST BORING

Test Boring No.: B-1
Start Date: 12/19/90
Completion Date: 12/19/90
Logged by: RJS
Location: south side of building
Boring Depth: 14.5 ft
Surface Elevation: 999.2

MSL ELEV	DEPTH FR LND SURF	SAMP DEPTH INTERVAL	TYPE	#	N	REC (ft)	DESCRIPTION OF MATERIAL	CLASS	LABORATORY TESTS	DRILLING AND SAMPLING NOTES
999.2	--0									
		2.5-4.5	SB	11	13	0.6	2.5YR 4/0 dk. gray, lean CLAY, slightly sandy, mod. plasticity, moist	CL		TIP 28.3 ppm
994.2	--5.0	5.0-7.0	SB	12	11	0.6	as above, saturated at 6.0'		lab sample	TIP NA
		7.5-9.5	SB	13	7	1.1	as above, w- some silt, friable, dense			TIP 4.4 ppm
989.2	--10	10.0-12.0	SB	14	11	1.7	as above			TIP 8.9 ppm
		12.5-14.5	SB	15	42	0.5	as above			TIP 3.8 ppm
						1.5	10YR 4/4 dk. ylwish brn, poorly graded SAND, fn-med sand w- some silt, loose, saturated	SP		
984.2	--15						End of boring at 14.5 feet. Monitoring well MW-1 constructed in borehole.			
979.2	--20									
974.2	--25									
969.2	--30									
964.2	--35									
959.2	--40									
954.2	--45									
949.2	--50									
944.2	--55									

DRILLING METHOD: 4.25" ID Hollow Stem Augers
DRILLING CONTRACTOR: WTD Environmental Drilling

DEPTH TO WATER -
AT COMPLETION: 7.7 ft. TOC
LATER TIME/DEPTH: 12-20-90/6.70 TOC

FOTH & VAN DYKE

Client: J. Stoessel
Project: Hedlund DX, Falun, WI.
Prepared by: RJS
Checked by:

Scope I.D.: 90S81
Page: 1
Date: 2/19/91
Date:

REPORT - LOG OF TEST BORING

Test Boring No.: B-2
Start Date: 12/19/90
Completion Date: 12/19/90
Logged by: RJS
Location: east side of building, tank basin
Boring Depth: 24 feet
Surface Elevation: 999.2

MSL ELEV	DEPTH FR LND SURF	SAMP DEPTH INTERVAL	TYPE	#	N	REC (ft)	DESCRIPTION OF MATERIAL	CLASS	LABORATORY TESTS	DRILLING AND SAMPLING NOTES
999.2	--0									
	-	2.5-4.5	SB	21	21	1.1	5G 6/1 grnish gray, lean CLAY mod. plasticity, dense, moist	CL		TIP 9.6 ppm
994.2	--5.0	5.0-7.0	SB	22	6	2.0	5Y 6/1 gray, lean CLAY, tr. sand & silt			TIP 10.2 ppm
	-	7.5-9.5	SB	23	9	2.0	as above, saturated		lab sample	TIP 5.7 ppm
989.2	--10	10.0-12.0	SB	24	27	1.0	as above			TIP 7.6 ppm
	-			24a		1.0	5YR 4/2 dk reddish brn, poorly SAND, fn sand, loose, saturated	SP		TIP 8.4 ppm
	-	12.5-14.5	SB	25	20	1.6	as above, coarsening downward			TIP 5.5 ppm
984.2	--15	15.0-17.0	SB	26	30	2.0	as above			TIP 4.3 ppm
	-	17.5-19.5	SB	27	75	1.7	as above			TIP 3.3 ppm
	-			27a		0.3	2.5YR 3/4 dk reddish brn, sandy lean CLAY, low plasticity, dense wet	SC-CL		TIP 3.2 ppm
979.2	--20	20.0-22.0	SB	28	56	0.5	as above			TIP 3.4 ppm
	-					0.6	2.5YR 3/4 dk reddish brn, sandy lean CLAY, interbedded w-poorly graded SAND, saturated	SC-SP		
	-	22.5-24.5	SB	29	48	1.8	as above			TIP 0.5 ppm
974.2	--25						End of boring at 24.5 feet. Borehole backfilled with bentonite.			
969.2	--30									
964.2	--35									

DRILLING METHOD: 4.25" ID Hollow Stem Augers
DRILLING CONTRACTOR: WTD Environmental Drilling

DEPTH TO WATER -
AT COMPLETION: 6.0'
LATER TIME/DEPTH: NA

FOTH & VAN DYKE

Client: J. Stoessel
Project: Hedlund DX, Falun WI.
Prepared by: RJS
Checked by:

Scope I.D.: 90S81
Page: 1
Date: 2/19/91
Date:

REPORT - LOG OF TEST BORING

Test Boring No.: B-4
Start Date: 12/20/90
Completion Date: 12/20/90
Logged by: RJS
Location: NE corner prop. (tank basin)
Boring Depth: 14.5 feet
Surface Elevation: 998.7

MSL ELEV	DEPTH FR LND SURF	SAMP DEPTH INTERVAL	TYPE	#	N	REC (ft)	DESCRIPTION OF MATERIAL	CLASS	LABORATORY TESTS	DRILLING AND SAMPLING NOTES
998.7	--0									
	-	2.5-4.5	SB	41	10	0.9	10YR 3/1 v dk gray, sandy CLAY, fn-med sand, cohesive	SC		TIP 2020 ppm discolored, petro odor
993.7	--5.0	5.0-7.0	SB	42	14	0.0	no sample recovery			TIP NA
	-	7.5-9.5	SB	43	8	1.5	10YR 5/1 gray, lean CLAY w- silt, mod plasticity, dense,wet	CL	lab sample	TIP 1499 ppm
988.7	--10	10.0-12.0	SB	44	12	2.0	as above			TIP 337 ppm
	-	12.5-14.5	SB	45	18	1.0	as above			TIP 55.7 ppm
	-									TIP 46.6 ppm
983.7	--15			45a		1.0	5YR 5/2 reddish gray, poorly graded SAND w- silt, loose, saturated	SP		
978.7	--20						End of boring at 14.5 feet. Monitoring well MW -4 constructed in borehole.			
973.7	--25									
968.7	--30									
963.7	--35									
958.7	--40									
953.7	--45									
948.7	--50									
943.7	--55									

DRILLING METHOD: 4.25" ID Hollow Stem Augers
DRILLING CONTRACTOR: WTD Environmental Drilling

DEPTH TO WATER -
AT COMPLETION: 4.4'
LATER TIME/DEPTH: 1-12-90/3.54'

FOTH & VAN DYKE	Client: J. Stoessel Project: Hedlund DX, Falun, WI. Prepared by: RJS Checked by:	Scope I.D.: 90S81 Page: 1 Date: 2/19/91 Date:

REPORT - LOG OF TEST BORING

Test Boring No.: B-3
Start Date: 12/19/90
Completion Date: 12/19/90
Logged by: RJS
Location: adjacent to pump island
Boring Depth: 14.5 feet
Surface Elevation: 999.1

MSL ELEV	DEPTH FR LND SURF	SAMP DEPTH INTERVAL	TYPE	#	N	REC (ft)	DESCRIPTION OF MATERIAL	CLASS	LABORATORY TESTS	DRILLING AND SAMPLING NOTES
999.1	--0									
		2.5-4.5	SB	31	7	1.0	10YR 4/2 dk gryish brn, poorly graded SAND w- clay	SP		TIP 2003 ppm
				31a		1.0	5BG 6/1 grnish gray, lean CLAY w-tr sand,dense,moist	CL		TIP 2149 ppm
994.1	--5.0	5.0-7.0	SB	32	10	1.8	as above, mod plasticity, wet			TIP 2076 ppm
		7.5-9.5	SB	33	10	2.0	as above, wet		lab sample	TIP 2288 ppm
989.1	--10	10.0-12.0	SB	34	9	2.0	10YR 4/1 dk gray, lean CLAY w-some silt, low plasticity, dense			TIP 2516 ppm
		12.5-14.5	SB	35	8	0.5	as above			TIP 159 ppm
						0.9	at 13.0' 5YR 4/2 dk reddish gray poorly graded SAND, fn sand, loose, saturated	SP		
984.1	--15									
							End of boring at 14.5 feet. Monitoring well MW- 3 constructed in borehole.			
979.1	--20									
974.1	--25									
969.1	--30									
964.1	--35									
959.1	--40									
954.1	--45									
949.1	--50									
944.1	--55									

DRILLING METHOD: 4.25" ID Hollow Stem Augers
DRILLING CONTRACTOR: WTD Environmental Drilling

DEPTH TO WATER -
AT COMPLETION: 5.5'
LATER TIME/DEPTH: 1-12-91/3.69'

APPENDIX B

Monitoring Well Construction Diagrams

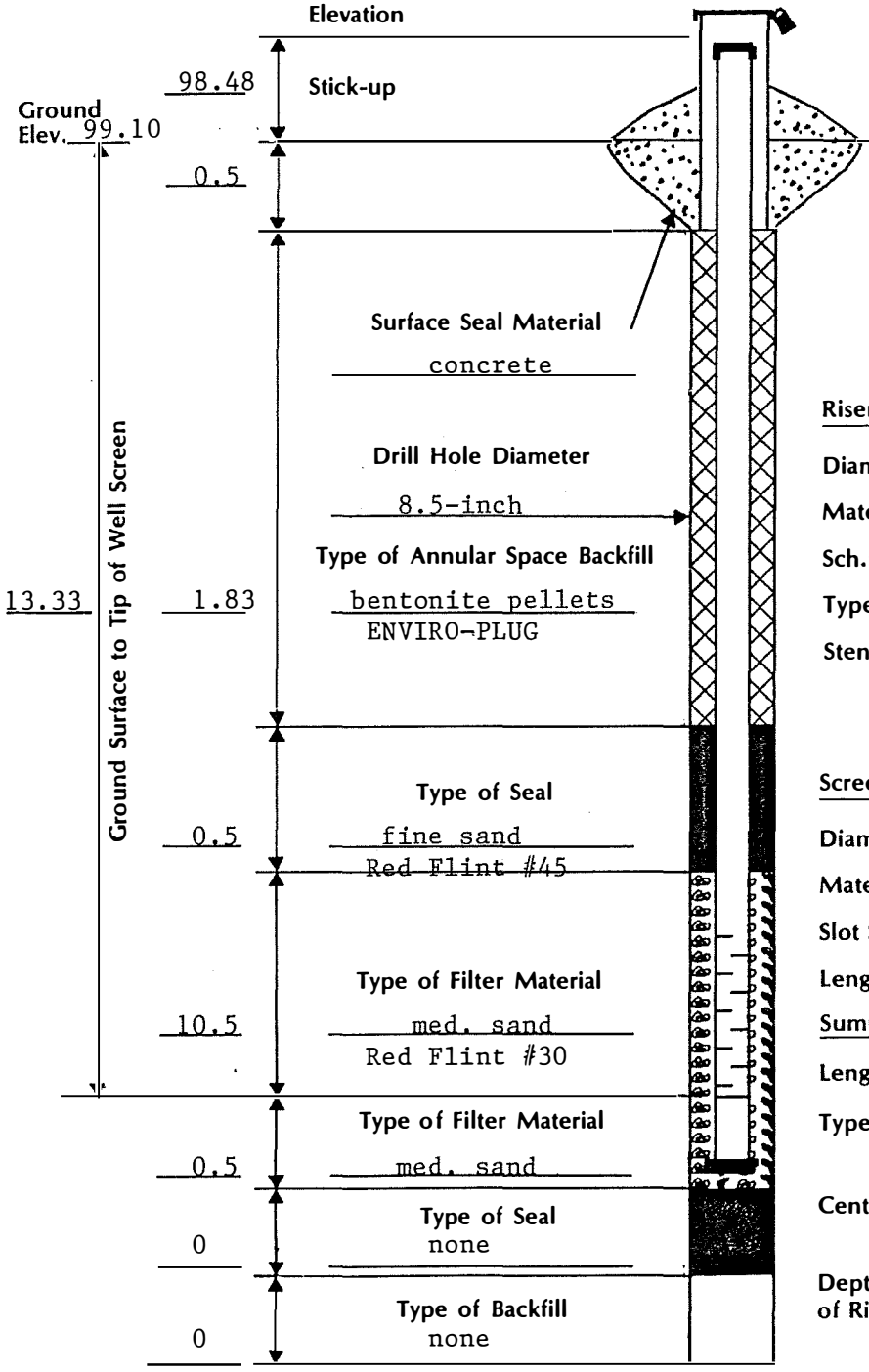
Foth & Van Dyke

Client: Hedlund — Scope I.D.: 90S81
Project: Hedlund, DX, Falun, WI — Page: 1
Prepared by: RJS — Date: 12/30/90
Checked by: — Date:

MONITORING WELL CONSTRUCTION DIAGRAM

Driller: WTD Environmental Drilling — Well No.: MW-3
Drilling Method: Hollow Stem Auger — Date Installed: 12/20/90

Coordinates:



Protector Pipe:
Size: 8-inch, flush mount
Material: steel
Lock No.: Master 2121

Riser:
Diameter: 2-inch
Material: PVC
Sch.: 40
Type of Joints: flush threaded
Stenciled? no

Screen:
Diameter: 2-inch
Material: PVC
Slot Size: 0.010-inch
Length: 10-feet

Sump:
Length: 0.25-feet
Type of Cap: threaded point cap

Centralizer: Used ☐
Not Used ☒

Depth to Water From Top of Riser at Completion: 3.69 feet

NOTE: Not to Scale

Foth & Van Dyke

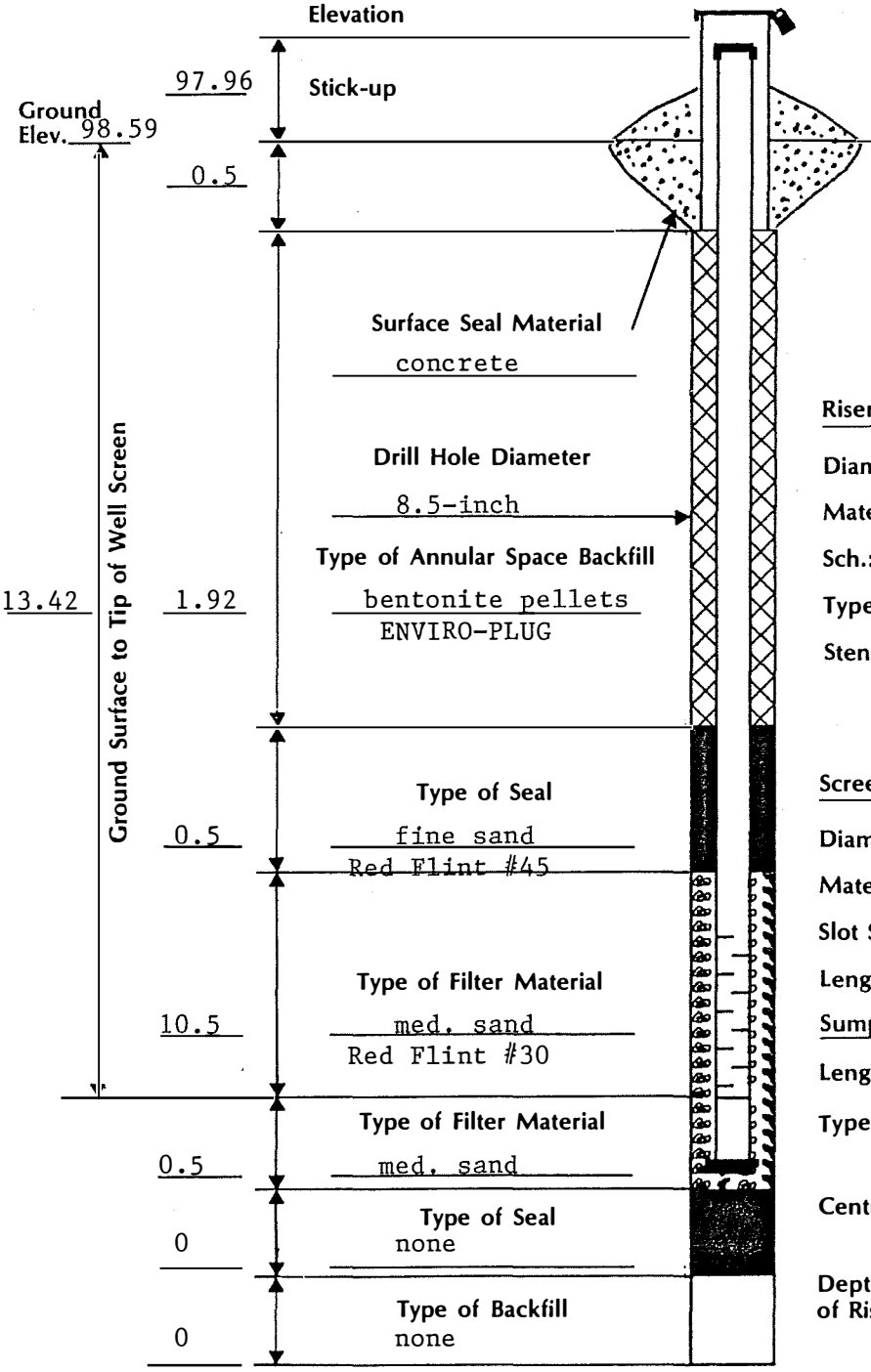
Client: Hedlund Scope I.D.: 90S81
Project: Hedlund DX, Falun, WI Page: 1
Prepared by: RJS Date: 12/30/90
Checked by: Date:

MONITORING WELL CONSTRUCTION DIAGRAM

Driller: WTD Environmental Well No.: MW-4
Drilling Method: Hollow Stem Auger Date Installed: 12/20/90

Coordinates:

Protector Pipe:
Size: 8-inch, flush mount
Material: steel
Lock No.: Master 2121



Riser:
Diameter: 2-inch
Material: PVC
Sch.: 40
Type of Joints: flush threaded
Stenciled? no

Screen:
Diameter: 2-inch
Material: PVC
Slot Size: 0.010-inch
Length: 10-feet

Sump:
Length: 0.25-feet
Type of Cap: threaded point cap

Centralizer: Used ☐
Not Used ☒

Depth to Water From Top of Riser at Completion: 3.54 feet

NOTE: Not to Scale

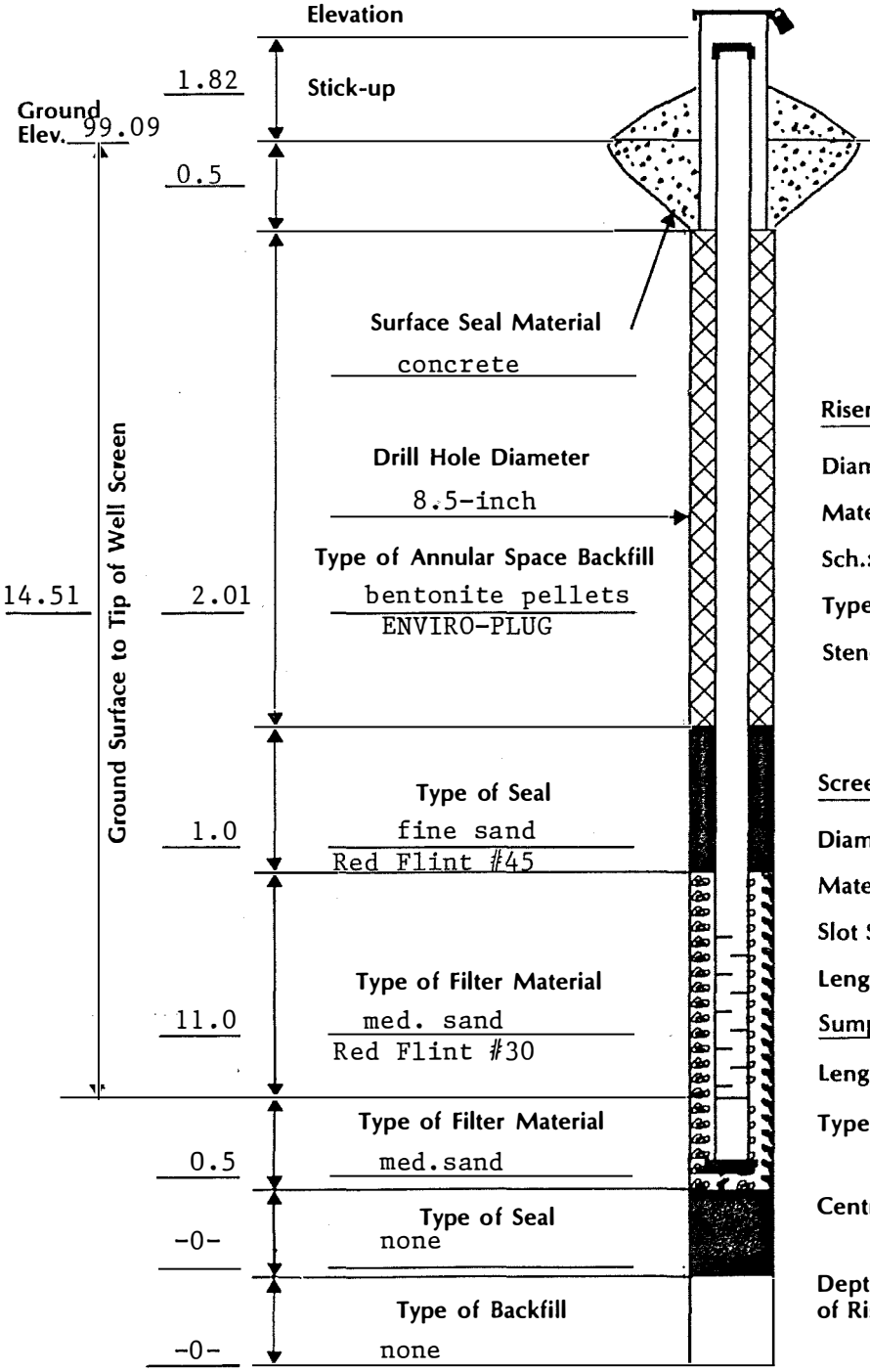
Foth & Van Dyke

Client: Hedlund — Scope I.D.: 90S81
Project: Hedlund DX, Falun, WI — Page: 1
Prepared by: RJS — Date: 12/30/90
Checked by: — Date:

MONITORING WELL CONSTRUCTION DIAGRAM

Driller: WTD Environmental Drilling — Well No.: MW-1
Drilling Method: Hollow Stem Auger — Date Installed: 12/19/90

Coordinates:



Protector Pipe:
Size: 4-inch diameter
Material: steel
Lock No.: master 2121

Riser:
Diameter: 2-inch
Material: PVC
Sch.: 40
Type of Joints: flush threaded
Stenciled? no

Screen:
Diameter: 2-inch
Material: PVC
Slot Size: 0.010-inch
Length: 10-feet

Sump:
Length: 0.25-feet
Type of Cap: threaded point cap

Centralizer: Used ☐ Not Used ☒

Depth to Water From Top of Riser at Completion: 6.77 feet

NOTE: Not to Scale

State of Wisconsin
Department of Natural Resources

GROUNDWATER MONITORING WELL INFORMATION FORM
Chapter 144, Wis. Stats.
Form 4400-89

2-84

Facility Name	Facility ID Number	Date	Completed By (Name and Firm)
HEDLUND DX		12/20/90	RANDALL SIPPEL / FOTH & VAN DYKE AND ASSOCIATES

Well Name	Well ID Number (DNR No.)	Well Location	N	S	E	W	Date Established	Well Casing Diam.	Well Casing Type	Elevations: Top of Well Casing	Elevations: Ground Surface	Elevations: Screen Top	Reference: MSL (✓)	Reference: Site Datum (✓)	Screen Length	Screen Material	Well Depth	Type of Well (✓): PIE2	OW	PW	LYS	Other
MW-1		T38 R17	X			X	12/19/90	2"	PVC	100.91	99.09	94.83		✓	10'	PVC	16.33	✓				
MW-3		T38 R17	X			X	12/20/90	2"	PVC	98.48	99.10	95.40		✓	10'	PVC	13.33	✓				
MW-4		T38 R17	X			X	12/20/90	2"	PVC	97.96	98.59	94.79		✓	10'	PVC	13.42	✓				

Location Coordinates Are:

☒ Grid System State Plane Coordinate ☐ Northern ☐ Central

Received In:

District: _____ Area: _____ Bureau: _____

By: _____

SMS Use:

File Maint. Completed: _____ Date

Other: _____

APPENDIX C

Monitoring Well Development Forms

Foth & Van Dyke

Client: Stoessel Scope I.D.: 90S81
Project: Hedlund DX Page: 1
Prepared by: RJS Date: 12/20/90
Checked by: [illegible] Date: 5/9/91

MONITORING WELL DEVELOPMENT

Well Number: MW-1
Well Diameter: 2 inch
Total Depth of Well: 15.60

Depth to Water:
Initial: 7.75
Final: Dry

Time of Measurement:

Description of Development Method:
Surged and purged with 1.66 inch x 5 feet hand bailer.
Well was bailed dry and allowed to recharge.
This was done four consecutive times.

Volume of Water Removed From Well: ~ 25 gallons
Clarity of Water in Well Before Development: cloudy - muddy
Clarity of Water in Well After Development: cloudy
Presence of Sediment at the Bottom of the Well: no
Volume of Water Added to Well: none
Source of Water Added to Well: none
Time Spent for Development:

Stabilization Readings:

Gal. Removed	Depth to Water	Time	Field Temperature	Spec. Cond.	pH
25	15.3		39.2°C	850	6.1

Foth & Van Dyke

Client: Stoessel Scope I.D.: 90S81
Project: Hedlund DX Page: 1
Prepared by: RJS Date: 12/20/90
Checked by: rjp Date: 5/9/91

MONITORING WELL DEVELOPMENT

Well Number: MW-3
Well Diameter: 2 inch
Total Depth of Well: 12.80

Depth to Water:
Initial: 3.40
Final: dry

Time of Measurement:

Description of Development Method:
Surged and purged with 1.66 inch x 5 feet hand bailer.
Well was bailed dry and allowed to recharge.
This was done four consecutive times.

Volume of Water Removed From Well: ~ 25 gallons
Clarity of Water in Well Before Development: cloudy - muddy
Clarity of Water in Well After Development: cloudy
Presence of Sediment at the Bottom of the Well: no
Volume of Water Added to Well: none
Source of Water Added to Well: none
Time Spent for Development:

Stabilization Readings:

Gal. Removed	Depth to Water	Time	Field Temperature	Spec. Cond.	pH
25	12.1		42.1°C	1235	6.1

FORM #449 GEM (5/88)

Foth & Van Dyke

Client: Stoessel Scope I.D.: 90S81
Project: Hedlund DX Page: 1
Prepared by: RJS Date: 12/20/90
Checked by: [illegible] Date: 5/9/91

MONITORING WELL DEVELOPMENT

Well Number: MW-4
Well Diameter: 2 inch
Total Depth of Well: 14.05

Depth to Water:
Initial: 3.54
Final: Dry

Time of Measurement:

Description of Development Method:
Surged and purged with 1.66 inch x 5 feet hand bailer.
Well was bailed dry and allowed to recharge.
This was done four consecutive times.

Volume of Water Removed From Well: ~ 20 gallons
Clarity of Water in Well Before Development: cloudy - muddy
Clarity of Water in Well After Development: cloudy
Presence of Sediment at the Bottom of the Well: no
Volume of Water Added to Well: none
Source of Water Added to Well: none
Time Spent for Development:

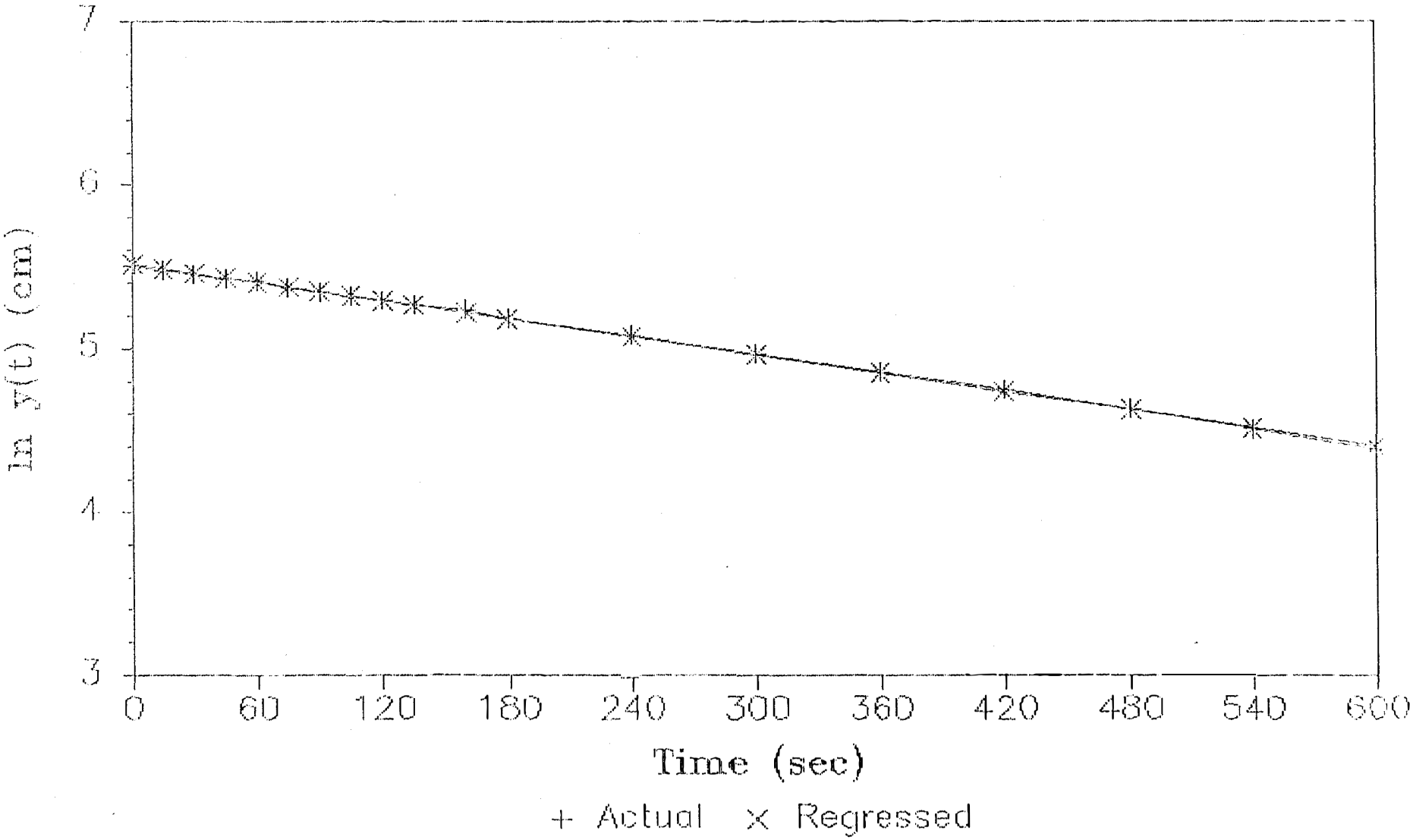
Stabilization Readings:

Gal. Removed	Depth to Water	Time	Field Temperature	Spec. Cond.	pH
20	1		42°C	1154	6.2

APPENDIX D

Aquifer Response Test
Bouwer and Rice Method

HEDLUND DX
Aquifer Response Test
MW--1



Bouwer and Rice Method

HEDLUND DX
Aquifer Response Tests - Bouwer & Rice Method
MW-1

$$K = \frac{rc^2 \ln(Re/rw)}{2Lt} \ln \frac{[y(0)]}{[y(t)]}$$

rc = casing radius = 2.54 cm
rw = borehole radius = 10.80 cm
L = screen length = 304.80 cm
D = aquifer thickness= 6,096.00 cm
H = well penetration = 291.39 cm
t = time
y(t) = drawdown @ time t

K = hydraulic conductivity = 2.3E-04 cm/s

DATA

Time (sec)	Drawdown y(t) (cm)
1.00	245.67
15.00	239.27
30.00	233.17
45.00	227.08
60.00	224.03
75.00	215.49
90.00	209.70
105.00	204.22
120.00	199.34
135.00	193.85
160.00	188.06

HEDLUND DX
Aquifer Response Tests - Bouwer & Rice Method
MW-1

180.00	178.92
240.00	160.93
300.00	143.87
360.00	128.93
420.00	115.82
480.00	103.02
540.00	91.14
600.00	80.16

Foth & Van Dyke

2.4×10^{-4} cm/s

Client: HEDLUND DX, FALIN Scope I.D.: 90581-1
Project: SLUG TEST Page: 1
Prepared by: MWD Date: 1/12/90
Checked by: Date:

AQUIFER RESPONSE TEST
FIELD DATA SHEET

Site Name: HEDLUND DX, FALIN Well: MW-1
Personnel: MWD

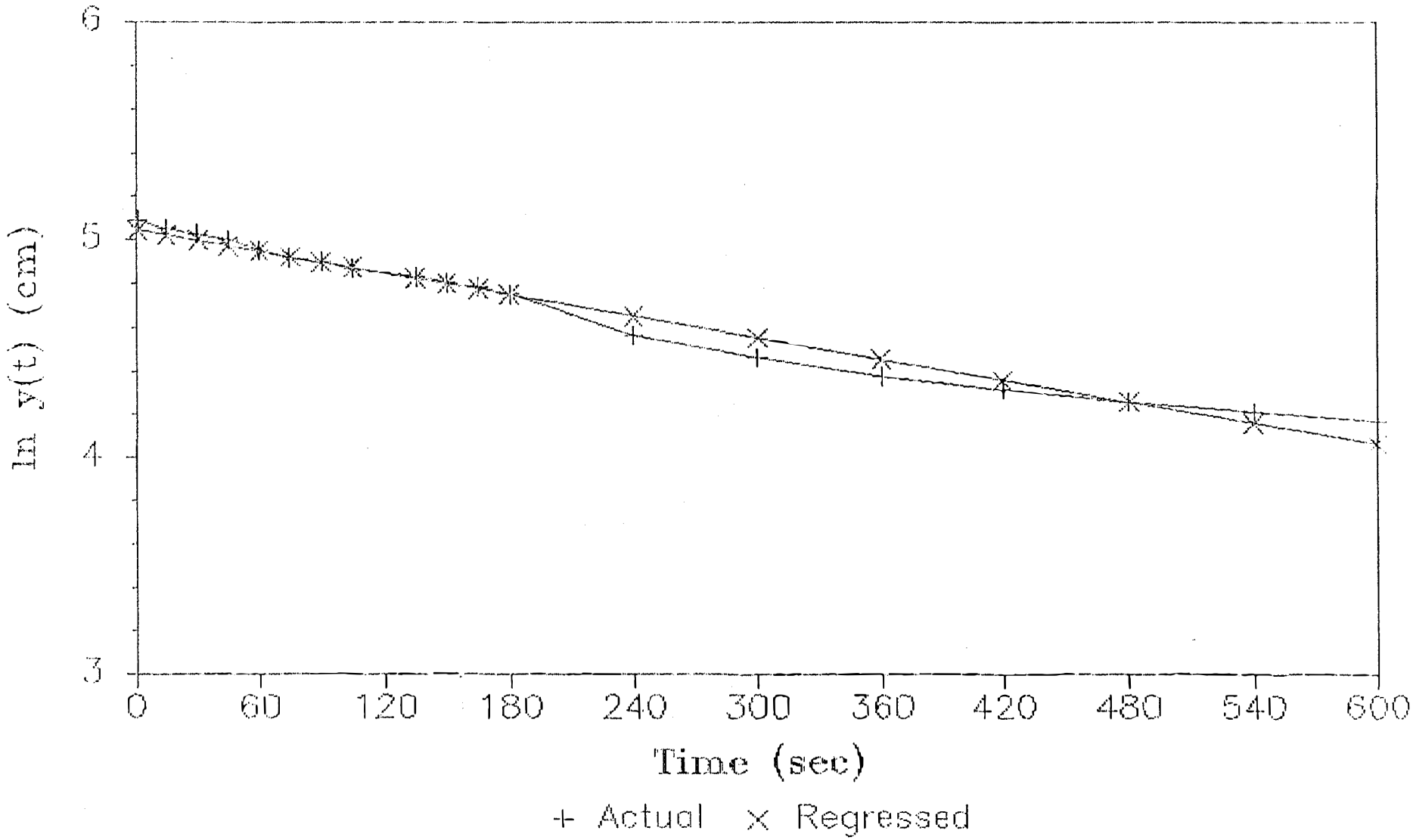
Type of Test *(Check One)*: ☒ Baildown ☐ Slug Displacement ☐ Bail Displacement
Depth to Water: 6.77 ft
Total Well Depth: 16.33 ft
Estimated Volume Removed or Displaced: 1.6 gallons
Measurement Device *(Check One)*: ☐ Transducer ☒ Water Level Indicator
Initial Transducer Reading *(If Used)*: ft

Readings

Time	Reading	Time	Reading
0	14.83	4 240	12.05
15	62	5 300	11.49
30	42	6 360	11.00
45	22	7 420	10.57
60	12	8 480	10.15
75	84	9 540	9.76
90	65	10 600	9.40
105	47		
120	31		
135	13		
160	13 74		
180	64		

Comments:

HEDLUND DX
Aquifer Response Test
MW--3



Bouwer and Rice Method

HEDLUND DX
Aquifer Response Tests - Bouwer & Rice Method
MW-3

$$K = \frac{rc^2 \ln(Re/rw)}{2Lt} \ln \frac{[y(0)]}{[y(t)]}$$

rc = casing radius = 2.54 cm
rw = borehole radius = 10.80 cm
L = screen length = 304.80 cm
D = aquifer thickness= 6,096.00 cm
H = well penetration = 293.83 cm
t = time
y(t) = drawdown @ time t

K = hydraulic conductivity = 2.1E-04 cm/s

DATA

Time (sec)	Drawdown y(t) (cm)
1.00	162.76
15.00	155.75
30.00	152.10
45.00	148.13
60.00	141.12
75.00	136.86
90.00	134.42
105.00	130.15
135.00	125.27
150.00	121.92
165.00	119.48

HEDLUND DX
Aquifer Response Tests - Bouwer & Rice Method
MW-3

180.00	115.82
240.00	96.01
300.00	86.87
360.00	79.55
420.00	74.68
480.00	70.71
540.00	67.36
600.00	64.62

Foth & Van Dyke

2.1×10^{-4}

Client: HEDLUND DX, FALIN Scope I.D.: 90581-1
Project: SLUG TEST Page: 2
Prepared by: MWD Date: 1/12/90
Checked by: Date:

AQUIFER RESPONSE TEST
FIELD DATA SHEET

Site Name: HEDLUN DX, FALIN Well: MW-3
Personnel: MWD

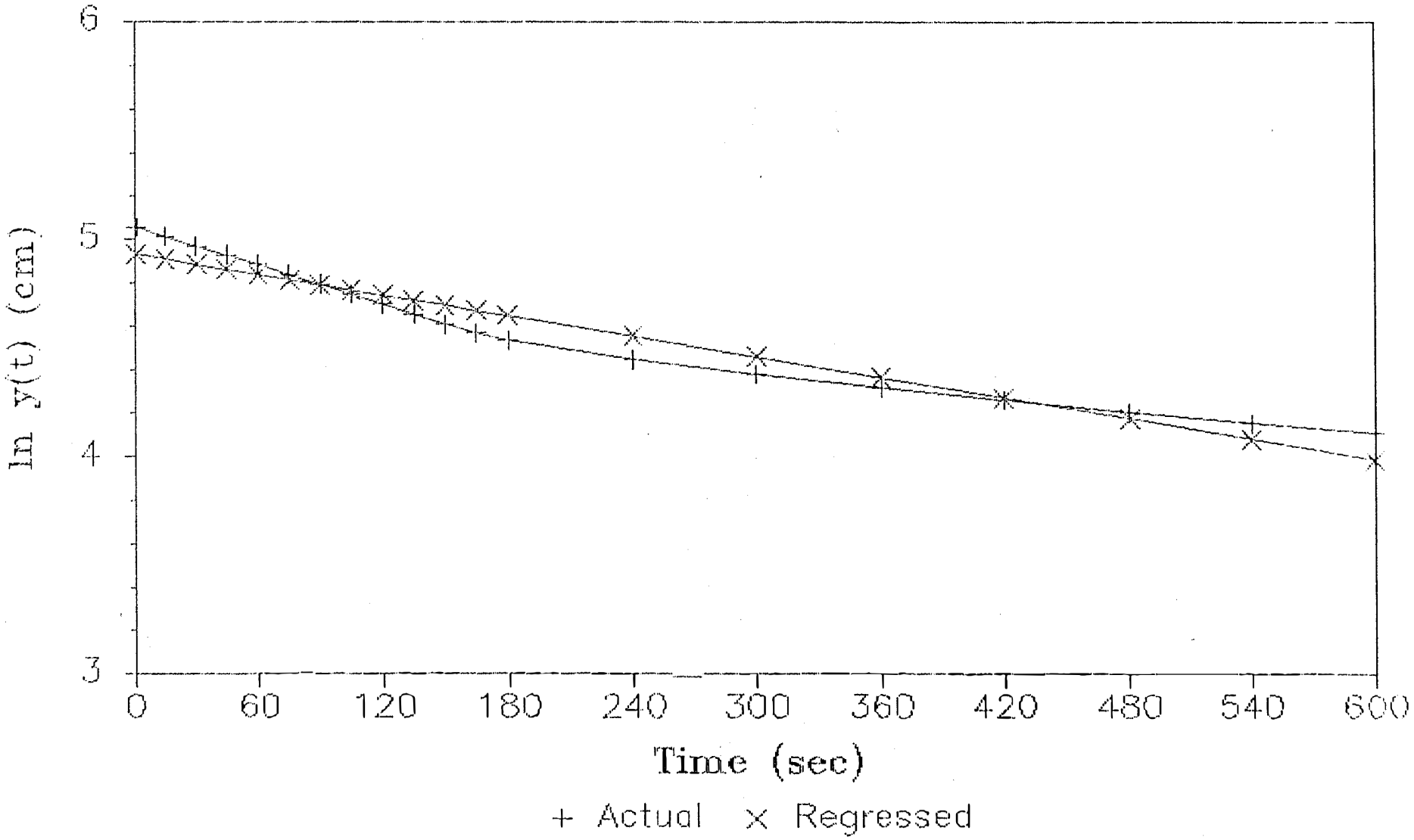
Type of Test *(Check One)*: ☒ Baildown ☐ Slug Displacement ☐ Bail Displacement
Depth to Water: 3.69 ft
Total Well Depth: 13.33 ft
Estimated Volume Removed or Displaced: 3.3 gallons
Measurement Device *(Check One)*: ☐ Transducer ☒ Water Level Indicator
Initial Transducer Reading *(If Used)*: ft

Readings

Time	Reading	Time	Reading
~~0~~ 1	9.03	4 240	6.84
15	8.84	5 300	6.54
30	8.68	6 360	6.30
45	8.55	7 420	6.14
1 60	8.32	8 480	6.01
15 75	8.18	9 540	5.90
30 90	8.10	10 600	5.81
45 105	7.96		
~~2 120~~			
15 135	7.80		
30 150	7.69		
45 165	7.61		
3 180	7.49		

Comments:

HEDLUND DX
Aquifer Response Test
MW-4



Bouwer and Rice Method

HEDLUND DX
Aquifer Response Tests - Bouwer & Rice Method
MW-4

$$K = \frac{rc^2 \ln(Re/rw) \ln \frac{[y(0)]}{[y(t)]}}{2Lt}$$

rc = casing radius = 2.54 cm
rw = borehole radius = 10.80 cm
L = screen length = 304.80 cm
D = aquifer thickness= 6,096.00 cm
H = well penetration = 301.14 cm
t = time
y(t) = drawdown @ time t

K = hydraulic conductivity = 2.0E-04 cm/s

DATA

Time (sec)	Drawdown y(t) (cm)
1.00	156.97
15.00	150.27
30.00	143.87
45.00	138.38
60.00	132.59
75.00	126.49
90.00	121.01
105.00	115.52
120.00	110.34
135.00	105.16
150.00	100.28

HEDLUND DX
Aquifer Response Tests - Bouwer & Rice Method
MW-4

165.00	96.32
180.00	93.27
240.00	85.34
300.00	79.86
360.00	75.29
420.00	71.02
480.00	67.06
540.00	63.70
600.00	60.96

Foth & Van Dyke

2.0×10^{-4}

Client: HEDLUND DX, FALIN Scope I.D.: 90581-1
Project: SLUG TEST Page: ~~2~~ 3
Prepared by: MWB Date: 1/12/90
Checked by: Date:

AQUIFER RESPONSE TEST FIELD DATA SHEET

Site Name: HEDLUND DX, FALIN Well: MW-4
Personnel: MWB

Type of Test *(Check One)*: ☒ Baildown ☐ Slug Displacement ☐ Bail Displacement
Depth to Water: 3.54 ft
Total Well Depth: 13.42 ft
Estimated Volume Removed or Displaced: _____ gallons
Measurement Device *(Check One)*: ☐ Transducer ☒ Water Level Indicator
Initial Transducer Reading *(If Used)*: _____ ft

Readings

Time	Reading	Time	Reading
0	8.69 ~~+8.82~~	4 240	6.34
15	8.47 ~~7.79~~	5 300	6.16
30	8.26 ~~7.61~~	6 360	6.01
45	8.08	7 420	5.87
1 60	7.89	8 480	5.74
15 75	7.69	9 540	5.63
30 90	7.51	10 600	5.54
45 105	7.33		
2 120	7.16		
15 135	6.99		
30 150	6.83		
45 165	6.70		
3 180	6.60		

Comments: STRONG ODOR

APPENDIX E

Laboratory Analysis Results

pace INCORPORATED
THE ASSURANCE OF QUALITY

REPORT OF LABORATORY ANALYSIS

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

January 14, 1991
PACE Project
Number: 901221536

Attn: Mr. Randall Sippel

Hedlund-Falun, WI.

Parameter	Units	MDL	10 0504920 12/20/90 12/21/90 MW-3	10 0504939 12/20/90 12/21/90 MW-1	10 0504947 12/20/90 12/21/90 MW-4
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Lead	mg/L	0.1	ND	0.2	0.4
ORGANIC ANALYSIS					
VOLATILE PETROLEUM RELATED COMPOUNDS					
Date Analyzed			H 01/03/91	H 01/06/91	H 01/04/91
Benzene	mg/L	0.001	0.006	ND HT	ND
Toluene	mg/L	0.001	0.026	0.001	ND
Ethylbenzene	mg/L	0.001	0.009	ND	ND
Xylenes	mg/L	0.003	0.049	ND	ND
Total hydrocarbons as gasoline	mg/L	0.01	0.87	0.06	0.07
Methyl tert-butyl ether	mg/L	0.004	ND	ND	ND

MDL Method Detection Limit
ND Not detected at or above the MDL.
HT Analysis conducted in excess of EPA recommended holding time.

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

REPORT OF LABORATORY ANALYSIS

January 14, 1991
PACE Project
Number: 901221536

Hedlund-Falun, WI.

PACE Sample Number:			10 0504955
Date Collected:			12/20/90
Date Received:			12/21/90
Parameter	Units	MDL	Trip Blank
ORGANIC ANALYSIS			
VOLATILE PETROLEUM RELATED COMPOUNDS			
Date Analyzed			H 01/08/91
Benzene	mg/L	0.001	ND HT
Toluene	mg/L	0.001	ND
Ethylbenzene	mg/L	0.001	ND
Xylenes	mg/L	0.003	ND
Total hydrocarbons as gasoline	mg/L	0.01	ND
Methyl tert-butyl ether	mg/L	0.004	ND

MDL Method Detection Limit
ND Not detected at or above the MDL.
HT Analysis conducted in excess of EPA recommended holding time.

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

REPORT OF LABORATORY ANALYSIS

January 14, 1991
PACE Project
Number: 901221536

Hedlund-Falun, WI.

PACE Sample Number:			10 0504882	10 0504890	10 0504904
Date Collected:			12/19/90	12/19/90	12/19/90
Date Received:			12/21/90	12/21/90	12/21/90
			B-1	B-2	B-3
Parameter	Units	MDL	5'-7'	7.5-9.5	7.5-9.5
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Lead	mg/kg	5.0	17	18	18
ORGANIC ANALYSIS					
VOLATILE PETROLEUM RELATED COMPOUNDS					
Date Analyzed			12/31/90	01/02/91	01/02/91
Benzene	mg/kg	0.12	ND	ND	1.2
Toluene	mg/kg	0.12	ND	ND	5.3
Ethyl benzene	mg/kg	0.12	ND	ND	1.5
Xylene	mg/kg	0.12	ND	ND	3.5
Total Hydrocarbons as gasoline	mg/kg	1.0	2.3	ND	46
Methyl tert-butyl ether	mg/kg	0.12	ND	ND	ND

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

pace INCORPORATED
THE ASSURANCE OF QUALITY

REPORT OF LABORATORY ANALYSIS

Mr. Randall Sippel
Page 4

January 14, 1991
PACE Project
Number: 901221536

Hedlund-Falun, WI.

PACE Sample Number:			10 0504963
Date Collected:			12/20/90
Date Received:			12/21/90
			B-4
Parameter	Units	MDL	7.5'-9.5'
INORGANIC ANALYSIS			
INDIVIDUAL PARAMETERS			
Lead	mg/kg	5.0	15
ORGANIC ANALYSIS			
VOLATILE PETROLEUM RELATED COMPOUNDS			
Date Analyzed			01/02/91
Benzene	mg/kg	0.12	2.2
Toluene	mg/kg	0.12	0.40
Ethyl benzene	mg/kg	0.12	0.17
Xylene	mg/kg	0.12	0.95
Total Hydrocarbons as gasoline	mg/kg	1.0	19
Methyl tert-butyl ether	mg/kg	0.12	0.16

MDL Method Detection Limit

The data contained in this report were obtained using EPA or other approved methodologies. All analyses were performed by me or under my supervision.

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

05706

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: [illegible] Van Dyke
Address: [illegible] Viking Drive, Suite 100 / [illegible] Prairie MN [illegible]
Phone: [illegible]

Report To: Randall Sippel
Bill To: Randall Sippel
P.O. # / Billing Reference: [illegible]
Project Name / No.: Herbung - Falling, WI

Pace Client No.: 150403
Pace Project Manager: RW
Pace Project No.: 90121536
*Requested Due Date:

Sampled By (PRINT): [illegible]
Sampler Signature: [signature]
Date Sampled: 12-11-96

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	UNPRESERVED	H_2SO_4	HNO_3	VOA			ANALYSES REQUEST: BTEX	TPH/GRO	LEAD	TOTAL PB / [illegible]	REMARKS
1	B-1 5'-7'	09:56		504882	2	X						✓	✓	✓	✓	TOTAL LEAD BY FLAME
2	~~B-1 12.5-14.5'~~	~~09:46~~			2	X										NOT SUBMITTED
3	B-2 7.5-9.5	11:39		50489.0	2	X						✓	✓	✓	✓	TOTAL LEAD BY FLAME
4	~~B-2 10-12~~	11:49			2	X										NOT SUBMITTED
5	~~B-3 3.5-4.5~~	14:16			2	X										↓
6	B-3 7.5-9.5	14:37		50490.4	2	X						✓	✓	✓	✓	TOTAL LEAD BY FLAME
7	~~B-3 12.5-14.5~~	15:06			2	X										NOT SUBMITTED
8																

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

Additional Comments

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
	Randall Sippel F.V.D		12/20/96	11:15
	Randall Sippel F.V.D	Armstrong Courier	12/21/96	12:10
		MOE - Pace	12/21/96	1:30

SEE REVERSE SIDE FOR INSTRUCTIONS

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05708

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: [illegible] Van Dyke		Report To: Randall Sippel	Pace Client No.
Address: 11940 Viking Drive Suite 100		Bill To: Randall Sippel	Pace Project Manager
Eden Prairie, MN 55344		P.O. # / Billing Reference: 90-281	Pace Project No. 901271536
Phone: [illegible] 2346		Project Name / No.: Hedlund	*Requested Due Date:

Sampled By (PRINT): Randall Sippel
Sampler Signature: Randall Sippel
Date Sampled: 12/20/[illegible]

Preservatives: Unpreserved, H_2SO_4, HNO_3, VOA, HCL

Analyses Request: Nitrate; BTEX; Total [illegible]; Dissolved [illegible]

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	UNPRESERVED	H_2SO_4	HNO_3	VOA	HCL		Analysis 1	Analysis 2	Analysis 3	Analysis 4	REMARKS
1	MW-3	11:08		504920	4					✓		✓	✓	✓	✓	Lead samples unfiltered
2	MW-1	11:17		504939	4					✓		✓	✓	✓	✓	Dissolved lead by furnace
3	MW-4	12:31		504947	3/4					✓		✓	✓	✓	✓	↓
4	Trip Blank			504955	3					✓		✓	✓	✓	✓	↓
5																
6																
7																
8																

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

Additional Comments: Trip Blank not checked in for Metals MSC

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
	Randall Sippel FVD		2/7/92	[illegible]
	Randall Sippel FVD	Armstrong, Courier	2/7/92	12:00
		MSC - Pace	12/[illegible]	13:30

SEE REVERSE SIDE FOR INSTRUCTIONS

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05707

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: Fine: Van Dyke
Address: 6240 Viking Dr. Suite 100
Eden Prairie MN 55344
Phone: 612-942-0376

Report To: Randall Sippel
Bill To: Randall Sippel
P.O. # / Billing Reference: 96-81
Project Name / No.: Hedlund

Pace Client No.:
Pace Project Manager:
Pace Project No.: 9012271536
*Requested Due Date:

Sampled By (PRINT): Randall Sippel
Sampler Signature: Randall Sippel
Date Sampled: 12/20/90

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	UNPRESERVED	H_2SO_4	HNO_3	VOA			ANALYSES REQUEST: TPH	BTEX	TOTAL GMT (LEAD)	REMARKS
1	B-4 2.5'-4.5'	7:01			2	X						~~—~~			NOT SUBMITTED
2	B-4 7.5'-9.5'	8:31 ~~2:05~~		504963	2	X						✓	✓	✓ ✓	TOTAL LEAD BY FLAME
3	B-4 12.5'-14.5'	9:05			2	X									(NOT SUBMITTED)
4															
5															
6															
7															
8															

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

Additional Comments

Only 1 JV rec'd

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
	Randall Sippel FVD		12/20/90	16:15
	Randall Sippel FVD	Armstrong Courier	12/21/90	12:00
		McG... Pace	12/21/90	17:35

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REPORT OF LABORATORY ANALYSIS

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

April 04, 1991
PACE Project Number: 910321526

Attn: Mr. Randall Sippel

Hedlund Dx

Parameter	Units	MDL	10 0110892 03/21/91 03/21/91 MW-1	10 0110906 03/21/91 03/21/91 MW-3	10 0110914 03/21/91 03/21/91 MW-4
PACE Sample Number:					
Date Collected:					
Date Received:					
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Lead, Dissolved	mg/L	0.001	ND	ND	0.04 (SC)
ORGANIC ANALYSIS					
VOLATILE PETROLEUM RELATED COMPOUNDS					
Date Analyzed			H 03/30/91	H 04/01/91	04/01/91
Benzene	ug/L	1.0	ND	-	-
Benzene	ug/L	20	-	-	6900
Benzene	ug/L	5.0	-	1700	-
Toluene	ug/L	1.0	ND	-	-
Toluene	ug/L	20	-	-	12000
Toluene	ug/L	5.0	-	890	-
Ethylbenzene	ug/L	1.0	1.0	-	-
Ethylbenzene	ug/L	20	-	-	1600
Ethylbenzene	ug/L	5.0	-	450	-
Xylenes	ug/L	10	-	1600	-
Xylenes	ug/L	2.0	9.3	-	-
Xylenes	ug/L	40	-	-	7800
Total hydrocarbons as gasoline	ug/L	10	78	-	-
Total hydrocarbons as gasoline	ug/L	200	-	-	120000
Total hydrocarbons as gasoline	ug/L	50	-	27000	-
Methyl tert-butyl ether	ug/L	20	-	88	-
Methyl tert-butyl ether	ug/L	4.0	ND	-	-
Methyl tert-butyl ether	ug/L	80	-	-	ND

MDL Method Detection Limit
ND Not detected at or above the MDL.
SC Interregional work is verified by the laboratory managers in the region in which the work was performed.

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

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REPORT OF LABORATORY ANALYSIS

Mr. Randall Sippel
Page 2

April 04, 1991
PACE Project Number: 910321526

Hedlund Dx

PACE Sample Number:			10 0110922
Date Collected:			03/21/91
Date Received:			03/21/91
Parameter	Units	MDL	Travel Blank
ORGANIC ANALYSIS			
VOLATILE PETROLEUM RELATED COMPOUNDS			
Date Analyzed			H 03/29/91
Benzene	ug/L	1.0	ND
Toluene	ug/L	1.0	ND
Ethylbenzene	ug/L	1.0	ND
Xylenes	ug/L	2.0	ND
Total hydrocarbons as gasoline	ug/L	10	ND

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

The data contained in this report were obtained using EPA or other approved methodologies. All analyses were performed by me or under my supervision.

Starla Enger
Inorganic Chemistry Manager

Liesa A. Shanahan
Organic Chemistry Manager

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

2C534

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CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: FOTH & VANDYKE
Address: 1390 VIKING DR SUITE 100
EDEN PRAIRIE MN 55344
Phone: 242-0396

Report To: RANDELL SIPPEL
Bill To: FOTH & VANDYKE
P.O. #/ Billing Reference: HEDLUND DX
Project Name / No.: HEDLUND DX

Pace Client No.:
Pace Project Manager: RLV
Pace Project No.:
*Requested Due Date:

Sampled By (PRINT): MICHAEL BLUMA
Sampler Signature
Date Sampled

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H₂SO₄	HNO₃	VOA			ANALYSES REQUEST: BETX	MTBE	TPH as GAS	DIS LEAD*							REMARKS
1	MW-1	1215	WATER	11089.2	4			1	3			x	x	x	x							
2	MW-3	1227		90.6	4			1	3			x	x	x	x							
3	MW-4	1242		91.4	4			1	3			x	x	x	x							
4	TRIP BLANK			92.2	2				2			x										
5																						
6																						
7																						
8																						

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

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
	[signature] FHD	[signature]	3/21	

Additional Comments

* DIS LEAD TO BE DONE BY FURNACE METHOD

SEE REVERSE SIDE FOR INSTRUCTIONS