MTS

MARATHON TECHNICAL SERVICES LLC

1699 Schofield Ave
Suite 115
Schofield, WI 54476
Phone: 715-843-7292

Village of Kronenwetter

2023
Well Site Investigation Study

WISCONSIN
MARK W. THOMPSON
E-17891
WESTON, WIS
PROFESSIONAL ENGINEER

March 7, 2023

Table of Contents

List of Figures

List of Tables

List of Appendices

SECTION 1

Introduction

The Kronenwetter Sanitary District No. 2 first started providing municipal potable water supply in 1996. Two wells were constructed that year to provide water to 700 customers in the Evergreen neighborhood. Since then, the customer count has grown to 2,474. The original two wells still provide the only water supply to the system.

Water quality issues, with high mineral content (primarily manganese), has reduced the current reliance on the Well No. 2 supply. The water supply from Well No. 2 has been throttled back 30%, to 500 gpm. The Well 1 and Well 2 waters are blended together, to reduce the manganese concentrations, before entering the distribution system.

A metered water main connection has been constructed to purchase water from the adjacent Village of Rothschild. However, current high levels of PFAS in the Rothschild water has postponed its use.

The construction of a third Kronenwetter well is the next step in its master plan to address water quality and water quantity issues. The search for a third well site began nearly 10 years ago. It's goal was to find a good water supply (one not requiring treatment) in the Maple Ridge Road or the current well field site on Lea Road.

SECTION 2

Proposed Well Site Location

The site being evaluated for the next Kronenwetter well is located on Pine Road, west of Tower Road. This site was considered in the late 1980's as a location for one of the original Kronenwetter Sanitary District No. 2 wells. However, high iron levels eliminated it, in favor of the two current wells, which originally did not need any treatment.

The site under consideration is currently owned by the Village and contains the water system water tower, a soccer field and a small playground. The parcel is 9.74 acres in size. The dimensions, east/west along Pine Road, are339 feet and 1,287 feet north/south, along Tower Road. Figure 1 is an aerial view of the parcel and its surroundings. The well would most likely be located in the southwest corner of the parcel. This is the area of a previous 1989 test well site.

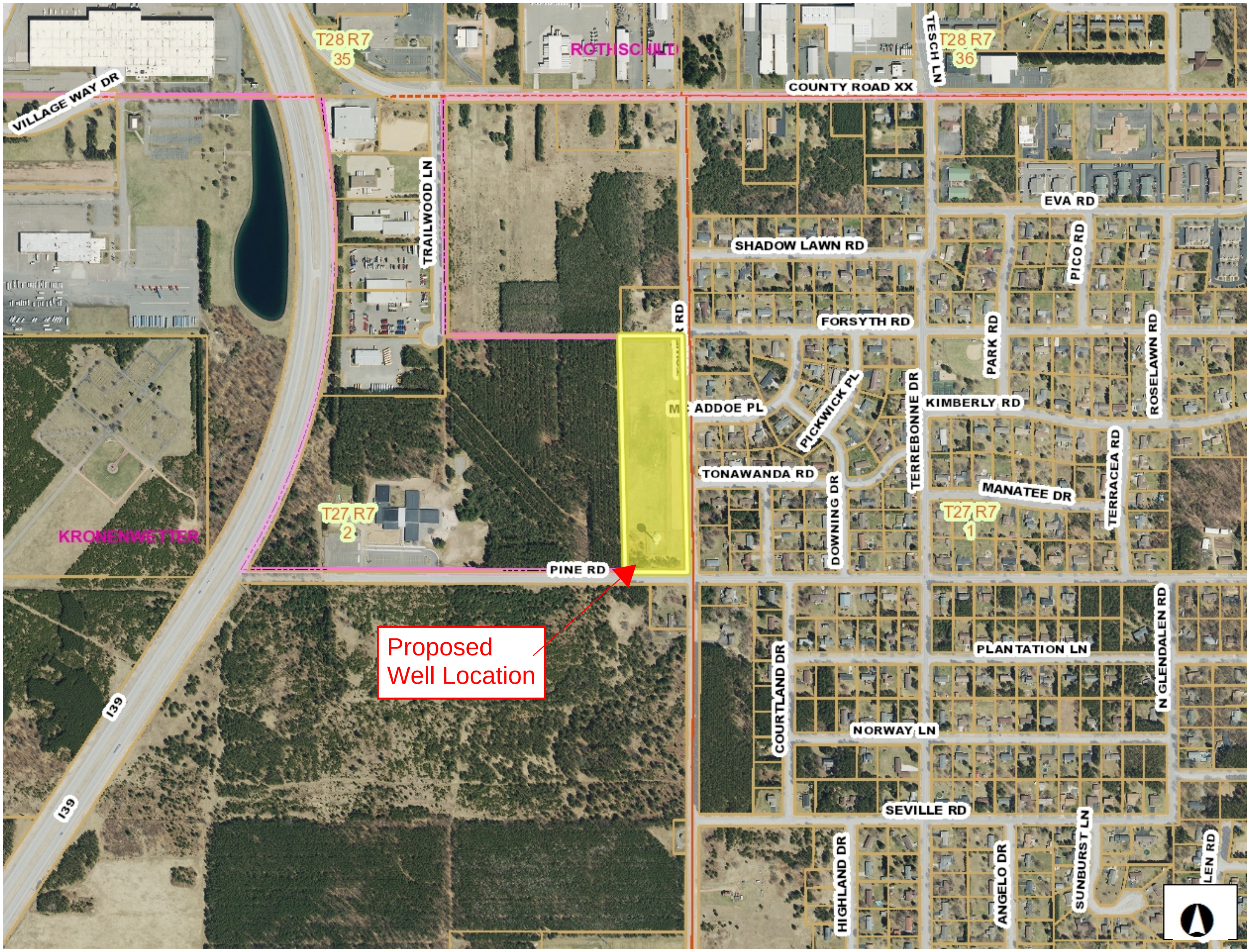
The proposed parcel is part of the southeast quarter of the northeast quarter of Section 2, Township 27 North, Range 7 East. The site latitude is 44.85164 North and longitude 89.62993 West.

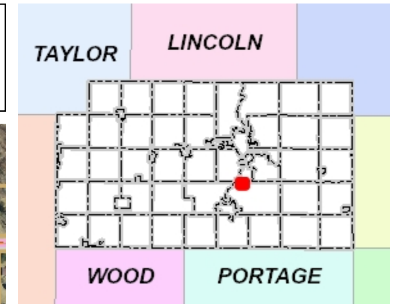
The parcel under consideration has very low relief. There is only four feet of elevation change over the nearly 10 acre parcel. Within a 1,200 feet radius of the site, the maximum elevation change is nine feet (1170 to 1179) as shown on the contour map, presented as Figure 2.

There are three surface waters near the proposed site. The Bull Junior Creek is located 4,600 feet to the south. To the north, 6,400 feet, is the Cedar Creek and the Wisconsin River is located 8,700 feet to the west.

Figure 1. Parcel Map

Land Information Mapping System





Legend

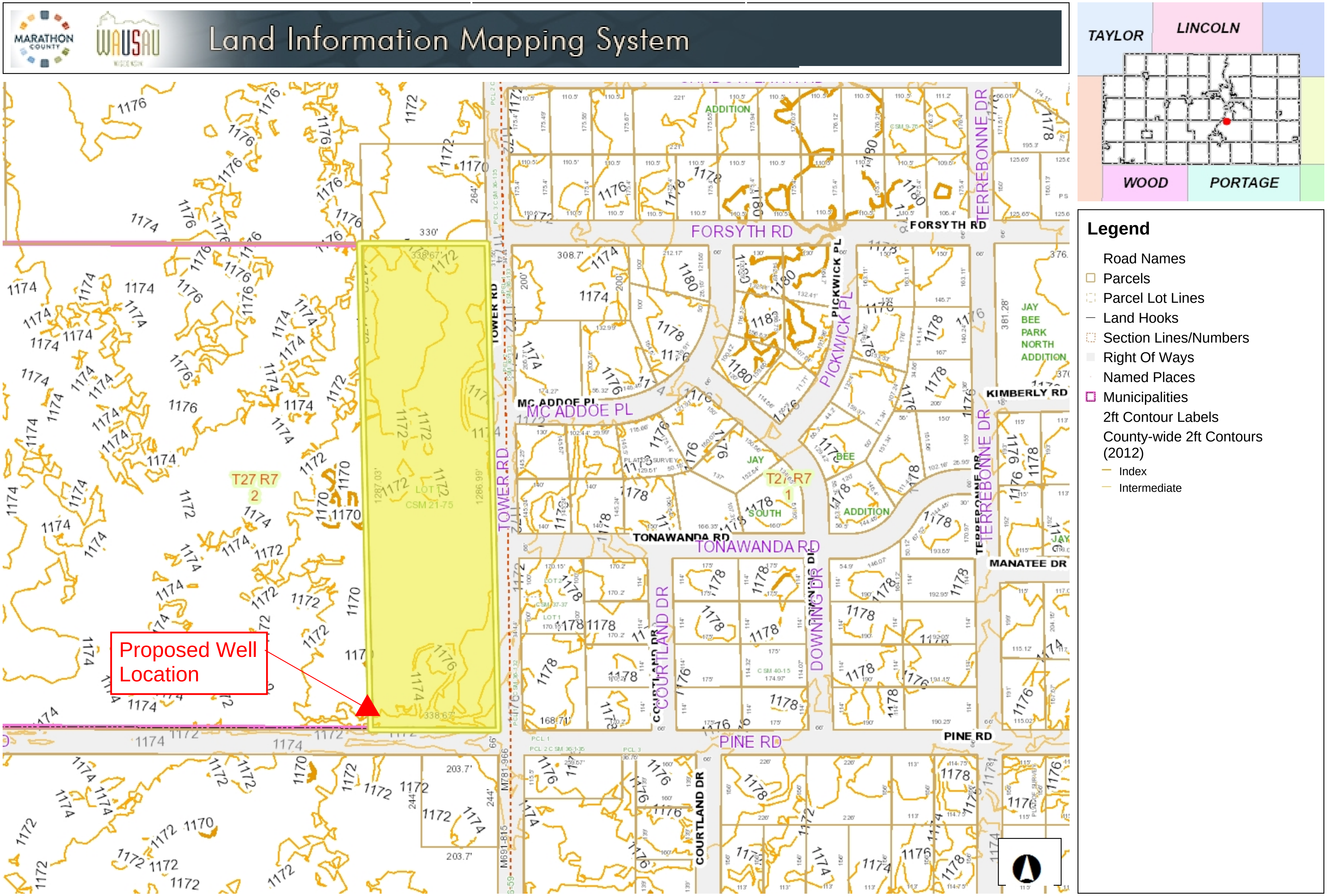
- Road Names
- Parcels
- Parcel Lot Lines
- Land Hooks
- Section Lines/Numbers
- Right Of Ways
- Named Places
- Municipalities
- 2020 Orthos Countywide
  - Red: Band_1
  - Green: Band_2
  - Blue: Band_3

405.63 0 405.63 Feet

NAD_1983_HARN_WISCRS_Marathon_County_Feet

Notes

Figure 2. Topographic Map



168.93 0 168.93 Feet

NAD_1983_HARN_WISCRS_Marathon_County_Feet

There are floodplain areas associated with the Bull Junior Creek principally to the south of the parcel, but also on the parcel of the proposed well site. Updated mapping has recently been completed. The preliminary floodplain maps (awaiting final FEMA approval) are shown in Figure 3.

SECTION 3

Geological Formation

The proposed site is part of the Wausau Aquifer. The formation is of alluvial deposits along the Wisconsin River, Cedar Creek and Bull Junior Creek, often to 80 to 100 feet thick.

In 1975 a well was drilled west of the proposed Kronenwetter site for the Evergreen School. The well log, contained in Appendix A, lists sand and gravel from the surface to 55 feet, sand from 55 to 60 feet and again sand and gravel from 60 to 83 feet. The well is screened from 74 to 83 feet.

In 1989, as part of the well site search for Kronenwetter Sanitary District No. 2, a test well was drilled at the currently proposed site. The 1989 test pumping revealed a high iron content. Water treatment was not being considered at the time, so the site was dropped from consideration. The well log is contained in Appendix B and generally is described as fine to coarse sand from the surface to the end of boring at 90 feet deep.

SECTION 4

Other Wells

There are a number of public and private wells in the area. Kronenwetter' s two existing municipal wells (PWS 73717006 – ID's – Well No. 1 LI607 and Well No. 2 KO361) are located approximately 5,500 feet to the southeast of the site under consideration. The Village of Weston has one municipal well (PWS 73701639- ID VX756), the Foremost/Kerry well, located approximately 6,300 feet to the northwest. These well sites are shown in Figure 4.

A single-family dwelling (2277 Tower Road) located southward across Pine Road from the proposed well site utilizes a private well for its domestic water supply. This well is approximately 300 feet south/southeast of the proposed well site. This parcel with the private well site is shown in Figure 5. At the time of the Sanitary District's Evergreen Project, this dwelling was not within the District. However, it is on a boundary street that contains municipal sewer and water. As part of the Evergreen Project, sewer and water services were extended to the right-of-way for this dwelling.

The single-family developments to the east of the proposed site were constructed with private water systems, so at one time, they all had wells. With the construction of the municipal water system, many of those wells have been abandon. However, generally within 1,600 feet of the proposed well site, there are 24 dwellings with permitted private garden wells. These parcels are listed in Table A and shown in Figure 5.

Figure 3. Flood Plain Map

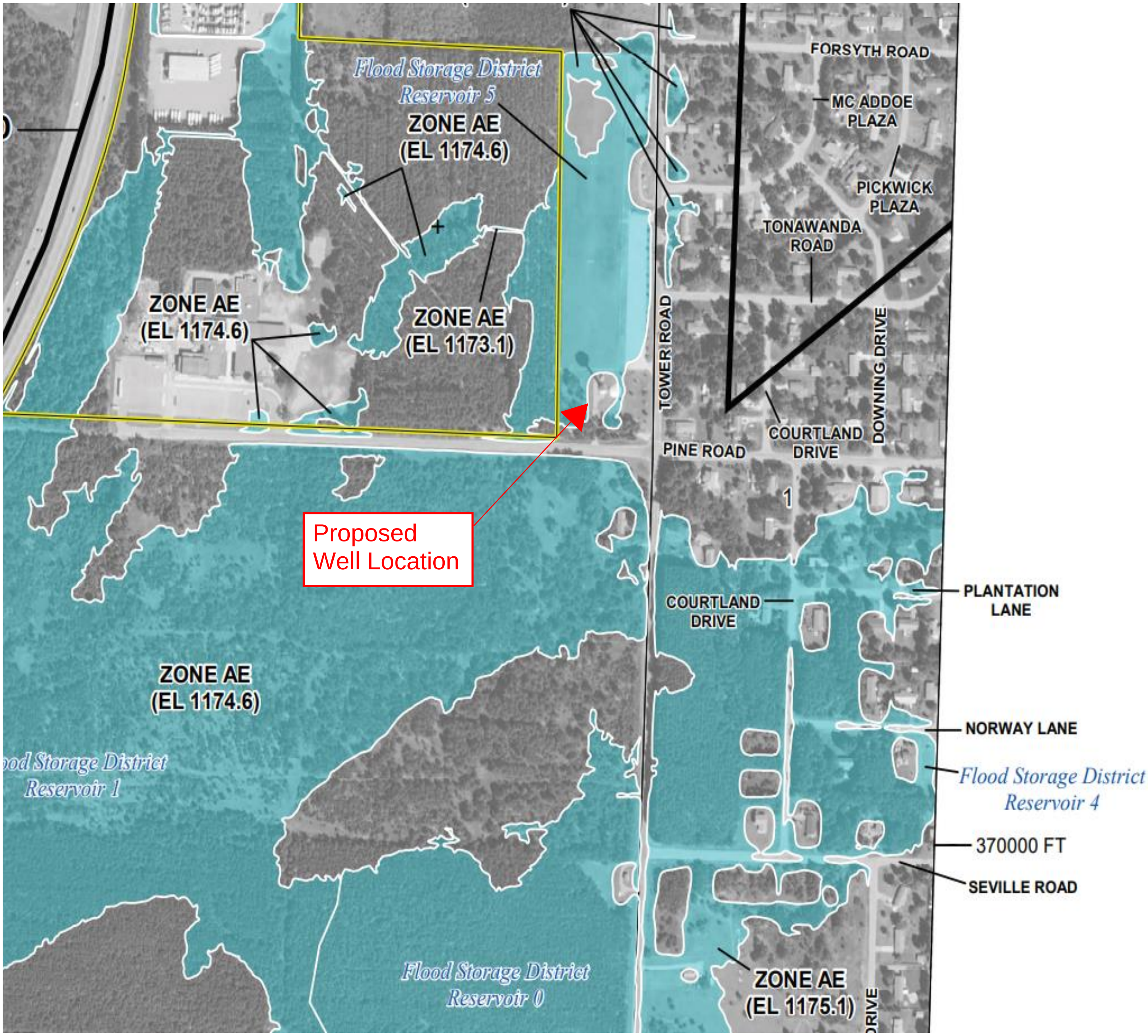


TABLE A - PRIVATE WELLS

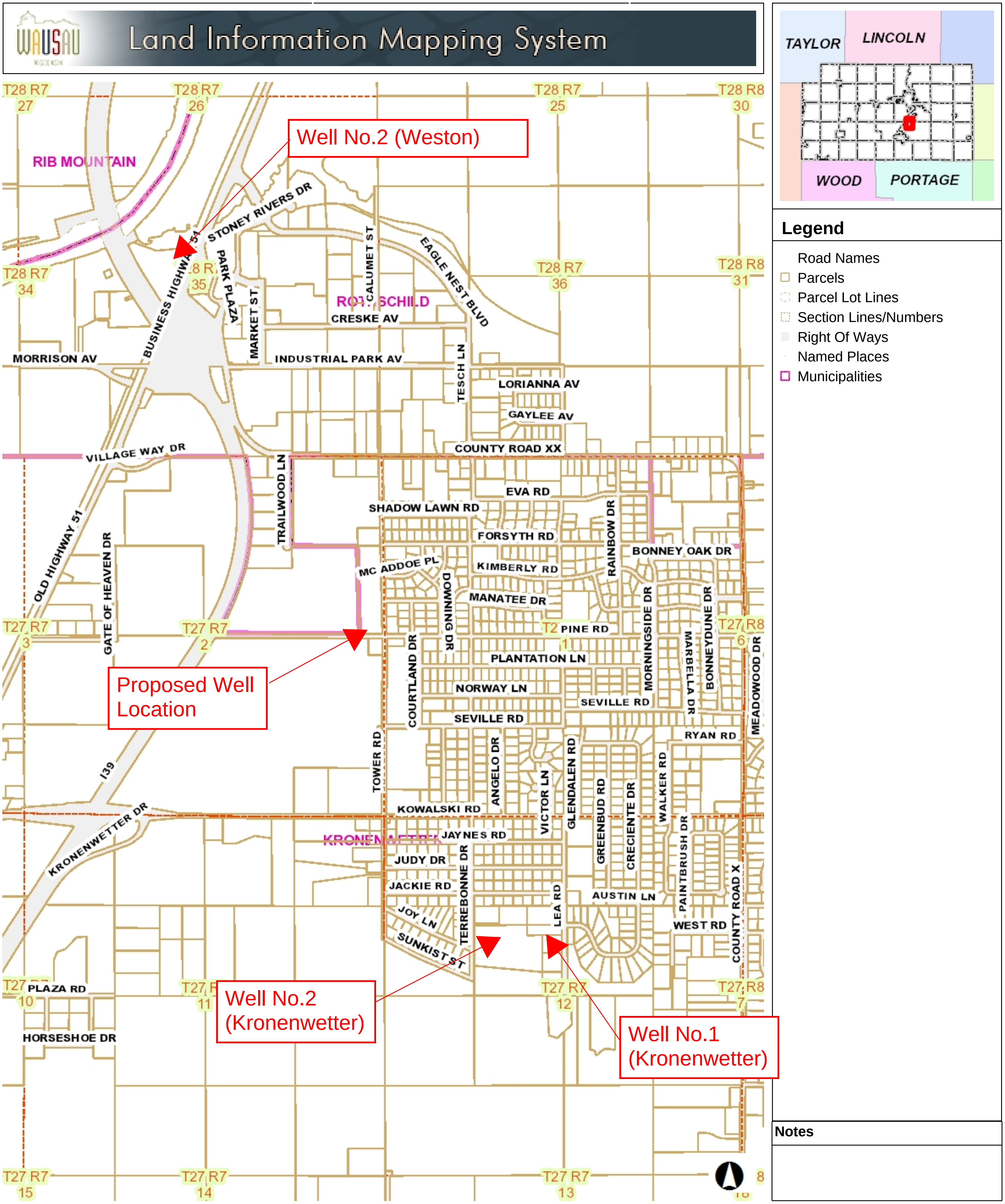
Private Well - Residential Domestic Supply

No.	Address	Street	Approx. Distance
1	`2277	Tower Road	300

Private Well - Garden Well (No Domestic Supply)

No.	Address	Street	Approx. Distance
1	2263	Courtland	1,000
2	2293	Courtland	800
3	2301	Courtland	625
4	2311	Courtland	600
5	2312	Courtland	800
6	1772	Norway	1,600
7	1792	Norway	1,800
8	1773	Plantation	1,475
9	1774	Plantation	1,350
10	2314	Downing	1,250
11	2324	Downing	1,250
12	2354	Downing	1,300
13	1717	McAddoe	800
14	1728	McAddoe	1,000
15	1762	McAddoe	1,300
16	1700	Tonawanda	600
17	1701	Tonawanda	625
18	1730	Tonawanda	800
19	1749	Tonawanda	1,100
20	1750	Tonawanda	1,125
21	1760	Tonawanda	1,300
22	1793	Tonawanda	1,500
23	2370	Pickwick	1,450
24	2377	Pickwick	1,400

Figure 4. Other Municipal Wells

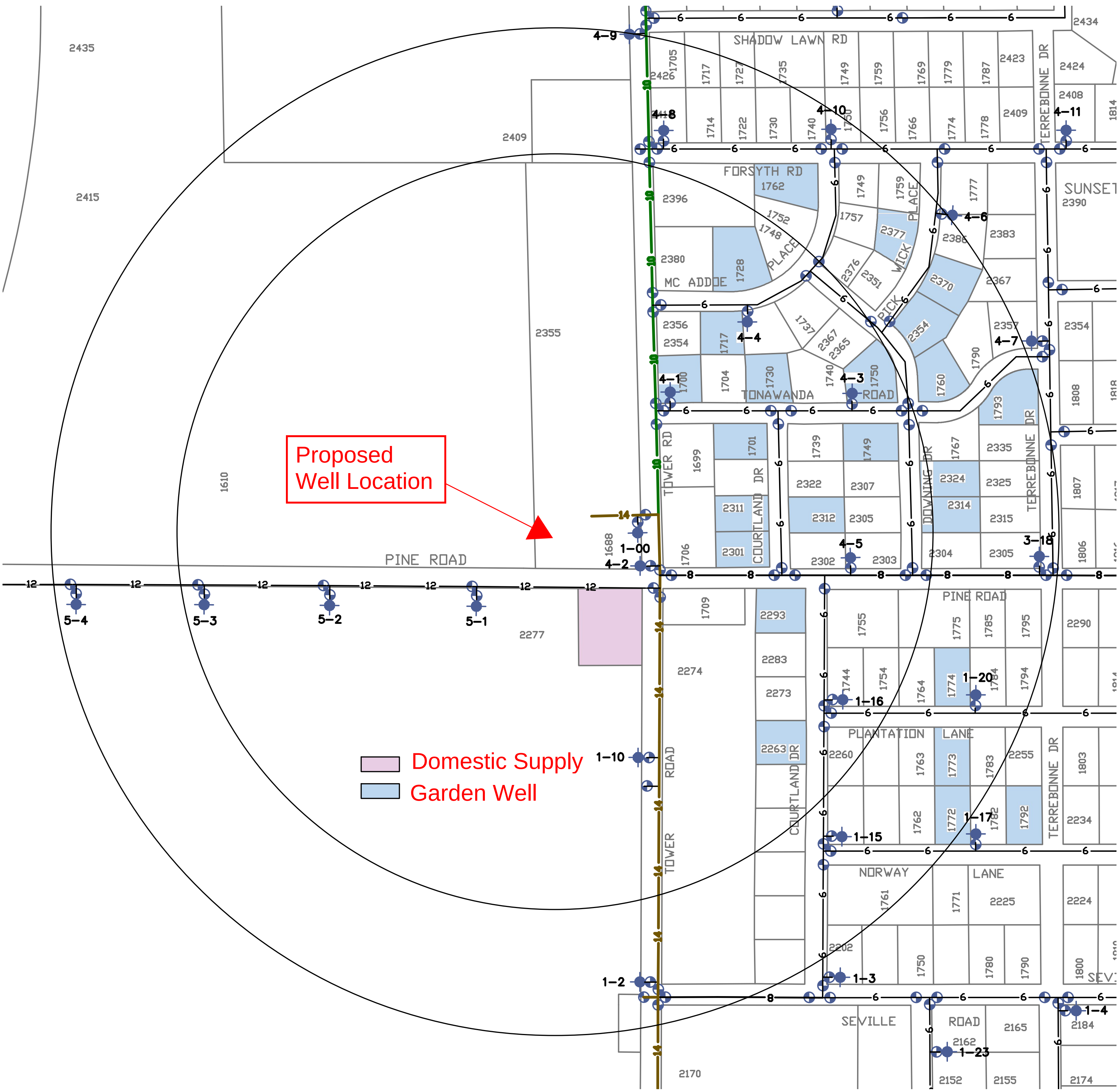


DISCLAIMER: The information and depictions herein are for informational purposes and Marathon County-City of Wausau specifically disclaims accuracy in this reproduction and specifically admonishes and advises that if specific and precise accuracy is required, the same should be determined by procurement of certified maps, surveys, plats, Flood Insurance Studies, or other official means. Marathon County-City of Wausau will not be responsible for any damages which result from third party use of the information and depictions herein or for use which ignores this warning.

NAD_1983_HARN_WISCRS_Marathon_County_Feet

THIS MAP IS NOT TO BE USED FOR NAVIGATION

Figure 5. Private Wells



SECTION 5

Land Use

Much of the land around the proposed well site is under-developed. An aerial view of the area is shown in Figure 6. Large parcels north and south of the site remain vacant. However, they are within Village commercial/industrial TID's. An elementary school utilizes a small portion of its large parcel. The highest density developments are single family subdivisions to the east.

The parcel under consideration for a future well site is currently Village owned and contains a water tower, soccer field and a small playground area. Some 25 years ago the parcel was part of a pine tree plantation. Prior to the parcel being planted with pine trees, the area was cropland, primarily planted with potatoes.

On the adjacent parcel, to the west, part of the pine plantation remains. The west parcel is owned by the DE Everest School District and includes an elementary school, on 29 acres.

The lands to the east are developed with single family dwellings. Originally developed in the 1970's, the dwellings were serviced by private wells and septic systems, but for the past 25 years they have been on municipal sewer and water.

Southward, across Pine Road from the proposed site, there is a single-family dwelling on a small parcel. While municipal sewer and water mains exist in Tower Road adjacent to the dwelling (and sewer/water service lines are extended to the right of way), this dwelling remains serviced by on-site private water well and septic systems. The balance of the lands south of the site are vacant. The lands are in a Village industrial/commercial TID.

The 40-acre parcel to the north of the site is vacant lands. Again, the lands are in a Village TID for commercial development.

To the northwest, in the Village of Rothschild, along Trailwood Dr., there is some existing retail, commercial and service-related development. These land uses range from banking to heavy bus/truck maintenance and repair businesses. These land uses are listed in the following section.

SECTION 6

Potential Contamination Sources

Within a 0.5 mile radius of the proposed well site there are a number of large vacant parcels and large under developed parcels, such as the school site. There are also several single-family subdivisions in the area. We have identified all non-residential land uses, labeling their locations in Figure 7. We have listed their names, addresses, land use and potential for groundwater contamination in Table B. Some of the structures may not fall within the 0.5 mile radius, but part of the parcels that they lay on do (such as Wausau Homes and the Gate of Heaven Cemetery).

Figure 6. Land Use Aerial Map

Land Information Mapping System

Legend

- Road Names
- Parcels
- Parcel Lot Lines
- Section Lines/Numbers
- Right Of Ways
- Named Places
- Municipalities
- 2020 Orthos Countywide
  - Red: Band_1
  - Green: Band_2
  - Blue: Band_3

Notes

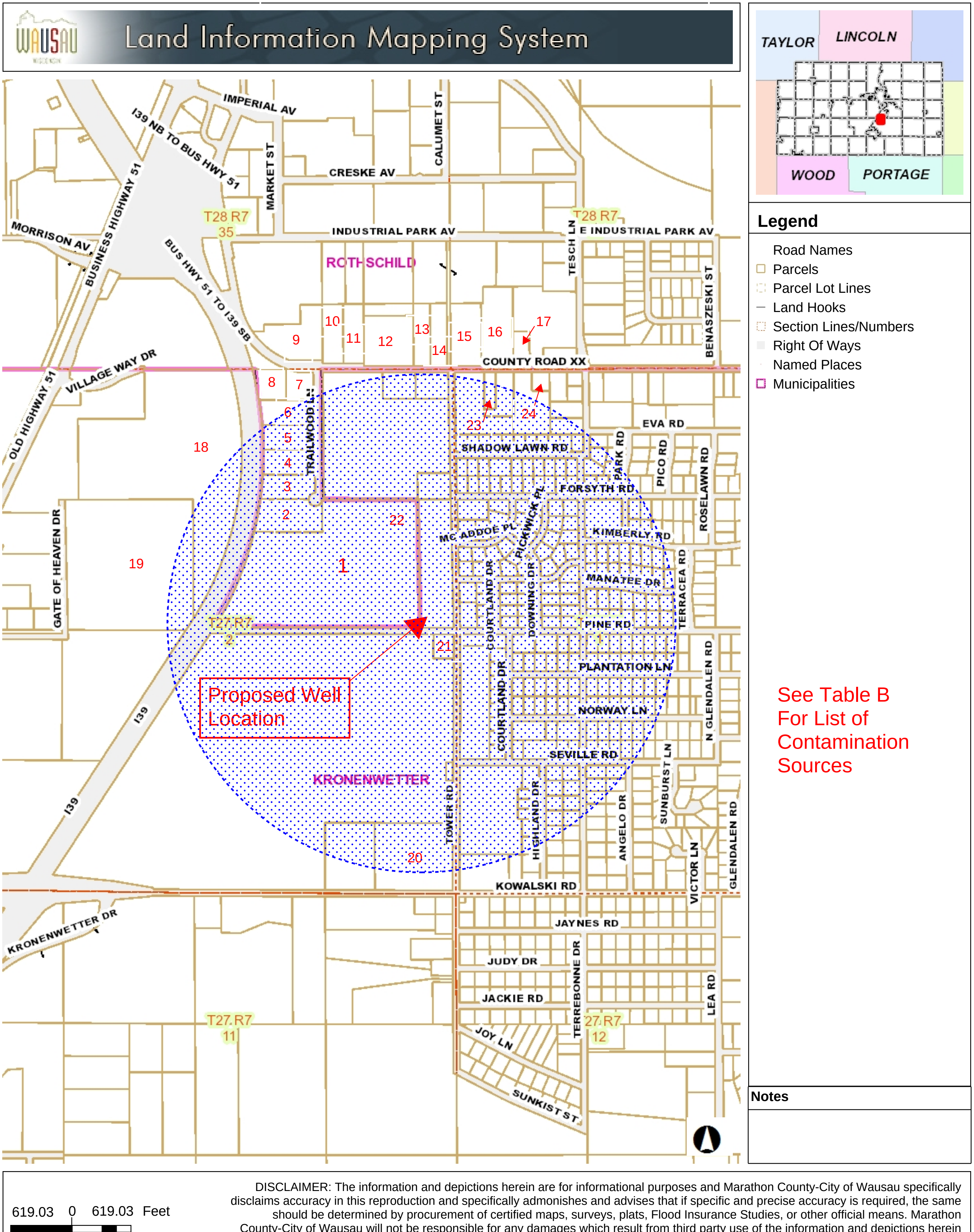
759.64 0 759.64 Feet

DISCLAIMER: The information and depictions herein are for informational purposes and Marathon County-City of Wausau specifically disclaims accuracy in this reproduction and specifically admonishes and advises that if specific and precise accuracy is required, the same should be determined by procurement of certified maps, surveys, plats, Flood Insurance Studies, or other official means. Marathon County-City of Wausau will not be responsible for any damages which result from third party use of the information and depictions herein or for use which ignores this warning.

NAD_1983_HARN_WISCRS_Marathon_County_Feet

THIS MAP IS NOT TO BE USED FOR NAVIGATION

Figure 7. Contamination Sites - 0.5-mile Radius



DISCLAIMER: The information and depictions herein are for informational purposes and Marathon County-City of Wausau specifically disclaims accuracy in this reproduction and specifically admonishes and advises that if specific and precise accuracy is required, the same should be determined by procurement of certified maps, surveys, plats, Flood Insurance Studies, or other official means. Marathon County-City of Wausau will not be responsible for any damages which result from third party use of the information and depictions herein or for use which ignores this warning.

NAD_1983_HARN_WISCRS_Marathon_County_Feet

THIS MAP IS NOT TO BE USED FOR NAVIGATION

TABLE B

Potential Contamination Sources Within 0.5 Miles					
Map No.	Name	Street	No.	Land Use	Potential Contamination
1	Evergreen Elem School	Pine	1610	school	low
2	Lamers	Trailwood	2415	intercity bus facility	petro products
3 & 4	Truck Country	Trailwood		truck sales & repair	petro products
5	Culligan Water	Trailwood	2465	water bottling	low
6	Pan-O-Gold Bakery	Trailwood	2485	retail & distribution	low
7	Co-Vantage Savings	CTH XX	1585	banking	low
8	Emmons Bus. Interiors - Lang Equipment	CTH XX	1575	office interiors motor sports	low petro products
9	Harley-Davidson	CTH XX	1570	motor cycle sales & repair	petro products
10 & 11	Carpenters Union	CTH XX	1630	training facility	low
12	Old Dominion Freightline	CTH XX	1660	freight terminal	low
13	BRB Auto Body	CTH XX	1680	auto repair	petro products
14	Southside Tire	CTH XX	1690	auto & Truck repair	petro products
15 & 16	L & S Electric	CTH XX	1730	electric motor repair	petro products
17	Krueger Wholesale Florist	CTH XX	1750	greenhouse & distribution	low
18	Wausua Homes	Village Way Dr		home building	low
19	St. Therese	Gate of Heaven	1399	cemetery	low
20	Northland Lutheran HS	Tower Rd	2107	high school	low
21	Lift Station No. 1	Tower Rd		sewerage lift station	low
22	Lift Station No. 3	Tower Rd		sewerage lift station	low
23	Prime Design	CTH XX	1721	office	low
24	Water Meter Station	CTH XX	1767	water meter building	low

There are a number of businesses that involve auto, bus and/or truck maintenance and repair. These would have moderate to high potentials for groundwater contamination from cleaning solvents, oils and fuels. However, all these locations are down gradient of the proposed well site based on groundwater contours (by Kendy) and groundwater modeling (by WRWA). This will be discussed further in the following section.

A review of the inventory of contamination sites shows no active sites within 0.5 miles of the proposed site. There are seven (7) closed sites in the area. There are three of these sites, where the property falls within the 0.5 mile radius, but the structures are outside of it. These three sites are 1) Site 12 (on Figure 7), the Old Dominion Freight terminal and 2) Site 18 the Wausau Homes site, which has two closed sites.

There is one land use existing within the required separation distances as established in NR 811.12(5)(d). An existing single -family dwelling south of the proposed site, at 2207 Tower Rd, remains on a private on-site waste disposal system, approximately 300 feet from the proposed well site. Tower Rd contains municipal sewer and water facilities. This dwell has been provided service laterals extended to the property line. However, at the time of the Evergreen sewer/water project, the dwelling was outside of the Sanitary District and not required or allowed to connect. Initially, with the dwelling outside of the Sanitary District there was no legal means to require the dwelling to be connected. Since the Village incorporation the Sanitary District has dissolved in favor of a village operated wastewater collection system. There are several of these situations, dwellings with service laterals but not connected, throughout the Village. To date there has been no effort by the Village to require connection to the municipal facilities. With service laterals readily available, in this case to eliminate a contamination source, a required connect maybe be easy to justify.

A table of the separation distances and any conflicts are presented in the following Table C.

TABLE C

Potential Contamination Sources			
Separation Distance	Contamination Sources	Sites	Sources nearby
50 feet	Sanitary or Storm sewer not constructed of water main materials	None	Tower Rd. Approx 250 ft
200 feet	1 or 2 family heating oil tanks or POWTS system tanks	None	POWTS Approx. 300 ft
300 feet	Farm Storage tanks	None	
400 feet	POWTS dispersal systems < 12,000 gpd, cemetery, storm water basins	POWTS Approx. 300 ft	Cemetery Approx 3,000 ft
600 feet	Farm storage tanks	None	
1,000 feet	Land spreading wastewater, wastewater lagoons	None	
1,200 feet	Solid waste handling facilities, landfills, groundwater contamination sites, coal storage	None	Coal Storage Approx. 5,000 ft

SECTION 7

Groundwater Conditions

The northwestern quadrant and western edge of the Village lie over the Wausau Aquifer, as defined by Kendy and Bradbury in 1989. The balance of the Village is, generally, thin loamy soils over high bedrock. The thickness of the sand and gravel formation ranges from, the deepest, 80 to 100 feet thick to very thin depths eastward along the Bull Junior Creek. The depth of formation and groundwater surfaces have been presented in several previous engineering studies for the Village by BHA, CWE and others, generally all based on the Kendy/Bradbury work. The BHA depth of formation map is shown in Figure 8.The two existing wells and the proposed site are located in an eighty foot plus depth finger shaped trough.

The groundwater surface contours by Kendy/Bradbury are shown in Figure 9. In the area of the proposed well the wetted formation is approximately 60 feet thick. The surface contours indicate a general groundwater flow in a northwesterly direction.

The Village has worked with Wisconsin Rural Water Association (WRWA) to evaluate the groundwater flows around the proposed site. There is some commercial development concept planning for the vacant 40 acre parcel north of the proposed well site parcel. The Village wanted to be proactive during rezoning and site development plans if the proposed well site might be impacted by land uses on this 40 acre parcel.

The WRWA technical memorandum is presented in Appendix C. the report confirmed the 40 acre parcel and the Rothschild Trailwood businesses are all down gradient from the proposed well site. The Five Year time of travel contours, contributing to a well pumping at the proposed site, travel outward to the southeast, as shown in Figure 10.

The cone of depression for the 1989 test pumping was calculated to be at an approximate radius of 750 feet. This cone would not impact the private garden wells. However, depending upon the pump depth setting in the domestic well at 2270 Tower Rd there may be some impact on the private well. Additional data on the private well is needed.

SECTION 8

Previous Test Pumping Results

The current water demand has been relatively stable, increasing slight from year to year. The average daily pumpage for 2022 was 380,589 gallons. The past five (5) year annual pumpage from Wells Nos. 1 and 2 is presented in Table D.

Figure 8. Depth of Formation

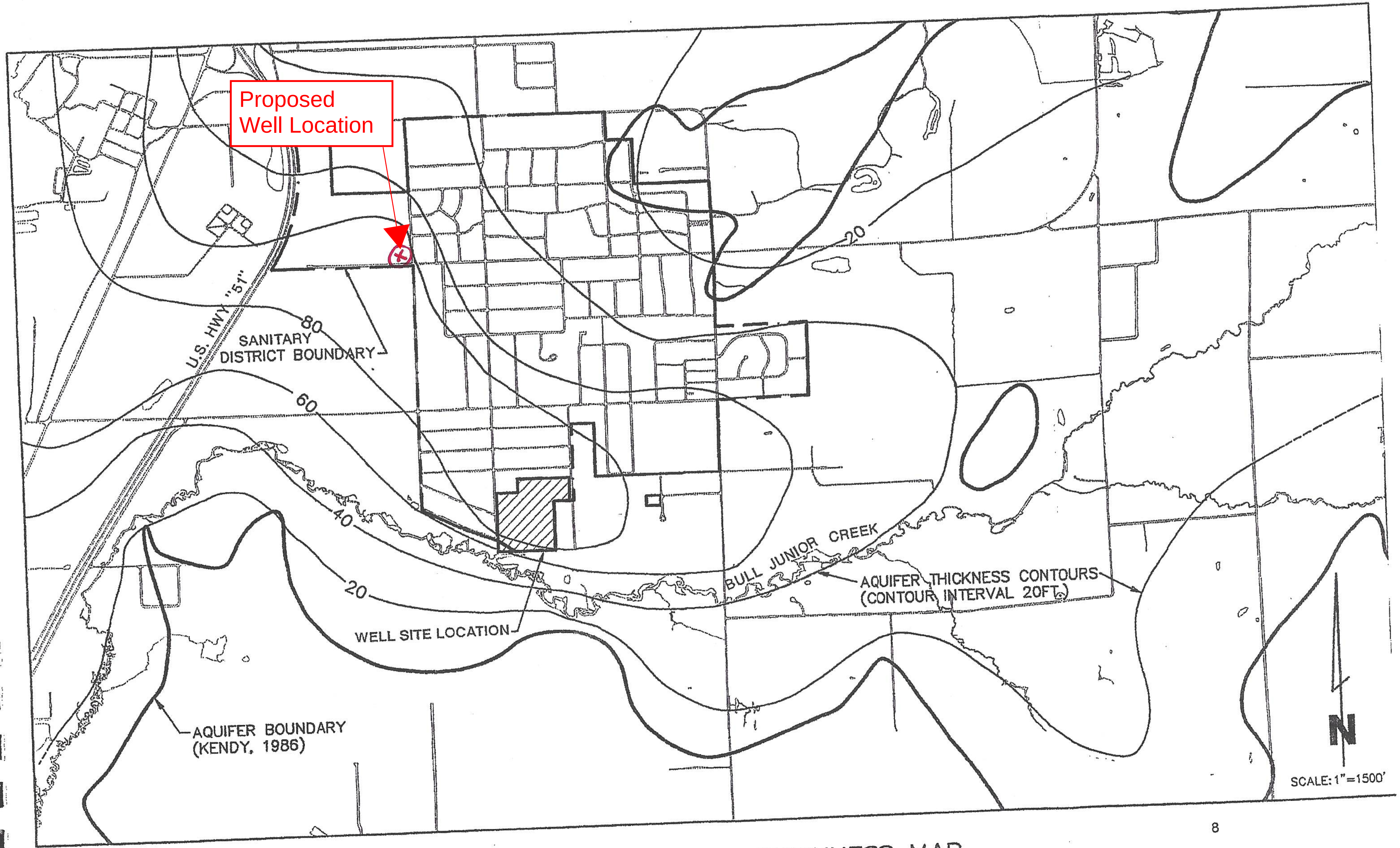


FIGURE 6 – AQUIFER THICKNESS MAP

Figure 9. Groundwater Contours

Elevation of the water table in the Wisconsin River valley, Marathon County, Wisconsin

Eloise Kendy and
Kenneth R. Bradbury

1988

EXPLANATION

Boundary of the Wausau aquifer

Contour interval is 10 feet.
Datum is mean sea level.

+5.2 x 10⁻⁴ Vertical hydraulic gradient (ft /ft) measured at piezometer nest.
The gradient is positive and the vertical component of groundwater flow is downward in recharge areas; the gradient is negative and the vertical component of groundwater flow is upward in discharge areas.

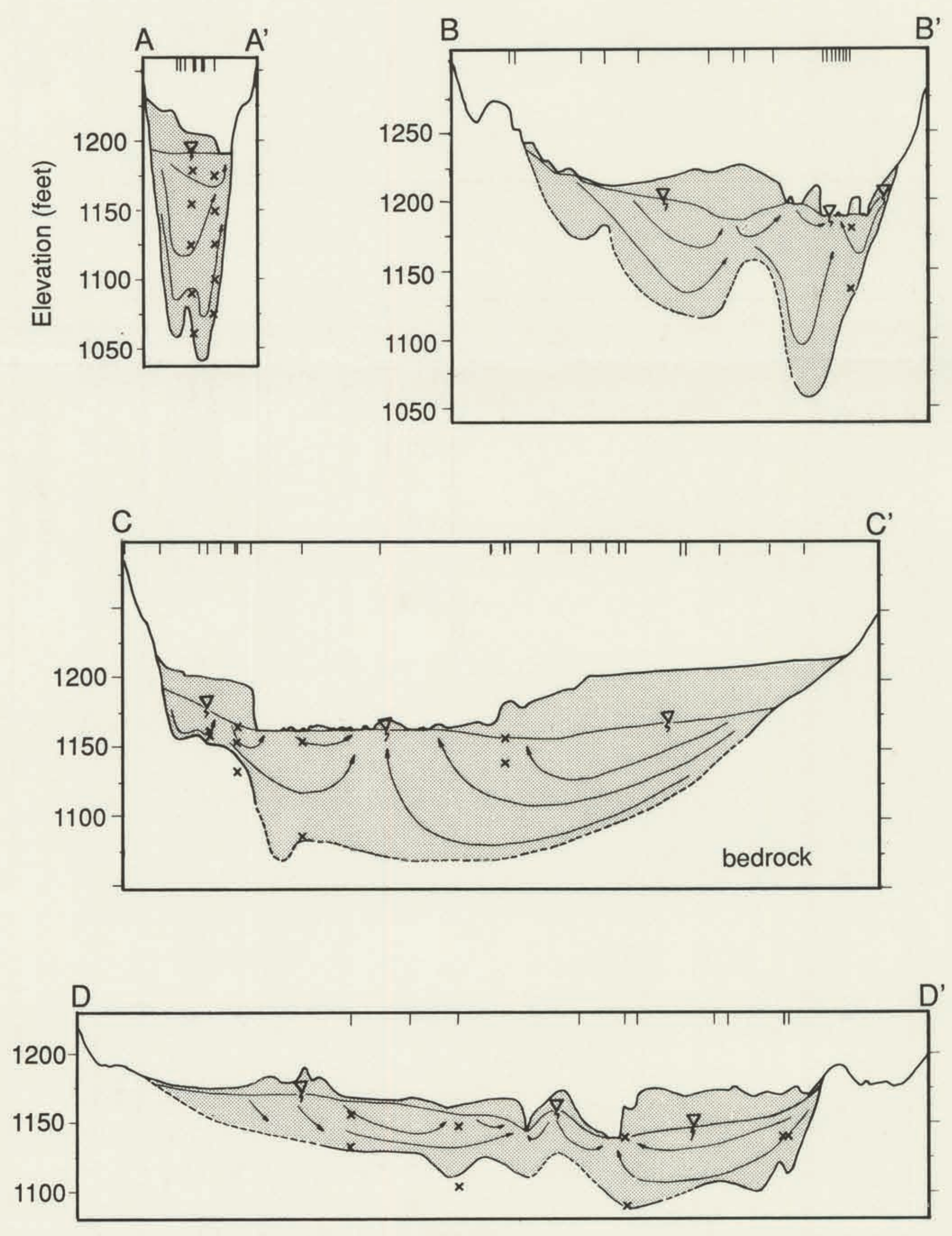
Within the boundary of the Wausau aquifer the water table is within the sand and gravel aquifer; outside the boundary it is within fractured bedrock.

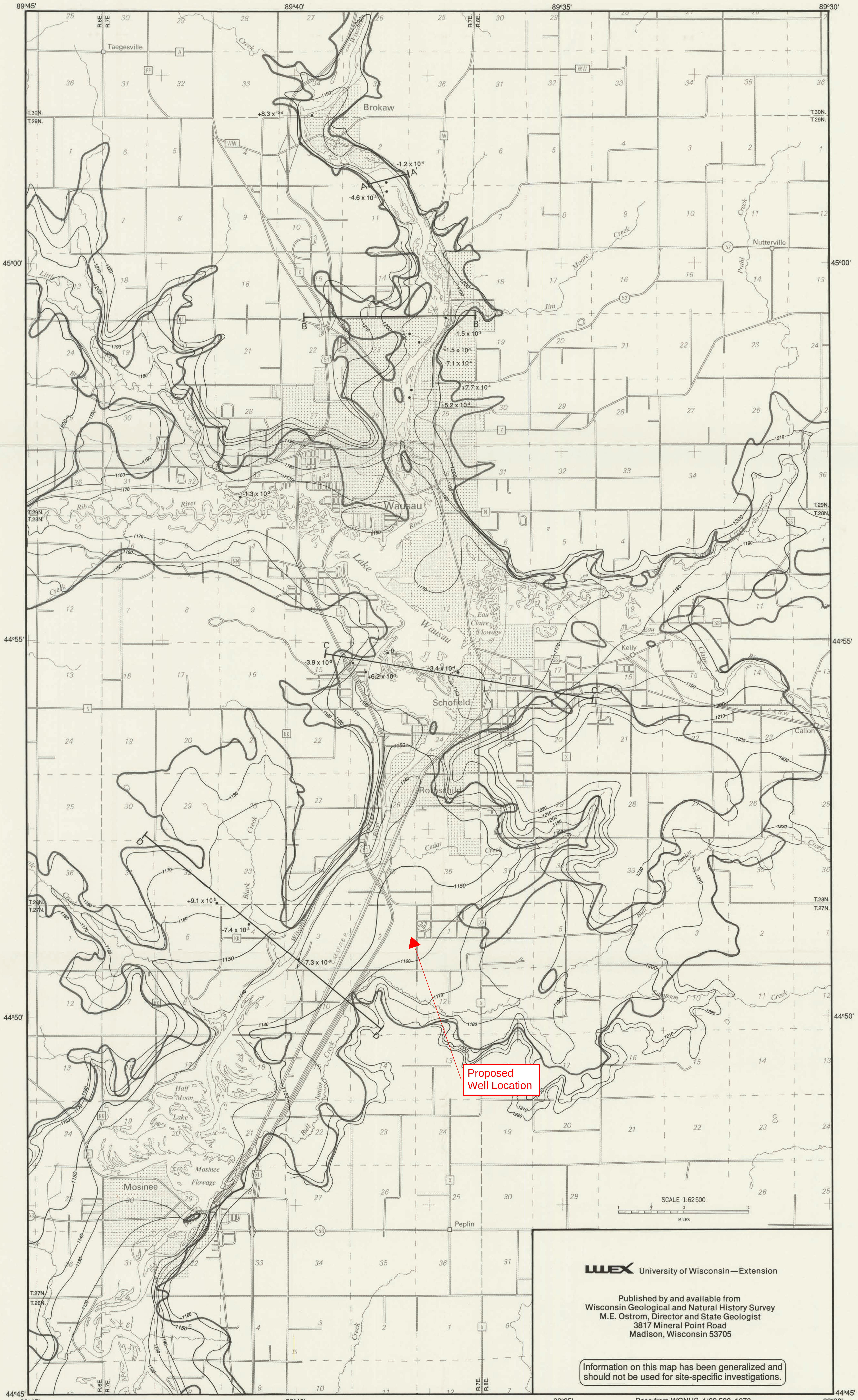
CROSS SECTIONS OF THE WAUSAU AQUIFER

EXPLANATION

Sand and gravel
Water table
Piezometer screen
Well location
Streamline

Scale: 0 – 3000 – 6000 ft; 0 – 50 – 100 ft; Vertical exaggeration 40 : 1





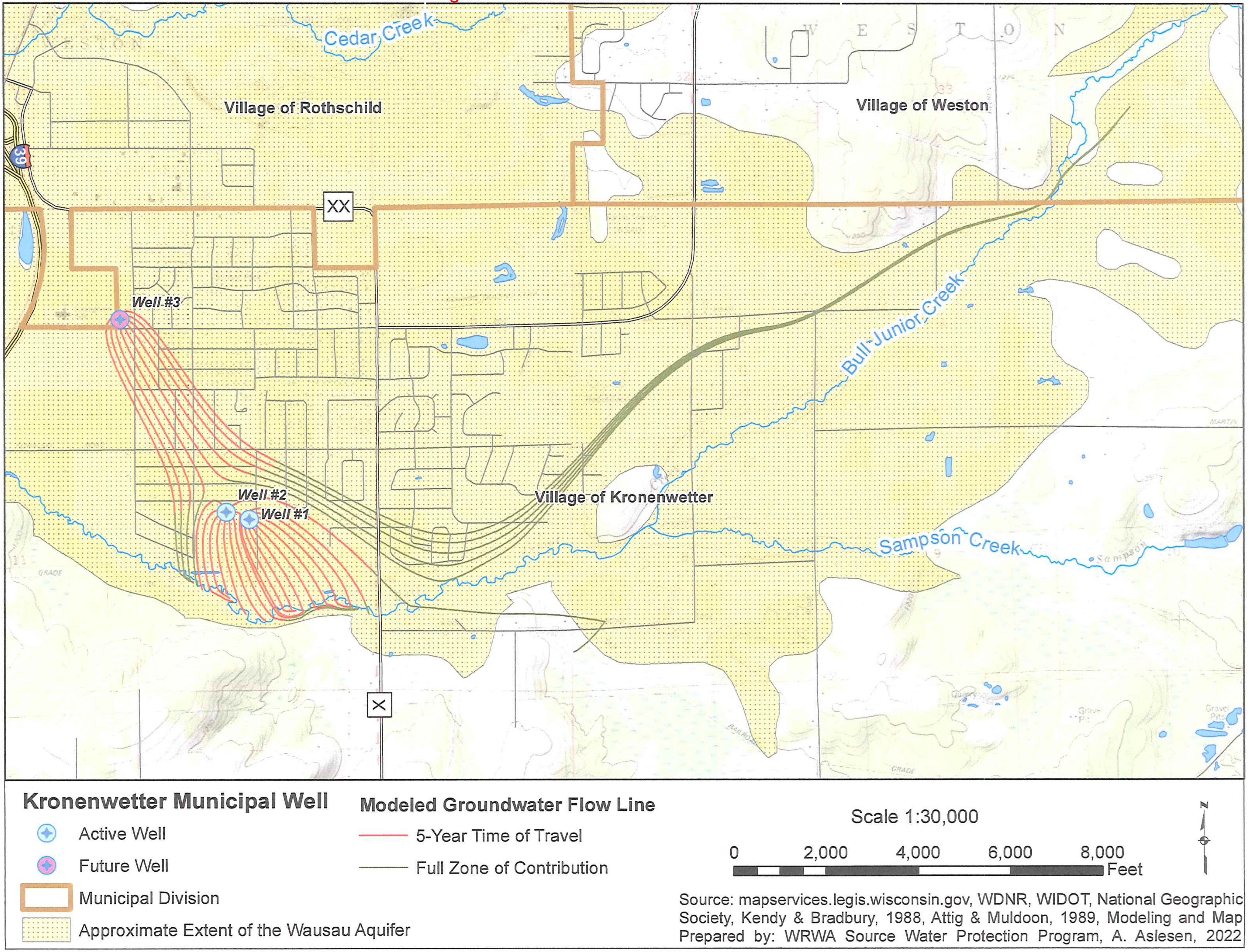
UWEX University of Wisconsin—Extension

Published by and available from
Wisconsin Geological and Natural History Survey
M.E. Ostrom, Director and State Geologist
3817 Mineral Point Road
Madison, Wisconsin 53705

Wisconsin Geological and Natural History Survey
Information Circular 64
Hydrogeology of the Wisconsin River valley
in Marathon County, Wisconsin

Plate 2 (Map 88-8b)

Figure 10. Wellhead Five Year Travel Time



Source: mapservices.legis.wisconsin.gov, WDNR, WIDOT, National Geographic Society, Kendy & Bradbury, 1988, Attig & Muldoon, 1989, Modeling and Map Prepared by: WRWA Source Water Protection Program, A. Aslesen, 2022

Figure 11. Cone of Depression

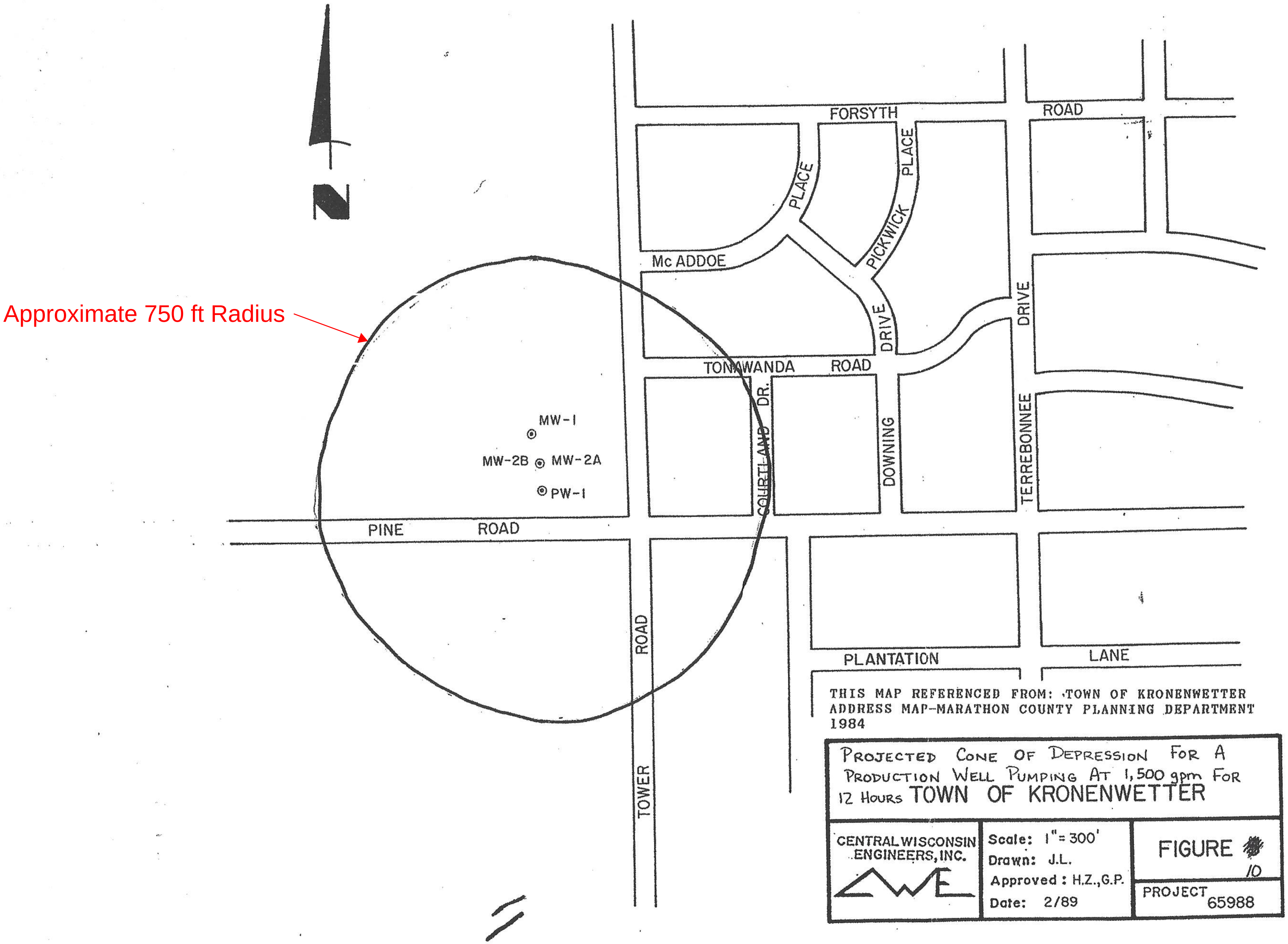


TABLE D				
Annual Water Pumpage				
Year	Well No. 1	Well No. 2	Total	Ave. Day
2018	67,287,000	59,210,000	126,497,000	346,567
2019	61,159,000	54,377,000	121,536,000	332,975
2020	74,494,000	60,366,000	134,860,000	369,479
2021	71,761,000	64,373,000	136,134,000	372,970
2022	79,016,000	59,899,000	138,915,000	380,589

Over the past decade there have been several utility system studies with 10 and 20 year future demand projections. An overall system needs study was completed in 2012 by Vierbicher. They were directed to use a previous Land Use Plan by SEH for population projections. Unfortunately, at the time of the land use study there was rapid growth in the Village, which was un-realistically projected forward. At the present time the Village water demand is slightly more than 50% of the 2020 Vierbicher projection of 736,190. More recently Clark-Dietz has summarized several water quality studies and again prepared future water pumpage demand projections. Their 2030 projection of 761,391 is double the current pumpage. The various projections are included in the following Table E. The Clark-Dietz reduction in projected demands principally involves commercial and industrial demands. While the developed acreage was similar to previous projections, they substantially reduced the demand per acre, from typical engineering standards to those rates currently being experienced by existing by land users.

TABLE E

Projected Average Daily Water Demand				
Year	2020	2022	2030	2040
Actual	369,479	380,589		
Vierbicher	736,190		1,129,614	
Clark-Dietz				761,391

At the present time the Village water production passes most engineering standard tests, except for the "Firm Capacity" test. With only two wells, and with the largest out of service (actually both produce 650 gpm), the remaining pump can not supply water for the recent peak day demand. However, the peak day demand is during the annual hydrant flushing program. Should a well be out of service the flushing would be re-scheduled. If for no other reason than a redundant reserve capacity third well should be developed with a minimum capacity in the 700 gpm, or larger, range.

The proposed site has been tested pumped during a 1989 CWE study on water supply options for the Kronenwetter Sanitary District No. 2. This study is presented as Appendix D. The study projects a pumping capacity of at least 1,500 gpm from an 18 inch diameter, 20 foot long screen at the proposed well site on Pine Road, just west of the Tower Rd intersection.

SECTION 9

Alternate Site Locations

There were two consultant well site searches for the initial two wells for Sanitary District No. 2 in the late 1980's and early 1990's. In the late 1980's CWE consider three sites, as shown in the attached Figure 12. One of the sites was test pumped. Then in the early 1990's BHA expanded the search with test probes and test wells at locations as shown in the attached Figure 13 This search resulted in the construction of the current production Wells Nos. 1 and 2 on Lea Rd.

As the water quality in Well No. 2 declined and water demands increased additional well site searches began in 2014 by LBG. This work was focused on trying to find a high capacity well , with low mineral content waters. The search started with a desktop study of possible sites. Test wells were drilled in the Maple Ridge area and the current well field area. The sites are shown in the attached Figure 14. No site, with neither high capacity nor good water quality, was found south Kowalski Rd.

The BHA well site study is attached as Appendix E. the LBG Phase 2 report is included as Appendix F.

With the decision to construct a water treatment plant to address the Well No. 2 high manganese levels, the initial high iron content impediment at the Pine Rd site is being over come by its potential for a high capacity supply. Should the site be approved, additional water quality testing will begin to update the available water quality data.

Figure 12. Previous Site Considerations - CWE 1989

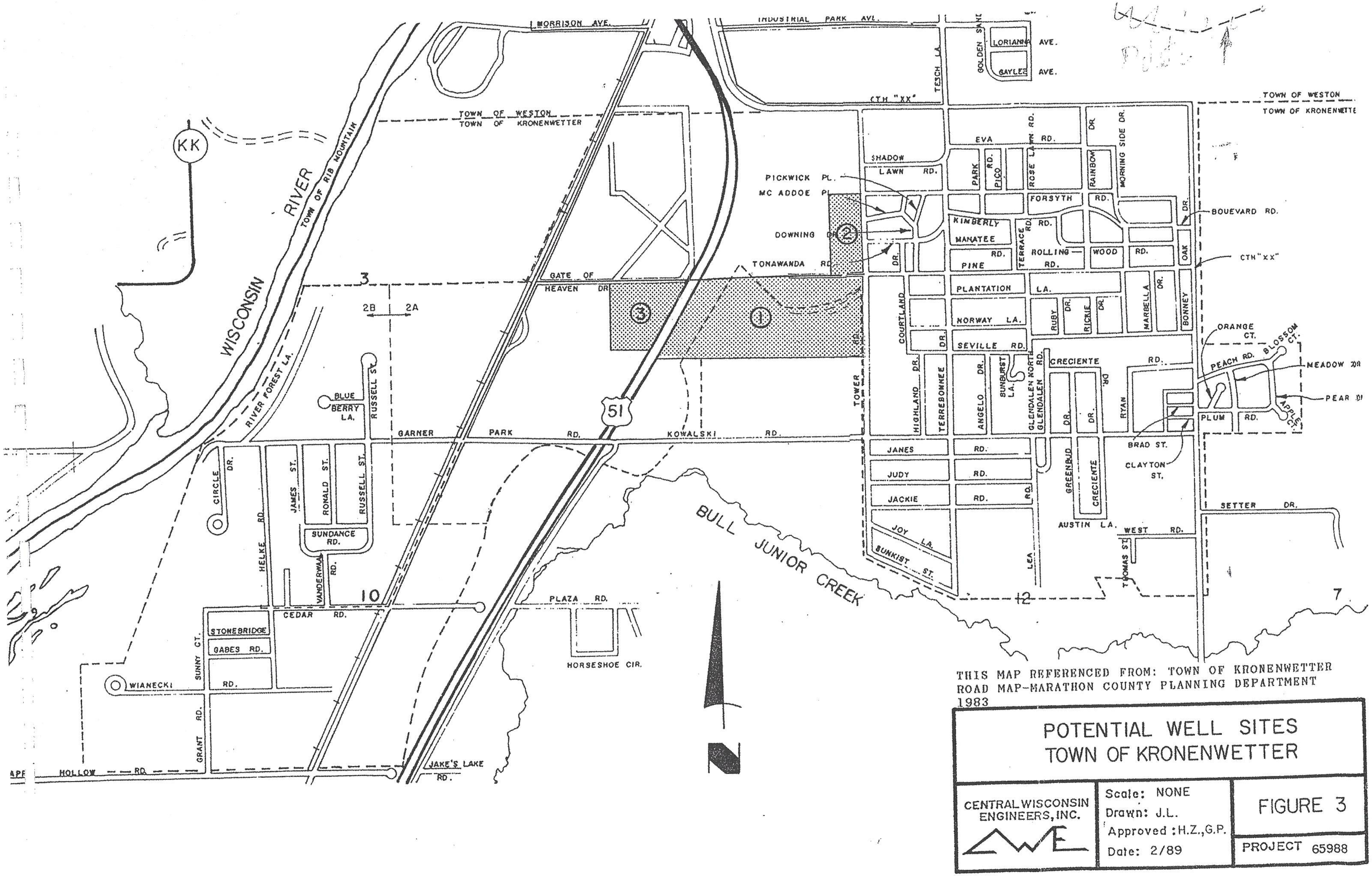
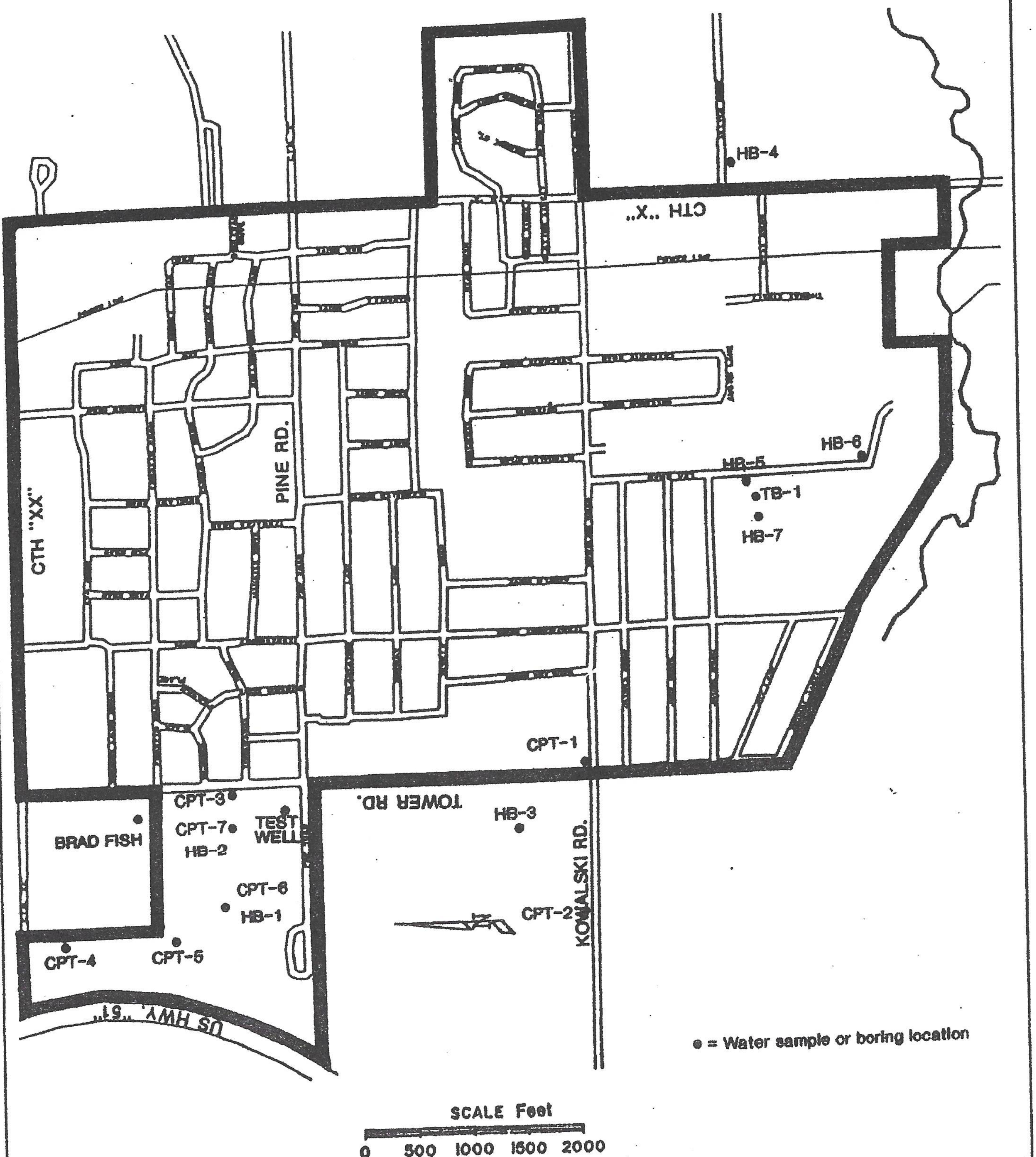


Figure 13. Previous Site Considerations - BHA 1994

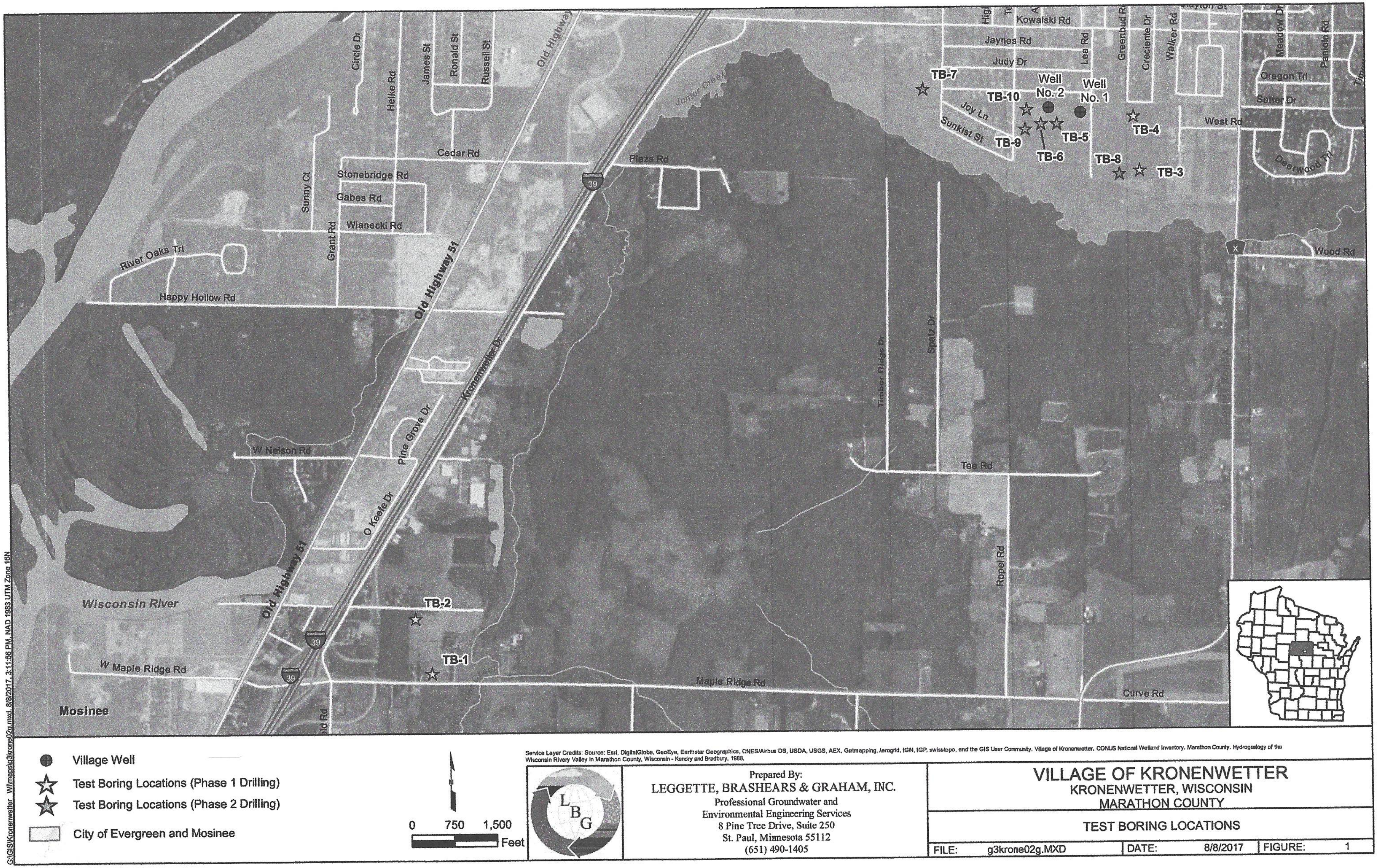
G.M.B. ENGINEERING 551424



REV	PROJECT: KRN140805	DATE: 07/14/92	KRONENWETTER SANITARY DISTRICT
	THIS DRAWING AND ALL INFORMATION CONTAINED THEREON IS THE PROPERTY OF NORTHERN ENVIRONMENTAL INCORPORATED AND SHALL NOT BE COPIED OR USED EXCEPT FOR THE PURPOSE FOR WHICH IT IS EXPRESSLY FURNISHED THE DRAWING AND ANY COPIES THEREOF SHALL BE RETURNED TO THE OWNER ON DEMAND		WATER SAMPLE AND BORING MAP
	Northern Environmental Hydrologists • Engineers • Geologists		

FIGURE 2

Figure 14. Previous Site Considerations - LBG 2017



APPENDIX A

EVERGREEN SCHOOL WELL LOG

Appendix A

NOV 21 1975

WELL CONSTRUCTOR'S REPORT
FORM 3300–15

NOTE
WHITE COPY – DIVISION'S COPY
GREEN COPY – DRILLER'S COPY
YELLOW COPY – OWNER'S COPY

STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES
Box 450
Madison, Wisconsin 53701

1. COUNTY Marathon

CHECK ONE: [XX] Town [ ] Village [ ] City — NAME: Kronenwetter

2. LOCATION – ¼ Section: NE | Section: 2 | Township: 27N | Range: 7E

OR – Grid or street no — Street name: Pine Street

AND – If available subdivision name, lot & block no

3. OWNER AT TIME OF DRILLING
Joint School District #1- Kronenwetter

ADDRESS
D.C. Everest Area Schools 1561 Grand Ave

POST OFFICE
Schofield, WI 54476

4. Distance in feet from well to nearest: (Record answer in appropriate block)

BUILDING	SANITARY SEWER C. I.	SANITARY SEWER TILE	FLOOR DRAIN C. I.	FLOOR DRAIN TILE	FOUNDATION DRAIN SEWER CONNECTED	FOUNDATION DRAIN INDEPENDENT	WASTE WATER DRAIN C. I.	WASTE WATER DRAIN TILE
–	–	–	–	–	–	– –	–	–

CLEAR WATER DRAIN C. I.	CLEAR WATER DRAIN TILE	SEPTIC TANK	PRIVY	SEEPAGE PIT	ABSORPTION FIELD	BARN	SILO	ABANDONED WELL	SINK HOLE
–	–	– –	–	–	–	–	–	–	–

OTHER POLLUTION SOURCES (Give description such as dump, quarry, drainage well, stream, pond, lake, etc.)
none

5. Well is intended to supply water for:
School

6. DRILLHOLE

Dia (in.)	From (ft.)	To (ft.)	Dia (in.)	From (ft.)	To (ft.)
12	Surface	60			
6	60	83			

7. CASING, LINER, CURBING, AND SCREEN

Dia (in.)	Kind and Weight	From (ft.)	To (ft.)
12	43.77# new black	Surface	60
	steel P.E. casing	ASTN A-53	
6	19.45# new black Std.	0	74
	steel T.&C. casing ASTN A-53		
5½	Stainless steel screen	74	83

8. GROUT OR OTHER SEALING MATERIAL

Kind	From (ft.)	To (ft.)
pressure cement grouted	Surface	60

9. FORMATIONS

Kind	From (ft.)	To (ft.)
Sand & Gravel	Surface	55
SAnd	55	60
Sand & Gravel	60	83

M R 4 9 4 3

10. TYPE OF DRILLING MACHINE USED
[XX] Cable Tool [ ] Direct Rotary [ ] Reverse Rotary
[ ] Rotary – air w/drilling mud [ ] Rotary – hammer with drilling mud & air [ ] Jetting with [ ] Air [ ] Water

Well construction completed on October 23, 19 75

Well is terminated 16 inches [XX] above [ ] below final grade

Well disinfected upon completion [XX] Yes [ ] No

Well sealed watertight upon completion [XX] Yes [ ] No

11. MISCELLANEOUS DATA
Yield test: 6 Hrs. at 125 GPM

Depth from surface to normal water level 23 ft.

Depth to water level when pumping 40 ft.

Water sample sent to Madison laboratory on: November 19, 19 75

Your opinion concerning other pollution hazards, information concerning difficulties encountered, and data relating to nearby wells, screens, seals, type of casing joints, method of finishing the well, amount of cement used in grouting, blasting, sub-surface pumprooms, access pits, etc., should be given on reverse side.

SIGNATURE: Alan L. Lang — Registered Well Driller

COMPLETE MAIL ADDRESS
Alan Lang Well Driller, Inc.
7514 Stettin Drive Wausau, WI 54401

Please do not write in space below

COLIFORM TEST RESULT	GAS – 24 HRS	GAS – 48 HRS	CONFIRMED	REMARKS
				plot

REV. 3–71

APPENDIX B

1989 PINE RD BORING LOG

Appendix B

BORING NO. Pump Well

SURFACE ELEV. 1172.68 FT.

Central Wisconsin
Engineers
P.O. BOX F • SCHOFIELD, WI 54476 • (715) 359-9400

SAMPLE NUMBER	BLOWS ON SAMPLER (140 lbs. - 2" O.D. - FALLING 30") 6"	6"	per ft.	CLASSIFICATION AND REMARKS	LAB TESTS	UNIFIED CLASSIFICATION	POCKET PEN. READING (T.S.F.)	GEOLOGY	DEPTH	ELEV.
				Coarse to fine sand, some to little fine gravel		SP			15	1157
				Coarse to medium sand, some fine gravel		SW			30	1142
				Coarse to fine sand, occasional trace of fine gravel		SP			62	1110
				Coarse to fine sand, some gravel		SW			70	1102
				Coarse to fine sand		SP			75	1097
				Coarse to fine sand and coarse to fine gravel		SW			90	1082
				E.O.B.						

KEY

C = ROCK CORE
A = AUGER SAMPLE
X = SPLIT SPOON
S = SHELBY TUBE
=

PROJECT ______
DATE(S) DRILLED ______
LOCATION ______
GROUNDWATER ______ FT. BELOW GS. AT ELEV. OF ______
DRILLERS ______ JOB NO. ______
DATE ______

APPENDIX C

WRWA GROUNDWATER MODELING

Technical Memorandum

To: **Village of Kronenwetter**
From: **Andrew Aslesen, Source Water Protection Specialist, WI Rural Water Assn.**
Date: **November 14, 2022**
Subject: **Future Well #3 Groundwater Modeling and Suggested Wellhead Protection Area**

INTRODUCTION

On November 2nd, 2022, I was contacted by Mark Thompson of Marathon Technical Services, former contract operator and occasional consultant for the Village of Kronenwetter. Mark explained that the Village owns a piece of land at the northwest corner of Pine Rd and Towner Rd, where the water tower is currently located, on which a test well was constructed in 1988. Due to high Iron and Manganese content this site was not previously considered for developing a new municipal well. Since then, the village has constructed multiple test wells in various locations and has been unable to locate a site with adequate water quality or supply. Because of this, the site at the northeast corner of Pine Rd & Tower Rd is being re-considered for development of a new municipal well. 1,200 feet north of the potential site is a 40-acre parcel that is currently undeveloped but is likely going to be marketed for sale and developed in the near future. Due to the potential for development on this parcel near the potential well site the village would like to delineate a groundwater capture zone for a scenario where a new municipal well is developed at the potential site. This will allow the village to update their wellhead protection ordinance and provide protection for the potential future well site.

PURPOSE

The purpose of this memo is to present the results of groundwater flow modeling to estimate the Zone of Contribution for a proposed Well #3 and provide a suggested wellhead protection area which can be incorporated into the village wellhead protection area and provide protection for a future well #3.

GROUNDWATER FLOW MODELING

Groundwater modeling was completed in November 2022 by Wisconsin Rural Water Association. The model was developed using the analytical element modeling software GFLOW. The analytic element method uses known water table elevations from hydrologic features and a series of mathematical equations to simulate a groundwater flow systems in two dimensions. When a pumping well is placed in the model, it uses reverse particle tracking to estimate a series of groundwater flow lines from the well backwards to their origination points. Two-dimensional analytic element models are particularly well suited for modeling simple single layer sand and gravel aquifer systems such as the Wausau Aquifer. The approximate extent of the Wausau aquifer was determined by geologic mapping (Attig & Muldoon, 1989) and is shown in Figure 1. Model parameters were chosen based on the work of Kendy & Bradbury (1988) who completed an extensive hydrogeologic study of the Wausau Aquifer. Assumptions used in the model include a hydraulic conductivity (K) of 180 ft/day, porosity of 0.3, average aquifer thickness of 55 ft, average annual recharge of 10 inches/year and pumping rates for each well equal to the village's average daily pumpage of 370,000 gallons. This simulates a scenario where each well would have to meet daily demand alone creating a conservative result.

The entire land area that contributes water to a well is known as the "Zone of Contribution" (ZOC). The model estimates the ZOC for each well by calculating groundwater flow lines that start at the well and are calculating backward in time to their origination points. Along with the full ZOC, "capture zones" equal to the 1-year and 5-year Time of Travel (TOT) were delineated. Water recharging the aquifer at the margin of the 1 & 5-year capture zones should take 1 & 5 years respectively to reach each pumping well. These time delineations were chosen because they match the current wellhead protection area three zone delineation. The modeled zone of contribution flow lines are mapped in Figure 1.

WELLHEAD PROTECTION AREA

The Village of Kronenwetter has an existing wellhead protection ordinance which designates a zoning overlay districts that is divided into three zones with progressively more stringent regulations in the zones closer to the wells (figure 2). This includes regulations that maintain the NR811.12(5)(d) setbacks for municipal wells from potential contaminant sources. The existing zoning overlay districts were set up under the assumption that a Well #3 would be installed southwest of the two exiting wells. Based on the current modeling and the new proposed Well #3 location near the water tower, a suggested revision to the zoning overlay district is included in Figure 3. Additionally, Zone C of the zoning overlay district was revised to fit the approximate extent of the Wausau Aquifer more closely. Outside of the Wausau aquifer, groundwater is not likely to contribute to the municipal wells.

CONCLUSIONS

To protect the area around the proposed Well #3 site next to the water tower it is advised that the village adopt the proposed wellhead protection zoning overlay district found in Figure 3. Doing this will not only protect the groundwater but will maintain NR811.12(5)(d) setbacks, which are required for the installation of a new municipal well. As for th40 acre parcel 1,200 feet north of the potential Well #3 site, the location is hydrologically down-gradient from the proposed site and land use on the site would pose minimal threat to a municipal well located near the village water tower. Additionally, the parcel is beyond the furthest NR811.12(5)(d) setback of 1,200 feet so from a regulatory standpoint development of that parcel would not limit the installation of a new municipal well near the village water tower.

FIGURES

REFERENCES

Attig, J.W., Muldoon, M.A., 1989. Pleistocene Geology of Marathon County, Wisconsin: WGNHS Information Circular 65.

Kendy, E., Bradbury, K.R., 1988. Hydrogeology of the Wisconsin River Valley in Marathon County, Wisconsin: WGNHS Information Circular 64.

Figure 1 – Village of Kronenwetter, Modeled Zones of Contribution

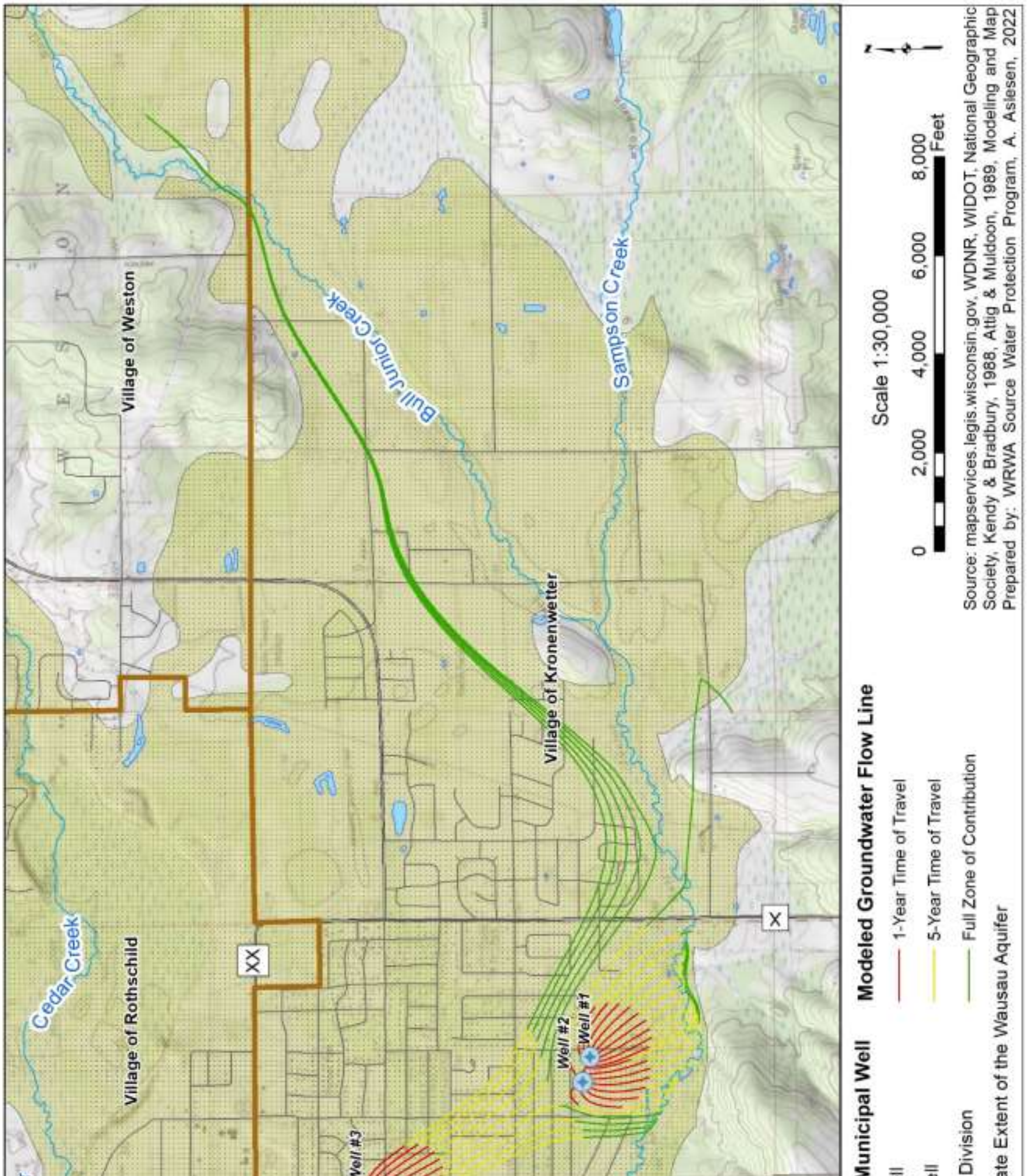


Figure 2 – Village of Kronenwetter, Existing Wellhead Protection Area

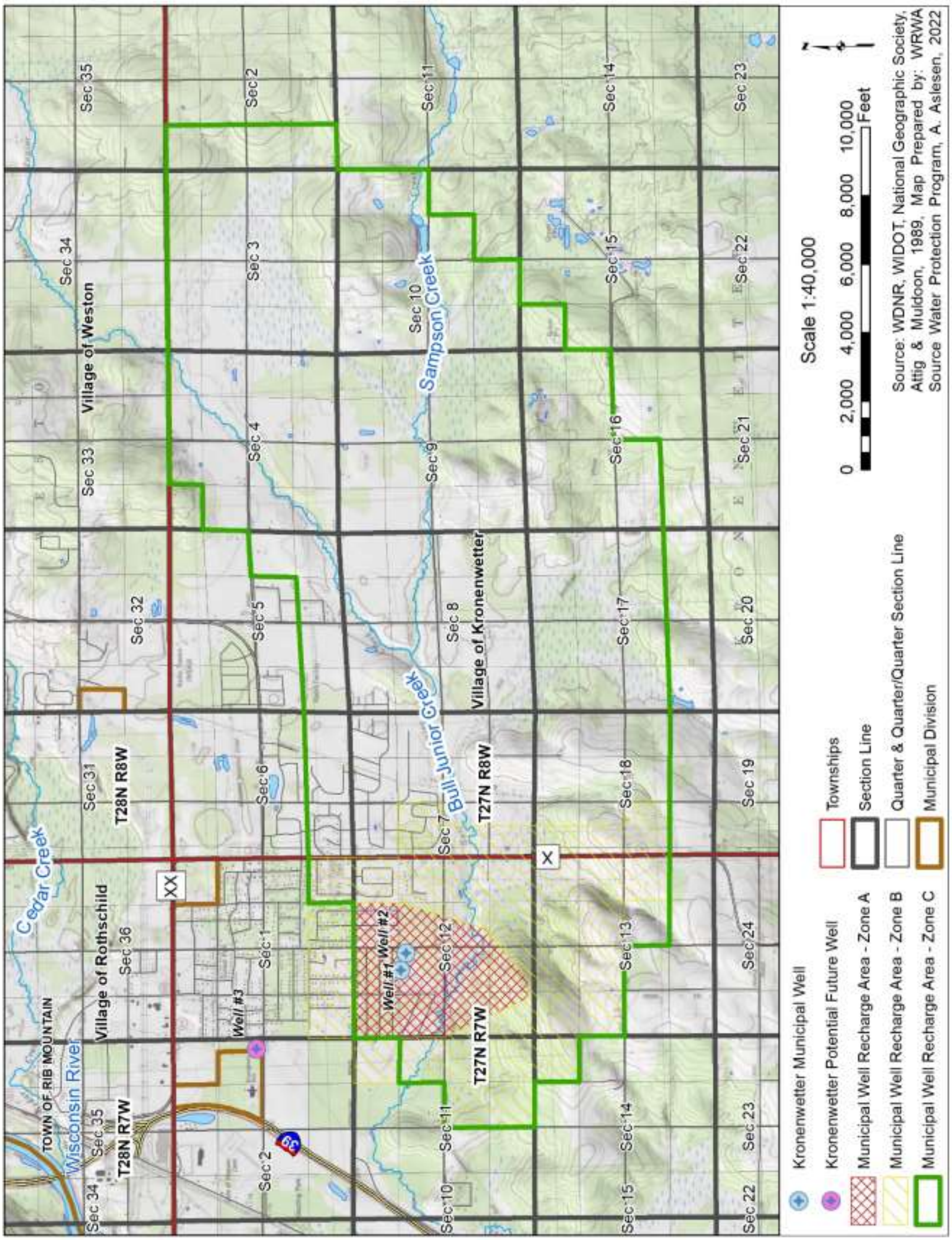
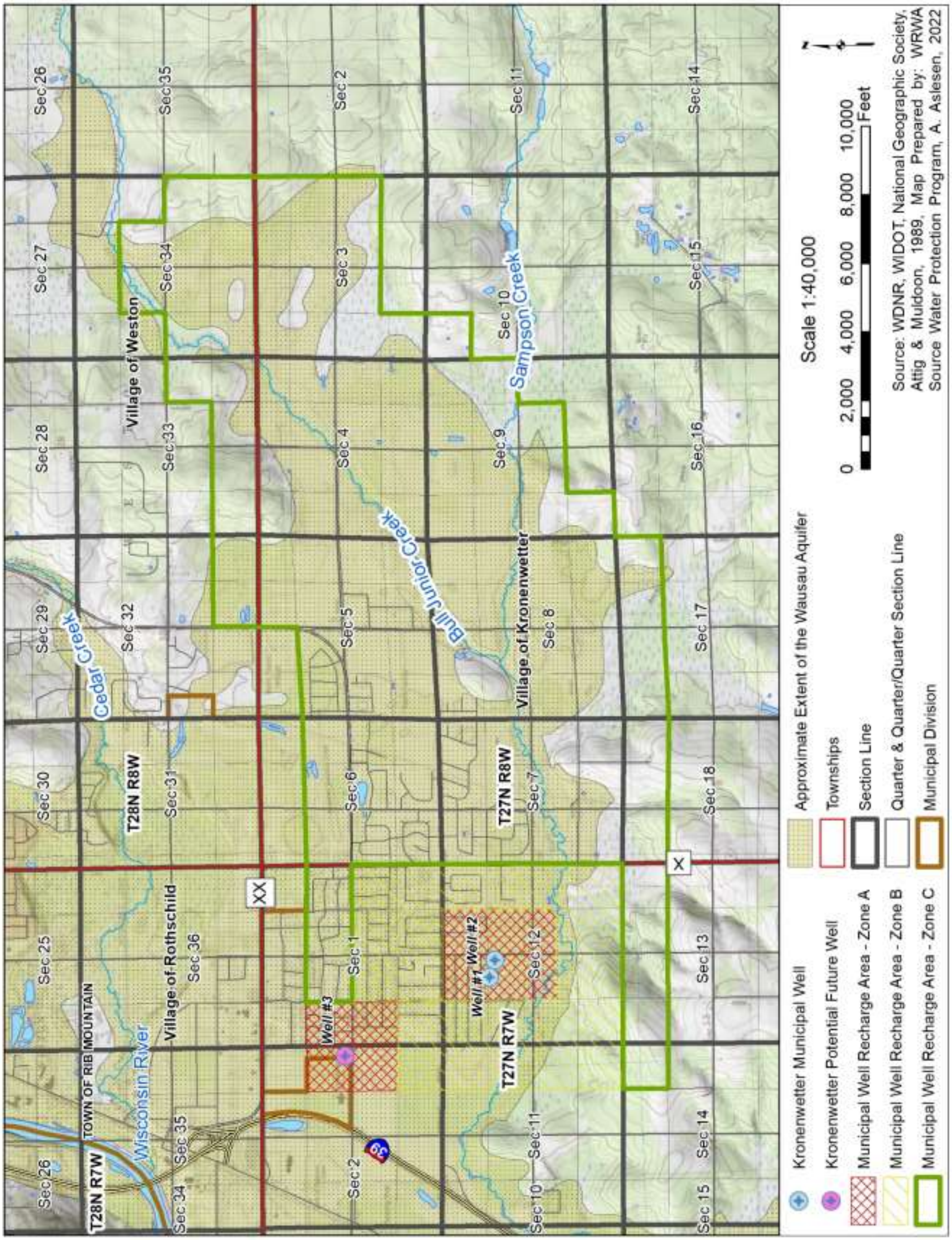


Figure 3 – Village of Kronenwetter, Existing Wellhead Protection Area



APPENDIX D

WATER SUPPLR ANALYSIS FOR WATER SUPPLY FOR TOWN OF KRONEWETTER

1989

CENTRAL WISCONSIN ENGINEERS

AN ANALYSIS OF MUNICIPAL WATER SUPPLY OPTIONS FOR THE TOWN OF KRONENWETTER

June 1989

Prepared by:

Central Wisconsin Engineers, Inc.
903 Grand Avenue
Rothschild, WI 54474
(715) 359-9400

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

Project History

The Town of Kronenwetter Board had been looking into the options for supplying municipal water to their residential neighborhoods since 1985. Their focus has not been to install a well and distribution system, but to begin the planning so that when the time comes to install a system, adequate planning has preceded the construction.

In 1985, Schneider Consultants prepared a report jointly for the Towns of Kronenwetter and Weston in which the respective municipalities' individual needs were evaluated and how these needs could be met jointly and possibly shared.

The Town Board has reviewed that report and has decided that it is important that the Town prepare for the future. Therefore, the Town Board has decided that they should locate lands suitable for development of a future municipal well system at this time, while land is available.

It is also the intent of the Board to implement a well head protection ordinance once potential well sites have been obtained.

Purpose

The purpose of this report is to document the steps and actions taken during the planning stages of the well site location study. It is important that the planning be documented because it is not the intent of the Board to develop a well at this time. The results of this study are intended to provide the guidance for the Town Board in selecting and planning appropriate water supply facilities at some later date. The study will also provide useful information to the DNR and Public Service Commission to assist them in completing their reviews.

Scope

The scope of this project includes identification, evaluation and comparison of various water supply alternatives. Alternatives were reviewed based upon available hydrogeologic and other data collected during the development of this project.

Chapter 2 includes an analysis of projected water needs and solutions available to the Town to fulfill those needs. It also discusses aspects of the potential for a inter-municipal agreement between Weston and Kronenwetter.

33:chapter1

CHAPTER 2

WATER SUPPLY NEEDS

This chapter will summarize our analysis of water supply needs, and investigate potential benefits that might be gained through an inter-municipal agreement with the Town of Weston for shared utilities. An analysis of water supply needs is essential to establish guidelines for site selection. The capacities required to meet present and future water needs must be determined so that the proper alternative can be implemented at the time the system is installed.

Water Needs Study

Several studies have been undertaken to estimate future water supply needs. All of these studies have arrived at the same conclusion. This conclusion is that a municipal water supply will be needed in the future, but the majority of the residents do not feel the immediate need is there at this time.

Recent studies of water supply needs include the "Comprehensive Sewer and Water Study, Town of Kronenwetter, Weston Water Utility, Weston Sanitary District, August, 1985" by Schneider Consultants.

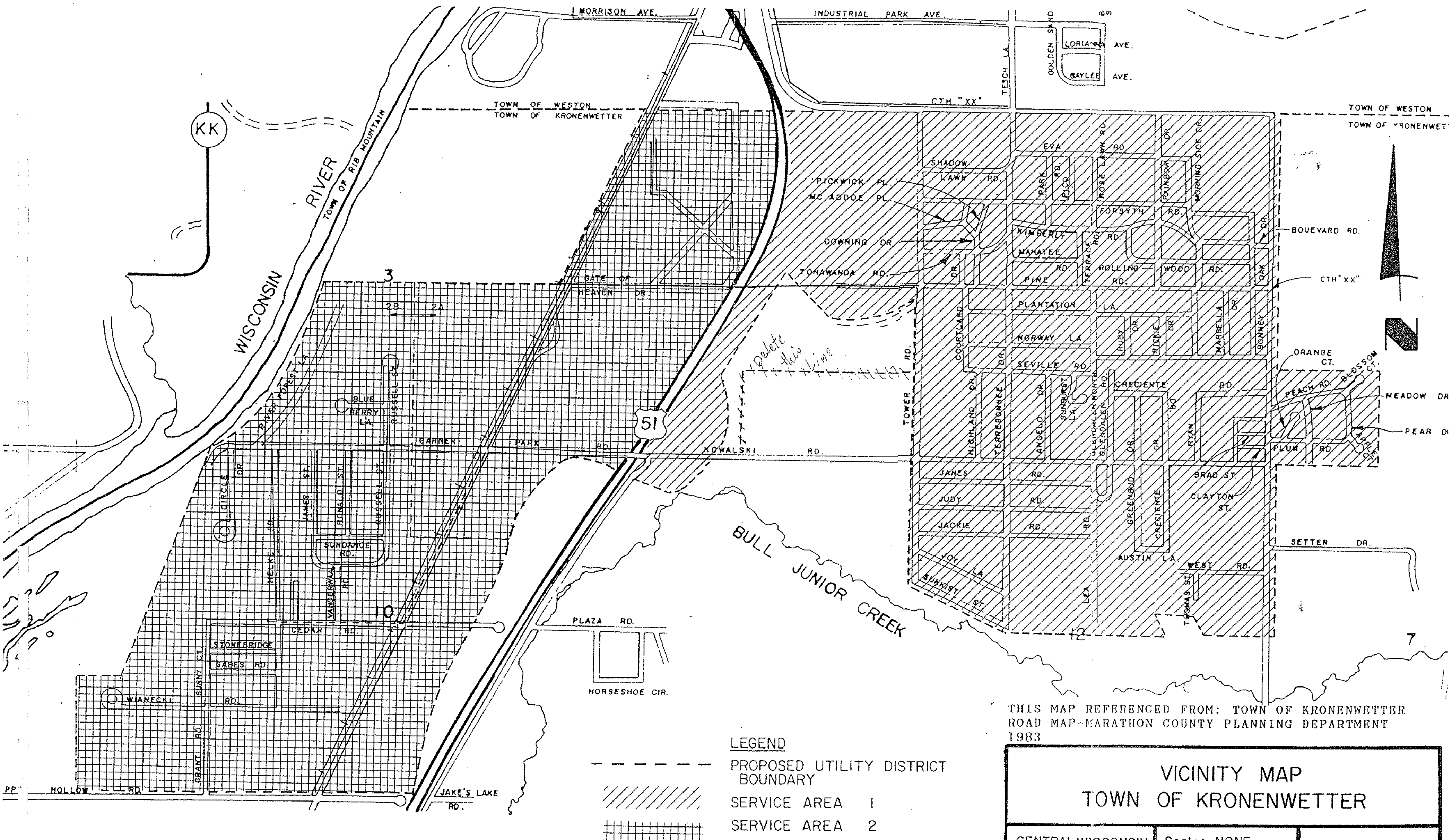
This study did not address the need for a municipal water supply or predict a time at which the need would exist. This report presented the data previously developed for the Wausau Area Facilities Plan and used that data to determine if it would be cost effective for the Town of Kronenwetter and the Weston Water Utility to share facilities.

The conclusion of this study was that there would be minor savings in capital expenditures, but predicted a savings of approximately $28,000 dollars in annual operating expenses. The strongest argument for the joint system was starting or initial capital costs for the Town of Kronenwetter plus flexibility in operation.

This study broke the potential service area into two service areas as shown on Figure 1. Service area one was the area commonly referred to as the Evergreen Neighborhood. Service area two is the area referred to as the Gardner Park area. Table 1 summarizes the water demand needs for these areas.

Table 1 was developed on the assumption that the entire service area is served by municipal water and all dwellings are connected thereto. This assumption may be accurate for the 40 year projections. However, the timing of the project initiation will control the accuracy of this projection.

To reach the peak flow rate of 2458 gallons per minute in the year 2025, the area will have to experience continued economic



THIS MAP REFERENCED FROM: TOWN OF KRONENWETTER ROAD MAP-MARATHON COUNTY PLANNING DEPARTMENT 1983

VICINITY MAP
TOWN OF KRONENWETTER

CENTRAL WISCONSIN ENGINEERS, INC.

Scale: NONE
Drawn: J. L.
Approved: H.Z., G.P.
Date: 2/89

FIGURE I

PROJECT 65988

growth and the Town of Kronenwetter will have to have their sewer and water system in place to encourage growth and development.

TABLE 1

WATER DEMAND PROJECTIONS

TOWN OF KRONENWETTER

	Avg. Daily Demand (MGD)	Peak Day (MGD)	Peak Flow Rate (gpm)
Service Area 1	(Evergreen Neighborhood)		
1985	0.18	0.27	562
40yr	0.53	0.80	1666
Ultimate	0.65	0.98	2041
Service Area 2	(Gardner Park)		
1985	0.08	0.12	250
40yr	0.25	0.38	792
Ultimate	0.53	0.80	1667
Summary			
1985	0.26	0.39	812
40yr	0.78	1.18	2458
Ultimate	0.18	1.78	3708

Anticipated Municipal Water Needs

In 1989, the Marathon County Planning Department released a report entitled "Kronenwetter Community Development Plan Update". In this report, they indicated that 97 wells were sampled by the Marathon County Health Department and analyzed for bacterial and nitrate/nitrogen contamination. Little sign of contamination was found in these wells. The contaminated wells were found in isolated areas and therefore not perceived as a regional problem. It was their conclusion that localized contamination can be corrected by individual homeowners.

In early 1987, Central Wisconsin Engineers, Inc. tested 12 wells in the town for 31 hazardous chemicals (see Appendix A). These tests were conducted because of the problems the surrounding communities were having with contaminated groundwater sources. The sampling program led to the following conclusion:

> "The results of the testing indicated there is no contamination of the groundwater at this time. However, this may change over a period of time. All of the parameters were found to be below the Enforcement Standard and Preventive Action Limit of the above stated standards set by the Department of Natural Resources."

Although these studies have indicated that the groundwater appears relatively free of contaminants, this report identified drinking water quality as a growing concern in the residential areas of the town. In the 1988 Community Development Survey, one-third of the respondents indicated that they rated their individual well water as being of fair to poor quality.

As a general rule the residents of the Evergreen Neighborhood feel that the Town should develop a utility district to begin planning for future utility installations. In the Gardner Park area, homeowners were not in favor of forming a utility district. Most homeowners perceive the need for a municipal water supply as 10 to 15 years away.

This study indicates that generally homeowners have concerns about whether they can continue to obtain safe drinking water from their relatively shallow groundwater sources. Their responses to questions on the survey can be interpreted to mean that a problem exists or is anticipated to exist, but concerns over future costs lead the homeowners to hope the expense of installation of the system can be delayed as long as possible.

<u>Inter-municipal Agreements</u>

Because that portion of Kronenwetter which at sometime in the near future will be in need of a municipal water supply is adjacent to the Weston municipal water system, the option of shared utilities with the Town of Weston should be investigated. If Weston had the excess capacity and if the sales and service agreements could be completed, the purchasing of water from Weston may be a cost effective solution for the Town of Kronenwetter.

At this time, purchasing of water from Weston would not be a viable solution to serving a portion of Kronenwetter for the following reasons:

1. The Weston Water Utility has only one well with no backup supply.
2. The existing Weston well had a design capacity of 750 gpm, however, due to dissolved metals this capacity has been reduced.
3. Approximately one-half of today's capacity is used by Foremost Dairy.
4. The utility has only one storage tower with a capacity of 100,000 gallons, which will soon be inadequate for the expanded service area.
5. The industrial park has recently been added to the service area, therefore, Weston no longer has sufficient capacity in their well to serve Kronenwetter.

Because Weston also understands the limitations upon their system, i.e., the single tower and well, they are presently attempting to locate a site for a second well.

To implement a joint utility, it would be necessary to have additional pumping capacity as well as storage capacity. At this time, neither of these conditions are met by the Weston Water Utility. Therefore, the capital expense at start-up would be approximately the same regardless of whether a joint or individual system were implemented. The primary saving would be in the operation and maintenance aspect and whatever arrangements are made for sharing capital costs. The savings available will be dependent upon any agreement between the two parties. However, if the Weston Water Utility has expanded their system to upgrade and provide more reliable service to their customers by the time Kronenwetter is ready to install their system, a joint system may be cost effective.

The report prepared by Schneider Consultants indicated that in 1985 there would be only minor savings in capital costs if the joint utility concept were implemented. However, it was estimated that the operation and maintenance savings could be approximately $28,000 annually.

If modifications have been made to the Weston System prior to the time Kronenwetter needs the system, purchasing of water from the Town of Weston for a limited time until Kronenwetter develops a customer base upon which to distribute capital cost may be an option. Another advantage which is available from Weston is that the Kronenwetter and Weston systems can be inter-connected, thereby eliminating the need for duplicate wells for backup supply. Another option is for Kronenwetter to develop its well and sell water to Weston so that Weston does not have to develop a backup well.

33:chapter2

CHAPTER 3

EVALUATION OF WATER SUPPLY ALTERNATIVES

This chapter summarizes our analysis of water supply alternatives. The initial phase of our analysis involved evaluating three sources of water supply; surface waters, groundwater and water purchase from the Weston Water Utility. The study will also focus upon potential groundwater sources within the Evergreen Neighborhood and Gardner Park vicinity. Each alternative will be discussed in detail with respect to feasibility, economic considerations and environmental issues.

Alternative Sources

Municipalities have three general sources from which they may obtain their municipal water supply; groundwater, surface water or purchase from another supplier. In Wisconsin a majority of the municipalities utilize the groundwater as a water supply source. As a general rule, only the communities adjacent to Lake Michigan obtain their water supply from a surface water source. However, the option of obtaining a surface water supply is available to any community having a large relatively clean water body within a reasonable distance.

Surface Water Supply

The option of utilizing surface water as a supply source should be investigated whenever a large body of reasonable quality water is available. In this case the nearest surface water supply source is the Wisconsin River. However, the use of surface water presents some unique challenges in terms of quality, quantity, treatability and capital and operation costs. Because of the questionable feasibility of this alternative, the preliminary analysis was not conducted in sufficient detail to fully resolve some of the issues that would need to be addressed if surface water were ultimately developed as a supply source. Instead, the analysis summarized here provides a relative indication of the issues, concerns and costs associated with developing a surface water supply.

Feasibility and Potential Impacts

An important issue that would need to be resolved in the early stages of developing this alternative is that of obtaining necessary approvals. This matter was investigated by contacting various representatives of the Wisconsin Department of Natural Resources. Concerns that would need to be addressed include:

1. Potential impacts on other surface water uses.
2. Potential environmental impacts during low river stage conditions.
3. Potential restrictions on withdrawal volumes or intake and discharge locations.

As with groundwater, surface water supplies represent a limited resource. In this area, the Wisconsin River is used heavily. The

River is used as a discharge for numerous municipal and industrial wastes.

In theory, if water is removed for drinking water purposes, it is eventually replaced in the form of a discharge from the municipal wastewater treatment plant. However, some of the water would be consumed for a number of uses such as industrial applications, sprinkling and fire protection. Also, the point of withdrawal would not coincide with the point of discharge from the wastewater treatment plant, which could impact surface water flows in certain reaches of the river.

The use of the Wisconsin River for public drinking water purposes could also pose some unique challenges. The Wisconsin River is not used by any communities for public drinking water. Instead, this river serves as an important discharge point for numerous industrial and municipal wastes. When used for this purpose, adequate river volumes are important to allow for proper dilution and dispersion of waste discharges without creating adverse impacts on the natural resources.

If the Wisconsin River were used as a public drinking water supply, the river would need to be reclassified as a potable water supply and from a regulatory standpoint, more stringent rules may need to be adopted regarding waste discharges and maintenance of river water quality. These more stringent rules could have a significant impact on local and regional industrial operations, and it is likely there would be much opposition. Even with present uses, the Wisconsin Department of Natural Resources has found it necessary to restrict water use on the Wisconsin River during low flow conditions in order to maintain river water quality.

As this discussion suggests, the use of the Wisconsin River as a drinking water supply source raises important concerns regarding feasibility, the reliability of the supply source under low flow conditions, and susceptibility to contamination from waste discharges.

Preliminary Analysis

A preliminary analysis of the project was performed assuming approvals could be obtained to use surface water as a supply source for public drinking water purposes. For this alternative, the primary issues affecting the project are related to water quality considerations. Because of unique water quality and treatment problems, the use of river water for public drinking water supplies in the State of Wisconsin has been discontinued. In order to provide an adequate and safe supply of drinking water from a river water source, treatment systems must accommodate problems related to temperature variations, taste and odor control, stringent turbidity requirements, organics control and microbiological control.

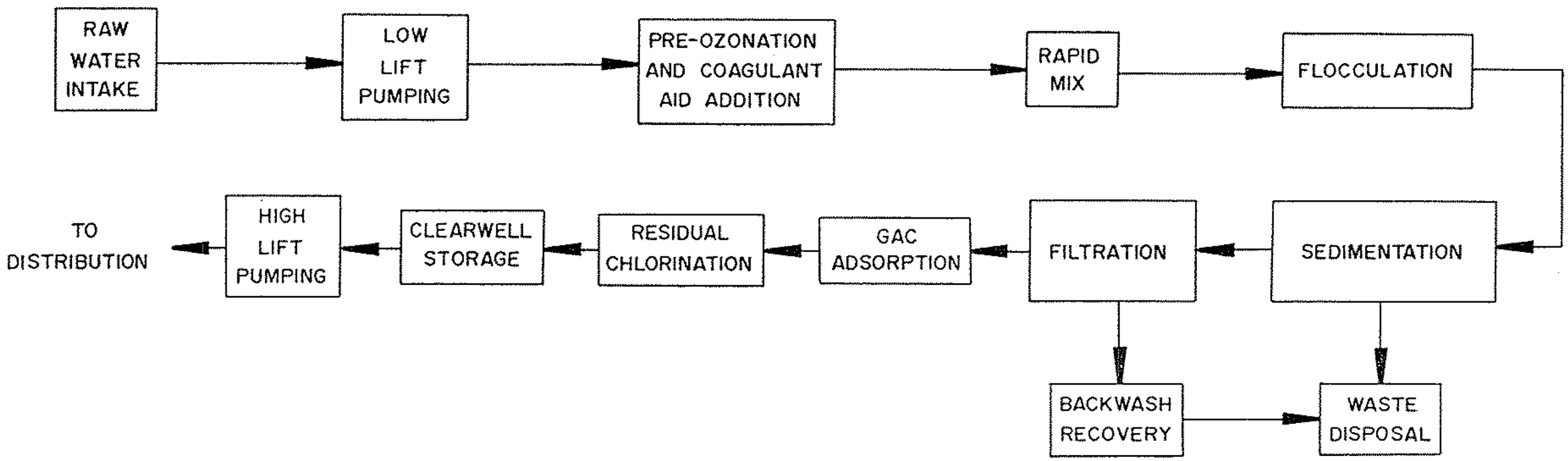
Figure 2 illustrates a preliminary flow scheme of the principal process components that are likely to be required for a river water treatment system. A final flow scheme would be developed after extensive pilot treatment testing to confirm the need for various process components and establish criteria for sizing and design of permanent facilities. During pilot testing, alternative systems and methodology would be tested to select the most economical flow scheme. However, the preliminary flow scheme is believed to provide a representative indication of the processes that would be required.

Previous studies of providing a surface water supply and treatment system from the Wisconsin River indicate that this would be a costly alternative. Previous studies have placed the capital cost at $4,800,000 for a 1.5 MGD plant.

To implement this alternative, it would be necessary to acquire property adjacent to the river for a treatment site. Because this site would not be centrally located in the service area, it would be necessary to extend service mains a considerable distance to serve the Evergreen Neighborhood area as an example.

This alternative would also involve considerable operation and maintenance expense. The treatment scheme requires full time supervision. Therefore, annual expenses would be considerable

PRELIMINARY PROCESS FLOW DIAGRAM
RIVER WATER TREATMENT
TOWN OF KRONENWETTER
1989



PRELIMINARY PROCESS FLOW DIAGRAM TOWN OF KRONENWETTER		
CENTRAL WISCONSIN ENGINEERS, INC.	Scale: NONE Drawn: J.L. Approved: H.Z., G.P. Date: 2/89	FIGURE 2 PROJECT 65988

for this supply source.

Summary - Surface Water Supply

Use of surface water as a supply source would have the advantage of not affecting the groundwater supply of residences in the vicinity. However, with the installation of a municipal water supply, residential wells would not be a primary source for anyone. There are several issues which are far more important that must be resolved prior to pursuing this option. It is believed that the disadvantages and costs associated with using surface water for drinking water purposes more than off-set any benefit. Specifically, use of surface water as a supply source is not recommended for the following reasons:

1. Potential impact on the operations of other users of the river through this load allocated reach.
2. Potential environmental impact of reduced river flows during low flow conditions.
3. Potential difficulty in obtaining necessary approvals.
4. Concerns regarding the reliability of surface water supplies during low flow conditions.
5. Concerns about treatability year round.
6. Concerns about susceptibility to contamination from waste discharges.

Well Water Supply

The alternative to using surface water for the municipal water supply system is to utilize a groundwater source. Deep, high capacity wells are the most common source of municipal and industrial waters in the State.

The municipalities and industries throughout this portion of Marathon County have been able to locate adequate supplies of groundwater. The physical feature most likely to influence groundwater availability appears to be the Wisconsin River. High production wells in this region are located along the Wisconsin River or near a tributary stream. Wells capable of producing in excess of 2 million gallons per day are not uncommon.

Groundwater quality in Marathon County is generally good, although locally high levels of iron, hardness, and total dissolved solids have been reported (Devaul and Green, 1971). In sand and gravel deposits near the Wisconsin River, groundwater tends to be soft and low in dissolved solids, thus making these areas good sources of potable water (Devaul and Green, 1971). Dissolved iron is a problem where sediments contain a high percentage of ferromagnesian minerals.

Site Selection

The primary concern in utilizing groundwater as a source is to find a site under which there is an aquifer capable of meeting the water demand of the municipality.

The site should be a minimum of 10 acres. It should be near the projected service area, yet have the recharge portion of its aquifer free of development, including certain agricultural uses. It should not have excavations extending into the groundwater. In addition, the recharge area should be free of landfills and dumps, industries and facilities handling hazardous products such as petroleum products. Also of importance is that the property be available for purchase or acquisition.

In our search to locate an acceptable site for a well to serve the Town of Kronenwetter's Evergreen Neighborhood and Gardner Park areas, we identified Sections 1-3, 9-12 of Township 27 North, Range 7 East and Sections 6 and 7 of Township 27 North, Range 8 East as potential sites.

Within the above described area, in excess of a dozen potential sites were initially identified. These sites were then reviewed in relationship to the following parameters:

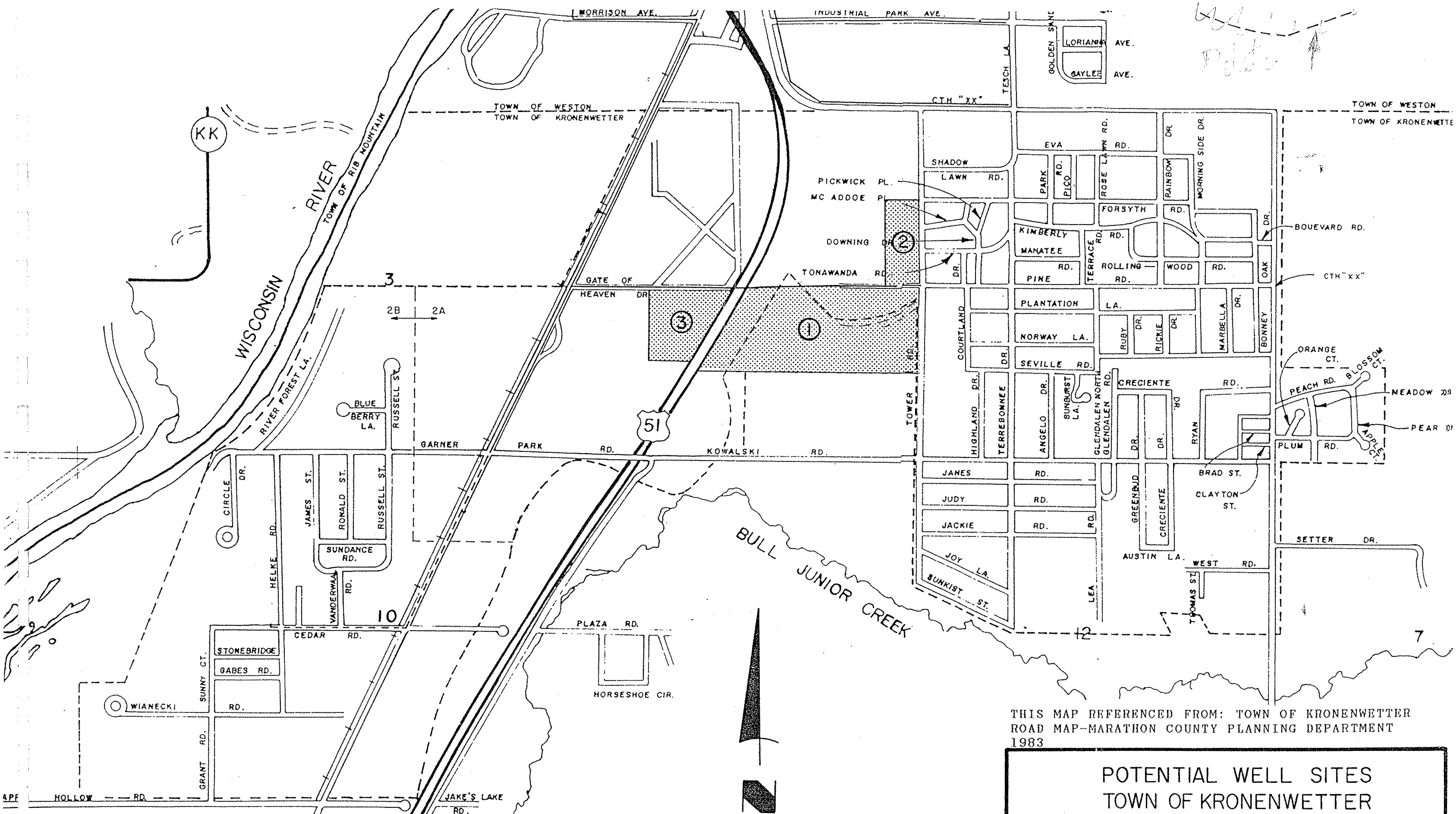
1. Depth to bedrock.
2. Location of existing and potential pollution sources.
3. Recharge area zoning and existing development.
4. Existing wells within the vicinity.
5. Water quality of area wells.

As a result of this review, the number of potential sites was reduced to three sites (see Figure 3). Sites one and two, because of their proximity to each other, were rated as equal and the third site was only slightly less desirable.

Site one consists of approximately 84 acres of vacant land owned by a private party. Site two is owned by the D. C. Everest Joint School District. This parcel contains approximately 68 acres. This land is a pine plantation except for an elementary school located in the southwest corner of the property. Site three is owned by the Diocese of La Crosse. This parcel consists of approximately 103 acres. The north 40 acres is a cemetery, and remainder is vacant land and/or forested.

Because site three is down gradient from U.S. Highway 51 and adjacent to the cemetery, it was rated as the least desirable of the three sites. However, the objections to this site are not so serious as to make the site unacceptable should sites one and two not be available.

All three sites are at the confluence of Bull Junior Creek valley and the Wisconsin River valley. These valleys contain deposits of glacial outwash and recent alluvium that may be more than 100 feet thick in the Wisconsin River Valley. The groundwater availability map prepared by the United States Geological Survey



THIS MAP REFERENCED FROM: TOWN OF KRONENWETTER ROAD MAP-MARATHON COUNTY PLANNING DEPARTMENT 1983

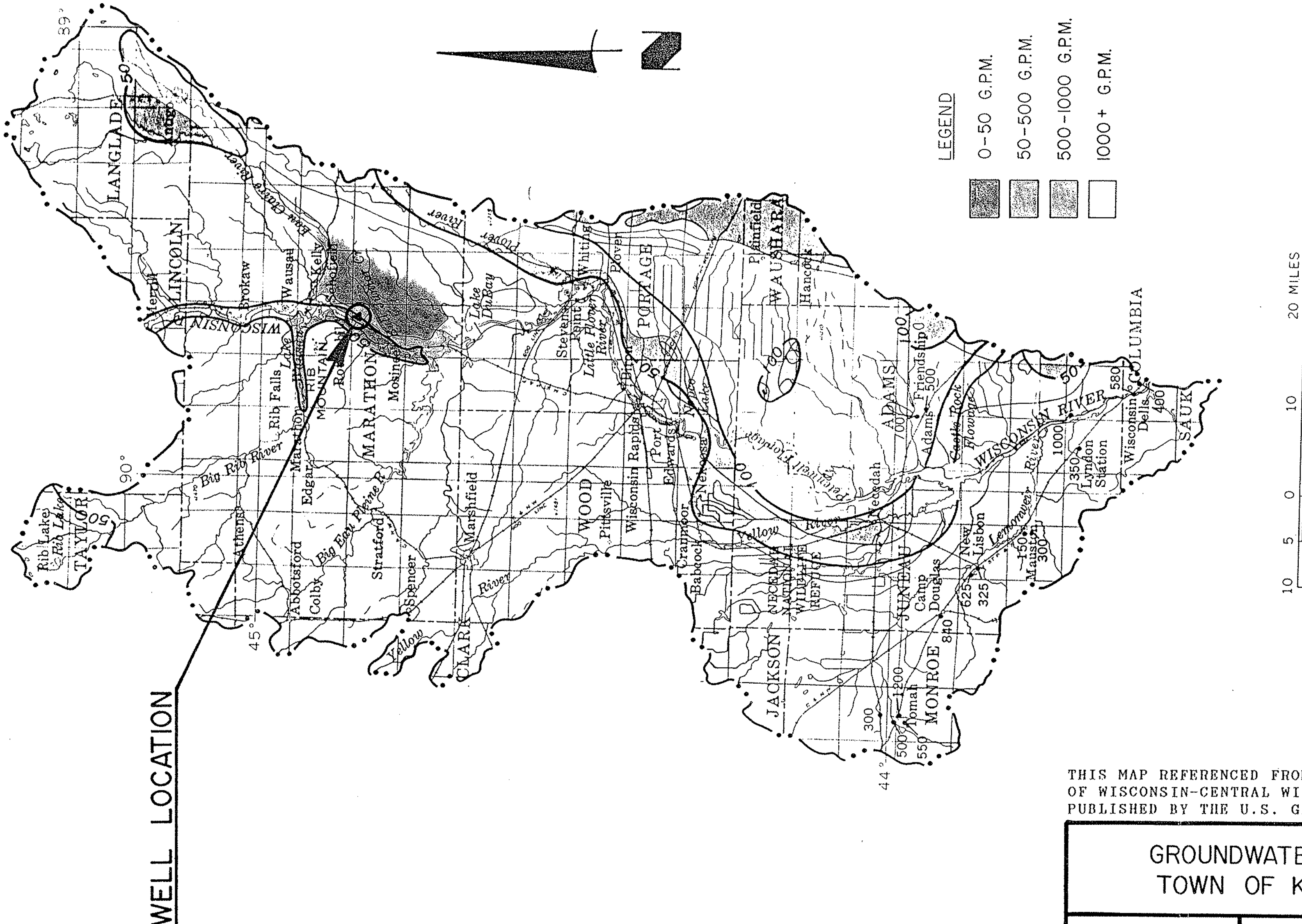
POTENTIAL WELL SITES
TOWN OF KRONENWETTER

CENTRAL WISCONSIN ENGINEERS, INC.	Scale: NONE Drawn: J.L. Approved: H.Z., G.P. Date: 2/89	FIGURE 3 PROJECT 65988

(Devaul and Green, 1971) indicates that in the vicinity of the three sites, anticipated well yields can vary from 500 to 1,000 gallons per minute (See Figure 4).

Residential wells in the vicinity encountered groundwater at approximately fifteen feet. The majority of these wells were drilled to a depth of between thirty and fifty feet, with a few wells exceeding 60 feet. Well logs indicate that the thickness of valley sediments is greater than 80 feet to the west (towards the Wisconsin River), but becomes less than 50 feet thick to the east (in Bull Junior Creek valley). Site two appears to be near the deepest part of Bull Junior Creek valley.

The deepest known well in the vicinity of the proposed sites is a supply well at the Evergreen School. This well is about a 1/4 mile west of site two and between sites two and three. It was installed in 1975 after a test well showed that sufficient capacity existed for the construction of a school. The test well was installed with a 2-inch screen 3 feet long at a depth of 60 feet and test pumped at 20 gpm. After 2 hours of pumping, the drawdown was 8 feet. At the 75 foot depth, this same system had a drawdown of 5 feet. As a result of this test well, a permanent well was installed to 83 feet. A 12-inch casing was installed to 60 feet. A 6-inch casing extending from the surface to 74 was grouted inside the 12-inch casing. Ten feet of 5 feet 5 inch diameter screen was placed below the 6-inch casing. A 100 gpm



THIS MAP REFERENCED FROM: WATER RESOURCES
OF WISCONSIN-CENTRAL WISCONSIN RIVER BASIN
PUBLISHED BY THE U.S. GEOLOGICAL SURVEY 1971

GROUNDWATER AVAILABILITY TOWN OF KRONENWETTER		
CENTRAL WISCONSIN ENGINEERS, INC.	Scale: NONE Drawn: J.L. Approved: H.Z., G.P. Date: 2/89	FIGURE 4 PROJECT 65988

pump at 60 psi was placed in this well. We do not have any performance data on this permanent well.

Summary - Well Water Supply

Based upon the estimated depth to bedrock, 100 to 120 feet, and the corresponding aquifer depth, 85 to 105 feet, we feel that sites one through three are capable of producing in excess of 500 gallons per minute.

33:chapter3

Chapter 4

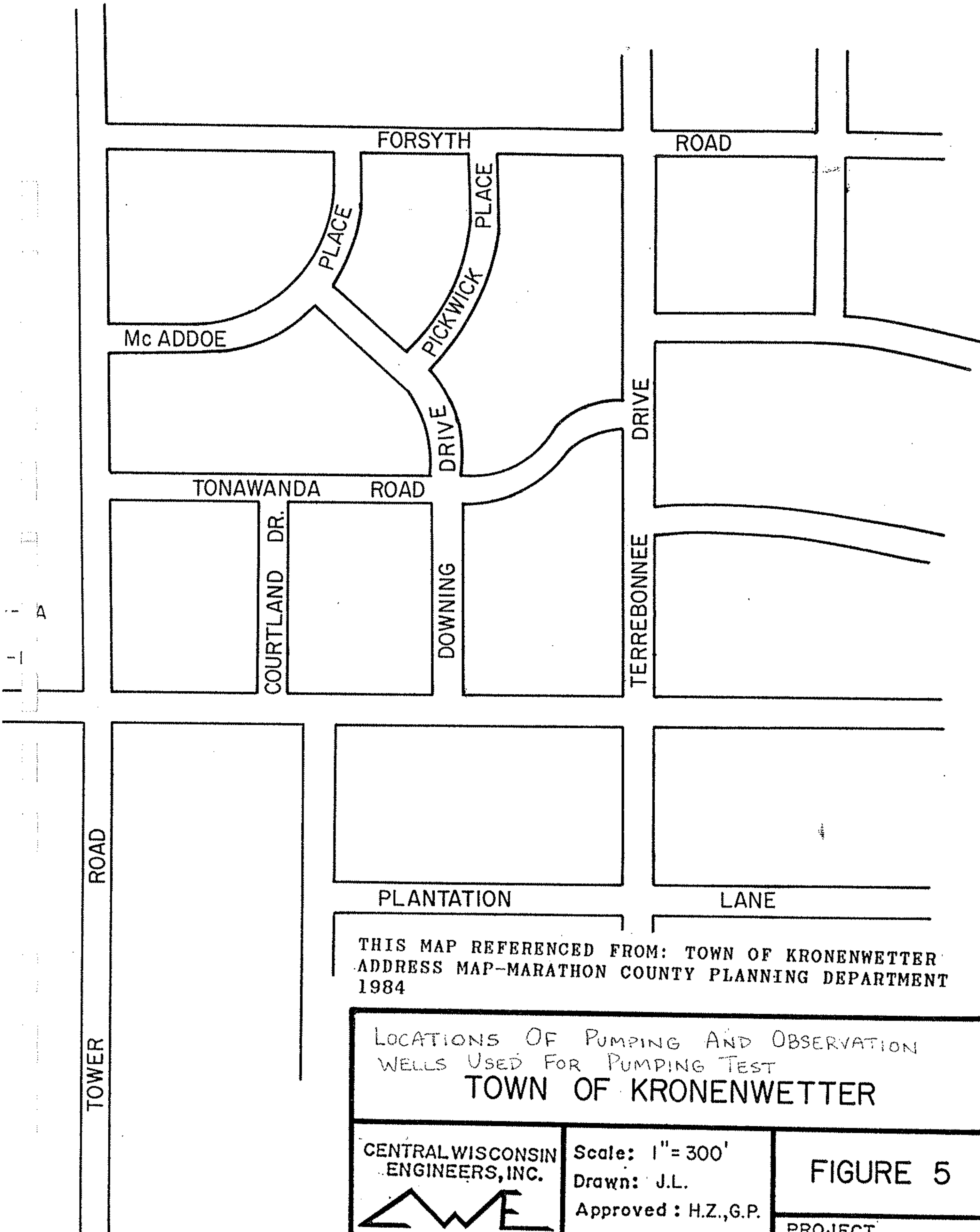
AQUIFER ANALYSIS

Site Selection

Site two, owned by the D. C. Everest Joint School District, was chosen as the location for a pumping test. The factors influencing this decision included the site availability and that a well already existed in the southeast corner of the site near Pine Road. The well (referred to hereafter as MW-1) is six inches in diameter and is screened from 68 feet below the surface to an unknown depth. Obstructions in the screened portion of this well prevented a determination of the well bottom. It is assumed that because this well was not locked that the screened portion was blocked with stones thrown in by children. However, this should not affect the suitability of the well to serve as a monitoring point during a pumping test.

Well Installation

Two new wells were installed on the property near the existing well (MW-1) in December 1988 (see Figure 5). The borehole for a second observation well (MW-2) was drilled to a depth of approximately 100 feet, at which point clay containing granite rock fragments was encountered. This is believed to represent the weathered surface of the underlying granite bedrock. Two two-inch monitoring wells were set in this hole with screens at different depths: one between 81 and 91 feet (MW-2B) and one between 51 and 61 feet (MW-2A). The borehole for the pump well



THIS MAP REFERENCED FROM: TOWN OF KRONENWETTER ADDRESS MAP-MARATHON COUNTY PLANNING DEPARTMENT 1984

LOCATIONS OF PUMPING AND OBSERVATION WELLS USED FOR PUMPING TEST

TOWN OF KRONENWETTER

CENTRAL WISCONSIN ENGINEERS, INC.	Scale: 1" = 300' Drawn: J.L. Approved: H.Z., G.P. Date: 2/89	FIGURE 5 PROJECT 65988

was drilled to the same depth and a six-inch well was installed with a screen between 80 and 90 feet. MW-1 and the pump test well were developed by pumping them at 20 gpm for one hour.

The drilling logs for these two new wells appear in Appendix B. These logs show that the valley sediments in this location are mostly sand and gravel, although a zone of predominantly sand occurs between 30 and 60 feet below the surface. This same general stratigraphy is also present in many of the residential well logs available for this area. When a test well was drilled for the Evergreen School (a 1/4 mile to the west), the driller's log reported sand and gravel to a depth of 25 feet, sand (with some clay) between 25 and 55 feet, and sand and gravel to a depth of 74 feet (Appendix C).

Pumping Test

A pumping test was attempted at a constant rate of 190 gpm, but produced no appreciable drawdown in MW-1 (190.8 feet from the pump well) or MW-2A or MW-2B (91.7 feet from the pump well). Therefore, a second pumping test was conducted at a constant rate of 290 gpm for a duration of 7,196 minutes (5 days). Drawdown data from this pump test are shown in Appendix D. Note that the static water level before pumping began ranged between 18.45 feet (MW-1) and 20.58 feet (pump well) below the land surface, making the average saturated aquifer thickness roughly 80 feet (assuming 100 feet to bedrock).

Well water was discharged through a hose approximately 200 feet west of the pumping well to prevent infiltration back into the cone of influence. Drawdown was measured in PW, MW-1, MW-2A (shallow screen) and MW-2B (deep screen) with decreasing frequency as the pump test duration increased. Water level recovery following the pumping test was also measured in these wells (see Appendix D).

<u>Data Analysis</u>

Data analysis is complicated by the fact that the wells used were open only to a small percentage of the aquifer (approximately 13%). This condition (known as partial well penetration) forces groundwater moving towards the pumped well to have vertical flow components because it can only enter the well through the screened interval. Usually, partially penetrating wells cause more drawdown to occur than if the test had been conducted with fully penetrating wells (Driscoll, 1986, p. 249). The effect of non-horizontal flow becomes negligible in observation wells greater than 1.5 times the aquifer thickness away from the pumped well. In this case, that threshold value is (1.5 x 80 feet) or 120 feet. Therefore, the data from MW-1 (190.8 feet from the pump well) can be used in the relatively simple "Jacobs" method of aquifer analysis. Data from MW-2 (91.7 feet from the pump well) require a more complicated procedure to correct for the effect of partial penetration.

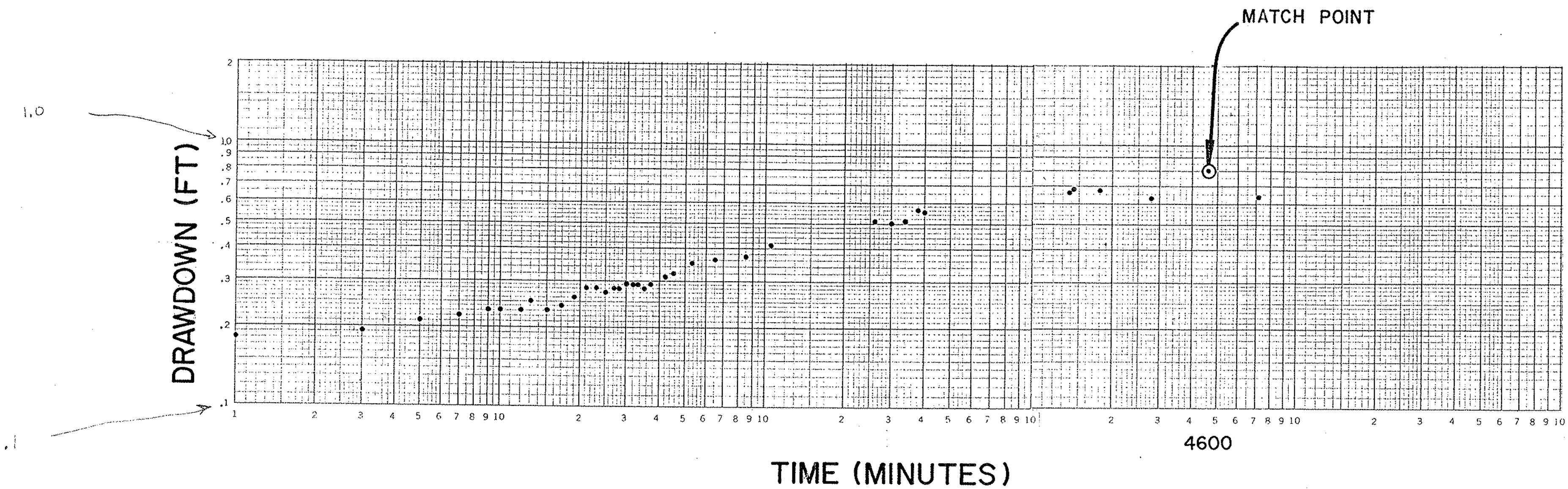
Before the drawdown data is analyzed, it is important to account for any other conditions which may have affected the aquifer's response to pumping. Because this is an unconfined, or water table aquifer, the time-drawdown data will reflect three stages of aquifer response (Fetter, 1988, p. 191.) These three stages are a result of the lag time between applied pumping stress and the corresponding drop in water table. The lag time occurs because a decline in the water table requires slow gravity drainage (Driscoll, 1986, p. 229). For the purposes of this study, we are only interested in the data collected during the third stage of aquifer response, when drawdown is not affected by transient groundwater flow conditions. Therefore, in the analysis to follow, only the late-stage drawdown data will be used. Generally, the effect of slow gravity drainage only lasts a few hours (Driscoll, 1986, p. 229).

In any pumping test analysis, it is important to recognize and account for deviations of time-drawdown data from the expected overall trend. In the pumping test conducted for this study, drawdown appears to have abruptly stabilized after 1520 minutes of elapsed time (see Appendix D). There are several reasons why such an unexpected stabilization might occur. Given the conditions at site two, the most probable explanation is that vertical groundwater flow due to partial well penetration has balanced the drawdown caused by pumping. Therefore, all data collected after 1520 minutes must be ignored in the analysis. The final problem to be considered is also a result of partial well penetration. It has been recognized that two observation wells the same distance from a pumping well but screened in different parts of the aquifer may have different time-drawdown responses (Fetter, 1988, p. 190). Therefore, the data collected from MW-2A and MW-2B may yield different aquifer properties upon analysis.

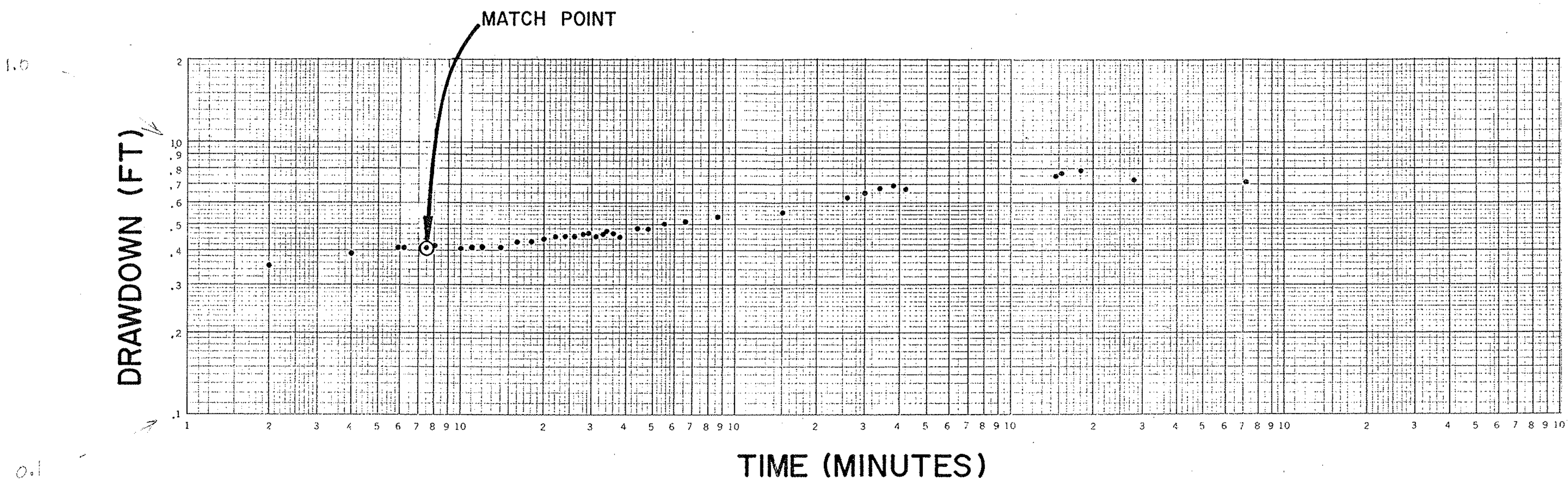
MW-2 Analysis

To utilize the data from MW-2A and MW-2B, log-log plots must be constructed of drawdown versus time (see Figures 6 and 7). From an inspection of these plots, it appears that the effect of delayed gravity drainage lasted until about 200 minutes into the pump test. Early time-drawdown data collected from MW-2A are somewhat erratic, perhaps reflecting heterogeneities in the aquifer materials.

Data analysis involved the comparison of Figures 6 and 7 to a "type curve" prepared from tables pertaining to well hydraulics in aquifers with partially penetrating wells (Figure 8). Using a light table, each time-drawdown plot was superimposed on the type curve plot so that its time-drawdown data fell on the type curve with the two sets of graph axes kept parallel. In so doing, it was important to use only the data points between 200 and 1520 minutes of elapsed time for reasons described above.

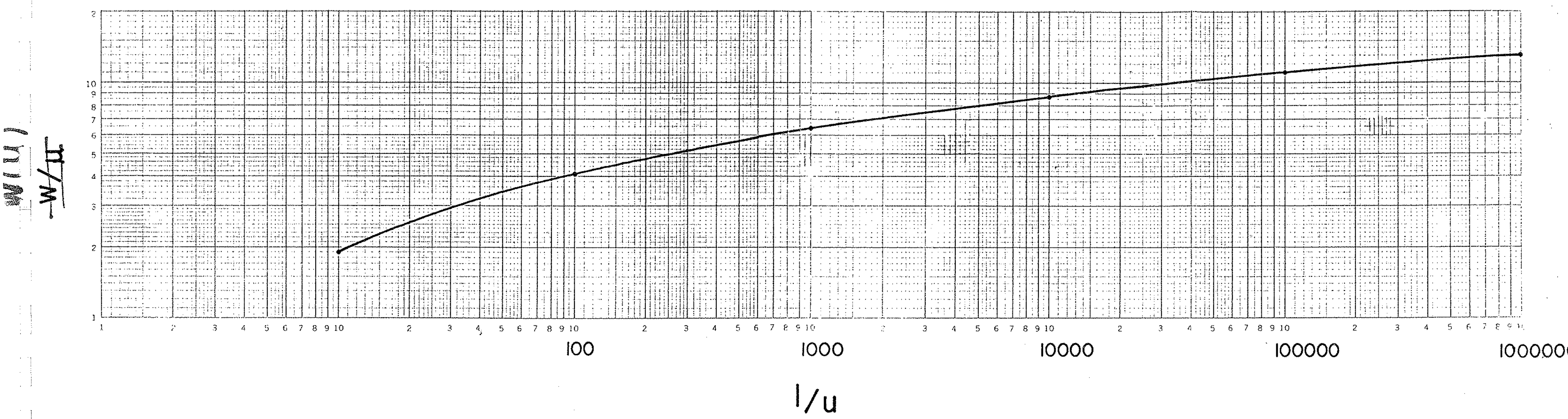


TIME-DRAWDOWN DATA FROM MW-2A TOWN OF KRONENWETTER		
CENTRAL WISCONSIN ENGINEERS, INC.	Scale: NONE Drawn: J.L. Approved: H.Z., G.P. Date: 2/89	FIGURE 6 PROJECT 65988



TIME-DRAWDOWN DATA FROM MW-2B
TOWN OF KRONENWETTER

CENTRAL WISCONSIN ENGINEERS, INC.	Scale: NONE Drawn: J.L. Approved : H.Z., G.P. Date: 2/89	FIGURE 7 PROJECT 65988



TYPE CURVE FOR UNSTEADY FLOW IN AQUIFER WITH PARTIALLY PENETRATING WELLS (r/m = 1.0 ; γ = 0.15)
TOWN OF KRONENWETTER

CENTRAL WISCONSIN ENGINEERS, INC.	Scale: NONE Drawn: J.L. Approved : H.Z., G.P. Date: 2/89	FIGURE 8 PROJECT 65988

When Figure 6 (with data from MW-2A) was properly superimposed over Figure 8, a "match point" was chosen from both plots to be used in the appropriate well hydraulics equations. As a result, the transmissivity of this aquifer was calculated to be 415,425 gpd/ft and the storativity was determined to be 0.00844 (see Appendix E). The same procedure using data from MW-2B yielded a transmissivity of 410,300 gpd/ft and a storativity of 0.00136 (see Appendix E). Definitions of the terms "transmissivity" and "storativity" appear in Appendix E.

The transmissivity values calculated from MW-2A and MW-2B are in close agreement. The average value (412,860 gpd/ft) divided by a saturated thickness of 80 feet yields a hydraulic conductivity of 5,160 gpd/ft^2 for this aquifer. The value is typical of very clean sands and gravels (Walton, 1987, p. 163) and would indicate a productive aquifer.

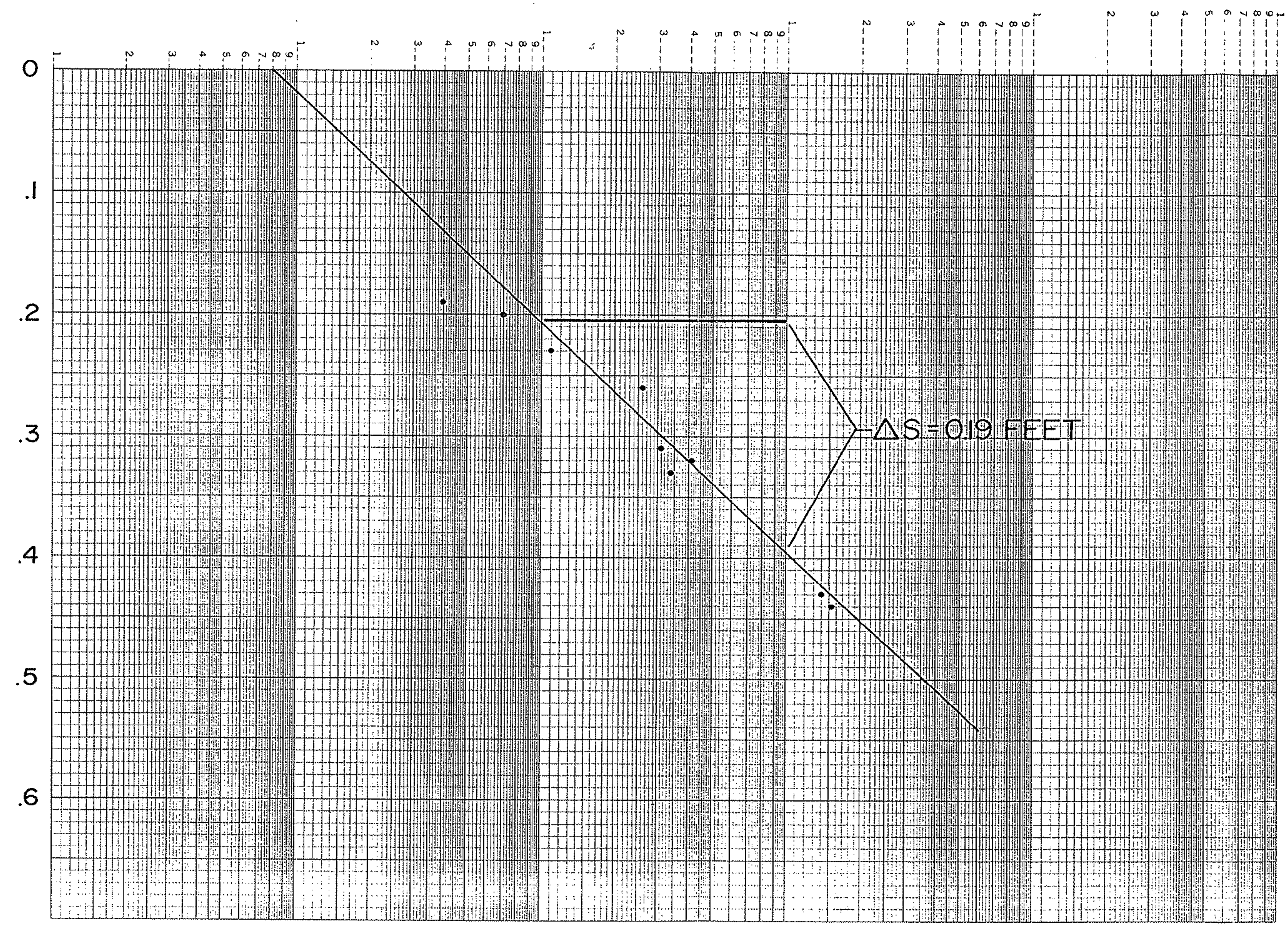
The two storativity values determined from these wells are quite different, and neither value is typical of a water table aquifer which usually has a storativity between 0.3 and 0.02 (Fetter, 1988, p. 107). These low values are more characteristic of confined aquifers, which release water to a well primarily from elastic compression. Therefore, it appears that the pump well is receiving most of its water from aquifer compression rather than gravity drainage due to the depth at which the well was screened.

MW-1 Analysis

Time-drawdown data from MW-1 has been plotted on semi-log paper to permit a "Jacobs" straight-line analysis (Figure 9). Once again, only the data collected between 200 and 1520 minutes of elapsed time were used in the analysis. A straight line was fitted to these points. The slope of this line (the change in drawdown per one log cycle of time) and its intercept with the zero drawdown axis are used in well hydraulics equations to determine transmissivity and storativity. From this analysis, transmissivity was calculated as 402,950 gpd/ft and storativity as 0.01890 (see Appendix E).

For this method to be valid, only drawdown data collected after a certain minimum elapsed time into the pump test can be used. This minimum elapsed time is calculated on the basis of the transmissivity and storativity values obtained. Appendix E shows the minimum elapsed time to be 230 minutes, which means that the data used in this analysis is acceptable.

The transmissivity value determined from MW-1 drawdown data is close to the values obtained previously form the analysis of MW-2A and MW-2B drawdown data. Therefore, we feel confident that the transmissivity of this aquifer is at least 400,000 gpd/ft. The storativity value calculated from MW-1 drawdown data approaches what is expected in a water table aquifer.



STRAIGHT - LINE ANALYSIS OF TIME - DRAWDOWN DATA FROM MW - 1

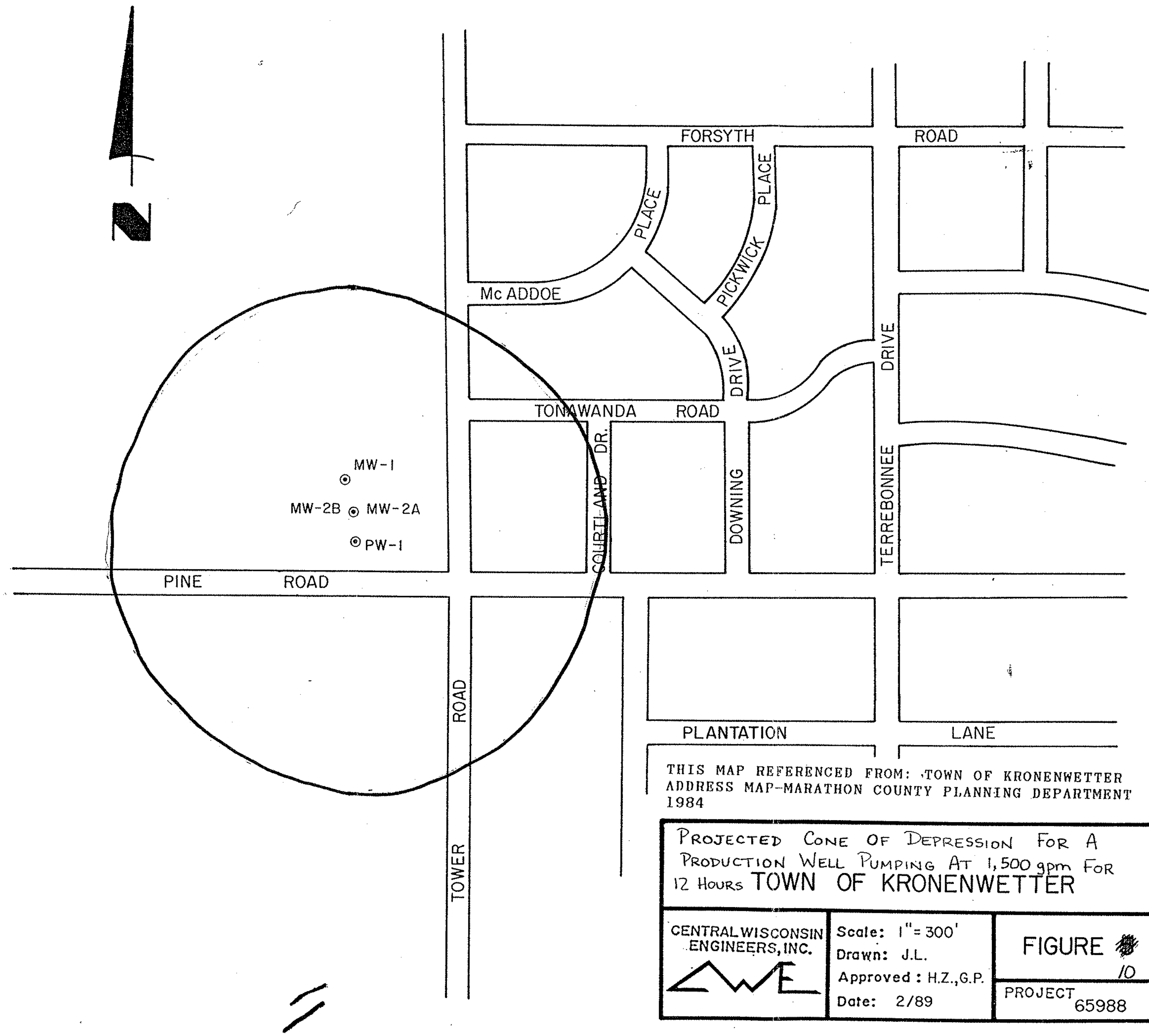
TOWN OF KRONENWETTER

CENTRAL WISCONSIN ENGINEERS, INC.	Scale: NONE Drawn: J.L. Approved: H.Z., G.P. Date: 2/89	FIGURE 9 PROJECT 65988

Data Extrapolation

If this site is developed for a municipal well, the anticipated pumping rates would be much higher than was used in the pumping test, although the duration of pumping would probably be less. To meet the projected long-term water demand for this community (1 million gpd) a production well would need to deliver 1,500 gpm for 12 hours pumping time. From the aquifer properties determined in this study, it is possible to predict the cone of depression caused by such a well. To make this prediction, certain assumptions are necessary. We shall use a transmissivity of 400,000 gpd/ft and a storativity of 0.25, which is a reasonable value for sand and gravel under water table conditions (Fetter, 1988, p. 74). Based on the type of aquifer materials present, the vertical-to-horizontal hydraulic conductivity ratio is assumed to be 1:2 (Walton, 1987, p. 164).

A computer algorithm was used to predict the expected drawdown in the aquifer from an 18-inch diameter production well pumping at a rate of 1,500 gpm for 12 hours (see Appendix F). A large well diameter was chosen to simulate "worst case conditions" in terms of cone of depression expansion. This analysis shows that the effect of the cone of depression is negligible (i.e. causes less than 1 inch or 0.08 feet of drawdown) beyond a distance of 750 feet from the production well (see Figure 10).



THIS MAP REFERENCED FROM: TOWN OF KRONENWETTER ADDRESS MAP-MARATHON COUNTY PLANNING DEPARTMENT 1984

Projected Cone of Depression For A Production Well Pumping At 1,500 gpm For 12 Hours TOWN OF KRONENWETTER		
CENTRAL WISCONSIN ENGINEERS, INC.	Scale: 1" = 300' Drawn: J.L. Approved: H.Z., G.P. Date: 2/89	FIGURE 10 PROJECT 65988

It should be noted that in order to achieve 1,500 gpm with an 18-inch diameter well and keep the entrance velocity below the recommended 0.1 ft/sec (Driscoll, 1986, p. 997), a minimum of 25 feet of continuous slot screen (size 60) would be necessary (see Appendix G). The slot size was estimated based on a visual inspection of the boring samples. Because slot size affects the length of screen required, a more accurate determination of the aquifer grain size distribution would be needed for the final well design.

Conclusions

1. Test wells drilled on Site two indicate that the potential aquifer at this location is approximately 80 feet thick. The aquifer is composed of relatively clean sands and gravels from a depth of 65 to 90 feet below the surface. We recommend that a production well at this site be screened in this lower 25 feet to maximize the sustained yields.

2. Pumping test analyses reveal that this is a very productive aquifer, having a transmissivity of about 400,000 gpd/ft. Assuming that our preliminary well design is accurate, an 18-inch diameter well with at least 25 feet of screen could yield up to 1,500 gpm.

3. A more detailed analysis could also consider a well field (comprised of two or more wells pumping at lower rates) to meet the same projected water demand of 1 million gpd.

Chapter 5

WATER CHEMISTRY

Appendix H contains the chemical analyses of a water sample taken from the pump well. The chemistry of this sample is consistent with the natural groundwater quality of the central Wisconsin River basin as summarized by Devaul and Green (1971). Groundwaters in the sand and gravel aquifers of this region tend to be "soft" (hardness less than 60 mg/l) and relatively low in total dissolved solids (less than 120 mg/l), especially near the Wisconsin River. This low mineralization of groundwater reflects a lack carbonate minerals in the sand and gravel deposits, which were derived primarily from Precambrian crystalline bedrock. Thus, the general water quality (hardness, total dissolved solids, and total alkalinity) beneath the Evergreen School site is acceptable for a drinking water supply.

An undesirable aspect to the groundwater sample analyzed in this study is its relatively high levels of iron (2.82 mg/l) and manganese (0.46 mg/l). Both of these values exceed recommended drinking water standards (0.30 mg/l for iron; 0.05 mg/l for manganese). Neither constituent is detrimental to health at the concentrations measured, but each contributes objectionable taste and staining characteristics to the water. A likely source of iron and manganese in this groundwater is the ferromagnesian silicate minerals derived from Precambrian crystalline rocks. It might be possible to reduce iron and manganese levels by drawing water from higher levels in the aquifer where the groundwater may have dissolved less of these constituents due to a shorter residence time. Otherwise, some type of water treatment is recommended.

The value of color measured in this water sample (95 units) also exceeds recommended drinking water standards (15 units). Color is usually a result of organic substances produced by the decay of plant materials in swamps or bogs; however, that is not likely to be the source in this case. Rather, high color is probably reflecting the high iron concentrations. Therefore, the solution to the iron and manganese problem should also take care of excessive color values.

The Langelier Index calculated from the chemical analyses (-0.98) indicates that this water is somewhat corrosive. This index is defined as the difference between the measured pH and the pH which would be expected if the water were saturated with respect to calcium carbonate ($CaCO_3$). A negative Langelier Index indicates that the groundwater has the potential to dissolve calcium carbonate and would probably be corrosive to steel if oxygen is present. In this case, the aquifer apparently contains fewer carbonate minerals than are needed to bring the groundwater to saturation. However, waters are not considered severely corrosive until the Langelier Index falls below -2.0, and values greater than -1.0 usually indicate that no treatment is necessary. If calcium phosphate compounds were used to correct the high iron levels found at this site, the added calcium ions would also tend to make the water less corrosive.

In summary, the groundwater beneath the Evergreen School site shows no signs of degradation from its natural water quality. Chemical analyzes have not detected any contaminants which can be traced to human activities, such as VOCs, heavy metals, or high nitrate levels. However, naturally high concentrations of iron and manganese would require some type of treatment to achieve acceptable taste and prevent staining. The moderately corrosive nature of this groundwater is probably not severe enough to warrant special treatment, but further study may be needed. In any case, the quality of this water should not pose any insurmountable problems to its use as a drinking water supply.

33:chapter5

REFERENCES

Devaul, R.W. and J.H. Green, 1971, Water Resources of Central Wisconsin River Basin; U.S. Geol. Survey Atlas HA-367.

Driscoll, F.G., 1986, Groundwater and Wells; Johnson Division, St. Paul, MN, 1108 pages.

Fetter, C.W., 1988, Applied Hydrogeology (2nd ed.); Merrill Publishing Co., Columbus, OH, 580 pages.

Walton, W.C., 1987, Groundwater Pumping Tests; Lewis Publishers, Chelsea, MI, 193 pages.

APPENDIX A

Water Sampling Results from 12 Private Wells in the Town of Kronenwetter

WATER SAMPLING

TOWN OF KRONENWETTER

March 25, 1987

Prepared by:

CENTRAL WISCONSIN ENGINEERS
903 Grand Avenue
Rothschild, WI 54474

LAB DATA

DATE _/9/_
SAMPLE SITE KRONENWETTER

DATA SHEET
University of Wisconsin
Stevens Point, WI 54481

WEATHER COND. ______
AIR TEMP. ______

NO.	SITE	pH	COND - Conductivity	ALK - Alkalinity	Ca Hard- Calcium Hardness	As- Arsenic	Ba- Barium	Cd- Cadmium	Cn - Cynaide	F- Fluorine	Pb - Lead	Hg - Mercury	NO3 - Nitrate	Se - Selenium	Ag- Silver	Na-Sodium	Corrosivity	VOC
1	#1	5.71	146	15	26	<.005	<.1	<.005	<.02	.26	<.05	<.0005	1.5	<.001	<.01	8.4	-3.6	
2	#2	6.45	78.4	23	14	<.005	<.1	<.005	<.02	.32	<.05	<.0005	<.1	<.001	<.01	2.8	-2.9	
3	#3	6.27	72.8	19	18	<.005	<.1	<.005	<.02	.08	<.05	<.0005	<.1	<.001	<.01	2.5	-3.0	
4	#4	7.13	130.1	30	30	<.005	<.1	<.005	<.02	.08	.18	<.0005	2.8	<.001	<.01	4.7	-1.8	
5	#5	6.37	91.9	12	22	<.005	<.1	<.005	<.02	.05	<.05	<.0005	1.0	<.001	<.01	3.5	-3.2	
6	#6	7.22	141	25	37	<.005	<.1	<.005	<.02	.08	<.05	<.0005	2.5	<.001	<.01	2.6	-1.7	
7	#7	5.96	183.1	16	33	<.005	<.1	<.005	<.02	.08	<.05	<.0005	3.0	<.001	<.01	15.0	-3.2	
8	#8	6.03	287	16	40	<.005	<.1	<.005	<.02	.10	<.05	<.0005	8.8	<.001	<.01	32.4	-3.1	
9	#9	6.42	129.3	18	17	<.005	<.1	<.005	<.02	.08	<.05	<.0005	1.1	<.001	<.01	13.4	-2.9	
10	#10	6.30	98.8	18	9	<.005	<.1	<.005	<.02	.06	<.05	<.0005	<.1	<.001	<.01	9.1	-3.3	
11	#11	6.98	212	119	68	<.005	<.1	<.005	<.02	.21	<.05	<.0005	<.1	<.001	<.01	4.7	-1.0	
12	#12	5.84	97.1	4	20	<.005	<.1	<.005	<.02	.04	<.05	<.0005	2.0	<.001	<.01	1.9	-3.8	

ALL DATA mg/l UNLESS NOTED

ENVIRONMENTAL TASK FORCE
Rm 220 College of Natural Resources
University of Wisconsin
Stevens Point, WI 54481
715/346-3209
Lab ID #750040280

MAR 23 1987

Occupant: Monitoring Wells?
WELL Address: #1
City: Kronenwetter | Zip
Phone ( )
Years of residence
Well Construction
Date
Well Driller
Address
Casing Diam ____ inches
Driven ____ Dug ____ Drilled ____
Depth
of Casing ____ feet
to Water ____ feet
of Well ____ feet
Distance to
Septic Tank ____ feet
Tile Field ____ feet
Seepage Pit ____ feet
Other ____ ft

Owner: Unknown
Address
City | Zip
Phone( )
Years of ownership
Last Water Quality Test
Date
Lab
for
Well Location
County: Marathon
Township
Legal Description
___ 1/4 | ___ 1/4 | S (sect.) | T (town) | R (range)
Water Source
Private ☐ Municipal ☐
Other

Mail to: Central Wisc Engineers
Address: 9103 Grand Ave
City: Rothschild | Zip 54474
Phone ( )
No. of wells at location
Sample Taken
Date
Time
Treatment Systems Owned
Softener? yes ☐ no ☐
Other
Tap Samples
Tap Location
Before Treatment? yes ☐ no ☐
Well Depth Changed? yes ☐ no ☐
Date of Change
Problems Observed
Color ☐ Taste ☐ Corrosion ☐
Odor ☐ Health ☐ None ☐
Other

Detection Limits (ug/l) are indicated in brackets [ ]

	Compound	Detected	Not Detected	(ug/l)
☐	007 Acrolein[50]	☐	☐	
☐	009 Acrylonitrile[20]	☐	☐	
☑	025 Benzene[1.0]	☐	☑	
☐	046 Bromobenzene[4.0]	☐	☐	
☑	051 Bromodichloromethane[1.5]	☐	☑	
☑	053 Bromoform[5.0]	☐	☑	
☑	055 Bromomethane[50]	☐	☑	
☐	063 n-Butylacetate[0.5]	☐	☐	
☐	071 Carbon Disulfide[5.0]	☐	☐	
☑	073 Carbon Tetrachloride[1.5]	☐	☑	
☑	083 Chlorobenzene[2.0]	☐	☑	
☑	087 Chloroethane[20]	☐	☑	
☑	093 2-Chloroethylvinyl Ether[4.0]	☐	☑	
☑	095 Chloroform[1.0]	☐	☑	
☐	108 o-Chlorotoluene[1.0]	☐	☐	
☐	110 p-Chlorotoluene[1.0]	☐	☐	
☑	147 Dibromochloromethane[2.0]	☐	☑	
☐	148 1,2-Dibromo-3-Chloropropane	☐	☐	[not quantified]
☐	153 o-Dichlorobenzene[2.0]	☐	☑	
☑	155 m-Dichlorobenzene[2.0]	☐	☑	
☑	157 p-Dichlorobenzene[2.0]	☐	☑	
☑	165 1,1-Dichloroethane[1.0]	☐	☑	
☑	167 1,2-Dichloroethane[1.0]	☐	☑	
	169 1,1-Dichloroethylene[1.0]	☐	☐	
☑	171 1,2-Dichloroethylene[1.0]	☐	☑	
	174 Dichloroiodomethane	☐	☐	[not quantified]
☑	181 1,2-Dichloropropane[1.0]	☐	☑	

EPA Methods 601 & 602 HECD & PID

GC Column(s) 1% SP1000

	Compound	Detected	Not Detected	ug/l
☑	183 cis-1,3-Dichloropropene[2.5]	☐	☑	
☑	185 trans-1,3-Dichloropropene[2.5]	☐	☑	
☑	233 Ethylbenzene[1.0]	☐	☑	
☑	427 Fluorotrichloromethane[1.0]	☐	☑	
☐	298 Isopropylbenzene[1.0]	☐	☐	
☐	319 Methylethylketone (MEK)[12]	☐	☐	
☐	393 Styrene[2.0]	☐	☐	
☐	396 1,1,1,2-Tetrachloroethane[3.0]	☐	☐	
☑	397 1,1,2,2-Tetrachloroethane[3.0]	☐	☑	
☑	399 Tetrachloroethylene[1.0]	☐	☑	
☐	401 Tetrahydrofuran (THF)[200]	☐	☐	
☑	411 Toluene[1.0]	☐	☑	
☑	421 1,1,1-Trichloroethane[1.0]	☐	☑	
☑	423 1,1,2-Trichloroethane[1.5]	☐	☑	
☑	425 Trichloroethylene[1.0]	☐	☑	
☐	428 Trichlorotrifluoroethane[3.0]	☐	☐	
☑	434 Vinyl Chloride	☐	☑	[not quantified]
☑	437 Xylenes[2.0]	☐	☑	
☑	Chloroethane	☐	☑	
☑	Methylene chloride	☐	☑	

Comments: Small Peak PID 10 min 2 mm
? Peak HECD 28 min bubble in Sample

Date Received and Sample No. 3/9/87 #1 311.02

Rm 220 College of Natural Resources
University of Wisconsin
Stevens Point, WI 54481
715/346-3209
Lab ID #750040280

Occupant Monitoring Wells?
WELL Address #2
City Kronenwetter Zip
Phone ( )

Years of residence
Well Construction
Date
Well Driller
Address
Casing Diam inches
Driven Dug Drilled
Depth
of Casing feet
to Water feet
of Well feet
Distance to
Septic Tank feet
Tile Field feet
Seepage Pit feet
Other ft

Owner Unknown
Address
City Zip
Phone( )
Years of ownership
Last Water Quality Test
Date
Lab
for
Well Location
County Marathon
Township
Legal Description
¼| ¼|S |T |R
1/4| 1/4 (sect.) (town) (range)

Water Source
Private ☐ Municipal ☐
Other

Mail to Central Wisc Engineers
Address 903 Grand Ave
City Rothschild Zip 54474
Phone ( )
No. of wells at location
Sample Taken
Date
Time
Treatment Systems Owned
Softener? yes ☐ no ☐
Other
Tap Samples
Tap Location
Before Treatment? yes ☐ no ☐
Well Depth Changed? yes ☐ no ☐
Date of Change
Problems Observed
Color ☐ Taste ☐ Corrosion ☐
Odor ☐ Health ☐ None ☐
Other

Detection Limits (ug/l) are indicated in brackets [ ]

	Compound	Detected	Not Detected	(ug/l)
☐	007 Acrolein[50]	☐	☐	
	009 Acrylonitrile[20]	☐	☐	
✓	025 Benzene[1.0]	☐	✓	
	046 Bromobenzene[4.0]	☐	☐	
✓	051 Bromodichloromethane[1.5]	☐	✓	
✓	053 Bromoform[5.0]	☐	✓	
✓	055 Bromomethane[50]	☐	✓	
☐	063 n-Butylacetate[0.5]	☐	☐	
	071 Carbon Disulfide[5.0]	☐	☐	
✓	073 Carbon Tetrachloride[1.5]	☐	✓	
✓	083 Chlorobenzene[2.0]	☐	✓	
✓	087 Chloroethane[20]	☐	✓	
✓	093 2-Chloroethylvinyl Ether[4.0]	☐	✓	
✓	095 Chloroform[1.0]	☐	✓	
☐	108 o-Chlorotoluene[1.0]	☐	☐	
	110 p-Chlorotoluene[1.0]	☐	☐	
✓	147 Dibromochloromethane[2.0]	☐	✓	
☐	148 1,2-Dibromo-3-Chloropropane	☐	☐	[not quantified]
	153 o-Dichlorobenzene[2.0]	☐	✓	
✓	155 m-Dichlorobenzene[2.0]	☐	✓	
✓	157 p-Dichlorobenzene[2.0]	☐	✓	
✓	165 1,1-Dichloroethane[1.0]	☐	✓	
✓	167 1,2-Dichloroethane[1.0]	☐	✓	
	169 1,1-Dichloroethylene[1.0]	☐	☐	
✓	171 1,2-Dichloroethylene[1.0]	☐	✓	
	174 Dichloroiodomethane	☐	☐	[not quantified]
✓	181 1,2-Dichloropropane[1.0]	☐	✓	

EPA Methods 601 & 602 HECD & PID
GC Column(s) 1% SP1000

	Compound	Detected	Not Detected	ug/l
✓	183 cis-1,3-Dichloropropene[2.5]	☐	✓	
✓	185 trans-1,3-Dichloropropene[2.5]	☐	✓	
✓	233 Ethylbenzene[1.0]	☐	✓	
✓	427 Fluorotrichloromethane[1.0]	☐	✓	
☐	296 Isopropylbenzene[1.0]	☐	☐	
☐	319 Methylethylketone (MEK)[12]	☐	☐	
☐	393 Styrene[2.0]	☐	☐	
☐	396 1,1,1,2-Tetrachloroethane[3.0]	☐	☐	
✓	397 1,1,2,2-Tetrachloroethane[3.0]	☐	✓	
✓	399 Tetrachloroethylene[1.0]	☐	✓	
☐	401 Tetrahydrofuran (THF)[200]	☐	☐	
✓	411 Toluene[1.0]	☐	✓	
✓	421 1,1,1-Trichloroethane[1.0]	☐	✓	
✓	423 1,1,2-Trichloroethane[1.5]	☐	✓	
✓	425 Trichloroethylene[1.0]	☐	✓	
☐	428 Trichlorotrifluoroethane[3.0]	☐	☐	
✓	434 Vinyl Chloride	☐	✓	[not quantified]
✓	437 Xylenes[2.0]	☐	✓	
✓	Chloroethane	☐	✓	
✓	Methylene Chloride	☐	✓	

Comments

Date Received and Sample No. 3/9/87 #2 311.03

Rm 220 College of Natural Resources
University of Wisconsin
Stevens Point, WI 54481
715/346-3209
Lab ID #750040280

Occupant Monitoring Wells?
WELL Address #3
City Kronenwetter | Zip
Phone ( )
Years of residence
Well Construction
Date
Well Driller
Address
Casing Diam ______ inches
Driven ____ Dug ____ Drilled ____
Depth
of Casing ____ feet
to Water ____ feet
of Well ____ feet
Distance to
Septic Tank ____ feet
Tile Field ____ feet
Seepage Pit ____ feet
Other ____ ft

Owner Unknown
Address
City | Zip
Phone( )
Years of ownership
Last Water Quality Test
Date
Lab
for
Well Location
County Marathon
Township
Legal Description
¼ | ¼ | S | T | R
1/4 | 1/4 | (sect.) | (town) | (range)
Water Source
Private ☐ Municipal ☐
Other

Mail to Central Wisc Engineers
Address 903 Grand Ave
City Rothschild 15447 Zip
Phone ( )
No. of wells at location
Sample Taken
Date
Time
Treatment Systems Owned
Softener? yes ☐ no ☐
Other
Tap Samples
Tap Location
Before Treatment? yes ☐ no ☐
Well Depth Changed? yes ☐ no ☐
Date of Change
Problems Observed
Color ☐ Taste ☐ Corrosion ☐
Odor ☐ Health ☐ None ☐
Other

Detection Limits (ug/l) are indicated in brackets [ ]

	Compound	Detected	Not Detected	(ug/l)
☐	007 Acrolein[50]	☐	☐	
	009 Acrylonitrile[20]	☐	☐	
✓	025 Benzene[1.0]	☐	☑	
	046 Bromobenzene[4.0]	☐	☐	
✓	051 Bromodichloromethane[1.5]	☐	☑	
✓	053 Bromoform[5.0]	☐	☑	
✓	055 Bromomethane[50]	☐	☑	
☐	063 n-Butylacetate[0.5]	☐	☐	
	071 Carbon Disulfide[5.0]	☐	☐	
✓	073 Carbon Tetrachloride[1.5]	☐	☑	
✓	083 Chlorobenzene[2.0]	☐	☑	
✓	087 Chloroethane[20]	☐	☑	
✓	093 2-Chloroethylvinyl Ether[4.0]	☐	☑	
✓	095 Chloroform[1.0]	☐	☑	
☐	108 o-Chlorotoluene[1.0]	☐	☐	
	110 p-Chlorotoluene[1.0]	☐	☐	
✓	147 Dibromochloromethane[2.0]	☐	☑	
☐	148 1,2-Dibromo-3-Chloropropane	☐	☐	[not quantified]
	153 o-Dichlorobenzene[2.0]	☐	☑	
✓	155 m-Dichlorobenzene[2.0]	☐	☑	
✓	157 p-Dichlorobenzene[2.0]	☐	☑	
✓	165 1,1-Dichloroethane[1.0]	☐	☑	
✓	167 1,2-Dichloroethane[1.0]	☐	☑	
	169 1,1-Dichloroethylene[1.0]	☐	☐	
✓	171 1,2-Dichloroethylene[1.0]	☐	☑	
	174 Dichloroiodomethane	☐	☐	[not quantified]
✓	181 1,2-Dichloropropane[1.0]	☐	☑	

EPA Methods 601 & 602 HECD & PID
GC Column(s) 1% SP1000

	Compound	Detected	Not Detected	ug/l
✓	183 cis-1,3-Dichloropropene[2.5]	☐	☑	
✓	185 trans-1,3-Dichloropropene[2.5]	☐	☑	
✓	233 Ethylbenzene[1.0]	☐	☑	
✓	427 Fluorotrichloromethane[1.0]	☐	☑	
☐	298 Isopropylbenzene[1.0]	☐	☐	
☐	319 Methylethylketone (MEK)[12]	☐	☐	
☐	393 Styrene[2.0]	☐	☐	
☐	396 1,1,1,2-Tetrachloroethane[3.0]	☐	☐	
✓	397 1,1,2,2-Tetrachloroethane[3.0]	☐	☑	
✓	399 Tetrachloroethylene[1.0]	☐	☑	
☐	401 Tetrahydrofuran (THF)[200]	☐	☐	
✓	411 Toluene[1.0]	☐	☑	
✓	421 1,1,1-Trichloroethane[1.0]	☐	☑	
✓	423 1,1,2-Trichloroethane[1.5]	☐	☑	
✓	425 Trichloroethylene[1.0]	☐	☑	
☐	428 Trichlorotrifluoroethane[3.0]	☐	☐	
✓	434 Vinyl Chloride	☐	☑	[not quantified]
✓	437 Xylenes[2.0]	☐	☑	
✓	Chloroethane	☐	☑	
✓	Methylene Chloride	☐	☑	

Comments

Date Received and Sample No. 3/9/87 #3 311.04

Rm 220 College of Natural Resources
University of Wisconsin
Stevens Point, WI 54481
715/346-3209
Lab ID #750040280

Occupant *Monitoring Wells?*
WELL Address *#4* [redacted]
City *Kronenwetter* Zip
Phone ( )
Years of residence
Well Construction
Date
Well Driller
Address
Casing Diam ____ inches
Driven ____ Dug ____ Drilled ____
Depth
of Casing ____ feet
to Water ____ feet
of Well ____ feet
Distance to
Septic Tank ____ feet
Tile Field ____ feet
Seepage Pit ____ feet
Other ____ ft

Owner *Unknown*
Address
City Zip
Phone( )
Years of ownership
Last Water Quality Test
Date
Lab
for
Well Location
County *Marathon*
Township
Legal Description
____ 1/4 | ____ 1/4 | S ____ (sect.) | T ____ (town) | R ____ (range)
Water Source
Private ☐ Municipal ☐
Other

Mail to *Central Wisc Engineers*
Address *903 Grand Ave*
City *Rothschild* *15447[illegible]* Zip
Phone ( )
No. of wells at location
Sample Taken
Date
Time
Treatment Systems Owned
Softener? yes ☐ no ☐
Other
Tap Samples
Tap Location
Before Treatment? yes ☐ no ☐
Well Depth Changed? yes ☐ no ☐
Date of Change
Problems Observed
Color ☐ Taste ☐ Corrosion ☐
Odor ☐ Health ☐ None ☐
Other

Detection Limits (ug/l) are indicated in brackets [ ]

	Compound	Detected	Not Detected	(ug/l)
☐	007 Acrolein[50]	☐	☐	
☐	009 Acrylonitrile[20]	☐	☐	
☑	025 Benzene[1.0]	☐	☑	
☐	046 Bromobenzene[4.0]	☐	☐	
☑	051 Bromodichloromethane[1.5]	☐	☑	
☑	053 Bromoform[5.0]	☐	☑	
☑	055 Bromomethane[50]	☐	☑	
☐	063 n-Butylacetate[0.5]	☐	☐	
☐	071 Carbon Disulfide[5.0]	☐	☐	
☑	073 Carbon Tetrachloride[1.5]	☐	☑	
☑	083 Chlorobenzene[2.0]	☐	☑	
☑	087 Chloroethane[20]	☐	☑	
☑	093 2-Chloroethylvinyl Ether[4.0]	☐	☑	
☑	095 Chloroform[1.0]	☐	☑	
☐	108 o-Chlorotoluene[1.0]	☐	☐	
☐	110 p-Chlorotoluene[1.0]	☐	☐	
☑	147 Dibromochloromethane[2.0]	☐	☑	
☐	148 1,2-Dibromo-3-Chloropropane	☐	☐	[not quantified]
☐	153 o-Dichlorobenzene[2.0]	☐	☑	
☑	155 m-Dichlorobenzene[2.0]	☐	☑	
☑	157 p-Dichlorobenzene[2.0]	☐	☑	
☑	165 1,1-Dichloroethane[1.0]	☐	☑	
☑	167 1,2-Dichloroethane[1.0]	☐	☑	
☐	169 1,1-Dichloroethylene[1.0]	☐	☐	
☑	171 1,2-Dichloroethylene[1.0]	☐	☑	
☐	174 Dichloroiodomethane	☐	☐	[not quantified]
☑	181 1,2-Dichloropropane[1.0]	☐	☑	

EPA Methods 601 & 602 HECD & PID
GC Column(s) *1% SP1000*

	Compound	Detected	Not Detected	ug/l
☑	183 cis-1,3-Dichloropropene[2.5]	☐	☑	
☑	185 trans-1,3-Dichloropropene[2.5]	☐	☑	
☑	233 Ethylbenzene[1.0]	☐	☑	
☑	427 Fluorotrichloromethane[1.0]	☐	☑	
☐	298 Isopropylbenzene[1.0]	☐	☐	
☐	319 Methylethylketone (MEK)[12]	☐	☐	
☐	393 Styrene[2.0]	☐	☐	
☐	396 1,1,1,2-Tetrachloroethane[3.0]	☐	☐	
☑	397 1,1,2,2-Tetrachloroethane[3.0]	☐	☑	
☑	399 Tetrachloroethylene[1.0]	☐	☑	
☐	401 Tetrahydrofuran (THF)[200]	☐	☐	
☑	411 Toluene[1.0]	☐	☑	
☑	421 1,1,1-Trichloroethane[1.0]	☐	☑	
☑	423 1,1,2-Trichloroethane[1.5]	☐	☑	
☑	425 Trichloroethylene[1.0]	☐	☑	
☐	428 Trichlorotrifluoroethane[3.0]	☐	☐	
☑	434 Vinyl Chloride	☐	☑	[not quantified]
☑	437 Xylenes[2.0]	☐	☑	
☑	*Chloroethane*	☐	☑	
☑	*Methylene Chloride*	☐	☑	

Comments *[illegible] 4 min peak PID 10 min*

Date Received and Sample No. *3/9/87 #5 Blue 318.02*

Rm 220 College of Natural Resources
University of Wisconsin
Stevens Point, WI 54481
715/346-3209
Lab ID #750040280

Occupant *Monitoring Wells?*
WELL Address *#5* [redacted]
City *Kronenwetter* Zip
Phone ( )
Years of residence
Well Construction
Date
Well Driller
Address
Casing Diam ____ inches
Driven ____ Dug ____ Drilled ____
Depth
of Casing ____ feet
to Water ____ feet
of Well ____ feet
Distance to
Septic Tank ____ feet
Tile Field ____ feet
Seepage Pit ____ feet
Other ____ ft

Owner *Unknown*
Address
City
Phone ( ) Zip
Years of ownership
Last Water Quality Test
Date
Lab
for
Well Location
County *Marathon*
Township
Legal Description
1/4 | 1/4 | S (sect.) | T (town) | R (range)
Water Source
Private ☐ Municipal ☐
Other

Mail to *Central Wisc Engineers*
Address *903 Grand Ave*
City *Rothschild* Zip *54474*
Phone ( )
No. of wells at location
Sample Taken
Date
Time
Treatment Systems Owned
Softener? yes ☐ no ☐
Other
Tap Samples
Tap Location
Before Treatment? yes ☐ no ☐
Well Depth Changed? yes ☐ no ☐
Date of Change
Problems Observed
Color ☐ Taste ☐ Corrosion ☐
Odor ☐ Health ☐ None ☐
Other

Detection Limits (ug/l) are indicated in brackets [ ]

	Compound	Detected	Not Detected	(ug/l)
☐	007 Acrolein[50]	☐	☐	
☐	009 Acrylonitrile[20]	☐	☐	
☑	025 Benzene[1.0]	☐	☑	
☐	046 Bromobenzene[4.0]	☐	☐	
☑	051 Bromodichloromethane[1.5]	☐	☑	
☑	053 Bromoform[5.0]	☐	☑	
☑	055 Bromomethane[50]	☐	☑	
☐	063 n-Butylacetate[0.5]	☐	☐	
☐	071 Carbon Disulfide[5.0]	☐	☐	
☑	073 Carbon Tetrachloride[1.5]	☐	☑	
☑	083 Chlorobenzene[2.0]	☐	☑	
☑	087 Chloroethane[20]	☐	☑	
☑	093 2-Chloroethylvinyl Ether[4.0]	☐	☑	
☑	095 Chloroform[1.0]	☐	☑	
☐	108 o-Chlorotoluene[1.0]	☐	☐	
☐	110 p-Chlorotoluene[1.0]	☐	☐	
☑	147 Dibromochloromethane[2.0]	☐	☑	
☐	148 1,2-Dibromo-3-Chloropropane	☐	☐	[not quantified]
☑	153 o-Dichlorobenzene[2.0]	☐	☑	
☑	155 m-Dichlorobenzene[2.0]	☐	☑	
☑	157 p-Dichlorobenzene[2.0]	☐	☑	
☑	165 1,1-Dichloroethane[1.0]	☐	☑	
☑	167 1,2-Dichloroethane[1.0]	☐	☐	
☐	169 1,1-Dichloroethylene[1.0]	☐	☐	
☑	171 1,2-Dichloroethylene[1.0]	☐	☑	
☐	174 Dichloroiodomethane	☐	☐	[not quantified]
☑	181 1,2-Dichloropropane[1.0]	☐	☑	

EPA Methods 601 & 602 HECD & PID

GC Column(s) *1% SP1000*

	Compound	Detected	Not Detected	ug/l
☑	183 cis-1,3-Dichloropropene[2.5]	☐	☑	
☑	185 trans-1,3-Dichloropropene[2.5]	☐	☑	
☑	233 Ethylbenzene[1.0]	☐	☑	
☑	427 Fluorotrichloromethane[1.0]	☐	☐	
☐	298 Isopropylbenzene[1.0]	☐	☐	
☐	319 Methylethylketone (MEK)[12]	☐	☐	
☐	393 Styrene[2.0]	☐	☐	
☐	396 1,1,1,2-Tetrachloroethane[3.0]	☐	☐	
☑	397 1,1,2,2-Tetrachloroethane[3.0]	☐	☑	
☑	399 Tetrachloroethylene[1.0]	☐	☑	
☐	401 Tetrahydrofuran (THF)[200]	☐	☐	
☑	411 Toluene[1.0]	☐	☑	
☑	421 1,1,1-Trichloroethane[1.0]	☐	☑	
☑	423 1,1,2-Trichloroethane[1.5]	☐	☑	
☑	425 Trichloroethylene[1.0]	☐	☑	
☐	428 Trichlorotrifluoroethane[3.0]	☐	☐	
☑	434 Vinyl Chloride	☐	☑	[not quantified]
☑	437 Xylenes[2.0]	☐	☑	
☑	*Chloroethane*	☐	☑	
☑	*Methylene Chloride*	☐	☑	

Comments

Date Received and Sample No. *3/9/87 #5 Black 31105*

Rm 220 College of Natural Resources
University of Wisconsin
Stevens Point, WI 54481
715/346-3209
Lab ID #750040280

Occupant *Monitoring Wells?*
WELL Address *#6*
City *Kronenwetter* Zip
Phone ( )
Years of residence
Well Construction
Date
Well Driller
Address
Casing Diam ____ inches
Driven ____ Dug ____ Drilled ____
Depth
of Casing ____ feet
to Water ____ feet
of Well ____ feet
Distance to
Septic Tank ____ feet
Tile Field ____ feet
Seepage Pit ____ feet
Other ____ ft

Owner *Unknown*
Address
City
Phone( ) Zip
Years of ownership
Last Water Quality Test
Date
Lab
for
Well Location
County *Marathon*
Township
Legal Description
1/4 | 1/4 | S (sect.) | T (town) | R (range)
Water Source
Private ☐ Municipal ☐
Other

Mail to *Central Wisc Engineers*
Address *903 Grand Ave*
City *Rothschild* Zip *54474*
Phone ( )
No. of wells at location
Sample Taken
Date
Time
Treatment Systems Owned
Softener? yes ☐ no ☐
Other
Tap Samples
Tap Location
Before Treatment? yes ☐ no ☐
Well Depth Changed? yes ☐ no ☐
Date of Change
Problems Observed
Color ☐ Taste ☐ Corrosion ☐
Odor ☐ Health ☐ None ☐
Other

Detection Limits (ug/l) are indicated in brackets [ ]

	Compound	Detected	Not Detected	(ug/l)
☐	007 Acrolein[50]	☐	☐	
☐	009 Acrylonitrile[20]	☐	☐	
☑	025 Benzene[1.0]	☐	☑	
☐	046 Bromobenzene[4.0]	☐	☐	
☑	051 Bromodichloromethane[1.5]	☐	☑	
☑	053 Bromoform[5.0]	☐	☑	
☑	055 Bromomethane[50]	☐	☑	
☐	063 n-Butylacetate[0.5]	☐	☐	
☐	071 Carbon Disulfide[5.0]	☐	☐	
☑	073 Carbon Tetrachloride[1.5]	☐	☑	
☑	083 Chlorobenzene[2.0]	☐	☑	
☑	087 Chloroethane[20]	☐	☑	
☑	093 2-Chloroethylvinyl Ether[4.0]	☐	☑	
☑	095 Chloroform[1.0]	☐	☑	
☐	108 o-Chlorotoluene[1.0]	☐	☐	
☐	110 p-Chlorotoluene[1.0]	☐	☐	
☑	147 Dibromochloromethane[2.0]	☐	☑	
☐	148 1,2-Dibromo-3-Chloropropane	☐	☐	[not quantified]
☐	153 o-Dichlorobenzene[2.0]	☐	☑	
☑	155 m-Dichlorobenzene[2.0]	☐	☑	
☑	157 p-Dichlorobenzene[2.0]	☐	☑	
☑	165 1,1-Dichloroethane[1.0]	☐	☑	
☑	167 1,2-Dichloroethane[1.0]	☐	☑	
☐	169 1,1-Dichloroethylene[1.0]	☐	☐	
☑	171 1,2-Dichloroethylene[1.0]	☐	☑	
	174 Dichloroiodomethane	☐	☐	[not quantified]
☑	181 1,2-Dichloropropane[1.0]	☐	☑	

EPA Methods 601 & 602 HECD & PID

GC Column(s) *1% SP1000*

	Compound	Detected	Not Detected	ug/l
☑	183 cis-1,3-Dichloropropene[2.5]	☐	☑	
☑	185 trans-1,3-Dichloropropene[2.5]	☐	☑	
☑	233 Ethylbenzene[1.0]	☐	☑	
☑	427 Fluorotrichloromethane[1.0]	☐	☑	
☐	298 Isopropylbenzene[1.0]	☐	☐	
☐	319 Methylethylketone (MEK)[12]	☐	☐	
☐	393 Styrene[2.0]	☐	☐	
☐	396 1,1,1,2-Tetrachloroethane[3.0]	☐	☐	
☑	397 1,1,2,2-Tetrachloroethane[3.0]	☐	☑	
☑	399 Tetrachloroethylene[1.0]	☐	☑	
☐	401 Tetrahydrofuran (THF)[200]	☐	☐	
☑	411 Toluene[1.0]	☐	☑	
☑	421 1,1,1-Trichloroethane[1.0]	☐	☑	
☑	423 1,1,2-Trichloroethane[1.5]	☐	☑	
☑	425 Trichloroethylene[1.0]	☐	☑	
☐	428 Trichlorotrifluoroethane[3.0]	☐	☐	
☑	434 Vinyl Chloride	☐	☑	[not quantified]
☑	437 Xylenes[2.0]	☐	☑	
☑	*Chloroethane*	☐	☑	
☑	*Methylene Chloride*	☐	☑	

Comments

Date Received and Sample No. *3/9/87 #6 311.06*

Rm 220 College of Natural Resources
University of Wisconsin
Stevens Point, WI 54481
715/346-3209
Lab ID #750040280

Occupant *Monitoring Wells?*
WELL Address *#7*
City *Kronenwetter* Zip
Phone ( )
Years of residence
Well Construction
Date
Well Driller
Address
Casing Diam ______ inches
Driven ______ Dug ______ Drilled ______
Depth
of Casing ______ feet
to Water ______ feet
of Well ______ feet
Distance to
Septic Tank ______ feet
Tile Field ______ feet
Seepage Pit ______ feet
Other ______ ft

Owner *Unknown*
Address
City Zip
Phone( )
Years of ownership
Last Water Quality Test
Date
Lab
for
Well Location
County *Marathon*
Township
Legal Description
1/4 | 1/4 | S (sect.) | T (town) | R (range)

Water Source
Private ☐ Municipal ☐
Other

Mail to *Central Wisc Engineers*
Address *903 Grand Ave*
City *Rothschild* Zip *15447*
Phone ( )
No. of wells at location
Sample Taken
Date
Time
Treatment Systems Owned
Softener? yes ☐ no ☐
Other
Tap Samples
Tap Location
Before Treatment? yes ☐ no ☐
Well Depth Changed? yes ☐ no ☐
Date of Change
Problems Observed
Color ☐ Taste ☐ Corrosion ☐
Odor ☐ Health ☐ None ☐
Other

Detection Limits (ug/l) are indicated in brackets [ ]

	Compound	Detected	Not Detected	(ug/l)
☐	007 Acrolein[50]	☐	☐	
☐	009 Acrylonitrile[20]	☐	☐	
✓	025 Benzene[1.0]	☐	✓	
☐	046 Bromobenzene[4.0]	☐	☐	
✓	051 Bromodichloromethane[1.5]	☐	✓	
✓	053 Bromoform[5.0]	☐	✓	
✓	055 Bromomethane[50]	☐	✓	
☐	063 n-Butylacetate[0.5]	☐	☐	
☐	071 Carbon Disulfide[5.0]	☐	☐	
✓	073 Carbon Tetrachloride[1.5]	☐	✓	
✓	083 Chlorobenzene[2.0]	☐	✓	
✓	087 Chloroethane[20]	☐	✓	
✓	093 2-Chloroethylvinyl Ether[4.0]	☐	✓	
✓	095 Chloroform[1.0]	☐	✓	
☐	108 o-Chlorotoluene[1.0]	☐	☐	
	110 p-Chlorotoluene[1.0]	☐	☐	
✓	147 Dibromochloromethane[2.0]	☐	✓	
☐	148 1,2-Dibromo-3-Chloropropane	☐	☐	[not quantified]
✓	153 o-Dichlorobenzene[2.0]	☐	✓	
✓	155 m-Dichlorobenzene[2.0]	☐	✓	
✓	157 p-Dichlorobenzene[2.0]	☐	✓	
✓	165 1,1-Dichloroethane[1.0]	☐	✓	
✓	167 1,2-Dichloroethane[1.0]	☐	✓	
☐	169 1,1-Dichloroethylene[1.0]	☐	☐	
✓	171 1,2-Dichloroethylene[1.0]	☐	✓	
☐	174 Dichloroiodomethane	☐	☐	[not quantified]
✓	181 1,2-Dichloropropane[1.0]	☐	✓	

EPA Methods 601 & 602 HECD & PID
GC Column(s) *1% SP1000*

	Compound	Detected	Not Detected	ug/l
✓	183 cis-1,3-Dichloropropene[2.5]	☐	✓	
✓	185 trans-1,3-Dichloropropene[2.5]	☐	✓	
✓	233 Ethylbenzene[1.0]	☐	✓	
✓	427 Fluorotrichloromethane[1.0]	☐	✓	
☐	298 Isopropylbenzene[1.0]	☐	☐	
☐	319 Methylethylketone (MEK)[12]	☐	☐	
☐	393 Styrene[2.0]	☐	☐	
☐	396 1,1,1,2-Tetrachloroethane[3.0]	☐	☐	
✓	397 1,1,2,2-Tetrachloroethane[3.0]	☐	✓	
✓	399 Tetrachloroethylene[1.0]	☐	✓	
☐	401 Tetrahydrofuran (THF)[200]	☐	☐	
✓	411 Toluene[1.0]	☐	✓	
✓	421 1,1,1-Trichloroethane[1.0]	☐	✓	
✓	423 1,1,2-Trichloroethane[1.5]	☐	✓	
✓	425 Trichloroethylene[1.0]	☐	✓	
☐	428 Trichlorotrifluoroethane[3.0]	☐	☐	
✓	434 Vinyl Chloride	☐	✓	[not quantified]
✓	437 Xylenes[2.0]	☐	✓	
✓	*Chloroethane*	☐	✓	
✓	*Methylene Chloride*	☐	✓	

Comments

Date Received and Sample No. *3/9/87 #7 312.02*

Rm 220 College of Natural Resources
University of Wisconsin
Stevens Point, WI 54481
715/346-3209
Lab ID #750040280

Occupant *Monitoring Wells?*
WELL Address *#8*
City *Kronenwetter* Zip
Phone ( )
Years of residence
Well Construction
Date
Well Driller
Address
Casing Diam ______ inches
Driven ______ Dug ______ Drilled ______
Depth
of Casing ______ feet
to Water ______ feet
of Well ______ feet
Distance to
Septic Tank ______ feet
Tile Field ______ feet
Seepage Pit ______ feet
Other ______ ft

Owner *Unknown*
Address
City Zip
Phone( )
Years of ownership
Last Water Quality Test
Date
Lab
for
Well Location
County *Marathon*
Township
Legal Description
¼ | ¼ | S | T | R
1/4 | 1/4 | (sect.) | (town) | (range)
Water Source
Private ☐ Municipal ☐
Other

Mail to *Central Wisc Engineers*
Address *903 Grand Ave*
City *Rothschild* Zip *54474*
Phone ( )
No. of wells at location
Sample Taken
Date
Time
Treatment Systems Owned
Softener? yes ☐ no ☐
Other
Tap Samples
Tap Location
Before Treatment? yes ☐ no ☐
Well Depth Changed? yes ☐ no ☐
Date of Change
Problems Observed
Color ☐ Taste ☐ Corrosion ☐
Odor ☐ Health ☐ None ☐
Other

Detection Limits (ug/l) are indicated in brackets [ ]

Compound	Detected	Not Detected	(ug/l)
007 Acrolein[50]	☐	☐	
009 Acrylonitrile[20]	☐	☐	
025 Benzene[1.0]	☐	☑	
046 Bromobenzene[4.0]	☐	☐	
051 Bromodichloromethane[1.5]	☐	☑	
053 Bromoform[5.0]	☐	☑	
055 Bromomethane[50]	☐	☑	
063 n-Butylacetate[0.5]	☐	☐	
071 Carbon Disulfide[5.0]	☐	☐	
073 Carbon Tetrachloride[1.5]	☐	☑	
083 Chlorobenzene[2.0]	☐	☑	
087 Chloroethane[20]	☐	☑	
093 2-Chloroethylvinyl Ether[4.0]	☐	☑	
095 Chloroform[1.0]	☐	☑	
108 o-Chlorotoluene[1.0]	☐	☐	
110 p-Chlorotoluene[1.0]	☐	☐	
147 Dibromochloromethane[2.0]	☐	☑	
148 1,2-Dibromo-3-Chloropropane	☐	☐	[not quantified]
153 o-Dichlorobenzene[2.0]	☐	☑	
155 m-Dichlorobenzene[2.0]	☐	☑	
157 p-Dichlorobenzene[2.0]	☐	☑	
165 1,1-Dichloroethane[1.0]	☐	☑	
167 1,2-Dichloroethane[1.0]	☐	☑	
169 1,1-Dichloroethylene[1.0]	☐	☐	
171 1,2-Dichloroethylene[1.0]	☐	☑	
174 Dichloroiodomethane	☐	☐	[not quantified]
181 1,2-Dichloropropane[1.0]	☐	☑	

EPA Methods 601 & 602 HECD & PID

GC Column(s) *1% SP1000*

Compound	Detected	Not Detected	ug/l
183 cis-1,3-Dichloropropene[2.5]	☐	☑	
185 trans-1,3-Dichloropropene[2.5]	☐	☑	
233 Ethylbenzene[1.0]	☐	☑	
427 Fluorotrichloromethane[1.0]	☐	☑	
296 Isopropylbenzene[1.0]	☐	☐	
319 Methylethylketone (MEK)[12]	☐	☐	
393 Styrene[2.0]	☐	☐	
396 1,1,1,2-Tetrachloroethane[3.0]	☐	☐	
397 1,1,2,2-Tetrachloroethane[3.0]	☐	☑	
399 Tetrachloroethylene[1.0]	☐	☑	
401 Tetrahydrofuran (THF)[200]	☐	☐	
411 Toluene[1.0]	☐	☑	
421 1,1,1-Trichloroethane[1.0]	☐	☑	
423 1,1,2-Trichloroethane[1.5]	☐	☑	
425 Trichloroethylene[1.0]	☐	☑	
428 Trichlorotrifluoroethane[3.0]	☐	☐	
434 Vinyl Chloride	☐	☑	[not quantified]
437 Xylenes[2.0]	☐	☑	
Chloroethane	☐	☑	
Methylene Chloride	☐	☑	

Comments *Small peak PID 10 min 2 min*

Date Received and Sample No. *3/9/87 #8 312.03*

Rm 220 College of Natural Resources
University of Wisconsin
Stevens Point, WI 54481
715/346-3209
Lab ID #750040280

Occupant Monitoring Wells?
WELL Address #9
City Kronenwetter
Phone ( )
Zip
Years of residence
Well Construction
Date
Well Driller
Address
Casing Diam ______ inches
Driven ____ Dug ____ Drilled ____
Depth
of Casing ______ feet
to Water ______ feet
of Well ______ feet
Distance to
Septic Tank ______ feet
Tile Field ______ feet
Seepage Pit ______ feet
Other ______ ft

Owner Unknown
Address
City
Phone ( )
Zip
Years of ownership
Last Water Quality Test
Date
Lab
for
Well Location
County Marathon
Township
Legal Description
¼ ¼ S T R
1/4 1/4 (sect.) (town) (range)
Water Source
Private ☐ Municipal ☐
Other

Mail to Central Wisc Engineers
Address 903 Grand Ave
City Rothschild 54474
Phone ( )
Zip
No. of wells at location
Sample Taken
Date
Time
Treatment Systems Owned
Softener? yes ☐ no ☐
Other
Tap Samples
Tap Location
Before Treatment? yes ☐ no ☐
Well Depth Changed? yes ☐ no ☐
Date of Change
Problems Observed
Color ☐ Taste ☐ Corrosion ☐
Odor ☐ Health ☐ None ☐
Other

Detection Limits (ug/l) are indicated in brackets [ ]

	Code	Compound	Detected	Not Detected	(ug/l)
☐	007	Acrolein[50]	☐	☐	
	009	Acrylonitrile[20]	☐	☐	
✓	025	Benzene[1.0]	☐	☑	
	046	Bromobenzene[4.0]	☐	☐	
✓	051	Bromodichloromethane[1.5]	☐	☑	
✓	053	Bromoform[5.0]	☐	☑	
✓	055	Bromomethane[50]	☐	☑	
☐	063	n-Butylacetate[0.5]	☐	☐	
	071	Carbon Disulfide[5.0]	☐	☐	
✓	073	Carbon Tetrachloride[1.5]	☐	☑	
✓	083	Chlorobenzene[2.0]	☐	☑	
✓	087	Chloroethane[20]	☐	☑	
✓	093	2-Chloroethylvinyl Ether[4.0]	☐	☑	
✓	095	Chloroform[1.0]	☐	☑	
☐	108	o-Chlorotoluene[1.0]	☐	☐	
	110	p-Chlorotoluene[1.0]	☐	☐	
✓	147	Dibromochloromethane[2.0]	☐	☑	
☐	148	1,2-Dibromo-3-Chloropropane	☐	☐	[not quantified]
✓	153	o-Dichlorobenzene[2.0]	☐	☑	
✓	155	m-Dichlorobenzene[2.0]	☐	☑	
✓	157	p-Dichlorobenzene[2.0]	☐	☑	
✓	165	1,1-Dichloroethane[1.0]	☐	☑	
✓	167	1,2-Dichloroethane[1.0]	☐	☑	
	169	1,1-Dichloroethylene[1.0]	☐	☐	
✓	171	1,2-Dichloroethylene[1.0]	☐	☑	
	174	Dichloroiodomethane	☐	☐	[not quantified]
✓	181	1,2-Dichloropropane[1.0]	☐	☑	

EPA Methods 601 & 602 HECD & PID

GC Column(s) 1% SP1000

	Code	Compound	Detected	Not Detected	ug/l
✓	183	cis-1,3-Dichloropropene[2.5]	☐	☑	
✓	185	trans-1,3-Dichloropropene[2.5]	☐	☑	
✓	233	Ethylbenzene[1.0]	☐	☑	
✓	427	Fluorotrichloromethane[1.0]	☐	☑	
☐	298	Isopropylbenzene[1.0]	☐	☐	
☐	319	Methylethylketone (MEK)[12]	☐	☐	
☐	393	Styrene[2.0]	☐	☐	
☐	396	1,1,1,2-Tetrachloroethane[3.0]	☐	☐	
✓	397	1,1,2,2-Tetrachloroethane[3.0]	☐	☑	
✓	399	Tetrachloroethylene[1.0]	☐	☑	
☐	401	Tetrahydrofuran (THF)[200]	☐	☑	
✓	411	Toluene[1.0]	☐	☑	
✓	421	1,1,1-Trichloroethane[1.0]	☐	☑	
✓	423	1,1,2-Trichloroethane[1.5]	☐	☑	
✓	425	Trichloroethylene[1.0]	☐	☑	
☐	428	Trichlorotrifluoroethane[3.0]	☐	☐	
☑	434	Vinyl Chloride	☐	☑	[not quantified]
✓	437	Xylenes[2.0]	☐	☑	
✓		Chloroethane	☐	☑	
✓		Methylene Chloride	☐	☑	

Comments peak at 10min PID 12mm

Date Received and Sample No. 3/9/87 #9 312.04

Rm 220 College of Natural Resources
University of Wisconsin
Stevens Point, WI 54481
715/346-3209
Lab ID #750040280

Occupant *Monitoring Wells?*
WELL Address *#10*
City *Kronenwetter* Zip
Phone ( )
Years of residence
Well Construction
Date
Well Driller
Address
Casing Diam ____ inches
Driven ____ Dug ____ Drilled ____
Depth
of Casing ____ feet
to Water ____ feet
of Well ____ feet
Distance to
Septic Tank ____ feet
Tile Field ____ feet
Seepage Pit ____ feet
Other ____ ft

Owner *Unknown*
Address
City
Phone( ) Zip
Years of ownership
Last Water Quality Test
Date
Lab
for
Well Location
County *Marathon*
Township
Legal Description
¼ ¼ S T R
1/4 1/4 (sect.) (town) (range)
Water Source
Private ☐ Municipal ☐
Other

Mail to *Central Wisc Engineers*
Address *903 Grand Ave*
City *Rothschild* Zip *54474*
Phone ( )
No. of wells at location
Sample Taken
Date
Time
Treatment Systems Owned
Softener? yes ☐ no ☐
Other
Tap Samples
Tap Location
Before Treatment? yes ☐ no ☐
Well Depth Changed? yes ☐ no ☐
Date of Change
Problems Observed
Color ☐ Taste ☐ Corrosion ☐
Odor ☐ Health ☐ None ☐
Other

Detection Limits (ug/l) are indicated in brackets [ ]

	Compound	Detected	Not Detected	(ug/l)
	007 Acrolein[50]	☐	☐	
	009 Acrylonitrile[20]	☐	☐	
✓	025 Benzene[1.0]	☐	✓	
	046 Bromobenzene[4.0]	☐	☐	
✓	051 Bromodichloromethane[1.5]	☐	✓	
✓	053 Bromoform[5.0]	☐	✓	
✓	055 Bromomethane[50]	☐	✓	
	063 n-Butylacetate[0.5]	☐	☐	
	071 Carbon Disulfide[5.0]	☐	☐	
✓	073 Carbon Tetrachloride[1.5]	☐	✓	
✓	083 Chlorobenzene[2.0]	☐	✓	
✓	087 Chloroethane[20]	☐	✓	
	093 2-Chloroethylvinyl Ether[4.0]	☐	✓	
	095 Chloroform[1.0]	☐	✓	
	108 o-Chlorotoluene[1.0]	☐	☐	
	110 p-Chlorotoluene[1.0]	☐	☐	
✓	147 Dibromochloromethane[2.0]	☐	✓	
	148 1,2-Dibromo-3-Chloropropane	☐	☐	[not quantified]
✓	153 o-Dichlorobenzene[2.0]	☐	✓	
✓	155 m-Dichlorobenzene[2.0]	☐	✓	
✓	157 p-Dichlorobenzene[2.0]	☐	✓	
✓	165 1,1-Dichloroethane[1.0]	☐	✓	
✓	167 1,2-Dichloroethane[1.0]	☐	✓	
	169 1,1-Dichloroethylene[1.0]	☐	☐	
✓	171 1,2-Dichloroethylene[1.0]	☐	✓	
	174 Dichloroiodomethane	☐	☐	[not quantified]
✓	181 1,2-Dichloropropane[1.0]	☐	✓	

EPA Methods 601 & 602 HECD & PID

GC Column(s) *1% SP1000*

	Compound	Detected	Not Detected	ug/l
✓	183 cis-1,3-Dichloropropene[2.5]	☐	✓	
✓	185 trans-1,3-Dichloropropene[2.5]	☐	✓	
✓	233 Ethylbenzene[1.0]	☐	✓	
✓	427 Fluorotrichloromethane[1.0]	☐	✓	
	298 Isopropylbenzene[1.0]	☐	☐	
	319 Methylethylketone (MEK)[12]	☐	☐	
	393 Styrene[2.0]	☐	☐	
	396 1,1,1,2-Tetrachloroethane[3.0]	☐	☐	
✓	397 1,1,2,2-Tetrachloroethane[3.0]	☐	✓	
✓	399 Tetrachloroethylene[1.0]	☐	✓	
	401 Tetrahydrofuran (THF)[200]	☐	☐	
✓	411 Toluene[1.0]	☐	✓	
✓	421 1,1,1-Trichloroethane[1.0]	☐	✓	
✓	423 1,1,2-Trichloroethane[1.5]	☐	✓	
✓	425 Trichloroethylene[1.0]	☐	✓	
	428 Trichlorotrifluoroethane[3.0]	☐	☐	
✓	434 Vinyl Chloride	☐	✓	[not quantified]
✓	437 Xylenes[2.0]	☐	✓	
✓	*Chloroethane*	☐	✓	
✓	*Methylene Chloride*	☐	✓	

Comments *Peak PID 10 min 10 min*

Date Received and Sample No. *3/9/87 #10 312.05*

Rm 220 College of Natural Resources
University of Wisconsin
Stevens Point, WI 54481
715/346-3209
Lab ID #750040280

Occupant Monitoring Wells?
WELL Address #11
City Kronenwetter
Phone ( )
Zip
Years of residence
Well Construction
Date
Well Driller
Address
Casing Diam ___ inches
Driven ___ Dug ___ Drilled ___
Depth
of Casing ___ feet
to Water ___ feet
of Well ___ feet
Distance to
Septic Tank ___ feet
Tile Field ___ feet
Seepage Pit ___ feet
Other ___ ft

Owner Unknown
Address
City
Phone( )
Zip
Years of ownership
Last Water Quality Test
Date
Lab
for
Well Location
County Marathon
Township
Legal Description
___ ¼ ___ ¼ S ___ T ___ R ___
1/4 1/4 (sect.) (town) (range)
Water Source
Private ☐ Municipal ☐
Other

Mail to Central Wisc Engineers
Address 903 Grand Ave.
City Rothschild 54474
Phone ( )
Zip
No. of wells at location
Sample Taken
Date
Time
Treatment Systems Owned
Softener? yes ☐ no ☐
Other
Tap Samples
Tap Location
Before Treatment? yes ☐ no ☐
Well Depth Changed? yes ☐ no ☐
Date of Change
Problems Observed
Color ☐ Taste ☐ Corrosion ☐
Odor ☐ Health ☐ None ☐
Other

Detection Limits (ug/l) are indicated in brackets [ ]

	Code	Compound	Detected	Not Detected	(ug/l)
☐	007	Acrolein[50]	☐	☐	
	009	Acrylonitrile[20]	☐	☐	
✓	025	Benzene[1.0]	☐	✓	
	046	Bromobenzene[4.0]	☐	☐	
✓	051	Bromodichloromethane[1.5]	☐	✓	
✓	053	Bromoform[5.0]	☐	✓	
✓	055	Bromomethane[50]	☐	✓	
☐	063	n-Butylacetate[0.5]	☐	☐	
	071	Carbon Disulfide[5.0]	☐	☐	
✓	073	Carbon Tetrachloride[1.5]	☐	✓	
✓	083	Chlorobenzene[2.0]	☐	✓	
✓	087	Chloroethane[20]	☐	✓	
✓	093	2-Chloroethylvinyl Ether[4.0]	☐	✓	
✓	095	Chloroform[1.0]	☐	✓	
☐	108	o-Chlorotoluene[1.0]	☐	☐	
	110	p-Chlorotoluene[1.0]	☐	☐	
✓	147	Dibromochloromethane[2.0]	☐	✓	
☐	148	1,2-Dibromo-3-Chloropropane	☐	☐	[not quantified]
✓	153	o-Dichlorobenzene[2.0]	☐	✓	
✓	155	m-Dichlorobenzene[2.0]	☐	✓	
✓	157	p-Dichlorobenzene[2.0]	☐	✓	
✓	165	1,1-Dichloroethane[1.0]	☐	✓	
✓	167	1,2-Dichloroethane[1.0]	☐	✓	
	169	1,1-Dichloroethylene[1.0]	☐	☐	
✓	171	1,2-Dichloroethylene[1.0]	☐	✓	
	174	Dichloroiodomethane	☐	☐	[not quantified]
✓	181	1,2-Dichloropropane[1.0]	☐	✓	

EPA Methods 601 & 602 HECD & PID

GC Column(s) 1% SP1000

	Code	Compound	Detected	Not Detected	ug/l
✓	183	cis-1,3-Dichloropropene[2.5]	☐	✓	
✓	185	trans-1,3-Dichloropropene[2.5]	☐	✓	
✓	233	Ethylbenzene[1.0]	☐	✓	
✓	427	Fluorotrichloromethane[1.0]	☐	✓	
	298	Isopropylbenzene[1.0]	☐	☐	
	319	Methylethylketone (MEK)[12]	☐	☐	
	393	Styrene[2.0]	☐	☐	
	396	1,1,1,2-Tetrachloroethane[3.0]	☐	☐	
✓	397	1,1,2,2-Tetrachloroethane[3.0]	☐	✓	
✓	399	Tetrachloroethylene[1.0]	☐	✓	
☐	401	Tetrahydrofuran (THF)[200]	☐	☐	
✓	411	Toluene[1.0]	☐	✓	
✓	421	1,1,1-Trichloroethane[1.0]	☐	✓	
✓	423	1,1,2-Trichloroethane[1.5]	☐	✓	
✓	425	Trichloroethylene[1.0]	☐	✓	
☐	428	Trichlorotrifluoroethane[3.0]	☐	☐	
✓	434	Vinyl Chloride	☐	✓	[not quantified]
✓	437	Xylenes[2.0]	☐	✓	
✓		Chloroethane	☐	✓	
✓		Methylene Chloride	☐	✓	

Comments

Date Received and Sample No. 3/9/87 #11 3/2.06

Rm 220 College of Natural Resources
University of Wisconsin
Stevens Point, WI 54481
715/346-3209
Lab ID #750040280

Occupant: Monitoring Wells?
WELL Address: #12
City: Kronenwetter Zip:
Phone: ( )
Years of residence:
Well Construction
Date:
Well Driller:
Address:
Casing Diam: ______ inches
Driven ____ Dug ____ Drilled ____
Depth
of Casing ______ feet
to Water ______ feet
of Well ______ feet
Distance to
Septic Tank ______ feet
Tile Field ______ feet
Seepage Pit ______ feet
Other ______ ft

Owner: Unknown
Address:
City: Zip:
Phone: ( )
Years of ownership:
Last Water Quality Test
Date:
Lab:
for:
Well Location
County: Marathon
Township:
Legal Description
___ 1/4 | ___ 1/4 | S (sect.) | T (town) | R (range)
Water Source
Private ☐ Municipal ☐
Other:

Mail to: Central Wisc Engineers
Address: 903 Grand Ave
City: Rothschild Zip: 54474
Phone: ( )
No. of wells at location:
Sample Taken
Date:
Time:
Treatment Systems Owned
Softener? yes ☐ no ☐
Other:
Tap Samples
Tap Location:
Before Treatment? yes ☐ no ☐
Well Depth Changed? yes ☐ no ☐
Date of Change:
Problems Observed
Color ☐ Taste ☐ Corrosion ☐
Odor ☐ Health ☐ None ☐
Other:

Detection Limits (ug/l) are indicated in brackets [ ]

	Compound	Detected	Not Detected	(ug/l)
☐	007 Acrolein[50]	☐	☐	
☐	009 Acrylonitrile[20]	☐	☐	
✓	025 Benzene[1.0]	☐	☑	
☐	046 Bromobenzene[4.0]	☐	☐	
✓	051 Bromodichloromethane[1.5]	☐	☑	
✓	053 Bromoform[5.0]	☐	☑	
✓	055 Bromomethane[50]	☐	☑	
☐	063 n-Butylacetate[0.5]	☐	☐	
☐	071 Carbon Disulfide[5.0]	☐	☐	
✓	073 Carbon Tetrachloride[1.5]	☐	☑	
✓	083 Chlorobenzene[2.0]	☐	☑	
✓	087 Chloroethane[20]	☐	☑	
	093 2-Chloroethylvinyl Ether[4.0]	☐	☑	
✓	095 Chloroform[1.0]	☐	☑	
	108 o-Chlorotoluene[1.0]	☐	☐	
☐	110 p-Chlorotoluene[1.0]	☐	☐	
	147 Dibromochloromethane[2.0]	☐	☑	
☐	148 1,2-Dibromo-3-Chloropropane	☐	☐	[not quantified]
✓	153 o-Dichlorobenzene[2.0]	☐	☑	
✓	155 m-Dichlorobenzene[2.0]	☐	☑	
✓	157 p-Dichlorobenzene[2.0]	☐	☑	
✓	165 1,1-Dichloroethane[1.0]	☐	☑	
✓	167 1,2-Dichloroethane[1.0]	☐	☑	
☐	169 1,1-Dichloroethylene[1.0]	☐	☐	
	171 1,2-Dichloroethylene[1.0]	☐	☑	
☐	174 Dichloroiodomethane	☐	☐	[not quantified]
✓	181 1,2-Dichloropropane[1.0]	☐	☑	

EPA Methods 601 & 602 HECD & PID

GC Column(s): 1% SP1000

	Compound	Detected	Not Detected	ug/l
✓	183 cis-1,3-Dichloropropene[2.5]	☐	☑	
✓	185 trans-1,3-Dichloropropene[2.5]	☐	☑	
✓	233 Ethylbenzene[1.0]	☐	☑	
✓	427 Fluorotrichloromethane[1.0]	☐	☑	
☐	298 Isopropylbenzene[1.0]	☐	☐	
☐	319 Methylethylketone (MEK)[12]	☐	☐	
☐	393 Styrene[2.0]	☐	☐	
☐	396 1,1,1,2-Tetrachloroethane[3.0]	☐	☐	
✓	397 1,1,2,2-Tetrachloroethane[3.0]	☐	☑	
✓	399 Tetrachloroethylene[1.0]	☐	☑	
☐	401 Tetrahydrofuran (THF)[200]	☐	☐	
✓	411 Toluene[1.0]	☐	☑	
✓	421 1,1,1-Trichloroethane[1.0]	☐	☑	
✓	423 1,1,2-Trichloroethane[1.5]	☐	☑	
✓	425 Trichloroethylene[1.0]	☐	☑	
☐	428 Trichlorotrifluoroethane[3.0]	☐	☐	
✓	434 Vinyl Chloride	☐	☑	[not quantified]
✓	437 Xylenes[2.0]	☐	☑	
✓	Chloroethane	☐	☑	
✓	Methylene Chloride	☐	☑	

Comments:

Date Received and Sample No.: 3/9/87 #12 317.02

N A M E S   A N D   A D D R E S S E S

1. JON'S AUTO SALES
921 Happy Hollow Road
693-6621

2. AMERICAN ASPHALT OF WIS.
1116 Happy Hollow Road
842-2045

3. LESTER KRUEGER, JR.
2067 James Street
359-5356

4. JOSEPH GOLEMBIEWSKI
2342 Old Highway 51
359-3316

5. KRONENWETTER CLINIC
1840 Hwy. XX
359-9467

6. EVERGREEN ELEMENTARY SCHOOL
1610 Pine Road
359-6591

7. LEONARD BRADFISH
2409 Tower Road
359-5892

8. RONALD SUTCH
1800 Seville Road
359-0749

9. GREGORY L. ZURN
2033 Kimberly Road
359-8294

10. GUY FREDEL
2240 Ruby Drive
359-8239

11. GEORGE OBERLANDER
2132 Plum Road
359-8725

12. JAMES KLEISNER
1802 Jackie Road
359-3044

APPENDIX B

Boring Logs for Pump Well and MW-2

BORING NO. Pump Well

SURFACE ELEV. 1172.68 FT.

Central Wisconsin
Engineers
P.O. BOX F • SCHOFIELD, WI 54476 • (715) 359-9400

SAMPLE NUMBER	BLOWS ON SAMPLER (140 lbs. - 2" O.D. - FALLING 30") 6"	6"	per ft.		CLASSIFICATION AND REMARKS	LAB TESTS	UNIFIED CLASSIFICATION	POCKET PEN. READING (T.S.F.)	GEOLOGY	DEPTH	ELEV.
					Coarse to fine sand, some to little fine gravel		SP			15	1157
					Coarse to medium sand, some fine gravel		SW			30	1142
					Coarse to fine sand, occasional trace of fine gravel		SP			62	1110
					Coarse to fine sand, some gravel		SW			70	1102
					Coarse to fine sand		SP			75	1097
					Coarse to fine sand and coarse to fine gravel		SW			90	1082
					E.O.B.						

KEY

C = ROCK CORE
A = AUGER SAMPLE
X = SPLIT SPOON
S = SHELBY TUBE
=

PROJECT ____
DATE(S) DRILLED ____
LOCATION ____
GROUNDWATER ____ FT. BELOW GS. AT ELEV. OF ____
DRILLERS ____ JOB NO. ____
DATE ____

BORING NO. MW - 2

SURFACE ELEV. 1171.59 FT.

Central Wisconsin Engineers

P.O. BOX F • SCHOFIELD, WI 54476 • (715) 359-9400

SAMPLE NUMBER	BLOWS ON SAMPLER (140 lbs. - 2" O.D. - FALLING 30") 6"	6"	per ft.		CLASSIFICATION AND REMARKS	LAB TESTS	UNIFIED CLASSIFICATION	POCKET PEN. READING (T.S.F.)	GEOLOGY	DEPTH	ELEV.
					Coarse to fine sand, some to little fine gravel		SP			15	1156
					Coarse to fine sand, some fine gravel		SW			30	1141
					Coarse to fine sand, occasional trace of fine gravel		SP			65	1106
					Coarse to fine sand, some gravel		SW			70	1092
					Coarse to fine sand and coarse to fine gravel		SW			98	1073
					Sand, silt, clay and gravel					100	1071
					E.O.B.						

KEY

C = ROCK CORE
A = AUGER SAMPLE
X = SPLIT SPOON
S = SHELBY TUBE
=

PROJECT

DATE(S) DRILLED

LOCATION

GROUNDWATER ____ FT. BELOW GS. AT ELEV. OF ____

DRILLERS ____ JOB NO. ____

DATE ____

HORNUNG WELL & PUMP CO.
N952 HWY W
MERRILL, WI 54452
January 25, 1989

KRONENWETTER OBSERVATION WELL
SE¼ NE¼ SEC 2 T. 27N R7E
WELL LOG
12-15-88

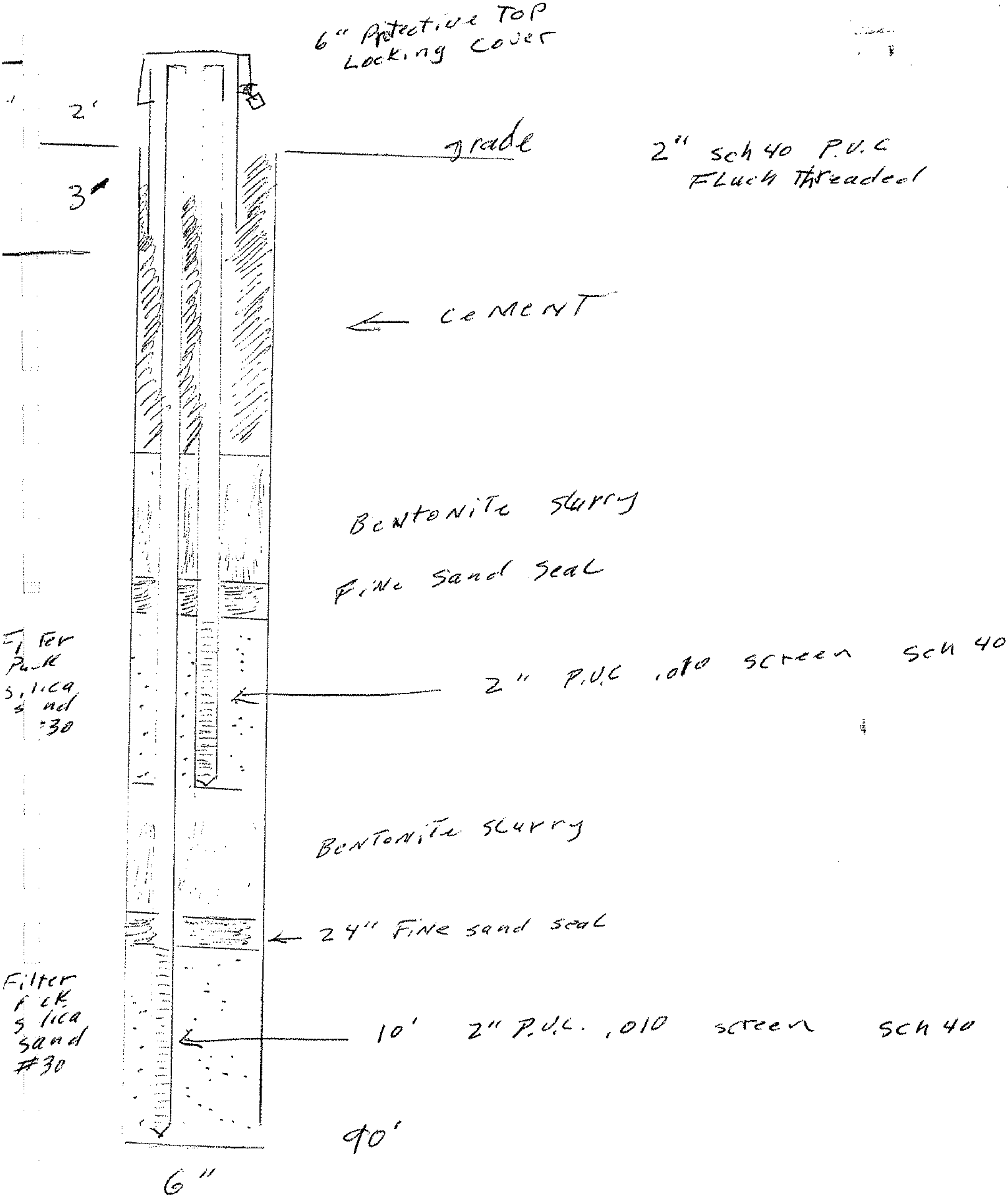
0-45	Med. sand yellow brown
45-55	Fine sand gray brown
55-65	Fine to med. sand some gravel brown
65-79	Med. sand gravel
79-95	Large gravel gray brown
95-99	Gravel gray
99-100	Clay & gravel

8" TEST WELL LOG
12-28-88

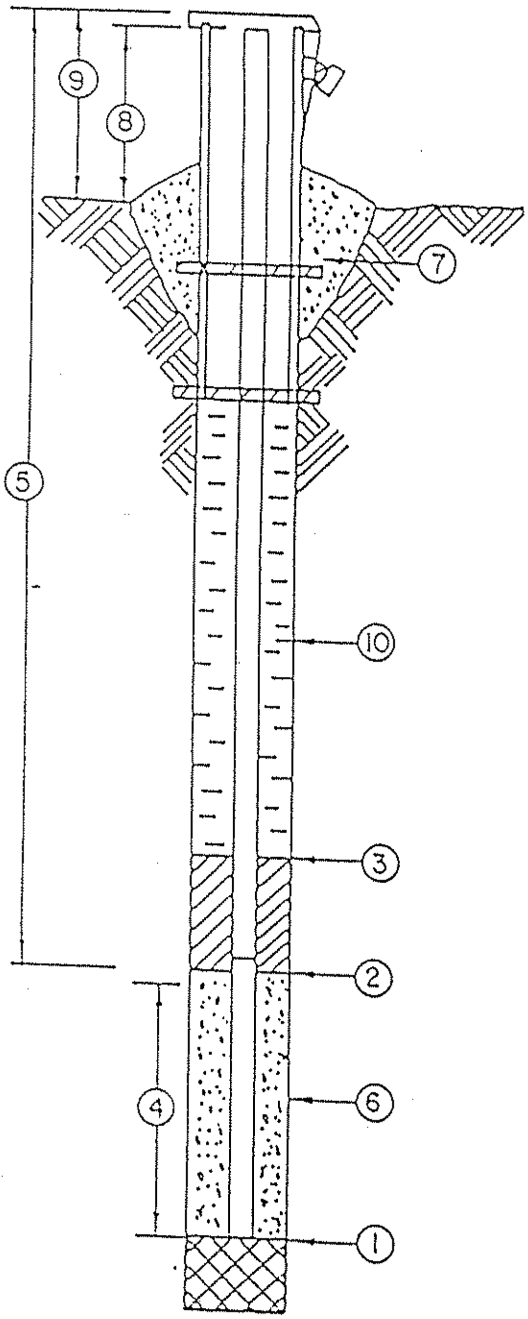
0-45	Med. sand yellow brown
45-62	Fine sand brown
62-85	Med. to fine sand some gravel
85-90	Med. gravel

KRONENWETTER
observation well

HORNUNG WELL & PUMP CO.
N952 Hwy W
Merrill, WI 54452



OBSERVATION WELL DETAIL (MW-2A, MW-2B)



① DEPTH TO BOTTOM OF WELL POINT OR SLOTTED PIPE 90' (51')

② DEPTH OF BOTTOM OF SEAL (if installed 80' (41')

③ THICKNESS OF SEAL (if installed) 24" (24")
- A. TYPE OF SEAL Finesand (Finesand)
- B. PHYSICAL CHARACTERISTICS OF SEAL
- C. DATE SEALED
- D. AMOUNT USED

④ LENGTH OF WELL SCREEN 10' (10')
- A. SCHEDULE 40 (40)
- B. SLOT TYPE .010 (.010)
- C. % OPEN AREA
- D. TYPE OF BOTTOM Point (Point)

⑤ TOTAL LENGTH OF PIPE 92' (53')
- A. PIPE TYPE PVC (PVC)
- B. DIAMETER 2" (2")
- C. SCHEDULE 40 (40)
- D. TYPE OF JOINT Flush Thread (Flush Thread)

⑥ TYPE OF FILTER MATERIAL Silica Sand (Silica Sand)
- A. QUANTITY
- B. MANUFACTURE INFORMATION
- C. DISTANCE ABOVE WELL SCREEN 2' (2')

⑦ CONCRETE PLUG
- A. HEIGHT ABOVE GROUND 0
- B. WIDTH 6"
- C. DEPTH BELOW GROUND 5'

⑧ HEIGHT OF WELL CASING ABOVE GROUND 1.5'
- A. ELEVATION 1173.09

⑨ PROTECTIVE CASING HEIGHT 1.5' above ground
- A. TYPE
- B. DIAMETER 6"
- C. LENGTH 2"
- D. DATE INSTALLED
- E. TYPE OF CAP & LOCK Lock and Key

⑩ TYPE OF GROUT Bentonite Slurry
- A. QUANTITY OF GROUT
- B. RATIO OF MIXTURE (2 OR MORE MATERIALS
- C. DATES GROUTED

LOCATION Kronenwetter
JOB NO. 65988
DEPTH OF BORE HOLE 90'
DIAMETER OF BORE HOLE 6"
DATE DRILLED 12-15-88
DRILLER Hornung Well and Pump
TYPE OF RIG
DRILLING METHOD Cable Tool
TYPE OF SOLVENT ---
WATER SOURCE ---

CENTRAL WISCONSIN ENGINEERS, INC.
CWE

State of Wisconsin
Department of Natural Resources

WELL/DRILLHOLE ABANDONMENT

Form 3300-5 Rev. 6-87

(1) GENERAL INFORMATION

Well/Drillhole Location — County: Marathon

SE 1/4 of NE 1/4 of Sec. 2; T. 27 N; R. 7 [X] E [ ] W

(If applicable) ______ Gov't Lot ______ Grid Number

Civil Town Name: Kronenwetter

Street Address of Well: Pine Rd.

City, Village: Mosinee

Date of Abandonment: 1-24 89

(2) FACILITY NAME

Original Well Owner (If Known): Town of Kronenwetter

Present Well Owner (agent): Central Wis Engineers

Street or Route: 903 E grand ave

City, State, Zip Code: Rothschild wi 54474

Well Number and/or Name (If Applicable): 8" test well Kronenwetter

Reason For Abandonment: Project Done

WELL/DRILLHOLE INFORMATION

(3) Original Well/Drillhole Construction Completed on (Date) 1-25-89

[X] Water Well
[ ] Drillhole

Construction Report Available? [ ] Yes [X] No

Construction Type:
[X] Drilled [ ] Driven (Sandpoint) [ ] Dug
[ ] Other (Specify) ______

Well Type:
[X] Unconsolidated Formation Well [ ] Bedrock Well

Total Well Depth (ft.) 90 Casing Diameter (ins.) 8"

Casing Depth (ft.) 80

Was Well Annular Space Grouted? [ ] Yes [X] No [ ] Unknown
If Yes, To What Depth? ______ Feet

(4) Depth to Water (Feet) 20

Pump & Piping Removed? [X] Yes [ ] No [ ] Not Applicable
Liner(s) Removed? [X] Yes [ ] No [ ] Not Applicable
Screen Removed? [X] Yes [ ] No [ ] Not Applicable
Casing Left in Place? [ ] Yes [X] No
If No, Explain: Casing Pulled out

Was Casing Cut Off Below Surface? [ ] Yes [ ] No
Did Sealing Material Rise to Surface? [X] Yes [ ] No
Did Material Settle After 24 Hours? [ ] Yes [X] No
If Yes, Was Drillhole Retopped? [ ] Yes [ ] No

(5) Required Method of Placing Sealing Material
[X] Conductor Pipe-Gravity [ ] Conductor Pipe-Pumped
[ ] Dump Bailer [ ] Other (Explain) ______

(6) Acceptable Sealing Materials
Neat Cement Grout; (Concrete Grout;) Concrete; Clay Slurry; Sodium Bentonite Slurry

(7) Kind of Sealing Material	From (Ft.)	To (Ft.)	No. Yards or Sacks Sealant	Mix Ratio or Mud Weight
Concretegrout	Surface	80	1 yard	6 bag mix

(8) Comments:

(9) Name of Person or Firm Doing Sealing Work: Hornung Well & Pump

Signature of Person Doing Work: [signature] — Date Signed: 1-25-89

Street or Route: N952 Hwy W — Telephone Number: (715) 536 9225

City, State, Zip Code: Merrill wi 54452

(10) FOR DNR OR COUNTY USE ONLY	
Date Received/Inspected	District/County
Reviewer/Inspector	
Follow-up Necessary	

WELL/DRILLHOLE OWNER

APPENDIX C

Boring Logs for Evergreen School Well

LANG WELL DRILLING CO.

"LATEST AND BEST TYPE OF MACHINERY AND EQUIPMENT"

HUBERT J. LANG
Phone 443-2478
Marathon, Wis. 54448

FREDERICK A. LANG
Phone 848-1234
1708 W. Garfield Avenue
Wausau, Wis. 54401

July 28, 1975

Krueger, Schutter & Associates
4251 W. Beltline Hwy.
Madison, Wi. 53711

Dear Mr. Krueger:

A log of our test well for the elementary school is enclosed.

We installed a 2" point 3' long #10 slot at a depth of 60'. We took a water sample and sent it to the DNR at Madison for iron, hardness and bacteria tests. This point pumped 20 GPM with an 8' DD.

At 72-75' we used a 3' cheap screen and pumped 20 GPM with a 5' DD.

I feel confident that you could get in excess of 70 GPM with a good screen - Johnson or equal - setting it from 63 to 73'. If you want us to, we could forward the formation samples to U. O. P. Johnson Screen Company and have them analize them for their recommendation for type of screen, slot number, lenghth and possible yield for this type of formation.

Yours truly,

Frederick A. Lang

Frederick A. Lang

[illegible]/13/75
Copy placed in
September 1975 [illegible]

ELL CONSTRUCTOR'S REPORT
ORM 3300 15

NOTE
WHITE COPY - DIVISION'S COPY
GREEN COPY - DRILLER'S COPY
YELLOW COPY - OWNER'S COPY

STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES
Box 450
Madison, Wisconsin 53701

COUNTY	CHECK ONE	NAME
Marathon	[X] Town [ ] Village [ ] City	Kronenwetter

2. LOCATION — ¼ Section: NE | Section: 2 | Township: 27N | Range: 7E

OR — Grid or street no. | Street name

AND — If available subdivision name, lot & block no.

3. OWNER AT TIME OF DRILLING: D. C. Everest School System
ADDRESS: 1461 Grand Ave.
POST OFFICE: Schofield, Wis. 54476

4. Distance in feet from well to nearest: (Record answer in appropriate block)

BUILDING	SANITARY SEWER C.I.	SANITARY SEWER TILE	FLOOR DRAIN C.I.	FLOOR DRAIN TILE	FOUNDATION DRAIN SEWER CONNECTED	FOUNDATION DRAIN INDEPENDENT	WASTE WATER DRAIN C.I.	WASTE WATER DRAIN TILE
-	-	-			-	-	-	-

CLEAR WATER DRAIN C.I.	CLEAR WATER DRAIN TILE	SEPTIC TANK	PRIVY	SEEPAGE PIT	ABSORPTION FIELD	BARN	SILO	ABANDONED WELL	SINK HOLE
-	-	-		-	-	-	-	-	- -

OTHER POLLUTION SOURCES (Give description such as dump, quarry, drainage well, stream, pond, lake, etc.)
- - - -

Well is intended to supply water for: Test well for School

6. DRILLHOLE

Dia. (in.)	From (ft.)	To (ft.)	Dia. (in.)	From (ft.)	To (ft.)
6	Surface	74			

7. CASING, LINER, CURBING, AND SCREEN

Dia. (in.)	Kind and Weight	From (ft.)	To (ft.)
6	New black std steel T&C 19.45#	Surface	72
5½	Stainless steel screen	72	74

9. FORMATIONS

Kind	From (ft.)	To (ft.)
Top soil	Surface	1
Sand & large gravel	1	10
Medium sand & coarse gravel	10	15
Sand & Gravel	15	25
Sandy clay (Dirty)	25	39
Sandy clay & fine gravel	39	44
Fine & coarse sand	44	55
Sand & some gravel	55	60
Sand & gravel	60	75
Fine sand (Pulled back to 74')	75	78

GROUT OR OTHER SEALING MATERIAL

Kind	From (ft.)	To (ft.)
None	Surface	

10. TYPE OF DRILLING MACHINE USED

[X] Cable Tool [ ] Direct Rotary [ ] Reverse Rotary
[ ] Rotary – air w/drilling mud [ ] Rotary – hammer with drilling mud & air [ ] Jetting with [ ] Air [ ] Water

Well construction completed on July 24 19 75

Well is terminated 12 inches [X] above [ ] below final grade

Well disinfected upon completion [X] Yes [ ] No

Well sealed watertight upon completion [X] Yes [ ] No

11. MISCELLANEOUS DATA

Yield test: 2 Hrs. at 20 GPM

Depth from surface to normal water level 16 ft.

Depth to water level when pumping 21 ft.

Water sample sent to Madison, Wis. laboratory on: July 24 19 75

Your opinion concerning other pollution hazards, information concerning difficulties encountered, and data relating to nearby wells, screens, seals, type of casing joints, method of finishing the well, amount of cement used in grouting, blasting, sub-surface pumprooms, access pits, etc., should be given on reverse side.

SIGNATURE: Lang Well Drilling Co. — Registered Well Driller

COMPLETE MAIL ADDRESS: 1708 W. Garfield Ave. Wausau, Wis. 54401

Please do not write in space below

COLIFORM TEST RESULT	GAS – 24 HRS.	GAS – 48 HRS.	CONFIRMED	REMARKS

LANG WELL DRILLING CO.

"LATEST AND BEST TYPE OF MACHINERY AND EQUIPMENT"

HUBERT J. LANG
Phone 443-2478
Marathon, Wis. 54448

FREDERICK A. LANG
Phone 848-1234
1708 W. Garfield Avenue
Wausau, Wis. 54401

July 25, 1975

Well Log For Test Well For The New Elementary School Town Of Kronenwetter

D.C. Everest School Systems

Test well location: 320' west & 310' north of secorner of Ne¼ of Section 2 T27N R7E

Drilled with cable tools.

Sample #	Top Ft.	Bottom Ft.	Formation
1	0	1	top soil
2	1	5	fine to coarse sand to large gravel to 2"
3	5	10	fine sand to large gravel
4	10	15	medium sand to coarse gravel
5	15	20	fine to coarse sand and a little gravel
6	20	25	fine to coarse sand; fine to coarse gravel
7	25	29	fine sandy clay (dirty)
8	29	33	sandy clay (dirty)
9	33	39	sandy clay & fine gravel (clean)
10	39	44	fine & coarse sand, mostly fine, 70% clean
11	44	50	fine sand (too fine)
12	50	55	fine & a little coarse sand
13	55	60	fine & a little coarse sand; some gravel (very little)
14	60	65	fine & coarse sand & fine & coarse gravel
15	65	68	fine & coarse sand + fine gravel good formation
16	68	72	good sand & fine & coarse gravel
17	72	75	good sand & fine & coarse gravel
18	75	78	fine sand

Bacteriological Water

Date of Collection: JULY 24, 75 (Month Day Year)

Hour of Collection: 5 P.M

Owner's Name: D.C. EVEREST AREA SCHOOLS

Address: 1000 MACHMUELLER SCHOFIELD 54476

Your Name and Address:

KRUEGER, SHUTTER & ASSOC.
4251 W. BELTLINE HWY.
CITY: MADISON
WISCONSIN 53711 ZIP CODE

№ 75346

Ph. 262-1293

Address of well:

Well Location: MARATHON (County) (City)

7E NE1/4-2 (Town) (Range) (Section)

Exact Sample Location: TEST PUMP

(House Tap; Milkhouse; Barn; Etc.)

Type of Supply: Municipal ☐ Private ☐

Institution ☐ School ☒ Industry ☐

Licensed Establishment ☐

Type TEST WELL

Type of Source:

Well ☒ Swimming Beach ☐

Lake or River ☐ Pool ☐

Name

CHEMICAL RESULTS ON SEPARATE REPORT

Well Data:

Date of Well Construction: 7 24 75 (Month Day Year)

Type of Well: Drilled ☒ Driven ☐

Dug ☐ Other

Remarks: TEST FOR IRON & HARDNESS ALSO

Well Constructor's Name and Address: LANG WELL DRILLING WAUSAU

Pump Installer's Name and Address: NONE - TEST WELL

Casing Diameter 6 inches

Casing Depth 72 feet

Depth to Water 16 feet

Well Depth 74 feet

Distance to Septic Tank — feet

Distance to Tile Field — feet

Distance to Seepage Pit — feet

Laboratory Results:

Presumptive 24 hours 2/5

Presumptive 48 hours /5

Confirmed Test 2

Coliform Group 2/5

UNSAFE BACTERIOLOGICALLY
SEE ENCLOSURE

Date Received JUL 26 75 08907

Date Reported JUL 28 '75 16

S. L. Inhorn, M.D., Director
Wisconsin State Laboratory of Hygiene
Madison, Wisconsin 53706

HYG. 390

USE ONLY BLACK INK OR SOFT PENCIL

Bacteriological Water

Date of Collection: JULY 24, 75 (Month Day Year)

Hour of Collection:

Owner's Name: D C EVEREST AREA SCHOOL

Address: 1000 MACHMUELLER SCHOFIELD 5

Your Name and Address:

KRUEGER SHUTTER & ASSOC
4251 W BELTLINE HWY
CITY: MADISON
WISCONSIN 53711 ZIP CODE

№ 75347

Address of well:

Well Location: MARATHON (County)

KRONENWETTER 7E NE1/4-2 (Town) (Range) (Section)

Exact Sample Location: TEST PUMP

(House Tap; Milkhouse; Barn; Etc.)

Type of Supply: Municipal ☐ Private ☐

Institution ☐ School ☒ Industry ☐

Licensed Establishment ☐

Type TEST WELL

Type of Source:

Well ☒ Swimming Beach ☐

Lake or River ☐ Pool ☐

Name

Well Data:

Date of Well Construction: 7 24 75 (Month Day Year)

Type of Well: Drilled ☐ Driven ☐

Dug ☐ Other

Remarks: TEST FOR IRON & HARDNESS ALSO

Well Constructor's Name and Address: LANG WELL DRIL WAUSAU

Pump Installer's Name and Address: NONE - TEST

Casing Diameter 6

Casing Depth 58

Depth to Water 16

Well Depth 60

Distance to Septic Tank —

Distance to Tile Field —

Distance to Seepage Pit —

Laboratory Results:

Presumptive 24 hours /5

Presumptive 48 hours /5

Confirmed Test

Coliform Group 0/5

SAFE BACTERIOLOGICALLY AT TIME OF ... NOT INDICATED

Date Received JUL 26 75 08975 Lab No.

Date Reported

S. L. Inhorn, M.D., Director
Wisconsin State Laboratory of Hygiene
Madison, Wis.

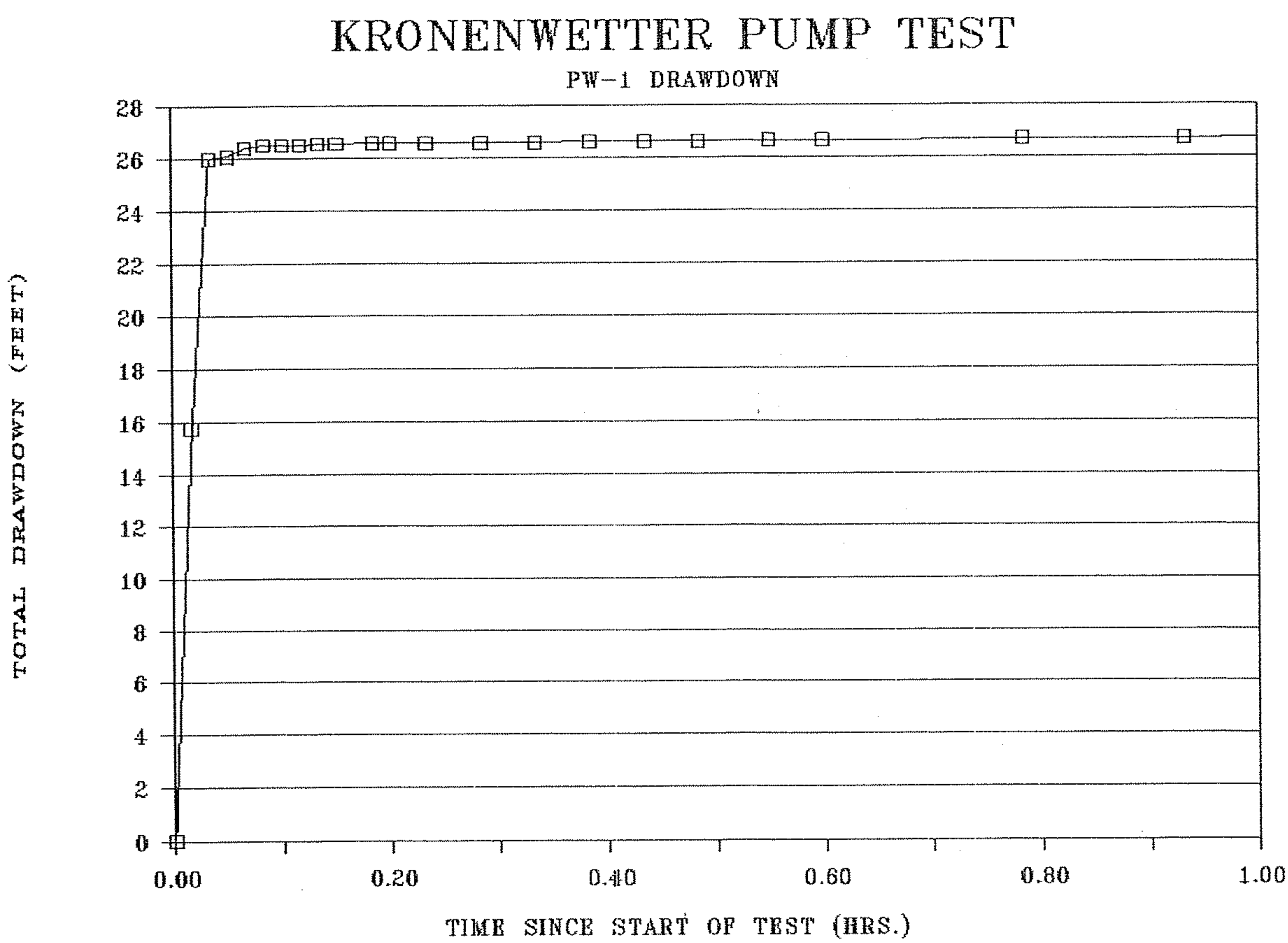
HYG. 390

APPENDIX D

Pumping Test Drawdown and Recovery Data

KRONENWETTER PUMP TEST DATA FOR PW-1

DATE	TIME: HOUR	MIN	TIME IN DECIMAL	HRS. START	MIN START	DEPTH TO H2O	TOTAL DRAWDOWN
1-11-89	9	8	9.1333	0.00	0	20.58	0.00
	9	9	9.1500	0.02	1	36.33	15.75
	9	10	9.1667	0.03	2	46.58	26.00
	9	11	9.1833	0.05	3	46.67	26.09
	9	12	9.2000	0.07	4	47.00	26.42
	9	13	9.2167	0.08	5	47.08	26.50
	9	14	9.2333	0.10	6	47.08	26.50
	9	15	9.2500	0.12	7	47.08	26.50
	9	16	9.2667	0.13	8	47.13	26.55
	9	17	9.2833	0.15	9	47.13	26.55
	9	19	9.3167	0.18	11	47.17	26.59
	9	20	9.3333	0.20	12	47.17	26.59
	9	22	9.3667	0.23	14	47.17	26.59
	9	25	9.4167	0.28	17	47.17	26.59
	9	28	9.4667	0.33	20	47.17	26.59
	9	31	9.5167	0.38	23	47.21	26.63
	9	34	9.5667	0.43	26	47.21	26.63
	9	37	9.6167	0.48	29	47.21	26.63
	9	41	9.6833	0.55	33	47.25	26.67
	9	44	9.7333	0.60	36	47.25	26.67
	9	55	9.9167	0.78	47	47.29	26.71
	10	4	10.0667	0.93	56	47.29	26.71
	10	21	10.3500	1.22	73	47.33	26.75
	10	39	10.6500	1.52	91	47.38	26.80
	10	59	10.9833	1.85	111	47.42	26.84
	13	26	13.4333	4.30	258	47.53	26.95
	14	2	14.0333	4.90	294	47.51	26.93
	14	48	14.8000	5.67	340	47.51	26.93
	15	29	15.4833	6.35	381	47.77	27.19
	15	49	15.8167	6.68	401	47.74	27.16
1-12-89	9	39	9.6500	24.52	1471	47.98	27.40
	10	23	10.3833	25.25	1515	47.95	27.37
	15	43	15.7167	30.58	1835	48.00	27.42
1-13-89	8	38	8.6333	47.50	2850	48.00	27.42
1-16-89	8	56	8.9333	119.80	7188	48.10	27.52

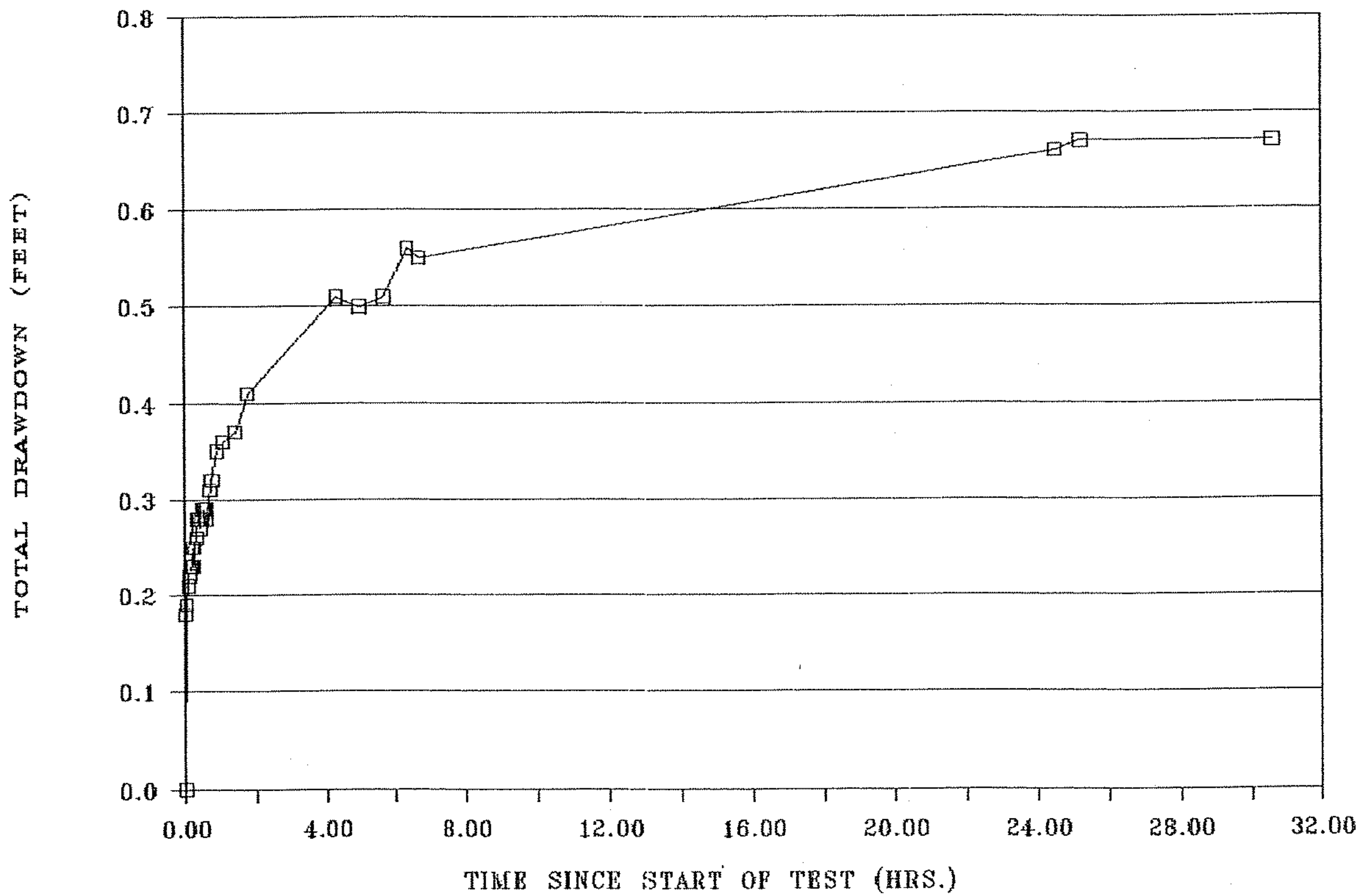

KRONENWETTER PUMP TEST
PW-1 DRAWDOWN
TOTAL DRAWDOWN (FEET)
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
0.00
0.20
0.40
0.60
0.80
1.00
TIME SINCE START OF TEST (HRS.)

KRONENWETTER PUMP TEST DATA FOR MW-2A

DATE	TIME HOUR	MIN	TIME IN DECIMAL	HRS. START	MIN START	DEPTH TO H2O	TOTAL DRAWDOWN
1-11-89	9	10	9.1667	0.00	0	19.27	0.00
	9	11	9.1833	0.02	1	19.45	0.18
	9	13	9.2167	0.05	3	19.46	0.19
	9	15	9.2500	0.08	5	19.48	0.21
	9	17	9.2833	0.12	7	19.49	0.22
	9	19	9.3167	0.15	9	19.50	0.23
	9	20	9.3333	0.17	10	19.50	0.23
	9	22	9.3667	0.20	12	19.50	0.23
	9	23	9.3833	0.22	13	19.52	0.25
	9	25	9.4167	0.25	15	19.50	0.23
	9	27	9.4500	0.28	17	19.52	0.25
	9	29	9.4833	0.32	19	19.53	0.26
	9	31	9.5167	0.35	21	19.55	0.28
	9	33	9.5500	0.38	23	19.55	0.28
	9	35	9.5833	0.42	25	19.54	0.27
	9	37	9.6167	0.45	27	19.55	0.28
	9	38	9.6333	0.47	28	19.55	0.28
	9	40	9.6667	0.50	30	19.56	0.29
	9	42	9.7000	0.53	32	19.56	0.29
	9	43	9.7167	0.55	33	19.56	0.29
	9	45	9.7500	0.58	35	19.55	0.28
	9	47	9.7833	0.62	37	19.56	0.29
	9	52	9.8667	0.70	42	19.58	0.31
	9	55	9.9167	0.75	45	19.59	0.32
	10	3	10.0500	0.88	53	19.62	0.35
	10	15	10.2500	1.08	65	19.63	0.36
	10	36	10.6000	1.43	86	19.64	0.37
	10	56	10.9333	1.77	106	19.68	0.41
	13	28	13.4667	4.30	258	19.78	0.51
	14	8	14.1333	4.97	298	19.77	0.50
	14	50	14.8333	5.67	340	19.78	0.51
	15	31	15.5167	6.35	381	19.83	0.56
	15	51	15.8500	6.68	401	19.82	0.55
1-12-89	9	43	9.7167	24.55	1473	19.93	0.66
	10	26	10.4333	25.27	1516	19.94	0.67
	15	45	15.7500	30.58	1835	19.94	0.67
1-13-89	8	40	8.6667	47.50	2850	19.90	0.63
1-16-89	9	2	9.0333	119.87	7192	19.91	0.64

KRONENWETTER PUMP TEST

MW−2A DRAWDOWN

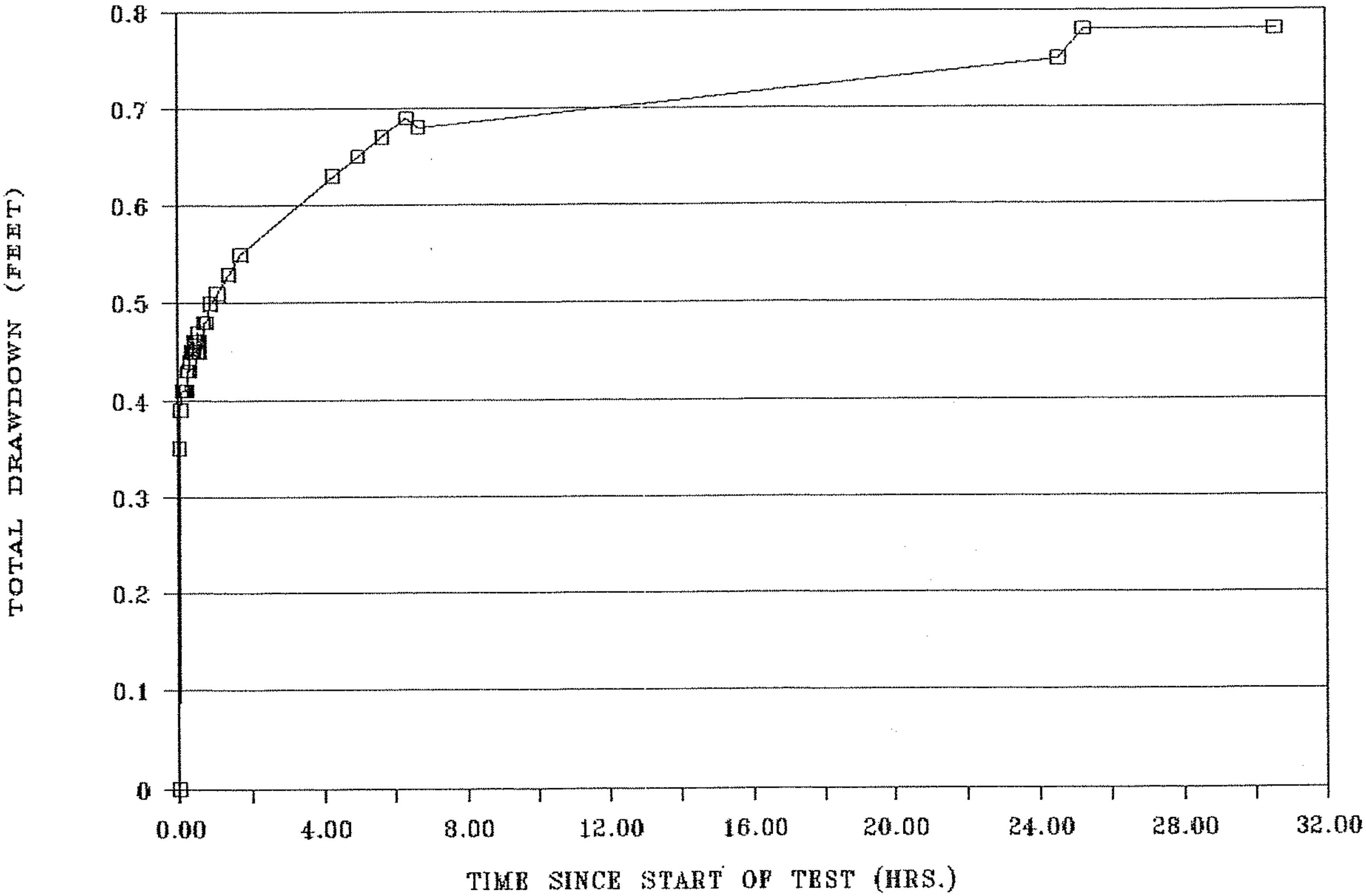


KRONENWETTER PUMP TEST DATA FOR MW-2B

DATE	TIME: HOUR	MIN	TIME IN DECIMAL	HRS. START	MIN START	DEPTH TO H2O	TOTAL DRAWDOWN
1-11-89	9	10	9.1667	0.00	0	19.27	0.00
	9	12	9.2000	0.03	2	19.62	0.35
	9	14	9.2333	0.07	4	19.66	0.39
	9	16	9.2667	0.10	6	19.68	0.41
	9	18	9.3000	0.13	8	19.68	0.41
	9	20	9.3333	0.17	10	19.68	0.41
	9	21	9.3500	0.18	11	19.68	0.41
	9	22	9.3667	0.20	12	19.68	0.41
	9	24	9.4000	0.23	14	19.68	0.41
	9	26	9.4333	0.27	16	19.70	0.43
	9	28	9.4667	0.30	18	19.70	0.43
	9	30	9.5000	0.33	20	19.71	0.44
	9	32	9.5333	0.37	22	19.72	0.45
	9	34	9.5667	0.40	24	19.72	0.45
	9	36	9.6000	0.43	26	19.72	0.45
	9	38	9.6333	0.47	28	19.73	0.46
	9	39	9.6500	0.48	29	19.73	0.46
	9	41	9.6833	0.52	31	19.72	0.45
	9	43	9.7167	0.55	33	19.73	0.46
	9	44	9.7333	0.57	34	19.74	0.47
	9	46	9.7667	0.60	36	19.73	0.46
	9	48	9.8000	0.63	38	19.72	0.45
	9	54	9.9000	0.73	44	19.75	0.48
	9	58	9.9667	0.80	48	19.75	0.48
	10	5	10.0833	0.92	55	19.77	0.50
	10	16	10.2667	1.10	66	19.78	0.51
	10	36	10.6000	1.43	86	19.80	0.53
	10	55	10.9167	1.75	105	19.82	0.55
	13	29	13.4833	4.32	259	19.90	0.63
	14	11	14.1833	5.02	301	19.92	0.65
	14	51	14.8500	5.68	341	19.94	0.67
	15	32	15.5333	6.37	382	19.96	0.69
	15	52	15.8667	6.70	402	19.95	0.68
1-12-89	9	44	9.7333	24.57	1474	20.02	0.75
	10	27	10.4500	25.28	1517	20.05	0.78
	15	46	15.7667	30.60	1836	20.05	0.78
1-13-89	8	43	8.7167	47.55	2853	20.00	0.73
1-16-89	9	3	9.0500	119.88	7193	19.99	0.72

KRONENWETTER PUMP TEST

MW-2B DRAWDOWN

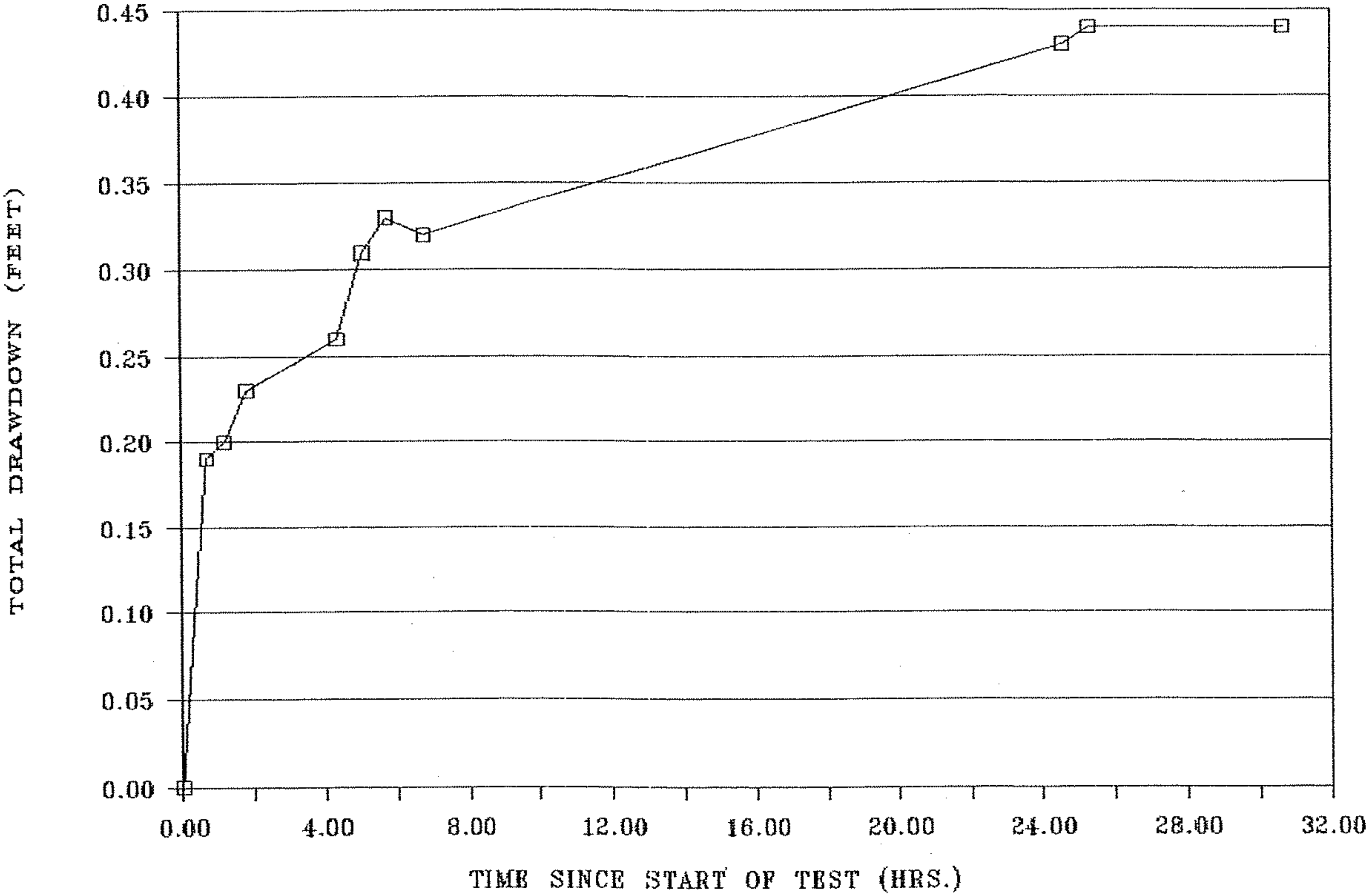


KRONENWETTER PUMP TEST DATA FOR MW-1

DATE	TIME: HOUR	MIN	TIME IN DECIMAL	HRS. START	MIN START	DEPTH TO H2O	TOTAL DRAWDOWN
1-11-89	9	10	9.1667	0.00	0	18.45	0.00
	9	50	9.8333	0.67	40	18.64	0.19
	10	20	10.3333	1.17	70	18.65	0.20
	10	58	10.9667	1.80	108	18.68	0.23
	13	30	13.5000	4.33	260	18.71	0.26
	14	12	14.2000	5.03	302	18.76	0.31
	14	52	14.8667	5.70	342	18.78	0.33
	15	54	15.9000	6.73	404	18.77	0.32
1-12-89	9	46	9.7667	24.60	1476	18.88	0.43
	10	30	10.5000	25.33	1520	18.89	0.44
	15	50	15.8333	30.67	1840	18.89	0.44
1-13-89	8	45	8.7500	47.58	2855	18.89	0.44
1-16-89	9	6	9.1000	119.93	7196	18.87	0.42

KRONENWETTER PUMP TEST

MW-1 DRAWDOWN

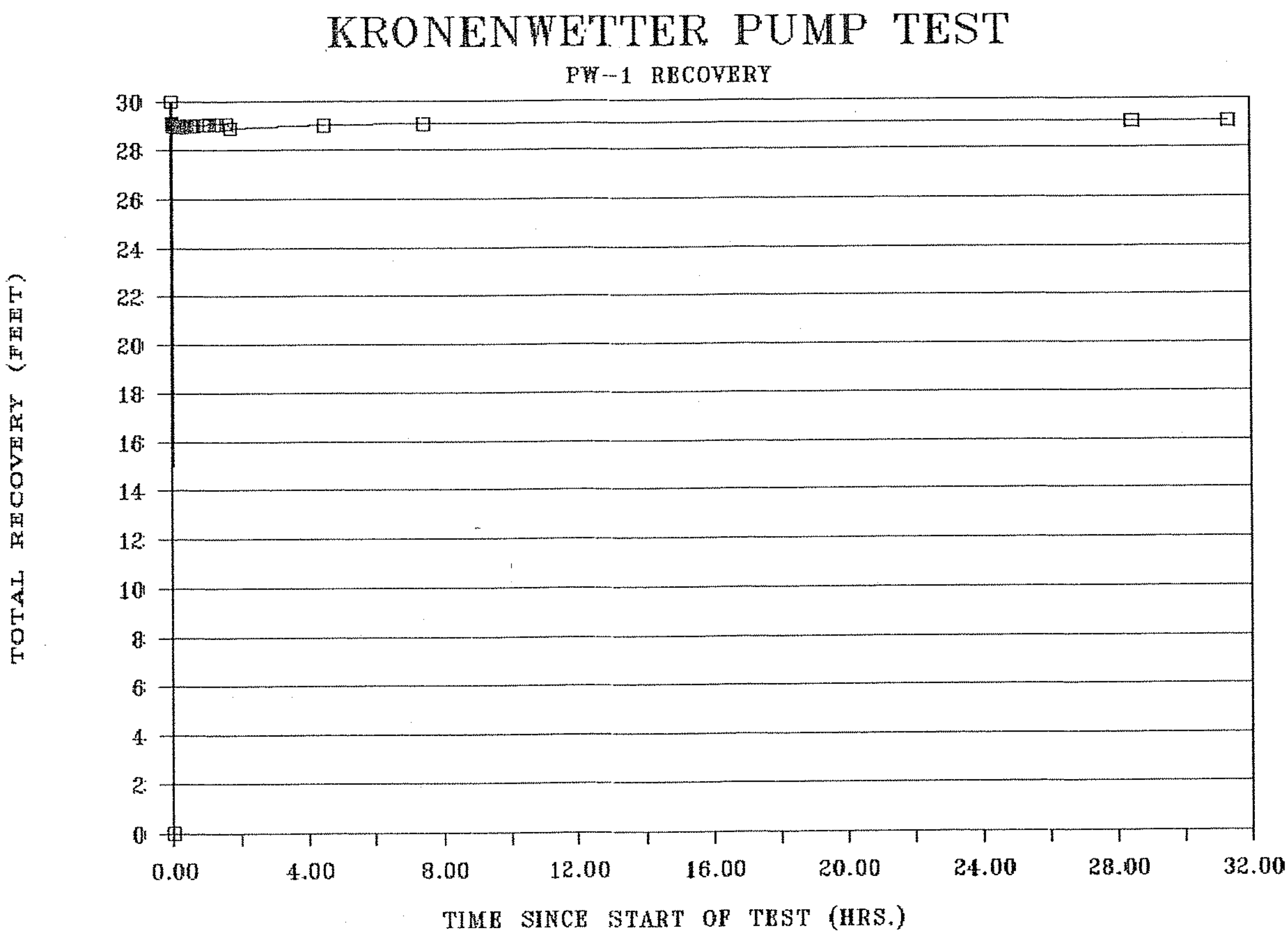


KRONENWETTER PUMP TEST DATA FOR PW-1

DATE	TIME: HOUR MIN	TIME IN DECIMAL	HRS. START	MIN START	DEPTH TO H2O	TOTAL RECOVERY
1-17-89	8 47.0	8.78	0.00	0.0	49.91	0.00
	8 48.0	8.80	0.02	1.0	19.92	29.99
	8 48.5	8.81	0.03	1.5	20.79	29.12
	8 49.0	8.82	0.03	2.0	20.83	29.08
	8 49.5	8.83	0.04	2.5	20.85	29.06
	8 50.0	8.83	0.05	3.0	20.88	29.03
	8 50.5	8.84	0.06	3.5	20.88	29.03
	8 51.0	8.85	0.07	4.0	20.90	29.01
	8 51.5	8.86	0.07	4.5	20.90	29.01
	8 52.0	8.87	0.08	5.0	20.92	28.99
	8 52.5	8.88	0.09	5.5	20.92	28.99
	8 53.0	8.88	0.10	6.0	20.92	28.99
	8 53.5	8.89	0.11	6.5	20.93	28.98
	8 54.0	8.90	0.12	7.0	20.94	28.97
	8 54.5	8.91	0.13	7.5	20.94	28.97
	8 55.0	8.92	0.13	8.0	20.95	28.96
	8 55.5	8.93	0.14	8.5	20.96	28.95
	8 56.0	8.93	0.15	9.0	20.95	28.96
	8 56.5	8.94	0.16	9.5	20.95	28.96
	8 57.0	8.95	0.17	10.0	20.95	28.96
	8 57.5	8.96	0.18	10.5	20.95	28.96
	8 58.0	8.97	0.18	11.0	20.96	28.95
	8 58.5	8.98	0.19	11.5	20.96	28.95
	8 59.0	8.98	0.20	12.0	20.96	28.95
	9 0.0	9.00	0.22	13.0	20.96	28.95
	9 0.5	9.01	0.22	13.5	20.95	28.96
	9 1.0	9.02	0.23	14.0	20.95	28.96
	9 1.5	9.03	0.24	14.5	20.96	28.95
	9 2.0	9.03	0.25	15.0	20.96	28.95
	9 2.5	9.04	0.26	15.5	20.96	28.95
	9 3.0	9.05	0.27	16.0	20.95	28.96
	9 3.5	9.06	0.28	16.5	20.95	28.96
	9 4.0	9.07	0.28	17.0	20.95	28.96
	9 4.5	9.08	0.29	17.5	20.95	28.96
	9 5.0	9.08	0.30	18.0	20.95	28.96
	9 5.5	9.09	0.31	18.5	20.95	28.96
	9 6.0	9.10	0.32	19.0	20.94	28.97
	9 6.5	9.11	0.32	19.5	20.94	28.97
	9 7.0	9.12	0.33	20.0	20.94	28.97
	9 7.5	9.13	0.34	20.5	20.94	28.97
	9 8.0	9.13	0.35	21.0	20.94	28.97
	9 8.5	9.14	0.36	21.5	20.94	28.97
	9 9.0	9.15	0.37	22.0	20.94	28.97
	9 9.5	9.16	0.38	22.5	20.94	28.97
	9 10.0	9.17	0.38	23.0	20.94	28.97
	9 11.0	9.18	0.40	24.0	20.94	28.97
	9 12.0	9.20	0.42	25.0	20.92	28.99
	9 17.0	9.28	0.50	30.0	20.90	29.01

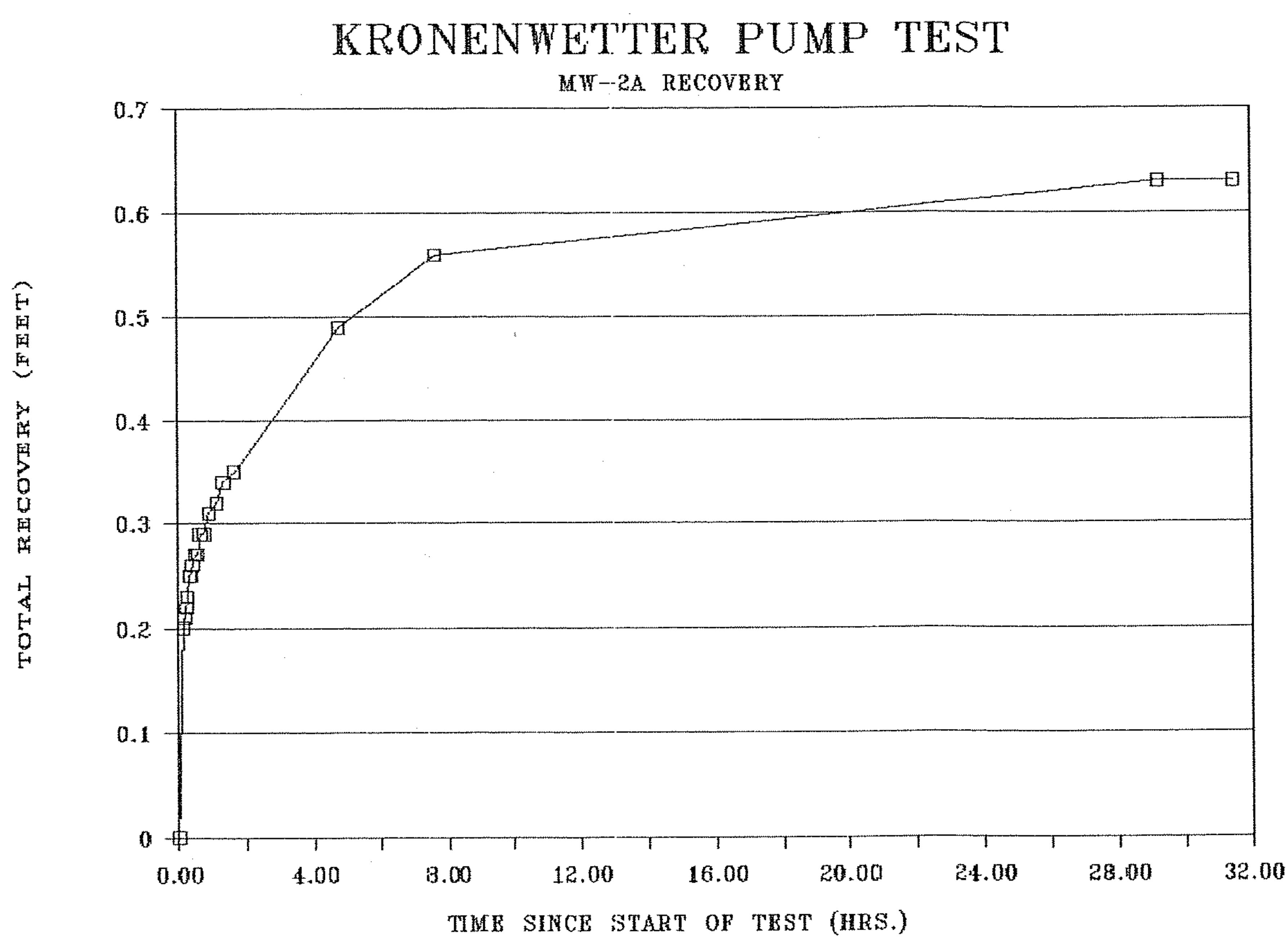
KRONENWETTER PUMP TEST DATA FOR PW-1

DATE	TIME: HOUR	MIN	TIME IN DECIMAL	HRS. START	MIN START	DEPTH TO H2O	TOTAL RECOVERY
	9	22.0	9.37	0.58	35.0	20.90	29.01
	9	27.0	9.45	0.67	40.0	20.90	29.01
	9	45.0	9.75	0.97	58.0	20.88	29.03
	9	50.0	9.83	1.05	63.0	20.88	29.03
	9	55.0	9.92	1.13	68.0	20.85	29.06
	10	8.0	10.13	1.35	81.0	20.85	29.06
	10	27.0	10.45	1.67	100.0	20.83	29.08
	10	33.0	10.55	1.77	106.0	21.03	28.88
	13	19.0	13.32	4.53	272.0	20.91	29.00
	16	17.0	16.28	7.50	450.0	20.86	29.05
1-18-89	13	17.0	13.28	28.50	270.0	20.83	29.08
	16	7.0	16.12	31.33	440.0	20.83	29.08


KRONENWETTER PUMP TEST
PW-1 RECOVERY
TOTAL RECOVERY (FEET)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
0.00
4.00
8.00
12.00
16.00
20.00
24.00
28.00
32.00
TIME SINCE START OF TEST (HRS.)

KRONENWETTER PUMP TEST DATA FOR MW-2A

DATE	TIME: HOUR	MIN	TIME IN DECIMAL	HRS. START	MIN START	DEPTH TO H2O	TOTAL RECOVERY
1-17-89	8	41	8.68	0.00	0	19.91	0.00
	8	49	8.82	0.13	8	19.71	0.20
	8	51	8.85	0.17	10	19.70	0.21
	8	52	8.87	0.18	11	19.70	0.21
	8	55	8.92	0.23	14	19.69	0.22
	8	57	8.95	0.27	16	19.68	0.23
	9	0	9.00	0.32	19	19.66	0.25
	9	2	9.03	0.35	21	19.66	0.25
	9	6	9.10	0.42	25	19.65	0.26
	9	10	9.17	0.48	29	19.64	0.27
	9	15	9.25	0.57	34	19.64	0.27
	9	20	9.33	0.65	39	19.62	0.29
	9	26	9.43	0.75	45	19.62	0.29
	9	35	9.58	0.90	54	19.60	0.31
	9	50	9.83	1.15	69	19.59	0.32
	10	1	10.02	1.33	80	19.57	0.34
	10	21	10.35	1.67	100	19.56	0.35
	13	28	13.47	4.78	287	19.42	0.49
	16	21	16.35	7.67	460	19.35	0.56
1-18-89	13	55	37.92	29.23	1754	19.28	0.63
	16	10	40.17	31.48	1889	19.28	0.63

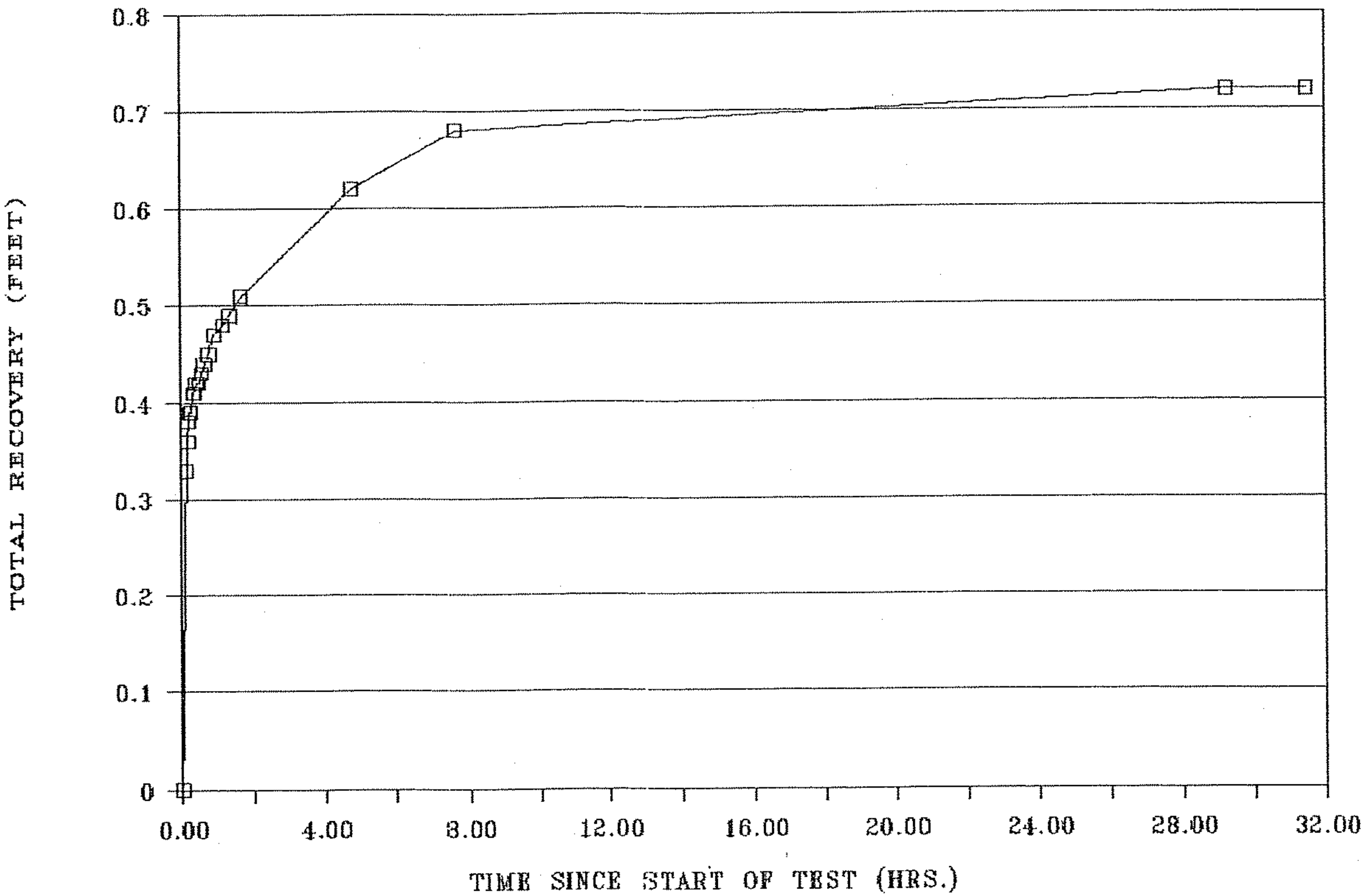

KRONENWETTER PUMP TEST
MW-2A RECOVERY
TOTAL RECOVERY (FEET)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.00
4.00
8.00
12.00
16.00
20.00
24.00
28.00
32.00
TIME SINCE START OF TEST (HRS.)

KRONENWETTER PUMP TEST DATA FOR MW-2B

DATE	TIME: HOUR	MIN	TIME IN DECIMAL	HRS. START	MIN START	DEPTH TO H2O	TOTAL RECOVERY
1-17-89	8	42	8.70	0.00	0	20.01	0.00
	8	50	8.83	0.13	8	19.68	0.33
	8	52	8.87	0.17	10	19.65	0.36
	8	53	8.88	0.18	11	19.63	0.38
	8	56	8.93	0.23	14	19.62	0.39
	8	58	8.97	0.27	16	19.62	0.39
	9	1	9.02	0.32	19	19.60	0.41
	9	3	9.05	0.35	21	19.60	0.41
	9	7	9.12	0.42	25	19.59	0.42
	9	11	9.18	0.48	29	19.59	0.42
	9	16	9.27	0.57	34	19.58	0.43
	9	21	9.35	0.65	39	19.57	0.44
	9	27	9.45	0.75	45	19.56	0.45
	9	36	9.60	0.90	54	19.54	0.47
	9	51	9.85	1.15	69	19.53	0.48
	10	2	10.03	1.33	80	19.52	0.49
	10	22	10.37	1.67	100	19.50	0.51
	13	29	13.48	4.78	287	19.39	0.62
	16	22	16.37	7.67	460	19.33	0.68
1-18-89	13	56	37.93	29.23	1754	19.29	0.72
	16	11	40.18	31.48	1889	19.29	0.72

KRONENWETTER PUMP TEST

MW-2B RECOVERY

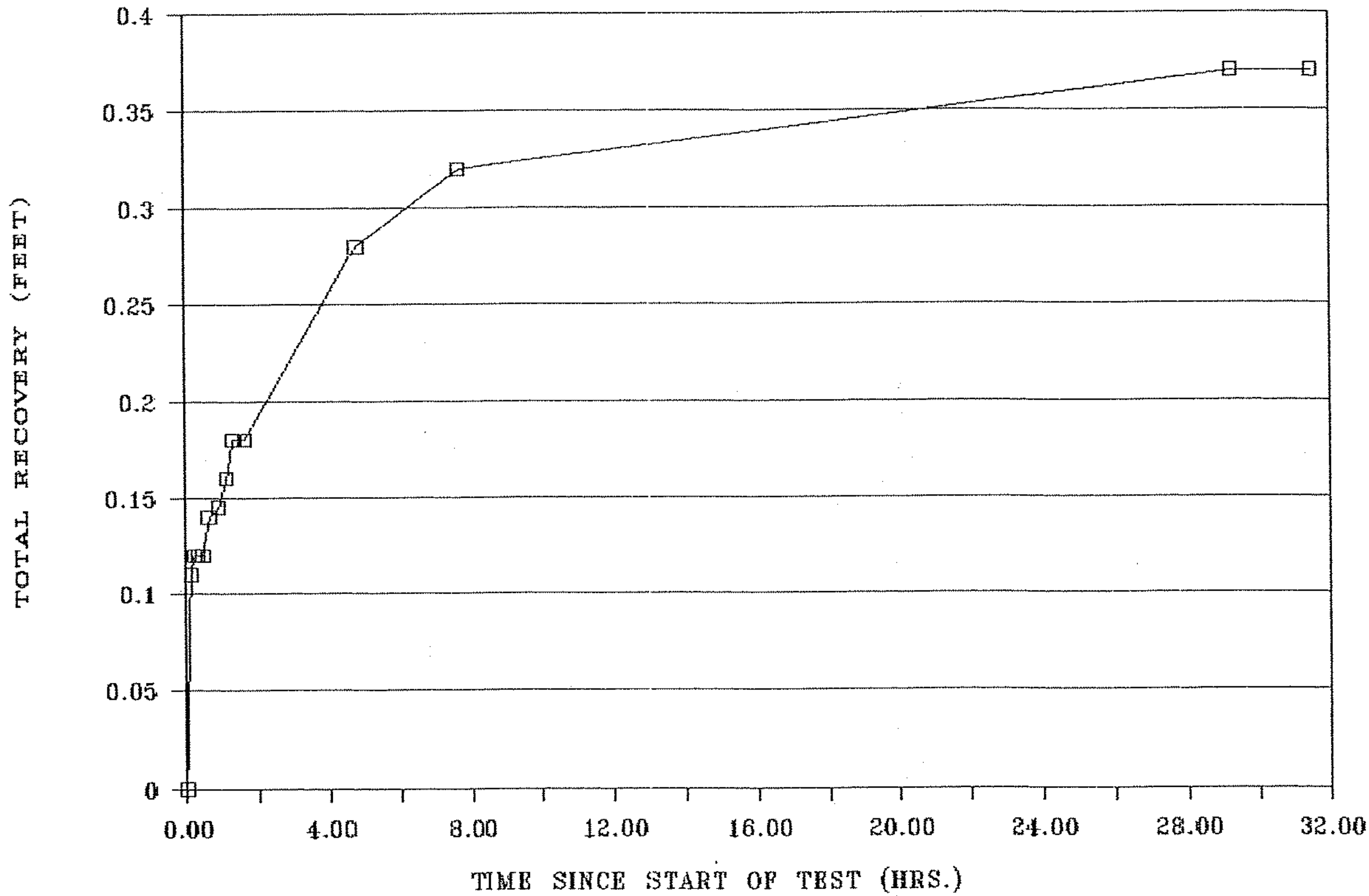


KRONENWETTER PUMP TEST DATA FOR MW-1

DATE	TIME: HOUR	MIN	TIME IN DECIMAL	HRS. START	MIN START	DEPTH TO H2O	TOTAL RECOVERY
1-17-89	8	45	8.75	0.00	0	18.87	0.00
	8	54	8.90	0.15	9	18.76	0.11
	8	59	8.98	0.23	14	18.75	0.12
	9	4	9.07	0.32	19	18.75	0.12
	9	13	9.22	0.47	28	18.75	0.12
	9	24	9.40	0.65	39	18.73	0.14
	9	40	9.67	0.92	55	18.73	0.14
	9	54	9.90	1.15	69	18.71	0.16
	10	5	10.08	1.33	80	18.69	0.18
	10	24	10.40	1.65	99	18.69	0.18
	13	33	13.55	4.80	288	18.59	0.28
	16	25	16.42	7.67	460	18.55	0.32
1-18-89	13	59	13.98	29.23	1754	18.50	0.37
	16	13	16.22	31.47	1888	18.50	0.37

KRONENWETTER PUMP TEST

MW-1 RECOVERY



APPENDIX E

Calculations for Pumping Test Analysis

DEFINITIONS

Storativity: the volume of water that an aquifer will release from or take into storage per unit of aquifer surface area per unit of change in head (groundwater level). In a water table or unconfined aquifer, storativity is primarily a function of the amount of void space which can drain or be filled with groundwater.

Transmissivity: the rate at which a volume of water can be transmitted horizontally through a unit width of the full aquifer thickness under a hydraulic gradient of 1.0. It is equivalent to the hydraulic conductivity of an aquifer multiplied by the aquifer thickness.

CALCULATIONS FOR PUMP TEST ANALYSIS

A. Analysis of Data from MW-2A

1. Match Point

From Figure 8: $u = 0.0001$, $W(u) = 10$
From Figure 6: drawdown (s) = 0.80 feet
time (t) = 4600 minutes = 3.194 days

2. Transmissivity

$$\text{Transmissivity (T)} = \frac{114.6\ (Q)}{s}\ W(u) \text{ in gpd/ft}$$

where: Q = pumping rate (290 gpm)
s and W(u) are from match point

$$T = \frac{114.6\ (290\text{ gpm})}{0.8\text{ feet}}\ (10) = 415{,}425\text{ gpd/ft}$$

3. Storativity

$$\text{Storativity (S)} = \frac{uTt}{187\ r^2} \quad \text{(dimensionless)}$$

where: r = distance to pump well (91.7 feet)
u and t are from match point

$$S = \frac{(0.0001)(415{,}425\text{ gpd/ft})(3.194\text{ days})}{1.87\ (91.7\text{ feet})^2} = 0.00844$$

B. Analysis of Data from MW-2B

1. Match Point

From Figure 8: $u = 0.01$, $W(u) = 5.0$
From Figure 7: drawdown (s) = 0.405 feet
time (t) = 7.5 minutes = 0.0052 days

2. Transmissivity

$$\text{Transmissivity (T)} = \frac{114.6(Q)}{s}\ W(u) \text{ in gpd/ft}$$

where: Q = pumping rate (290 gpm)
s and W(u) are from match point

$$T = \frac{114.6\ (290\ \text{gpm})}{(0.405\ \text{feet})}\ (5.0) = 410{,}300\ \text{gpd/ft}$$

3. Storativity

$$\text{Storativity (S)} = \frac{uTt}{1.87\ r^2}\ \text{(dimensionless)}$$

where r = distance to pump well (91.7 feet)
u and t are from match point

$$S = \frac{(0.01)(410{,}300\ \text{gpd/ft})(0.0052\ \text{days})}{1.87\ (91.7\ \text{feet})^2} = 0.00136$$

C. Analysis of Data from MW-1

1. Data from Figure 9

Change in drawdown per one log cycle of time (Δs) = 0.19 feet

Zero drawdown intercept (t_o) = 8.2 minutes
= 0.0057 days

2. Transmissivity

$$\text{Transmissivity (T)} = \frac{264(Q)}{\Delta s}\ \text{in gpd/ft}$$

where: Q = pumping rate (290 gpm)
Δs is from Figure (0.19 feet)

$$T = \frac{264\ (290\ \text{gpm})}{(0.19\ \text{feet})} = 402{,}950\ \text{gpd/ft}$$

3. Storativity

$$\text{Storativity (S)} = \frac{0.3\ T\ t_o}{r^2}\ \text{(dimensional)}$$

where: t_o is from Figure E (0.0057 days)
r = distance to pump well (190.8 feet)

$$S = \frac{0.3\ (402{,}950\ \text{gpd/ft})(0.0057\ \text{days})}{(190.8\ \text{feet})^2} = 0.0189$$

D. Validity of MW-1 Data Analysis

A minimum elapsed time (t_{s1}) is required for the "Jacobs" straight-line method to be valid.

$$t_{s1} = \frac{1.35 \times 10^5 \; (r^2) \; S}{T} \quad \text{in minutes}$$

where: r = distance to pump well (190.8 feet)
S = storativity (0.0189)
T = transmissivity (402,950 gpd/ft)

$$t_{s1} = \frac{1.35 \times 10^5 \; (190.8 \text{ feet})^2 \; (0.0189)}{(402,950 \text{ gpd/ft})} = 230 \text{ minutes}$$

APPENDIX F

Predicted Drawdown Due to Production Well

PRODUCTION WELL DISCHARGE RATE (GPM)= 1500.00

TIME-DRAWDOWN OR WATER LEVEL VALUES (FT)

TIME(MIN)	SELECTED DISTANCES (FT) 0.75	118.87	298.58	750.00	1883.91	4732.18
0.12	2.96	0.00	0.00	0.00	0.00	0.00
0.19	3.30	0.00	0.00	0.00	0.00	0.00
0.30	3.58	0.01	0.00	0.00	0.00	0.00
0.48	3.82	0.03	0.00	0.00	0.00	0.00
0.76	4.04	0.06	0.00	0.00	0.00	0.00
1.21	4.24	0.12	0.00	0.00	0.00	0.00
1.91	4.41	0.19	0.01	0.00	0.00	0.00
3.03	4.57	0.27	0.01	0.00	0.00	0.00
4.80	4.71	0.36	0.03	0.00	0.00	0.00
7.61	4.83	0.44	0.04	0.00	0.00	0.00
12.06	4.94	0.52	0.07	0.00	0.00	0.00
19.11	5.04	0.60	0.09	0.00	0.00	0.00
30.29	5.13	0.67	0.12	0.00	0.00	0.00
48.01	5.21	0.74	0.16	0.00	0.00	0.00
76.10	5.29	0.81	0.20	0.00	0.00	0.00
120.60	5.38	0.88	0.24	0.01	0.00	0.00
191.14	5.48	0.97	0.30	0.01	0.00	0.00
302.94	5.59	1.07	0.38	0.03	0.00	0.00
480.13	5.72	1.19	0.47	0.05	0.00	0.00
720.00	5.86	1.31	0.57	0.08	0.00	0.00

TIME AFTER PUMPING STARTED(MIN)= 720.00

DISTANCE-DRAWDOWN OR WATER LEVEL VALUES AT END OF PUMPING PERIOD

NODE NO	RADIUS(FT)	DRAWDOWN OR WATER LEVEL (FT)
2	0.75	5.86
3	1.19	5.43
4	1.88	5.01
5	2.99	4.59
6	4.73	4.17
7	7.50	3.75
8	11.89	3.34
9	18.84	2.93
10	29.86	2.52
11	47.32	2.11
12	75.00	1.71
13	118.87	1.31
14	188.39	0.93
15	298.58	0.57
16	473.22	0.28
17	750.00	0.08
18	1188.67	0.01

APPENDIX G

Preliminary Screen Length Calculations For a Production Well

Preliminary Screen Length Calculations
For an 18-inch Well Pumped at 1,500 gpm

A. Required Slot Size

1. Average Grain Size

Based on the boring logs, an average grain size of coarse to very coarse sand is assumed for the interval of aquifer to be screened.

2. Slot Size

The slot size which would retain 40% of the aquifer sediment is 60, or 0.06 inches (Driscoll, 1986, p. 438).

B. Screen Length Required

1. Screen Area

Area/ft of screen = (circumference)(1 foot)

$$\text{Circumference} = \pi(\text{diameter})$$
$$\pi(1.5 \text{ feet})$$
$$4.71 \text{ feet}$$

Area/ft of screen = 4.71 feet^2/ft

2. Open Area

Open Area = (Screen Area)(% Open Area)

For a slot size of 60 and an 18-inch well, the open screen area is 28% (Driscoll, 1986, p. 948).

$$\text{Open Area} = (4.71 \text{ ft}^2/\text{foot})\ (0.28)$$
$$= 1.32 \text{ ft}^2/\text{foot}$$

3. Screen Length

The screen length required is determined from the maximum entrance velocity (v = 0.1 ft/sec), the desired pumping rate (Q = 1,500 gpm = 3.33 ft^3/sec), and the open screen area (1.32 ft^2/foot).

$$\text{Total Screen Area} = Q/V = (3.33\ ft^3/sec)/(0.1\ ft/sec) = 33.33\ ft^2$$

$$\text{Total Screen Area} = (\text{Open Area})(\text{Length})$$

$$33.33\ ft^2 = (1.32\ ft^2/\text{foot})(\text{Length})$$

Length = 25.25 feet

APPENDIX H

Chemical Analyses of Water Samples Taken from Pump Well

ENVIROSCAN

February 8, 1989

RECEIVED FEB 10 1989

Central Wisconsin Engineers
903 Grand Avenue
Rothschild, WI 54474

Attn: Steve Braun

Re: Kronenwetter Well

Attached are the analytical results for the sample received January 17, 1989. All analyses were done in accordance with EPA Methods (EPA-600/4-79-020).

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

Sincerely,

ENVIROSCAN, INC.

James R. Salkowski

James R. Salkowski
Manager of Inorganic Laboratories

JRS/ls

303 West Military Road Rothschild, WI 54474 (715) 359-7226

ANALYTICAL REPORT

ENVIROSCAN
ENVIRONMENTAL AND ANALYTICAL SERVICES
WISCONSIN LAB CERTIFICATION NO. 737053130

FOR:

Central Wisconsin Engineers
903 Grand Avenue
Rothschild, WI 54474

Attn: Steve Braun

P.O. #: 65988
SAMPLED BY: Client
DATE REC'D: 1-17-89
REPORT DATE: 2-8-89
APPROVED BY: [signature]

	Detection Limit	Kronenwetter Well
T. Alkalinity, mg/l $CaCO_3$	20.	68.
Calcium Hardness, mg/l $CaCO_3$	0.1	56.6
T. Dissolved Solids, mg/l	10.	222.
Color, Co-Pt Units	4.	95.
pH (Lab)	-	7.28
Chloride, mg/l	1.	10.2
Fluoride, mg/l	0.2	X
Sulfate, mg/l	3.	9.1
Nitrate, mg/l as N	0.1	3.7
Turbidity, NTU	0.5	2.0
Langelier Index (Calculated at Temp. = 20°C)	-	-0.98
Analytical No.		12433

X = Analyzed but not detected

All analyses have been conducted in accordance with the Enviroscan Analytical Services Quality Assurance Program.

ANALYTICAL REPORT

ENVIROSCAN

ENVIRONMENTAL AND ANALYTICAL SERVICES

WISCONSIN LAB CERTIFICATION NO. 737053130

FOR:

Central Wisconsin Engineers
903 Grand Avenue
Rothschild, WI 54474

Attn: Steve Braun

P.O. #: 65988
SAMPLED BY: Client
DATE REC'D: 1-17-89
REPORT DATE: 2-8-89
APPROVED BY: [signature]

	Detection Limit	Kronenwetter Well
Metals, ug/l		
Ag	5.	X
As	5.	X
Ba	2.	77.
Ca	30.	22600.
Cd	4.	X
Cr	9.	X
Cu	5.	X
Fe	3.	2820.
Hg	0.2	X
Mg	30.	9260.
Mn	5.	460.
Na	30.	6000.
Pb	2.	4.
Se	5.	X
Zn	3.	69.
Analytical No.		12433

X = Analyzed but not detected

All analyses have been conducted in accordance with the Enviroscan Analytical Services Quality Assurance Program.

ANALYTICAL REPORT ENVIROSCAN

ENVIRONMENTAL AND ANALYTICAL SERVICES

WISCONSIN LAB CERTIFICATION NO. 737053130

FOR:

Central Wisconsin Engineers
903 Grand Avenue
Rothschild, WI 54474

Attn: Steve Braun

P.O. #: 65988
SAMPLED BY: Client
DATE REC'D: 1-17-89
REPORT DATE: 2-8-89
APPROVED BY: [signature]

VOC Analysis (ug/l)

	Detection Limit	Kronenwetter Well
Benzene	0.5	X
Bromoform	2.0	X
Bromomethane	4.0	X
Carbon Tetrachloride	0.5	X
Chlorobenzene	2.0	X
Chloroethane	2.0	X
2-Chloroethylvinyl Ether	5.0	X
Chloroform	0.5	X
Chloromethane	2.0	X
Dibromochloromethane	0.5	X
1,2-Dichlorobenzene	1.0	X
1,3-Dichlorobenzene	1.0	X
1,4-Dichlorobenzene	1.0	X
Dichlorobromomethane	0.5	X
1,1-Dichloroethane	0.5	X
1,2-Dichloroethane	0.5	X
1,1-Dichloroethylene	1.0	X
1,2-Dichloroethylene	1.0	X
Dichloromethane	1.0	X
1,2-Dichloropropane	0.5	X
cis-1,3-Dichloropropene	2.0	X
trans-1,3-Dichloropropene	0.5	X
Ethylbenzene	1.0	X
1,1,2,2-Tetrachloroethane	1.0	X
Tetrachloroethylene	0.5	X
Toluene	0.5	X
1,1,1-Trichloroethane	0.5	X
1,1,2-Trichloroethane	0.5	X
Trichloroethylene	0.5	X
Vinyl Chloride	2.0	X
Trichlorofluoromethane	1.0	X
Dichlorodifluoromethane	2.0	X
Analytical No.		12433

X = Analyzed but not detected

APPENDIX E

WELL SITE INVESTIGATION STUDY

1994

BECHER HOPPE ASSOCIATES

Well Site Investigation Report

Kronenwetter Sanitary District No. 2
Town of Kronenwetter
Marathon County, Wisconsin

April, 1994
Project No. 93069

PREPARED BY

BECHER-HOPPE ASSOCIATES INC.
ENGINEERS ARCHITECTS SCIENTISTS
330 FOURTH STREET • P.O. BOX 8000 • WAUSAU, WISCONSIN 54402-8000 • TELEPHONE (715) 845-8000

KRONENWETTER SANITARY DISTRICT NO. 2

WELL SITE INVESTIGATION REPORT

APRIL 1994

WISCONSIN
JAMES W.
SCHULZ
E-12526
WAUSAU,
WIS.
PROFESSIONAL ENGINEER

HYDROGEOLOGIST'S STATEMENT

I, Bruce D. Meissner, hereby certify that I am a hydrogeologist and meet the requirements of Wisconsin Administrative Code NR 500.03(64).

Bruce D. Meissner, Hydrogeologist

BECHER-HOPPE ASSOCIATES, INC.
330 Fourth Street - P.O. Box 8000
Wausau, Wisconsin 54402-8000

TABLE OF CONTENTS

LIST OF FIGURES

APPENDICES

I. LOCATION INFORMATION

The municipal well site for the Kronenwetter Sanitary District No. 2 is located in the SE 1/4 of the NW 1/4, Section 12, T27N, R7E, Town of Kronenwetter, Marathon County, Wisconsin (see Figures 1 and 2 for location). The site address is 1979 Lea Road. The following legal description of the municipal well site describes the dimensions of the site.

Commencing at the North 1/4 corner of said Section 12, thence S 00° 17' 08" W, along the East line of the NW 1/4 of said Section 12, 1314.91 feet to the North line of said SE 1/4 of the NW 1/4, thence N 89° 52' 19" W, along said North line, 33.00 feet to the West Right-of-Way of Lea Road, also being the SE corner of Lot 113 of Joe Swiderski's Villas, also being the point of beginning;

Thence S 00° 17' 08" W, along said West Right-of-Way, 430.00 feet to the NE corner of Outlot 1 of Lea Road plat, thence N 89° 52' 19" W, along the North line of said Outlot 1, 286.00 feet to the NW corner of said Outlot 1, thence S 08° 17' 08" W, along the West line of said plat, 885.03 feet to the South line of said SE 1/4 of the NW 1/4, also being the SW corner of Lot 1 of said plat, thence N 89° 53' 38" W, along the South line of said SE 1/4 of the NW 1/4, thence N 00° 08' 34" E, along the West line of said SE 1/4 of the NW 1/4, 1065.42 feet, thence S 89° 52' 19" E, 370.00 feet, thence N 00° 08' 34" E, 250.00 feet to the South line of Joe Swiderski's Villas, thence S 89° 52' 19" E, along said South line, 1286.17 feet to the West Right-of-Way of Lea Road, also being the point of beginning; subject to easements, restrictions and roadways of record.

Two wells (1 and 2) are proposed to be constructed, with a third well to be constructed in the future (Well 3). Figure 3 presents the proposed well locations and the site contours

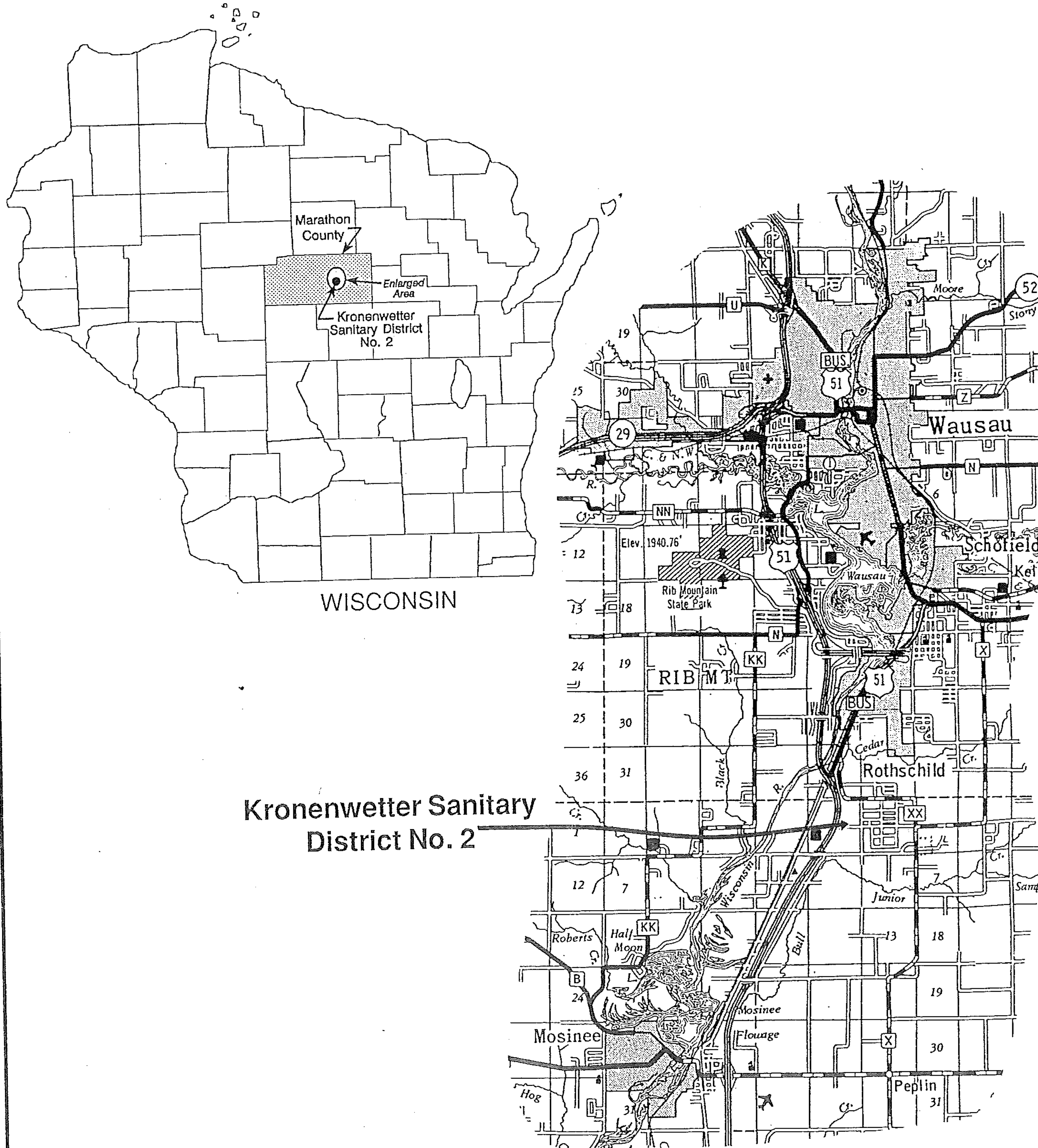
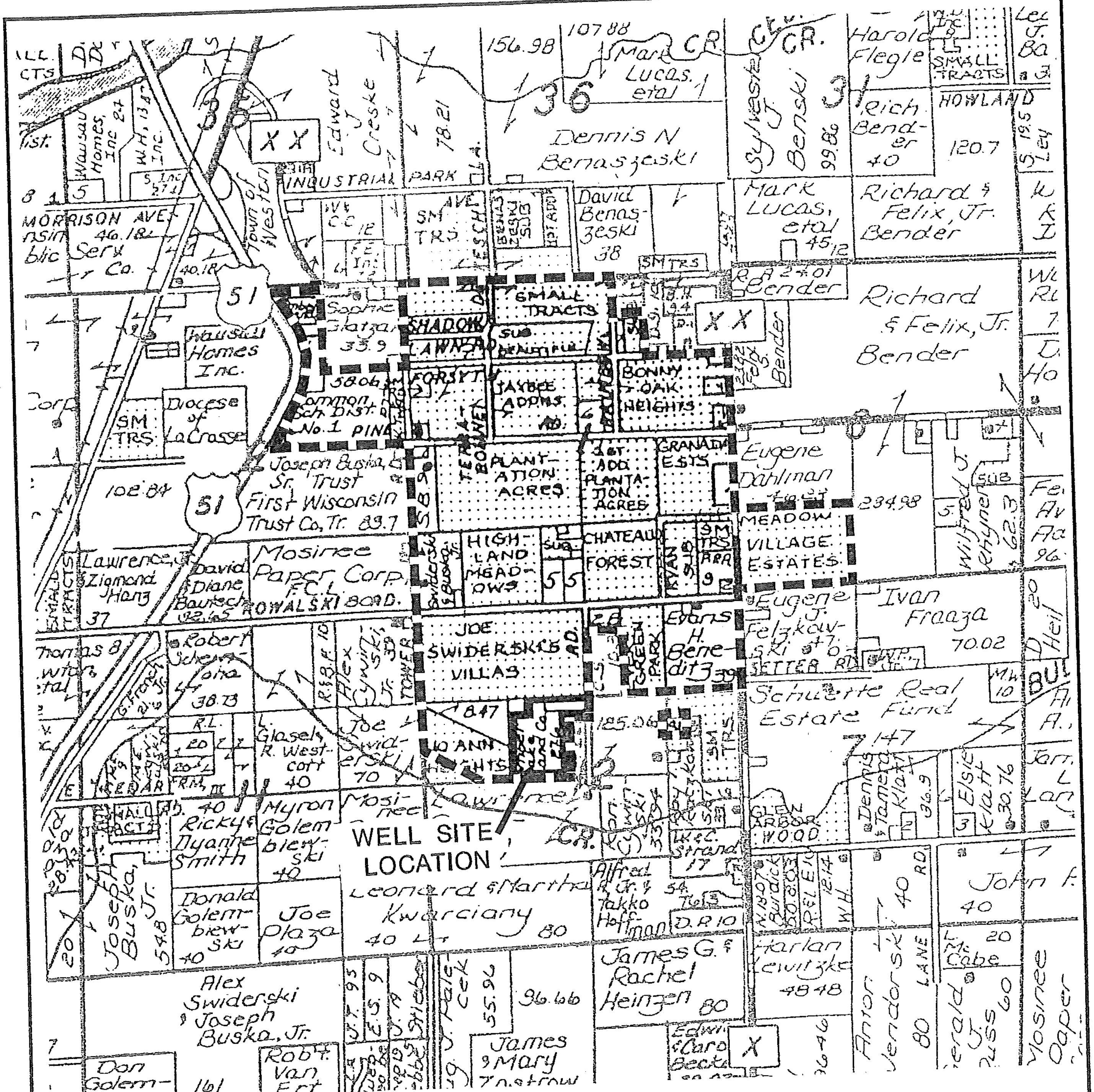


FIGURE 1
Well Site Location
Kronenwetter Sanitary District No. 2



Scale: 2½ Inch Equals 1 Mile

Sanitary District Boundary

FIGURE 2

Well Site Location on Plat Map

(from Marathon County Plat Book, 1992)

Kronenwetter Sanitary District No. 2

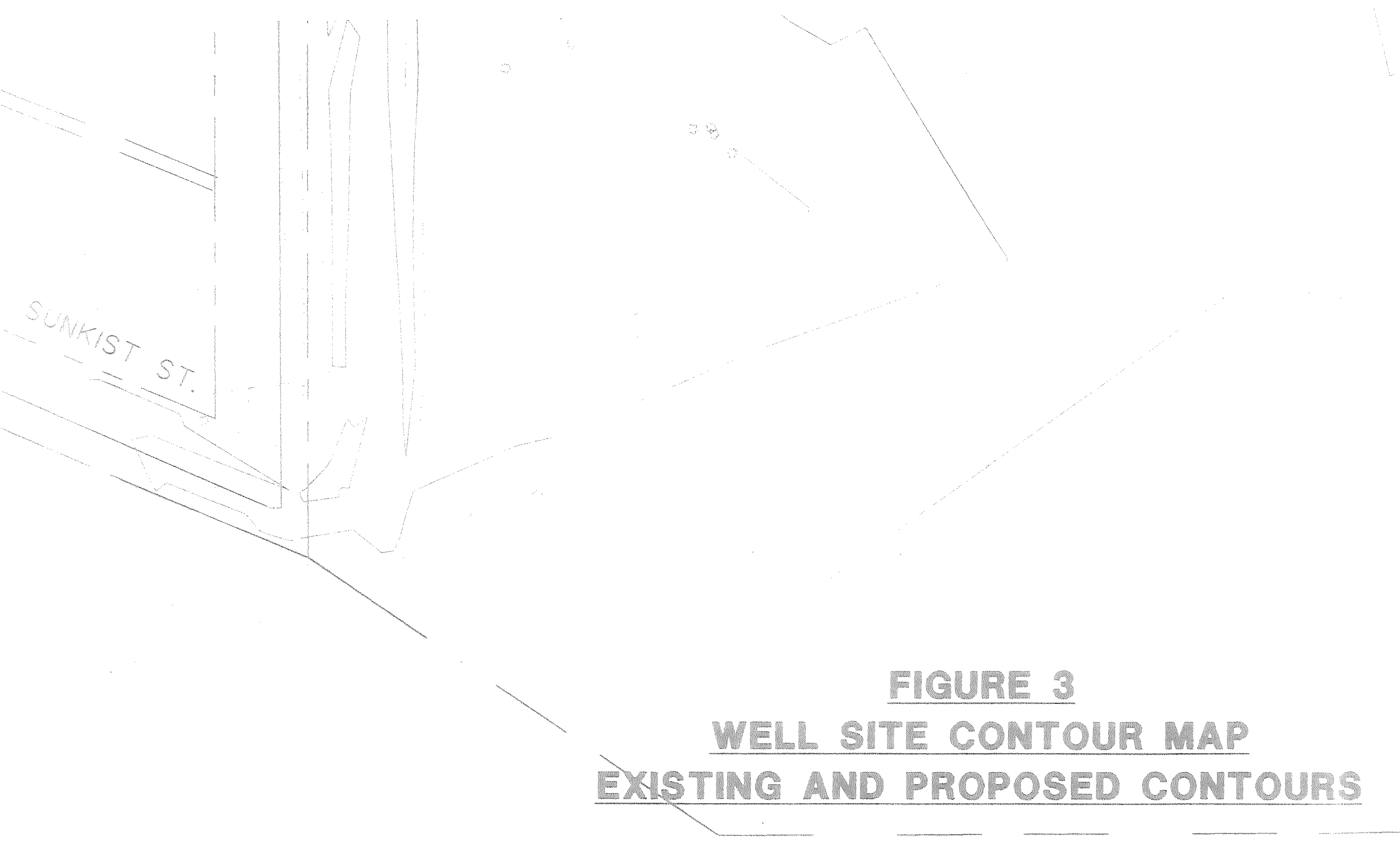
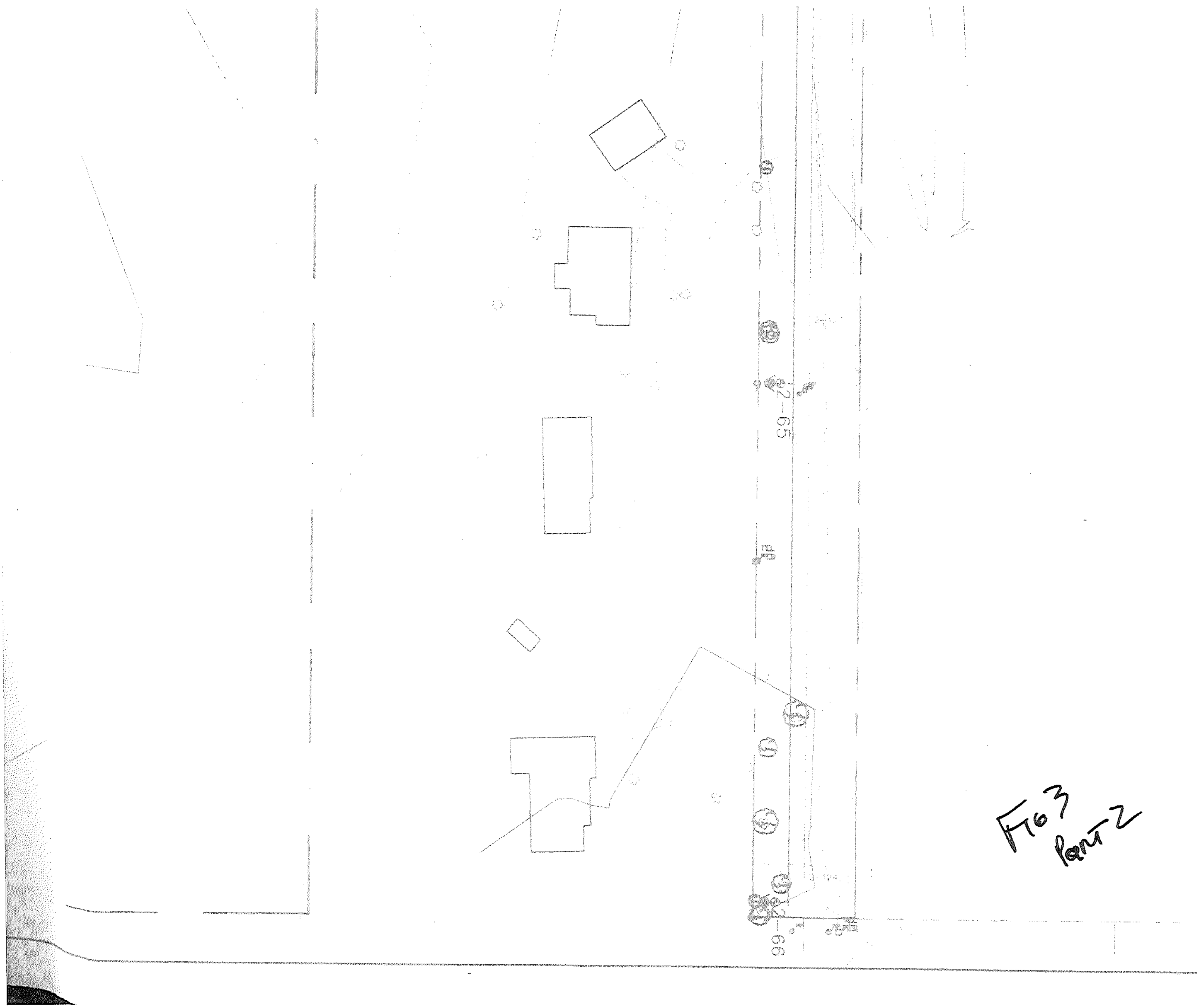


FIGURE 3

WELL SITE CONTOUR MAP

EXISTING AND PROPOSED CONTOURS



BECHER-HOPPE ASSOCIATES INC.
ENGINEERS ARCHITECTS SCIENTISTS
330 FOURTH ST. P.O. BOX 8000 WAUSAU, WIS. 54402-8000
Telephone (715) 845-8000 Fax (715) 845-8008

SUBCONSULTANT(S):

PROJECT:

KRONENWETTER SANITARY DIST.

OWNER:

KSD2

SHEET TITLE:

WELL FIELD PLOT PLAN

PROJECT NUMBER:

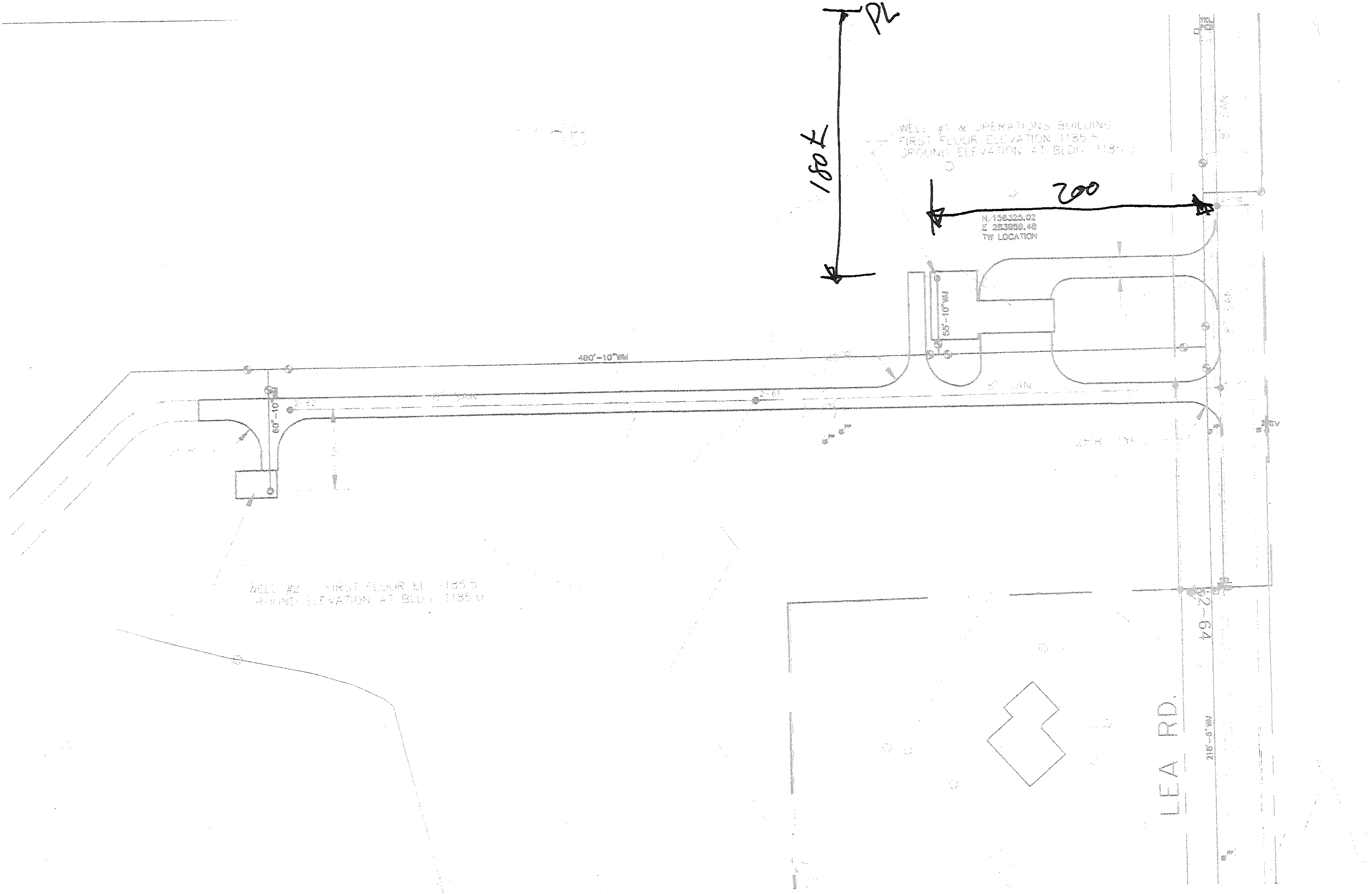
93069.22

DRAWING FILE NAME:

PLOTW.DWG

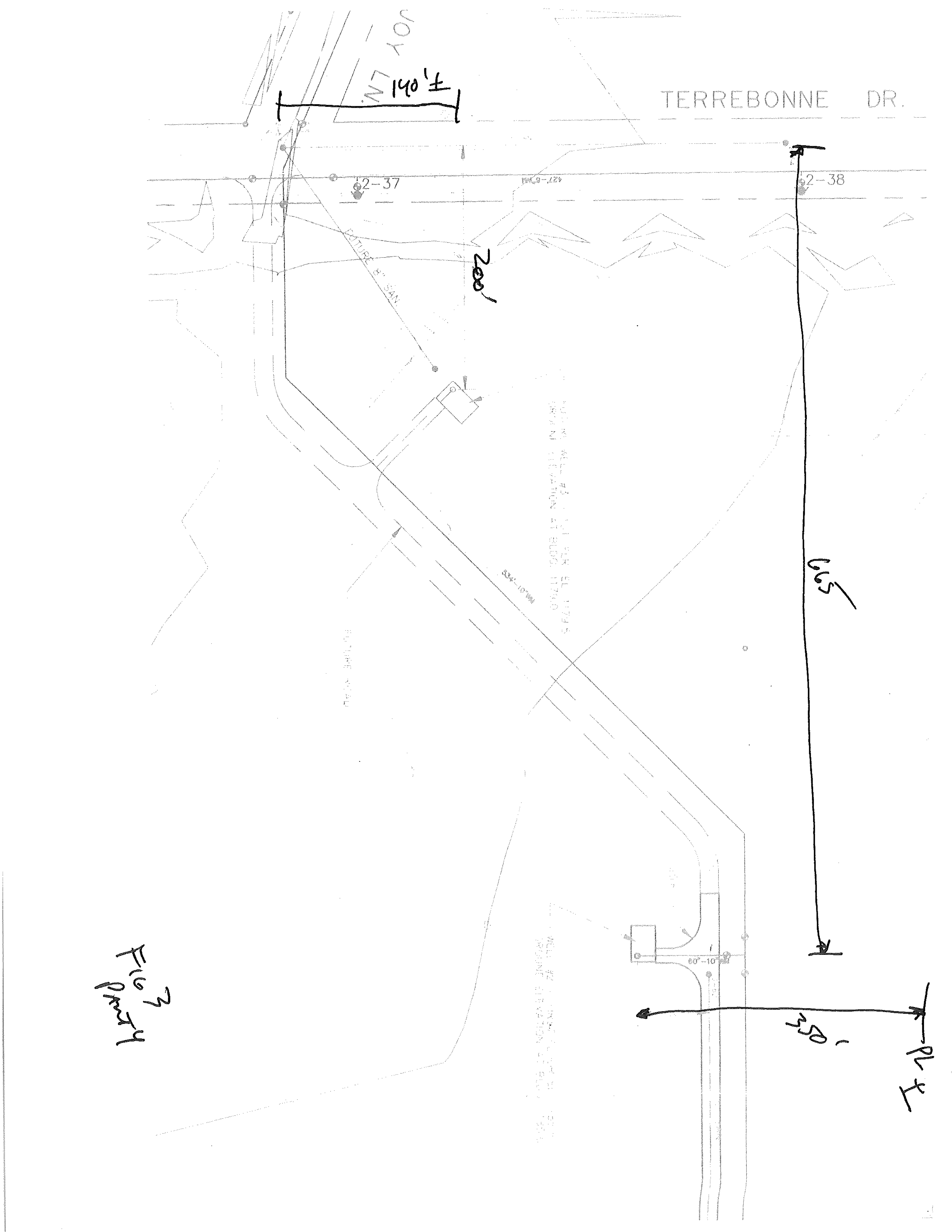
WELLS

SHEET NUMBER 1 OF 5



PL
180'
200
WELL #1 & OPERATIONS BUILDING
FIRST FLOOR ELEVATION
TW LOCATION
480'-10"WM
55'-10"WM
60'-10
WELL #2
LEA RD.
216'-8"WM

FIG 3
PART 3


TERREBONNE DR.
JOY LN
140' ±
2-37
2-38
200'
FUTURE 8" SAN
665'
350'
PL I
FIG 3
Pm I 4

existing and proposed). The regional floodplain elevation, and location of wetlands are shown on Figure 4. Local zoning is presented on Figure 5.

II. PROPOSED WELL INFORMATION

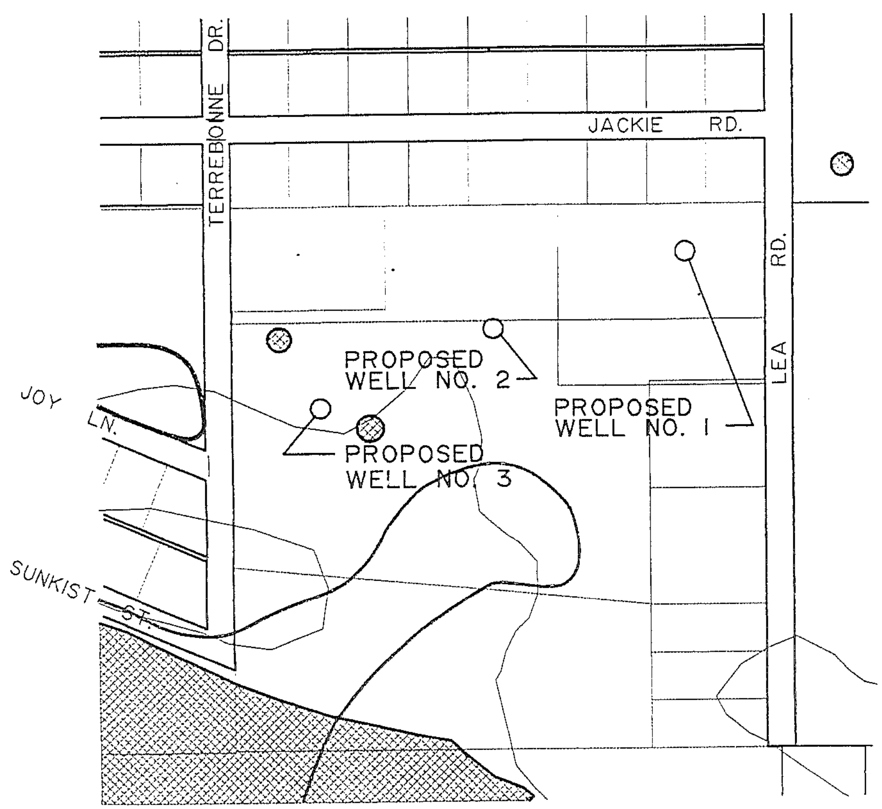
The two wells proposed for the Kronenwetter Sanitary District No. 2 are to be completed in the unconfined aquifer comprised of glacio-fluvial sediment deposited in the Wisconsin River Valley. The wells are to consist of 24 inch diameter casing installed in a 36 inch diameter drill hole. The well casing is to extend to a depth of 60 feet with the total depth of the drill hole to reach 90 feet. The well screen diameter is to be 24 inch and shall be set from 60 to 90 feet below land surface. The wells are to be designed to achieve 1,000 gallons per minute (gpm) capacity.

III. AQUIFER INFORMATION

As stated above, the wells are to be completed in an unconfined aquifer composed of glacio-fluvial sediment. This highly permeable unlithified sediment overlies less permeable igneous and metamorphic bedrock. The formation thickness is approximately 90 feet in the vicinity of the well site. Figure 6 presents an aquifer thickness map for the region.

Groundwater flow in the region generally conforms to topography in the study area and shows the highest gradients along the lateral boundaries of the aquifer. The groundwater flow direction is depicted on a water table map on Figure 7. Also shown on Figure 7 is the recharge basin for the well field.

The anticipated cone of depression for the well site was calculated according to the suggested guidelines specified in the WI-DNR "Public Water Supply Operations Handbook", Municipal Well Site Survey Section, Part 3. Specifically, the calculation was performed



1"=300'
3/21/94

FIGURE 4
REGIONAL FLOODPLAIN AND WETLAND LOCATIONS

KRONENWETTER
SANITARY
DISTRICT
No. 2

FEMA FLOOD PLAIN CONTOUR

BHA FLOOD PLAIN CONTOUR

WETLANDS

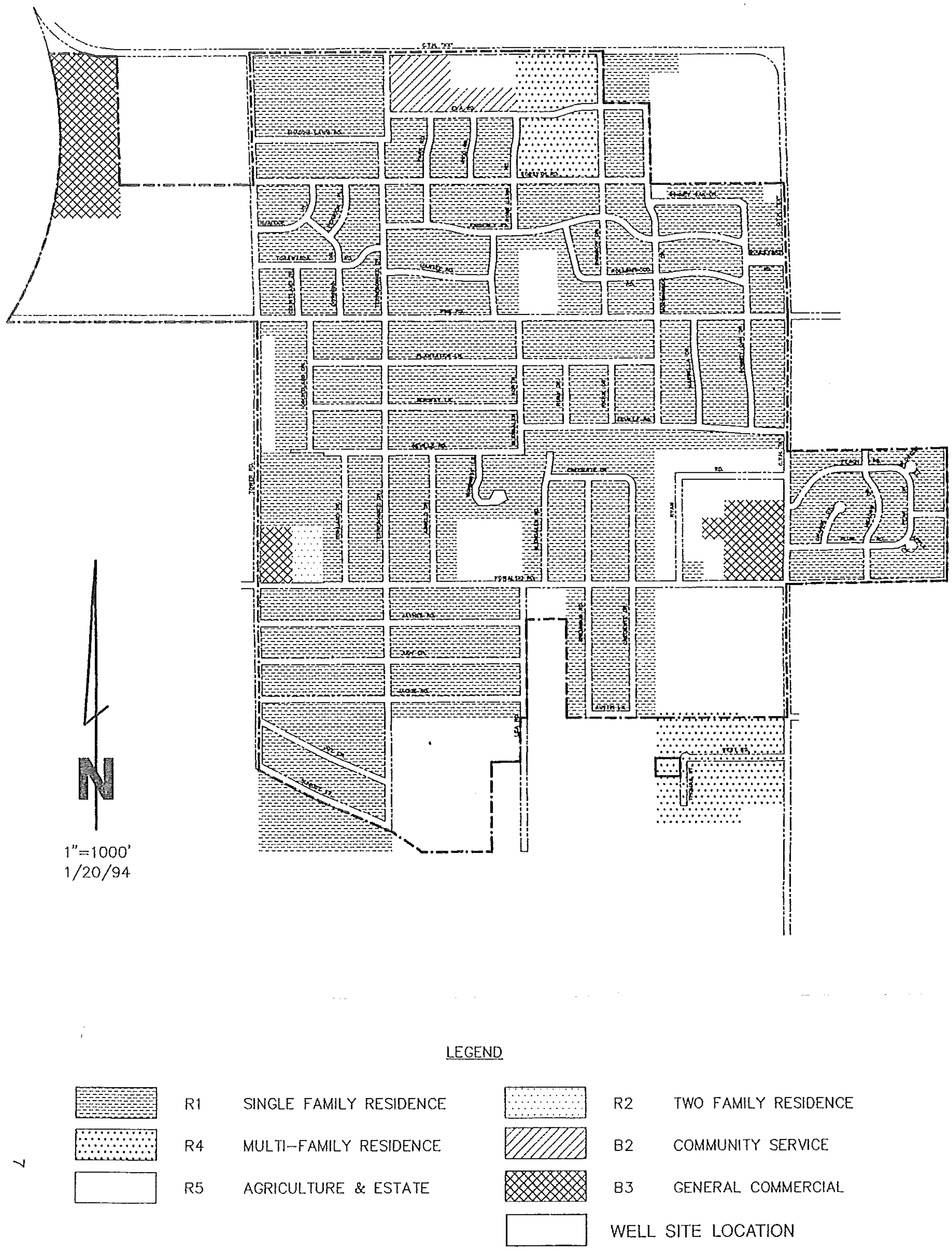


FIGURE 5
Zoning
Kronenwetter Sanitary District No. 2

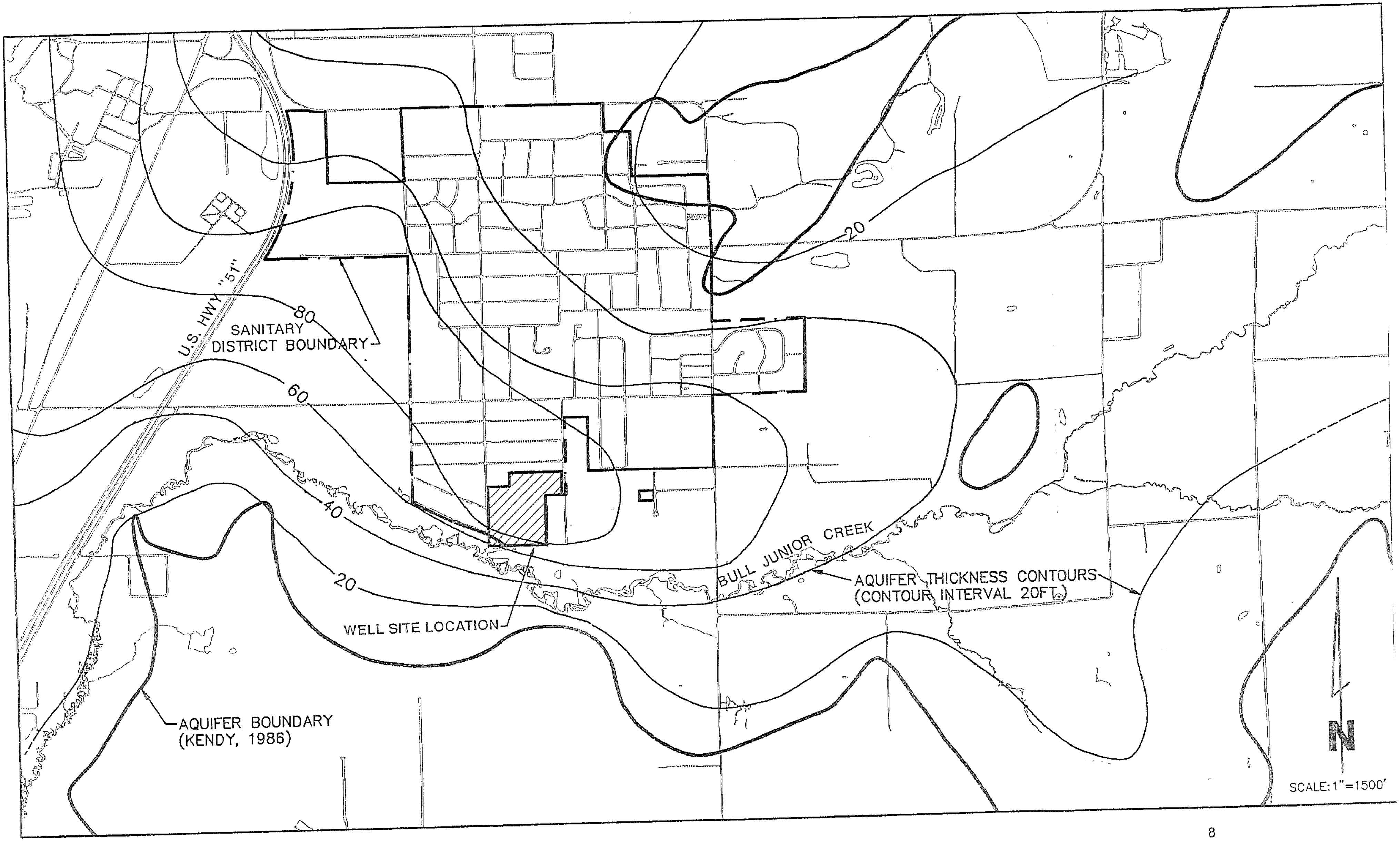
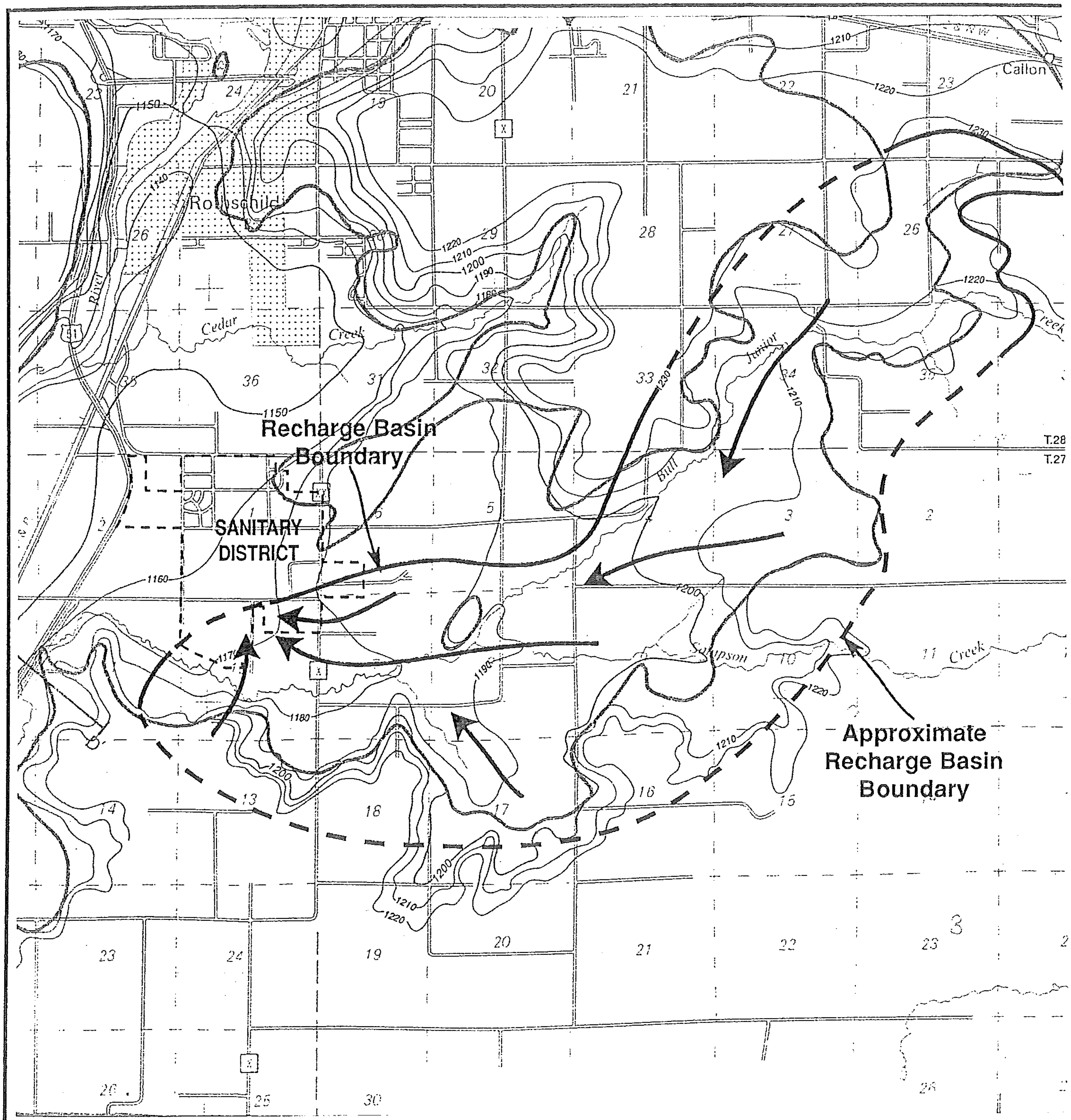


FIGURE 6 – AQUIFER THICKNESS MAP



EXPLANATION

Boundary of the Wausau aquifer

Contour interval is 10 feet.
Datum is mean sea level.

Ground Water Flow Direction

Scale 1:62,500

FIGURE 7

Recharge Basin for Kronenwetter Sanitary District No.2
(from Kendy, 1986)

assuming 30 days of continuous pumping at the proposed well pumping capacity of 1,000 gpm with no recharge. Although two wells are proposed at the site only one will be in operation at any given time. Therefore, the calculation is performed for one well and the cone of depression is overlain for each well location.

The Theis method was used for the actual calculation. The Theis method is an analytical method used to determine the extent of the cone of depression for specified pumping rates and time intervals.

The drawdown can be calculated through the use of the equation:

$$s = \frac{114.6Q}{T} W(u)$$

Where:

s	=	drawdown at any point in the vicinity of the well discharging at a constant rate.
Q	=	pumping rate, in gpm
T	=	coefficient of transmissivity of the aquifer, in gpd/ft.
W(u)	=	the well function of u, and represents an exponential integral

In the W(u) function u is equal to:

$$u = \frac{2{,}693(r^2)S}{T * t}$$

Where:

r	=	distance in feet
S	=	coefficient of storage
t	=	time since pumping started (minutes)

The corresponding value of u for the W(u) value is found in a well function table. The radius of the cone of depression can then be calculated for a given time. The choice for drawdown and time to use in the Theis equation are not immediately evident. Recharge is not considered in the Theis equation therefore as time of pumping the well increases, the radius of the cone of depression and drawdown within the cone will continue to expand indefinitely. Therefore, a decision must be made as to the duration of the pumping (t) and drawdown (s) to use in determining an appropriate cone of depression. The suggested pumping duration of 30 days was used and the radius at which drawdown is equal to 0.1 foot was used to define the extent of the cone of depression. The resultant cone of depression for the well site is approximately 1,919.3 feet from a pumping well (see Figure 8). It is important to point out that the calculated value is believed to represent a conservative estimate of the cone of depression. Based on the projected water needs of the Sanitary District, it is unlikely that the wells will be in operation more than 12 hours on any given day.

		YEAR	
Water Consumption (GPD/GPM)	2005	2015	2035
Maximum Day @ 120 GPCD	445,680	533,040	710,400
	310 gpm	370 gpm	494 gpm

Previous subsurface investigations were performed at four potential well sites in the Sanitary District in June, 1992. In summary, the present well site was found to be capable of yielding a good supply of high quality water. More information regarding this investigation can be found in the report for this work in Appendix A. In August of 1992 a test well was installed at the present well site, as well as appropriately spaced monitoring wells, to perform a five-day pump test. The results of this work are presented in Appendix B. Appendix C contains lab analysis of groundwater sampling performed at the end of the five day pump test.

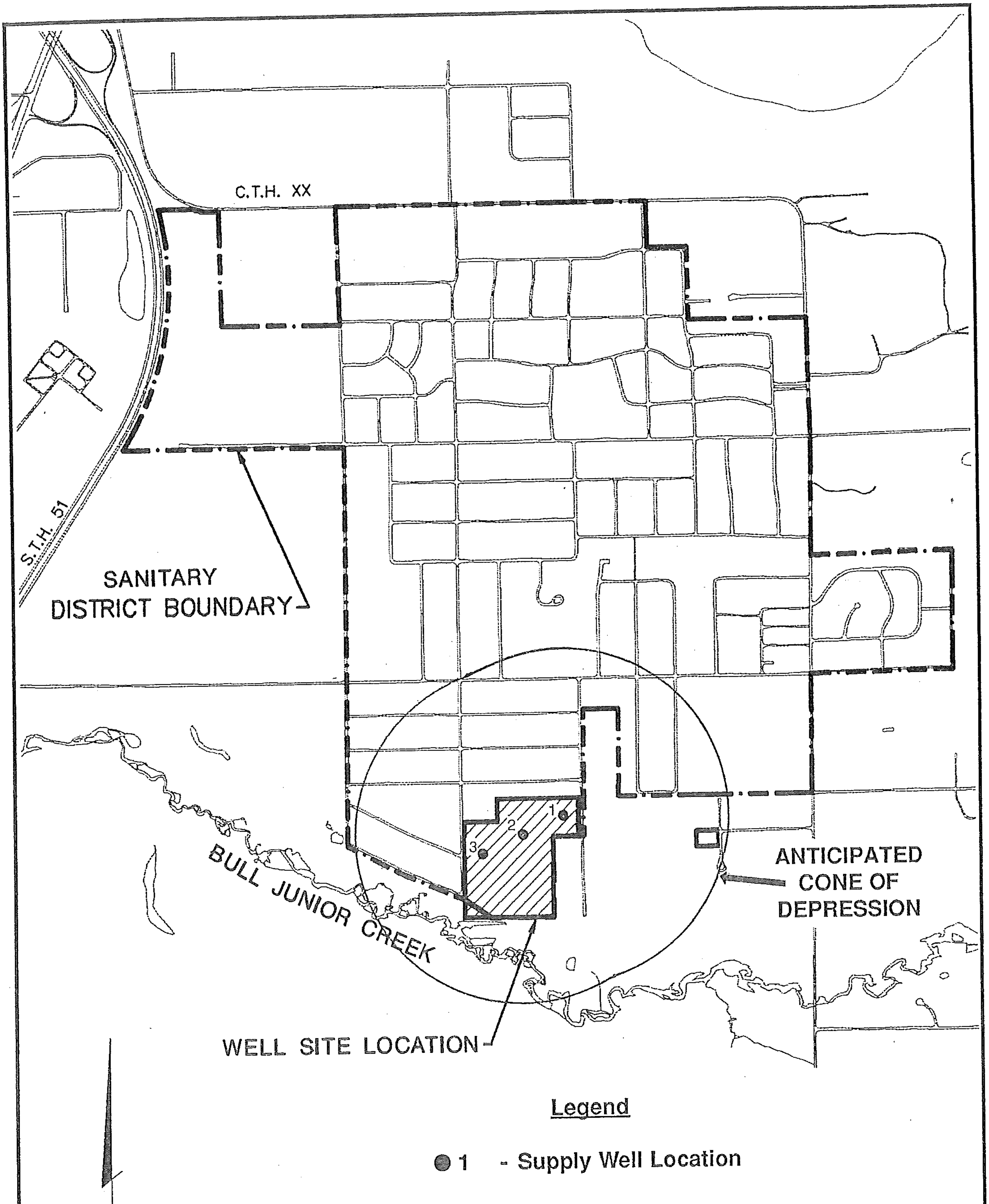


FIGURE 8
Anticipated Cone of Depression
Kronenwetter Sanitary District No. 2

IV. INVENTORY OF POTENTIAL CONTAMINATION SOURCES

Potential contamination sources are defined as current contamination sites identified by the DNR or EPA as well as present business or land use practices that involve the handling or use of hazardous substances that if improperly handled or disposed of could result in a contamination problem (i.e. petroleum products, pesticides, hazardous waste, etc.). To accomplish the inventory of potential contamination sites a variety of information sources were relied upon. The Department of Natural Resources (DNR) documents, (Spills list, L.U.S.T. list and Environmental Data Retrieval) information from the Department of Industry, Labor and Human Relations (DILHR) and Environmental Protection Agency (Resource Conservation and Recovery Act, 1976 and Comprehensive Environmental Response, Compensation and Liability Act, 1980 documents), and a field check.

The location of the following potential contamination sources were identified if present within 1/2 mile of the well site. Also listed with each source is the method used to determine its presence.

1 Abandoned Wells (1)
2 Above Ground Storage Tank (3,4)
3 Agricultural Fertilizer Use (3)
4 Agricultural Pesticide Use (3)
5 Airport (3)
6 Animal Feedlot, Barnyard Waste Storage Pit (3)
7 Auto Repair, Body Shop, Salvage, Car Wash (3)
8 Cemetery (3)
9 Chemical Production or Storage (2,3)
10 Electroplaters, Metal Refinishing (3)
11 Fertilizer/Pesticide Storage, Mixing, Production or Loading (1,3)
12 Golf Course (3)
13 Grain Storage Site (3)
14 Hazardous Waste Site (2)

26 Wastewater Lagoons (3)
27 Coal Storage (3)
28 Municipal Sewer (3)
29 Mining Operation (Gravel Pit, Quarry) (1,3)
30 Oil or Gas Pipeline (3)
31 Photo Processors (3)
32 Plastics Manufacturing (3)
33 Printers (3)
34 Private Wells (1)
35 Production or Other Wells (1)
36 Road Salt Storage (usage) (1)
37 Septic Systems (1)
38 Service or Gas Stations (3)
39 Sewage Treatment Plant (3)

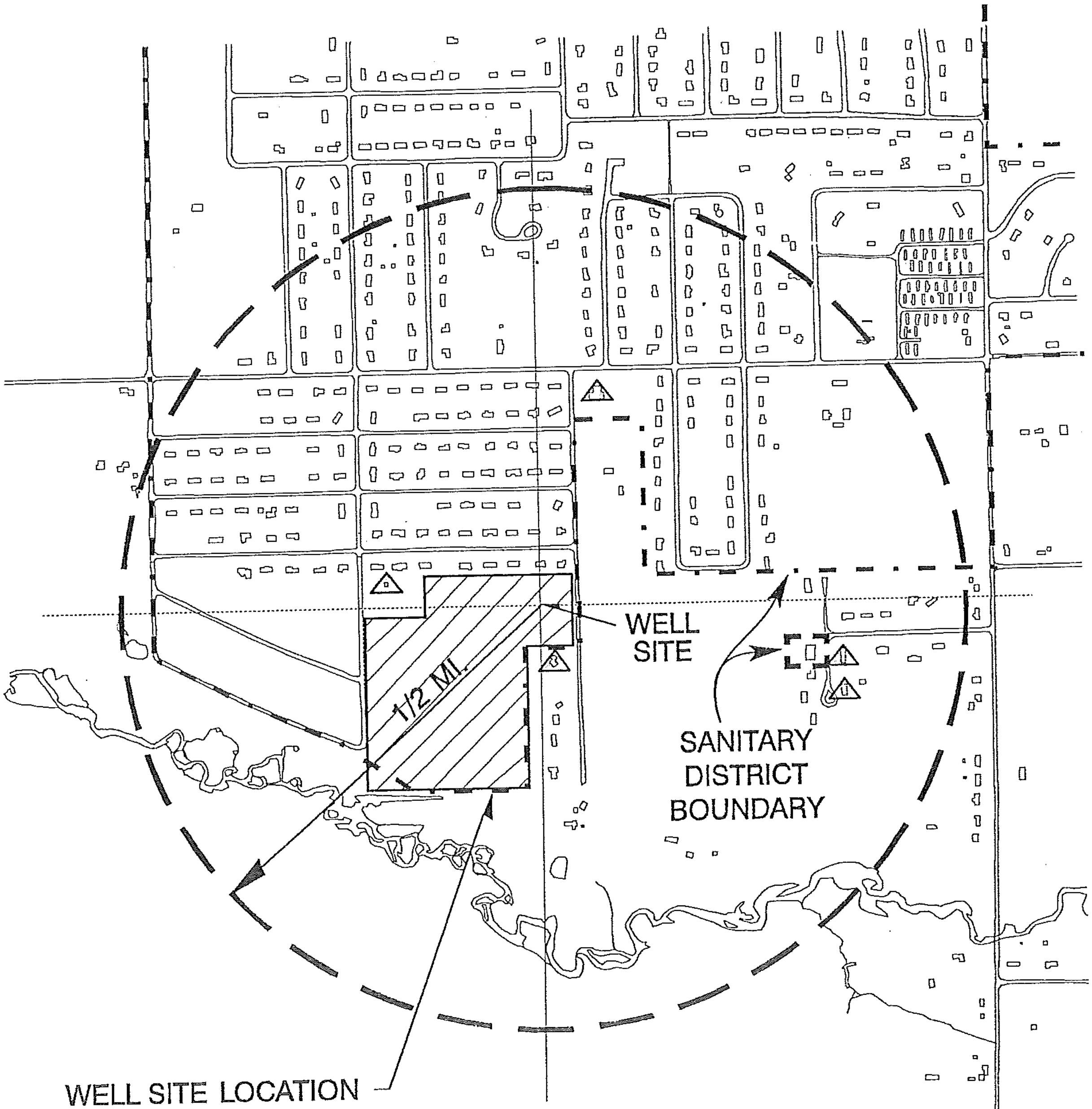
15 Hazardous Waste Generators, Transporters, Storage
Disposal, Treatment and Storage Facilities (2)
16 Holding Pond/Lagoon (3)
17 Infiltration Pond (3)
18 Injection, Drainage Well (1,3)
19 Irrigation System
20 Landfill (active or abandoned) (1)

21 Laundromat or Dry Cleaner (3)
22 Machine Shop (3)
23 Manure Spreading Storage (3)
24 Lakes, Rivers, Creeks (3)
25 Railroad Lines (3)

40 DILHR Registered Underground Storage Tank (4)
41 Urban Fertilizer and Pesticide Use (3)
42 Waste Tailing Piles (3)
43 Wood Preserving Facility (3)
44 Environmental Repair Sites (1)
45 Leaking Underground Storage Tank Sites (1)
46 Septage Spreading Sites (1)
47 Sludge Spreading Sites (1)
48 Spills Cases (1)
49 Superfund Sites (1,2)
50 Storm Sewer (3)
51 Lift Station (3)

Method of Determinations: (1) DNR Info. (2) EPA Info. (3) Site Inspection (4) DILHR Info.

The well site is located adjacent to a residential neighborhood to the north and sparsely populated land to the east, west and south. No commercial properties are within 1/2 mile of the site eliminating many business related practices that would involve the use or handling of hazardous chemicals. Figure 9 presents an inventory of potential contamination sources. The only potential source that is of concern is residential septic systems in the Kronenwetter Sanitary District No. 2 to the north of the well site. Each residence shown on Figure 9 has a private sewage disposal system. Figure 9 also portrays residences with non-conventional sewage disposal systems (i.e. mound systems, holding tank). There are some residences to the south and east of the well site that are within 1/2 mile of the well site and are not included in the District.



<u>Legend</u>

▭ - All residence within 1/2 mile presently have private septic systems.

⚠ - Residence with Nonconventional Systems. Includes mounds, Holding Tanks, and IGP Systems.

N

FIGURE 9

Potential Contamination Sources

Kronenwetter Sanitary District No. 2

V. MISCELLANEOUS INFORMATION

Reasons for Site Selection

As stated above, the proposed well site was chosen based on information obtained from previous subsurface investigations at the site. The results of these investigations (included in Appendix A and B) indicated the well site was found to be capable of yielding an adequate supply of high quality water.

Associated Water Supply Improvements Intended for On-Site Construction

Installation of two 1,000 gpm capacity wells, pumps, chlorine and fluoride feeders, buildings and standby power facilities is contemplated. Construction of an office building including laboratory and garage at well site is also anticipated. There is the potential for a third well to be installed on-site.

Distance to Nearest Private/Municipal Wells

The distance to the nearest private well from Well No. 1 is 300 feet to the south. The distance to Well No. 2 is approximately 600 feet to the east-southeast. The nearest municipal well belongs to the Town of Weston and is approximately 11,000 feet to the NW of the well site.

Water Quality Study for Municipal Well,
Kronenwetter Sanitary District No. 2

Appendix A

Northern Environmental℠
Hydrologists • Engineers • Geologists

1214 West Venture Court
Mequon, WI 53092
Fax 1-414-241-8222
1-414-241-3133
1-800-776-7140

July 14, 1992
(KNR140805)

Mr. Jim Schulz, P.E.
330 Fourth Street
P.O. Box 8000
Wausau, Wisconsin 54402-8000

RE: Water Quality Study for Municipal Well, Town of Kronenwetter, Marathon County, Wisconsin

Dear Mr. Schulz:

Between May 11 and 14, and June 15 and 24, 1992, Northern Environmental Technologies, Incorporated (Northern Environmental) conducted a water quality study for the Town of Kronenwetter Sanitary District, under the direction of Becher-Hoppe. The purpose of the study was to locate an area within the boundary of the sanitary district, where the concentration of iron, manganese, and nitrates in the aquifer was at or below potable water standards. This report presents the results of the study.

SITE DESCRIPTION

The location of the study area is in part of Section 1 and Section 2, and 12 of Township 27 North, Range 7 East, Marathon County, Wisconsin (Figure 1). The topography of the study area is predominantly flat. Most of the land is either wooded or residential lots.

The geology of the study area is characterized by unconsolidated Pleistocene deposits overlying Precambrian bedrock. The Pleistocene deposits of the study area range from fine to coarse brown sand, with layers of silty sand, gravel and cobbles. These deposits are typical of glacial outwash environments. The geologic maps of the study area indicate that the Pleistocene deposits are underlain by igneous and metamorphic rocks ranging in composition from granite, syenite, and diorite to gneiss. The bedrock in the study area is relatively impermeable, and is not a suitable aquifer. However, the permeable sand and gravel overlying the bedrock can yield a large quantity of water and is an excellent aquifer.

WATER QUALITY OF THE STUDY AREA

In 1988, an eight-inch test well was drilled to 90 feet in Section 2 Township 27 North, Range 7 East, north of Pine Road, on property owned by the Town of Kronenwetter. The concentration of iron, manganese, and nitrates in the water was 2.8, .46, and 3.7 ppm, respectively. The iron and manganese concentrations both exceed the recommended drinking water standards, which are .30 and .05 ppm, respectively, whereas the nitrate concentration is below the standard of 10 ppm. High iron and manganese concentrations do not pose a serious health concern, but are bothersome because of bad taste and staining problems. Nitrate concentrations of 10 ppm can pose a health threat, especially to small children. Treatment to reduce the concentration of iron, and manganese to a level that meets the drinking water standard is possible. Many communities in Wisconsin treat for iron and manganese, and the costs associated with treatment is expensive, with a cost range of approximately $500,000.00 to over $1,000,000.00, not including operating costs. Generally, it is not feasible to treat nitrate contaminated water. In cases of high nitrate contamination, the usual remedy is to replace the well.

Water samples obtained from private wells and borings in the study area indicate that the concentrations of iron, manganese and nitrates varies throughout the aquifer. This trend is a natural phenomena based on the geochemistry that occurs in the aquifer and the residence time of the water in the aquifer. The relative concentration of iron and manganese is controlled by the geochemistry associated with oxidizing and reducing zones in the aquifer. Areas of the aquifer that have elevated dissolved oxygen levels, tend to be oxidizing environments, which results in iron and manganese precipitating out of solution and prevents dissolution of iron and manganese from the aquifer material. High concentrations of iron and manganese in ground water are caused by reducing conditions associated with bogs and swamps or dissolution of iron and manganese from minerals in crystalline rock in contact with reducing ground water. Nitrates enter the ground water from fertilizers and septic tanks. The concentration of nitrates in a particular area of the aquifer is a result of the distance from the original nitrate source and the infiltration rate of the soil in that area. Once nitrates enter the ground water they are very mobile, and decay very slowly. The possibility exists that nitrates levels will increase with time in a pumping well due to the downward gradients created around the well. Based on the above information, it appears that the existing test well is in an unfavorable location. Due to the variability of conditions in the aquifer, it should be practical and feasible to find an area that has concentrations of all three of these parameters that meet the drinking water standard.

DESCRIPTION OF METHODS

Northern Environmental proposed to conduct a three dimensional water quality sampling program for the Kronenwetter Sanitary District to locate a suitable well site with favorable water quality. The initial plans involved collecting water samples from 30 feet, 60 feet, and immediately above bedrock. The samples were to be analyzed in the field for pH, iron, manganese, and nitrates, and then preserved with nitric acid for later laboratory analysis. Field analysis provides the most representative data for iron and manganese, due to rapid oxidation of these ions when exposed to air. Samples preserved with nitric acid are prone to erroneously high readings due to dissolution of iron and manganese from silt or grains in the sample caused by the nitric acid preservative. In addition, field analysis aids in directing the sampling program. The resultant water quality data was to be used to construct cross-sections and maps which would illustrate the lateral and vertical distribution of iron, manganese, and nitrates. The pH data would be used as an indicator of any zones of natural oxidation or reduction which could explain the occurrence of low iron and manganese zones.

To achieve these goals, Northern Environmental tried a cone penetrometer rig to obtain water samples at various depths within the Kronenwetter Sanitary District. A cone penetrometer rig hydraulically drives a steel sampling point down into the subsurface and is able to draw a water sample from discrete intervals in the subsurface. By recording the tip resistance and side friction ratio of the cone, the stratigraphy of the subsurface can be determined. In favorable conditions, a cone penetrometer is a much faster and more efficient method to obtain water samples and determine subsurface stratigraphy than conventional drilling methods, thereby reducing project costs. However, the cone penetrometer is limited by the fact that it can not push through gravelly, dense soil. A review of existing subsurface information of the area, including well logs and geologic maps, indicated that there was a good chance that a cone penetrometer would be successful at collecting water samples at various depths. Based on available information, it was decided that the cone penetrometer rig was the most effective alternative.

Between May 12 and 14, 1992, a cone penetrometer rig, provided by STS Consultants Ltd., Northbrook, Illinois, was used to obtain water samples within the Kronenwetter Sanitary District boundary. Initially, Northern Environmental had hoped to recover samples from 3 depths at 12 sites, but problems were encountered with thin silt layers plugging the sampling cone and with dense gravel layers limiting penetration depths. Cone penetrometer tests were attempted at seven locations with the Kronenwetter Sanitary District (Figure 2). At five of the locations, water samples were collected with a vacuum pump, at depths ranging from 54 to 69 feet. Each sample was analyzed in the field for iron, manganese, and nitrates using a Hach Colorimetric Kits, and the remaining portion of each sample was preserved with nitric acid for laboratory analysis.

Cone penetrometer refusal was encountered at two of the locations, CPT-2 and CPT-7. Two separate tests were tried at CPT-2, but both encountered refusal between 2 and 4 feet. CPT-7 also encountered refusal between nine and 12 feet. A second test at CPT-7 resulted in the rod snapping off at a depth of 9.2 feet below the ground. At this point, a decision was made to discontinue further water sampling with the cone penetrometer due to the inability of the cone penetrometer to penetrate deeper than 70 feet.

A decision was made to try and obtain water samples by conventional drilling techniques. Between June 15 and June 24, 1992, a drill rig, provided by Twin City Testing, Wausau, Wisconsin, was used to obtain water samples. An initial attempt was made at the approximate location of CPT-6 to drill down to approximately 70 to 80 feet with hollow stem augers, drive a 1.25 inch steel sand point ahead of the bottom of the borehole, and pump a water sample for analysis. However, the high water table (10 to 15 feet below the ground surface), and the cohesive nature of the fine to medium sand resulted in difficult drilling, placing strong torque on the augers which caused the augers to break at a depth of about 85 feet, resulting in the loss of approximately 60 feet of hollow stem auger flites down hole in the first hole.

Due to the difficult augering conditions, a decision was made to switch to mud rotary drilling. The initial intention was to drill down to approximately 50 feet, push the well point three feet ahead of the bottom of the borehole, surge water into the formation to push the fine material away from the screen, and then continue pumping until all the water that was added during development was removed and a clear water sample could be taken. The initial intent was to collect a water sample at a depth of 50 feet and then drill down to within five feet of bedrock and repeat the process. During the field operation, it was decided to only sample right above bedrock to save time and to concentrate the sampling program on the interval in the aquifer that was most likely to have the highest concentrations of iron and manganese.

Eight borings were drilled within the Kronenwetter Sanitary District (Figure 2). Five water samples were collected at depths ranging from 52 to 77.5 feet. In addition, a water sample was collected from a private residence for control purposes. The samples were analyzed in the field for iron, manganese and nitrate concentration using a Hach DR\2000 Spectrophotometer and tested for pH with a pH ep test meter. In addition, a portion of each sample was preserved with nitric acid for later laboratory analysis of iron and manganese. The boring at HB-1 was abandoned due to loss of hollow stem auger flites, and close proximity of the Evergreen Grade School septic beds. The boring at HB-6 was abandoned without collecting a water sample due to the presence of a 10 foot thick clay layer above bedrock. The formation at this interval was impermeable, so it was not considered as a possible well site due to insufficient formation thickness. Boring TB-1 was drilled and sampled by split spoon. Samples were collected every 10 feet down to 40 feet, and every 5 feet from 45 to 90 feet to obtain representative formation samples. An attempt was made to collect a water sample at 90 feet from TB-1, but the well point could only be driven down to 91.4 feet, where refusal was encountered. Because the point could not be advanced beyond the boring, the well screen became clogged with bentonite drilling mud and fine sand, and a water sample could not be drawn.

DISCUSSION OF RESULTS

Table 1 shows the results of the cone penetrometer sampling program. The depth of the sample, pH, iron, manganese and nitrate concentrations are listed for each sample collected. For samples CPT-3 and CPT-4, no nitrate analysis was performed because the available sample volume was to small. Table 2 shows the results of the mud rotary sampling program. Note that the Bradfish sample was from a private residence located east of Tower Road (Figure 2). The parameters listed are similar to the cone penetrometer sampling program. In addition, pump discharge was measured for HB-3, HB-4, HB-5, and HB-7. This parameter is a relative indicator of formation permeability, but it is significantly affected by other factors, such as static water level and the physical integrity of the well point and piping.

Tables 1 and 2 present both the field analysis and lab analysis results. While laboratory analytical techniques have an obvious advantage in precision, the difficulty in obtaining a representative sample for iron and manganese seriously reduces the reliability of the results. From Tables 1 and 2 it can be seen that the lab analysis results are almost always higher than the field results. This suggests that the nitric acid preservative has dissolved iron and manganese from the small amount of silt present in the sample, causing the lab results to be less representative of actual water quality. For this reason, we have chosen to use the field results for further analysis. Please note that the field and laboratory analysis from the Bradfish well sample are very close, suggesting very little silt was present in the sample due to prolonged pumpage of this domestic well.

Figures 3 and 4 are plots of iron and manganese concentrations vs. depth for all of the samples collected, including the analysis done on the existing test well in 1988. The plots do not indicate any clear trend of increasing concentration of iron and manganese vs. depth. The scattering of the data points seem to indicate that the iron and manganese concentrations are controlled more by geographic location in the aquifer and not by depth.

Figures 5 and 6 are plots of iron and manganese concentrations vs. pH of all of the samples collected. The plots indicate that there are two populations of data for each plot, one population between pH values 6.9 and 7.7, and the second population between pH values 8.2 and 8.7. The iron concentrations in the first data set range from .01 to greater than 3.3 ppm, while the manganese concentration ranges from .02 to .46 ppm. The range of concentrations for both iron and manganese in the second set is much lower than the first set. The range of iron concentrations for the second set is .02 to .06 ppm, while the manganese concentration range is .014 to .08 ppm. The data indicates that there is a relationship between high pH and low concentrations of iron and manganese in the aquifer. This indicates that some type of geochemical processes are occurring in the aquifer that results in areas of reducing or oxidizing conditions. In areas of low pH, the aquifer conditions are probably reducing and concentrations of iron and manganese are high. Areas of the aquifer which have a pH above 7.7 appear to be under oxidizing conditions for which iron and manganese are essentially insoluble, causing the concentrations of these ions to be low.

Figures 7, 8, and 9 are maps of the study area which show the concentrations of iron, manganese, and nitrates for all the samples collected, including the Bradfish sample and the test well. Figure 10 is a map that breaks down the entire study area into four separate water quality areas labelled area 1 through 4. The results of the water quality of each area is as follows:

AREA 1:

The area contains water quality data from CPT-4, CPT-5, CPT-6, HB-2, the Bradfish sample, and the test well. The iron concentration range of the area is from .01 to 2.8 ppm, and the manganese concentration range is from .01 to .46 ppm. The nitrate concentration ranges from 3.0 to 7.0 ppm. The possibility exists that a well site could be found in the area that has initial iron and manganese concentrations below the drinking water standard. However, the concentrations of these ions is quite high in many places in this area, suggesting that iron and manganese levels are likely to increase after prolonged pumpage. The nitrate concentrations are currently below the standard. However, historical evidence indicates that in the past area 1 was farmland. The field north of area 1 is presently agricultural land. The possibility exists that fertilizers and animal manure may have be spread extensively over the entire area. The movement of nitrates from the fertilizers and manure from the unsaturated zone to the water table is a slow process. Although the present nitrate concentrations are below the health standard, it is very possible that continued pumpage in the aquifer could result in increasing nitrate levels which could exceed the health standard in the future. Therefore, from a long term water quality standpoint, area 1 is not a good choice for a municipal well.

AREA 2:

Area 2 is outlined on the basis of water quality data from CPT-1 and HB-3. The iron concentration ranges from 1.0 to greater than 3.3 ppm, while the manganese concentration ranges from .3 to .32 ppm. The nitrate concentration ranges from nondetection to 1.2 ppm. The nitrate concentrations are low, and do not pose a long term health concern as in area 1. However, both the iron and manganese concentrations exceed the drinking water standard, and it is unlikely that a test well can be developed with low iron and manganese concentrations in this area.

AREA 3:

Area 3 is defined on the basis of water quality data from HB-4. The iron concentration is .02 ppm, whereas the manganese concentration is less than .03 ppm. The nitrate concentration is 5.0 ppm. All three chemical parameters are below the drinking water standard. The area north of area 3 is currently being used for agricultural purposes and it is possible that the nitrate level could surpass the health standard in the future. The sanitary district may wish to consider this area as a secondary prospect. A possibility exists that placing a well to the south of HB-4 in the wooded area, and establishing a well head protection plan, could prevent nitrate levels from rising and provide a good long term water supply.

AREA 4:

Area 4 is defined on the basis of water quality data from HB-5 and HB-7. The iron concentration ranges from .02 to .06 ppm, whereas the manganese concentration ranges from .014 to .019 ppm. The nitrate concentration ranges from 2.9 to 3.7 ppm. All three of the chemical parameters are well below the drinking water standard. The land use surrounding Area 4 is mostly residential and wooded lots. In the past, a turkey farm occupied the site. The threat of nitrate contamination associated with this farm does not seem to be a problem, based on the low nitrate levels from the chemical analysis. In addition, turkey farming does not involve spreading of fertilizer and manure on the land, as is done with dairy farming. Therefore, surrounding land use does not appear to pose a threat to long term water quality of this site. Formation samples and sieve analysis (Attachment B) from TB-1, which is located between HB-5 and HB-7, indicated that the formation is permeable and the aquifer may be capable of yielding a good supply of high quality water.

RECOMMENDATIONS

Northern Environmental recommends installing an eight-inch test well in Area 4 at location TB-1. The test well should by drilled by a cable tool rig, and formation samples should be collected every five feet. The well screen should be set between 60 to 90 feet, but the final depth will depend on sieve analysis of the cable tool samples. After installation, the test well should be surged and pumped to remove the fine material from around the screen, and development should continue until the water is pumped clear. A well completion test should be run on the well in order to determine capacity and efficiency of the well. If the capacity of the well is lower than 500 gpm and the data indicates poor well efficiency, then more time should be spent on development of the test well.

Once the desired well capacity is achieved, three temporary observation wells should be installed to approximately 70 feet, at 120° azimuths from the test well, at distances of 50, 100, and 150 feet. An aquifer test should then be conducted for approximately five days, or until water levels and water quality stabilize. In addition, draw down in some nearby domestic wells should be measured. Water samples from the test well should be collected three times the first day of the test, and once a day until the end of the test. The samples should be analyzed for iron, manganese, nitrogen-nitrate, pH, and temperature. Preferably, the analysis should be done in the field with a portable spectrophotometer. Additional samples should be properly preserved and analyzed in the lab. Temperature and pH must be measured in the field. Before the pump is shut off, a sample should be collected and analyzed in a laboratory for inorganics, VOCs, and pesticides. Once the pump is shut off, recovery measurements should be made for at least the first 24 hours or until the original static water level is reached. The data should then be analyzed to determine the zone of contribution for the well, and to estimate time of travel contours for the well head protection plan.

Northern Environmental is very optimistic that a suitable well site with sufficient capacity and water quality can be developed at Area 4. However, the success of the well is dependent on proper installation and development of the test well, and running a thorough completion and aquifer test. While we cannot guarantee that iron, manganese, or nitrate levels will not increase with time, past experience suggests that it is reasonable to assume that satisfactory water quality will be maintained if water quality results remain low during the aquifer test. We trust this information meets your needs. Please feel free to contact us if you have any questions or comments.

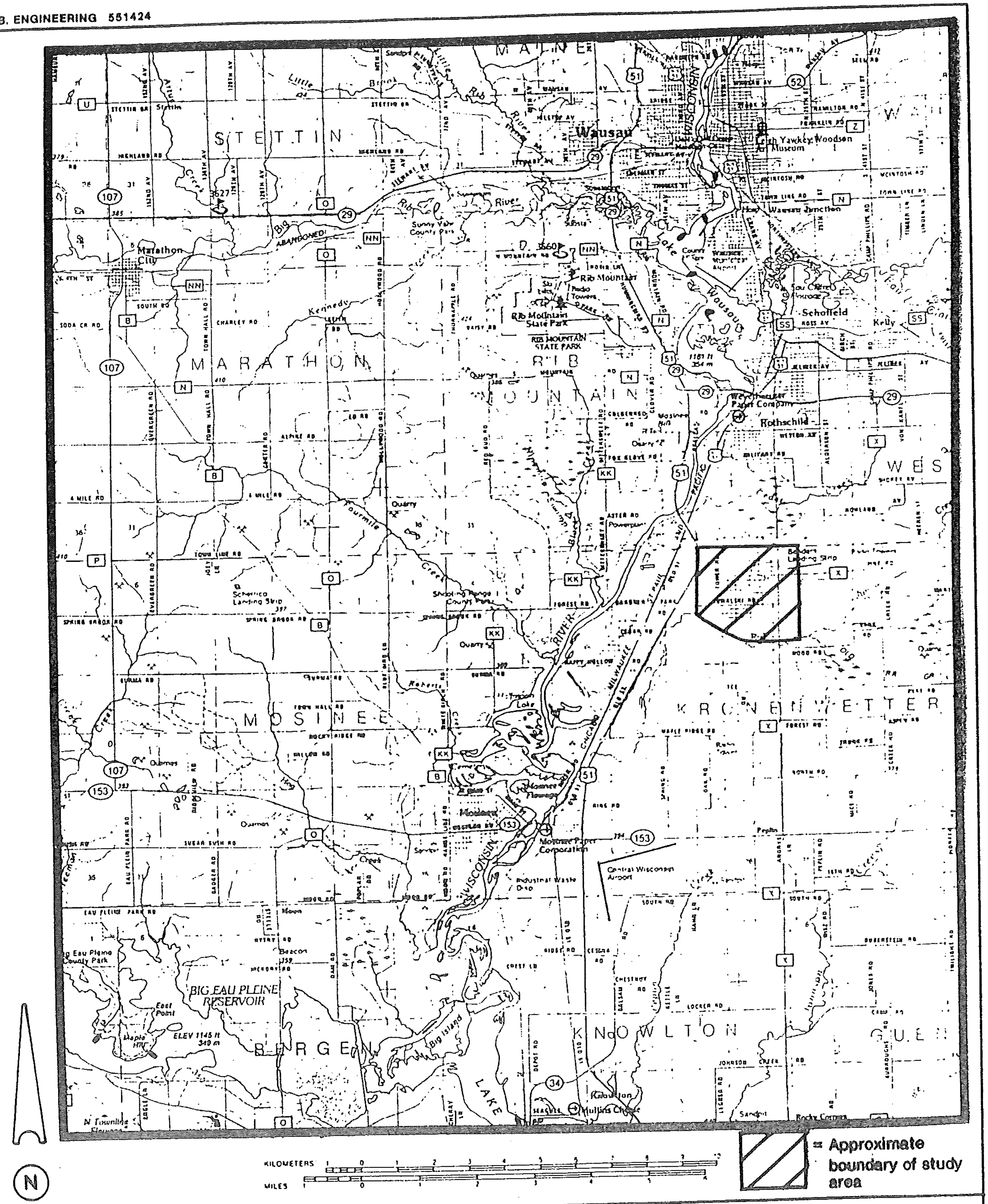
Sincerely,
Northern Environmental Technologies, Incorporated

Patrick J. Jurcek
Geophysicist/Hydrogeologist II

John R. Jansen, C.P.G., R.Gp.
Director of Geosciences

PJJ/gjw

G.M.B. ENGINEERING 551424



REV	PROJECT: KRN140805	DATE: 07/14/92	KRONENWETTER SANITARY DISTRICT

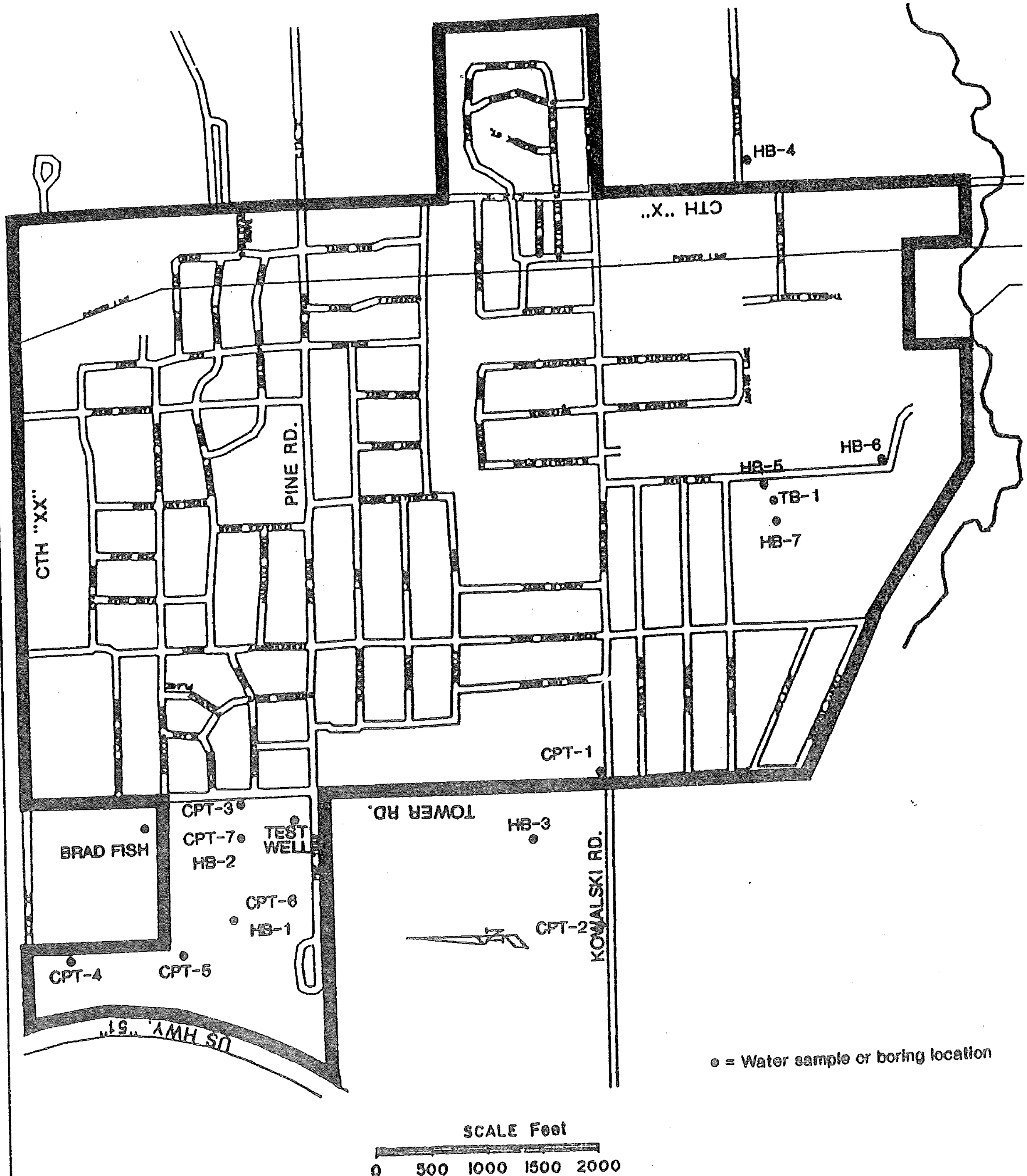
THIS DRAWING AND ALL INFORMATION CONTAINED THEREON IS THE PROPERTY OF NORTHERN ENVIRONMENTAL INCORPORATED AND SHALL NOT BE COPIED OR USED EXCEPT FOR THE PURPOSE FOR WHICH IT IS EXPRESSLY FURNISHED THE DRAWING AND ANY COPIES THEREOF SHALL BE RETURNED TO THE OWNER ON DEMAND

STUDY AREA LOCATION MAP

Northern Environmental
Hydrologists • Engineers • Geologists

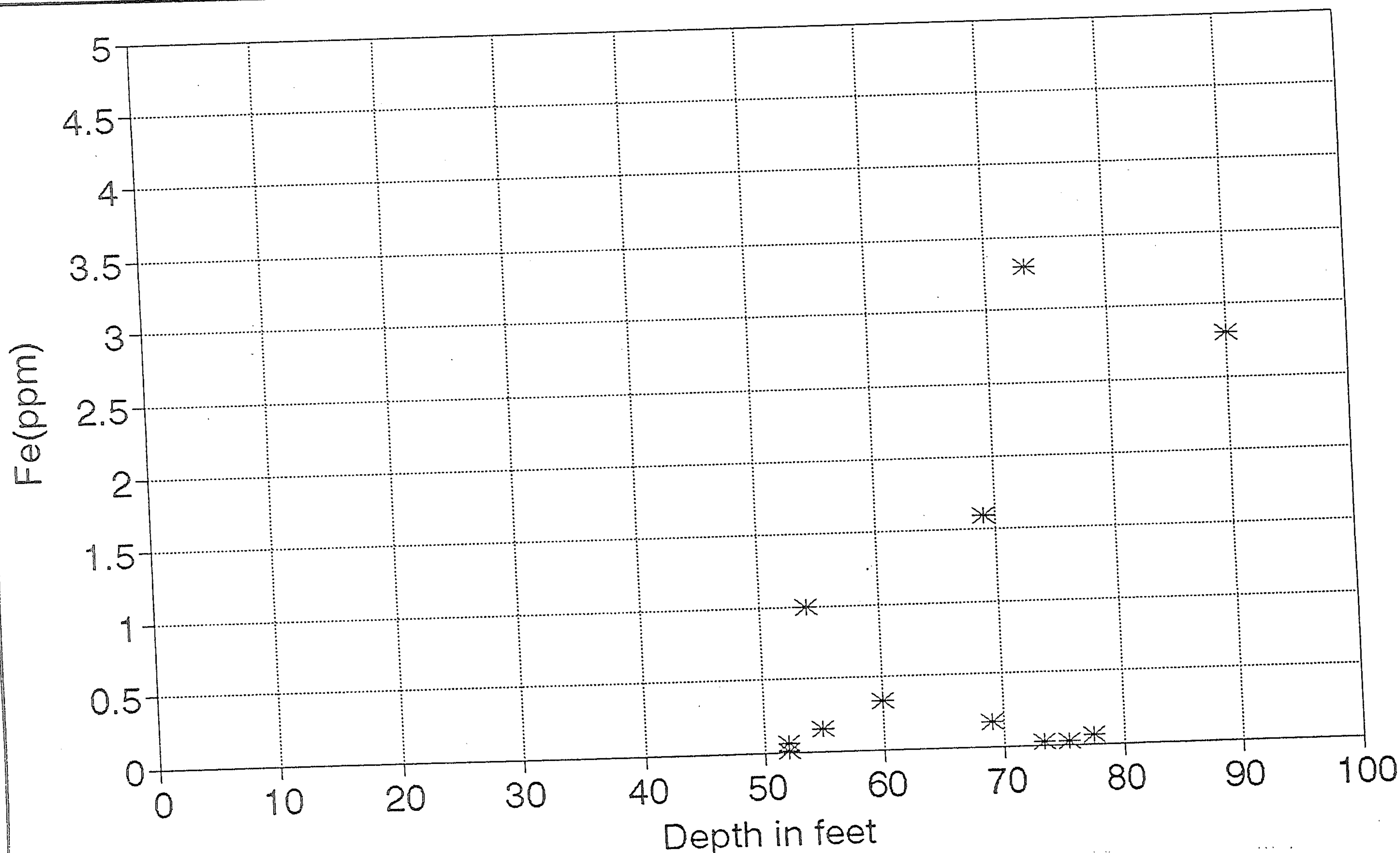
FIGURE 1

G.M.B. ENGINEERING 551424



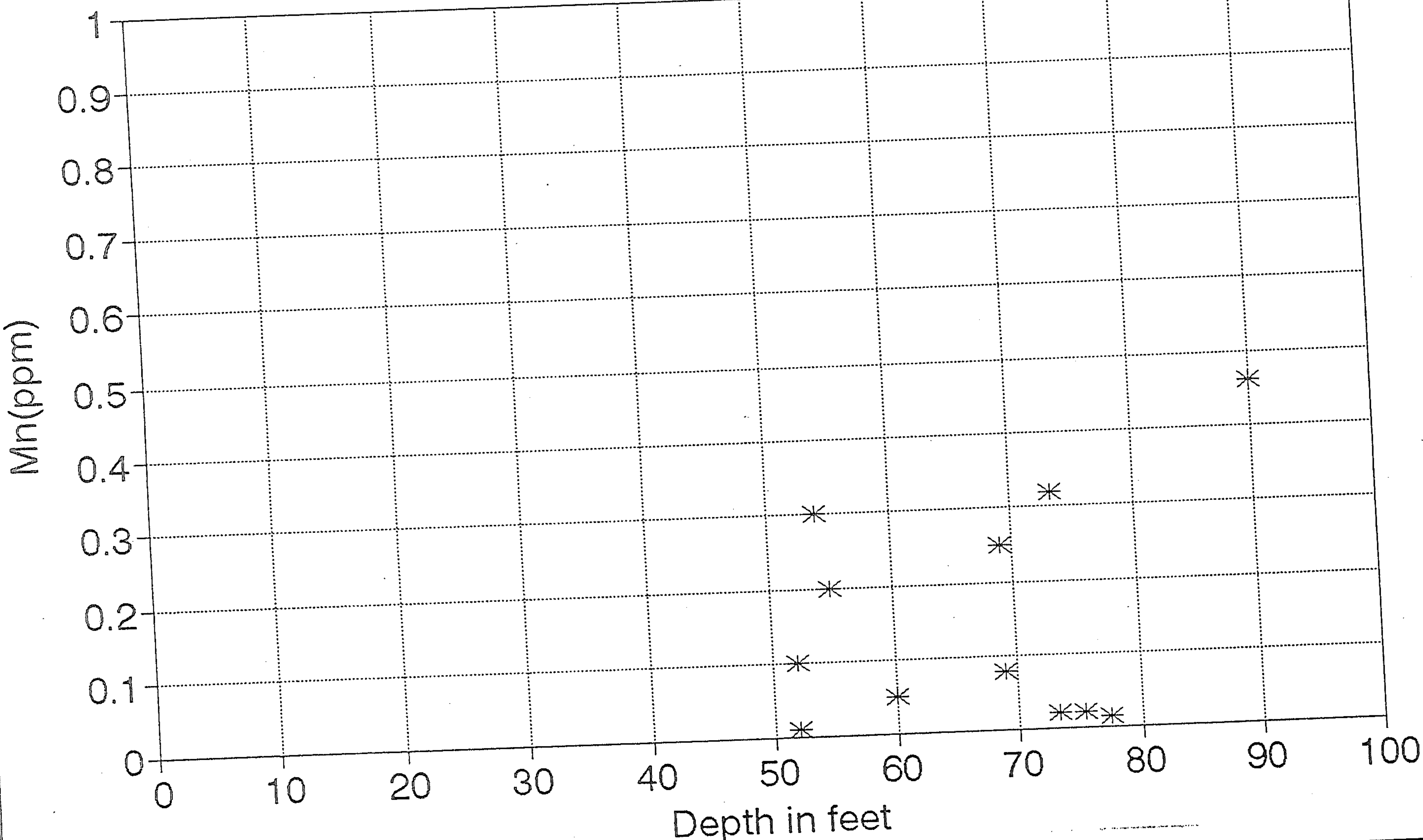
REV	PROJECT: KRN140805	DATE: 07/14/92	KRONENWETTER SANITARY DISTRICT
	THIS DRAWING AND ALL INFORMATION CONTAINED THEREON IS THE PROPERTY OF NORTHERN ENVIRONMENTAL INCORPORATED AND SHALL NOT BE COPIED OR USED EXCEPT FOR THE PURPOSE FOR WHICH IT IS EXPRESSLY FURNISHED THE DRAWING AND ANY COPIES THEREOF SHALL BE RETURNED TO THE OWNER ON DEMAND		WATER SAMPLE AND BORING MAP
Northern Environmental Hydrologists • Engineers • Geologists			

FIGURE 2



REV	PROJECT: KRN 140805	DATE: 07/14/92	KRONENWETTER SANITARY DISTRICT
	THIS DRAWING AND ALL INFORMATION CONTAINED THEREON IS THE PROPERTY OF NORTHERN ENVIRONMENTAL INCORPORATED AND SHALL NOT BE COPIED OR USED EXCEPT FOR THE PURPOSE FOR WHICH IT IS EXPRESSLY FURNISHED. THE DRAWING AND ANY COPIES THEREOF SHALL BE RETURNED TO THE OWNER ON DEMAND		PLOT OF IRON CONCENTRATION (FIELD DATA) VS. DEPTH
	▲ **Northern Environmental** *Hydrologists • Engineers • Geologists*		

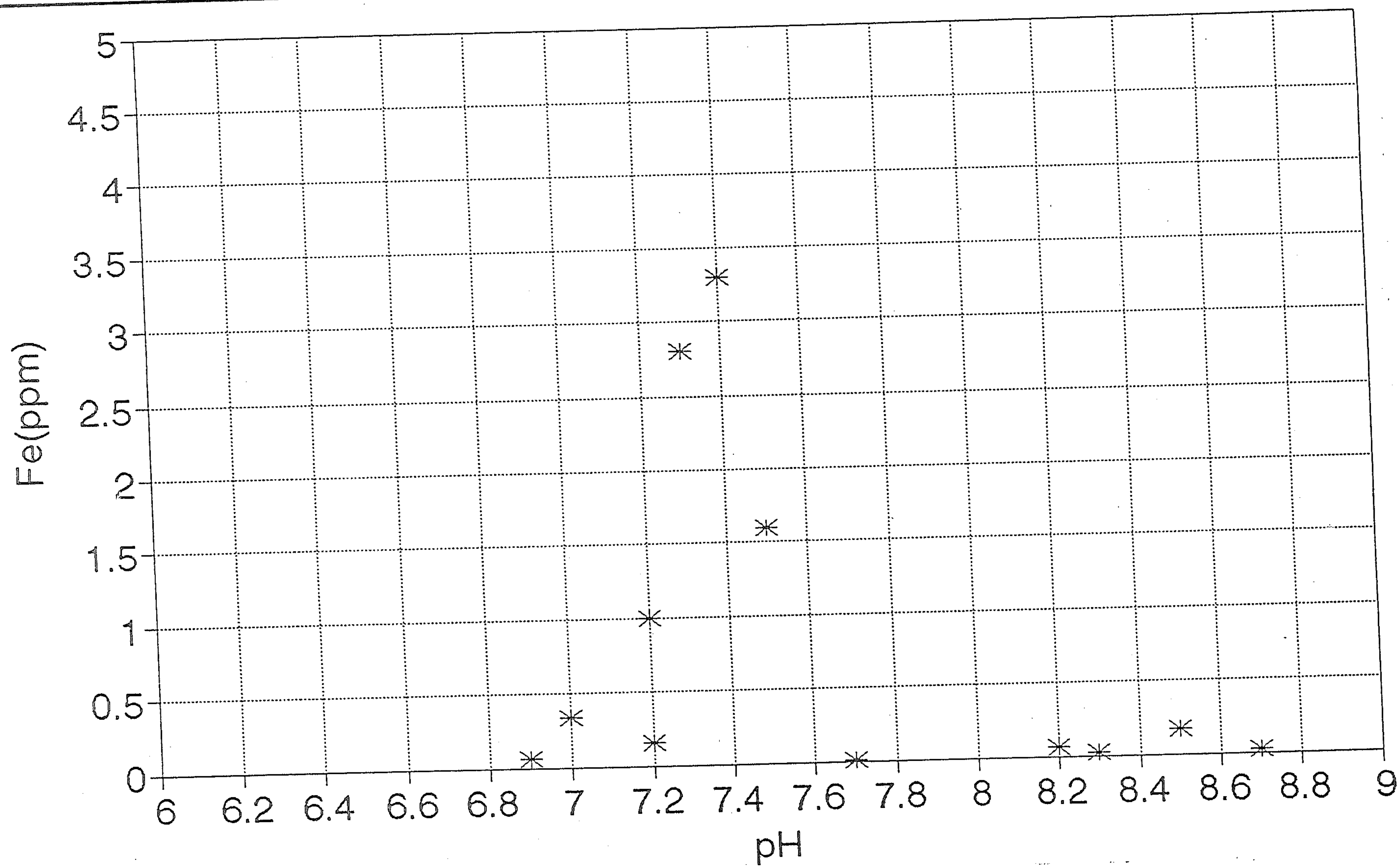
FIGURE 3



REV	PROJECT: **KRN 140805**	DATE: 07/14/92	KRONENWETTER SANITARY DISTRICT
	THIS DRAWING AND ALL INFORMATION CONTAINED THEREON IS THE PROPERTY OF NORTHERN ENVIRONMENTAL INCORPORATED AND SHALL NOT BE COPIED OR USED EXCEPT FOR THE PURPOSE FOR WHICH IT IS EXPRESSLY FURNISHED. THE DRAWING AND ANY COPIES THEREOF SHALL BE RETURNED TO THE OWNER ON DEMAND		PLOT OF MANGANESE CONCENTRATION (FIELD DATA) VS. DEPTH
	Northern Environmental *Hydrologists • Engineers • Geologists*		

FIGURE 4

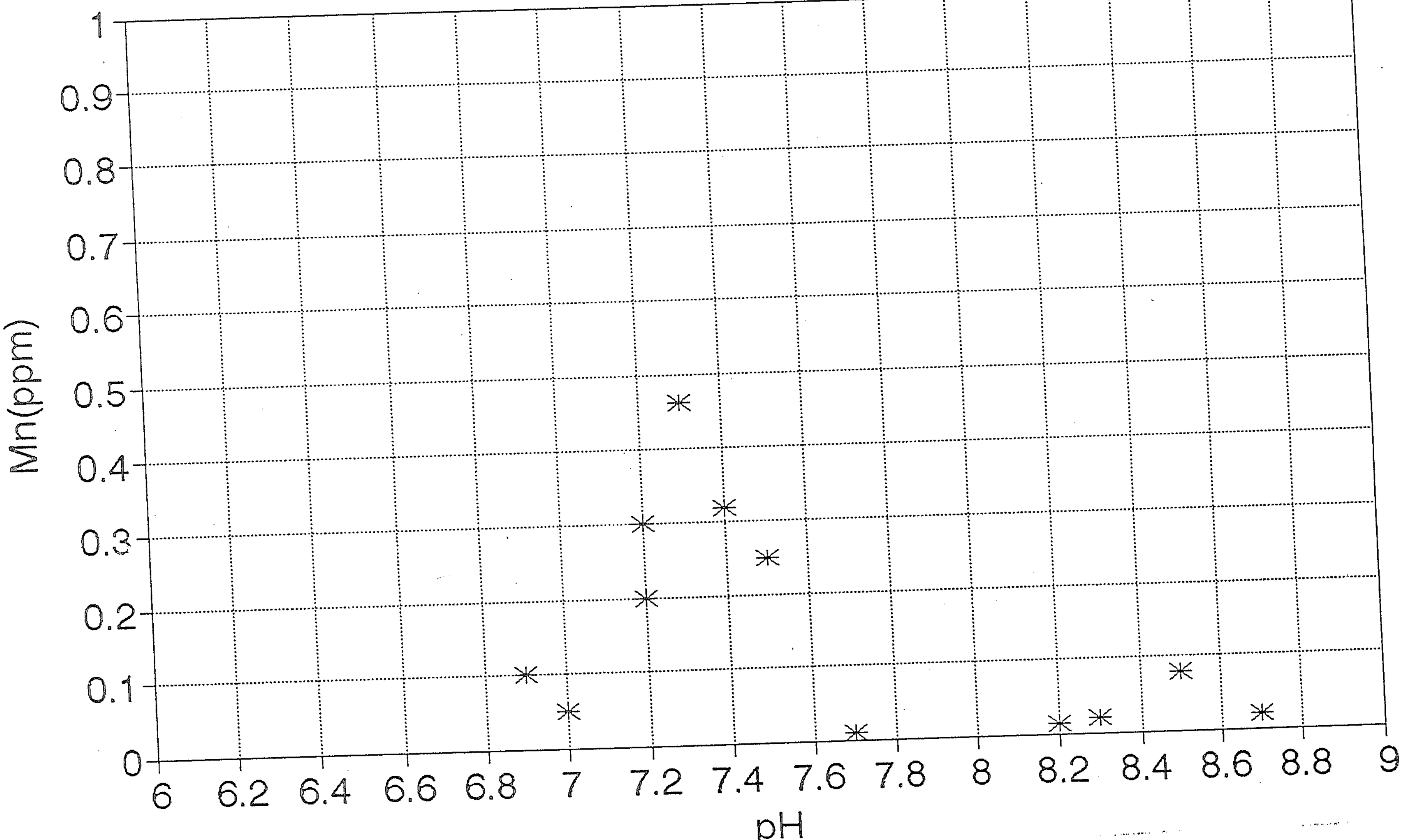
G.M.B ENGINEERING 551424



REV	PROJECT: **KRN 140805**	DATE: 07/14/92	**KRONENWETTER SANITARY DISTRICT**
	THIS DRAWING AND ALL INFORMATION CONTAINED THEREON IS THE PROPERTY OF NORTHERN ENVIRONMENTAL INCORPORATED AND SHALL NOT BE COPIED OR USED EXCEPT FOR THE PURPOSE FOR WHICH IT IS EXPRESSLY FURNISHED. THE DRAWING AND ANY COPIES THEREOF SHALL BE RETURNED TO THE OWNER ON DEMAND		**PLOT OF IRON CONCENTRATION (FIELD DATA) VS. pH**
	Northern Environmental *Hydrologists • Engineers • Geologists*		

FIGURE 5

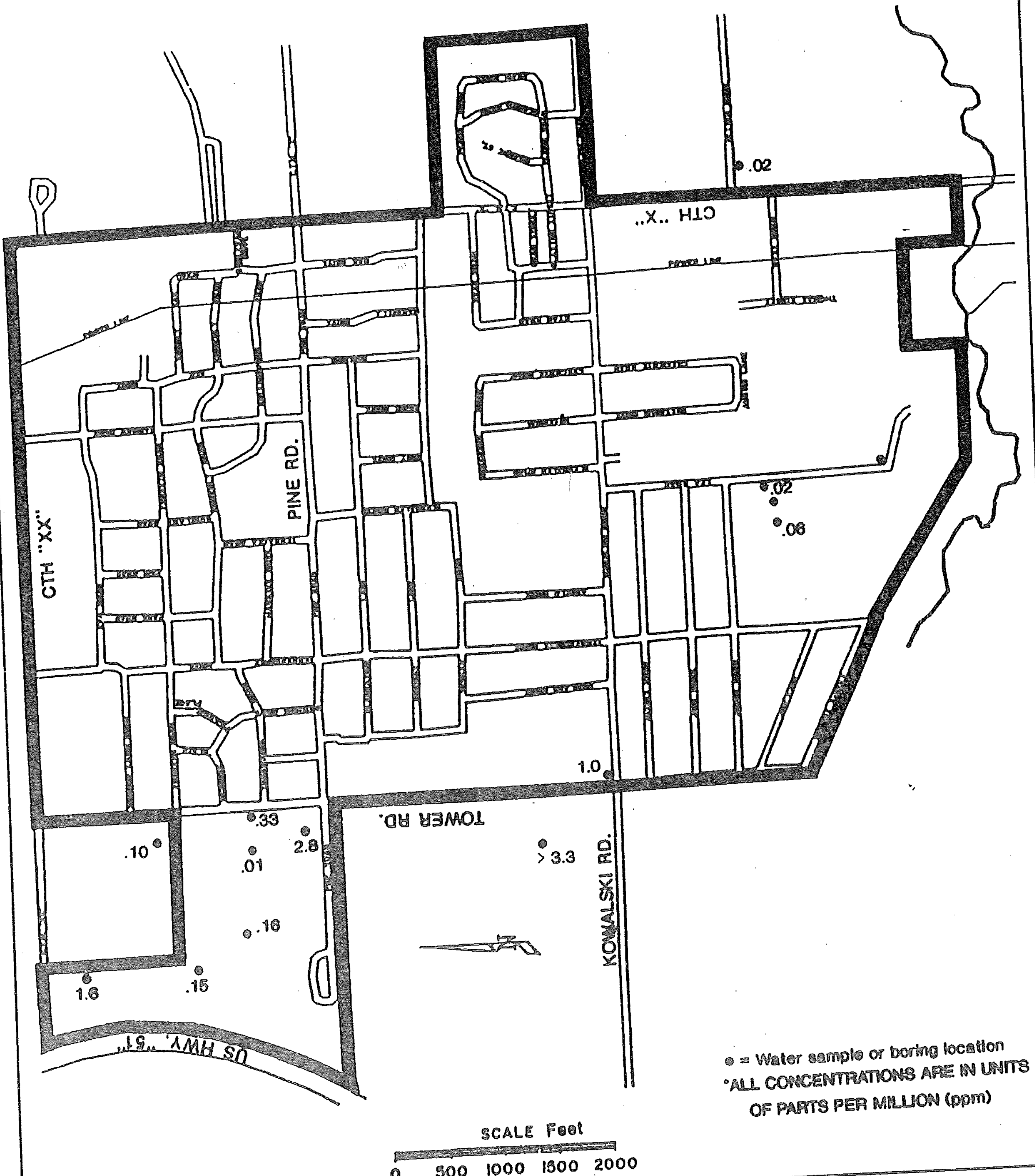
G.M.B ENGINEERING 551424



REV	PROJECT: **KRN 140805**	DATE: 07/14/92	KRONENWETTER SANITARY DISTRICT
	THIS DRAWING AND ALL INFORMATION CONTAINED THEREON IS THE PROPERTY OF NORTHERN ENVIRONMENTAL INCORPORATED AND SHALL NOT BE COPIED OR USED EXCEPT FOR THE PURPOSE FOR WHICH IT IS EXPRESSLY FURNISHED. THE DRAWING AND ANY COPIES THEREOF SHALL BE RETURNED TO THE OWNER ON DEMAND		PLOT OF MANGANESE CONCENTRATION (FIELD DATA) VS. pH
	Northern Environmental *Hydrologists • Engineers • Geologists*		

FIGURE 6

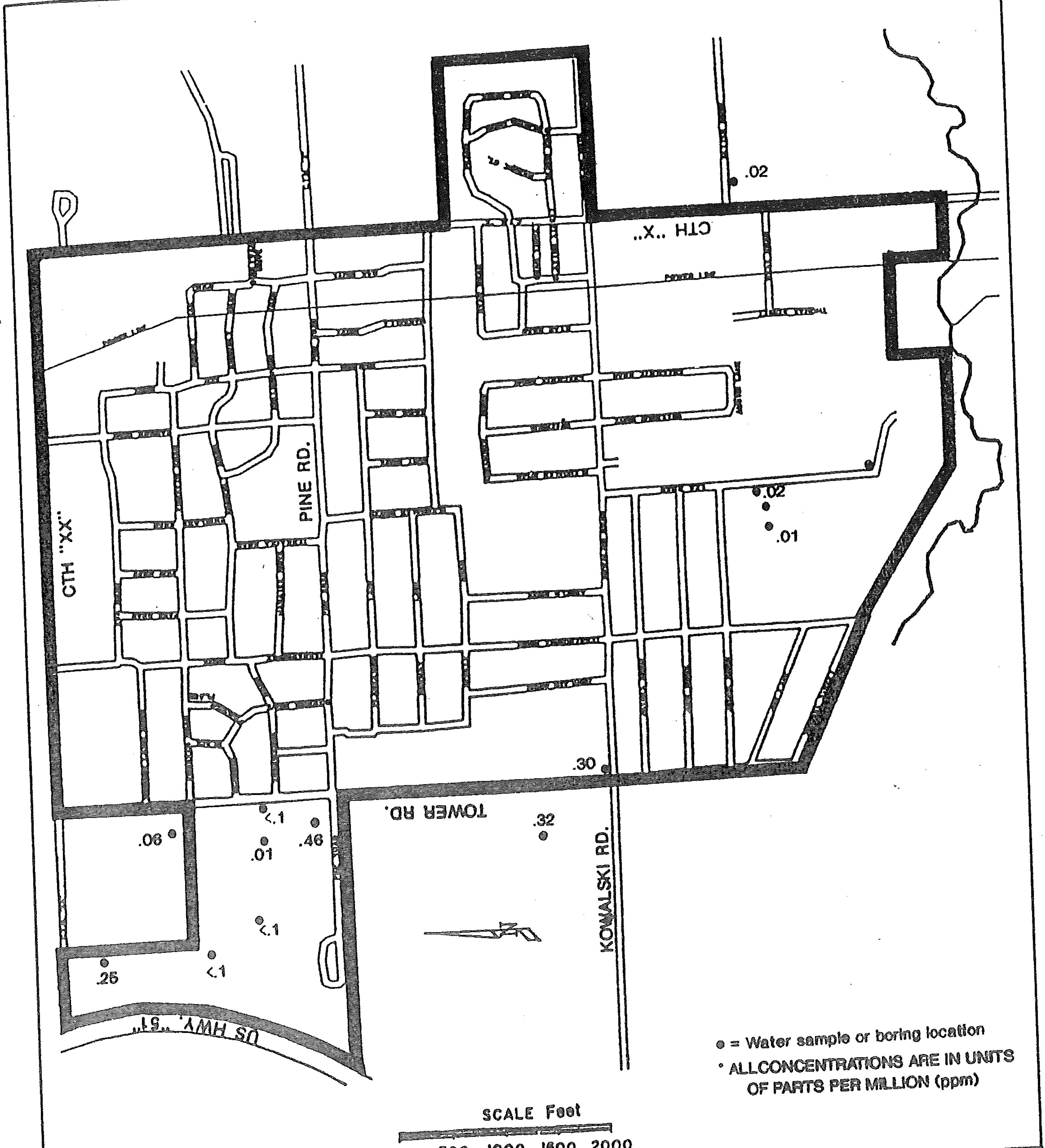
G.M.B. ENGINEERING 551424



REV	PROJECT: KRN140805	DATE: 07/14/92	KRONENWETTER SANITARY DISTRICT
	THIS DRAWING AND ALL INFORMATION CONTAINED THEREON IS THE PROPERTY OF NORTHERN ENVIRONMENTAL INCORPORATED AND SHALL NOT BE COPIED OR USED EXCEPT FOR THE PURPOSE FOR WHICH IT IS EXPRESSLY FURNISHED THE DRAWING AND ANY COPIES THEREOF SHALL BE RETURNED TO THE OWNER ON DEMAND		IRON CONCENTRATION MAP FROM FIELD DATA
Northern Environmental Hydrologists • Engineers • Geologists			

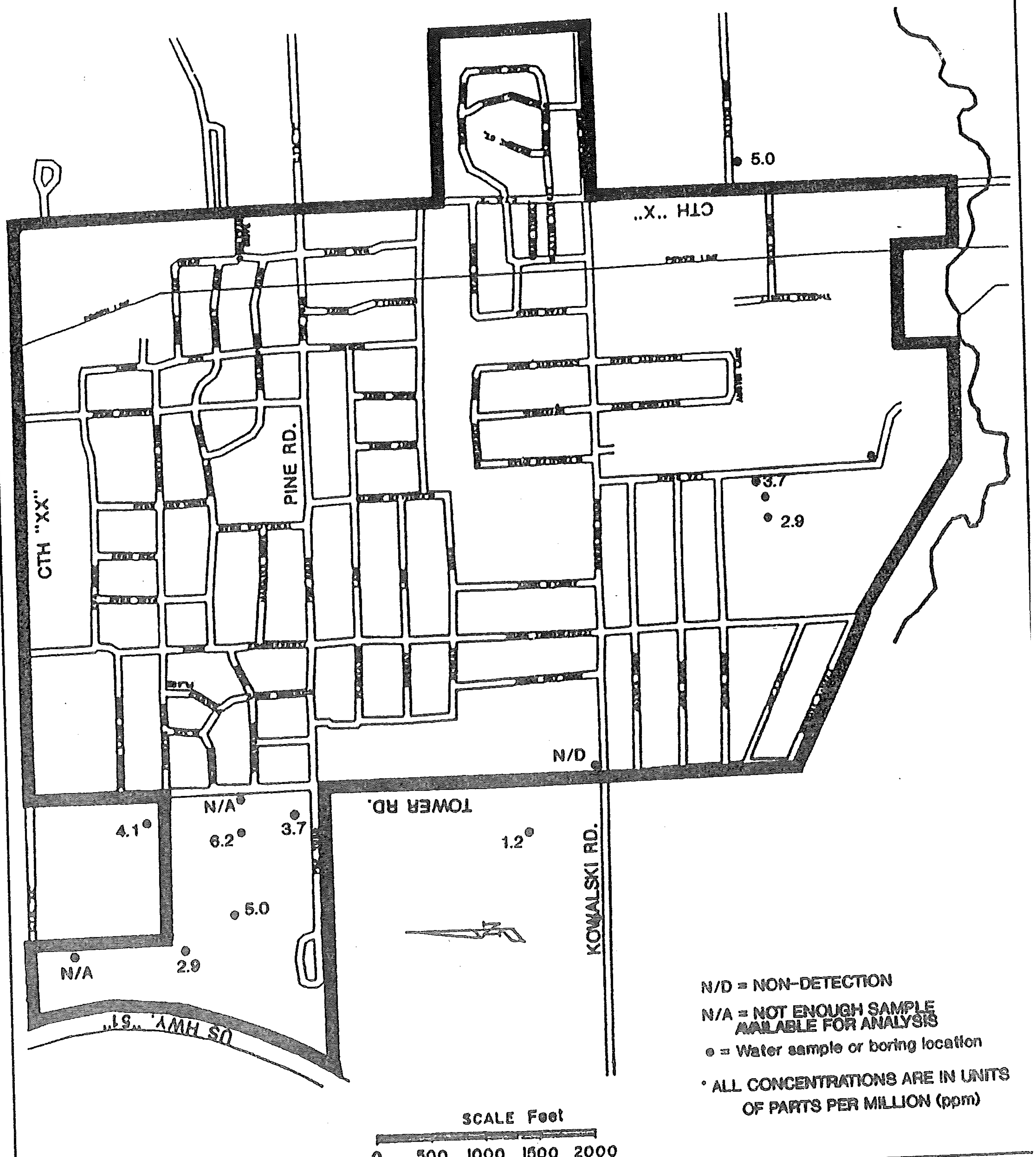
FIGURE 7

G.M.B. ENGINEERING 551424



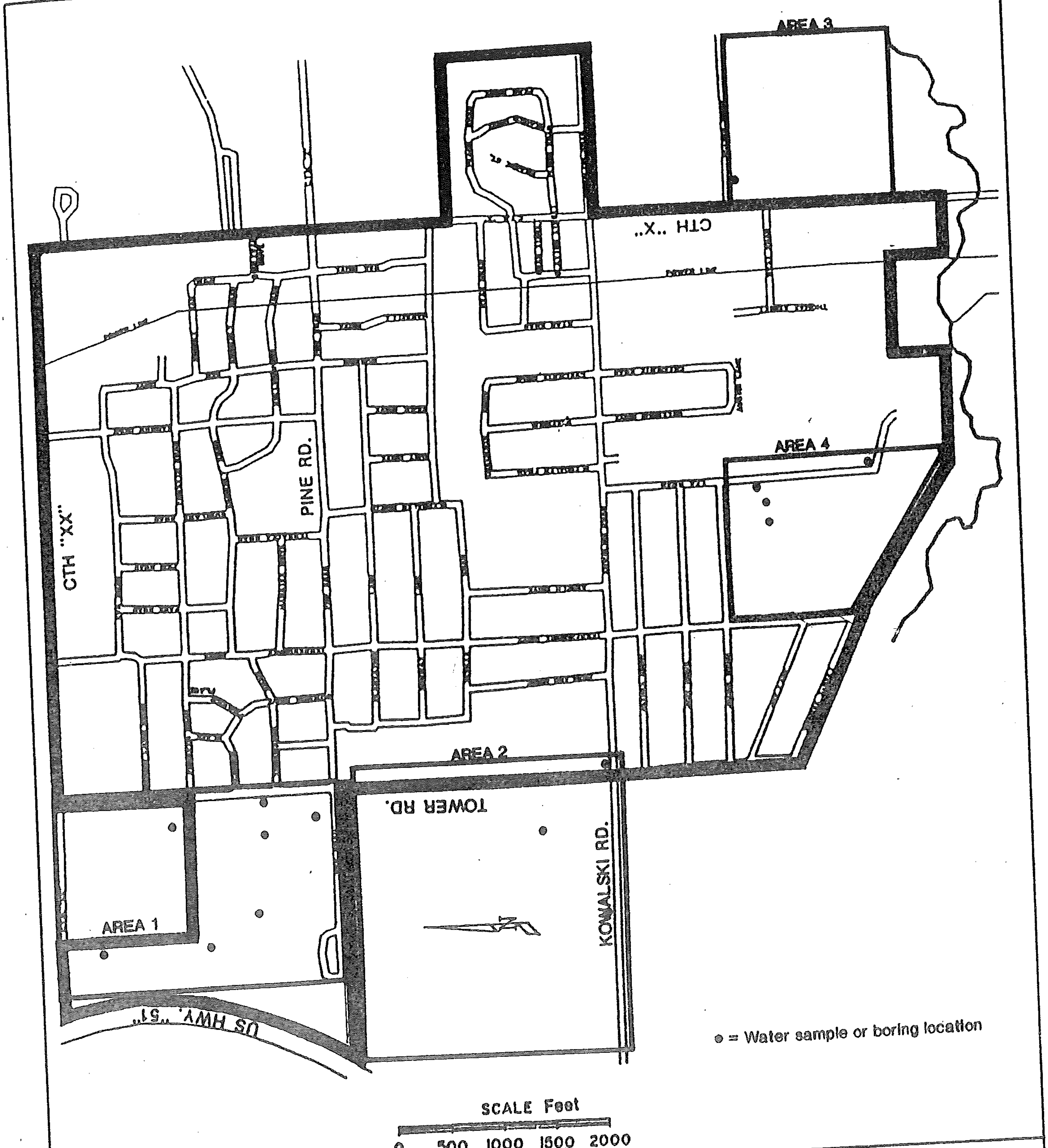
REV	PROJECT: KRN140805	DATE: 07/14/92	KRONENWETTER SANITARY DISTRICT
	THIS DRAWING AND ALL INFORMATION CONTAINED THEREON IS THE PROPERTY OF NORTHERN ENVIRONMENTAL INCORPORATED AND SHALL NOT BE COPIED OR USED EXCEPT FOR THE PURPOSE FOR WHICH IT IS EXPRESSLY FURNISHED THE DRAWING AND ANY COPIES THEREOF SHALL BE RETURNED TO THE OWNER ON DEMAND		MANGANESE CONCENTRATION MAP FROM FIELD DATA
Northern Environmental Hydrologists • Engineers • Geologists			

FIGURE 8



REV	PROJECT: KRN140805	DATE: 07/14/92	KRONENWETTER SANITARY DISTRICT
	THIS DRAWING AND ALL INFORMATION CONTAINED THEREON IS THE PROPERTY OF NORTHERN ENVIRONMENTAL INCORPORATED AND SHALL NOT BE COPIED OR USED EXCEPT FOR THE PURPOSE FOR WHICH IT IS EXPRESSLY FURNISHED THE DRAWING AND ANY COPIES THEREOF SHALL BE RETURNED TO THE OWNER ON DEMAND		NITROGEN – NITRATE CONCENTRATION MAP FROM FIELD DATA
	Northern Environmental Hydrologists • Engineers • Geologists		FIGURE

G.M.B. ENGINEERING 551424



REV	PROJECT: KRN140805	DATE: 07/14/92

KRONENWETTER SANITARY DISTRICT

WATER QUALITY AREA MAP

Northern Environmental
Hydrologists • Engineers • Geologists

FIGURE 10

Northern Environmental
Hydrologists • Engineers • Geologists

TABLE 1
CONE PENETROMETER TESTING DATA FROM KRONENWETTER SANITARY DISTRICT WATER QUALITY STUDY

CPT-1	FIELD	LAB
Sample depth=	54.0 feet	N/S
pH=	7.2	
Iron=	1.0 ppm	
Manganese=	.30 ppm	
Nitrogen-Nitrate=	No detection	

CPT-2	FIELD	LAB
-Refusal 4 feet down -Tried another test 100 north, refusal 4 feet down	N/S	N/S

CPT-3		
Sample depth=	60 feet	N/S
pH=	7.0	
Iron=	.33 ppm	
Manganese=	0-.1 ppm	
Nitrogen-Nitrate=	*N/A	

CPT-4		
Sample depth=	69 feet	N/S
pH=	7.5	
Iron=	1.6 ppm	
Manganese=	.2-.3 ppm	
Nitrogen-Nitrate=	*N/A	

CPT-5		
Sample depth=	55 feet	
pH=	7.2	
Iron=	.15 ppm	.4 ppm
Manganese=	<.1 ppm	.2 ppm
Nitrogen-Nitrate=	2.9 ppm	

CPT-6		
Sample depth=	68-69 feet	
pH=	8.5	
Iron=	.16 ppm	.8 ppm
Manganese=	<.1 ppm	.08 ppm
Nitrogen-Nitrate=	5.0 ppm	

CPT-7

- Lost sample cone 9.2 feet below ground surface
  N/S

*N/A= Not enough water sample available for Nitrogen-Nitrate analysis
N/S= No sample

Northern Environmental
Hydrologists • Engineers • Geologists

TABLE 2
MUD ROTARY DRILLING DATA FROM KRONENWETTER SANITARY DISTRICT WATER QUALITY STUDY

HB-1	FIELD	LAB
- Drilled rod snapped, abandoned hole	N/S	N/S

HB-2	FIELD	LAB
Sample depth=	52 feet	
pH=	7.7	
Iron=	.01 ppm	.80 ppm
Manganese=	.009 ppm	.13 ppm
Nitrogen-Nitrate=	6.2 ppm	

Bradfish Sample		
Well depth=	52 feet	
pH=	6.9	
Iron=	.10 ppm	.1 ppm
Manganese=	.06 ppm	<.03 ppm
Nitrogen-Nitrate=	4.1 ppm	

HB-3		
Sample depth=	73.3 feet	
pH=	7.4	
Iron=	>3.3 ppm	14 ppm
Manganese=	.322 ppm	.35 ppm
Nitrogen-Nitrate=	1.2 ppm	
Discharge=	14.2 gpm	

HB-4		
Sample depth=	75.3 feet	
pH=	8.7	
Iron=	.02 ppm	<.1 ppm
Manganese=	.02 ppm	<.03 ppm
Nitrogen-Nitrate=	5.0 ppm	
Discharge=	16.5 gpm	

HB-5		
Sample depth=	73.3 feet	
pH=	8.3	
Iron=	.02 ppm	<.1 ppm
Manganese=	.02 ppm	<.03 ppm
Nitrogen-Nitrate=	3.7 ppm	
Discharge=	10.6 gpm	

HB-6

- Abandoned due to clay layer from 70-80 feet, could not get a water sample
N/S

HB-7		
Sample depth=	77.5 feet	
pH=	8.2	
Iron=	.06 ppm	.2 ppm
Manganese=	.01 ppm	<.03 ppm
Nitrogen-Nitrate=	2.9 ppm	
Discharge=	9.5 gpm	

N/S = No sample

Northern Environmental℠
Hydrologists • Engineers • Geologists

ATTACHMENT A

TB-1 BORING LOG

TB-1
SAMPLE DESCRIPTION LOG

Depth (feet)	Description
9.0	Sand, Fine to coarse, some gravel, some silt
25-26.5	Sand, fine to medium, trace silt and clay
30-31.5	Sand, fine to medium, trace silt
40-41.5	Sand, silty, fine to medium, trace clay
50-51.5	Sand, fine to coarse, some silt
55-56.5	Sand, fine to medium, some silt
60-85.5	Sand, fine to medium, some silt
90-91.4	Sand, silty, fine to medium
91.4	Sand point refusal, Bedrock ?

Northern Environmental℠
Hydrologists • Engineers • Geologists

ATTACHMENT B

SIEVE ANALYSIS OF SAMPLES FROM TB-1

Wisconsin TESTING LABORATORIES

W T L

Testing and Inspection of:
Soils
Concrete
Asphalt
Geotechnical Reports
Soil Borings
Rock Coring

July 1, 1992

Mr. Pat Jurcek
Northern Environmental Technologies, Inc.
1214 West Venture Court
Mequon, Wisconsin 53092

Re: Grain Size Analyses
Kronen Wetter
Project No. KNR 140805
(WTL L-9263)

Dear Mr. Jurcek:

We are submitting herewith the results of grain size analyses performed on seven (7) soil samples from the referenced project. These samples were delivered to our laboratory on June 26, 1992.

If there are any questions regarding these data, please call. We appreciate the opportunity to be of service to you.

Very truly yours,

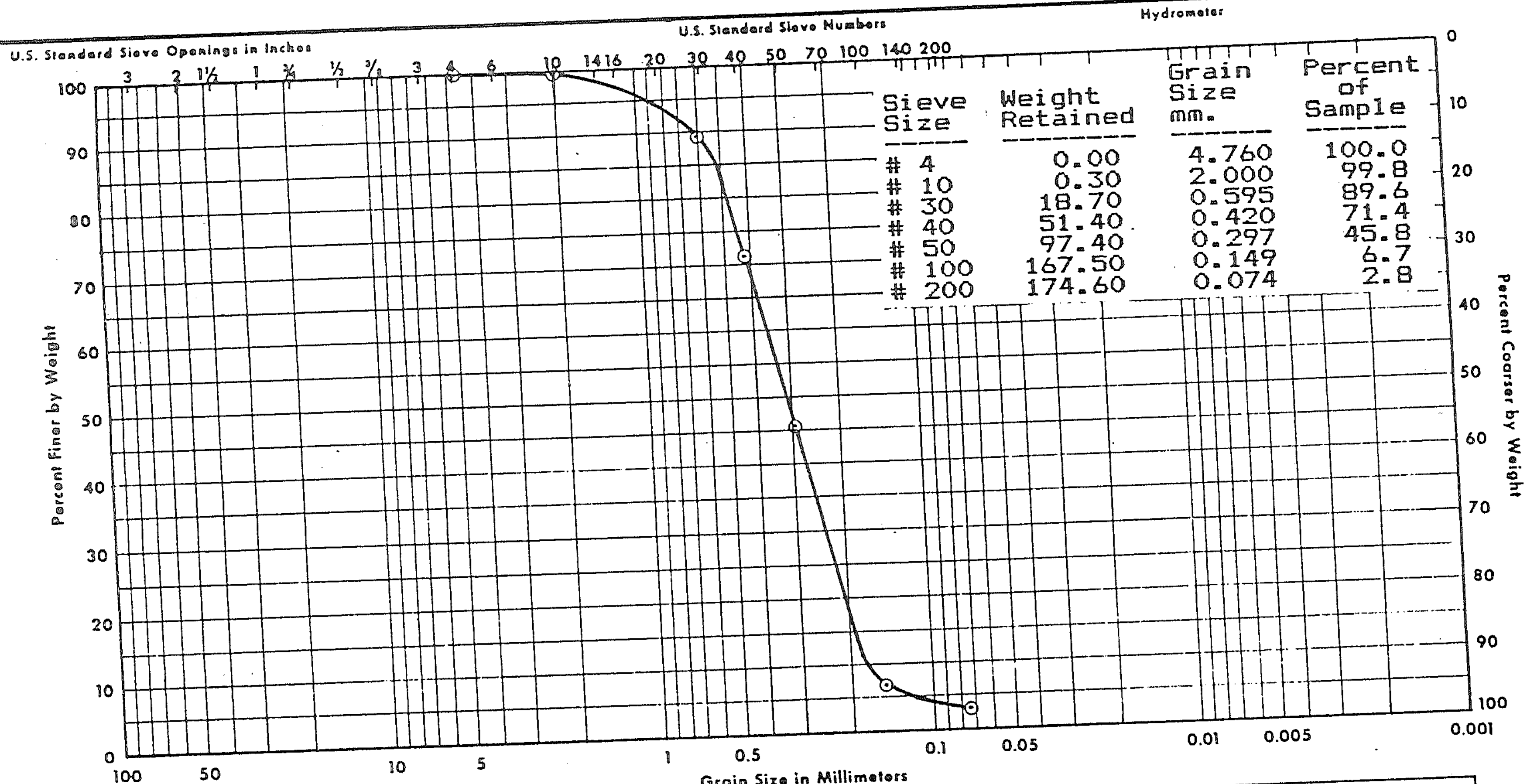
Jeffrey G. Smith, P.E.
Geotechnical Engineer

JGS/bh

Copies (2) Client

N59 W14176 Kaul Avenue/Menomonee Falls, WI 53051/(414) 252-3300

GRAIN SIZE ANALYSIS



Sieve Size	Weight Retained	Grain Size mm.	Percent of Sample
# 4	0.00	4.760	100.0
# 10	0.30	2.000	99.8
# 30	18.70	0.595	89.6
# 40	51.40	0.420	71.4
# 50	97.40	0.297	45.8
# 100	167.50	0.149	6.7
# 200	174.60	0.074	2.8

UNIFIED	GRAVEL	SAND		SILT OR CLAY	
AASHO	GRAVEL	COARSE	FINE	SILT	CLAY

NUMBER	DEPTH	w	w_L	w_P	CLASSIFICATION
B-8 S-8	60'-61½'				Poorly Graded Sand (SP)

Project: Kroner Wetter

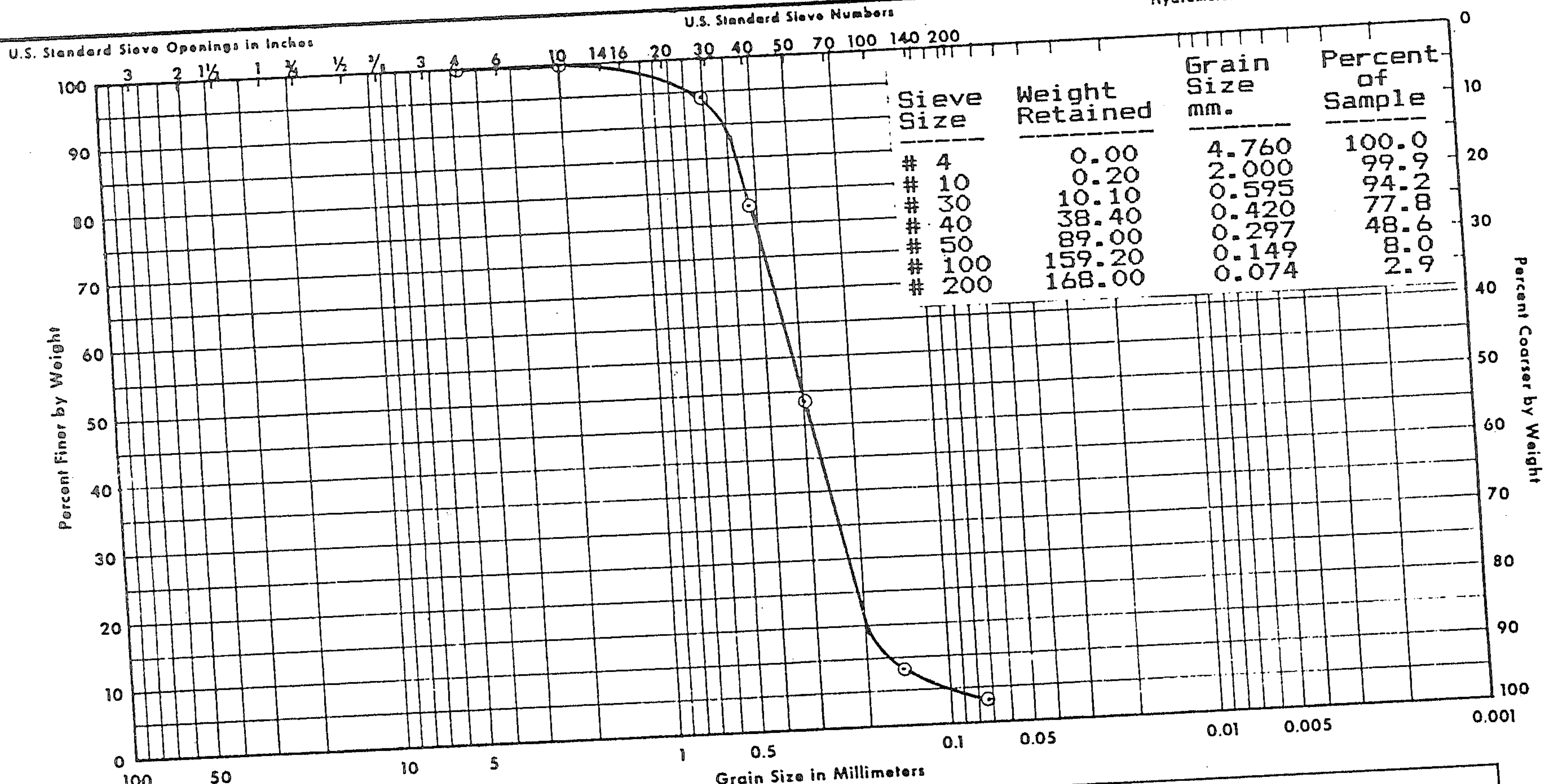
Project No. KNR 140805

Laboratory: WTL (L-9263)

For: Northern Environmental Technologies, Inc.

Date: July 1, 1992

GRAIN SIZE ANALYSIS



Sieve Size	Weight Retained	Grain Size mm.	Percent of Sample
# 4	0.00	4.760	100.0
# 10	0.20	2.000	99.9
# 30	10.10	0.595	94.2
# 40	38.40	0.420	77.8
# 50	89.00	0.297	48.6
# 100	159.20	0.149	8.0
# 200	168.00	0.074	2.9

UNIFIED	GRAVEL	SAND		SILT OR CLAY (SILT / CLAY)
AASHO	GRAVEL	COARSE	FINE	

NUMBER	DEPTH	w	w_L	w_P	CLASSIFICATION
B-8 S-9	65'-66½'				Poorly Graded Sand (SP)

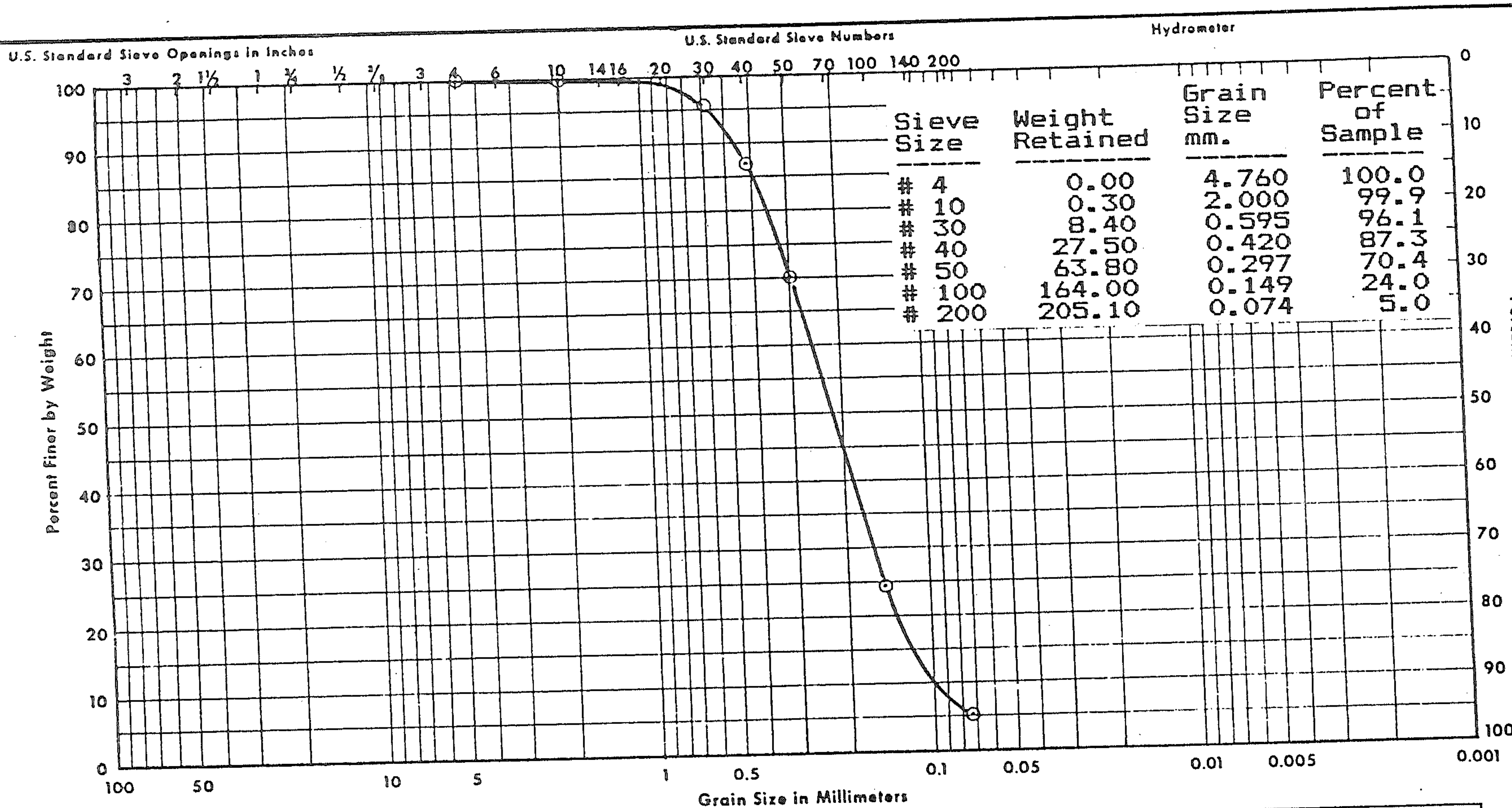
Project: Kronen Wetter
Project No. KNR 140805

Laboratory: WTL (L-9263)

For: Northern Environmental Technologies, Inc.

Date: July 1, 1992

GRAIN SIZE ANALYSIS



Sieve Size	Weight Retained	Grain Size mm.	Percent of Sample
# 4	0.00	4.760	100.0
# 10	0.30	2.000	99.9
# 30	8.40	0.595	96.1
# 40	27.50	0.420	87.3
# 50	63.80	0.297	70.4
# 100	164.00	0.149	24.0
# 200	205.10	0.074	5.0

UNIFIED	GRAVEL	SAND		SILT OR CLAY	
AASHO	GRAVEL	COARSE	FINE	SILT	CLAY

NUMBER	DEPTH	w	w_L	w_P	CLASSIFICATION
B-8 S-10	70'-71½'				Poorly Graded Sand with silt
					(or silty clay or clay)
					(SP-SM or SP-SC)

Project: Kronen Wetter
Project No. KNR 140805

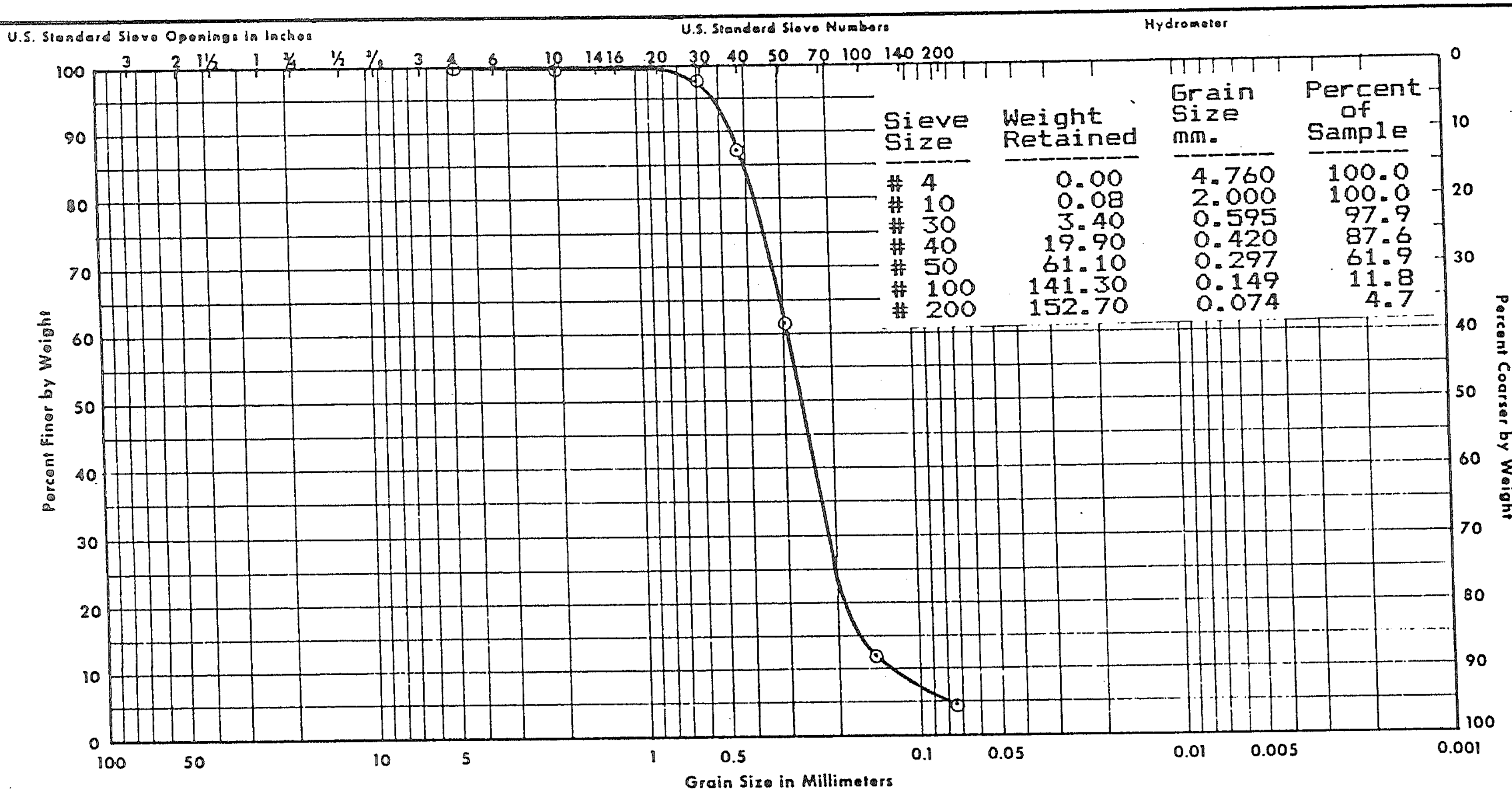
Laboratory: WTL (L-9263)

For: Northern Environmental Technologies, Inc.

Date: July 1, 1992

WISCONSIN TESTING LABORATORIES

GRAIN SIZE ANALYSIS



Sieve Size	Weight Retained	Grain Size mm.	Percent of Sample
# 4	0.00	4.760	100.0
# 10	0.08	2.000	100.0
# 30	3.40	0.595	97.9
# 40	19.90	0.420	87.6
# 50	61.10	0.297	61.9
# 100	141.30	0.149	11.8
# 200	152.70	0.074	4.7

UNIFIED	GRAVEL	SAND		SILT OR CLAY	
AASHO	GRAVEL	COARSE	FINE	SILT	CLAY

NUMBER	DEPTH	w	w_L	w_P	CLASSIFICATION
B-8 S-11	75'-76½'				Poorly Graded Sand (SP)

Project: Kronen Wetter

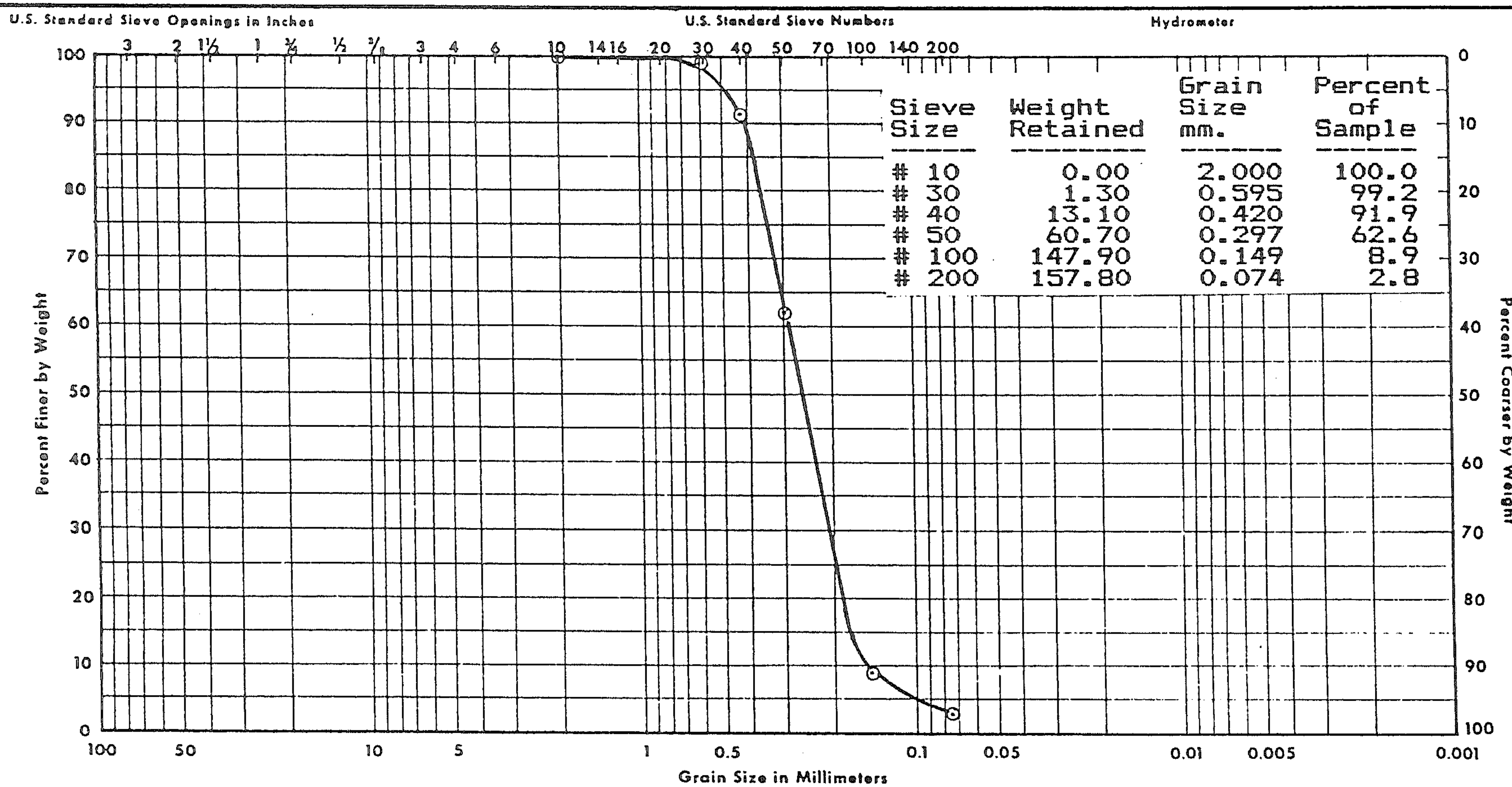
Project No. KNR 140805

Laboratory: WTL (L-9263)

For: Northern Environmental Technologies, Inc.

Date: July 1, 1992

GRAIN SIZE ANALYSIS



Sieve Size	Weight Retained	Grain Size mm.	Percent of Sample
# 10	0.00	2.000	100.0
# 30	1.30	0.595	99.2
# 40	13.10	0.420	91.9
# 50	60.70	0.297	62.6
# 100	147.90	0.149	8.9
# 200	157.80	0.074	2.8

UNIFIED	GRAVEL		SAND		SILT OR CLAY	
AASHO	GRAVEL		COARSE	FINE	SILT	CLAY

NUMBER	DEPTH	w	w_L	w_P	CLASSIFICATION
B-8 S-12	80'-81½'				Poorly Graded Sand (SP)

Project: Kronen Wetter

Project No. KNR 140805

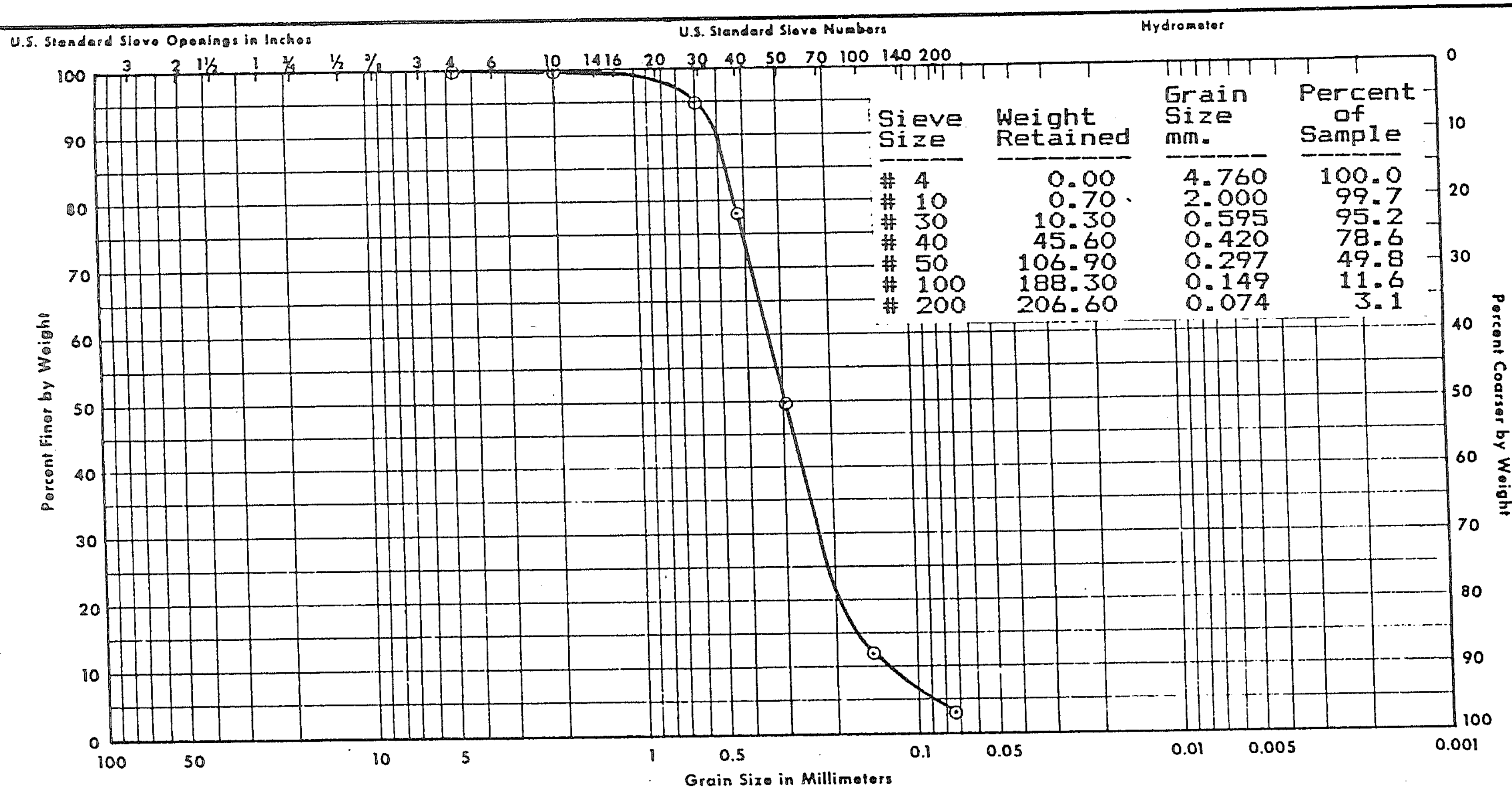
Laboratory: WTL (L-9263)

For: Northern Environmental Technologies, Inc.

Date: July 1, 1992

WISCONSIN TESTING LABORATORIES

GRAIN SIZE ANALYSIS



Sieve Size	Weight Retained	Grain Size mm.	Percent of Sample
# 4	0.00	4.760	100.0
# 10	0.70	2.000	99.7
# 30	10.30	0.595	95.2
# 40	45.60	0.420	78.6
# 50	106.90	0.297	49.8
# 100	188.30	0.149	11.6
# 200	206.60	0.074	3.1

UNIFIED	GRAVEL	SAND		SILT OR CLAY	
AASHO	GRAVEL	COARSE	FINE	SILT	CLAY

NUMBER	DEPTH	w	w_L	w_P	CLASSIFICATION
B-8 S-13	85'-86½'				Poorly Graded Sand (SP)

Project: Kronen Wetter

Project No. KNR 140805

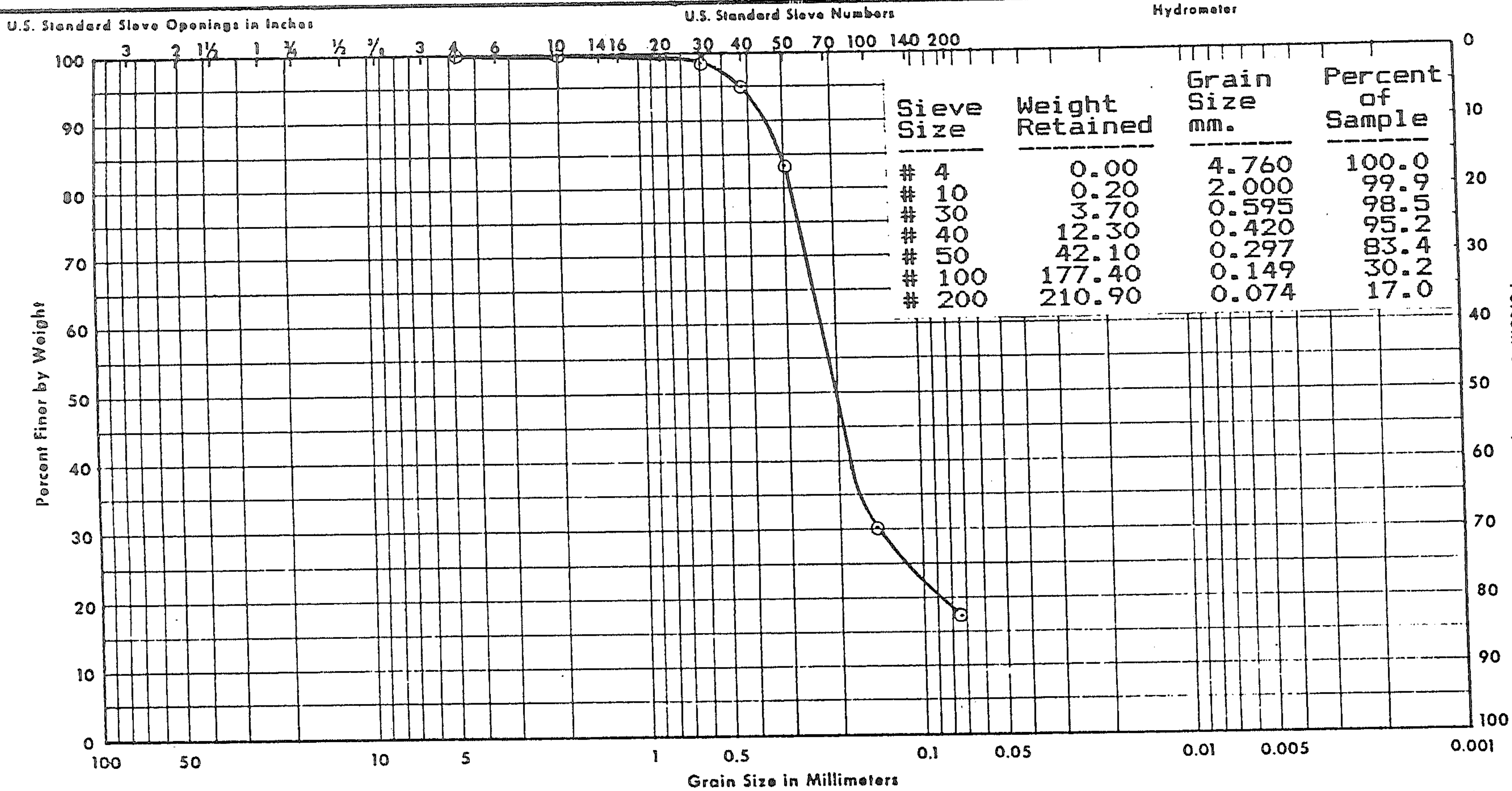
Laboratory: WTL (L-9263)

For: Northern Environmental Technologies, Inc.

Date: July 1, 1992

WISCONSIN TESTING LABORATORIES

GRAIN SIZE ANALYSIS



Sieve Size	Weight Retained	Grain Size mm.	Percent of Sample
# 4	0.00	4.760	100.0
# 10	0.20	2.000	99.9
# 30	3.70	0.595	98.5
# 40	12.30	0.420	95.2
# 50	42.10	0.297	83.4
# 100	177.40	0.149	30.2
# 200	210.90	0.074	17.0

UNIFIED	GRAVEL	SAND		SILT OR CLAY	
AASHO	GRAVEL	COARSE	FINE	SILT	CLAY

NUMBER	DEPTH	w	w_L	w_P	CLASSIFICATION
B-8 S-14	90'-91½'				Silty Sand (SM) or Silty, Clayey Sand (SC-SM) or Clayey Sand (SC)

Project: Kronen Wetter

Project No. KNR 140805

Laboratory: WTL (L-9263)

For: Northern Environmental Technologies, Inc.

Date: July 1, 1992

WISCONSIN TESTING LABORATORIES

Appendix
B

Northern Environmental℠
Hydrologists • Engineers • Geologists

1214 West Venture Court
Mequon, WI 53092
Fax 1-414-241-8222
1-414-241-3133
1-800-776-7140

September 10, 1992
(KNR140805)

Mr. James Schulz P.E.
Becher-Hoppe Engineers
330 Fourth Street
P.O. Box 8000
Wausau, Wisconsin 54402-8000

RE: Aquifer Performance Test at the Lea Road Test Well Site for Kronenwetter Sanitary District Number 2

Dear Mr. Schulz:

In August of 1992, an extended pumping test was performed on a test well at the Lea Road site for Kronenwetter Sanitary District Number 2. The purpose of the test was to determine the safe continuous yield of a final well at this location, determine the water quality present at the site and to determine if any change in water quality could occur after extended pumpage. This report presents the results of the aquifer test and water quality sampling.

DESCRIPTION OF TEST

The test well is located approximately 375 feet south of Jackie Road and 210 feet west of Lea Road on a parcel of approximately 4 acres within the boundaries of Kronenwetter Sanitary District Number 2. Figure 1 shows the location of the test well. The test well was drilled in June of 1991 by Layne Northwest Company to a depth of 91.5 feet. The well was completed with 8 inch 10 slot telescoping screen from 70 to 90 feet, with 8 inch casing to the surface. The screen was completed with a natural formation gravel pack.

Capacity tests were run on the well on July 30 at 261 gpm for one hour with 48 feet of draw down and on July 31st at 242 gpm for 1.5 hours with 42 feet of draw down. On both tests, approximately 90% of the draw down occurred in the first 30 seconds of pumping with 90% of the recovery occurring within 30 seconds of shut down. Based on these results, it was determined that the efficiency of the test well was probably relatively low and that most of the draw down in the casing was due to well loss, not draw down in the formation. It is likely that the formation would be capable of supplying substantially more water to a more efficient well.

Based on the small slot opening, it was considered unlikely that the efficiency of the test well could be significantly improved by further development. A final well with a gravel pack could be constructed with a larger slot size thereby increasing well efficiency and over all well efficiency.

BH 1994 Appendix B

Based on the initial completion test, it appeared that the aquifer had a sufficient capacity for a satisfactory well. The safe continuous yield and long term water quality could not be determined from the initial completion test. To determine these values, a five day extended aquifer test was proposed. Prior to starting the extended aquifer test, three observation wells were drilled to a depth of 70 feet and completed with 5 feet of PVC screen and a two inch PVC riser. Monitoring well M-1 was installed 101 feet north-northeast of the test well. M-2 was located 49 feet south-southeast of the test well. M-3 was 148.5 feet to the west-southwest of the test well, and M-4 was 2.5 feet southeast. The location of the test wells are shown on Figure 2. All four observation well were instrumented with down hole pressure transducers and Telog digital data loggers.

On August 6 at 8:00 am, an extended aquifer test was begun. The well was pumped continuously at 224 gpm for 7345 minutes (approximately 5 days). The change in water levels versus time was measured regularly in all four monitoring wells using the data loggers. The draw down in the test well casing was measured periodically using an airline. The draw down at three nearby domestic wells was measured four times on August 6th, and daily until August 12th. Figure 2 shows the location of the domestic wells monitored. Domestic well H-1 is especially significant in that this well was not yet in service and was not affected by pumpage from the well. The exact construction of these wells is not known, but it is reasonably certain that these wells are completed as open casing in the sand and gravel deposits.

Water samples were taken from the discharge line near the pump discharge three times on August 6th, and then daily on August 8th, 9th, 10th, and 11th. Unpreserved samples were taken directly to Enviroscan and analyzed within one hour of collection on August 6th, 7th, 10th, and 11th. Preserved samples were taken to Becher-Hoppe's lab and analyzed on all five days. Temperature and pH were measured in the field immediately after sampling. On August 11 at 10:25 am, the pump was shut off. Recovery readings were taken in each well until 15:00 on August 13.

DISCUSSION OF RESULTS

During the first two minutes of the test, a total of 37.5 feet of draw down was observed in the test well casing. Over the next 5 days, only 2.5 feet of additional draw down was observed. The rapid initial draw down is consistent with the results of the initial completion test and probably indicates draw down due to well loss. The rapid initial draw down, combined with the small subsequent draw down and the limited precision of airline measurements, make it difficult to analyze the draw down data from the test well beyond estimating the efficiency of the well. Better results were obtained from the monitoring wells.

Figures 3, 4, 5 and 6 are semi-log plots of the draw down data from M-1 through M-4. The plots show a linear trend in the draw down curve between about 1 to 10 minutes. After approximately 10 minutes of pumping, the increase in draw down in each well slowed significantly. Approximately 60 minutes into the test, the draw down ceased to increase with time and the aquifer was at or near steady state pumping conditions. The water level in the aquifer remained relatively stable for the remainder of the test, with minor fluctuations of a few tenths of a foot, probably due to pumpage at the domestic wells. These fluctuations were strongest at M-1, the monitoring well closest to a row of homes with private wells.

At approximately 1410 minutes, the aquifer recovered approximately 4.6 feet at M-4 and lesser amounts at M-1, M-2, and M-3. The response of the aquifer suggests that the pump shut off briefly at 1410 minutes and the aquifer began to recover. However, the interruption appears to have been very brief and should not compromise the analysis of the data.

The transmissivity of the aquifer was calculated from the linear portion of the draw down plots between 1 to 10 minutes Using the Cooper-Jacob method. This portion of the draw down plot indicates the response of the aquifer without any boundary conditions. The value of the well function, u, was calculated for each well for the time interval for the linear section of the draw down plots. The Cooper-Jacob method was found to be strictly valid ($u < 0.01$) for M-4 only. The transmissivity values calculated for M-4 by the Cooper-Jacob method was 26,880 gpd/ft. This value is probably a reasonable estimate of the true value. The transmissivity values calculated by the Cooper-Jacob method for M-1, M-2, and M-3 are substantially higher and probably are not valid due to the early occurrence of the recharge boundary.

The storage values calculated by the Cooper-Jacob method were indicative of highly confined conditions, which contrasts sharply to the geology of the aquifer and the rapid recharge observed during the test. It appears that casing storage and delayed yield significantly affected the storage calculations and that the values obtained do not reflect true aquifer conditions. Table 1 presents the results of the transmissivity and storage analysis by the Cooper Jacob-Method.

It was not possible to apply the Cooper-Jacob method to the later portion of the draw down plots of M-1, M-2, and M-3, the portion for which the Cooper-Jacob method is valid, due to the occurrence of a recharge boundary after approximately 10 minutes of pumpage. Log-log plots of the draw down data at all four monitoring wells were constructed (Figures 7, 8, 9, and 10) and analyzed using the Stallman method which considers the effects of a recharge boundary and does not have the same limitations as the Cooper-Jacob method.

The transmissivity values calculated by the Stallman method are listed on Table 2. The calculated values for M-1, M-2, and M-3 are very similar to the transmissivity value calculated for M-4 by the Cooper-Jacob method. This suggests that the Stallman analysis successfully accounted for the early occurrence of the recharge boundary and that these values are probably more representative of actual aquifer conditions. The transmissivity calculated by the Stallman method for M-4 is anomalously low, suggesting that the turbulent flow immediately around the well is interfering with the analysis. The storage values calculated by the Stallman analysis are similar to the Cooper-Jacob results, indicating that the storage analysis by the Stallman method also suffered from the effects of delayed yield and casing storage.

Figures 11, 12, and 13 are semi-log plots of the recovery data at monitoring wells M-1, M-2, and M-3. The recovery at M-4 was too rapid for reasonable analysis. The recovery plots show a very similar trend to the draw down plots. Transmissivity and storage values were computed from the semi-log plots of the recovery data using the Cooper-Jacob method. Table 1 presents the results. The calculated transmissivity and storage values from the recovery data are very similar to the values calculated from the draw down data. The same limitations apply to the recovery data as to the draw down data, suggesting that the storage values are erroneously low and the transmissivity values are erroneously high.

Figures 14, 15, and 16 are log-log plots of the recovery data. Transmissivity and storage calculations were made using the Stallman method. The results are presented on Table 2. The transmissivity values were similar to the values calculated by the Stallman method from the draw down values. However, the storage values are unrealistically high, probably suggesting interference from back flow from the pump column.

The Cooper-Jacob analysis was successful at estimating a reasonable transmissivity value at M-4. The Stallman analysis was successful at estimating the transmissivity values at M-1, M-2, and M-3. Neither method was able to make a reasonable estimate of storage. This is not uncommon in pumping tests in unconfined aquifers due to delayed yield in the aquifer, casing storage, and partial penetration effects.

Figure 17 is a distance draw down plot from the last readings taken at M-1, M-2, M-3, M-4, and domestic wells H-1, H-2, and H-3. The plot shows a linear trend for all wells except M-4. This is probably due to turbulent flow immediately around the test well causing greater draw down at M-4. The transmissivity and storage values of the aquifer were calculated using the distance draw down method. The calculated transmissivity, 29,568 is slightly higher than the values calculated by the Stallman method for the monitoring well, but the difference is relatively small considering the complexity of the data set. The storage value was calculated to be 0.3, assuming that steady state conditions were reached in about one day. This is a reasonable value for an unconfined fine to medium sand aquifer. The distance draw down plot indicates that the radius of influence of the well at 224 gpm is about 450 feet.

DISCUSSION OF SAFE CONTINUOUS YIELD

The specific capacity of the test well during the pumping test was approximately 5.7 gpm/ft. This value is probably artificially depressed due to turbulent flow around the well. From Figure 17, it can be seen that the draw down at a radius of 0.33 ft (8 inch well diameter) should be approximately 11 feet when pumping at 224 gpm.

Assuming a draw down of 11 feet at 224 gpm, the test well should have a maximum specific capacity of about 20.3 gpm/ft, suggesting that the test well is only about 28% efficient. This is typical of a test well with a 10 slot screen, but this efficiency value would be unacceptable for a permanent well. It is likely that the efficiency of a larger diameter well with a thick gravel pack and coarser screen will be over 85%. Assuming a 36 inch diameter for the well and gravel pack and an efficiency of 85%, the expected specific capacity of a permanent well at this location should be
approximately 21 gpm/ft.

Assuming the permanent well is constructed with 30 feet of screen between 60 to 90 feet and has a static water level of 10 feet, the well could support a maximum draw down of approximately 50 feet. Assuming a specific capacity of 21 gpm/ft, the maximum capacity this well could be pumped at would be approximately 1,050 gpm. before drawing the pumping level into the screen.

Considering the radius of influence observed after steady state conditions were achieved at 224 gpm, the well was able to intercept enough surface recharge to replace the pumped water in an area of about 636,000 square feet. Assuming the aquifer is generally homogeneous over a large area, the area needed to replace a pumping rate of 1,000 gpm is approximately 2,840,000 square feet. Under these conditions, the radius of influence of the well at steady sate should be approximately 950 feet. Considering the extent of the sand and gravel deposits in this area, this radius of influence is not unreasonable. Therefore, it is likely that this well can support a safe continuous yield of approximately 1,000 gpm (1.44 mgd), if properly drilled and developed.

Figure 18 is a theoretical distance draw down plot constructed for a permanent well pumping at 1,000 gpm continuously, assuming a radius of influence of 950 feet and a transmissivity of 29,568 gpd/ft. it can be seen from the plot that the draw down at a distance of 250 feet caused by the well should be approximately 10 feet. This is the approximate amount of interference that would be caused in a second well at this location. The draw down in a second well at a distance of 500 feet would be approximately 5 feet. Pumping the second well would create similar interference effects on the initial well. Assuming a specific capacity of 21 gpm/ft, operating two well simultaneously would result in a decrease in yield of approximately 210 gpm in each well if they were spaced at a distance of 250 feet, or 110 gpm for a separation of 500 feet. Considering the rapid recharge of the aquifer, pumping two wells in this area is probably quite possible. However, if water quality begins to change with time, operating two wells might hasten the change.

These calculations are estimates only. It is possible that an aquifer boundary will be encountered before steady sate conditions are reached. In this event, the amount of draw down will increase faster than predicted and the safe continuous yield will be decreased. The actual safe continuous yield can only be determined by a extended test at a higher rate on a more efficient well. However, based on the geology of the aquifer and the rapid recharge observed during the test, we believe that the predicted safe continuous yield of 1.44 mgd from one well is reasonable, and a total yield of approximately 2.56 mgd for two wells spaced 500 feet apart is also reasonable.

DISCUSSION OF WATER QUALITY

The results of the water samples taken during the five day test are presented on Table 3. The data indicates that the water is exceptionally low in iron and manganese, and that no trend toward increasing iron and manganese levels occurred with time. The pH values measured were consistently around 8.3, which is well into the basic range and suggests that the oxidation state of the water is unlikely to support dissolve iron or manganese. The correlation between low iron and manganese levels and pH values above 8 was demonstrated during the water quality study performed by Northern in May and June of 1992. Unless the draw down cone of the permanent well intercept areas of the aquifer with groundwater with lower pH and a reducing oxidation state, it is unlikely that the iron and manganese levels will change with time.

The nitrate levels during early pumpage were approximately 4 ppm, but dropped steadily during the test to approximately 3 ppm. This suggests that the groundwater around the well has slightly elevated nitrate levels, possibly from the turkey farm formerly on this site. The decrease in nitrate levels with continued pumpage suggests that the water recharging the well is lower in nitrates and that nitrate levels are unlikely to increase and may continue to drop with continued pumping. It should be noted that nitrate levels of 7 ppm were measured in portions of the aquifer during the water sampling study, indicating that areas of nitrate contamination do exist in the aquifer and could be drawn into the well by continued pumpage.

The water quality produced from the test well is generally excellent. The water quality is significantly better than the water produced from the original test well near Pine Street. For comparison, the Pine Street well had an iron concentration of 2.8 ppm and Manganese concentration of 0.46. This water would require substantial treatment. The pH of from the Pine Street well is 7.3, which is within the high iron and manganese pH range determined by the water sampling study. The dramatic difference in water quality and pH values suggests the oxidation state of the groundwater in the aquifer around the Lea Road site is significantly different than the Pine Street site. While it is impossible to predict with certainty, it is likely that the superior water quality in the Lea Road well is caused by shorter residence time in the aquifer due to more rapid recharge and/or biological or chemical processes producing oxidizing conditions within the aquifer. In any event, it seems likely that the water quality will be maintained, barring significant change in the flow system (i.e. extended draught or over pumping).

CONCLUSIONS

The results of the extended pumping test are sufficient to draw the following conclusions regarding a permanent well at the Lea Road site.

1) The transmissivity of the aquifer is approximately 25,000 to 30,000 gpd/ft which is lower than at the Pine Road test well, but still a relatively high transmissivity.

2) The storage coefficient (specific yield) of the aquifer is approximately 0.3, indicating high porosity and unconfined conditions.

3) The test well reached steady state quickly, suggesting that the aquifer receives strong surface recharge.

4) The efficiency of the test well was low, which is not surprising considering the small slot size.

5) The efficiency of the final well can be significantly improved by using a larger diameter screen (24 inch) in a thick gravel pack (36 inch diameter borehole)

6) The safe sustainable yield of a permanent well should be about 1.44 mgd (1,000 gpm, continuous).

7) At 1,000 gpm, the radius of influence of the well should be about 950 feet.

8) The aquifer may be able to support a second well, but the yield of each well will be reduced from mutual interference which is dependent on the separation between the wells.

9) The water quality at this site is excellent and presently will not require iron or manganese removal.

10) The water quality may remain good indefinitely, providing the flow system does not change.

11) The permeable soils and rapid recharge make wellhead protection critically important for this well. The information obtained from this test is sufficient to design an effective wellhead protection plan with further analysis.

12) The duration and pumping rate of this test were limited by the efficiency of the test well and the practical limits of the budget. Unforseen boundaries in the aquifer could be present which would reduce the safe continuous yield of the aquifer. Water quality could also deteriorate with extended pumping. However, due to the hydrogeology of the aquifer, it is unlikely that a barrier boundary will be encountered within the projected radius of influence. Based on experience with other wells in the Wisconsin River Valley Aquifer, the water quality could stay good indefinitely.

SUMMARY

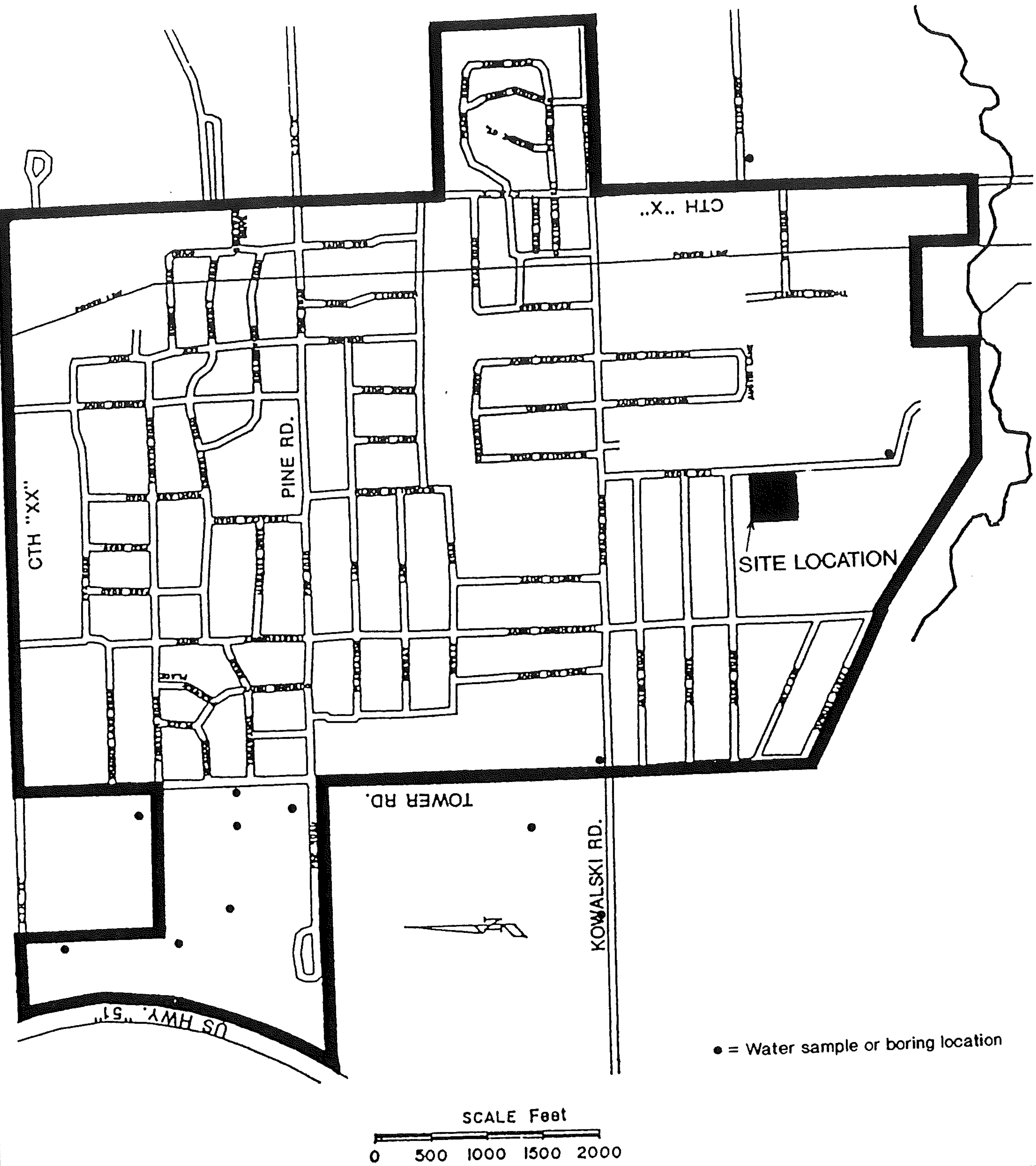
The results of the test indicate that the Lea Road site has superior water quality to the Pine Road site. The capacity of the Pine Road site is higher, but the cost savings from the higher water quality at the Lea Road site will more than offset any advantages from a higher pumping rate at the Pine Road site. We recommend that the Lea Road site be developed into a permanent well site. We also recommend that surrounding land be explored for future well sites. An effective well head protection program is essential to protect this aquifer.

Sincerely,
Northern Environmental Technologies, Incorporated

John R. Jansen, C.P.G., R.Gp.
Director of Geosciences

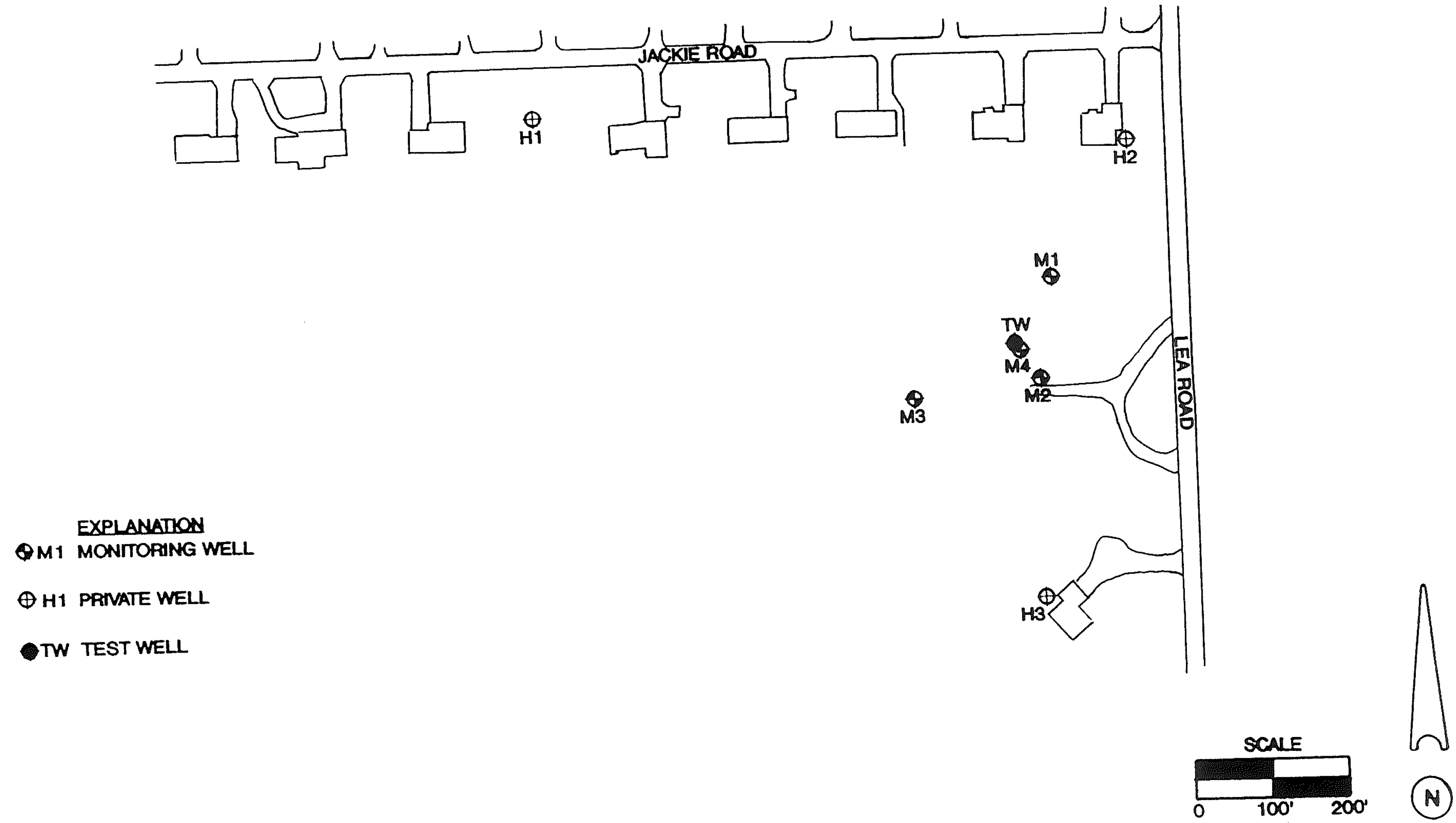
JRJ/gjw

G.M.B. ENGINEERING 351424



REV	PROJECT:	DATE: 09/10/92	SITE LOCATION MAP
	THIS DRAWING AND ALL INFORMATION CONTAINED THEREON IS THE PROPERTY OF NORTHERN ENVIRONMENTAL INCORPORATED AND SHALL NOT BE COPIED OR USED EXCEPT FOR THE PURPOSE FOR WHICH IT IS EXPRESSLY FURNISHED. THE DRAWING AND ANY COPIES THEREOF SHALL BE RETURNED TO THE OWNER ON DEMAND		KRONENWETTER SANITARY DISTRICT #2
	Northern Environmental *Hydrologists • Engineers • Geologists*		

FIGURE 1



REV	PROJECT: KRN140805	DATE: 09/10/92	LEA ROAD TEST WELL SITE MAP
	THIS DRAWING AND ALL INFORMATION CONTAINED THEREON IS THE PROPERTY OF NORTHERN ENVIRONMENTAL INCORPORATED AND SHALL NOT BE COPIED OR USED EXCEPT FOR THE PURPOSE FOR WHICH IT IS EXPRESSLY FURNISHED. THE DRAWING AND ANY COPIES THEREOF SHALL BE RETURNED TO THE OWNER ON DEMAND		
	Northern Environmental *Hydrologists • Engineers • Geologists*		

FIGURE 2

LEA ROAD SITE AQUIFER TEST
MONITORING WELL 1 - DRAWDOWN DATA

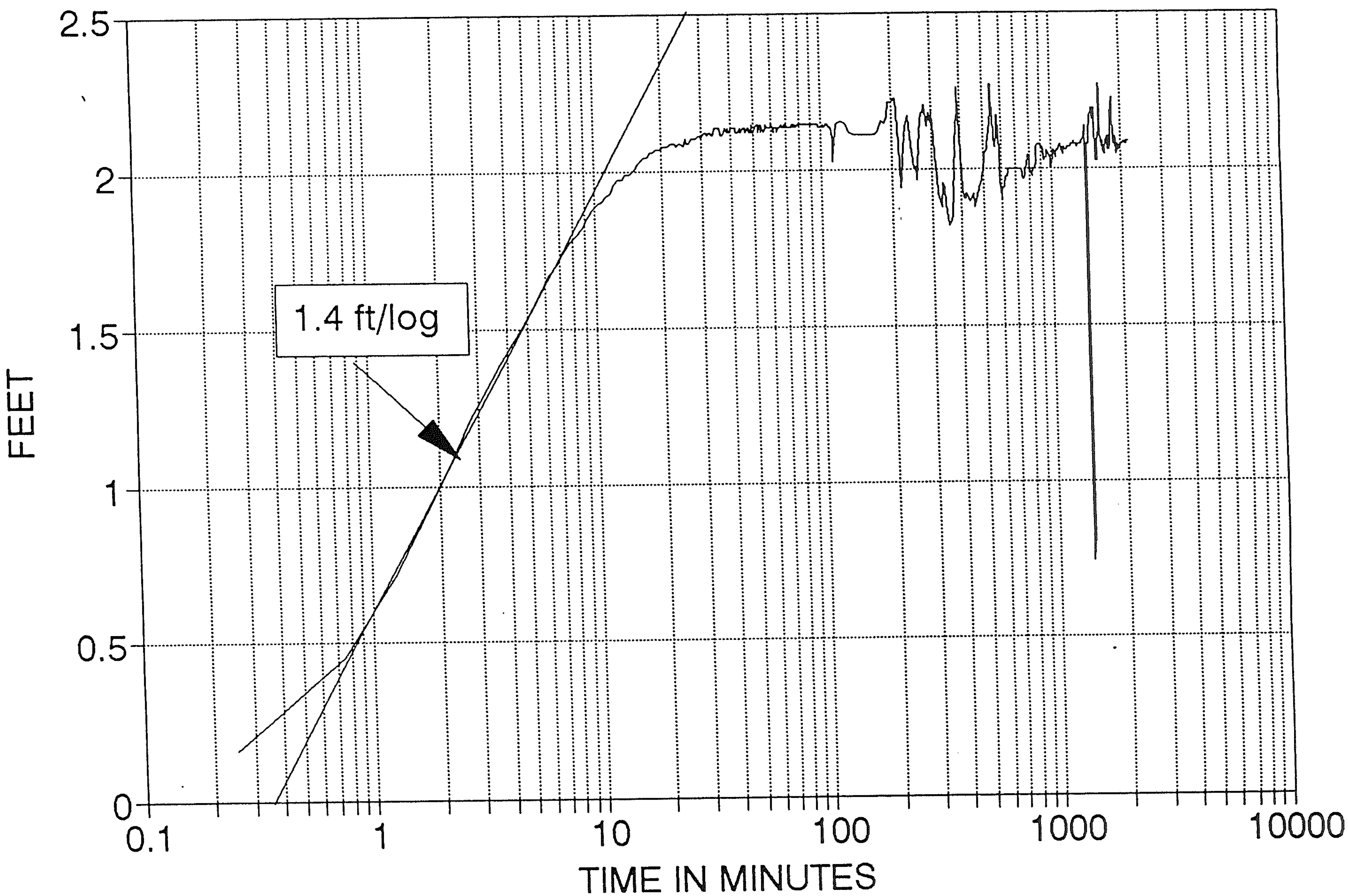


FIGURE 3

NORTHERN ENVIRONMENTAL
SEPTEMBER, 1992

LEA ROAD SITE AQUIFER TEST
MONITORING WELL 2 - DRAW DOWN DATA

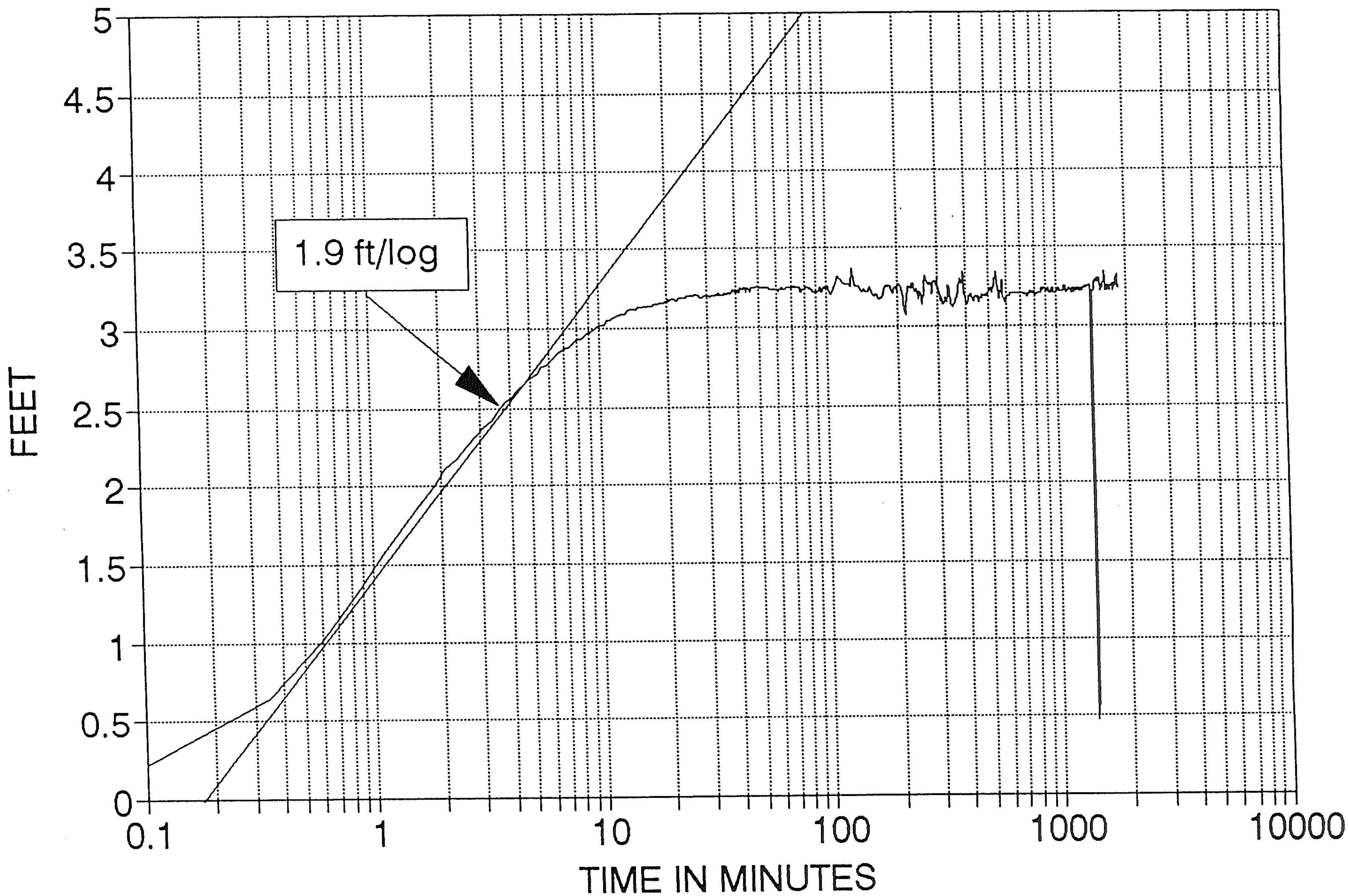


FIGURE 4

NORTHERN ENVIRONMENTAL
SEPTEMBER, 1992

LEA ROAD TEST WELL SITE AQUIFER TEST
MONITORING WELL 3 - DRAW DOWN DATA

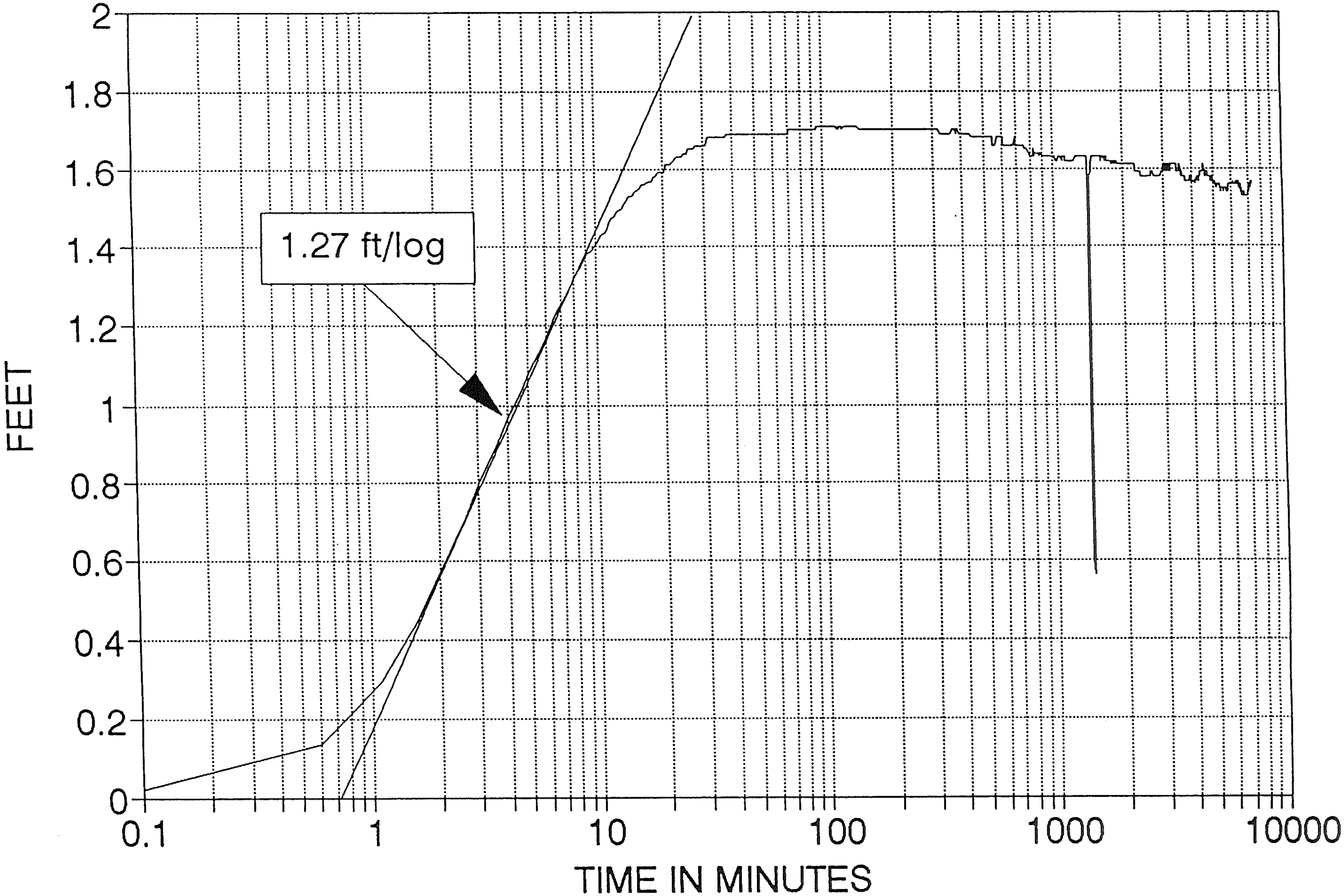


FIGURE 5

NORTHERN ENVIRONMENTAL
SEPTEMBER, 1992

LEA ROAD TEST WELL SITE AQUIFER TEST

MONITORING WELL 4 - DRAW DOWN DATA

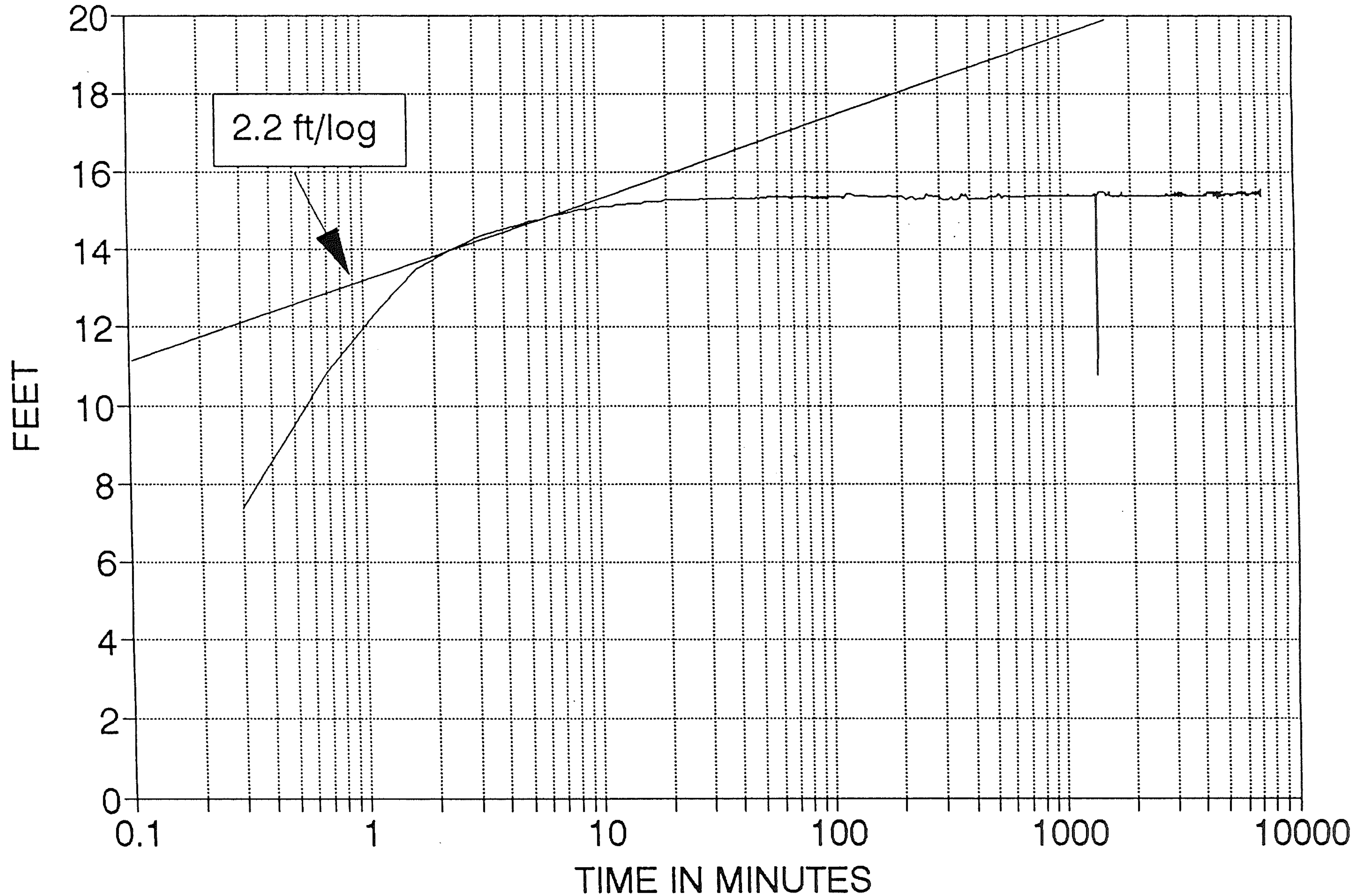


FIGURE 6

NORTHERN ENVIRONMENTAL
SEPTEMBER, 1992

LEA ROAD SITE AQUIFER TEST
MONITORING WELL 1 - DRAWDOWN DATA

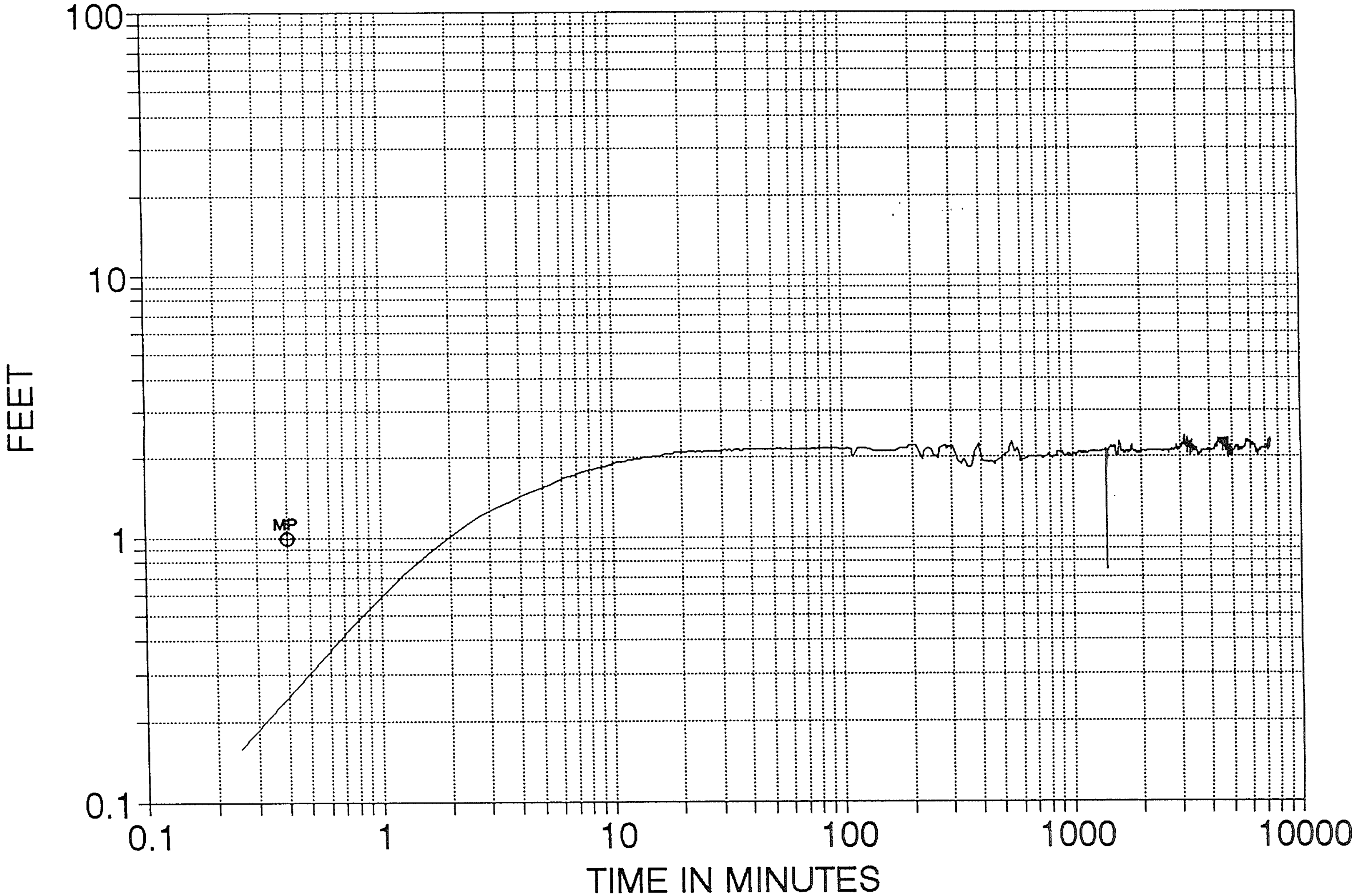


FIGURE 7

NORTHERN ENVIRONMENTAL
SEPTEMBER, 1992

LEA ROAD SITE AQUIFER TEST

MONITORING WELL 2 - DRAW DOWN DATA

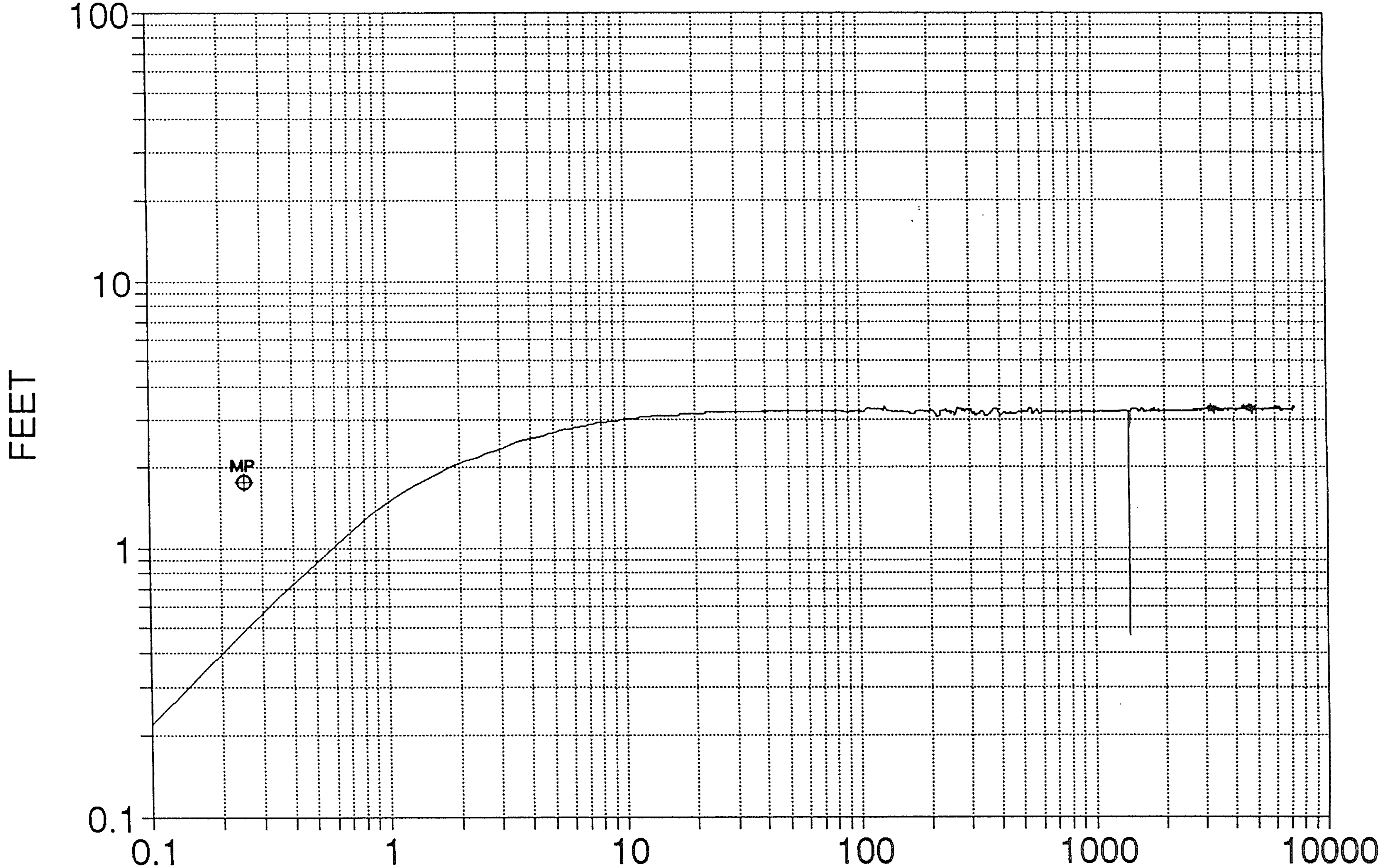


FIGURE 8

NORTHERN ENVIRONMENTAL
SEPTEMBER, 1992

LEA ROAD TEST WELL SITE AQUIFER TEST

MONITORING WELL 3 - DRAW DOWN DATA

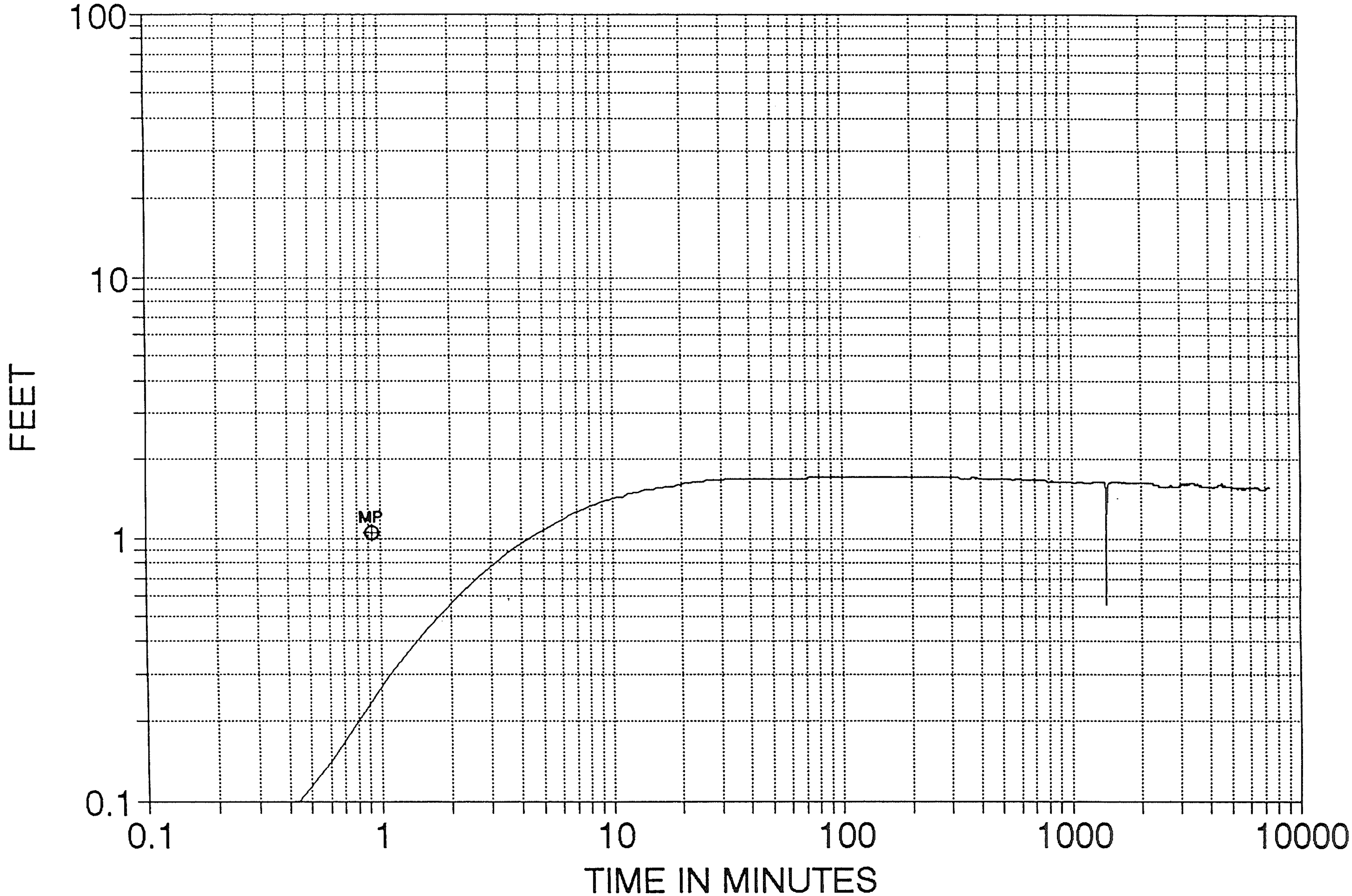


FIGURE 9

NORTHERN ENVIRONMENTAL
SEPTEMBER, 1992

LEA ROAD TEST WELL SITE AQUIFER TEST

MONITORING WELL 4 - DRAW DOWN DATA

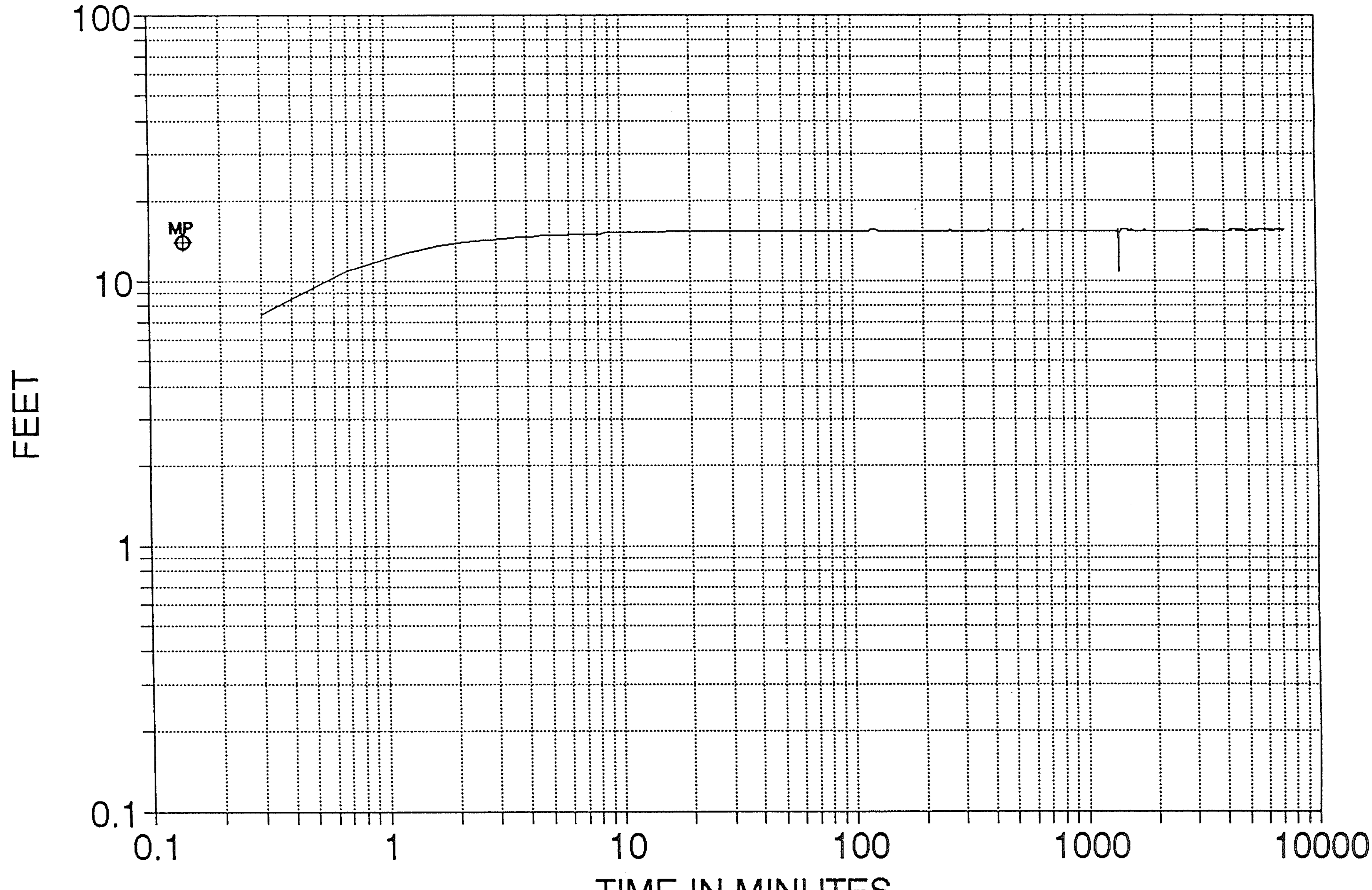


FIGURE 10

NORTHERN ENVIRONMENTAL
SEPTEMBER, 1992

LEA ROAD TEST WELL SITE AQUIFER TEST
MONITORING WELL 1 - RECOVERY DATA

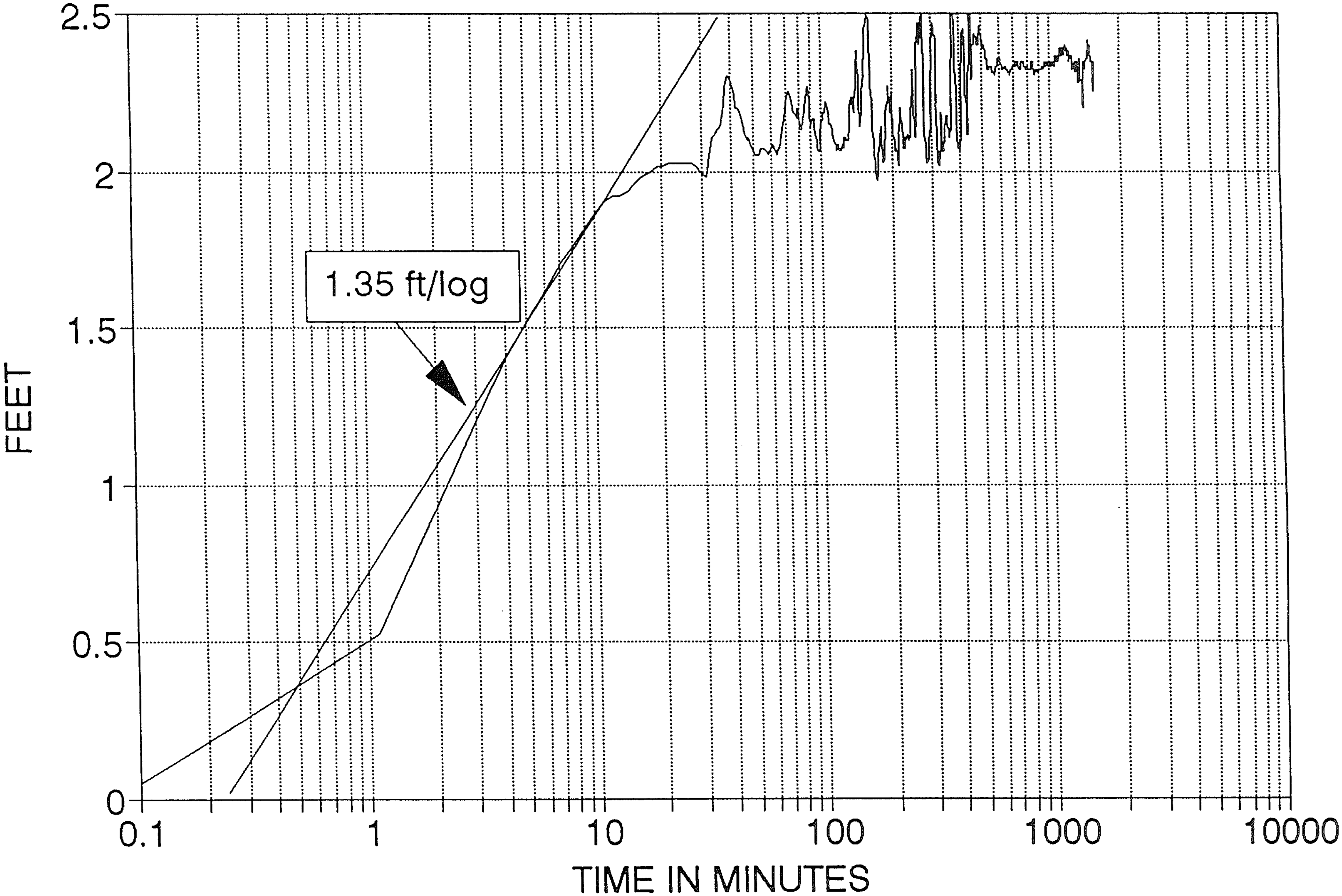


FIGURE 11

NORTHERN ENVIRONMENTAL
SEPTEMBER, 1992

LEA ROAD TEST WELL SITE AQUIFER TEST

MONITORING WELL 2 - RECOVERY DATA

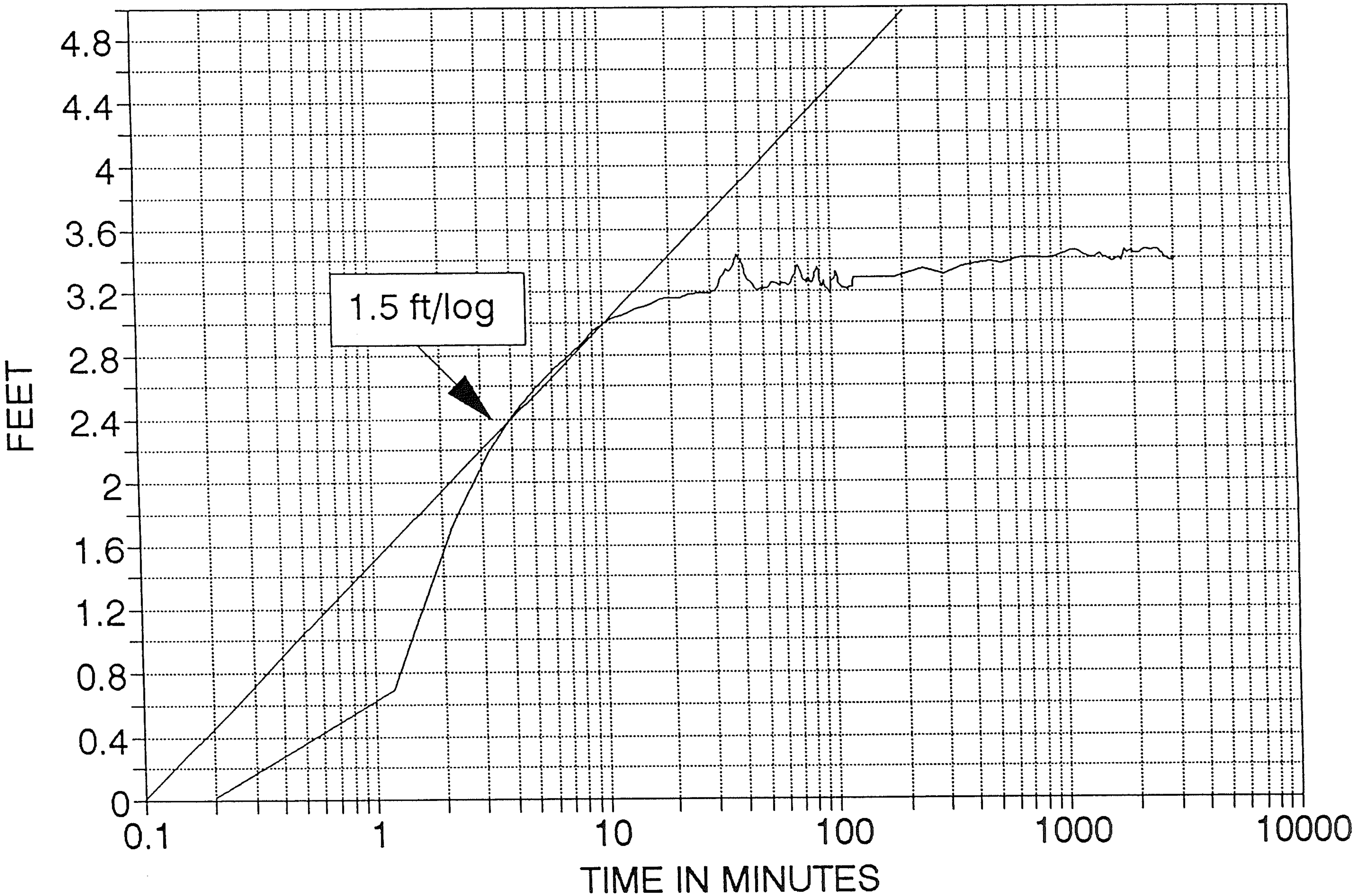


FIGURE 12

NORTHERN ENVIRONMENTAL
SEPTEMBER, 1992

LEA ROAD TEST WELL SITE AQUIFER TEST
MONITORING WELL 3 - RECOVERY DATA

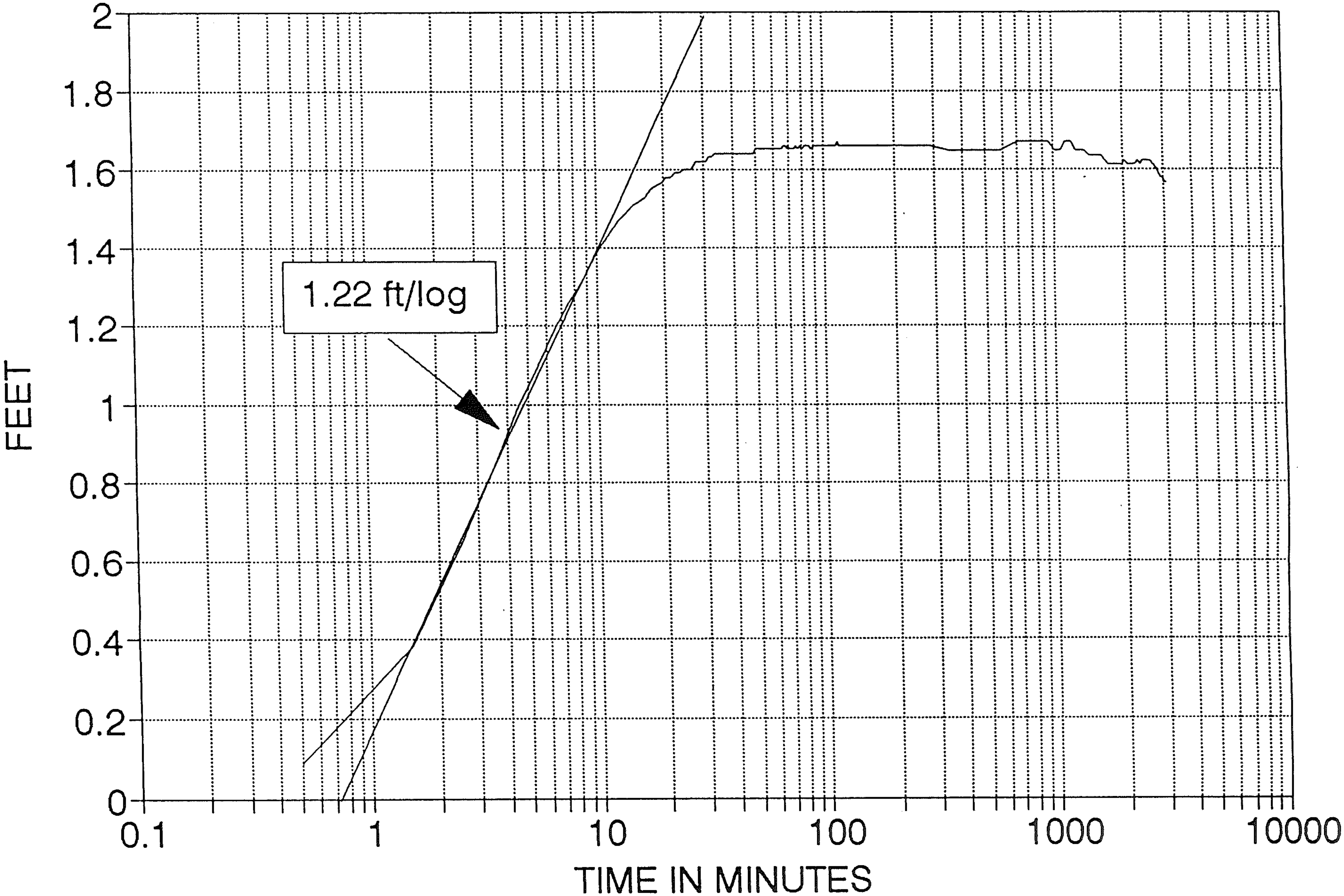


FIGURE 13

NORTHERN ENVIRONMENTAL
SEPTEMBER, 1992

LEA ROAD TEST WELL SITE AQUIFER TEST
MONITORING WELL 1 - RECOVERY DATA

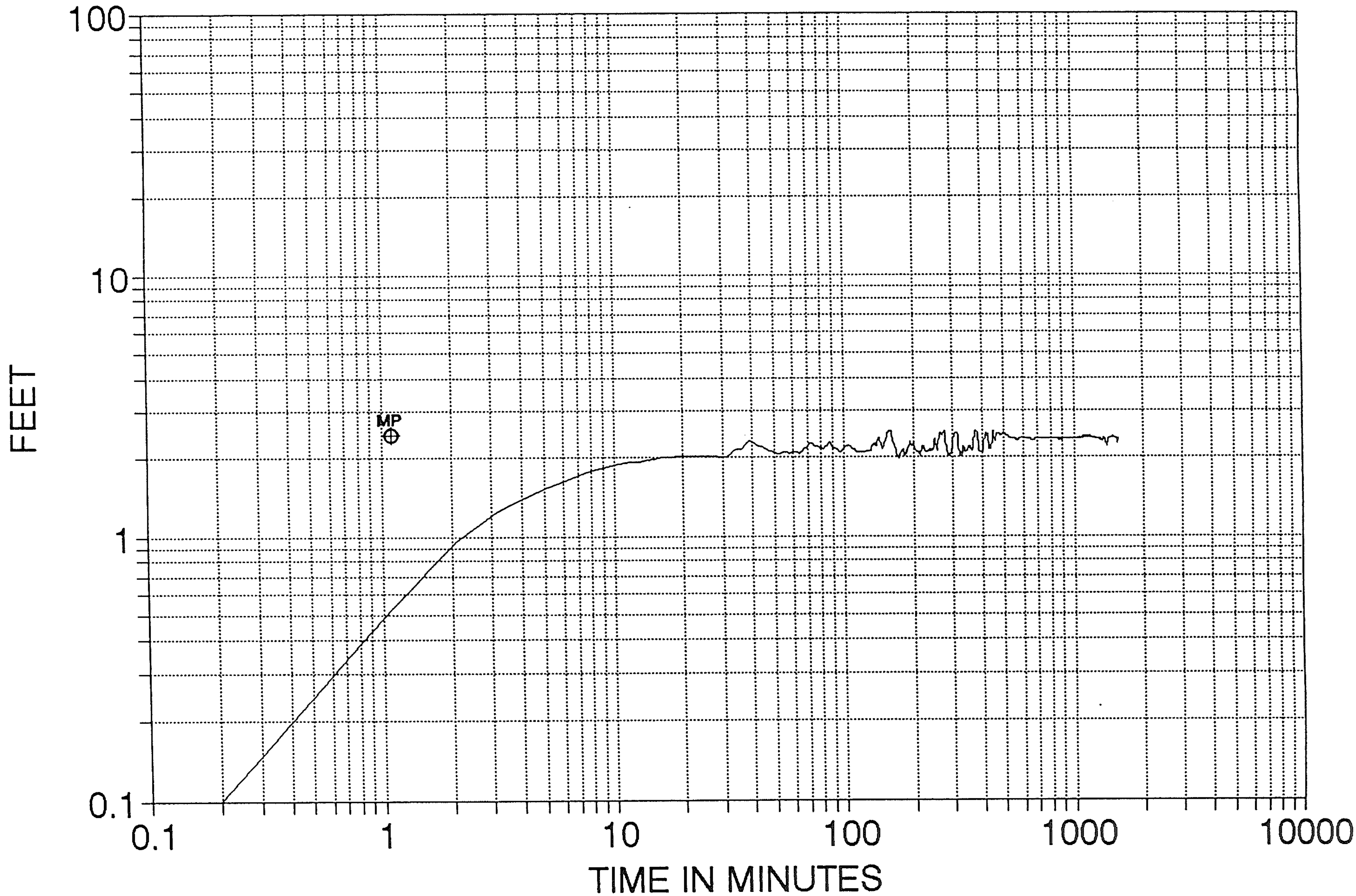


FIGURE 14

NORTHERN ENVIRONMENTAL
SEPTEMBER, 1992

LEA ROAD TEST WELL SITE AQUIFER TEST
MONITORING WELL 2 - RECOVERY DATA

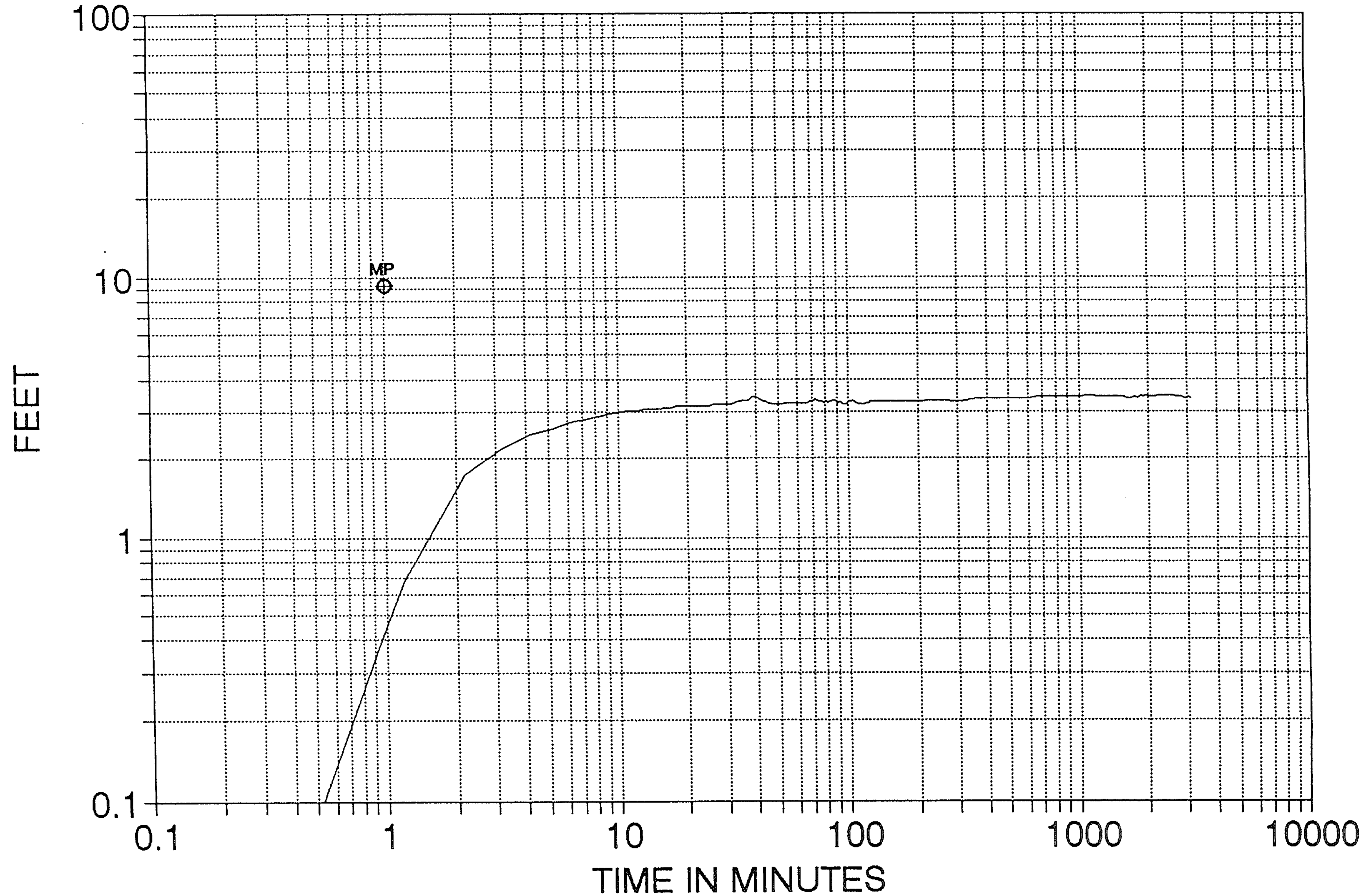


FIGURE 15

NORTHERN ENVIRONMENTAL
SEPTEMBER, 1992

LEA ROAD TEST WELL SITE AQUIFER TEST
MONITORING WELL 3 - RECOVERY DATA

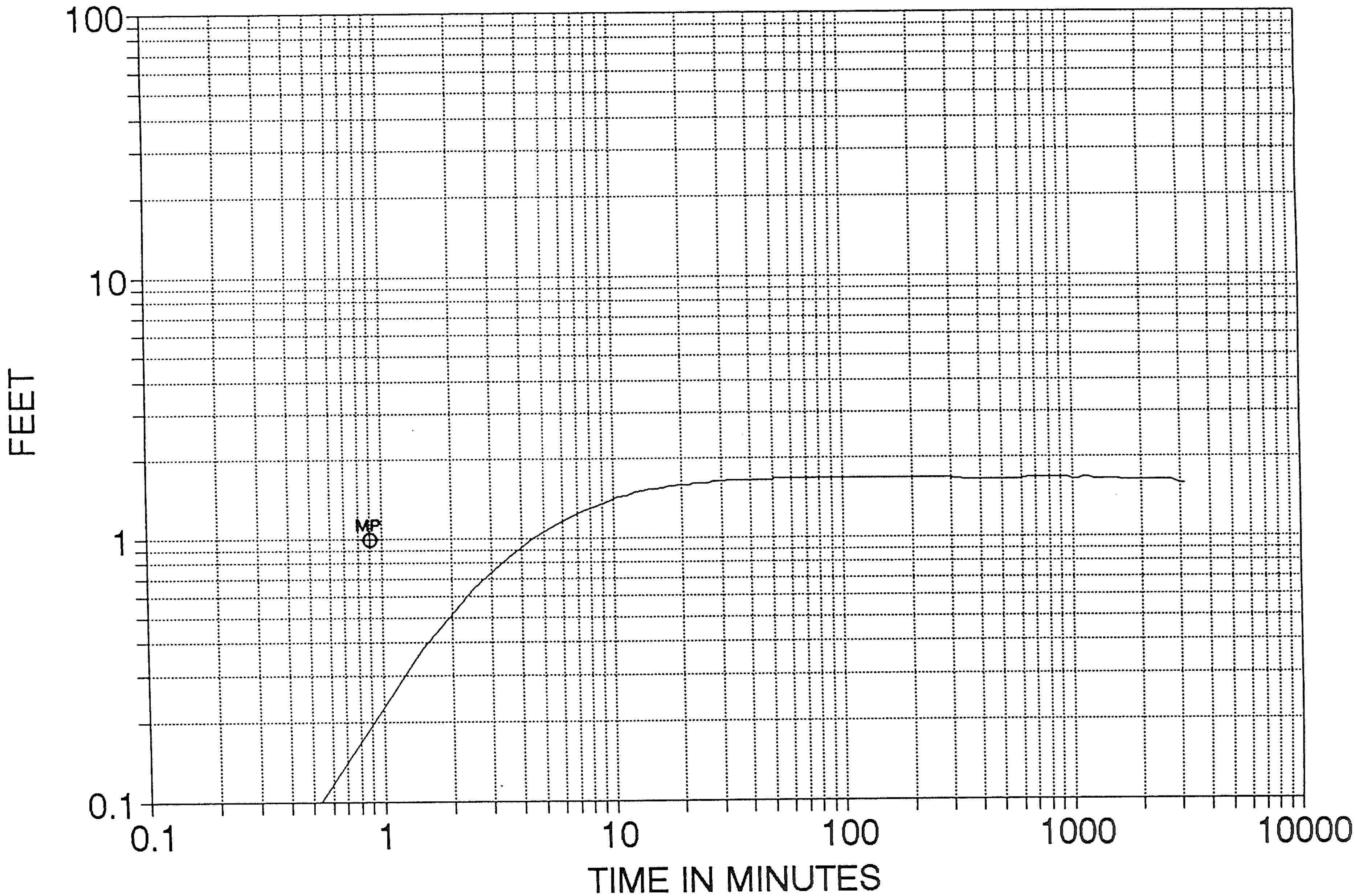


FIGURE 16

NORTHERN ENVIRONMENTAL
SEPTEMBER, 1992

LEA ROAD TEST WELL SITE AQUIFER TEST
DISTANCE VS. DRAW DOWN PLOT, Q=224 GPM

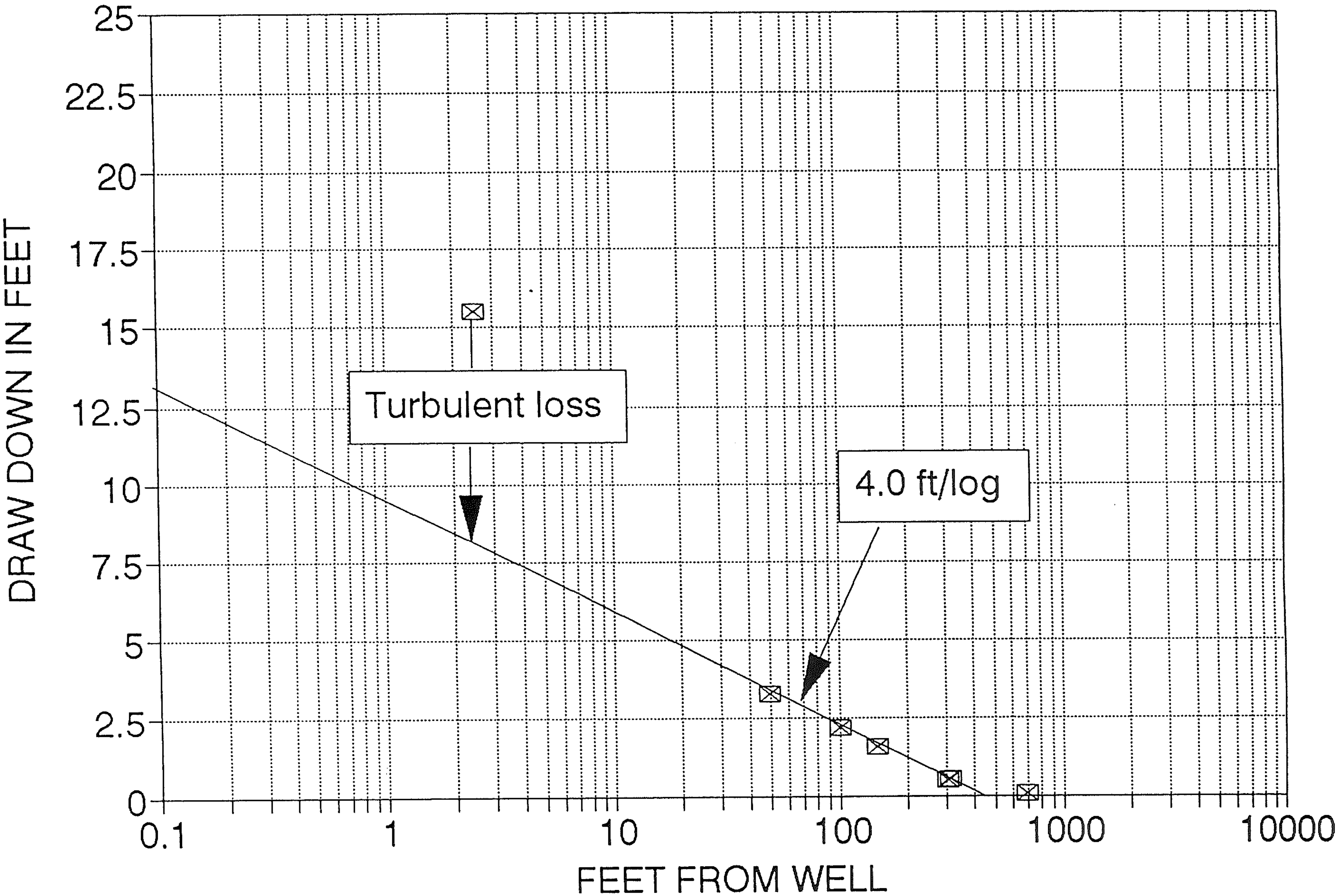


FIGURE 17

NORTHERN ENVIRONMENTAL
SEPTEMBER, 1992

LEA ROAD TEST WELL SITE AQUIFER TEST
DISTANCE VS. DRAW DOWN PLOT, Q=1,000GPM

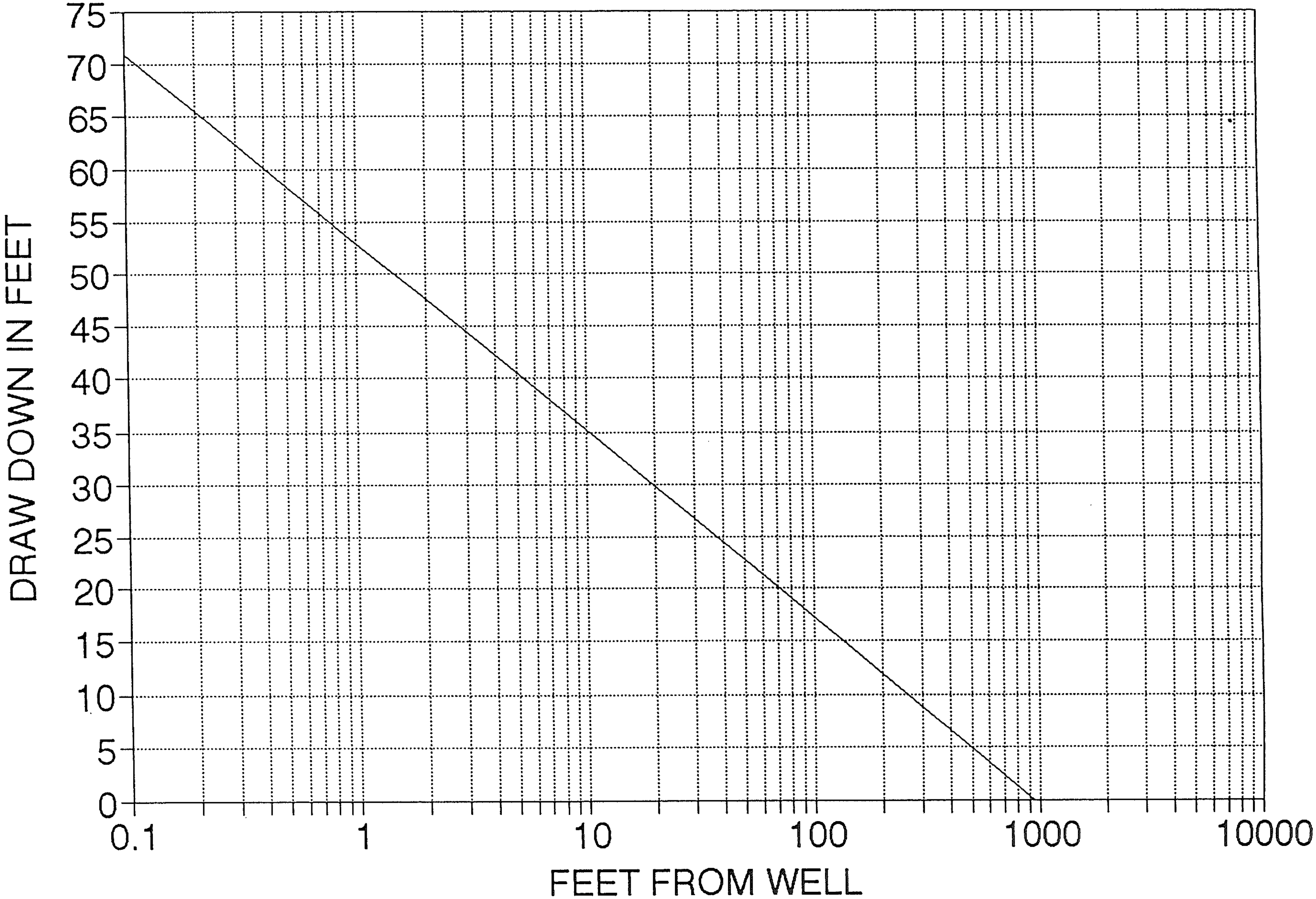


FIGURE 18

NORTHERN ENVIRONMENTAL
SEPTEMBER, 1992

TABLE 1: RESULTS OF COOPER-JACOB ANALYSIS

DRAW DOWN DATA

Well	Transmissivity gpd/ft	Storage	Comments
M-1	42,239	.0004	Method not valid
M-2	31,124	.0004	Method not valid
M-3	46,564	.0003	Method not valid
M-4	26,880	.016	Transmissivity valid Storage too low

RECOVERY DATA

Well	Transmissivity gpd/ft	Storage	Comments
M-1	43,804	.0003	Method not valid
M-2	39,424	.0009	Method not valid
M-3	46,472	.0004	Method not valid
M-4	Recovery too rapid for analysis		

TABLE 2: STALLMAN ANALYSIS

DRAW DOWN DATA

Well	Transmissivity gpd/ft	Storage	Comments
M-1	29,193	.0004	Storage too low
M-2	23,111	.0006	Storage too low
M-3	25,212	.0003	Storage too low
M-4	1,834	.016	Turbulent flow

RECOVERY DATA

Well	Transmissivity gpd/ft	Storage	Comments
M-1	21,392	.0004	Storage too low
M-2	25,670	.0009	Storage too low
M-3	23,337	.0003	Storage too low
M-4	Recovery too rapid for analysis		

Average transmissivity from Stallman analysis = 24,257 gpd/ft

DISTANCE DRAW DOWN ANALYSIS

Transmissivity = 29,568 gpd/ft

Storage = 0.3

Radius of Influence at 224 gpm = 450 feet

Radius of influence at 1,000 gpm = 950 feet

Northern Environmental℠
Hydrologists • Engineers • Geologists

TABLE 3

Test Well Pumping
Preliminary Analytical Results
KRONENWETTER SANITARY DISTRICT NO. 2

						Iron (0.3)		Manganese (0.05)		Nitrate-Nitrogen (10)		Becher-Hoppe			
Date	Time	Airline Reading	Sample No.	pH *	Temp. oC/oF	B-H **	Enviroscan *	BH **	Enviroscan *	B-H **	Enviroscan *	Alkalinity	Calcium Hardness	Total Solids	Langelier Index (>-1)
8/6/92	9:45 a.m.	11	1	8.39	14.1 / 57.4	0.2	ND ****	Trace <0.03	ND ****	4.4	3.64	62	56	140	-0.11
8/6/92	11:15 a.m.	10	2	8.37	10.6 / 51.1	Trace <0.1	ND	Trace <0.03	ND	3.9	3.42	60	56	120	-0.23
8/6/92	2:50 p.m.	11	3	8.36	10.2 / 50.4	ND***	ND	Trace <0.03	ND	4.1	3.24	60	54	120	-0.26
8/7/92	9:45 a.m.	10	4	8.26	10.0 / 50	Trace <0.1	0.011	Trace <0.03	ND	3.7	3.54	60	56	140	-0.36
8/8/92	9:45 a.m.	10	5	o 8.30	10.8 / 51.4	ND		Trace <0.03		3.5		62	56	130	-0.30
8/9/92	10:10 a.m.	10	6	o 8.30	10.2 / 50.4	ND		Trace <0.03		2.8		62	56	140	-0.31
8/10/92	9:45 a.m.	10	7	8.25	10.6 / 51.1	ND	0.01	ND *****	ND	3.2	3.04	64	50	120	-0.37
8/11/92	9:45 a.m.	10	8	8.32	10.0 / 50	ND	ND	ND	ND	3.0	3.01	66	50	110	-0.30

* Enviroscan received the water samples within 20 minutes after sampling, and performed the analyses within one hour after sampling.
o pH by Becher-Hoppe, Inc. at the well.
** Becher-Hoppe, Inc. analyzed preserved samples.
*** ND - Not Detectable. Detection Limit = 0.1.
**** ND = Not Detectable. Detection Limit = 0.002 mg/l.
***** ND = Not Detectable. Detection Limit = 0.03.

Analytical Results from Kronenwetter Sanitary District No. 2 Test Well

Appendix C

ANALYTICAL REPORT

Becher Hoppe Inc.
330 4th Street
P.O. Box 8000
Wausau, WI 54401

Attn: Jim Schultz

CUST NUMBER: 92052
SAMPLED BY: Client
DATE REC'D: 08/11/92
REPORT DATE: 08/31/92
PREPARED BY: JCH
REVIEWED BY:

	Units	Detection Limit	KSD2 08/11/92
Benzene	µg/l	0.2	X
Bromobenzene	µg/l	0.5	X
Bromodichloromethane	µg/l	0.5	X
Bromoform	µg/l	2.0	X
Bromomethane	µg/l	4.0	X
Carbon Tetrachloride	µg/l	0.5	X
Chlorobenzene	µg/l	2.0	X
Chloroethane	µg/l	2.0	X
Chloroform	µg/l	0.5	X
Chloromethane	µg/l	2.0	X
o-Chlorotoluene	µg/l	1.0	X
p-Chlorotoluene	µg/l	1.0	X
Dibromomethane	µg/l	0.5	X
Chlorodibromomethane	µg/l	0.5	X
1,2-Dibromo-3-chloropropane	µg/l	13.3	X
1,2-Dichlorobenzene	µg/l	1.0	X
1,3-Dichlorobenzene	µg/l	1.0	X
1,4-Dichlorobenzene	µg/l	0.5	X
1,1-Dichloroethane	µg/l	0.5	X
1,2-Dichloroethane	µg/l	0.5	X
1,1-Dichloroethylene	µg/l	0.4	X
cis-1,2-Dichloroethylene	µg/l	0.5	X
trans-1,2-Dichloroethylene	µg/l	0.5	X
Methylene Chloride	µg/l	2.5	X
1,2-Dichloropropane	µg/l	0.5	X
1,3-Dichloropropane	µg/l	0.5	X
1,1-Dichloropropene	µg/l	1.0	X
2,2-Dichloropropane	µg/l	2.0	X
1,3-Dichloropropene	µg/l	0.5	X
Ethylbenzene	µg/l	1.0	X
1,2-Dibromoethane	µg/l	1.0	X
Styrene	µg/l	5.0	X
1,1,1,2-Tetrachloroethane	µg/l	0.5	X
Analytical No.:			70911

X = Analyzed but not detected.

All analyses conducted in accordance with Enviroscan Quality Assurance Program.

ANALYTICAL REPORT

Becher Hoppe Inc.
330 4th Street
P.O. Box 8000
Wausau, WI 54401

CUST NUMBER: 92052
SAMPLED BY: Client
DATE REC'D: 08/11/92
REPORT DATE: 09/03/92
PREPARED BY: JCH
REVIEWED BY:

Attn: Jim Schultz

	Units	Detection Limit	KSD2 08/11/92
1,1,2,2-Tetrachloroethane	µg/l	1.0	X
Tetrachloroethylene	µg/l	0.5	X
Toluene	µg/l	0.5	X
1,1,1-Trichloroethane	µg/l	0.5	X
1,1,2-Trichloroethane	µg/l	0.5	X
Trichloroethylene	µg/l	0.2	X
1,2,3-Trichloropropane	µg/l	0.5	X
Vinyl Chloride	µg/l	0.2	X
o-Xylene	µg/l	1.0	X
m & p-Xylene	µg/l	1.0	X
Analytical No.:			70911

X = Analyzed but not detected.

ANALYTICAL REPORT

Becher Hoppe Inc.
330 4th Street
P.O. Box 8000
Wausau, WI 54401

CUST NUMBER: 92052
SAMPLED BY: Client
DATE REC'D: 08/11/92
REPORT DATE: 08/31/92
PREPARED BY: BMS BN
REVIEWED BY: [signature]

Attn: Jim Schultz

	Units	Detection Limit	KSD2 08/11/92
Arsenic	μg/l	1.4	1.72
Cadmium	μg/l	0.23	X
Lead	μg/l	2.0	X
Selenium	μg/l	5.0	X
Barium	mg/l	0.002	0.014
Calcium	mg/l	0.019	18.7
Chromium	mg/l	0.005	X
Hardness as CaCO3	mg/l	0.29	81.9
Iron	mg/l	0.002	0.004
Magnesium	mg/l	0.058	8.56
Manganese	mg/l	0.002	X
Silver	mg/l	0.004	X
Sodium	mg/l	0.042	3.05
Alkalinity as CaCO3	mg/l	20.0	61.2
pH		-	8.29
Total Solids	mg/l	10.0	120.
Sol. Chloride	mg/l	1.0	4.67
Sol. Fluoride	mg/l	0.2	X
Sol. Sulfate	mg/l	3.0	10.0
Nitrate N	mg/l	0.5	2.93
Nitrite N	mg/l	0.5	X
Analytical No.:			70911

X = Analyzed but not detected.

All analyses conducted in accordance with Enviroscan Quality Assurance Program.

Environmental Health Laboratories

110 S. Hill Street
South Bend, IN 46617
(219) 233-4777
(219) 233-3272
FAX (219) 233-8207

LABORATORY REPORT

Client: Enviroscan
Attn: Jim Salkowski
303 W. Military Road
Rothschild, WI 54474

Report#: 40057-58

Priority: Standard Written

Status: Final

Project/Site: #71203

Samples Submitted: Two drinking water samples

Copies to: None

Collected: 08-17-92 By: Client Received: 08-20-92

REPORT SUMMARY

Two drinking water samples were submitted for multiple parameter analysis.

Herbicides: 2,4-D and 2,4,5-TP were not detected in the sample submitted for analysis.

Pesticides: None of the pesticides listed in the detailed parameter list were detected in the water sample submitted for analysis.

Toxaphene: Toxaphene was not detected in the sample submitted for analysis.

Results of all associated quality control samples were within acceptance limits. No project specific quality control was requested.

Detailed quantitative results are presented on the following pages.

We appreciate the opportunity to provide you with this analysis. If you have any questions concerning this report, please do not hesitate to call us at (219) 233-4777.

APPROVED BY: Paul Bowen DATE: 09-16-92
Quality Assurance Manager

John E. Iberge III DATE: 9-16-92
Laboratory Manager

Client: Enviroscan

Report#: 40057–58

HERBICIDES--Drinking Water

Site: #71203

Lab#: 40058

Parameter	MCL	PQL	Results		
2,4-D	70	0.5	<	0.5	µg/L
2,4,5-TP (Silvex)	50	0.5	<	0.5	µg/L

If dilutions were required for quantitation of specific parameters, they are indicated by a (√) preceeding the result.

Surrogate Standards	Limits (%)	% Recovery Undil
2,4-Dichlorophenylacetic acid	70-130	70

Analyzed: 09–09–92 Analyst: RSD Method: EPA Method 515.1

PESTICIDES--Drinking Water

Site: #71203

Lab #: 40057

Parameter	MCL	PQL	Results		
Endrin	2	0.1	<	0.1	µg/L
Lindane	0.2	0.1	<	0.1	µg/L
Methoxychlor	40	0.1	<	0.1	µg/L

If dilutions were required for quantitation of specific parameters, they are indicated by a (√) preceeding the result.

Surrogate Standards	Limits (%)	% Recovery Undil
2,4,5,6-Tetrachloro-m-xylene	70-130	89
Pentachloronitrobenzene	70-130	101
4,4'-Dichlorobiphenyl	70-130	87
Triphenylphosphate	70-130	121

Analyzed: 09–08–92 Analyst: RSD Method: EPA Method 525.1

Client: Enviroscan

Report#: 40057–58

SEMI-VOLATILE ORGANIC CHEMICALS--Drinking Water

Site: #71203

Lab #: 40057

Parameter	MCL	PQL	Results		
Toxaphene	3	1.0	<	1.0	µg/L

If dilutions were required for quantitation of specific parameters, they are indicated by a (√) preceeding the result.

Analyzed: 09–15–92

Analyst: JV

Method: EPA 505

SEPARATE REPORT
TEST WELL PUMPING
220 GPM – 5 DAYS
August 6 – 1992

@ THE SITE OF
FINAL WELL

KRONENWETTER SANITARY DISTRICT NO. 2
TOWN OF KRONENWETTER
MARATHON COUNTY, WISCONSIN

TEST WELL PUMPING

[220 GPM for Five Days]

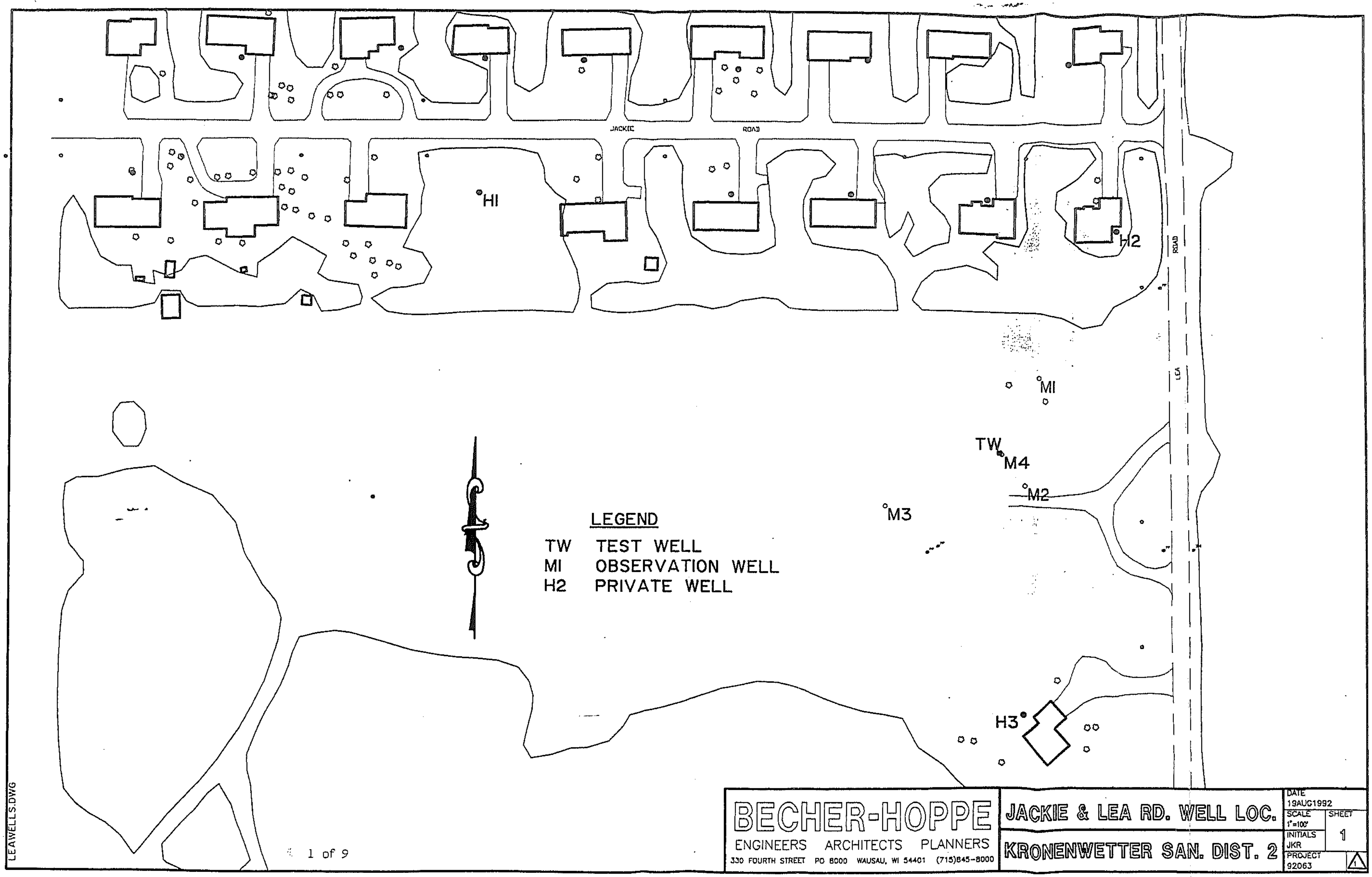
August 6 - 11, 1992

WATER LEVELS IN PRIVATE AND OBSERVATION WELLS
DURING TEST PUMPING

AND

RESULTS OF LABORATORY ANALYSES

92052



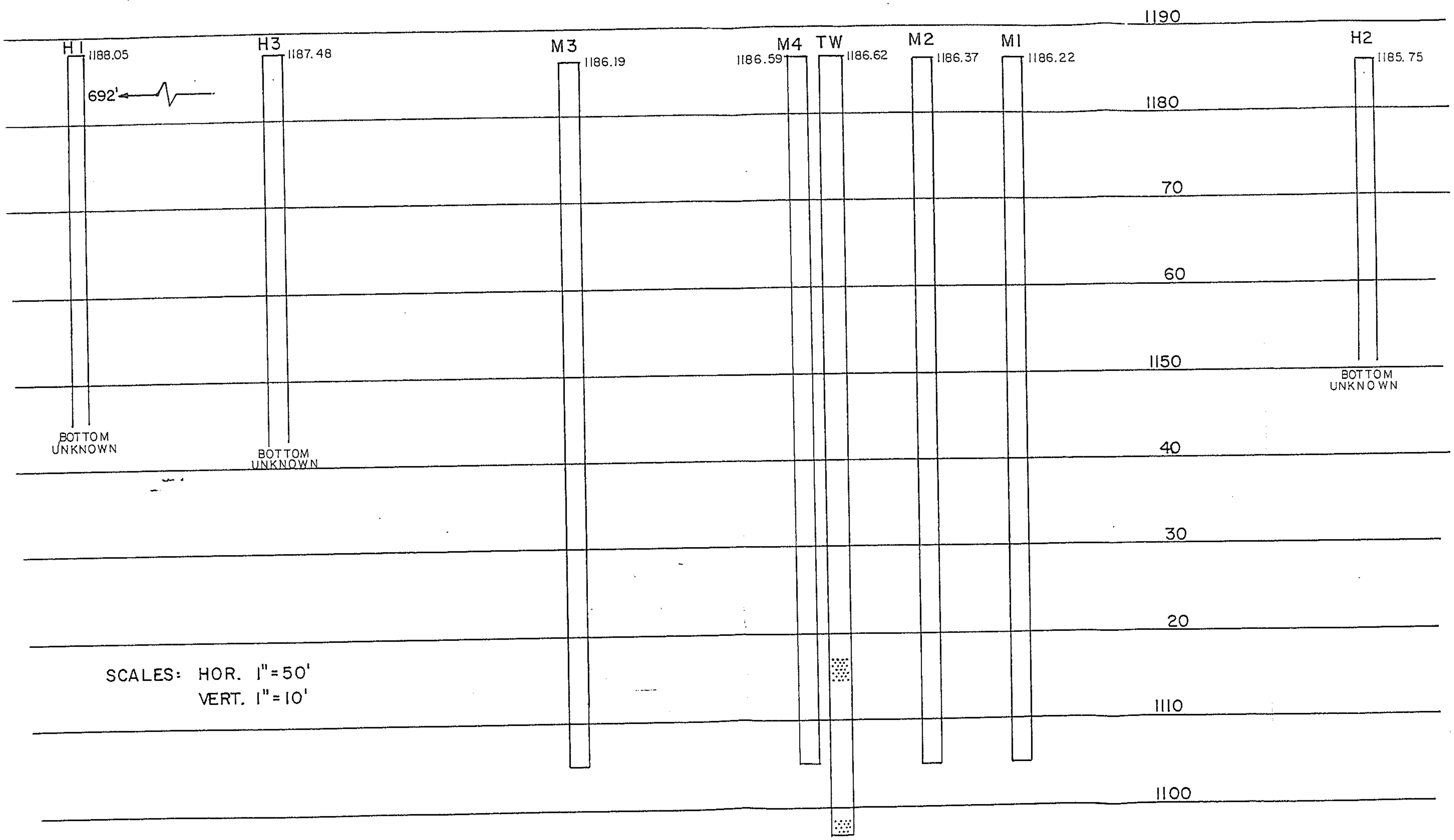
BECHER-HOPPE
ENGINEERS ARCHITECTS PLANNERS
330 FOURTH STREET PO 8000 WAUSAU, WI 54401 (715)845-8000

JACKIE & LEA RD. WELL LOC.
KRONENWETTER SAN. DIST. 2

DATE 19AUG1992	
SCALE 1"=100'	SHEET 1
INITIALS JKR	
PROJECT 92063	

KRONENWETTER SANITARY DISTRICT NO. 2

CASING ELEVATIONS



KRONENWETTER SANITARY DISTRICT NO. 2
PRIVATE WELLS - LEA & JACKIE ROADS
ADDRESS: 1891 Jackie Road (Mark Knapp)

Date	Time	Well Identifier	Top of Casing Elevation	Water Depth Below Casing (ft.)	Water Elevation
8/6/92	12:50 a.m.	H2	1185.75	9.68	1176.07
8/6/92	9:25 a.m.	H2	1185.75	9.72	1176.03
8/6/92	10:55 a.m.	H2	1185.75	9.74	1176.01
8/6/92	2:28 a.m.	H2	1185.75	9.72	1176.03
8/7/92	9:27 a.m.	H2	1185.75	9.92	1175.83
8/8/92	9:20 a.m.	H2	1185.75	10.04	1175.71
8/9/92	9:40 a.m.	H2	1185.75	10.33	1175.42
8/10/92	9:15 a.m.	H2	1185.75	10.14	1175.61
8/11/92	9:22 a.m.	H2	1185.75	10.19	1175.56
8/12/92	12:35 a.m.	H2	1185.75	9.97	1175.78

KRONENWETTER SANITARY DISTRICT NO. 2

PRIVATE WELLS - LEA & JACKIE ROADS

ADDRESS: 1831 Jackie Road (Kevin Noel)

Date	Time	Well Identifier	Top of Casing Elevation	Water Depth Below Casing (ft.)	Water Elevation
8/6/92	12:30 a.m.	H1	1188.05	13.65	1174.40
8/6/92	9:15 a.m.	H1	1188.05	13.67	1174.38
8/6/92	10:50 a.m.	H1	1188.05	13.68	1174.37
8/6/92	2:20 p.m.	H1	1188.05	13.69	1174.36
8/7/92	9:20 a.m.	H1	1188.05	13.72	1174.33
8/8/92	9:15 a.m.	H1	1188.05	13.71	1174.34
8/9/92	9:30 a.m.	H1	1188.05	13.72	1174.33
8/10/92	9:00 a.m.	H1	1188.05	13.69	1174.36
8/11/92	9:15 a.m.	H1	1188.05	13.73	1174.32
8/12/92	12:20 a.m.	H1	1188.05	13.67	1174.38

KRONENWETTER SANITARY DISTRICT NO. 2
PRIVATE WELLS - LEA & JACKIE ROADS
ADDRESS: 1955 Lea Road (Lyle Kriegel)

Date	Time	Well Identifier	Top of Casing Elevation	Water Depth Below Casing (ft.)	Water Elevation
8/6/92	1:00 a.m.	H3	1187.48	10.80	1176.68
8/6/92	9:28 a.m.	H3	1187.48	11.38	1176.10
8/6/92	11:00 a.m.	H3	1187.48	11.40	1176.08
8/6/92	2:30 p.m.	H3	1187.48	11.40	1176.08
8/7/92	9:32 a.m.	H3	1187.48	11.39	1176.09
8/8/92	9:32 a.m.	H3	1187.48	11.39	1176.09
8/9/92	9:50 a.m.	H3	1187.48	11.38	1176.10
8/10/92	9:23 a.m.	H3	1187.48	11.35	1176.13
8/11/92	9:27 a.m.	H3	1187.48	11.38	1176.10
8/12/92	12:50 a.m.	H3	1187.48	10.78	1176.70

KRONENWETTER SANITARY DISTRICT NO. 2
OBSERVATION WELL M1

Date	Time	Well Identifier	Top of Casing Elevation	Water Depth Below Casing (ft.)	Water Elevation
8/6/92	9:37 a.m.	M1	1186.22	12.22	1174.00
8/6/92	11:00 a.m.	M1	1186.22	12.22	1174.00
8/6/92	2:30 p.m.	M1	1186.22	12.24	1173.98
8/7/92	9:44 a.m.	M1	1186.22	12.32	1173.90
8/8/92	9:41 a.m.	M1	1186.22	12.35	1173.87
8/9/92	10:05 a.m.	M1	1186.22	12.38	1173.84
8/10/92	9:32 a.m.	M1	1186.22	12.38	1173.84
8/11/92	9:36 a.m.	M1	1186.22	12.41	1173.81

KRONENWETTER SANITARY DISTRICT NO. 2
OBSERVATION WELL M2

Date	Time	Well Identifier	Top of Casing Elevation	Water Depth Below Casing (ft.)	Water Elevation
8/6/92	9:30 a.m.	M2	1186.37	13.59	1172.78
8/6/92	11:02 a.m.	M2	1186.37	13.59	1172.78
8/6/92	2:38 p.m.	M2	1186.37	13.62	1172.75
8/7/92	9:40 a.m.	M2	1186.37	13.69	1172.68
8/8/92	9:36 a.m.	M2	1186.37	13.70	1172.67
8/9/92	10:00 a.m.	M2	1186.37	13.70	1172.67
8/10/92	9:26 a.m.	M2	1186.37	13.72	1172.65
8/11/92	9:31 a.m.	M2	1186.37	13.75	1172.62

KRONENWETTER SANITARY DISTRICT NO. 2

OBSERVATION WELL M3

Date	Time	Well Identifier	Top of Casing Elevation	Water Depth Below Casing (ft.)	Water Elevation
8/6/92	9:35 a.m.	M3	1186.19	11.88	1174.31
8/6/92	11:04 a.m.	M3	1186.19	11.85	1174.34
8/6/92	2:40 p.m.	M3	1186.19	11.85	1174.34
8/7/92	9:42 a.m.	M3	1186.19	11.83	1174.36
8/8/92	9:38 a.m.	M3	1186.19	11.78	1174.41
8/9/92	10:03 a.m.	M3	1186.19	11.77	1174.42
8/10/92	9:30 a.m.	M3	1186.19	11.74	1174.45
8/11/92	9:33 a.m.	M3	1186.19	11.74	1174.45

Test Well Pumping
Preliminary Analytical Results
KRONENWETTER SANITARY DISTRICT NO. 2

						Iron (0.3)		Manganese (0.05)		Nitrate-Nitrogen (10)		Becher-Hoppe			
Date	Time	Airline Reading	Sample No.	pH *	Temp. oC/oF	B-H **	Enviroscan *	BH **	Enviroscan *	B-H **	Enviroscan *	Alkalinity	Calcium Hardness	Total Solids	Langelier Index (>-1)
8/6/92	9:45 a.m.	11	1	8.39	14.1 / 57.4	0.2	ND ****	Trace <0.03	ND ****	4.4	3.64	62	56	140	-0.11
8/6/92	11:15 a.m.	10	2	8.37	10.6 / 51.1	Trace <0.1	ND	Trace <0.03	ND	3.9	3.42	60	56	120	-0.23
8/6/92	2:50 p.m.	11	3	8.36	10.2 / 50.4	ND***	ND	Trace <0.03	ND	4.1	3.24	60	54	120	-0.26
8/7/92	9:45 a.m.	10	4	8.26	10.0 / 50	Trace <0.1	0.011	Trace <0.03	ND	3.7	3.54	60	56	140	-0.36
8/8/92	9:45 a.m.	10	5	o 8.30	10.8 / 51.4	ND		Trace <0.03		3.5		62	56	130	-0.30
8/9/92	10:10 a.m.	10	6	o 8.30	10.2 / 50.4	ND		Trace <0.03		2.8		62	56	140	-0.31
8/10/92	9:45 a.m.	10	7	8.25	10.6 / 51.1	ND	0.01	ND *****	ND	3.2	3.04	64	50	120	-0.37
8/11/92	9:45 a.m.	10	8	8.32	10.0 / 50	ND	ND	ND	ND	3.0	3.01	66	50	110	-0.30

* Enviroscan received the water samples within 20 minutes after sampling, and performed the analyses within one hour after sampling.
o pH by Becher-Hoppe, Inc. at the well.
** Becher-Hoppe, Inc. analyzed preserved samples.
*** ND - Not Detectable. Detection Limit = 0.1.
**** ND = Not Detectable. Detection Limit = 0.002 mg/l.
***** ND = Not Detectable. Detection Limit = 0.03.

APPENDIX F

LBG PHASE 2 REPORT

2017

LEGGETTE, BRASHEARS & GRAHAM, INC.

PROFESSIONAL GROUNDWATER AND
ENVIRONMENTAL ENGINEERING SERVICES

----
8 Pine Tree Drive, Suite 250
St. Paul, MN 55112
651-490-1405
FAX 651-490-1006
www.lbgweb.com

November 3, 2017

Mr. Richard Downey
Administrator
Village of Kronenwetter
1582 Kronenwetter Drive
Kronenwetter WI 54455

RE: Phase 2 Test Boring Results and Recommendations
TB-5 through TB-10
Village of Kronenwetter, Wisconsin

Dear Mr. Downey:

Executive Summary

A total of six test borings (TB-5 through TB-10) were completed as part of the Phase 2 test boring activities. Temporary test wells were installed in test borings TB-5 and TB-9 to facilitate collection of aquifer chemistry and hydraulic data. Groundwater analytical data collected during test pumping at TB-5 and TB-9 indicate that with the exception of manganese and iron in TB-5 and manganese in TB-9, the water quality from the sand and gravel aquifer in this area is generally of good quality. Based on the evaluation of the estimated aquifer hydraulic data it appears that test boring TB-5 may be a potential candidate for construction of a larger diameter test well. The data suggests that a yield of up to 250 gpm is possible. Completion of a larger diameter test well at TB-5 is necessary to more accurately determine the capacity and water quality of the aquifer. TB-9 does not appear favorable for conversion to a test well.

Based on the data collected as part of these well siting activities, we have presented two options to move forward with acquiring additional capacity for the Village's water system.

Option 1: Conduct additional geophysical testing and test borings at other locations to identify sites that may have higher yield and better water quality. Two potential areas of interest are the Evergreen Elementary School Site on Pine Street west of Tower Road, and the Lutheran School property on the northwest corner of Tower and Kowalski Road.

Option 2: Construct a larger diameter test well at TB-5, with the well screened deeper to maximize drawdown and intersect a zone of coarser formation.

Introduction

Leggette, Brashears & Graham, Inc. (LBG) is pleased to provide you with the results of the recently completed sand and gravel test boring and aquifer pumping test activities, referred to herein as Phase 2. The Phase 2 test borings were conducted at select locations in the Village of Kronenwetter (the Village) and were a continuation of the Village's program to site a new high capacity well that will provide additional capacity to the water system. The borings were completed based on the findings of the Phase 1 test boring activities and subsequent geophysical surveys completed by LBG. The results and recommendations of the Phase 1 test borings were submitted to the Village in LBG's draft Phase 1 Test Boring letter report dated March 30, 2016. The results and recommendations of the geophysical surveys were presented to the Village in a July 28, 2016 email from John Jansen, Senior Associate at LBG, to former Director of Public Works, Duane Gau (**Attachment A)**. Based on our recommendations the Village secured access to select test drilling sites as necessary in several areas deemed favorable for locating saturated sand and gravel aquifer material. The Phase 2 field activities were completed between November 15, 2016 and July 17, 2017. A brief description of the methodologies, results and options for moving forward follows.

Test Boring Activities

Five test borings (TB-5 through TB-9) were initially completed as part of the Phase 2 test boring activities (between November 15 and December 20, 2016). A tenth test boring (TB-10) was drilled on July 17, 2017 as an add-on to the Phase 2 activities. Two of the test borings (TB-5 and TB-9) were completed as test boring temporary wells for the purpose of collecting water samples and performing aquifer pumping tests. The test boring locations are shown on **Figure 1**. Consistent with the Phase 1 drilling activities, Badger Well Drilling (Badger) of Fond Du Lac, Wisconsin was retained by the Village to complete the test borings activities, which included providing the required pumping equipment, and performing the pumping test activities. The borings were advanced using the casing hammer drilling technique. Six-inch diameter steel casing was advanced ahead of the bit through the upper unconsolidated material into the bedrock. Composite soil samples were collected at five-foot intervals while advancing the boring. Each boring was advanced through the upper unconsolidated material, to bedrock. An LBG hydrogeologist performed oversight duties during the majority of drilling activities. The bagged drilling samples were stored in the well house for further use as needed (i.e., visual observations and/or submittal to a geotechnical lab for sieve analysis). The completed soil boring logs are presented in **Attachment B**. A summary of the test boring and temporary well construction details are presented in **Table 1**. The test boring locations are shown on **Figure 1**.

All six borings encountered sand and gravel formation above bedrock. Competent bedrock was encountered at depths of between 80 and 141 feet below ground surface (ft bgs). Most of the borings encountered low permeability intervals of clay and broken/weathered rock below the upper sand units and above competent bedrock. The sandy deposits encountered in TB-5 and TB-9 contained intervals that appeared to be permeable enough to support a high capacity well. The intervals considered to be most favorable with respect to potential water production were selected to be screened as small diameter (approximately 6-inch diameter) temporary test wells. The sand deposits in TB-6, TB-7, TB-8 and TB-10 were deemed to be too fine-grained and/or contain too much silt to support a high capacity well and were abandoned by Badger per DNR requirements. The well abandonment forms for TB-6, TB-7, TB-8 and TB-10 are included in **Attachment B**.

Temporary Test Well Installation

To facilitate collection of initial aquifer hydraulic parameters and water chemistry data at the two most promising test boring locations, temporary well screens were installed into test borings TB-5 and TB-9 between the depths of 60 to 80 ft bgs and 61 to 73 ft bgs, respectively. Temporary wells were not constructed at TB-6, TB-7, TB-8 or TB-10 due to unfavorable (low permeability) conditions observed during drilling activities. The temporary well screen at TB-5 and TB-9 consisted of 0.015-inch slot, 6-inch nominal diameter, telescoping steel screen. The temporary wells were developed prior to pumping by surging the screened interval with compressed air until the water was as clear and free of sediment as could be attained.

Test Boring Temporary Well Pumping Tests

Following construction and development activities at temporary well locations TB-5 and TB-9, limited duration step-drawdown pumping tests (step tests) were conducted to estimate the hydraulic parameters of the aquifer immediately adjacent to the well screen and to collect groundwater samples for laboratory chemical analysis of select organic and inorganic parameters. Each step test consisted of three different discharge rates, or steps, with the discharge rate of each step maintained relatively constant for the duration of the step. The step tests were conducted on December 19 and 20, 2016 at TB-9 and TB-5, respectively.

A 7.5 horsepower submersible well pump, supplied and installed by Badger, was utilized to evacuate water from the wells during the step tests. Power to the pump was supplied by a portable generator, which was also supplied by Badger. During step testing activities, the discharge rate was measured by periodically measuring the amount of time to fill a container of known volume (55-gallon plastic drum). The pumped water from each well was discharged directly to the ground surface, approximately 50 feet away from the pumping well. Recharge to the aquifer through infiltration of the discharge water is not considered to have impacted the test results due to the short duration of pumping and frozen ground conditions.

Throughout the step testing activities, water level measurements were obtained by manually gauging each well using an electric water level indicator. The static water level was measured prior to starting each step test so that the amount of drawdown in the well casing owing to pumping could be determined. Measurements of the well water level were obtained as quickly as possible for the first 5 to 10 minutes of each step and at approximately 10 to 15-minute intervals thereafter.

As an initial check of the aquifer water quality, water samples were collected near the end of the final step at each temporary well and submitted for laboratory analysis of volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), and select inorganic and general water quality parameters. All of the samples were collected in laboratory supplied bottles, placed on ice and delivered to NLS, a Wisconsin Department of Natural Resources (WDNR) certified laboratory in Waukesha, Wisconsin.

Water level recovery data was collected following the cessation of pumping at each well. Water level measurements were taken until approximately 90 percent recovery had occurred, which enabled the collection of data sufficient to calculate an estimated transmissivity (T) value for the aquifer material adjacent to the well screen. The step test data was analyzed for relative drawdown only. The water level recovery data from both wells were analyzed using semi-log graphical analysis and the Eden-Hazel method. Water level changes due to barometric influences, diurnal fluctuations, or long-term background water-level trends were not accounted for.

On December 19 and 20, 2016 during the step testing activities, Village personnel monitored the pumping rates and levels in both Village Wells 1 and 2, and the Village water tower. Village Well 2 was shut off during the day and did not pump during either of the step tests.

Investigation Results

Data collected during the step tests enabled a T value, which is the measure of water flow through a 1-foot wide vertical section of the saturated aquifer, to be estimated. The estimated T value calculated using the Eden-Hazel method was approximately 51,970 and 11,690 gallons per day per foot (gpd/ft) at TB-5 and TB-9, respectively. The T value at TB-5 and TB-9 was also estimated utilizing the theoretical modified nonequilibrium equation (Jacob Equation), which utilizes the specific capacity multiplied by a constant of 1,500 for an unconfined aquifer. The estimated T value at TB-5 and TB-9 based on the Jacob Equation was approximately 10,575 and 4,980 gpd/ft, respectively. Based on the results of these two methods, the average T for TB-5 is approximately 31,300 gpd/ft (4,200 feet squared per day [ft^2/d]) and the average T for TB-9 is approximately 8,300 gpd/ft (1,100 ft^2/d). Typically, a shallow sand and gravel well will need a T of greater than 10,000 gpd/ft to sustain pumping at a higher rate for longer periods of time. Graphical analysis of the pumping data is presented in **Attachment C**. A summary of the pumping test results is presented in **Table 2**.

Specific capacity represents the relationship between drawdown in a pumping well and the yield of the well, and is measured in units of gallons per minute per foot of drawdown (gpm/ft). The calculated specific capacity at the end of the third step was approximately 7.1 gpm/ft at TB-5 and 3.3 gpm/ft at TB-9.

The estimated aquifer thickness at TB-5 and TB-9 as determined by the thickness of saturated sand and gravel formation that was penetrated during drilling was 100 and 75 feet, respectively. Hydraulic conductivity, which is a measure of the rate of flow through the aquifer, was calculated for TB-5 and TB-9 by dividing the average estimated T values calculated above by the assumed aquifer thickness values. The estimated hydraulic conductivity calculated from the average T values was 42 ft/day at TB-5 and 15 ft/day at TB-9.

Based on the calculated specific capacities obtained from the step test data, an estimate of the efficiency of the test boring temporary wells were calculated as part of our test analysis. The estimated efficiency of the temporary wells allows for a better understanding of the potential yield of the aquifer from a properly constructed test and production well. The efficiency of a well takes into account the drawdown in the well due to turbulent flow within the well and laminar flow within the aquifer. The observed and theoretical drawdown in the well can be compared, and an estimate of the drawdown attributable to turbulent well loss can be calculated. Turbulent well loss is strongly influenced by factors such as a plugged formation, filter pack (if applicable), or well screen and is primarily the result of insufficient development activities. The efficiency of the test boring temporary wells, as calculated from the final drawdown measured during the third step of each step test (using the methodology of Kawecki, 1995, and others) ranged from approximately 85 percent at TB-5 to approximately 94 percent at TB-9.

The step test analysis method of Eden and Hazel was also utilized to obtain a general relative estimate of the efficiency of the temporary wells by comparing the amount of well loss attributable laminar flow within the aquifer to total predicted drawdown at much higher pumping rates. Using the predicted drawdown at various higher pumping rates provides an estimate of the maximum pumping rate, while not exceeding over seventy percent of the maximum available drawdown in a hypothetical well completed at each of the temporary wells. This assumes the efficiency of a production well constructed at any of these test boring locations remains consistent with the test boring temporary well construction. Using this relationship, a production well constructed and developed properly should be capable of pumping approximately 250 gpm at TB-5 and 130 gpm at TB-9. If a new production well can be screened at a deeper interval at the TB-5 location, this will allow for more available drawdown and a higher pumping rate;

however, this cannot be determined until the soil boring formation samples are sieved and a grain size analysis is completed. The calculated well efficiency estimates and predicted yield for TB-5 and TB-9 are presented in **Attachment C**.

Review of the groundwater analytical data collected near the end of pumping during the step tests conducted at TB-5 and TB-9 indicate that with the exception of manganese and iron in TB-5, and manganese in TB-9, the water quality from the sand and gravel aquifer adjacent to the well screens in these temporary wells was of generally good quality. It should be noted that manganese was detected in TB-5 and TB-9 at concentrations of 250 and 98 micrograms per liter (ug/L), respectively, which exceed the Federal Secondary Drinking Water Standard (Secondary Standard) of 50 ug/L. Secondary Standards are non-enforceable guidelines regulating contaminants that may cause cosmetic or aesthetic effects in drinking water such as color, taste, odor or turbidity. The United States Environmental Protection Agency (EPA) recommends Secondary Standards to water systems but the EPA does not require the systems to comply with the standards.

Additionally, iron was detected at a concentration of 5.2 milligrams per liter (mg/L) in TB-5, which exceeds the Secondary Standard of 0.3 mg/L. In the sample collected from TB-9, iron was not detected at a concentration exceeding the method detection limit (MDL) of 0.05 mg/L. None of the other constituents that were analyzed for were detected at a concentration that exceeded their respective Primary or Secondary Standards.

As was discussed in LBG's Phase 1 Test Boring Report, high concentrations of manganese and iron can be the result of very turbid water ("dirty" with clay and silt entrained in the water) and are not representative of actual groundwater conditions. However, in the sample collected from TB-5 near the end of the step test, manganese was detected at a concentration of 98 ug/L, which exceeds the Secondary Standard, and iron was detected at 5.2 mg/L, which greatly exceeds the Secondary Standard of 0.3 mg/L. Based on our observation in the field, the water samples appeared clear and free of sediment. This, indicates that the elevated iron and manganese concentrations in TB-5 may reflect actual groundwater conditions and not a result of a turbid sample. However, until a properly designed, constructed and developed well at this location is pumped at a higher rate for a much longer period of time we will not know for sure if the concentrations detected during the test pumping are representative of the actual aquifer concentrations.

The detected concentrations of other constituents of interest are as follow: Chloride was detected at a concentration of 11 mg/L and 5.9 mg/L in TB-5 and TB-9, respectively. Total dissolved solids (TDS) were detected at concentrations of 150 mg/L in TB-5 and 97 mg/L in TB-9. Sulfate was detected at a concentration of 3.6 mg/L and 6.7 mg/L in TB-5 and TB-9, respectively. Hardness was detected at a concentration of

68 mg/L in TB-5 and 130 mg/L in TB-9. Arsenic was not detected at a concentration greater than the limit of quantification in either temporary well.

No VOCs or PAHs were detected at a concentration exceeding their respective MDL. The laboratory analytical reports are included in **Attachment D**. A summary of the groundwater quality data is presented in **Table 3**.

Review of the water level data obtained at Village Well 1 and Well 2 indicate that pumping from the two temporary test wells during the step testing activities appeared to cause measureable drawdown (interference) in the Village Wells. The pumping rate at Well 1 was set at approximately 400 gpm early in the morning on December 19 and 20, 2016, and Well 2 was not pumping. Based on the December 19 airline data obtained by the Village staff during the step test activities at TB-9, it appears that approximately 1.5 feet of drawdown at Well 1 and 4 feet at drawdown at Well 2 was attributable to pumping TB-9 at a rate of 120 gpm. During the step test activities at TB-5, which was conducted on December 20, the drawdown attributable to pumping TB-5 at 136 gpm was approximately 3 feet at Well 1 and 1 foot at Well 2.

It should be noted that during the step test the pumping rate at Well 1 was not steady and was observed to gradually fall throughout the day as the head rose in the water tower due to more water being pumped in the tank than was evacuated to the distribution system. On December 19, during the step test at TB-9, the pumping rate at Well 1 dropped from 400 gpm in the morning to 314 gpm at the end of the day (approximately 5 PM). On December 20, the pumping rate at Well 1 dropped from 400 gpm prior to beginning the step test to 380 gpm at the end of the step test. If the pumping rate in Well 1 would have remained steady, more drawdown would likely have been observed in the Village wells.

Conclusions and Recommendations

Based on the evaluation of the estimated aquifer hydraulic parameters, in conjunction with the review of the test boring formation samples and findings of the previous well siting activities, it appears that test boring TB-5 may be a potential candidate for construction of a larger-diameter test well. Completion of a larger diameter test well at TB-5 is necessary to more accurately determine the capacity and water quality of the aquifer, and the additional interference on Village Wells 1 and 2. The results from this Phase 2 investigation suggests that a yield of up to 250 gpm is possible. It appears that test boring TB-9 is not hydraulically favorable for conversion to a test well.

As was demonstrated during the Phase 2 step test activities, it appears that TB-5 is located closer to the existing Village wells than is preferred and imparts extra drawdown at the Village Wells when pumping. The current location is likely more suitable for a backup well when either Well 1 or Well 2 is out of service, but may cause too much interference if pumping concurrently with the existing Village wells. For this reason, it may be worthwhile to find a new well site several hundred feet or more away from the existing wells.

The water quality data obtained from the groundwater samples during the step tests indicate the water quality with regard to manganese and iron is of concern. The iron and magnesium concentrations exhibited in TB-5, and in most all of the other samples collected as part of the Phase 1 and Phase 2 test boring activities are very high and as such will likely require the implementation of a treatment system to make the water quality acceptable to the Villages' customers. With this in mind, locating a new well in the existing well field has the advantage of allowing one plant to treat all three wells, which avoids the expense of a second treatment plant and reduces the cost of transmission main between the wells and the plant. It also reduces the portion of the Village that needs to be controlled or monitored under a wellhead protection plan.

Based on our analysis of the data collected as part of these well siting activities, two options are provided for the Village to consider if moving forward with acquiring additional capacity for the Village's water system. The options are listed based on our inferred ranking with option 1 being the preferred option.

Option 1:

Conduct additional geophysical testing and test borings in other locations to identify sites with higher potential well yield and better water quality. Two potential areas of interest are the Evergreen Elementary School Site on Pine Street west of Tower Road, and the Lutheran School property on the northwest corner of Tower and Kowalski Road. These sites are far enough from Wells 1 and 2 that interference is not a concern. Both sites appear to have limited but sufficient open land, but it may be worthwhile to investigate both of these sites with regards to access and setbacks as we move forward. A pumping test was conducted at the Evergreen School site in 1988. The aquifer at the site was found to be very productive. The test well was pumped at 290 gpm for 5 days and the data indicated a production well could support significantly higher pumping rates. The water samples collected during test pumping detected iron at 2.8 ppm and manganese at 0.46 ppm, indicating treatment would likely be necessary. Additionally, it may be worthwhile to investigate some of the open area that is in the flood plain or wetlands. It is possible to permit a well in these areas, although it costs more due to permitting issues and building up the land surface elevation by filling, and replacing lost wetland and flood plain in different areas. However, if we can target parcels that are not that far off a main road it would reduce the costs. It is likely that any well site in a flood plain may have elevated iron or manganese that requires treatment to meet secondary drinking water standards. These issues will need to be evaluated at a later date after the Village decides how they would like to proceed.

Option 2:

Construct a larger test well at TB-5. The analysis completed on data collected from the step test at TB-5 suggest that a yield of approximately 250 gpm is possible with a properly designed and constructed production well. We understand that 250 gpm may be on the low side for the Village. One way that we may be able to maximize the capacity at a test and production well at TB-5 is to determine if there is a better formation interval to screen. If the test and production well can be screened at a deeper interval the drawdown could be maximized and the well pumped at a higher rate. Review of the formation samples obtained from TB-5 showed a zone of sand and gravel located from approximately 105 to 109 ft bgs. This interval was not initially screened because it was only four feet thick and the sand above this zone appeared much finer. If a sieve analysis indicates that we can effectively screen both the coarser interval and the fine material above, we will design a test well to straddle the interval from about 85 to 108 ft bgs. To evaluate this potential option, the following activities are recommended:

- Perform a sieve analysis and based on our analysis of the data, design a test and production well based on the formation grain size distribution. A properly designed well will allow us to maximize the capacity.

- Construct a lager diameter test well and conduct test pumping activities, including a step test, sample collection, a 1 to 3-day constant-rate pumping test and sample collection.

- Prepare a Well Site Investigation Report. If the test well proves favorable, the Village will need to prepare and submit a Well Site Investigation Report to DNR. This report is required by DNR and is typically prepared and submitted prior to constructing a test well. However, in this case we are unsure if the Village would choose to proceed with the production well until additional hydraulic and water chemistry data is collected. Therefore, it is advisable to hold off on the preparation and submittal until the Village has decided to move forward. There is a risk that the DNR may not approve a production well at the chosen location. Based on our review of the potential site, LBG does not foresee any permitting problems with the site, but the DNR has final authority over such decisions and the Village would have to submit a Well Site Investigation Report to ensure the site would be approved.

- Construct a production well, including hydraulic testing and collection of water chemistry data after approval of the Well Site Investigation report.

We trust this information meets your needs. If you have any questions or comments, please do not hesitate to call.

Very truly yours,

LEGGETTE, BRASHEARS & GRAHAM, INC

Ted Powell, P.G.
Senior Hydrogeologist

John Jansen, PhD., P.G.
Associate Hydrogeologist/Geophysicist

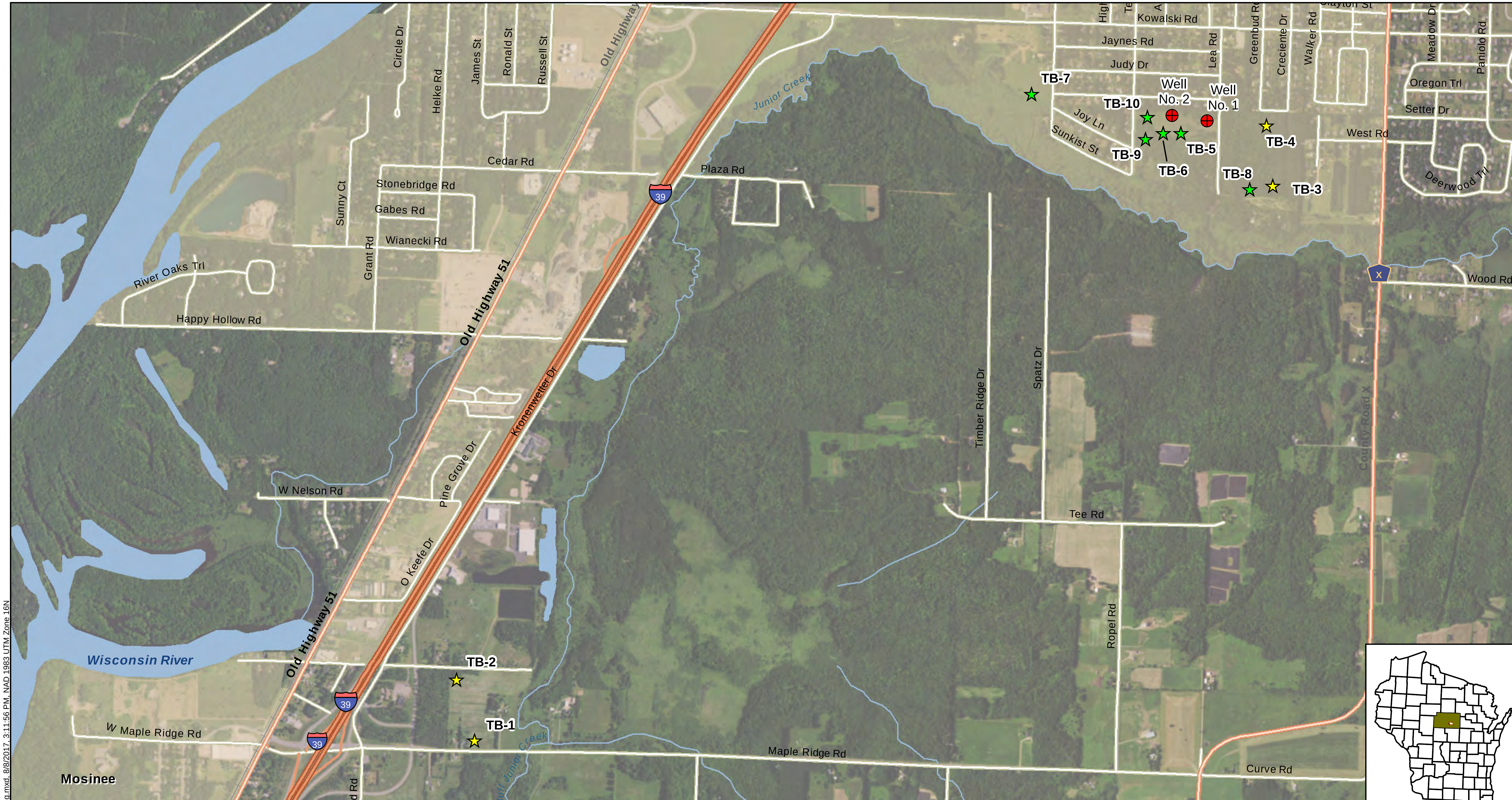
Reviewed by:

Dave Hume
Senior Associate

Enclosures

cc: File

Figure



- Village Well
- Test Boring Locations (Phase 1 Drilling)
- Test Boring Locations (Phase 2 Drilling)
- City of Evergreen and Mosinee

N

0 750 1,500
Feet

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community. Village of Kronenwetter. CONUS National Wetland Inventory. Marathon County. Hydrogeology of the Wisconsin Rivery Valley in Marathon County, Wisconsin - Kendry and Bradbury, 1988.

Prepared By:
LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Groundwater and
Environmental Engineering Services
8 Pine Tree Drive, Suite 250
St. Paul, Minnesota 55112
(651) 490-1405

VILLAGE OF KRONENWETTER
KRONENWETTER, WISCONSIN
MARATHON COUNTY

TEST BORING LOCATIONS

FILE:	g3krone02g.MXD	DATE:	8/8/2017	FIGURE:	1

G:\GIS\Kronenwetter_WI\maps\g3krone02g.mxd, 8/8/2017, 3:11:56 PM, NAD 1983 UTM Zone 16N

Tables

TABLE 1

TEST BORING AND TEMPORARY WELL CONSTRUCTION DETAILS
PHASE 2 TEST BORINGS
VILLAGE OF KRONENWETTER, WISCONSIN

Test Boring Number	Borehole & Casing Diameter (in)	Completion Date	Depth to Competent Bedrock (ft bgs)	Total Depth (ft bgs)	Temporary Well Screen Interval (ft bgs)	Static Depth to Water (ft bl TOC)
TB-5	6	11/14/2016	141	142	60-80	12.7
TB-6	6	11/15/2016	120	124	--	--
TB-7	6	11/15/2016	80	84	--	--
TB-8	6	11/16/2016	120	125	--	--
TB-9	6	11/18/2016	105	105	61-73	7.95
TB-10	6	7/17/2017	132	140	--	--

ft bgs - Feet below ground surface
ft bl TOC - Feet below top of casing
-- - Not Applicable
in - Inches

TABLE 2

SUMMARY OF PUMPING TEST RESULTS
PHASE 2 TEST BORINGS
VILLAGE OF KRONENWETTER, WISCONSIN

Test Bore	(gpd/ft)[A]	(gpd/ft)[B]	(gpd/ft)[C]	(ft^2/d)[C]	Aquifer Thickness (ft)	Hydraulic Conductivity (ft/d)	Specific Capacity[D] (gpm/ft)
TB-5	51,970	10,575	31,300	4,200	100	42	7.1
TB-9	11,690	4,980	8,300	1,100	75	15	3.3

gpd/ft - gallons per day per foot
ft^2/d - feet squared per day
ft/d - feet per day
gpm/ft - gallons per minute per foot

[A] Transmissivity calculated using step test drawdown data (Eden - Hazel, 1973).
[B] Transmissivity calculated using theoretical modified nonequilibrium equation (Jacob Equation)
[C] Average Transmissivity
[D] Specific capacity calculated at the end of the third step in each test, when drawdown was still increasing somewhat.

TABLE 3
SUMMARY OF GROUNDWATER QUALITY
PHASE 1 AND PHASE 2 TEST BORING ACTIVITIES
VILLAGE OF KRONENWETTER, WISCONSIN

	Phase 2		Phase 1						
Temporary Well No. Sample Depth (ft bgs) Sample Date	**TB-5 60-80 12/20/2016**	**TB-9 61-73 12/19/2016**	**TB-4 80 2/19/2016**	**TB-4 95 2/19/2016**	**TB-4 115 2/19/2016**	**TB-4 135 2/19/2016**	**MW-4S 20 3/1/2016**	**TB-4 113-126 3/1/2016**	**Drinking Water Standard**
Laboratory Analysis									
Arsenic (µg/L)	[1.1]	[1.3]	[1.0]	2.8	[1.5]	ND	ND	ND	10^A
Calcium (mg/L)	16	30	NA	NA	NA	NA	NA	29	--
Chloride (mg/L)	11	5.9	16	1	[4.9]	5.2	54	5.2	250^B
Iron (mg/L)	5.2	ND	5	34	13	1.4	1.3	0.12	0.3^B
Magnesium (mg/L)	6.9	14	NA	NA	NA	NA	NA	12	--
Manganese (µg/L)	250	98	120	980	410	440	73	400	50^B
Sodium (mg/L)	3.3	4.5	NA	NA	NA	NA	NA	4.0	--
Total Dissolved Solids (mg/L)	150	97	NA	NA	NA	NA	NA	120	500^B
Sulfate (mg/L)	3.6	6.7	NA	NA	NA	NA	NA	ND	250^B
Hardness (mg/L)	68	130	NA	NA	NA	NA	NA	NA	--
Nitrate + Nitrite, as N	[0.047]	ND	6.7	0.31	[0.023]	ND	1.7	[0.028]	10^A

Abbreviations:
mg/L - Milligrams per Liter (equivalent to parts per million)
ND - Not detected above the method detection limit
µg/L - Micrograms per liter (equivalent to parts per billion)
NA - Not Analyzed
A - Federal Primary Standard
B - Federal Secondary Standard
-- - No Applicable Standard
[shaded] - Exceeds the applicable Federal Drinking Water Standard
[x.xx] - Detected at a concentration greater than the LOD but less than the LOQ, and are therefore "less-certain"
ft bgs - Feet below ground surface

Attachment A

Geophysical Survey Report

Ted Powell

From: John Jansen
Sent: Thursday, July 28, 2016 2:34 PM
To: Duane Gau
Cc: Ted Powell
Subject: Mini Report on Geophysical Survey
Attachments: Geophysics summary.pdf; Kronenwetter Change Order 7-28-2016.pdf

Dear Duane,

As per your request we have prepared a “mini Report” to share the results of our geophysical exploration work to site a new well. This e mail summarizes the results and describes the attached figures that illustrate our findings.

We conducted six electrical resistivity lines to map the distribution of permeable sand and gravel deposits suitable for a new well, and to screen out areas where the formation is likely to be silty or clay rich making it unsuitable for a well. We also collected seismic refraction data at five of the resistivity line locations as a means to independently estimate the depth to bedrock to help us pick the best test drilling locations on the resistivity lines. We could not collect seismic data at resistivity line R4 due to high noise from strong winds and rain.

As shown on the first figure, the data were collected at three locations. The first location is a new subdivision east of Lee Road and south of Austin Road. Resistivity and seismic lines 1 were run on the south end of the site to avoid conflict with required offsets between a municipal well and a new storm water pond. Three resistivity lines (R2, R3, and R4) and two seismic lines (S2 and S3) were run on the parcel of land that Wells 1 and 2 are located on. Resistivity and seismic lines 5 and 6 were run on a private parcel west of Tower Road. As per our discussions, we placed more emphasis on the existing well field site and the subdivision site due to the easier site access for test borings.

The next six figures shows the interpreted resistivity and seismic profiles. The profiles are generally oriented with the west end on the left side of the plots and the east end of the lines on the right side. The horizontal axis on the resistivity and seismic profiles correspond to distance along the line labeled in feet. The vertical scales refer to depth below the surface, also in feet. The colors on the resistivity profiles corresponds to the measured resistivity of the subsurface material with the color scale legend on the right. Resistivity is the inverse of electrical conductivity and can be used to distinguish saturated soils from unsaturated, sand from clay or silt, and unconsolidated material from bedrock. On most of the plots the red band on top indicates unsaturated sand above the water table. The blue to green and yellow band in the middle of the profiles corresponds to saturated sand to clay deposits above the bedrock, which is the primary aquifer zone. Bedrock is indicated by the red band on the bottom of the profiles.

Seismic refraction uses sound waves from a small explosive charge detonated a few feet below the ground surface to propagate soundwaves through the ground. The velocity of the sound waves through the ground is measured by a line of geophones planted on the surface. Changes in the velocity of sound waves in the subsurface correlates to the thickness and composition of the layers. The seismic profiles found three distinct layers. The upper layer is generally 5 to 10 feet thick and has a low seismic velocity, consistent with unsaturated soil. The middle layer ranges from a few feet to over 100 feet thick and has a velocity consistent with saturated sand and clay. The bottom layer has a high velocity and indicates bedrock.

The estimated bedrock surface was interpreted from the resistivity and seismic data and is shown on the resistivity sections. This forms the base of the aquifer. The upper layer of the resistivity profiles is dry and will not produce water. It is the middle layer where the potential aquifer deposits are located. The resistivity of the middle layer, as indicated by the color, distinguishes sand and gravel material, which will be green to yellow or occasionally red, from silty or clay rich material, which will be blue to lighter green. We selected three primary test boring locations and three secondary boring locations based on the resistivity and thickness of the middle layer. The results can be summarized as follows:

- We estimate the depth to bedrock to be about 80 to 95 feet on line 1, which is deep enough for a well. We recommend a primary test boring at station 750 (750 feet east of the west end of the line) and a secondary boring location at station 260.
- The depth to bedrock is about 100 to 120 feet at line 2. We did not recommend and test borings on this line because the most promising locations were close to the existing wells. Drilling too close to the existing wells reduces the production capacity of the well field due to interference between the wells. Several zones of clay rich soils in the aquifer zone were detected as shown by the blue colored areas.
- We estimate the depth to bedrock to be about 100 to 120 feet on line 3. We recommend a primary test boring at station 500 in sandy formation between some apparent clay zones.
- Bedrock ranges from about 60 feet on the west end of line 4, to over 100 feet on the east end. The bedrock is too shallow to site a well on the west end of the line but there appears to be a sandy zone (green) between apparent clay zones (blue) in the middle layer near the middle of the line where bedrock is deeper. We recommend a primary test boring at station 425.
- Bedrock is not as deep at line 5, ranging from about 80 to 90 feet over most of the line, and about 100 feet on the southeastern end. We recommend a secondary boring at station 800, just east of an apparent small pocket of clay.
- Bedrock slopes to the east on line 6. Rock is within 30 to 40 feet of the surface on the west end and reaches over 100 feet on the eastern end of the line. We recommend a secondary test boring at station 620.

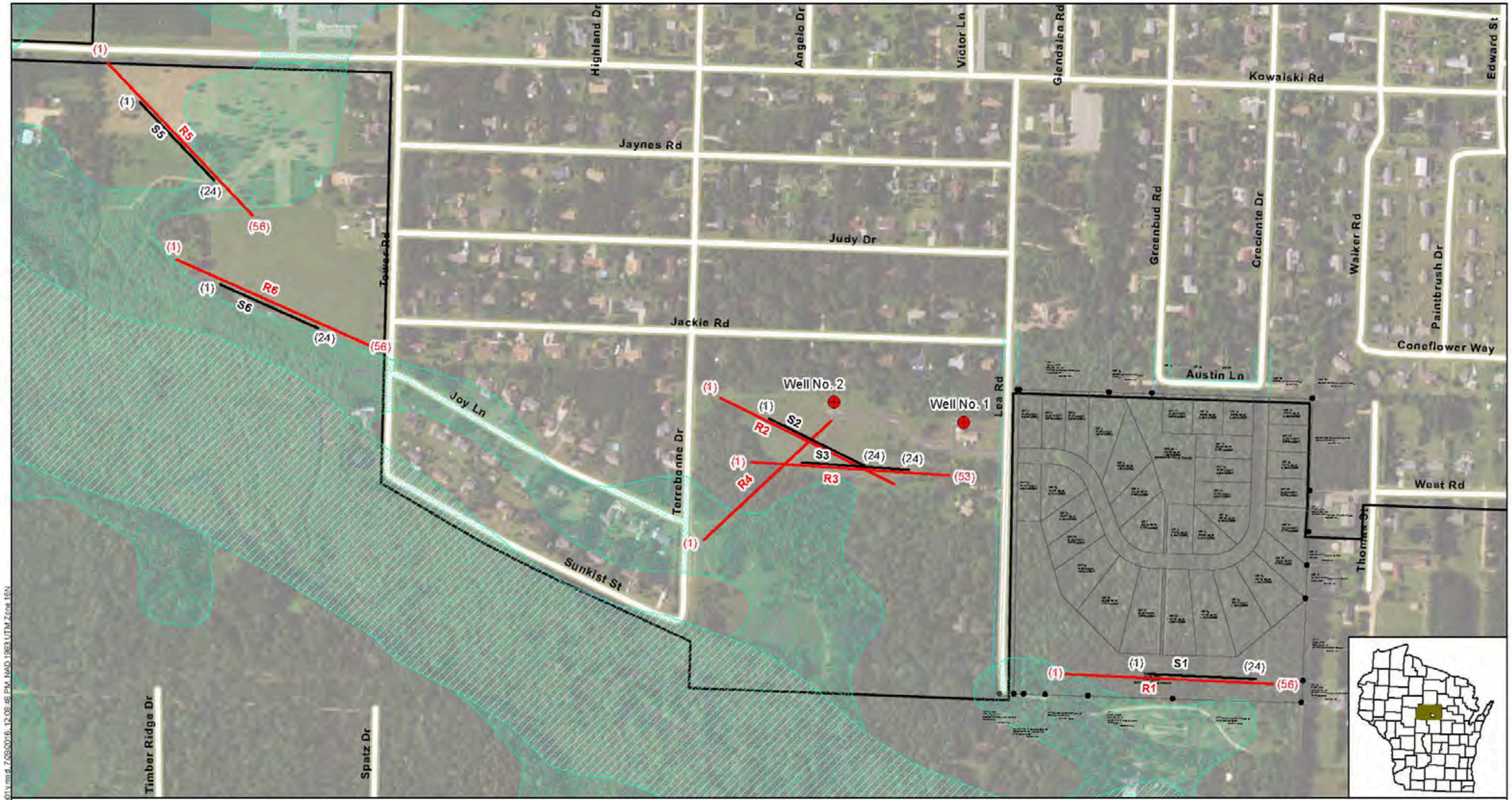
We recommend that three to six test borings be drilled to confirm the results of the geophysical survey and select the best location for a new well. The primary test borings should be drilled first, starting with R4, then R3 and R1. If favorable formation is found, we recommend installing a 6 inch telescoping test screen and conducting a short duration pumping test in the most favorable wells in the manner discussed in our original proposal. This will provide a good estimate of the permeability of the sand and a sample of the water quality. The test drilling program can be terminated on the first or second boring if a suitable site has been found. We suggest you consider drilling all three primary borings to be sure the best site is selected and to bank any other favorable sites for future wells. The exploration program to date has illustrated the limited number of areas suitable for municipal wells that are left in the Village. Access to these sites will be much more difficult in the future. If no suitable well sites are found after drilling the primary sites we recommend drilling the secondary boring locations.

LBG will provide an experienced Professional Geologist in the field to coordinate the drilling work and evaluate the formation samples. He will determine which borings are suitable for conversion to temporary test wells and conduct short duration pumping tests and collect water samples. The work will be conducted as described in our original test drilling support proposal. We are assuming a maximum of six borings and two test pumping events so our estimated costs are lower than the initial estimates as shown on the attached change order request. The initial scope assumed eight borings and four test pumping events. Last Spring Badger Drilling indicated a willingness to honor their existing bid for the additional test drilling work. We are in the process of confirming that this is still the case and estimating the expected drilling costs for three to six borings and two test pumping events.

I trust this "mini report" was adequate to explain work completed to date and describe the next steps. Please let me know if you need any more details top make your decision on continuing the well siting project.

John Jansen, P.G., R.Gp., Ph.D.
Senior Associate

Leggette, Brashears & Graham, Inc.
5939 Wausaukee Rd, West Bend, WI 53095
Cell: (239) 896-0576
Email: john.jansen@lbgmn.com



Village Well

Water Service Area

100 Year Flood Area (White Diagonal Lines Show Floodway)

Designated Wetland Boundary (WI DNR)

Geophysical Survey Locations

(1)—(56) Resistivity Line (Electrode No.)

(1)—(24) Seismic Line (Geophone No.)

0 200 400 Feet

Scale: 1:2,400

Source: ESRI and supporting sources. Village of Kronenwetter. Marathon County. Hydrogeology of the Wisconsin Rivery Valley in Marathon County, Wisconsin - Kendry and Bradbury, 1988. EDR Environmental Data Resources, Inc. FEMA Flood Hazard Firm Data. WI DNR ArcGIS Service Data.

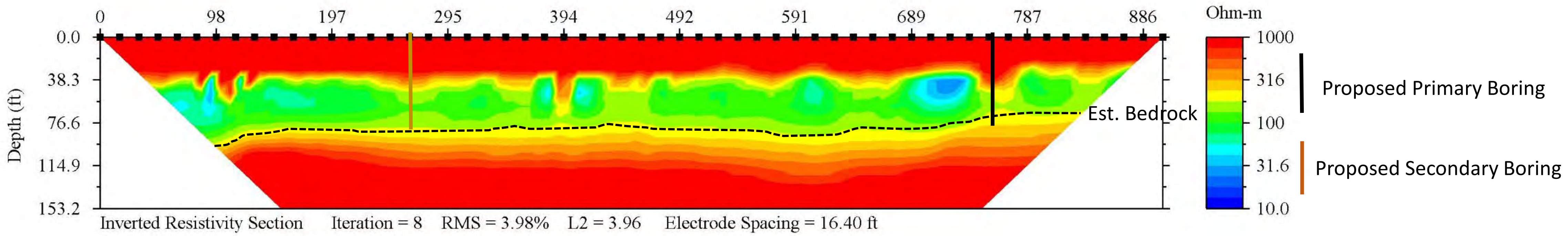
Prepared By:
LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Groundwater and
Environmental Engineering Services
8 Pine Tree Drive, Suite 250
St. Paul, Minnesota 55112
(651) 490-1405

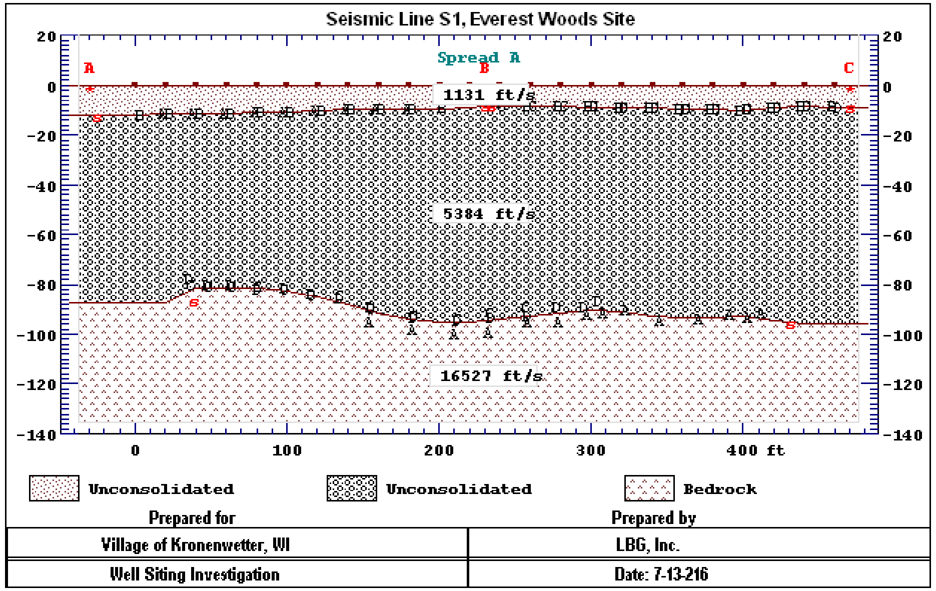
VILLAGE OF KRONENWETTER
KRONENWETTER, WISCONSIN
MARATHON COUNTY

GEOPHYSICAL LOCATIONS

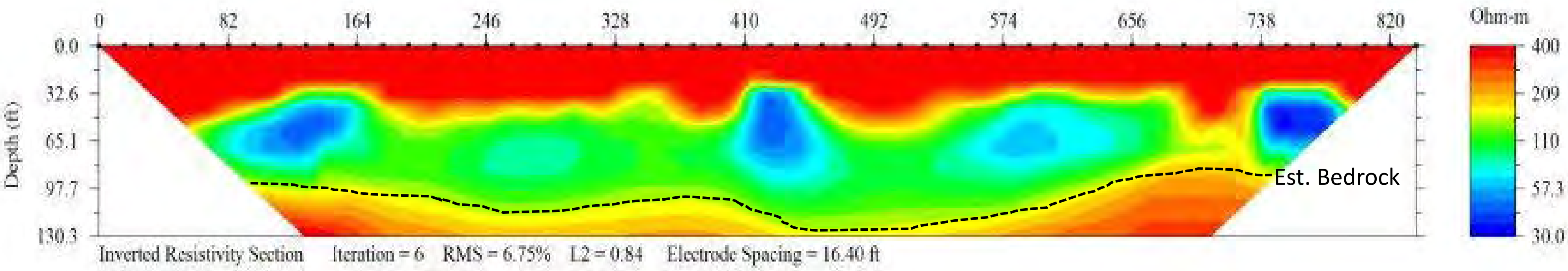
FILE: g3krone01y.MXD | DATE: 7/28/2016 | FIGURE: 1

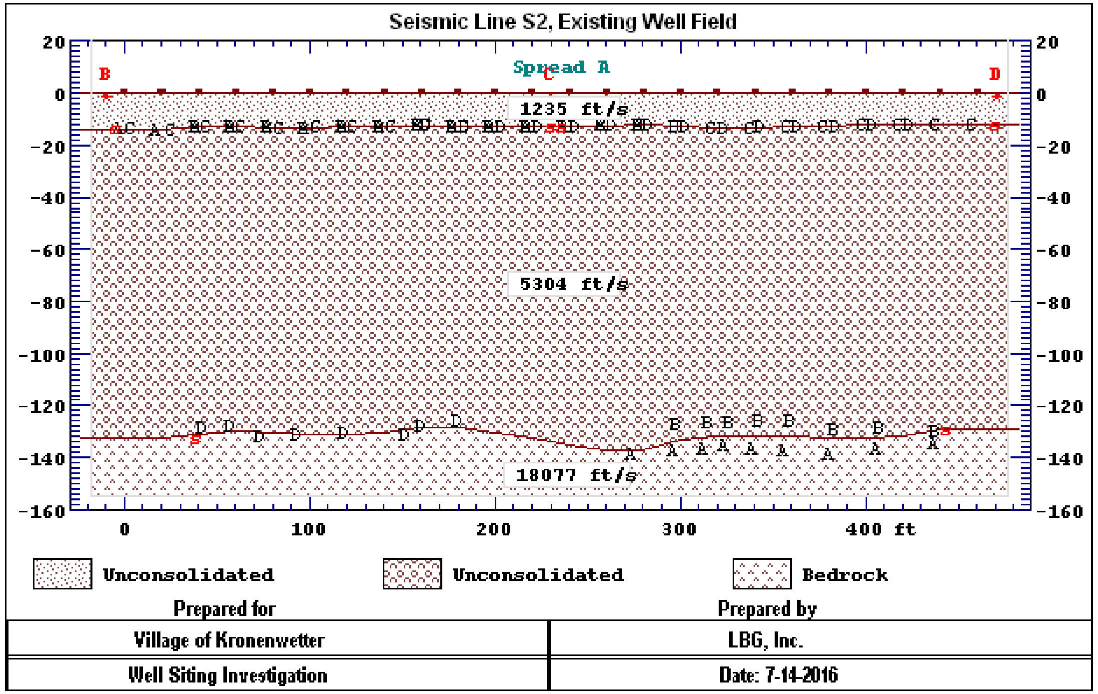
Resistivity Line R1



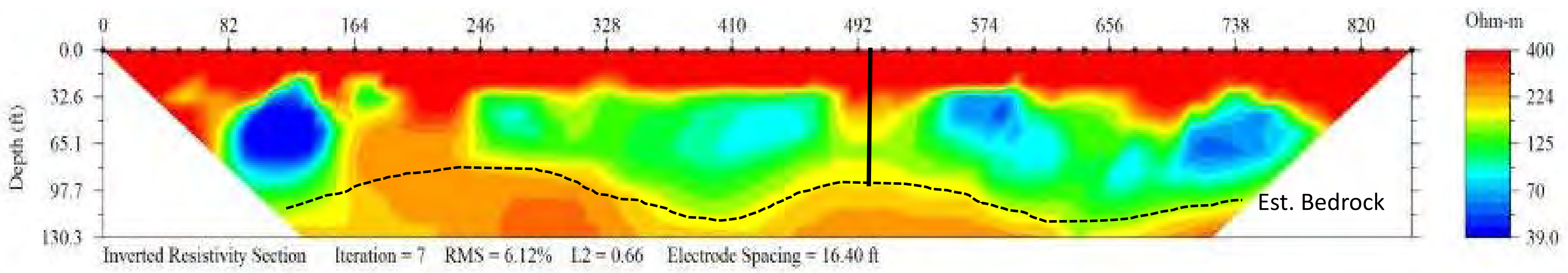


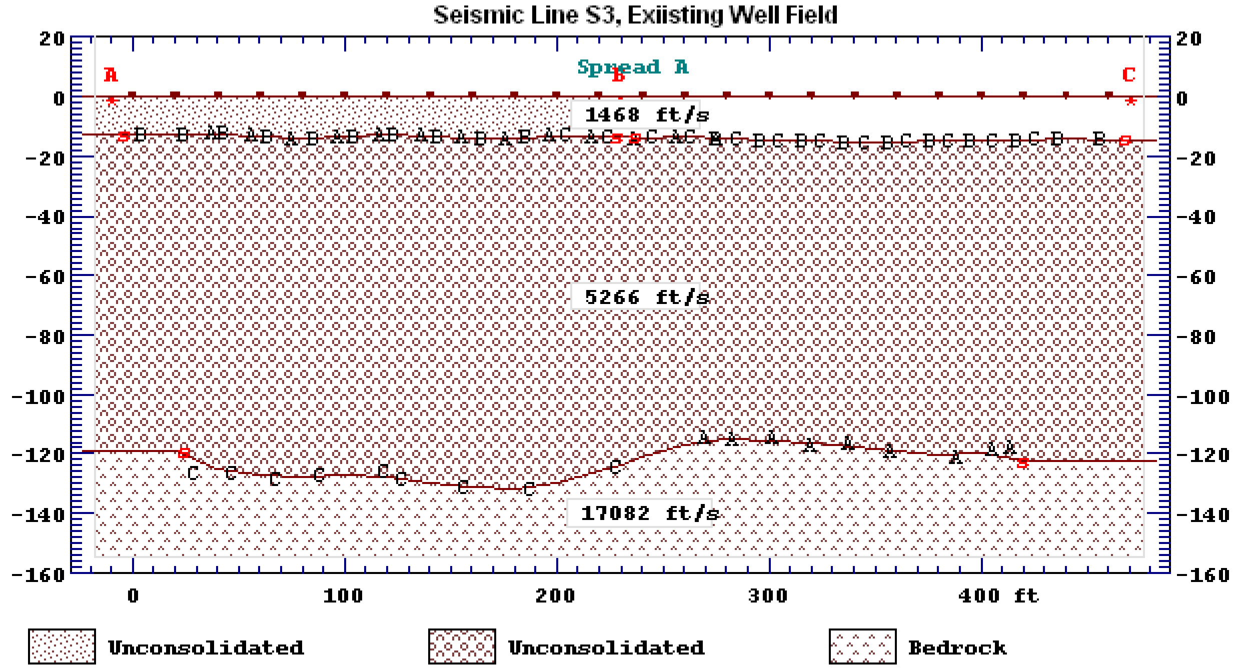
Resistivity Line R2





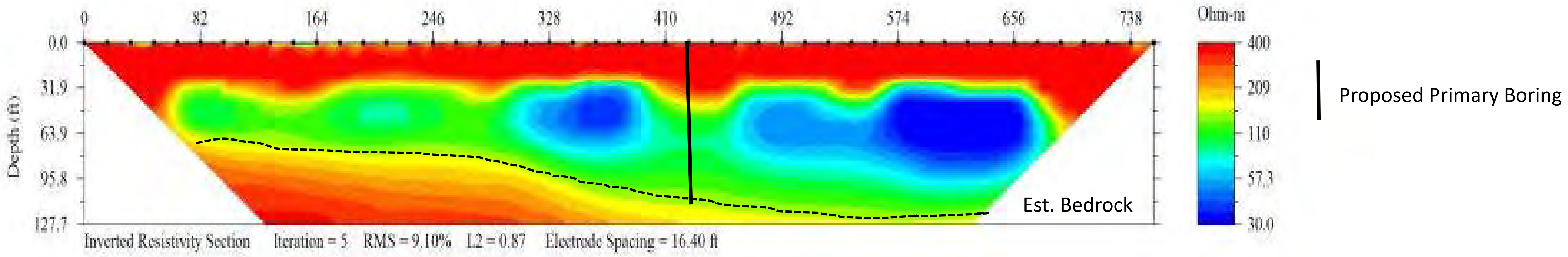
Resistivity Line R3





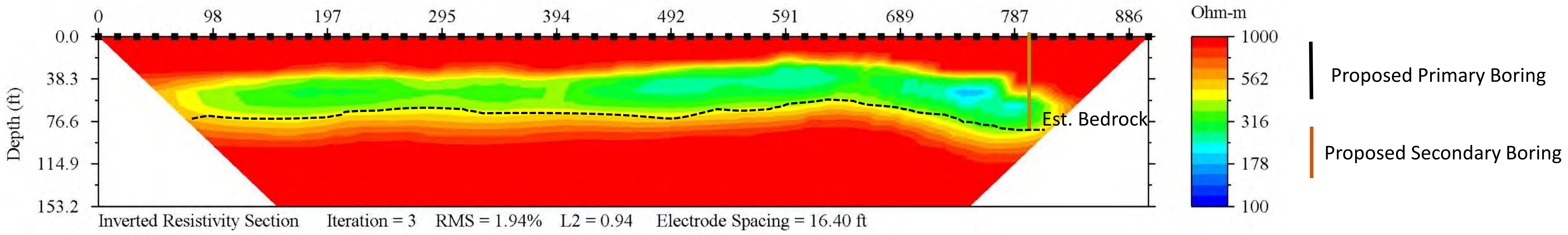
Prepared for	Prepared by
Village of Kronenwetter	LBG, Inc.
Well Siting Investigation	Date: 7-14-2016

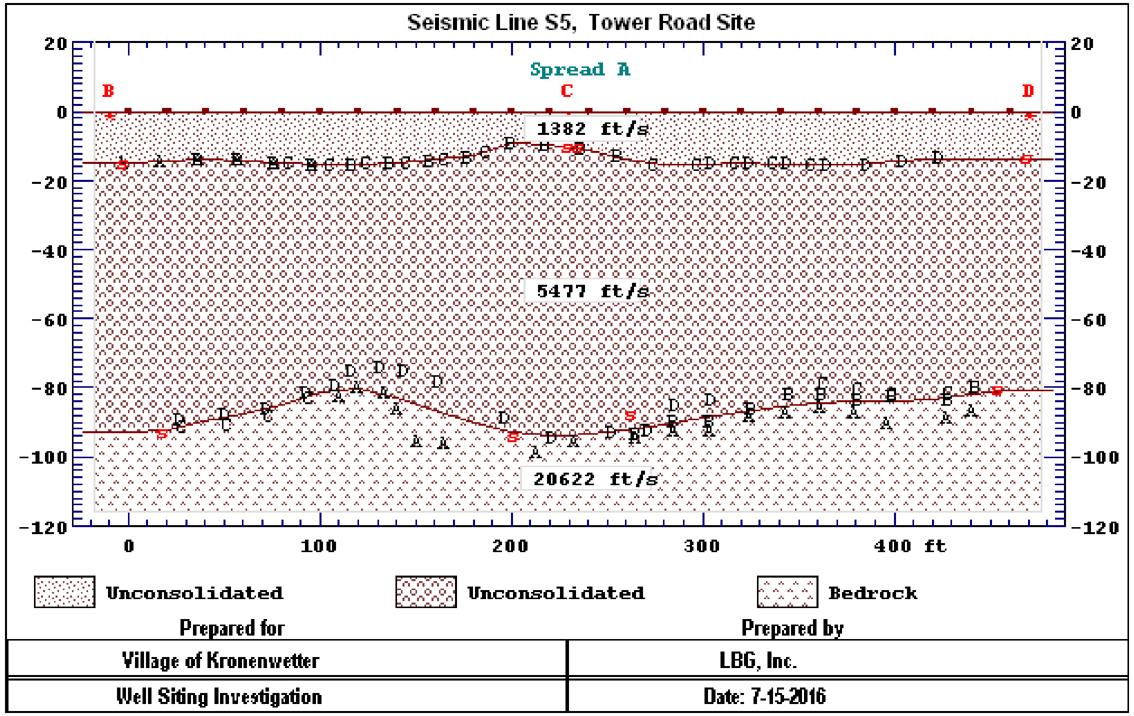
Resistivity Line R4



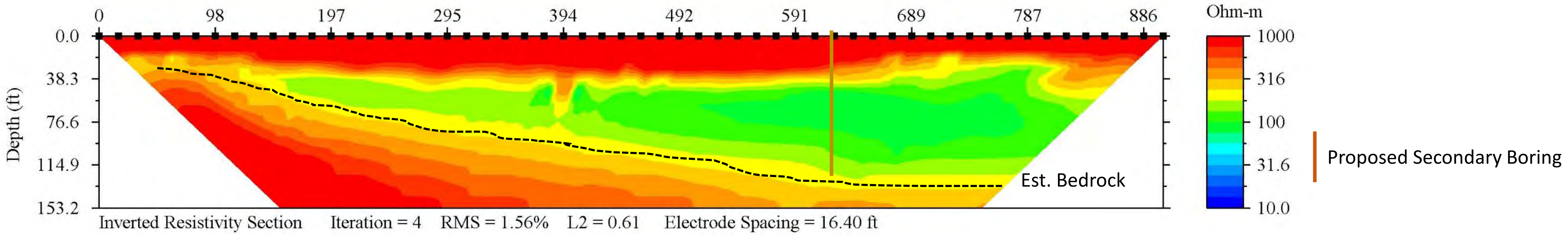
No Seismic Data

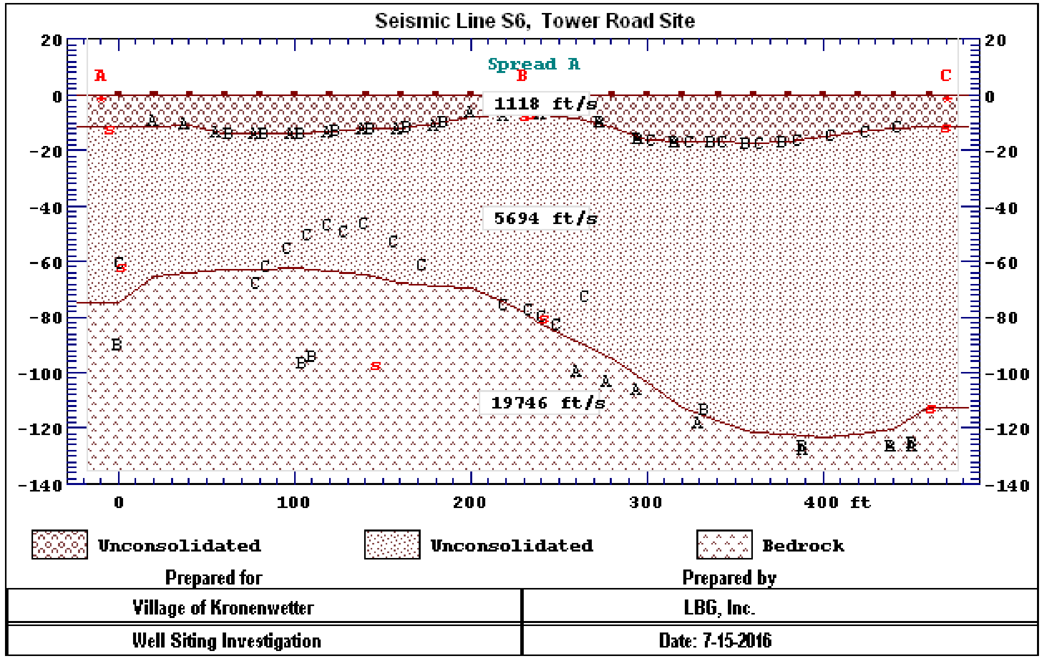
Resistivity Line R5

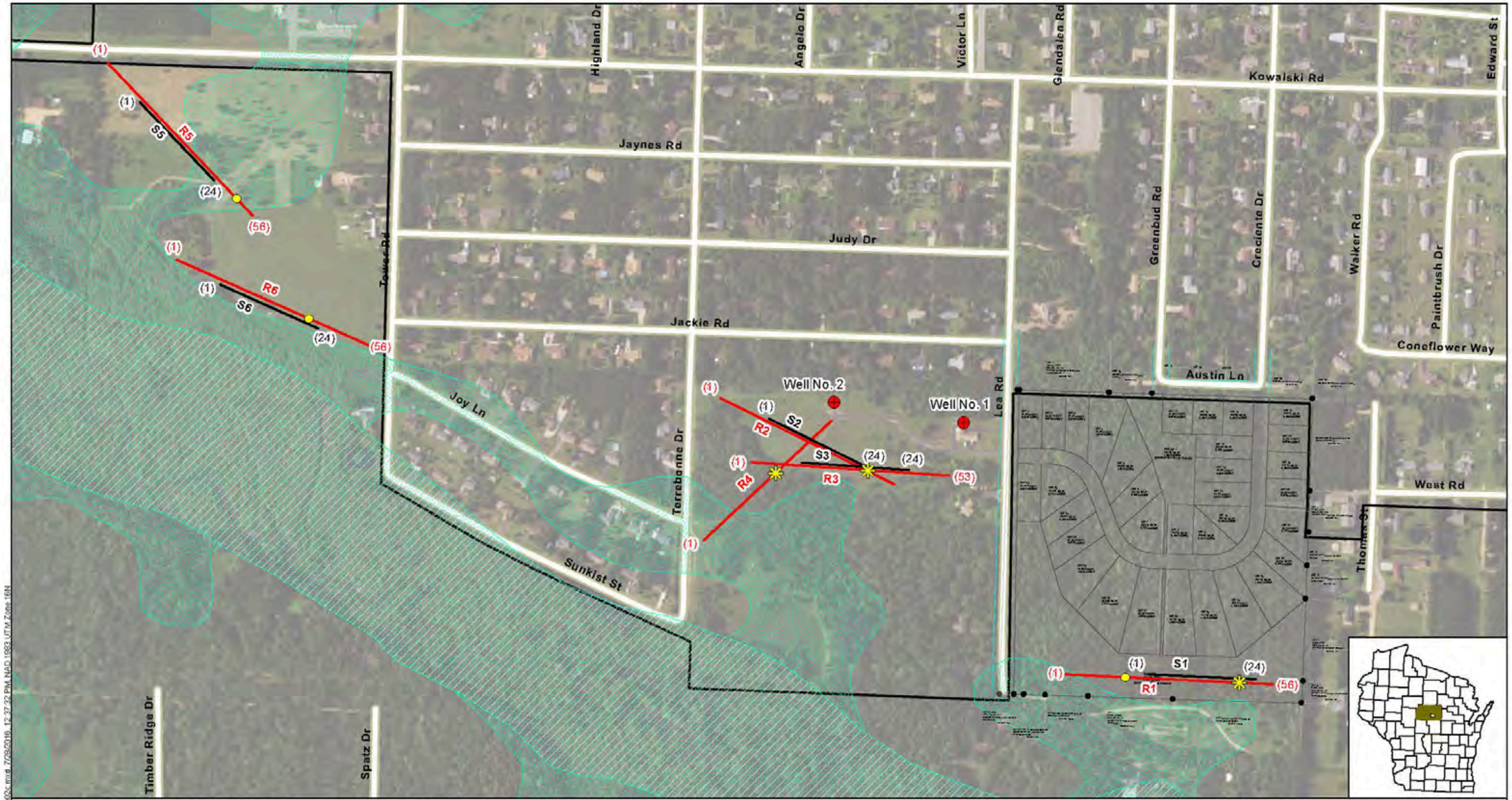




Resistivity Line R6







Village Well
Primary Test Boring
Secondary Test Boring
Water Service Area
100 Year Flood Area (White Diagonal Lines Show Floodway)
Designated Wetland Boundary (WI DNR)

Geophysical Survey Locations

(1) (56) Resistivity Line (Electrode No.)

(1) (24) Seismic Line (Geophone No.)

0 200 400 Feet

Scale: 1:2,400

Source: ESRI and supporting sources. Village of Kronenwetter. Marathon County. Hydrogeology of the Wisconsin Rivery Valley in Marathon County, Wisconsin - Kendry and Bradbury, 1988. EDR Environmental Data Resources, Inc. FEMA Flood Hazard Firm Data. WI DNR ArcGIS Service Data.

Prepared By:
LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Groundwater and
Environmental Engineering Services
8 Pine Tree Drive, Suite 250
St. Paul, Minnesota 55112
(651) 490-1405

VILLAGE OF KRONENWETTER
KRONENWETTER, WISCONSIN
MARATHON COUNTY

PROPOSED TEST BORING LOCATIONS

FILE:	g3krone02c.MXD	DATE:	7/28/2016	FIGURE:	2

Attachment B

Well Construction Reports
and
Well Abandonment Forms

Well Construction Report
WISCONSIN UNIQUE WELL NUMBER XZ 368

State of WI - Private Water Systems-DG/5
Department of Natural Resources, Box 7921
Madison, WI 53707

Property Owner: Village of Kronenwetter — Telephone Number ( )

Mailing Address: 1582 Kronenwetter Dr.

City: Kronenwetter — State: Wi — Zip Code: 54455

County of Well Location: — Co. Well Permit No.: W — Well Completion Date (mm-dd-yyyy): 11-14-2016

Well Constructor (Business Name): — License #: — Facility ID Number (Public Wells):

Address: — Well Plan Approval #:

City — State — Zip Code — Date of Approval (mm/dd/yyyy): / /

Hicap Permanent Well #: — Common Well #: — Specific Capacity: gpm/ft

3. Well serves 1 # of Test Well (For example: home, barn, restaurant, church, school, industry, etc.)

High Capacity: Well? ☐ Yes ☐ No — Property? ☐ Yes ☐ No

1. Well Location
☐ Town ☐ City ☐ Village of — Fire # (if avail.)

Street Address or Road Name and Number

Subdivision Name — Lot # — Block #

Gov't Lot # ___ or ___ 1/4 of ___ 1/4 of
Section ___, T ___ N; R ___ ☐ E ☐ W

Latitude Deg. 44 Min. .83921
Longitude Deg. 89 Min. .62133

Lat/Long Method

2. Well Type ☐ New ☐ Replacement ☐ Reconstruction (see item 12 below)
of previous unique well # ___ constructed in ___
Reason for replaced or reconstructed well? TBS

☐ Drilled ☐ Driven Point ☐ Jetted ☐ Other

4. Is the well located upslope or sideslope and not downslope from any contamination sources, including those on neighboring properties? ☐ Yes ☐ No If no, explain on back side.
Well located within 1,200 feet of a quarry? ☐ Yes ☐ No If yes, distance in feet from quarry:
Well located in floodplain? ☐ Yes ☐ No

Distance in feet from well to nearest: (include proposed)
1. Landfill
2. Building Overhang
3. Septic ☐ Holding Tank ☐
4. Sewage Absorption Unit
5. Nonconforming Pit
6. Buried Home Heating Oil Tank
7. Buried Petroleum Tank
8. Shoreline ☐ Swimming Pool ☐
9. Downspout/Yard Hydrant
10. Privy
11. Foundation Drain to Clearwater
12. Foundation Drain to Sewer
13. Building Drain ☐ Cast Iron or Plastic ☐ Other
14. Building Sewer ☐ Gravity ☐ Pressure ☐ Cast Iron or Plastic ☐ Other
15. Collector Sewer: ☐ sanitary ___ units ___ in. diam. ☐ storm ☐ ≤ 6" ☐ > 6"
16. Clearwater Sump
17. Wastewater Sump
18. Paved Animal Barn Pen
19. Animal Yard or Shelter
20. Silo
21. Barn Gutter
22. Manure Pipe ☐ Gravity ☐ Pressure ☐ Cast Iron or Plastic ☐ Other
23. Other Manure Storage
24. Ditch
25. Other NR 812 Waste Source

5. Drillhole Dimensions and Construction Method

Dia.(in.)	From (ft.)	To (ft.)
6	surface	142

Upper Enlarged Drillhole / Lower Open Bedrock:
- ☐ 1. Rotary - Mud Circulation ☐
- ☐ 2. Rotary - Air ☐
- ☐ 3. Rotary - Air and Foam ☐
- ☒ 4. Drill-Through Casing Hammer
- ☐ 5. Reverse Rotary
- ☐ 6. Cable-tool Bit ___ in. dia. ☐
- ☐ 7. Temp. Outer Casing ___ in. dia. Removed? ___ depth ft. ☐ Yes ☐ No - If no, explain on back side.
- ☐ 8. Dual Rotary ☐

8. Geology

Geology Codes	Type, Caving/Noncaving, Color, Hardness, etc.	From (ft.)	To (ft.)
	Sand & Gravel	surface	41
	Silty Fine Sand	41	105
	Sand & Gravel	105	109
	Gray Clay	109	130
	Broke Rock & Clay	130	141
	Bedrock	141	142

6. Casing, Liner, Screen

Dia. (in.)	Material, Weight, Specification Manufacturer & Method of Assembly	From (ft.)	To (ft.)
6"	Astm A53B 6.625x.280	surface	120

Dia. (in.)	Screen type, material & slot size	From	To

7. Grout or Other Sealing Material
Method

Kind of Sealing Material	From (ft.)	To (ft.)	# Sacks Cement
	surface		
(Gravel pack if applicable)			

9. Static Water Level
___ ft. above ground surface
10' ft. below ground surface

11. Well Is: 15 in. ☒ Above ☐ Below Grade

10. Pump Test
Pumping level 34 ft. below surface
Pumping at 136 GPM/GPH for 4 Hrs.

Developed? ☒ Yes ☐ No
Disinfected? ☒ Yes ☐ No
Capped? ☒ Yes ☐ No

12. Did you permanently abandon and fill all unused, noncomplying or unsafe wells on this property?
☐ Yes ☐ No If no, explain on reverse.

13. Signature of Well Constructor or Supervisory Driller: Daniel Steffen — Date Signed

Print Name of Drill Rig Operator (Mandatory unless same as above) Date

Make additional comments on reverse side about geology, additional screens, water quality, etc.
Comments on reverse side ___ (CHECK √, IF YES) Variance Issued ☐ Yes ☐ No

Notification #

DNR

Well Construction Report

WISCONSIN UNIQUE WELL NUMBER XZ 368

State of WI - Private Water Systems-DG/5, Department of Natural Resources, Box 7921, Madison, WI 53707

Property Owner: Village of Kronenwetter
Telephone Number: ( )
Mailing Address:
City: State: Zip Code:
County of Well Location: Co. Well Permit No. W
Well Completion Date (mm-dd-yyyy): 11-15-2016

1. Well Location
☐ Town ☐ City ☐ Village of
Street Address or Road Name and Number
Subdivision Name — Lot # — Block #
Gov't Lot # ___ or ___ 1/4 of ___ 1/4 of
Section ___, T ___ N; R ___ ☐ E ☐ W
Latitude Deg. 44 Min. .83919
Longitude Deg. 89 Min. .62240
Lat/Long Method

Well Constructor (Business Name) — License #
Facility ID Number (Public Wells)
Address
Well Plan Approval #
City — State — Zip Code
Date of Approval (mm/dd/yyyy) / /
Hicap Permanent Well # — Common Well #
Specific Capacity ___ gpm/ft

2. Well Type ☐ New ☐ Replacement ☐ Reconstruction (see item 12 below)
of previous unique well # ___ constructed in ___
Reason for replaced or reconstructed well? TB 6
☐ Drilled ☐ Driven Point ☐ Jetted ☐ Other

3. Well serves 6 # of Test well (For example: home, barn, restaurant, church, school, industry, etc.)
High Capacity: Well? ☐ Yes ☐ No Property? ☐ Yes ☐ No

4. Is the well located upslope or sideslope and not downslope from any contamination sources, including those on neighboring properties? ☐ Yes ☐ No If no, explain on back side.
Well located within 1,200 feet of a quarry? ☐ Yes ☐ No If yes, distance in feet from quarry:
Well located in floodplain? ☐ Yes ☐ No

Distance in feet from well to nearest: (include proposed)
___ 1. Landfill
___ 2. Building Overhang
___ 3. Septic ☐ Holding Tank ☐
___ 4. Sewage Absorption Unit
___ 5. Nonconforming Pit
___ 6. Buried Home Heating Oil Tank
___ 7. Buried Petroleum Tank
___ 8. Shoreline ☐ Swimming Pool ☐
___ 9. Downspout/Yard Hydrant
___ 10. Privy
___ 11. Foundation Drain to Clearwater
___ 12. Foundation Drain to Sewer
___ 13. Building Drain ☐ Cast Iron or Plastic ☐ Other
___ 14. Building Sewer ☐ Gravity ☐ Pressure ☐ Cast Iron or Plastic ☐ Other
___ 15. Collector Sewer: ☐ sanitary ___ units ___ in. diam. ☐ storm ☐ ≤ 6" ☐ > 6"
___ 16. Clearwater Sump
___ 17. Wastewater Sump
___ 18. Paved Animal Barn Pen
___ 19. Animal Yard or Shelter
___ 20. Silo
___ 21. Barn Gutter
___ 22. Manure Pipe ☐ Gravity ☐ Pressure ☐ Cast Iron or Plastic ☐ Other
___ 23. Other Manure Storage
___ 24. Ditch
___ 25. Other NR 812 Waste Source

5. Drillhole Dimensions and Construction Method

Dia. (in.)	From (ft.)	To (ft.)
6	surface	124

Upper Enlarged Drillhole / Lower Open Bedrock:
☐ 1. Rotary - Mud Circulation ☐
☐ 2. Rotary - Air ☐
☐ 3. Rotary - Air and Foam ☐
☒ 4. Drill-Through Casing Hammer
☐ 5. Reverse Rotary
☐ 6. Cable-tool Bit ___ in. dia. ☐
☐ 7. Temp. Outer Casing ___ in. dia. Removed? ___ depth ft. ☐ Yes ☐ No - If no, explain on back side.
☐ 8. Dual Rotary ☐

8. Geology (Type, Caving/Noncaving, Color, Hardness, etc.)

Geology Codes	Geology	From (ft.)	To (ft.)
	Sand + Gravel	surface	10
	Sand	10	32
	Fine Silty Sand	32	90
	Clay + Silty Sand	90	103
	Gray Clay Broken Granite	103	120
	Bedrock	120	124

6. Casing, Liner, Screen

Dia. (in.)	Material, Weight, Specification, Manufacturer & Method of Assembly	From (ft.)	To (ft.)
6"	Astm A53B 6.625x.280	surface	100

Dia. (in.)	Screen type, material & slot size	From	To

7. Grout or Other Sealing Material
Method

Kind of Sealing Material	From (ft.)	To (ft.)	# Sacks Cement
	surface		
(Gravel pack if applicable)			

9. Static Water Level
___ ft. above ground surface
___ ft. below ground surface

11. Well Is: ___ in. ☐ Above ☐ Below Grade

10. Pump Test
Pumping level ___ ft. below surface
Pumping at ___ GPM/GPH for ___ Hrs.

Developed? ☐ Yes ☐ No
Disinfected? ☐ Yes ☐ No
Capped? ☐ Yes ☐ No

12. Did you permanently abandon and fill all unused, noncomplying or unsafe wells on this property? ☐ Yes ☐ No If no, explain on reverse.

13. Signature of Well Constructor or Supervisory Driller: Dan Steffen — Date Signed
Print Name of Drill Rig Operator (Mandatory unless same as above) Date

Make additional comments on reverse side about geology, additional screens, water quality, etc. Notification #
Comments on reverse side ___ (CHECK √, IF YES) Variance Issued ☐ Yes ☐ No

DNR

Well Construction Report
WISCONSIN UNIQUE WELL NUMBER XZ 368

State of WI - Private Water Systems-DG/5
Department of Natural Resources, Box 7921
Madison, WI 53707

Property Owner: Village Konenwetter
Telephone Number ( )
Mailing Address
City | State | Zip Code
County of Well Location | Co. Well Permit No. W | Well Completion Date (mm-dd-yyyy) 11-15-2016

1. Well Location
☐ Town ☐ City ☐ Village of
Fire # (If avail.)
Street Address or Road Name and Number
Subdivision Name | Lot # | Block #
Gov't Lot # ___ or ___ 1/4 of ___ 1/4 of
Section ___, T ___ N; R ___ ☐E ☐W
Latitude Deg. 44 Min. 84020
Longitude Deg. 89 Min. 63052
Lat/Long Method

Well Constructor (Business Name) | License #
Address
City | State | Zip Code
Hicap Permanent Well # | Common Well #

Facility ID Number (Public Wells)
Well Plan Approval #
Date of Approval (mm/dd/yyyy)
Specific Capacity ___ gpm/ft
High Capacity: Well? ☐Yes ☐No Property? ☐Yes ☐No

2. Well Type ☐ New ☐ Replacement ☐ Reconstruction
(see item 12 below)
of previous unique well # ___ constructed in ___
Reason for replaced or reconstructed well? TB # 7
☐ Drilled ☐ Driven Point ☐ Jetted ☐ Other

3. Well serves 7 # of Test well
(For example: home, barn, restaurant, church, school, industry, etc.)

4. Is the well located upslope or sideslope and not downslope from any contamination sources, including those on neighboring properties? ☐ Yes ☐ No If no, explain on back side.
Well located within 1,200 feet of a quarry? ☐Yes ☐ No If yes, distance in feet from quarry: ___
Well located in floodplain? ☐Yes ☐ No

Distance in feet from well to nearest: (include proposed)
___ 1. Landfill
___ 2. Building Overhang
___ 3. Septic ☐ Holding Tank ☐
___ 4. Sewage Absorption Unit
___ 5. Nonconforming Pit
___ 6. Buried Home Heating Oil Tank
___ 7. Buried Petroleum Tank
___ 8. Shoreline ☐ Swimming Pool ☐
___ 9. Downspout/Yard Hydrant
___ 10. Privy
___ 11. Foundation Drain to Clearwater
___ 12. Foundation Drain to Sewer
___ 13. Building Drain
☐ Cast Iron or Plastic ☐ Other
___ 14. Building Sewer ☐Gravity ☐ Pressure
☐ Cast Iron or Plastic ☐ Other
___ 15. Collector Sewer:
☐ sanitary ___ units ___ in. diam.
☐ storm ☐ ≤ 6" ☐ > 6"
___ 16. Clearwater Sump
___ 17. Wastewater Sump
___ 18. Paved Animal Barn Pen
___ 19. Animal Yard or Shelter
___ 20. Silo
___ 21. Barn Gutter
___ 22. Manure Pipe ☐Gravity ☐ Pressure
☐ Cast Iron or Plastic ☐ Other
___ 23. Other Manure Storage ___
___ 24. Ditch
___ 25. Other NR 812 Waste Source

5. Drillhole Dimensions and Construction Method

Dia.(in.)	From (ft.)	To (ft.)
6	surface	84

Upper Enlarged Drillhole / Lower Open Bedrock
☐ 1. Rotary - Mud Circulation ☐
☐ 2. Rotary - Air ☐
☐ 3. Rotary - Air and Foam ☐
☐ 4. Drill-Through Casing Hammer
☐ 5. Reverse Rotary
☐ 6. Cable-tool Bit ___ in. dia. ☐
☐ 7. Temp. Outer Casing ___ in. dia. Removed? ___ depth ft.
☐ Yes ☐No - If no, explain on back side.
☐ 8. Dual Rotary ☐

8. Geology

Geology Codes	Type, Caving/Noncaving, Color, Hardness, etc.	From (ft.)	To (ft.)
	Fine Sand	surface	52
	Clay Silty Sand	52	56
	Clay Broken Granite	56	80
	Bedrock	80	84

6. Casing, Liner, Screen

Dia. (in.)	Material, Weight, Specification Manufacturer & Method of Assembly	From (ft.)	To (ft.)
6	Astm A53B 6.625x.280	surface	60

Dia. (in.)	Screen type, material & slot size	From	To

7. Grout or Other Sealing Material
Method ___

Kind of Sealing Material	From (ft.)	To (ft.)	# Sacks Cement
	surface		
(Gravel pack if applicable)			

9. Static Water Level
___ ft. above ground surface
___ ft. below ground surface

11. Well Is: ___ in. ☐ Above ☐ Below Grade

10. Pump Test
Pumping level ___ ft. below surface
Pumping at ___ GPM/GPH for ___ Hrs.

Developed? ☐ Yes ☐ No
Disinfected? ☐ Yes ☐ No
Capped? ☐ Yes ☐ No

12. Did you permanently abandon and fill all unused, noncomplying or unsafe wells on this property?
☐ Yes ☐ No If no, explain on reverse.

13. Signature of Well Constructor or Supervisory Driller: Dan Steffey | Date Signed
Print Name of Drill Rig Operator (Mandatory unless same as above) Date

Make additional comments on reverse side about geology, additional screens, water quality, etc.
Comments on reverse side ___ (CHECK √, IF YES) Variance Issued ☐ Yes ☐ No
Notification #

DNR

Well Construction Report
WISCONSIN UNIQUE WELL NUMBER XZ 368

State of WI - Private Water Systems-DG/5
Department of Natural Resources, Box 7921
Madison, WI 53707

Form [illegible]

Property Owner: Village Kronenwetter | Telephone Number ( )

Mailing Address:

City: | State: | Zip Code:

County of Well Location: | Co. Well Permit No. W | Well Completion Date (mm-dd-yyyy): 11-16-2016

Well Constructor (Business Name): | License #: | Facility ID Number (Public Wells):

Address: | Well Plan Approval #:

City: | State: | Zip Code: | Date of Approval (mm/dd/yyyy): / /

Hicap Permanent Well #: | Common Well #: | Specific Capacity: gpm/ft

3. Well serves 8 # of Testwell (For example: home, barn, restaurant, church, school, industry, etc.)

High Capacity: Well? ☐ Yes ☐ No Property? ☐ Yes ☐ No

1. Well Location
☐ Town ☐ City ☐ Village of | Fire # (If avail.)

Street Address or Road Name and Number:

Subdivision Name: | Lot #: | Block #:

Gov't Lot # ___ or ___ 1/4 of ___ 1/4 of Section ___, T ___ N; R ___ ☐ E ☐ W

Latitude Deg. 44 Min. .83637
Longitude Deg. 89 Min. .61701

Lat/Long Method:

2. Well Type
☐ New ☐ Replacement ☐ Reconstruction (see item 12 below)

of previous unique well # ___ constructed in ___

Reason for replaced or reconstructed well? TB #8

☐ Drilled ☐ Driven Point ☐ Jetted ☐ Other

4. Is the well located upslope or sideslope and not downslope from any contamination sources, including those on neighboring properties? ☐ Yes ☐ No (If no, explain on back side.)

Well located within 1,200 feet of a quarry? ☐ Yes ☐ No If yes, distance in feet from quarry: ___

Well located in floodplain? ☐ Yes ☐ No

Distance in feet from well to nearest: (include proposed)

___ 1. Landfill
___ 2. Building Overhang
___ 3. Septic ☐ Holding Tank ☐
___ 4. Sewage Absorption Unit
___ 5. Nonconforming Pit
___ 6. Buried Home Heating Oil Tank
___ 7. Buried Petroleum Tank
___ 8. Shoreline ☐ Swimming Pool ☐
___ 9. Downspout/Yard Hydrant
___ 10. Privy
___ 11. Foundation Drain to Clearwater
___ 12. Foundation Drain to Sewer
___ 13. Building Drain ☐ Cast Iron or Plastic ☐ Other
___ 14. Building Sewer ☐ Gravity ☐ Pressure ☐ Cast Iron or Plastic ☐ Other
___ 15. Collector Sewer: ☐ sanitary ___ units ___ in. diam. ☐ storm ☐ ≤ 6" ☐ > 6"
___ 16. Clearwater Sump
___ 17. Wastewater Sump
___ 18. Paved Animal Barn Pen
___ 19. Animal Yard or Shelter
___ 20. Silo
___ 21. Barn Gutter
___ 22. Manure Pipe ☐ Gravity ☐ Pressure ☐ Cast Iron or Plastic ☐ Other
___ 23. Other Manure Storage ___
___ 24. Ditch
___ 25. Other NR 812 Waste Source

5. Drillhole Dimensions and Construction Method

Dia.(in.)	From (ft.)	To (ft.)
6	surface	125

Upper Enlarged Drillhole / Lower Open Bedrock:
- ☐ 1. Rotary - Mud Circulation ☐
- ☐ 2. Rotary - Air ☐
- ☐ 3. Rotary - Air and Foam ☐
- ☒ 4. Drill-Through Casing Hammer
- ☐ 5. Reverse Rotary
- ☐ 6. Cable-tool Bit ___ in. dia. ☐
- ☐ 7. Temp. Outer Casing ___ in. dia. Removed? ___ depth ft. ☐ Yes ☐ No - If no, explain on back side.
- ☐ 8. Dual Rotary ☐

8. Geology

Geology Codes	Type, Caving/Noncaving, Color, Hardness, etc.	From (ft.)	To (ft.)
	Course Sand n Gravel	surface	30
	Fine Silty Sand	30	75
	Tan Clay & Sand	75	85
	Clay Gray & Granite	85	120
	Granite	120	125

6. Casing, Liner, Screen

Dia. (in.)	Material, Weight, Specification, Manufacturer & Method of Assembly	From (ft.)	To (ft.)
6"	Astm A53B 6.625x.280	surface	100

Dia. (in.)	Screen type, material & slot size	From	To

9. Static Water Level
___ ft. above ground surface
___ ft. below ground surface

11. Well Is:
20 in. ☒ Above ☐ Below Grade

10. Pump Test
25GPM
Pumping level ___ ft. below surface
Pumping at ___ GPM/GPH for ___ Hrs.

Developed? ☐ Yes ☐ No
Disinfected? ☐ Yes ☐ No
Capped? ☐ Yes ☐ No

7. Grout or Other Sealing Material
Method: Mounded

Kind of Sealing Material	From (ft.)	To (ft.)	# Sacks Cement
Granular Bentonite	surface		2
(Gravel pack if applicable)			

12. Did you permanently abandon and fill all unused, noncomplying or unsafe wells on this property? ☐ Yes ☐ No If no, explain on reverse.

13. Signature of Well Constructor or Supervisory Driller: [signature] | Date Signed:

Print Name of Drill Rig Operator (Mandatory unless same as above) | Date

Make additional comments on reverse side about geology, additional screens, water quality, etc. | Notification #

Comments on reverse side ___ (CHECK √, IF YES) Variance Issued ☐ Yes ☐ No

DNR

Well Construction Report

WISCONSIN UNIQUE WELL NUMBER XZ 368

State of WI - Private Water Systems-DG/5
Department of Natural Resources, Box 7921
Madison, WI 53707

Property Owner: Village Kronenwetter	Telephone Number ( )
Mailing Address	
City	State	Zip Code
County of Well Location	Co. Well Permit No. W	Well Completion Date (mm-dd-yyyy) 11-18-2016

1. Well Location ☐ Town ☐ City ☐ Village of

Street Address or Road Name and Number

Subdivision Name | Lot # | Block #

Gov't Lot # ___ or ___ 1/4 of ___ 1/4 of Section ___, T ___ N; R ___ ☐E ☐W

Latitude Deg. 44 Min. 83881

Longitude Deg. 89 Min. .62348

Lat/Long Method

Well Constructor (Business Name)	License #	Facility ID Number (Public Wells)
Address		Well Plan Approval #
City	State	Zip Code	Date of Approval (mm/dd/yyyy)
Hicap Permanent Well #	Common Well #	Specific Capacity gpm/ft

2. Well Type ☐ New ☐ Replacement ☐ Reconstruction (see item 12 below) of previous unique well # ___ constructed in ___

Reason for replaced or reconstructed well? TBT

☐ Drilled ☐ Driven Point ☐ Jetted ☐ Other

3. Well serves 9 # of Test Well (For example: home, barn, restaurant, church, school, industry, etc.)

High Capacity: Well? ☐ Yes ☐ No Property? ☐ Yes ☐ No

4. Is the well located upslope or sideslope and not downslope from any contamination sources, including those on neighboring properties? ☐ Yes ☐ No If no, explain on back side.

Well located within 1,200 feet of a quarry? ☐ Yes ☐ No If yes, distance in feet from quarry: ___

Well located in floodplain? ☐ Yes ☐ No

Distance in feet from well to nearest: (include proposed)

- ___ 1. Landfill
- ___ 2. Building Overhang
- ___ 3. Septic ☐ Holding Tank ☐
- ___ 4. Sewage Absorption Unit
- ___ 5. Nonconforming Pit
- ___ 6. Buried Home Heating Oil Tank
- ___ 7. Buried Petroleum Tank
- ___ 8. Shoreline ☐ Swimming Pool ☐
- ___ 9. Downspout/Yard Hydrant
- ___ 10. Privy
- ___ 11. Foundation Drain to Clearwater
- ___ 12. Foundation Drain to Sewer
- ___ 13. Building Drain ☐ Cast Iron or Plastic ☐ Other
- ___ 14. Building Sewer ☐ Gravity ☐ Pressure ☐ Cast Iron or Plastic ☐ Other
- ___ 15. Collector Sewer: ☐ sanitary ___ units ___ in. diam. ☐ storm ☐ ≤ 6" ☐ > 6"
- ___ 16. Clearwater Sump
- ___ 17. Wastewater Sump
- ___ 18. Paved Animal Barn Pen
- ___ 19. Animal Yard or Shelter
- ___ 20. Silo
- ___ 21. Barn Gutter
- ___ 22. Manure Pipe ☐ Gravity ☐ Pressure ☐ Cast Iron or Plastic ☐ Other
- ___ 23. Other Manure Storage
- ___ 24. Ditch
- ___ 25. Other NR 812 Waste Source

5. Drillhole Dimensions and Construction Method

Dia.(in.)	From (ft.)	To (ft.)	Upper Enlarged Drillhole	Lower Open Bedrock
6	surface	105	☐ 1. Rotary - Mud Circulation	☐
			☐ 2. Rotary - Air	☐
			☐ 3. Rotary - Air and Foam	☐
			☒ 4. Drill-Through Casing Hammer	
			☐ 5. Reverse Rotary	
			☐ 6. Cable-tool Bit ___ in. dia.	☐
			☐ 7. Temp. Outer Casing ___ in. dia. Removed? ___ depth ft. ☐ Yes ☐ No - If no, explain on back side.	
			☐ 8. Dual Rotary	☐

8. Geology

Geology Codes	Type, Caving/Noncaving, Color, Hardness, etc.	From (ft.)	To (ft.)
	Course Sand + Gravel	surface	20
	Fine Sand Silty	20	80
	Gray Clay	80	83
	Gray Clay Broken Granite	83	105

6. Casing, Liner, Screen

Dia. (in.)	Material, Weight, Specification Manufacturer & Method of Assembly	From (ft.)	To (ft.)
6"	ASTM A53 B 6.625 x .280	surface	100

Dia. (in.)	Screen type, material & slot size	From	To

9. Static Water Level

___ ft. above ground surface

7 ft. below ground surface

11. Well Is: 24 in. ☒ Above ☐ Below Grade

10. Pump Test

Pumping level 42 ft. below surface

Pumping at 120 GPM/GPH for 3 Hrs.

Developed? ☒ Yes ☐ No

Disinfected? ☒ Yes ☐ No

Capped? ☒ Yes ☐ No

7. Grout or Other Sealing Material

Method ___

Kind of Sealing Material	From (ft.)	To (ft.)	# Sacks Cement
	surface		
(Gravel pack if applicable)			

12. Did you permanently abandon and fill all unused, noncomplying or unsafe wells on this property? ☐ Yes ☐ No If no, explain on reverse.

13. Signature of Well Constructor or Supervisory Driller: Dan Steffes | Date Signed

Print Name of Drill Rig Operator (Mandatory unless same as above) Date

Make additional comments on reverse side about geology, additional screens, water quality, etc.

Comments on reverse side ___ (CHECK √, IF YES) Variance Issued ☐ Yes ☐ No

Notification #

DNR

WISCONSIN UNIQUE WELL NUMBER

Source:

State of WI-Private Water Systems-DG/2 Form 3300-77A
Department Of Natural Resources, Box 7921 (Rev 02/02)bw
Madison, WI 53707

Depth FT

Property Owner: Village of Kronenwetter	Telephone Number: - -
Mailing Address: 1582 Kronenwetter Dr.	
City: Kronenwetter	State: WI	Zip Code: 54455
County of Well Location:	Co Well Permit No: W	Well Completion Date:
Well Constructor:	License #:	Facility ID (Public):
Address:		Public Well Plan Approval#:
City:	State:	Zip Code:	Date Of Approval:
Hicap Permanent Well #:	Common Well #:	Specific Capacity: gpm/ft

1. Well Location

T=Town C=City V=Village of — Fire#

Street Address or Road Name and Number:

Subdivision Name: — Lot#: — Block #:

Gov't Lot or 1/4 of 1/4 of

Section 12 T 27 N R 07 E

2. Well Type (See item 12 below)

1=New 2=Replacement 3=Reconstruction

of previous unique well# ______ constructed in ______

Reason for replaced or reconstructed Well? TBID

1=Drilled 2=Driven Point 3=Jetted 4=Other

3. Well Serves # of homes and or Test well (eg: barn, restaurant, church, school, industry, etc.) High Capacity Well? Property?

M=Munic O=OTM N=NonCom P=Private Z=Other X=NonPot A=Anode L=Loop H=Drillhole

4. Is the well located upslope or sideslope and not downslope from any contamination sources, including those on neighboring properties?
Well located in floodplain?
Distance in feet from well to nearest: (including proposed)

1. Landfill
2. Building Overhang
3. 1=Septic 2= Holding Tank
4. Sewage Absorption Unit
5. Nonconforming Pit
6. Buried Home Heating Oil Tank
7. Buried Petroleum Tank
8. 1=Shoreline 2= Swimming Pool
9. Downspout/ Yard Hydrant
10. Privy
11. Foundation Drain to Clearwater
12. Foundation Drain to Sewer
13. Building Drain 1=Cast Iron or Plastic 2=Other
14. Building Sewer 1=Gravity 2=Pressure 1=Cast Iron or Plastic 2=Other
15. Collector Sewer: ___ units ___ in. diam.
16. Clearwater Sump
17. Wastewater Sump
18. Paved Animal Barn Pen
19. Animal Yard or Shelter
20. Silo
21. Barn Gutter
22. Manure Pipe 1=Gravity 2=Pressure 1=Cast iron or Plastic 2=Other
23. Other manure Storage
24. Ditch
25. Other NR 812 Waste Source

5. Drillhole Dimensions and Construction Method

Dia.(in.)	From (ft)	To (ft)
6	surface	140

Upper Enlarged Drillhole / Lower Open Bedrock
-- 1. Rotary - Mud Circulation
-- 2. Rotary - Air
-- 3. Rotary - Air and Foam
-- 4. Drill-Through Casing Hammer
-- 5. Reverse Rotary
-- 6. Cable-tool Bit ___ in. dia
-- 7. Temp. Outer Casing ___ in. dia ___ depth ft. Removed ?
Other

8. Geology

Geology Codes	Type, Caving/Noncaving, Color, Hardness, etc	From (ft.)	To (ft.)
	Sand + Gravel	0	36
	Silty Fine Sand	36	112
	Grey Black Clay	112	132
	Bedrock	132-	140
	Abandoned		

6. Casing Liner Screen

Dia. (in.)	Material, Weight, Specification Manufacturer & Method of Assembly	From (ft.)	To (ft.)
6"	Astm A53B Ipsco EL 20 Plain End	surface	120

Dia.(in.)	Screen type, material & slot size	From	To

9. Static Water Level feet ground surface A=Above B=Below

10. Pump Test Pumping level ft. below surface; Pumping at GP Hrs

11. Well Is: in. Grade A=Above B=Below; Developed? Disinfected? Capped?

7. Grout or Other Sealing Material

Method / Kind of Sealing Material	From (ft.)	To (ft.)	# Sacks Cement
	surface		

12. Did you notify the owner of the need to permanently abandon and fill all unused wells on this property? If no, explain

13. Initials of Well Constructor or Supervisory Driller — Date Signed

Initials of Drill Rig Operator (Mandatory unless same as above) — Date Signed

Additonal Comments? Variance Issued?
Owner Sent Label? More Geology?

Batch

State of Wis., Dept. of Natural Resources
dnr.wi.gov

Well / Drillhole / Borehole Filling & Sealing

Form 3300-005P (R 4/08)

Notice: Completion of this report is required by chs. 160, 281, 283, 289, 291-293, 295, and 299, Wis. Stats., and ch. NR 141, Wis. Adm. Code. In accordance with chs. 281, 289, 291-293, 295, and 299, Wis. Stats., failure to file this form may result in a forfeiture of between $10-25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be used for any other purpose. Return form to the appropriate DNR office and bureau. See instructions on reverse for more information.

☐ **Verification Only of Fill and Seal**

Route to: ☐ Drinking Water ☐ Watershed/Wastewater ☐ Remediation/Redevelopment ☐ Waste Management ☐ Other:

1. Well Location Information

County: Marathon
WI Unique Well # of Removed Well:
Hicap #:
Latitude / Longitude (Degrees and Minutes): 44.50353 °N, 89.37279 °W
Method Code (see instructions):
¼ / ¼: ¼: or Gov't Lot #:
Section: 12 Township: 27 N Range: 07 ☒ E ☐ W
Well Street Address: TB-5
Well City, Village or Town:
Well ZIP Code:
Subdivision Name:
Lot #:
Reason For Removal From Service: test well
WI Unique Well # of Replacement Well:

2. Facility / Owner Information

Facility Name:
Facility ID (FID or PWS):
License/Permit/Monitoring #:
Original Well Owner: Village of Kronenwetter
Present Well Owner:
Mailing Address of Present Owner: 1582 Kronenwetter Dr
City of Present Owner: Kronenwetter State: WI ZIP Code: 54455

3. Well / Drillhole / Borehole Information

☐ Monitoring Well ☐ Water Well ☒ Borehole / Drillhole
Original Construction Date (mm/dd/yyyy): 11-14-2016
If a Well Construction Report is available, please attach.
Construction Type: ☒ Drilled ☐ Driven (Sandpoint) ☐ Dug ☐ Other (specify):
Formation Type: ☐ Unconsolidated Formation ☐ Bedrock
Total Well Depth From Ground Surface (ft.): 142
Casing Diameter (in.): 6
Lower Drillhole Diameter (in.): 6
Casing Depth (ft.): 120
Was well annular space grouted? ☐ Yes ☒ No ☐ Unknown
If yes, to what depth (feet)?
Depth to Water (feet): 10

4. Pump, Liner, Screen, Casing & Sealing Material

	Yes	No	N/A
Pump and piping removed?	☐	☐	☒
Liner(s) removed?	☐	☐	☒
Screen removed?	☐	☐	☐
Casing left in place?	☐	☒	☐
Was casing cut off below surface?	☐	☐	☒
Did sealing material rise to surface?	☒	☐	☐
Did material settle after 24 hours?	☐	☒	☐
If yes, was hole retopped?	☐	☐	☒
If bentonite chips were used, were they hydrated with water from a known safe source?	☒	☐	☐

Required Method of Placing Sealing Material: ☐ Conductor Pipe-Gravity ☐ Conductor Pipe-Pumped ☒ Screened & Poured (Bentonite Chips) ☐ Other (Explain):

Sealing Materials: ☐ Neat Cement Grout ☐ Clay-Sand Slurry (11 lb./gal. wt.) ☐ Sand-Cement (Concrete) Grout ☐ Bentonite-Sand Slurry " " ☐ Concrete ☒ Bentonite Chips

For Monitoring Wells and Monitoring Well Boreholes Only: ☐ Bentonite Chips ☐ Bentonite - Cement Grout ☐ Granular Bentonite ☐ Bentonite - Sand Slurry

5. Material Used To Fill Well / Drillhole

Material Used To Fill Well / Drillhole	From (ft.)	To (ft.)	No. Yards, Sacks Sealant or Volume (circle one)	Mix Ratio or Mud Weight
3/8 Bentonite chips	Surface	142	40 bags	

6. Comments

The casing was removed

7. Supervision of Work

Name of Person or Firm Doing Filling & Sealing: Badger Well Drilling
License #: 6109
Date of Filling & Sealing (mm/dd/yyyy): 07-18-2017
Street or Route: N7900 Locust LN
Telephone Number: ( )
City: Mt Calvary State: WI ZIP Code: 53057
Signature of Person Doing Work: Dan Steffes
Date Signed: 8-25-17

DNR Use Only
Date Received:
Noted By:
Comments:

DNR

State of Wisconsin
Department of Natural Resources
PO Box 7921, Madison WI 53707-7921
dnr.wi.gov

Well / Drillhole / Borehole Filling & Sealing

Form 3300-005 (R 8/07)

Notice: Completion of this report is required by chs. 160, 281, 283, 289, 291-293, 295, and 299, Wis. Stats., and ch. NR 141, Wis. Adm. Code. In accordance with chs. 281, 289, 291-293, 295, and 299, Wis. Stats., failure to file this form may result in a forfeiture of between $10-25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be used for any other purpose. Return form to the appropriate DNR office and bureau. See instructions on reverse for more information.

Route to:
[X] Drinking Water [ ] Watershed/Wastewater [ ] Waste Management [ ] Remediation/Redevelopment [ ] Other: ____

1. Well Location Information

County: Marathon
WI Unique Well # of Removed Well: ____
Hicap #: ____
Latitude / Longitude (Degrees and Minutes): 44.83.919 'N / 89.62.240 'W
Method Code (see instructions): ____
¼ / ¼: ____ ¼: ____ or Gov't Lot #: ____
Section: 12 Township: 27 N Range: 07 [X] E [ ] W
Well Street Address: TB-6
Well City, Village or Town: ____ Well ZIP Code: ____
Subdivision Name: ____ Lot #: ____
Reason For Removal From Service: Test well
WI Unique Well # of Replacement Well: ____

2. Facility / Owner Information

Facility Name: ____
Facility ID (FID or PWS): ____
License/Permit/Monitoring #: ____
Original Well Owner: Village of Kronenwetter
Present Well Owner: ____
Mailing Address of Present Owner: 1582 Kronenwetter Dr
City of Present Owner: Kronenwetter State: Wi ZIP Code: 54455

3. Well / Drillhole / Borehole Information

[ ] Monitoring Well
[ ] Water Well
[X] Borehole / Drillhole

Original Construction Date (mm/dd/yyyy): 11-15-2016
If a Well Construction Report is available, please attach.

Construction Type: [X] Drilled [ ] Driven (Sandpoint) [ ] Dug [ ] Other (specify): ____

Formation Type: [ ] Unconsolidated Formation [ ] Bedrock

Total Well Depth From Ground Surface (ft.): 124
Casing Diameter (in.): 6
Lower Drillhole Diameter (in.): ____
Casing Depth (ft.): 100
Was well annular space grouted? [ ] Yes [X] No [ ] Unknown
If yes, to what depth (feet)? ____
Depth to Water (feet): ____

4. Pump, Liner, Screen, Casing & Sealing Material

	Yes	No	N/A
Pump and piping removed?	[ ]	[ ]	[X]
Liner(s) removed?	[ ]	[ ]	[X]
Screen removed?	[ ]	[ ]	[X]
Casing left in place?	[ ]	[X]	[ ]
Was casing cut off below surface?	[ ]	[ ]	[X]
Did sealing material rise to surface?	[X]	[ ]	[ ]
Did material settle after 24 hours?	[ ]	[X]	[ ]
If yes, was hole retopped?	[ ]	[ ]	[X]
If bentonite chips were used, were they hydrated with water from a known safe source?	[X]	[ ]	[ ]

Required Method of Placing Sealing Material:
[ ] Conductor Pipe-Gravity [ ] Conductor Pipe-Pumped
[X] Screened & Poured (Bentonite Chips) [ ] Other (Explain): ____

Sealing Materials:
[ ] Neat Cement Grout [ ] Clay-Sand Slurry (11 lb./gal. wt.)
[ ] Sand-Cement (Concrete) Grout [ ] Bentonite-Sand Slurry " "
[ ] Concrete [X] Bentonite Chips

For Monitoring Wells and Monitoring Well Boreholes Only:
[ ] Bentonite Chips [ ] Bentonite - Cement Grout
[ ] Granular Bentonite [ ] Bentonite - Sand Slurry

5. Material Used To Fill Well / Drillhole

Material	From (ft.)	To (ft.)	No. Yards, (Sacks) Sealant or Volume (circle one)	Mix Ratio or Mud Weight
3/8 Bentonite Chips	Surface	124	30	

6. Comments

7. Supervision of Work

Name of Person or Firm Doing Filling & Sealing: Badger Well Drilling
License #: 6109
Date of Filling & Sealing (mm/dd/yyyy): 11-16-2016
Street or Route: N7900 Locust Ln.
Telephone Number: (920) 945-4432
City: Mt. Calvary State: Wi ZIP Code: 53057
Signature of Person Doing Work: [signature]
Date Signed: ____

DNR Use Only
Date Received: ____ Noted By: ____
Comments: ____

DNR

State of Wisconsin
Department of Natural Resources
PO Box 7921, Madison WI 53707-7921
dnr.wi.gov

Well / Drillhole / Borehole Filling & Sealing

Form 3300-005 (R 8/07)

Notice: Completion of this report is required by chs. 160, 281, 283, 289, 291-293, 295, and 299, Wis. Stats., and ch. NR 141, Wis. Adm. Code. In accordance with chs. 281, 289, 291-293, 295, and 299, Wis. Stats., failure to file this form may result in a forfeiture of between $10-25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be used for any other purpose. Return form to the appropriate DNR office and bureau. See instructions on reverse for more information.

Route to:
[X] Drinking Water [ ] Watershed/Wastewater [ ] Waste Management [ ] Remediation/Redevelopment [ ] Other: ____

1. Well Location Information

County: Marathon
WI Unique Well # of Removed Well: ____
Hicap #:

Latitude / Longitude (Degrees and Minutes): 44.84070 'N / 89.63.052 'W
Method Code (see instructions):

¼ / ¼: | ¼: | Section: 11 | Township: 27 N | Range: 07 [X] E [ ] W
or Gov't Lot #:

Well Street Address: TB-7

Well City, Village or Town: Village of Kronenwetter
Well ZIP Code:

Subdivision Name:
Lot #:

Reason For Removal From Service:
WI Unique Well # of Replacement Well:

2. Facility / Owner Information

Facility Name:

Facility ID (FID or PWS):

License/Permit/Monitoring #:

Original Well Owner: Village of Kronenwetter

Present Well Owner:

Mailing Address of Present Owner: 1582 Kronenwetter Dr

City of Present Owner: Kronenwetter | State: WI | ZIP Code: 54455

3. Well / Drillhole / Borehole Information

[ ] Monitoring Well
[ ] Water Well
[X] Borehole / Drillhole

Original Construction Date (mm/dd/yyyy): 11-15-2016

If a Well Construction Report is available, please attach.

Construction Type: [X] Drilled [ ] Driven (Sandpoint) [ ] Dug [ ] Other (specify): ____

Formation Type: [ ] Unconsolidated Formation [X] Bedrock

Total Well Depth From Ground Surface (ft.): 84
Casing Diameter (in.): 6

Lower Drillhole Diameter (in.):
Casing Depth (ft.): 80

Was well annular space grouted? [ ] Yes [ ] No [ ] Unknown

If yes, to what depth (feet)?
Depth to Water (feet):

4. Pump, Liner, Screen, Casing & Sealing Material

	Yes	No	N/A
Pump and piping removed?	[ ]	[ ]	[X]
Liner(s) removed?	[ ]	[ ]	[X]
Screen removed?	[ ]	[ ]	[X]
Casing left in place?	[ ]	[X]	[ ]
Was casing cut off below surface?	[ ]	[ ]	[X]
Did sealing material rise to surface?	[X]	[ ]	[ ]
Did material settle after 24 hours?	[ ]	[X]	[ ]
If yes, was hole retopped?	[ ]	[ ]	[X]
If bentonite chips were used, were they hydrated with water from a known safe source?	[X]	[ ]	[ ]

Required Method of Placing Sealing Material
[ ] Conductor Pipe-Gravity [ ] Conductor Pipe-Pumped
[X] Screened & Poured (Bentonite Chips) [ ] Other (Explain): ____

Sealing Materials
[ ] Neat Cement Grout [ ] Clay-Sand Slurry (11 lb./gal. wt.)
[ ] Sand-Cement (Concrete) Grout [ ] Bentonite-Sand Slurry " "
[ ] Concrete [X] Bentonite Chips

For Monitoring Wells and Monitoring Well Boreholes Only:
[ ] Bentonite Chips [ ] Bentonite - Cement Grout
[ ] Granular Bentonite [ ] Bentonite - Sand Slurry

5. Material Used To Fill Well / Drillhole

Material Used To Fill Well / Drillhole	From (ft.)	To (ft.)	No. Yards, Sacks Sealant or Volume (circle one)	Mix Ratio or Mud Weight
3/4 bentonite chips	Surface	84	24 bags	

6. Comments

The casing was removed.

7. Supervision of Work

Name of Person or Firm Doing Filling & Sealing: Badger Well Drilling
License #: 6109
Date of Filling & Sealing (mm/dd/yyyy): 11-15-2016

Street or Route: N7900 Locust Lane
Telephone Number: ( )

City: Mt Calvary | State: WI | ZIP Code: 53057

Signature of Person Doing Work: Dan Steffes
Date Signed:

DNR Use Only
Date Received: | Noted By:
Comments:

State of Wisconsin
Department of Natural Resources
PO Box 7921, Madison WI 53707-7921
dnr.wi.gov

Well / Drillhole / Borehole Filling & Sealing

Form 3300-005 (R 8/07)

Notice: Completion of this report is required by chs. 160, 281, 283, 289, 291-293, 295, and 299, Wis. Stats., and ch. NR 141, Wis. Adm. Code. In accordance with chs. 281, 289, 291-293, 295, and 299, Wis. Stats., failure to file this form may result in a forfeiture of between $10-25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be used for any other purpose. Return form to the appropriate DNR office and bureau. See instructions on reverse for more information.

Route to:
[X] Drinking Water [ ] Watershed/Wastewater [ ] Waste Management [ ] Remediation/Redevelopment [ ] Other:

1. Well Location Information

County: Marathon
WI Unique Well # of Removed Well:
Hicap #:
Lattitude / Longitude (Degrees and Minutes): 44 . 83.687 'N; 89 . 61.701 'W
Method Code (see instructions):
¼ / ¼: ¼:
or Gov't Lot #:
Section: 12
Township: 27 N
Range: 07 [X] E [ ] W
Well Street Address: TB-8
Well City, Village or Town: Village of Kronenwetter
Well ZIP Code:
Subdivision Name:
Lot #:
Reason For Removal From Service:
WI Unique Well # of Replacement Well:

2. Facility / Owner Information

Facility Name:
Facility ID (FID or PWS):
License/Permit/Monitoring #:
Original Well Owner: Village of Kronenwetter
Present Well Owner:
Mailing Address of Present Owner: 1582 Kronenwetter Dr
City of Present Owner: Kronenwetter
State: WI
ZIP Code: 54455

3. Well / Drillhole / Borehole Information

[ ] Monitoring Well
[ ] Water Well
[X] Borehole / Drillhole

Original Construction Date (mm/dd/yyyy):
If a Well Construction Report is available, please attach.

Construction Type:
[X] Drilled [ ] Driven (Sandpoint) [ ] Dug
[ ] Other (specify):

Formation Type:
[ ] Unconsolidated Formation [X] Bedrock

Total Well Depth From Ground Surface (ft.): 125
Casing Diameter (in.): 6
Lower Drillhole Diameter (in.):
Casing Depth (ft.): 120
Was well annular space grouted? [ ] Yes [ ] No [ ] Unknown
If yes, to what depth (feet)?
Depth to Water (feet):

4. Pump, Liner, Screen, Casing & Sealing Material

	Yes	No	N/A
Pump and piping removed?	[ ]	[ ]	[X]
Liner(s) removed?	[ ]	[ ]	[X]
Screen removed?	[ ]	[ ]	[X]
Casing left in place?	[X]	[ ]	[ ]
Was casing cut off below surface?	[X]	[ ]	[ ]
Did sealing material rise to surface?	[X]	[ ]	[ ]
Did material settle after 24 hours?	[ ]	[X]	[ ]
If yes, was hole retopped?	[ ]	[ ]	[X]
If bentonite chips were used, were they hydrated with water from a known safe source?	[X]	[ ]	[ ]

Required Method of Placing Sealing Material
[ ] Conductor Pipe-Gravity [ ] Conductor Pipe-Pumped
[X] Screened & Poured (Bentonite Chips) [ ] Other (Explain):

Sealing Materials
[ ] Neat Cement Grout [ ] Clay-Sand Slurry (11 lb./gal. wt.)
[ ] Sand-Cement (Concrete) Grout [ ] Bentonite-Sand Slurry " "
[ ] Concrete [X] Bentonite Chips

For Monitoring Wells and Monitoring Well Boreholes Only:
[ ] Bentonite Chips [ ] Bentonite - Cement Grout
[ ] Granular Bentonite [ ] Bentonite - Sand Slurry

5. Material Used To Fill Well / Drillhole

Material	From (ft.)	To (ft.)	No. Yards, Sacks Sealant or Volume (circle one)	Mix Ratio or Mud Weight
3/4 Bentonite chips	Surface		35 bags	

6. Comments

7. Supervision of Work

Name of Person or Firm Doing Filling & Sealing: Badger Well Drilling
License #: 6109
Date of Filling & Sealing (mm/dd/yyyy):
Street or Route: N7900 Locust Lane
Telephone Number: ( )
City: Mt Calvary
State: WI
ZIP Code: 53057
Signature of Person Doing Work: Dan Steffes
Date Signed:

DNR Use Only
Date Received:
Noted By:
Comments:

State of Wis., Dept. of Natural Resources
dnr.wi.gov

Well / Drillhole / Borehole Filling & Sealing

Form 3300-005P (R 4/08)

Notice: Completion of this report is required by chs. 160, 281, 283, 289, 291-293, 295, and 299, Wis. Stats., and ch. NR 141, Wis. Adm. Code. In accordance with chs. 281, 289, 291-293, 295, and 299, Wis. Stats., failure to file this form may result in a forfeiture of between $10-25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be used for any other purpose. Return form to the appropriate DNR office and bureau. See instructions on reverse for more information.

☐ **Verification Only of Fill and Seal**

Route to: ☐ Drinking Water ☐ Watershed/Wastewater ☐ Remediation/Redevelopment ☐ Waste Management ☐ Other:

1. Well Location Information

County: Marathon
WI Unique Well # of Removed Well:
Hicap #:

Lattitude / Longitude (Degrees and Minutes): 44.50334 N, 89.37408 W
Method Code (see instructions):

¼ / ¼: ¼: Section: 12 Township: 27 N Range: 07 ☒ E ☐ W
or Gov't Lot #:

Well Street Address: TB-9

Well City, Village or Town:
Well ZIP Code:

Subdivision Name:
Lot #:

Reason For Removal From Service: test Well
WI Unique Well # of Replacement Well:

2. Facility / Owner Information

Facility Name:

Facility ID (FID or PWS):

License/Permit/Monitoring #:

Original Well Owner: Village of Kronenwetter

Present Well Owner:

Mailing Address of Present Owner: 1582 Kronenwetter Dr

City of Present Owner: Kronenwetter State: WI ZIP Code: 54455

3. Well / Drillhole / Borehole Information

☐ Monitoring Well
☐ Water Well
☒ Borehole / Drillhole

Original Construction Date (mm/dd/yyyy): 11-18-16

If a Well Construction Report is available, please attach.

Construction Type: ☒ Drilled ☐ Driven (Sandpoint) ☐ Dug ☐ Other (specify):

Formation Type: ☐ Unconsolidated Formation ☐ Bedrock

Total Well Depth From Ground Surface (ft.): 105
Casing Diameter (in.): 6

Lower Drillhole Diameter (in.): 6
Casing Depth (ft.): 100

Was well annular space grouted? ☐ Yes ☒ No ☐ Unknown

If yes, to what depth (feet)?
Depth to Water (feet): 7

4. Pump, Liner, Screen, Casing & Sealing Material

	Yes	No	N/A
Pump and piping removed?	☐	☐	☒
Liner(s) removed?	☐	☐	☒
Screen removed?	☒	☐	☐
Casing left in place?	☐	☒	☐
Was casing cut off below surface?	☐	☐	☒
Did sealing material rise to surface?	☒	☐	☐
Did material settle after 24 hours?	☐	☒	☐
If yes, was hole retopped?	☐	☐	☒
If bentonite chips were used, were they hydrated with water from a known safe source?	☒	☐	☐

Required Method of Placing Sealing Material
☐ Conductor Pipe-Gravity ☐ Conductor Pipe-Pumped
☒ Screened & Poured (Bentonite Chips) ☐ Other (Explain):

Sealing Materials
☐ Neat Cement Grout ☐ Clay-Sand Slurry (11 lb./gal. wt.)
☐ Sand-Cement (Concrete) Grout ☐ Bentonite-Sand Slurry " "
☐ Concrete ☒ Bentonite Chips

For Monitoring Wells and Monitoring Well Boreholes Only:
☐ Bentonite Chips ☐ Bentonite - Cement Grout
☐ Granular Bentonite ☐ Bentonite - Sand Slurry

5. Material Used To Fill Well / Drillhole

Material Used To Fill Well / Drillhole	From (ft.)	To (ft.)	No. Yards, Sacks Sealant or Volume (circle one)	Mix Ratio or Mud Weight
3/8 Bentonite chips	Surface	105	30 bags	

6. Comments

the Casing was removed

7. Supervision of Work

Name of Person or Firm Doing Filling & Sealing: Badger Well Drilling
License #: 6109
Date of Filling & Sealing (mm/dd/yyyy): 07-18-2017

Street or Route: N7900 Locust Lane
Telephone Number: ( )

City: Mt Calvary State: WI ZIP Code: 53057
Signature of Person Doing Work: [signature]
Date Signed: 8-25-17

DNR Use Only
Date Received:
Noted By:
Comments:

DNR

State of Wis., Dept. of Natural Resources
dnr.wi.gov

Well / Drillhole / Borehole Filling & Sealing

Form 3300-005P (R 4/08)

Notice: Completion of this report is required by chs. 160, 281, 283, 289, 291-293, 295, and 299, Wis. Stats., and ch. NR 141, Wis. Adm. Code. In accordance with chs. 281, 289, 291-293, 295, and 299, Wis. Stats., failure to file this form may result in a forfeiture of between $10-25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be used for any other purpose. Return form to the appropriate DNR office and bureau. See instructions on reverse for more information.

☐ **Verification Only of Fill and Seal**

Route to: ☐ Drinking Water ☐ Waste Management ☐ Watershed/Wastewater ☐ Other: ☐ Remediation/Redevelopment

1. Well Location Information

County	Marathon
WI Unique Well # of Removed Well	
Hicap #	
Latitude / Longitude (Degrees and Minutes)	44.50392 °N, 89.37404 °W
Method Code (see instructions)	
¼ / ¼	
¼	
or Gov't Lot #	
Section	12
Township	27 N
Range	07 ☒ E ☐ W
Well Street Address	TB-10
Well City, Village or Town	
Well ZIP Code	
Subdivision Name	
Lot #	
Reason For Removal From Service	test boring
WI Unique Well # of Replacement Well	

2. Facility / Owner Information

Facility Name	
Facility ID (FID or PWS)	
License/Permit/Monitoring #	
Original Well Owner	Village of Kronenwetter
Present Well Owner	
Mailing Address of Present Owner	1582 Kronenwetter Dr
City of Present Owner	Kronenwetter
State	WI
ZIP Code	54455

3. Well / Drillhole / Borehole Information

☐ Monitoring Well ☐ Water Well ☒ Borehole / Drillhole

Original Construction Date (mm/dd/yyyy): 07-17-2017

If a Well Construction Report is available, please attach.

Construction Type: ☒ Drilled ☐ Driven (Sandpoint) ☐ Dug ☐ Other (specify):

Formation Type: ☐ Unconsolidated Formation ☐ Bedrock

Total Well Depth From Ground Surface (ft.)	140
Casing Diameter (in.)	6
Lower Drillhole Diameter (in.)	6
Casing Depth (ft.)	120
Was well annular space grouted?	☐ Yes ☒ No ☐ Unknown
If yes, to what depth (feet)?	
Depth to Water (feet)	

4. Pump, Liner, Screen, Casing & Sealing Material

	Yes	No	N/A
Pump and piping removed?	☐	☐	☒
Liner(s) removed?	☐	☐	☒
Screen removed?	☐	☐	☒
Casing left in place?	☐	☒	☐
Was casing cut off below surface?	☐	☐	☒
Did sealing material rise to surface?	☒	☐	☐
Did material settle after 24 hours?	☐	☒	☐
If yes, was hole retopped?	☐	☐	☒
If bentonite chips were used, were they hydrated with water from a known safe source?	☒	☐	☐

Required Method of Placing Sealing Material: ☐ Conductor Pipe-Gravity ☐ Conductor Pipe-Pumped ☒ Screened & Poured (Bentonite Chips) ☐ Other (Explain):

Sealing Materials: ☐ Neat Cement Grout ☐ Sand-Cement (Concrete) Grout ☐ Concrete ☐ Clay-Sand Slurry (11 lb./gal. wt.) ☐ Bentonite-Sand Slurry ☒ Bentonite Chips

For Monitoring Wells and Monitoring Well Boreholes Only: ☐ Bentonite Chips ☐ Granular Bentonite ☐ Bentonite - Cement Grout ☐ Bentonite - Sand Slurry

5. Material Used To Fill Well / Drillhole

Material	From (ft.)	To (ft.)	No. Yards, Sacks Sealant or Volume (circle one)	Mix Ratio or Mud Weight
3/8 Bentonite chips	Surface	140	40 bags	

6. Comments

The casing was removed

7. Supervision of Work

Name of Person or Firm Doing Filling & Sealing	Badger Well Drilling
License #	6109
Date of Filling & Sealing (mm/dd/yyyy)	07-17-2017
Street or Route	N7900 Locust Lane
Telephone Number	( )
City	Mt Calvary
State	WI
ZIP Code	53057
Signature of Person Doing Work	Don Steffes
Date Signed	8-25-17

DNR Use Only

Date Received	Noted By

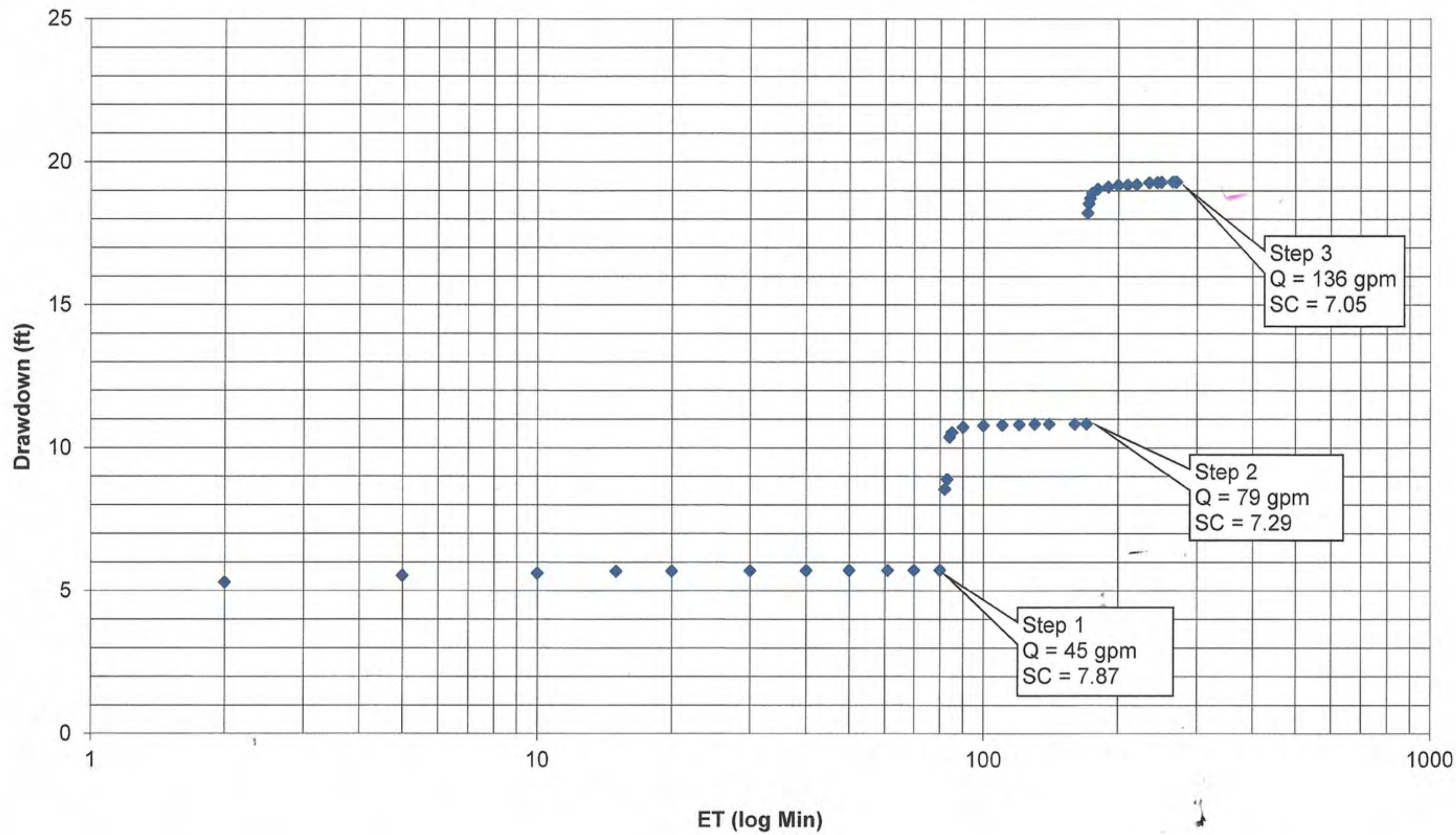
Comments:

DNR

Attachment C

Graphical Analysis of Pumping Data

TB-5 Step Test
Village of Kronenwetter, WI
12-20-2016



Village of Kronenwetter, WI TB-5
badger Step Drawdown test Directed by TLP
20-Dec-16
SWL= 12.7
screen interval = 60-80 ftbgs

ET (min)	DD(ft)	DTW (ftbl TOC)	Q(gpm)	sc
0	0	12.7	0	
2	5.3	18		
5	5.53	18.23		
10	5.62	18.32	45	8.01
15	5.68	18.38		
20	5.69	18.39		
30	5.7	18.4		
40	5.71	18.41		
50	5.72	18.42		
61	5.72	18.42	45	7.87
70	5.72	18.42		
80	5.72	18.42	45	7.87
82	8.55	21.25		
83	8.89	21.59		
84	10.38	23.08	79	7.61
85	10.54	23.24		
90	10.72	23.42		
100	10.78	23.48	79	7.33
110	10.8	23.5		
120	10.82	23.52		
130	10.83	23.53		
140	10.83	23.53		
160	10.83	23.53	79	7.29
170	10.83	23.53	79	7.29
171	18.22	30.92		
172	18.54	31.24	136	7.26
173	18.73	31.43		
175	18.91	31.61		
180	19.05	31.75		
190	19.13	31.83		
200	19.18	31.88	136	7.09
210	19.19	31.89		
220	19.21	31.91		
235	19.27	31.97	136	7.06
245	19.28	31.98		
250	19.29	31.99		
265	19.3	32.00		
269	19.3	32.00	136	7.05
270	19.3	32.00	136	7.05

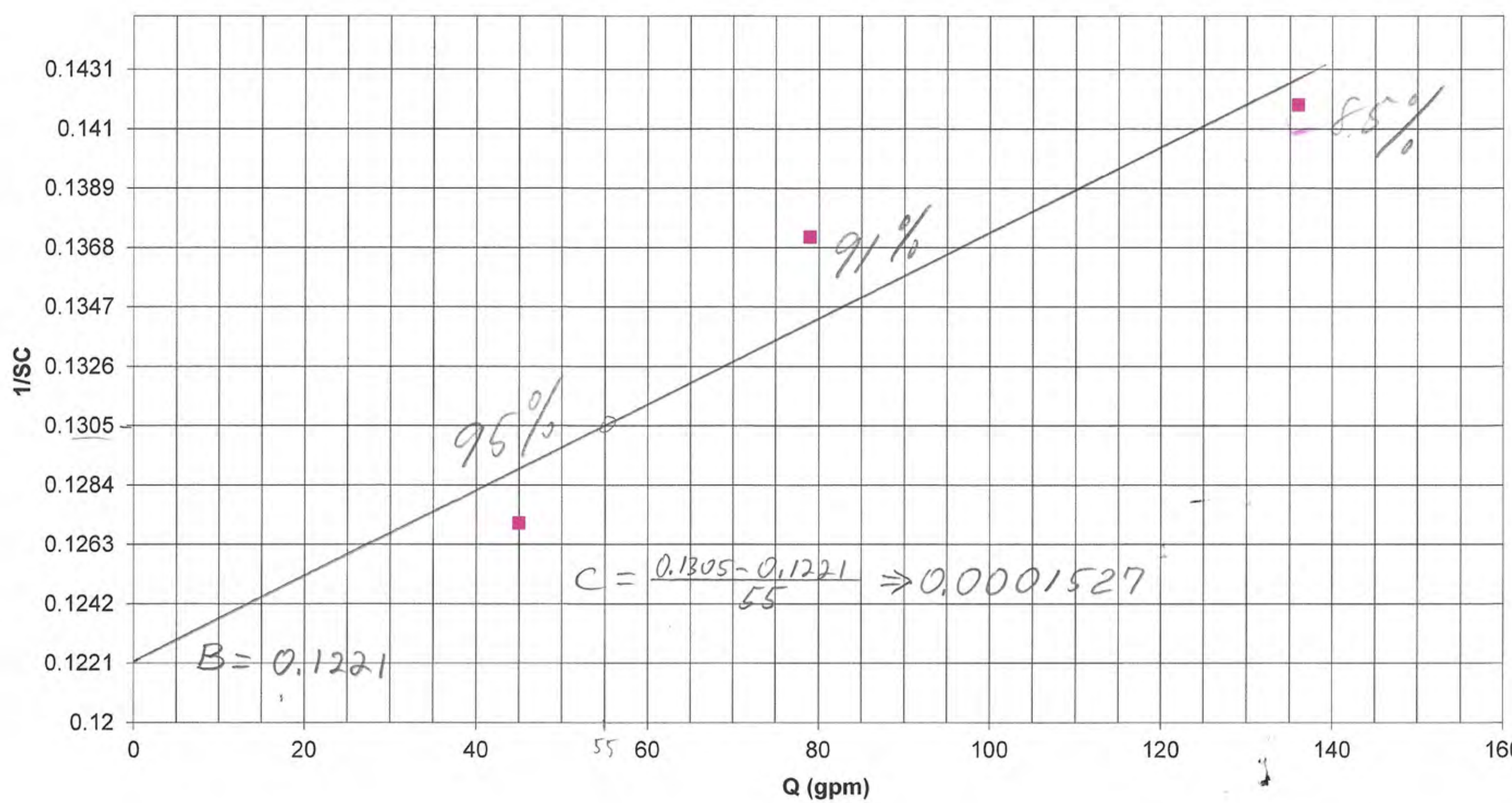
Q	SC	1/SC
45	7.87	0.127065
79	7.29	0.137174
136	7.05	0.141844

RECOVERY

Elapsed Time (min)	DTW (ftbl TOC)	time (t') since pumping stopped (min)	time (t) since pumping started (min)	t/t'	(recov dtw - static) resid dd (ft)
0	32	0	270.00	#DIV/0!	19.3
0.067	27	0.067	270.07	4030.851	14.3
0.23	22	0.23	270.23	1174.913	9.3
0.35	18	0.35	270.35	772.4286	5.3
0.5	16	0.5	270.50	541	3.3
0.7	15	0.7	270.70	386.7143	2.3
1.23	14	1.23	271.23	220.5122	1.3
1.77	13.5	1.77	271.77	153.5424	0.8
2.45	13.2	2.45	272.45	111.2041	0.5
3.1	13	3.1	273.10	88.09677	0.3

TB-5 Step Test
Village of Kronenwetter
12-20-2016

1/SC v Q



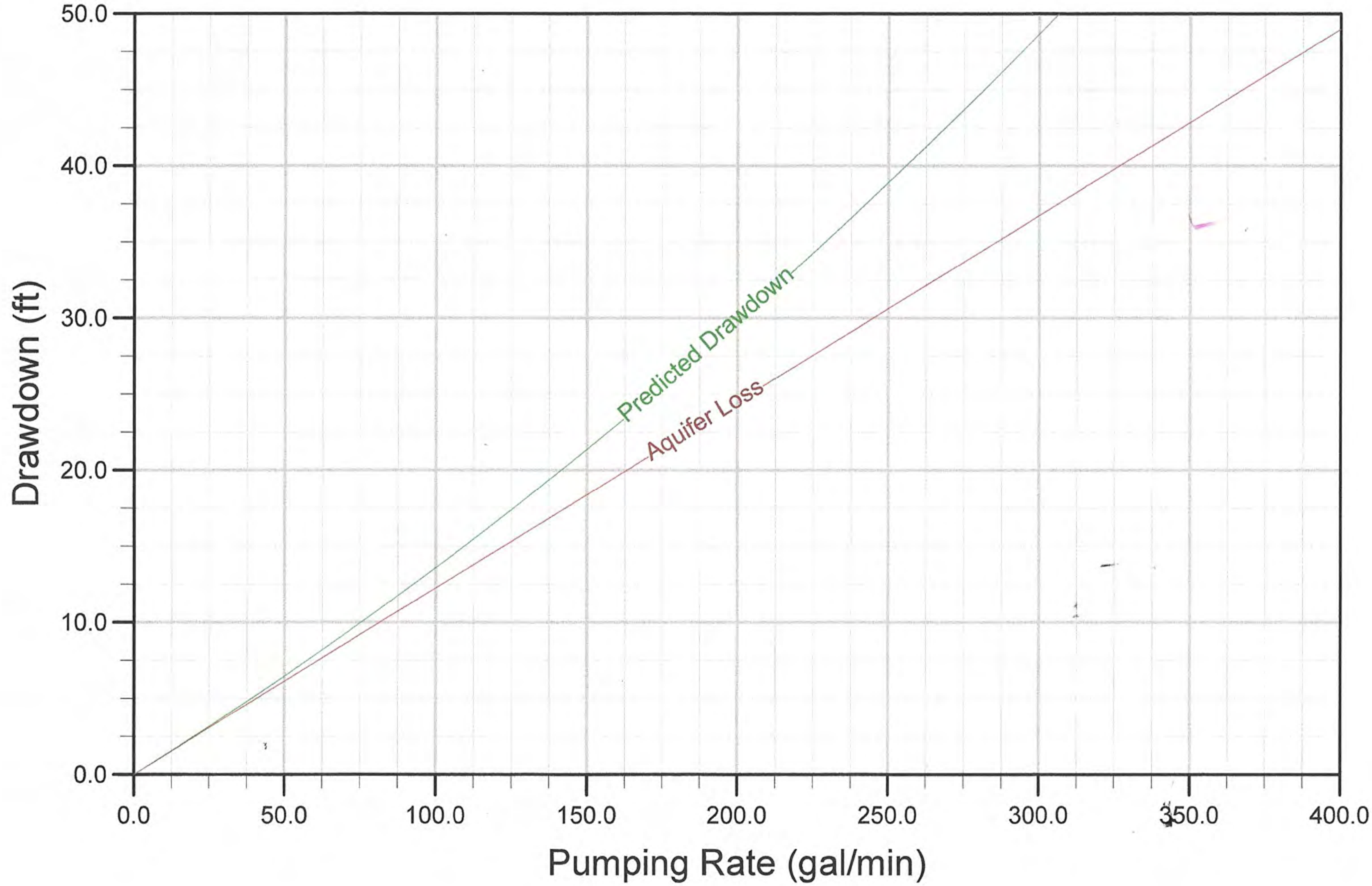
Village of Kronenwetter, WI TB-5
badger Step Drawdown test Directed by TLP
20-Dec-16
SWL= 11.73
screen interval = 60-80 ftbgs

Q	SC	1/SC
45	7.87	0.127065
79	7.29	0.137174
136	7.05	0.141844

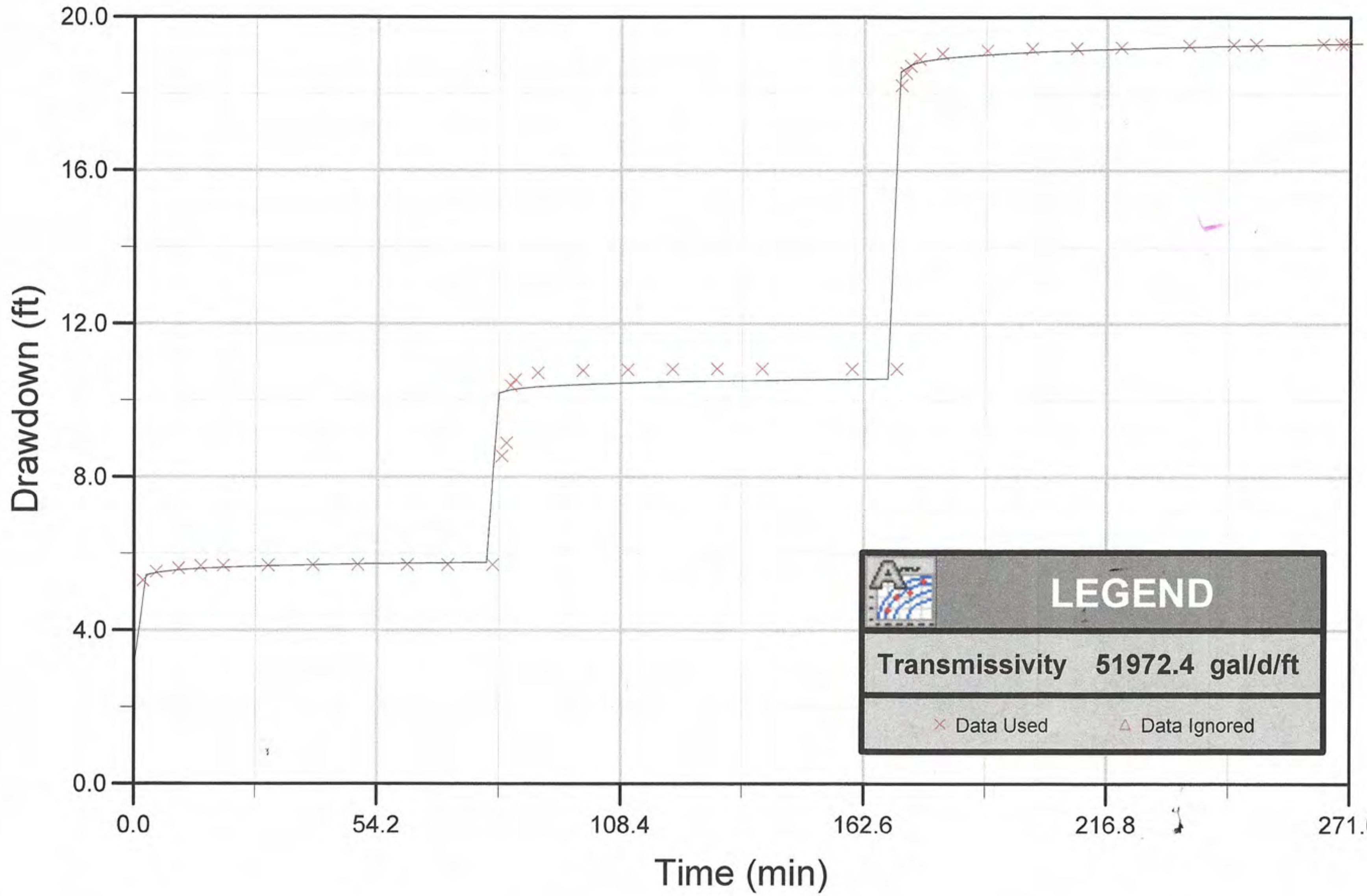
Efficiency Calculations
Using all rates
Intercept B=0.1221
Slope C=.0001527

	Laminar Drawdown	Turbulent Drawdown	(BQ+CQ^2) Theoretical Drawdown	BQ/BQ+CQ^2*100 Efficiency
Q	B*Q	C*Q^2	(ft)	(%)
45	5.4945	0.3092175	5.8037175	94.7
79	9.6459	0.9530007	10.5989007	91.0
136	16.6056	2.8243392	19.4299392	85.5

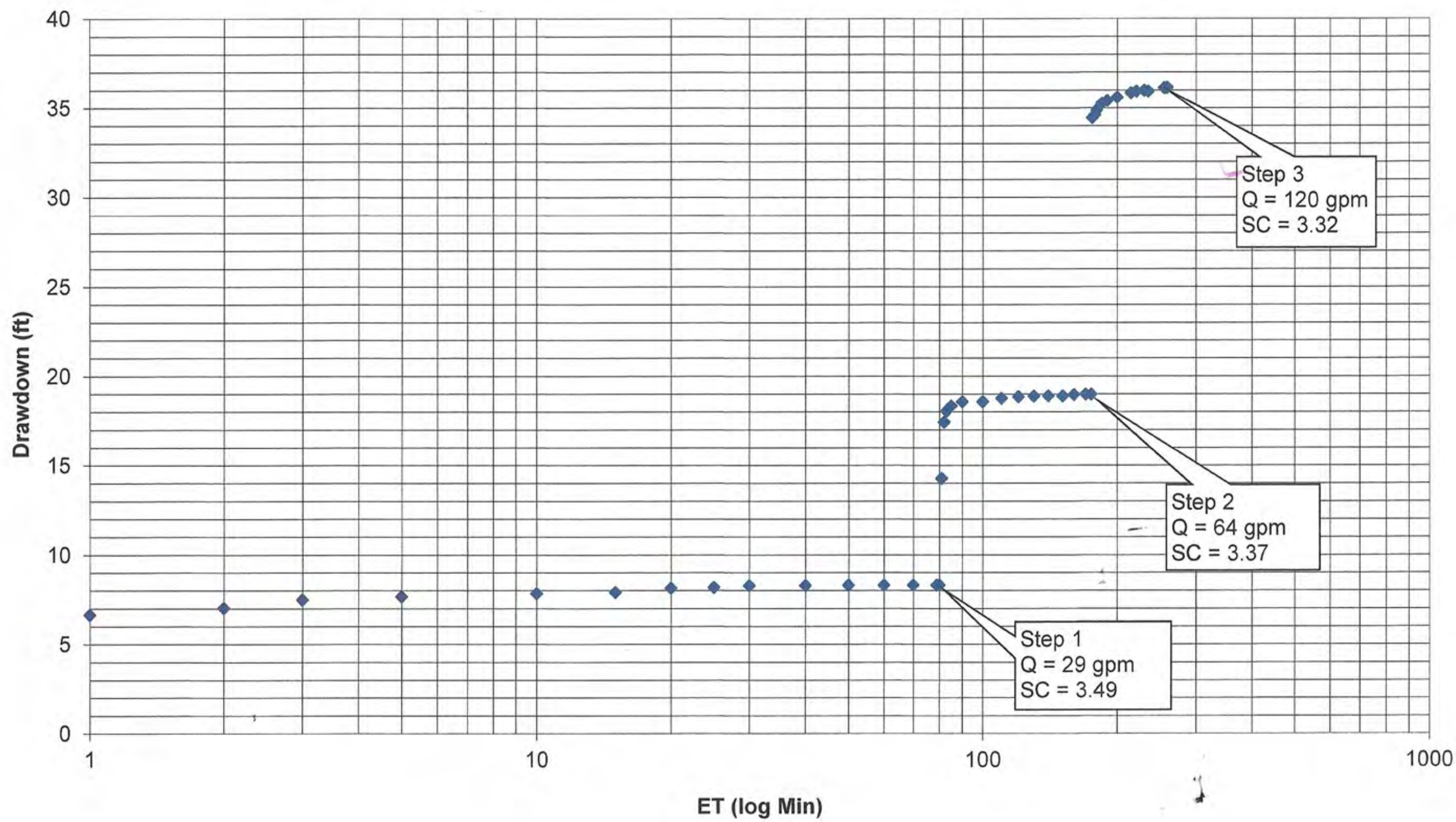
TB-5 Predicted Yield/Drawdown



Kronenwetter TB-5 Observed and Predicted Well Response



TB-9 Step Test
Village of Kronenwetter, WI
12-19-2016



Village of Kronenwetter, WI TB-9
badger Step Drawdown test Directed by TLP
19-Dec-16
SWL= 7.95
screen interval = 61-73 ftbgs

ET (min)	DD(ft)	DTW (ftbl TOC)	Q(gpm)	sc
0	0	7.95	0	
1	6.65	14.6		
2	7.03	14.98	28	3.98
3	7.5	15.45		
5	7.66	15.61		
10	7.84	15.79		
15	7.9	15.85		
20	8.16	16.11	29	3.55
25	8.19	16.14		
30	8.27	16.22		
40	8.29	16.24		
50	8.3	16.25	29	3.49
60	8.3	16.25		
70	8.3	16.25		
79	8.3	16.25		
80	8.3	16.25	29	3.49
81	14.28	22.23		
82	17.43	25.38		
83	18.05	26	64	3.55
85	18.33	26.28		
90	18.57	26.52		
100	18.57	26.71		
110	18.76	26.8	64	3.41
120	18.85	26.83		
130	18.88	26.85		
140	18.9	26.85		
151	18.9	26.91	64	3.39
160	18.97	26.92		
170	18.98	26.93		
175	18.985	26.935	64	3.37
176	34.45	42.4		
178	34.61	42.56		
180	34.88	42.83	120	3.44
185	35.26	43.21		
190	35.41	43.36		
200	35.59	43.54	120	3.37
215	35.84	43.79		
221	35.93	43.88		
230	35.98	43.93		
235	35.94	43.89	120	3.34
255	36.13	44.08		
258	36.13	44.08		
259	36.14	44.09	120	3.32

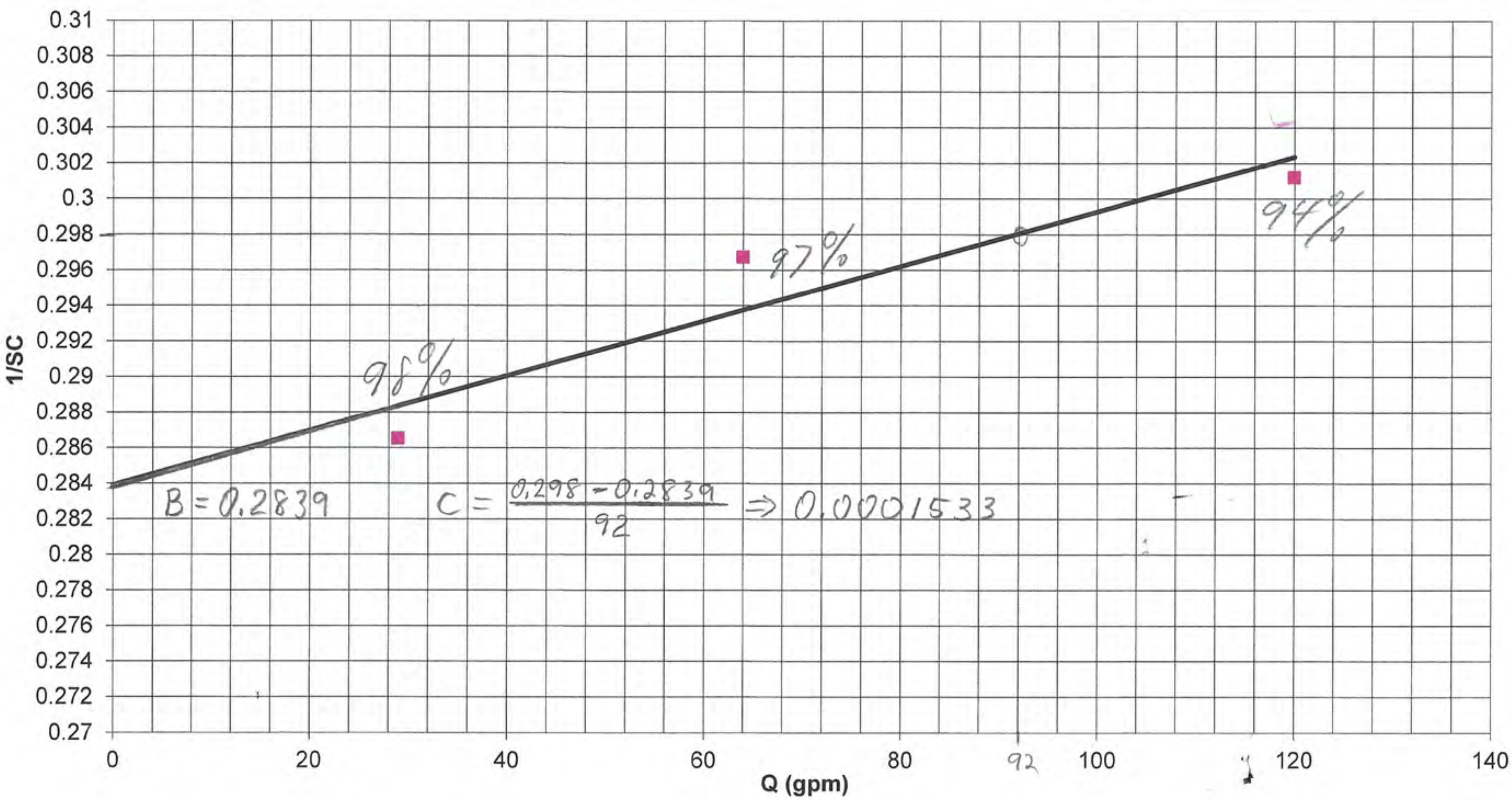
Q	SC	1/SC
29	3.49	0.286533
64	3.37	0.296736
120	3.32	0.301205

RECOVERY

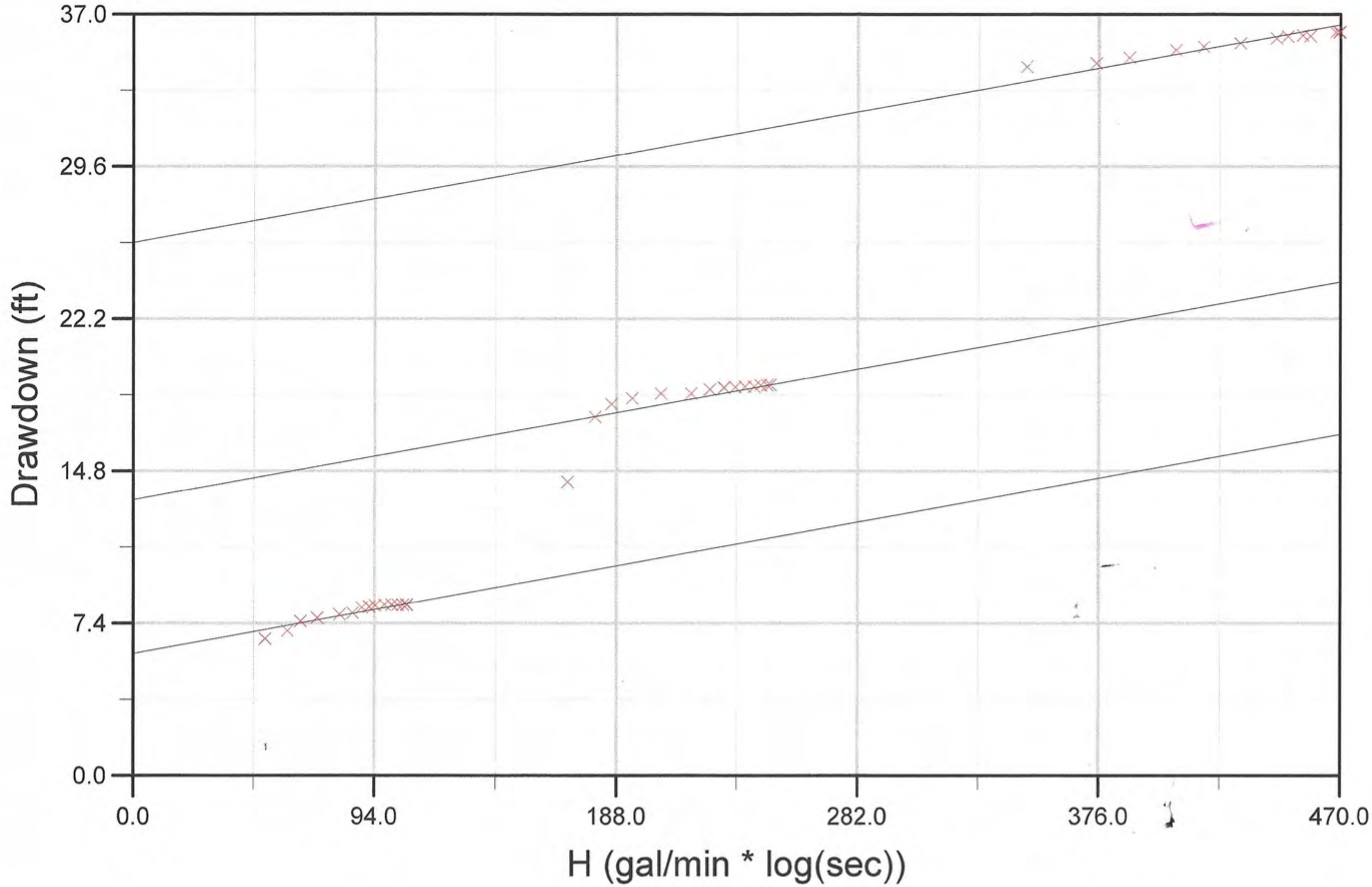
Elapsed Time (min)	DTW (ftbl TOC)	time (t') since pumping stopped (min)	time (t) since pumping started (min)	t/t'	(recov dtw - static) resid dd (ft)
0	44.09	0	259.00	#DIV/0!	36.14
0.117	35	0.117	259.12	2214.675	27.05
0.55	20	0.55	259.55	471.9091	12.05
0.88	15	0.88	259.88	295.3182	7.05
1.02	14	1.02	260.02	254.9216	6.05
1.17	13	1.17	260.17	222.3675	5.05
1.35	12	1.35	260.35	192.8519	4.05
1.78	11	1.78	260.78	146.5056	3.05
2.15	10.5	2.15	261.15	121.4651	2.55
2.73	10	2.73	261.73	95.87179	2.05
3.3	9.7	3.3	262.30	79.48485	1.75
3.77	9.5	3.77	262.77	69.70027	1.55
4.58	9.2	4.58	263.58	57.55022	1.25
5.68	9	5.68	264.68	46.59859	1.05

TB-9 Step Test
Village of Kronenwetter
12-19-2016

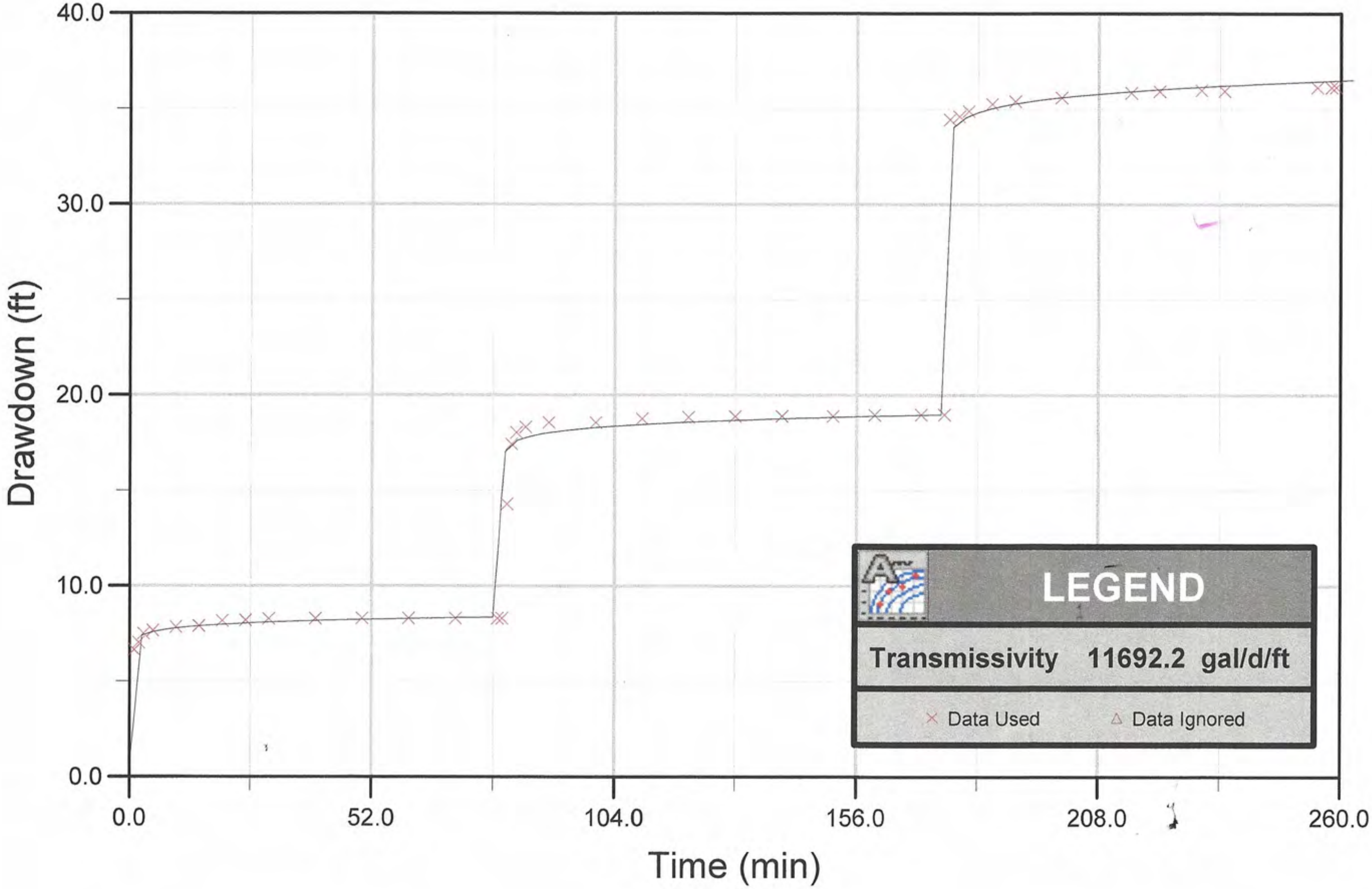
1/SC v Q



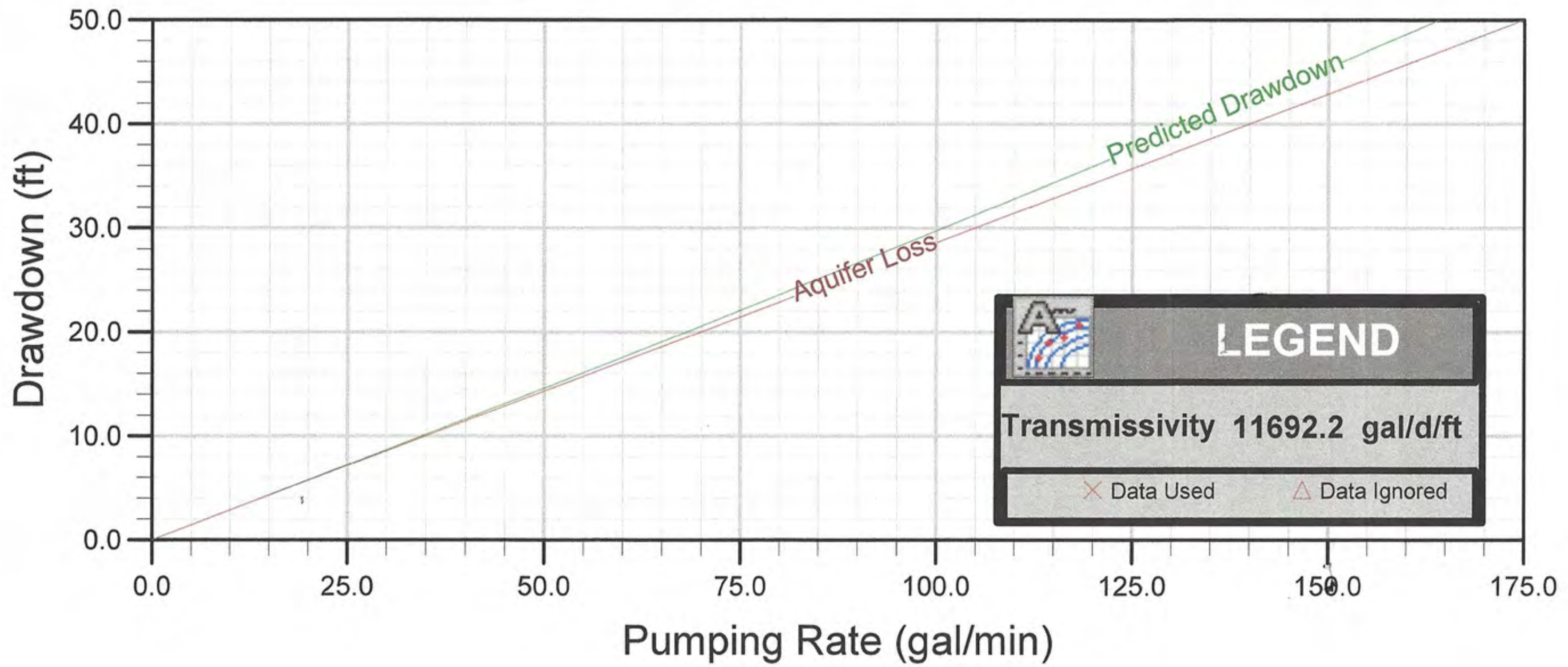
Kronenwetter TB-9 Eden and Hazel - Step 1



Kronenwetter TB-9 Observed and Predicted Well Response



TB-9 Predicted Yield/Drawdown



Attachment D

Laboratory Analytical Report

NORTHERN LAKE SERVICE, INC.
Analytical Laboratory and Environmental Services
400 North Lake Avenue - Crandon, WI 54520
Ph: (715)-478-2777 Fax: (715)-478-3060

ANALYTICAL REPORT

WDNR Laboratory ID No. 721026460
WDATCP Laboratory Certification No. 105-330
EPA Laboratory ID No. WI00034

Printed: 01/04/17

Client: Leggette Brashears & Graham Inc
Attn: Ted Powell
5957 Mckee Road Suite 7
Madison, WI 53719

NLS Project: 272873
NLS Customer: 17750
Fax: 608 441 5545 Phone: 608 441 5544

Project: Kronenwetter/TB5 & TB9

TB-9 NLS ID: 967551
COC: 204282:1 Matrix: GW
Collected: 12/19/16 16:35 Received: 12/22/16

Parameter	Result	Units	Dilution	LOD	LOQ	Analyzed	Method	Lab
Arsenic, tot. recoverable as As by ICP-MS	[1.3]	ug/L	1	1.0*	2.0*	12/28/16	EPA 200.8, Rev 5.4	721026460
Calcium, tot. recoverable as Ca by ICP	30	mg/L	1	0.15*	0.30*	12/28/16	SW846 6010	721026460
Chloride, as Cl (unfiltered)	5.9	mg/L	10	2.5	5.0	12/28/16	SW846 9056	721026460
Hardness, tot. recoverable, (calc/unfilt/icp)	130	mg/L	1	1.0*	2.0*	12/28/16	SW846 6010	721026460
Iron, tot. recoverable as Fe by ICP	ND	mg/L	1	0.025	0.050	12/28/16	SW846 6010	721026460
Magnesium, tot. recoverable as Mg by ICP	14	mg/L	1	0.15	0.30	12/28/16	SW846 6010	721026460
Manganese, tot. recoverable as Mn by ICP	98	ug/L	1	1.0	2.0	12/28/16	SW846 6010	721026460
Nitrogen, NO2 + NO3 as N (unfiltered)	ND	mg/L	1	0.019	0.062	01/04/17	4500-NO3 F-2000	721026460
Sodium, tot. recoverable as Na by ICP	4.5	mg/L	1	0.15	0.30	12/28/16	SW846 6010	721026460
Solids, tot. dis. (TDS)	97	mg/L	1	2.0*		12/22/16	2540 C-1997	721026460
Sulfate, as SO4 (unfiltered)	6.7	mg/L	10	2.5	5.0	12/28/16	SW846 9056	721026460
Lab filtration for TDS	yes					12/22/16	EPA 160.1	721026460
Metals digestion - tot. recov.ICP	yes					12/27/16	SW846 3005M	721026460
Metals digestion - tot. recov. ICP-MS	yes					12/26/16	EPA 200.8M, Rev 5.4	721026460
VOCs (water) by GC/MS	see attached					12/28/16	SW846 8260C	721026460
PAH (water) by GC/MS - SIM	see attached					12/27/16	SW846 8270C	721026460
Organics Extraction PAH (water) by GC/MS - SIM	yes					12/22/16	EPA 8270C	721026460

TB-5 NLS ID: 967552
COC: 204282:2 Matrix: GW
Collected: 12/20/16 13:35 Received: 12/22/16

Parameter	Result	Units	Dilution	LOD	LOQ	Analyzed	Method	Lab
Arsenic, tot. recoverable as As by ICP-MS	[1.1]	ug/L	1	1.0*	2.0*	12/28/16	EPA 200.8, Rev 5.4	721026460
Calcium, tot. recoverable as Ca by ICP	16	mg/L	1	0.15*	0.30*	12/28/16	SW846 6010	721026460
Chloride, as Cl (unfiltered)	11	mg/L	10	2.5	5.0	12/28/16	SW846 9056	721026460
Hardness, tot. recoverable, (calc/unfilt/icp)	68	mg/L	1	1.0*	2.0*	12/28/16	SW846 6010	721026460
Iron, tot. recoverable as Fe by ICP	5.2	mg/L	1	0.025	0.050	12/28/16	SW846 6010	721026460
Magnesium, tot. recoverable as Mg by ICP	6.9	mg/L	1	0.15	0.30	12/28/16	SW846 6010	721026460
Manganese, tot. recoverable as Mn by ICP	250	ug/L	1	1.0	2.0	12/28/16	SW846 6010	721026460
Nitrogen, NO2 + NO3 as N (unfiltered)	[0.047]	mg/L	1	0.019	0.062	01/04/17	4500-NO3 F-2000	721026460
Sodium, tot. recoverable as Na by ICP	3.3	mg/L	1	0.15	0.30	12/28/16	SW846 6010	721026460
Solids, tot. dis. (TDS)	150	mg/L	1	2.0*		12/22/16	2540 C-1997	721026460
Sulfate, as SO4 (unfiltered)	[3.6]	mg/L	10	2.5	5.0	12/28/16	SW846 9056	721026460
Lab filtration for TDS	yes					12/22/16	EPA 160.1	721026460
Metals digestion - tot. recov.ICP	yes					12/27/16	SW846 3005M	721026460
Metals digestion - tot. recov. ICP-MS	yes					12/26/16	EPA 200.8M, Rev 5.4	721026460
VOCs (water) by GC/MS	see attached					12/28/16	SW846 8260C	721026460
PAH (water) by GC/MS - SIM	see attached					12/27/16	SW846 8270C	721026460
Organics Extraction PAH (water) by GC/MS - SIM	yes					12/22/16	EPA 8270C	721026460

Trip Blank NLS ID: 967553
COC: 204282:3 Matrix: TB
Collected: 12/20/16 00:00 Received: 12/22/16

Parameter	Result	Units	Dilution	LOD	LOQ	Analyzed	Method	Lab
VOCs (water) by GC/MS	see attached					12/28/16	NA	721026460

NORTHERN LAKE SERVICE, INC.
Analytical Laboratory and Environmental Services
400 North Lake Avenue - Crandon, WI 54520
Ph: (715)-478-2777 Fax: (715)-478-3060

ANALYTICAL REPORT

WDNR Laboratory ID No. 721026460
WDATCP Laboratory Certification No. 105-330
EPA Laboratory ID No. WI00034

Printed: 01/04/17

Client: Leggette Brashears & Graham Inc
Attn: Ted Powell
5957 Mckee Road Suite 7
Madison, WI 53719

NLS Project: 272873
NLS Customer: 17750
Fax: 608 441 5545 Phone: 608 441 5544

Project: Kronenwetter/TB5 & TB9

Values in brackets represent results greater than or equal to the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than or equal to the LOQ are considered to be in the region of "Certain Quantitation". LOD and/or LOQ tagged with an asterisk(*) are considered Reporting Limits. All LOD/LOQs adjusted to reflect dilution and/or solids content.

ND = Not Detected (< LOD) LOD = Limit of Detection LOQ = Limit of Quantitation NA = Not Applicable
DWB = Dry Weight Basis %DWB = (mg/kg DWB) / 10000 1000 ug/L = 1 mg/L
MCL = Maximum Contaminant Levels for Drinking Water Samples. Shaded results indicate >MCL.

Reviewed by:

Authorized by:
R. T. Krueger
President

ANALYTICAL RESULTS: VOC's by P&T/GCMS - Water - (VarSat3)

Customer: Leggette Brashears & Graham Inc NLS Project: 272873

Project Description: Kronenwetter/TB5 & TB9

Project Title: Template: SAT3W Printed: 01/04/2017 16:56

Sample: 967552 TB-5 Collected: 12/20/16 Analyzed: 12/28/16 - Analytes: 61

ANALYTE NAME	RESULT	UNITS	DIL	LOD	LOQ	Note
Benzene	ND	ug/L	1	0.19	0.69	
Bromobenzene	ND	ug/L	1	0.25	0.87	
Bromochloromethane	ND	ug/L	1	0.15	0.54	
Bromodichloromethane	ND	ug/L	1	0.19	0.68	
Bromoform	ND	ug/L	1	0.16	0.56	
Bromomethane	ND	ug/L	1	0.22	0.79	
n-Butylbenzene	ND	ug/L	1	0.19	0.67	
sec-Butylbenzene	ND	ug/L	1	0.20	0.71	
tert-Butylbenzene	ND	ug/L	1	0.20	0.71	
Carbon Tetrachloride	ND	ug/L	1	0.19	0.66	
Chlorobenzene	ND	ug/L	1	0.16	0.56	
Chloroethane	ND	ug/L	1	1.5	5.4	
Chloroform	ND	ug/L	1	0.17	0.60	
Chloromethane	ND	ug/L	1	0.19	0.68	
2-Chlorotoluene	ND	ug/L	1	0.21	0.75	
4-Chlorotoluene	ND	ug/L	1	0.19	0.68	
Dibromochloromethane	ND	ug/L	1	0.17	0.61	
1,2-Dibromo-3-Chloropropane	ND	ug/L	1	0.21	0.73	
1,2-Dibromoethane	ND	ug/L	1	0.12	0.43	
Dibromomethane	ND	ug/L	1	0.21	0.73	
1,2-Dichlorobenzene	ND	ug/L	1	0.22	0.76	
1,3-Dichlorobenzene	ND	ug/L	1	0.20	0.72	
1,4-Dichlorobenzene	ND	ug/L	1	0.21	0.76	
Dichlorodifluoromethane	ND	ug/L	1	0.14	0.49	
1,1-Dichloroethane	ND	ug/L	1	0.18	0.64	
1,2-Dichloroethane	ND	ug/L	1	0.19	0.69	
1,1-Dichloroethene	ND	ug/L	1	0.16	0.57	
cis-1,2-Dichloroethene	ND	ug/L	1	0.18	0.62	
trans-1,2-Dichloroethene	ND	ug/L	1	0.15	0.51	
1,2-Dichloropropane	ND	ug/L	1	0.24	0.84	
1,3-Dichloropropane	ND	ug/L	1	0.18	0.63	
2,2-Dichloropropane	ND	ug/L	1	0.12	0.41	
1,1-Dichloropropene	ND	ug/L	1	0.15	0.54	
cis-1,3-Dichloropropene	ND	ug/L	1	0.19	0.68	
trans-1,3-Dichloropropene	ND	ug/L	1	0.14	0.51	
Ethylbenzene	ND	ug/L	1	0.30	1.1	
Hexachlorobutadiene	ND	ug/L	1	0.20	0.69	
Isopropylbenzene	ND	ug/L	1	0.17	0.60	
p-Isopropyltoluene	ND	ug/L	1	0.19	0.68	
Methylene chloride	ND	ug/L	1	0.20	0.70	
Naphthalene	ND	ug/L	1	0.29	1.0	
n-Propylbenzene	ND	ug/L	1	0.20	0.71	
ortho-Xylene	ND	ug/L	1	0.16	0.56	
Styrene	ND	ug/L	1	0.16	0.56	
1,1,1,2-Tetrachloroethane	ND	ug/L	1	0.19	0.66	
1,1,2,2-Tetrachloroethane	ND	ug/L	1	0.19	0.68	
Tetrachloroethene	ND	ug/L	1	0.17	0.58	
Toluene	ND	ug/L	1	0.19	0.68	
1,2,3-Trichlorobenzene	ND	ug/L	1	0.20	0.70	
1,2,4-Trichlorobenzene	ND	ug/L	1	0.18	0.63	
1,1,1-Trichloroethane	ND	ug/L	1	0.17	0.61	
1,1,2-Trichloroethane	ND	ug/L	1	0.17	0.59	
Trichloroethene	ND	ug/L	1	0.24	0.84	

ANALYTICAL RESULTS: VOC's by P&T/GCMS - Water - (VarSat3)

Customer: Leggette Brashears & Graham Inc **NLS Project: 272873**

Project Description: Kronenwetter/TB5 & TB9

Project Title: **Template: SAT3W** **Printed: 01/04/2017 16:56**

Sample: 967552 TB-5 Collected: 12/20/16 Analyzed: 12/28/16 - Analytes: 61

ANALYTE NAME	RESULT	UNITS	DIL	LOD	LOQ	Note
Trichlorofluoromethane	ND	ug/L	1	0.17	0.60	
1,2,3-Trichloropropane	ND	ug/L	1	0.29	1.0	
1,2,4-Trimethylbenzene	ND	ug/L	1	0.18	0.65	
1,3,5-Trimethylbenzene	ND	ug/L	1	0.20	0.71	
Vinyl chloride	ND	ug/L	1	0.16	0.57	
meta,para-Xylene	ND	ug/L	1	0.32	1.1	
MTBE	ND	ug/L	1	0.22	0.76	
Isopropyl ether	ND	ug/L	1	0.19	0.66	
Dibromofluoromethane (SURR)	107%					S
Toluene-d8 (SURR)	102%					S
1-Bromo-4-Fluorobenzene (SURR)	96%					S

NOTES APPLICABLE TO THIS ANALYSIS:

S = This compound is a surrogate used to evaluate the quality control of a method.

ANALYTICAL RESULTS: Polynuclear Aromatic Hydrocarbons by GC/MS SIM
Customer: Leggette Brashears & Graham Inc NLS Project: 272873
Project Description: Kronenwetter/TB5 & TB9
Project Title: Template: SVPAHW Printed: 01/04/2017 16:56

Sample: 967551 TB-9 Collected: 12/19/16 Analyzed: 12/27/16 - Analytes: 18

ANALYTE NAME	RESULT	UNITS WWB	DIL	LOD	LOQ	Note
Acenaphthene	ND	ug/L	1	0.022	0.075	
Acenaphthylene	ND	ug/L	1	0.021	0.071	
Anthracene	ND	ug/L	1	0.020	0.068	
Benzo (a) anthracene	ND	ug/L	1	0.042	0.14	
Benzo (a) pyrene	ND	ug/L	1	0.014	0.047	
Benzo (b) fluoranthene	ND	ug/L	1	0.019	0.063	
Benzo (g,h,i) perylene	ND	ug/L	1	0.053	0.18	
Benzo (k) fluoranthene	ND	ug/L	1	0.062	0.21	
Chrysene	ND	ug/L	1	0.010	0.034	
Dibenzo (a,h) anthracene	ND	ug/L	1	0.046	0.15	
Fluoranthene	ND	ug/L	1	0.028	0.095	
Fluorene	ND	ug/L	1	0.019	0.065	
Indeno (1,2,3-cd) pyrene	ND	ug/L	1	0.048	0.16	
Methyl-1-Naphthalene	ND	ug/L	1	0.024	0.082	
Methyl-2-Naphthalene	ND	ug/L	1	0.023	0.078	
Naphthalene	ND	ug/L	1	0.027	0.089	
Phenanthrene	ND	ug/L	1	0.024	0.079	
Pyrene	ND	ug/L	1	0.028	0.095	
Nitrobenzene-d5 (SURR)	66%					S
2-Fluorobiphenyl (SURR)	65%					S
Terphenyl-d14 (SURR)	52%					S

NOTES APPLICABLE TO THIS ANALYSIS:
S = This compound is a surrogate used to evaluate the quality control of a method.

Sample: 967552 TB-5 Collected: 12/20/16 Analyzed: 12/27/16 - Analytes: 18

ANALYTE NAME	RESULT	UNITS WWB	DIL	LOD	LOQ	Note
Acenaphthene	ND	ug/L	1	0.022	0.075	
Acenaphthylene	ND	ug/L	1	0.021	0.071	
Anthracene	ND	ug/L	1	0.020	0.068	
Benzo (a) anthracene	ND	ug/L	1	0.042	0.14	
Benzo (a) pyrene	ND	ug/L	1	0.014	0.047	
Benzo (b) fluoranthene	ND	ug/L	1	0.019	0.063	
Benzo (g,h,i) perylene	ND	ug/L	1	0.053	0.18	
Benzo (k) fluoranthene	ND	ug/L	1	0.062	0.21	
Chrysene	ND	ug/L	1	0.010	0.034	
Dibenzo (a,h) anthracene	ND	ug/L	1	0.046	0.15	
Fluoranthene	ND	ug/L	1	0.028	0.095	
Fluorene	ND	ug/L	1	0.019	0.065	
Indeno (1,2,3-cd) pyrene	ND	ug/L	1	0.048	0.16	
Methyl-1-Naphthalene	ND	ug/L	1	0.024	0.082	
Methyl-2-Naphthalene	ND	ug/L	1	0.023	0.078	
Naphthalene	ND	ug/L	1	0.027	0.089	
Phenanthrene	ND	ug/L	1	0.024	0.079	
Pyrene	ND	ug/L	1	0.028	0.095	
2-Fluorobiphenyl (SURR)	68%					S
Nitrobenzene-d5 (SURR)	70%					S
Terphenyl-d14 (SURR)	54%					S

NOTES APPLICABLE TO THIS ANALYSIS:
S = This compound is a surrogate used to evaluate the quality control of a method.

ANALYTICAL RESULTS: VOC's by P&T/GCMS - Water - (VarSat3)
Customer: Leggette Brashears & Graham Inc NLS Project: 272873
Project Description: Kronenwetter/TB5 & TB9
Project Title: Template: SAT3W Printed: 01/04/2017 16:56

Sample: 967551 TB-9 Collected: 12/19/16 Analyzed: 12/28/16 - Analytes: 61

ANALYTE NAME	RESULT	UNITS	DIL	LOD	LOQ	Note
Benzene	ND	ug/L	1	0.19	0.69	
Bromobenzene	ND	ug/L	1	0.25	0.87	
Bromochloromethane	ND	ug/L	1	0.15	0.54	
Bromodichloromethane	ND	ug/L	1	0.19	0.68	
Bromoform	ND	ug/L	1	0.16	0.56	
Bromomethane	ND	ug/L	1	0.22	0.79	
n-Butylbenzene	ND	ug/L	1	0.19	0.67	
sec-Butylbenzene	ND	ug/L	1	0.20	0.71	
tert-Butylbenzene	ND	ug/L	1	0.20	0.71	
Carbon Tetrachloride	ND	ug/L	1	0.19	0.66	
Chlorobenzene	ND	ug/L	1	0.16	0.56	
Chloroethane	ND	ug/L	1	1.5	5.4	
Chloroform	ND	ug/L	1	0.17	0.60	
Chloromethane	ND	ug/L	1	0.19	0.68	
2-Chlorotoluene	ND	ug/L	1	0.21	0.75	
4-Chlorotoluene	ND	ug/L	1	0.19	0.68	
Dibromochloromethane	ND	ug/L	1	0.17	0.61	
1,2-Dibromo-3-Chloropropane	ND	ug/L	1	0.21	0.73	
1,2-Dibromoethane	ND	ug/L	1	0.12	0.43	
Dibromomethane	ND	ug/L	1	0.21	0.73	
1,2-Dichlorobenzene	ND	ug/L	1	0.22	0.76	
1,3-Dichlorobenzene	ND	ug/L	1	0.20	0.72	
1,4-Dichlorobenzene	ND	ug/L	1	0.21	0.76	
Dichlorodifluoromethane	ND	ug/L	1	0.14	0.49	
1,1-Dichloroethane	ND	ug/L	1	0.18	0.64	
1,2-Dichloroethane	ND	ug/L	1	0.19	0.69	
1,1-Dichloroethene	ND	ug/L	1	0.16	0.57	
cis-1,2-Dichloroethene	ND	ug/L	1	0.18	0.62	
trans-1,2-Dichloroethene	ND	ug/L	1	0.15	0.51	
1,2-Dichloropropane	ND	ug/L	1	0.24	0.84	
1,3-Dichloropropane	ND	ug/L	1	0.18	0.63	
2,2-Dichloropropane	ND	ug/L	1	0.12	0.41	
1,1-Dichloropropene	ND	ug/L	1	0.15	0.54	
cis-1,3-Dichloropropene	ND	ug/L	1	0.19	0.68	
trans-1,3-Dichloropropene	ND	ug/L	1	0.14	0.51	
Ethylbenzene	ND	ug/L	1	0.30	1.1	
Hexachlorobutadiene	ND	ug/L	1	0.20	0.69	
Isopropylbenzene	ND	ug/L	1	0.17	0.60	
p-Isopropyltoluene	ND	ug/L	1	0.19	0.68	
Methylene chloride	ND	ug/L	1	0.20	0.70	
Naphthalene	ND	ug/L	1	0.29	1.0	
n-Propylbenzene	ND	ug/L	1	0.20	0.71	
ortho-Xylene	ND	ug/L	1	0.16	0.56	
Styrene	ND	ug/L	1	0.16	0.56	
1,1,1,2-Tetrachloroethane	ND	ug/L	1	0.19	0.66	
1,1,2,2-Tetrachloroethane	ND	ug/L	1	0.19	0.68	
Tetrachloroethene	ND	ug/L	1	0.17	0.58	
Toluene	ND	ug/L	1	0.19	0.68	
1,2,3-Trichlorobenzene	ND	ug/L	1	0.20	0.70	
1,2,4-Trichlorobenzene	ND	ug/L	1	0.18	0.63	
1,1,1-Trichloroethane	ND	ug/L	1	0.17	0.61	
1,1,2-Trichloroethane	ND	ug/L	1	0.17	0.59	
Trichloroethene	ND	ug/L	1	0.24	0.84	

ANALYTICAL RESULTS: VOC's by P&T/GCMS - Water - (VarSat3)

Customer: Leggette Brashears & Graham Inc NLS Project: 272873

Project Description: Kronenwetter/TB5 & TB9

Project Title: Template: SAT3W Printed: 01/04/2017 16:56

Sample: 967551 TB-9 Collected: 12/19/16 Analyzed: 12/28/16 - Analytes: 61

ANALYTE NAME	RESULT	UNITS	DIL	LOD	LOQ	Note
Trichlorofluoromethane	ND	ug/L	1	0.17	0.60	
1,2,3-Trichloropropane	ND	ug/L	1	0.29	1.0	
1,2,4-Trimethylbenzene	ND	ug/L	1	0.18	0.65	
1,3,5-Trimethylbenzene	ND	ug/L	1	0.20	0.71	
Vinyl chloride	ND	ug/L	1	0.16	0.57	
meta,para-Xylene	ND	ug/L	1	0.32	1.1	
MTBE	ND	ug/L	1	0.22	0.76	
Isopropyl ether	ND	ug/L	1	0.19	0.66	
Dibromofluoromethane (SURR)	112%					S
Toluene-d8 (SURR)	104%					S
1-Bromo-4-Fluorobenzene (SURR)	99%					S

NOTES APPLICABLE TO THIS ANALYSIS:

S = This compound is a surrogate used to evaluate the quality control of a method.

ANALYTICAL RESULTS: VOC's by P&T/GCMS - Water - (VarSat3)
Customer: Leggette Brashears & Graham Inc NLS Project: 272873
Project Description: Kronenwetter/TB5 & TB9
Project Title: Template: SAT3W Printed: 01/04/2017 16:56

Sample: 967553 Trip Blank Collected: 12/20/16 Analyzed: 12/28/16 - Analytes: 61

ANALYTE NAME	RESULT	UNITS	DIL	LOD	LOQ	Note
Benzene	ND	ug/L	1	0.19	0.69	
Bromobenzene	ND	ug/L	1	0.25	0.87	
Bromochloromethane	ND	ug/L	1	0.15	0.54	
Bromodichloromethane	ND	ug/L	1	0.19	0.68	
Bromoform	ND	ug/L	1	0.16	0.56	
Bromomethane	ND	ug/L	1	0.22	0.79	
n-Butylbenzene	ND	ug/L	1	0.19	0.67	
sec-Butylbenzene	ND	ug/L	1	0.20	0.71	
tert-Butylbenzene	ND	ug/L	1	0.20	0.71	
Carbon Tetrachloride	ND	ug/L	1	0.19	0.66	
Chlorobenzene	ND	ug/L	1	0.16	0.56	
Chloroethane	ND	ug/L	1	1.5	5.4	
Chloroform	ND	ug/L	1	0.17	0.60	
Chloromethane	ND	ug/L	1	0.19	0.68	
2-Chlorotoluene	ND	ug/L	1	0.21	0.75	
4-Chlorotoluene	ND	ug/L	1	0.19	0.68	
Dibromochloromethane	ND	ug/L	1	0.17	0.61	
1,2-Dibromo-3-Chloropropane	ND	ug/L	1	0.21	0.73	
1,2-Dibromoethane	ND	ug/L	1	0.12	0.43	
Dibromomethane	ND	ug/L	1	0.21	0.73	
1,2-Dichlorobenzene	ND	ug/L	1	0.22	0.76	
1,3-Dichlorobenzene	ND	ug/L	1	0.20	0.72	
1,4-Dichlorobenzene	ND	ug/L	1	0.21	0.76	
Dichlorodifluoromethane	ND	ug/L	1	0.14	0.49	
1,1-Dichloroethane	ND	ug/L	1	0.18	0.64	
1,2-Dichloroethane	ND	ug/L	1	0.19	0.69	
1,1-Dichloroethene	ND	ug/L	1	0.16	0.57	
cis-1,2-Dichloroethene	ND	ug/L	1	0.18	0.62	
trans-1,2-Dichloroethene	ND	ug/L	1	0.15	0.51	
1,2-Dichloropropane	ND	ug/L	1	0.24	0.84	
1,3-Dichloropropane	ND	ug/L	1	0.18	0.63	
2,2-Dichloropropane	ND	ug/L	1	0.12	0.41	
1,1-Dichloropropene	ND	ug/L	1	0.15	0.54	
cis-1,3-Dichloropropene	ND	ug/L	1	0.19	0.68	
trans-1,3-Dichloropropene	ND	ug/L	1	0.14	0.51	
Ethylbenzene	ND	ug/L	1	0.30	1.1	
Hexachlorobutadiene	ND	ug/L	1	0.20	0.69	
Isopropylbenzene	ND	ug/L	1	0.17	0.60	
p-Isopropyltoluene	ND	ug/L	1	0.19	0.68	
Methylene chloride	ND	ug/L	1	0.20	0.70	
Naphthalene	ND	ug/L	1	0.29	1.0	
n-Propylbenzene	ND	ug/L	1	0.20	0.71	
ortho-Xylene	ND	ug/L	1	0.16	0.56	
Styrene	ND	ug/L	1	0.16	0.56	
1,1,1,2-Tetrachloroethane	ND	ug/L	1	0.19	0.66	
1,1,2,2-Tetrachloroethane	ND	ug/L	1	0.19	0.68	
Tetrachloroethene	ND	ug/L	1	0.17	0.58	
Toluene	ND	ug/L	1	0.19	0.68	
1,2,3-Trichlorobenzene	ND	ug/L	1	0.20	0.70	
1,2,4-Trichlorobenzene	ND	ug/L	1	0.18	0.63	
1,1,1-Trichloroethane	ND	ug/L	1	0.17	0.61	
1,1,2-Trichloroethane	ND	ug/L	1	0.17	0.59	
Trichloroethene	ND	ug/L	1	0.24	0.84	

ANALYTICAL RESULTS: VOC's by P&T/GCMS - Water - (VarSat3)

Customer: Leggette Brashears & Graham Inc NLS Project: 272873
Project Description: Kronenwetter/TB5 & TB9
Project Title: Template: SAT3W Printed: 01/04/2017 16:56

Sample: 967553 Trip Blank Collected: 12/20/16 Analyzed: 12/28/16 - Analytes: 61

ANALYTE NAME	RESULT	UNITS	DIL	LOD	LOQ	Note
Trichlorofluoromethane	ND	ug/L	1	0.17	0.60	
1,2,3-Trichloropropane	ND	ug/L	1	0.29	1.0	
1,2,4-Trimethylbenzene	ND	ug/L	1	0.18	0.65	
1,3,5-Trimethylbenzene	ND	ug/L	1	0.20	0.71	
Vinyl chloride	ND	ug/L	1	0.16	0.57	
meta,para-Xylene	ND	ug/L	1	0.32	1.1	
MTBE	ND	ug/L	1	0.22	0.76	
Isopropyl ether	ND	ug/L	1	0.19	0.66	
Dibromofluoromethane (SURR)	120%					S
Toluene-d8 (SURR)	104%					S
1-Bromo-4-Fluorobenzene (SURR)	100%					S

NOTES APPLICABLE TO THIS ANALYSIS:

S = This compound is a surrogate used to evaluate the quality control of a method.

SAMPLE COLLECTION AND CHAIN OF CUSTODY RECORD

NORTHERN LAKE SERVICE, INC.

Analytical Laboratory and Environmental Services

400 North Lake Avenue • Crandon, WI 54520-1298
Tel: (715) 478-2777 • Fax: (715) 478-3060

Wisconsin DNR cert ID
721026460 (Cran) / 268533760 (Wauk)
Wisconsin DATCP ID
105-000330 (Cran) / 105-000479 (Wauk)

NO. 204282

CLIENT: Leggette, Brashears & Graham Inc
ADDRESS: 5957 McKee Rd, Ste 7
CITY: Madison STATE: WI ZIP: 53719
PROJECT DESCRIPTION / NO.: Kronenwetter / TB5 + TB9
QUOTATION NO.:
DNR FID #: DNR LICENSE #:
CONTACT: Ted Powell PHONE: 414-881-6957
PURCHASE ORDER NO.: FAX:

MATRIX:
SW = surface water
WW = waste water
GW = groundwater
DW = drinking water
TIS = tissue
AIR = air
SOIL = soil
SED = sediment
PROD = product
SL = sludge
OTHER

ANALYZE PER ORDER OF ANALYSIS

USE BOXES BELOW: Indicate Y or N if GW Sample is field filtered.
Indicate G or C if WW Sample is Grab or Composite.

ITEM NO.	NLS LAB. NO.	SAMPLE ID	COLLECTION DATE	COLLECTION TIME	MATRIX (See above)	VOCs 40ml HCl (EPA 8260B)	Cl SO4 TDS 1L NT	Nitrate+Nitrite 250ml H2SO4	~~Hardness~~	As, Fe, Mg, Mn, Ca, Na, Hardness	1L Amber PAH (8270)						COLLECTION REMARKS (i.e. DNR Well ID #)
Field filtered						N6	N6				DNG						
1.	961551	TB-9	12/19/2016	16:35	GW	2	1	1		1	2						
2.	552	TB-5	12/20/2016	13:35	GW	2	1	1		1	2						
3.	553	Trip Blank				1											
4.																	
5.																	
6.																	
7.																	
8.																	
9.																	
10.																	

COLLECTED BY (signature): [illegible] CUSTODY SEAL NO. (IF ANY): DATE/TIME: 12/20/16 / 13:35
RELINQUISHED BY (signature): [illegible] RECEIVED BY (signature): [illegible] DATE/TIME: 12/21/16 1300
DISPATCHED BY (signature): delivered by [illegible] METHOD OF TRANSPORT: to Waukesha lab DATE/TIME:
RECEIVED AT NLS BY (signature): Julie Braun DATE/TIME: 12/22/16 930 CONDITION: OK, 4 TEMP.
REMARKS & OTHER INFORMATION
COOLER #
WDNR FACILITY NUMBER E-MAIL ADDRESS

REPORT TO: Ted Powell
ted.powell@lbgmn.com

INVOICE TO: A/A

PRESERVATIVE:
NP = no preservative N = nitric acid OH = sodium hydroxide
S = sulfuric acid Z = zinc acetate HA = hydrochloric & ascorbic acid
M = methanol H = hydrochloric acid

IMPORTANT:
1. TO MEET REGULATORY REQUIREMENTS, THIS FORM **MUST** BE COMPLETED IN DETAIL AND INCLUDED IN THE COOLER CONTAINING THE SAMPLES DESCRIBED.
2. PLEASE USE ONE LINE PER SAMPLE, **NOT** PER BOTTLE.
3. RETURN THIS FORM WITH SAMPLES - CLIENT MAY KEEP YELLOW COPY.
4. PARTIES COLLECTING SAMPLE LISTED AS **REPORT TO** AND LISTED AS **INVOICE TO** AGREE TO STANDARD TERMS & CONDITIONS ON REVERSE

Rev. 7/20/15