

WATER PERMIT NO. 7055-3

Name of Applicant: **Watertown Municipal Utilities Dept.**

Address: **901 4th Ave SW, Watertown SD 57201**

Phone: **605 882-6233**

Amount of Water Claimed: **4500 AF**

Total Acres: **NA**

Source of Water Supply: **groundwater (9 wells)**

Water to be used for: **municipal**

County: **Codington**

Type of Waste Disposal System:

Location: **4 miles north of Watertown**

PRIORITY

Date Received: **8-11-08**

Application/License Fee: **\$1175**

Corrected Application Received:

Period of Annual Use: **January 1 – December 31**

Remarks: **Withdrawing from Future Use Permit No. 5862-3**

Diversion Point: **N ½ Sec 31-T118N-R52W**

Land to be Irrigated: **NA**

Depth of Well:

Well Driller: :

Remarks:

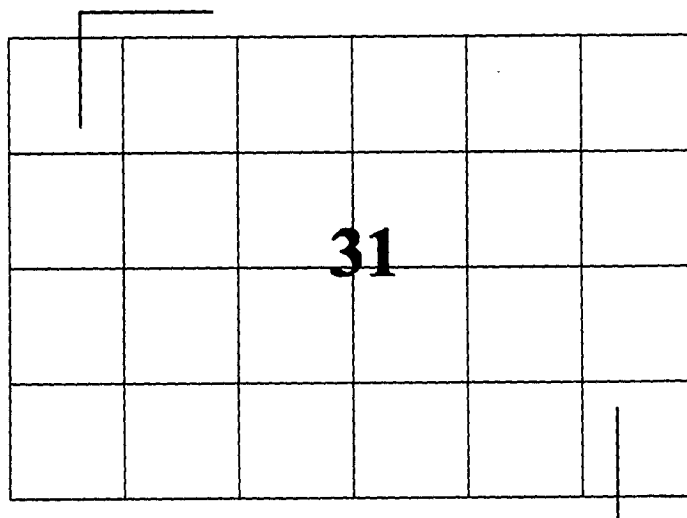
Type of Map: **topo**

Prepared by:

Reviewed and the Number Assigned on: **8-12-08**

By: **Karen Schlaak**

Notice of Hearing - date to intervene: _____



Mail to: Water Rights Program Joe Foss Building 523 E. Capitol Pierre, SD 57501-3181 (605) 773-3352	No. <u>1055-3</u> (office use only)	Hydrologic Unit <u>10170202</u>
	Basin <u>Sioux River</u>	
	Newspaper <u>Public Opinion PO Box 10 Watertown</u>	
	<u>605-886-6901</u>	<u>57201</u>

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Application For Permit To Appropriate Water Within The State Of South Dakota

Check use(s) of water:

- | | | | |
|---|---|--|--|
| ☒ Municipal | ☐ Suburban Housing | ☐ Recreational | ☐ Institutional |
| ☐ Rural Water System | ☐ Commercial | ☐ Fish & Wildlife | ☐ Geothermal Heat |
| ☐ Domestic (over 18 gpm) | ☐ Industrial | ☐ Other | |

Type of Application: (check one)

- ☐ New ☐ Vested Right (Use predates Mar 2, 1955) ☐ Future Use Reservation
☒ Place to Beneficial Use Water Reserved by Future Use Permit No. 5862-3
☐ Amendment/Correction to Permit No. _____

Description of amendment/correction: (i.e. change diversion point(s), add diversion point(s), change use, etc.)

1. Name of Applicant Watertown Municipal Utilities Dept. Phone (605) 882-6233
(check one) ☐ Owner ☐ Tenant/lessee
Mailing Address 901 4th Ave SW Watertown State SD 57201
(Street, RR, or Box and City) (Zip Code)
2. Amount of water claimed 8 *CFS or 4500 **GPM ***AF
(*Cubic Feet per Second) (**Gallons per Minute) (***Acre Feet - storage capacity of dam/dugout or annual use if applicable)
3. Source of water supply Big Sioux Aquifer
4. Location of point of diversion (example - 3 wells in SW1/4 NE1/4 section 12-T104N-R53W) County Codington
9 - Wells located at N 1/2 Section 20, T118,R52W
31
5. County or counties where water will be used Codington
6. Annual period during which water is to be used All year long
7. Give a description of the project. When available include any preliminary engineering report or other reports or information that will help explain the project. (Attach sheet if more space is needed)

This new well field will be developed along with a new water treatment plant. We are going to quit using surface water and will be discontinuing the use of the Lake Kampeska plant. Enclosed with this application is the Detailed Hydrogeologic Assessment Of The Proposed Rauville Wellfield.

STATE OF SOUTH DAKOTA)
County of CODINGTON) SS

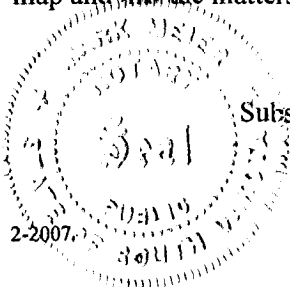
Attachments: Attach Form 2A if diversion is from a well or dugout, or if storage of water is proposed. Attach map and any other technical information. (see instructions)

I, GEOFF HEIG, the applicant, certify that I have read this application, have examined the attached map and that the matters stated are true and that I intend, and am able to complete the necessary construction.

Applicant's signature G. Heig, GENERAL MANAGER

Subscribed and sworn to before me this 17th day of August 20 08

Notary Public signature



**SOUTH DAKOTA
WATER PERMIT NO. 7055-3**

Date of first receipt of application August 11, 2008.

The Water Management Board approved Water Permit No. 7055-3 on October 2, 2008 for Watertown Municipal Utilities Department, 901 4th Ave SW, Watertown SD 57201 authorizing the construction of the water use system and the placing of water to beneficial use subject to the following limitations, conditions and qualifications:

1. Water Permit No. 7055-3 authorizes placing to beneficial use 4,500 acre-feet annually appropriated and reserved by Future Use Permit No. 5862-3. A diversion rate of 8.0 cubic feet of water per second is authorized from nine wells to be completed into the Big Sioux:North Aquifer (approximately 50 feet deep) located in N ½ Section 31-T118N-R52W.
2. The water appropriated shall be used for the purpose of supplying municipal use for the City of Watertown and may not exceed the amount of water needed for beneficial use.
3. The water is to be used during the following described annual period: January 1 – December 31.
4. The date from which applicant may claim right is April 6, 1995 (established by Future Use Permit No. 5862-3).
5. One-fifth of the construction is to be completed on or before April 2, 2011.
6. All construction is to be completed on or before October 2, 2013.
7. Water is to be put to beneficial use on or before October 2, 2017.
8. Water rights obtained in compliance with the laws of the State of South Dakota may not be unlawfully impaired by this appropriation.

QUALIFICATIONS

1. The wells approved under this Permit will be located near domestic wells and other wells which may obtain water from the same aquifer. The well owner under this Permit shall control his withdrawals so there is not a reduction of needed water supplies in adequate domestic wells or in adequate wells having prior water rights.
2. The wells authorized by Permit No. 7055-3 shall be constructed by a licensed well driller and construction of the well and installation of the pump shall comply with Water Management Board Well Construction Rules, Chapter 74:02:04 with the well casing pressure grouted (bottom to top) pursuant to Section 74:02:04:28.
3. Watertown Municipal Utilities Department shall report to the Chief Engineer annually the amount of water withdrawn from the Big Sioux:North Aquifer.

WATER MANAGEMENT BOARD

By: Garland Erbele
Garland Erbele, Chief Engineer
Water Rights Program
Department of Environment and Natural Resources

OCT 31 2008
date



(type or print in ink)

1. Well Information - Proposed Construction

- a) Drill Hole Diameter See report Depth
- b) Casing Type Diameter Thickness
- c) Screen Type Diameter Thickness
- d) Gravel Pack Length of Gravel Pack
- e) Depth to Top of Water Bearing Material See attached report
- f) Depth to Water (ground surface to water level) See attached report
- g) Distance to nearest existing domestic well:
- On applicants property On property owned by others

2. Wastewater Disposal System Information

- a) Type of System (i.e. septic tank, drain field)
- b) System Capacity (gallons) Year Constructed
- c) Connected to the City of Sanitary System

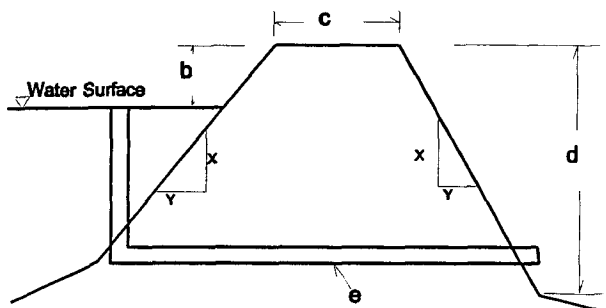
3. Dugout Information

- a) Surface Dimensions Depth
- b) Depth to water (ground surface to water level)

4. Water Storage Dams

If the proposed water use system contains one or more storage dams, please furnish the information requested below for each dam. The locations of the dams need to be shown on the map submitted with the application.

- a) If a private engineering firm or government agency was involved in the design of this dam, please give their name and address:



- b) Freeboard
- c) Crest Width
Crest Length
- d) Height
- e) Primary Outlet Capacity
If pipe, diameter
- f) Secondary Spillway Capacity
Spillway Width
- g) X & Y Slope
Upstream
Downstream
- h) Surface Area of Impoundment
- i) Storage Acre Feet
- j) Drainage Area Above Dam Acres



Legend

- Proposed Production Wells
- Property Outline
- Proposed Production Well Spacing

0 125 250 500 Feet

PROPOSED PRODUCTION WELL LOCATIONS Waterown Municipal Utilities Wellfield Expansion

Figure 10



RECEIPT

WATER RIGHTS PROGRAM

South Dakota Department of Environment and Natural Resources

Date 8/12, 20 08

RECEIVED OF Watertown Municipal Utilities Watertown SD 57201

The following amount in fees for services rendered as provided for by law:

Fee for Application for Permit No. _____ to Appropriate Water, to construct and to put water to beneficial use	1325	00
Fee for Application for Permit No. _____ to Appropriate Water for Future use		
Fee to retain Future Use Permit No. _____ after period of seven years.		
Fee for Inspecting Constructed Works, confirming beneficial use and issuing Water License No. _____	50	00
Fee for Filing Transfer Form _____		
Fee for _____		
Fee for Issuing New Well Driller's License No. _____ for C.Y. _____		
Fee for Renewal of Well Driller's License No. _____ for C.Y. _____		
Fee for Issuing Well Pump Installer's License No. _____ for C.Y. _____		
Fee for Renewal of Well Pump Installer's License No. _____ for C.Y. _____		
(Any Other Work Provided by Law)	TOTAL	1425 00

No.

By

Chief Engineer

03716

LETTER OF TRANSMITTAL

TO: SD DENR
 PMB 2020
 Joe Foss Bldg
 523 E Capitol
 Pierre SD 57501

DATE		JOB NO.	
8/13/08		P00847-2007-02	
ATTENTION	Eric Gronlund		
RE	Water System Expansion Project Watertown Municipal Utilities		

WE ARE SENDING YOU:

☒ Report
 ☐ Plans
 ☐ Specifications
 ☐ Copy of Letter
 ☐ Shop Drawings
☐ Samples
 ☐ Change Order
 ☐ Other

COPIES	DATE	NO.	DESCRIPTION
2	08/12/2008		Proposed Well Locations Diagram

THESE ARE TRANSMITTED as checked below:

☐ For approval
 ☐ For your use
 ☒ As requested
 ☐ For review and comment

REMARKS:

Enclosed for your use are two copies of a diagram showing proposed well locations for the above referenced project. Please contact me at 218-299-5610 with any questions.

Copy to: _____

Signed: _____

Brian R. Bergantine
 Brian R. Bergantine, PE

If enclosures are not as noted, kindly notify us at once.

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**DETAILED HYDROGEOLOGIC ASSESSMENT
OF THE
PROPOSED RAUVILLE WELLFIELD**

RAUVILLE, SOUTH DAKOTA



PREPARED FOR:

WATERTOWN MUNICIPAL UTILITIES
901 FOURTH AVENUE SOUTHWEST
WATERTOWN, SOUTH DAKOTA

PREPARED BY:

ST. CROIX ENVIRONMENTAL, INC.
1094 GOLDEN OAKS DRIVE
HUDSON, WISCONSIN 54016
(715) 381-5701

AUGUST 7, 2008



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- Figure 2** – Surficial Geology of South Dakota
- Figure 3** – Bedrock Elevation Contours
- Figure 4** – Aerial Extent of the Big Sioux Aquifer
- Figure 5** – USGS Topographic Map
- Figure 6** – Test Borings and Test Well Locations
- Figure 7** – Lithologic Section Location
- Figure 8** – NW-SE Lithologic Section
- Figure 9** – Aquifer Saturated Thickness
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APPENDICES

- Appendix 1** – Preliminary Hydrogeologic Evaluation Report (SCE 2007)
- Appendix 2** – Well Logs for Test Borings and Test Wells
- Appendix 3** – Aquifer Test Analytical Results for TW-1
- Appendix 4** – Aquifer Test Analytical Results for TW-2
- Appendix 5** – Sieve Analyses for TW-1 and TW-2 Samples
- Appendix 6** – Laboratory Analytical Results for TW-1 Sample

INTRODUCTION

Watertown Municipal Utilities (WMU) is in the process of expanding their existing ground water supply. Water rights have been secured from the Big Sioux Aquifer, located in Sections 29, 30 and 31, Township 118 North, Range 52 West, Codington County, South Dakota (**Figure 1**) for the new expansion. Within those sections, WMU has acquired property to support development of future wells and associated infrastructure. This area, located approximately four miles north of the City and outlined on **Figure 1**, is referred to in this report as the proposed Rauville Wellfield.

The projected water requirements for the proposed water supply expansion are 4,500 acre-feet/year. In the spring of 2007, WMU authorized St. Croix Environmental, Inc. (SCE) to initiate a hydrogeologic assessment for the proposed Rauville Wellfield. The assessment was conducted in stages. A preliminary evaluation, consisting of compiling and evaluating existing data, was performed to describe the hydrogeologic setting of the Rauville Wellfield and to determine if the potential exists to meet the needs of the proposed ground water supply expansion. The results were reported in the "Preliminary Hydrogeologic Evaluation" prepared by SCE in December, 2007 (**Appendix 1**). The preliminary evaluation indicated that the proposed Rauville Wellfield appears suitable for the proposed expansion and recommended that a more detailed hydrogeologic evaluation be performed.

The results of the detailed hydrogeologic evaluation are presented in this report. The evaluation involved completion of nine test borings; construction of two test production wells and associated observation wells; short-term and long-term aquifer performance testing; baseline water chemistry testing; determination of aquifer hydraulic properties; estimation of sustainable well yields; and providing a basis for preliminary well field design.

BACKGROUND INFORMATION

The general geology of the area surrounding the proposed Rauville Wellfield consists of glacial outwash, along with unconsolidated sand and gravel deposited by receding glacial activity (**Figure 2**). The outwash consists of stratified deposits of poor- to well-sorted sand and gravel. Underlying the sand and gravel is a till layer. This till is grayish blue clay, with silt and fine sand. The Pierre shale is the predominant bedrock in the area. It is composed of medium to dark gray shale. Depth to bedrock in the subject area averages about 400 feet below land surface (**Figure 3**).

Three of the seven glacial aquifers in the Codington/Grant county area underlie the general Rauville Wellfield area (USGS, 1994). From shallowest to deepest, these are the Big Sioux Aquifer, the Prairie Coteau Aquifer and the Altamont aquifer. The Big Sioux Aquifer, from which water rights have been secured, is the focus of this assessment.

The Big Sioux Aquifer is predominantly a water table aquifer. The Big Sioux Aquifer and associated subsurface drainage follow the Big Sioux River, Willow Creek, Lake Kampeska and Pelican Lake as shown on **Figure 4**. The aquifer is approximately 150 square miles in size and is confined to the floodplain of the Big Sioux River and its tributaries.

The Big Sioux Aquifer originates from glacial drift formations consisting of deposits of poorly to well-sorted surficial outwash. This outwash ranges from medium grained sand to medium gravel. In most areas the aquifer generally becomes coarser and more sorted with depth. The Big Sioux Aquifer is encountered at depths generally less than 10 feet below grade surface (bgs) and averages 22 feet in thickness, with a maximum observed thickness of 79 feet. The Big Sioux Aquifer is underlain by the till sequences of the Prairie Coteau Aquifer.

The general direction of water movement in the Big Sioux Aquifer is to the south and toward the Big Sioux River, which flows from north to south. Topography of the area is shown on **Figure 5**. Recharge to the Big Sioux Aquifer is by direct infiltration and percolation of rainfall and snowmelt through the overlying soil strata. Recharge ranges from 4 inches per year to as much as 10 inches per year.

Discharge from the Big Sioux Aquifer occurs through evapotranspiration, and through permitted withdrawals. Water is also discharged from the aquifer into lakes and the Big Sioux River. Lakes Kampeska and Pelican Lake are hydraulically connected to the Big Sioux Aquifer. In the spring and early summer, lake levels commonly exceed the water level in the aquifer, thus, the lakes recharge the aquifer. During the summer and fall, when evaporation exceeds precipitation, the lake levels drop below the water levels in the surrounding Big Sioux Aquifer and water from the aquifer discharges to the lakes.

The overall hydraulic gradient of the Big Sioux Aquifer water table surface is generally about 6 to 10 feet per mile (ft/mi) (USGS, 1990). The estimated volume of water in storage within the Big Sioux is 320,000 acre-feet, or approximately 104,288 million gallons (USGS, 1994). The aquifer flows from north to south at an estimated rate of two million gallons per day with the water table fluctuating between three and thirty-three (33) feet below the ground surface.

Aquifer tests, referenced in Barari (1991), were performed within the Big Sioux Aquifer by the South Dakota Geological Survey and the United States Geological Survey in 1964 and 1965. The tests were run for 72 hours at an average rate of 260 gallons per minute. Results of the tests indicate the average transmissivity under field conditions to be 5.0×10^{-4} gal/day/ft, with an average thickness of saturated aquifer of approximately 23 feet. The permeability was 2.2×10^{-3} gal/day/ft².

The findings of the initial hydrogeologic study (**Appendix 1**) suggested that the proposed Rauville Wellfield had the potential to meet the projected water needs. Aquifer yield is highly dependant upon the thickness of the aquifer, which varies significantly throughout this area. Estimates of well yields indicated that some wells may produce less water than desired, while others may have the capacity to produce

more. The production from each future well will be dependant upon the sediments encountered and the aquifer thickness at each particular location.

It was recommended that additional area-specific aquifer pumping data should be collected in an effort to adequately determine if sustainable yields would be acceptable.

PURPOSE AND SCOPE

The purpose of the detailed hydrogeologic assessment is to assess the capability of the proposed Rauville Wellfield to support the future water supply needs for WMU, and to provide a basis for the final design of the well field, including well spacing and projected well yield.

The following summarizes the assessment components, the results of which are described later in this report.

- Completion of Infill Test Borings
 - Purpose – To determine aquifer thickness at additional locations within the well field.
 - Actions Completed – Installation of nine test borings, six of which were subsequently completed as monitoring wells.
- Installation of Test Pumping and Associated Observation Wells
 - Purpose – To facilitate aquifer testing at two locations across the well field.
 - Actions Completed – Drilled and installed two 6-inch diameter test wells, and four 3-inch diameter observation wells.
- Completion of Aquifer Testing
 - Purpose – To determine projected aquifer/well yield and well spacing requirements.
 - Actions Completed – Set-up and completed an 8-hour variable-rate step test at each test well; set up and completed a 72-hour constant rate pumping test at TW-1 and TW-2; and completed a seven day constant rate pumping test at TW-1.
- Analysis of Aquifer Test Results
 - Purpose – To analyze and present aquifer test data, including estimates of well yield and well spacing.
 - Actions Completed – Tabulated the data, and analyzed same using standard aquifer test analytical methods and calculations.
- Sampling and Analysis for Water Quality
 - Purpose – To provide water quality characteristics to facilitate well siting and plant design.
 - Actions Completed – Sampled the test wells toward end of aquifer testing, obtaining data for nitrate-nitrite, phosphorous, iron, manganese and other analytes.
- Completion of Sieve Analyses for Aquifer Materials
 - Purpose – To determine aquifer characteristics as it relates to well design considerations.
 - Actions Completed – Obtained two samples, one from each test well, and submitted for detailed sieve analysis.
- Data Evaluation and Reporting
 - Purpose – To document findings, conclusions and recommendations.
 - Actions Completed – Generated boring logs and cross sections; compiled aquifer test data and interpretations; assessed the water quality data and implications for well field development; and prepared this report including field methods, findings and conclusions.

DRILLING ACTIVITIES AND SUBSURFACE GEOLOGY

Previous boring log data provided by the City and compiled from the South Dakota Geological Survey indicate that sediments in this area consist primarily of surficial outwash deposits, consisting of unconsolidated sand and gravel. Our previous review of these existing geologic logs indicated that saturated aquifer thicknesses range from approximately 10 feet to 80 feet in the surrounding area, although no data yet existed for the acquired property. The aquifer is thinnest in the western portions of Section 31 and Section 30. Existing data indicate that the thickest portion of the aquifer, approximately 80 feet, occurs in a small, localized area in the southeast quarter of Section 30.

A total of nine boreholes (test borings) were advanced across the proposed wellfield area to confirm earlier findings relating to aquifer materials and aquifer thickness. The locations of these test borings are shown on **Figure 6**. Drilling was completed between January 21 and January 31, 2008. Kaiser Well Drilling utilized mud rotary drilling, with a specially-designed surfactant drilling fluid, to install the borings and wells. The wells were developed immediately following installation to remove any remnants of the drilling fluid and formation materials, and to establish a strong hydraulic connection to the aquifer. Samples of the sediments were collected during drilling and described by the onsite hydrogeologist. Geologic logs are included in **Appendix 2**. Sediments encountered at most boring locations during this phase of work consisted of interbedded layers of fine to medium sand, gravel and clay.

A cross section was prepared from northwest to southeast across the wellfield, incorporating these recent borings and the previously installed Test Boring 10 (TB-10, completed by WMU). The location of the cross section is shown on **Figure 7**. The cross section is included as **Figure 8**. Several thin clay layers were encountered within the Big Sioux Aquifer, although most were on the order of a foot or two in thickness. A thin but laterally extensive clay layer was encountered in each of the borings at depths between 27 and 31 feet. This clay layer was not reported at TB-10 located immediately to the north. This clay layer may act as a small but significant semi-confining layer for the wellfield, providing some protection for future wells assuming they are completed below the clay layer.

Eight of the nine boreholes advanced during this phase of work terminated in a blue clay layer encountered at depths of 51 to 55 feet bgl. The remaining boring terminated in a yellow clay layer at a depth of 57 feet bgl. Three of the boreholes were advanced an additional 15 to 20 feet deeper to assess the thickness of the underlying clay. Clay was present throughout this interval, indicating that it likely represents the base of the Big Sioux Aquifer. These findings indicate that the saturated thickness of the aquifer is generally 51 feet across the area investigated, with the exception of the TB-2 location. The saturated thickness of the aquifer is approximately 47 feet at the TB-2 location, which was placed in the south central portion of the area assessed. **Figure 9** shows the saturated thickness of the aquifer in the area of interest, and has been updated to include the recent findings.

Two six-inch diameter test wells were installed for the purpose of conducting aquifer testing (TW-1 and TW-2). The wells were screened from approximately 35 to 55 feet below grade level and are constructed of PVC well materials. Four observation wells consisting of three-inch diameter construction were installed to monitor response of the aquifer to pumping (OB-1 through OB-4). The observation wells were also screened at depths of approximately 35 to 55 feet bgl. In addition, three test borings were advanced solely to further assess lithologic conditions. Depth to water, as measured in the test and observation wells before the aquifer tests, was approximately 4 feet below ground surface.

AQUIFER TESTING AND ANALYSIS

Two long-term aquifer pumping tests were performed, one using each test well, for durations of 48 and 168 hours. The data obtained from the test were evaluated by SCE's hydrogeologist to determine the hydraulic properties of the aquifer beneath the proposed wellfield, to provide recommendations on the sustainable yield of a water supply well, and to determine an appropriate well spacing.

The site-specific aquifer hydraulic properties are defined below:

- Transmissivity (T) – defined as the volume of water flowing through a cross-sectional area of an aquifer whose height is the entire thickness of the aquifer; whose width is one foot; under a hydraulic gradient of one foot per foot (ft/ft).
- Hydraulic Conductivity (k) – defined as the transmissivity divided by the aquifer thickness, or the volume of water flowing through a one foot by one foot cross sectional area of the aquifer, under a hydraulic gradient of one ft/ft, in a given amount of time (usually a day).
- Storage Coefficient (S) – is the volume of water released from an aquifer per one square foot surface area per one foot change in head.

The calculated aquifer properties were then used to estimate the sustainable yield of a supply well. The measured drawdown during the test was used to determine an appropriate spacing between multiple wells. The following sections describe the work performed to achieve the objectives described above.

Variable-Rate (Step) Tests

Prior to conducting the constant-rate tests, a variable rate (step) test was completed on each test well to verify the ability of each well to sustain a specific rate for the longer-term testing.

- Test Well TW-1 was pumped for approximately 30 minutes at 100, 200 and 290 gallons per minute (gpm), followed by an additional 30 minutes at 290 gpm. Based on the ability of the test well to sustain the maximum rate tested of 290 gpm, that rate was selected for the longer term test.
- Test Well TW-2 was pumped for approximately 30 minutes at 100, 200 and 300 gallons per minute (gpm), followed by an additional 30 minutes at 330 gpm. Based on the ability of the test well to sustain the maximum rate tested of 330 gpm, that rate was selected for the longer term test.

Constant-Rate Tests

The long-term aquifer tests were completed using a 5 horsepower submersible pump, capable of delivering approximately 300 gallons per minute of discharge. Water from the test pumping was diverted, away from the wellhead through a series of PVC discharge pipes, with discharged water ultimately entering the nearby creek. Flow rate was controlled manually using a ball valve, and both flow rate and total discharge measurements were obtained from an in-line flow meter. Downhole transducers were utilized for water level measurement, at one minute intervals, augmented by hand measurements on a periodic basis.

A 48-hour aquifer test was completed at Test Well TW-2 between February 22 and 24, 2007. Changes in the potentiometric surface were monitored at the pumping well and at three (3) observation wells: Wells OB-3, OB-4 and OB-2, located 50, 150 and 1500 feet from the pumping well, respectively. Water level measurements were collected using electronic pressure transducers/data loggers, and an electronic

water level indicator was used to collect manual measurements. The test well was pumped at a constant rate of 333 gallons per minute. After 48 hours, upon cessation of pumping, recovery data were collected under non-pumping conditions for an additional 12 hours.

A 168-hour aquifer test was completed at Test Well TW-1 between June 12 and 19, 2008. Changes in the potentiometric surface were monitored at the pumping well and at three (3) observation wells: Wells OB-1, OB-2 and OB-4, located 50, 150 and 1500 feet from the pumping well, respectively. Water level measurements were collected using electronic pressure transducers/data loggers, and an electronic water level indicator was used to collect manual measurements. The test well was pumped at a constant rate of 290 gallons per minute. After 168 hours, upon cessation of pumping, recovery data were collected under non-pumping conditions for an additional 72 hours.

Test Analysis

The pumping test data were analyzed using the aquifer test analysis software Aquifer Test Pro (Schlumberger). Four methods of analysis were applied to the data sets for each pumping well: two versions of the Cooper- Jacob straight-line method of analysis, the Theis method, and the Boulton method. Details of these analytical methods are beyond the scope of this report, but can be provided upon request.

The results of the analyses are summarized in **Appendix 3** (TW-1) and **Appendix 4** (TW-2), and include the following plots/tables:

- A summary table is provided for each test providing the aquifer parameters determined from various analytical methods;
- A summary table is provided which includes the well construction information used in the analysis;
- Plots of drawdown versus time are provided for the pumping well, and each observation well, throughout the test period;
- Analytical plots for each method are provided, which show the test data and the best-fit curves associated with each analysis;
- A contour map is provided for each test, depicting the drawdown contours at the termination of pumping.

Upon reviewing all of the testing results, we believe it appropriate to select the most conservative of the analytical methods (Cooper and Jacob II) for purposes of water appropriation and wellfield design. Aquifer hydraulic parameters obtained from the test results via that method are as follows:

- The transmissivity, based on the TW-2 test results, is 4,380 ft²/day or 32,762 gallons per day per foot (gpd/ft). The storage coefficient value is 0.00149 ft³/ft³. Based on the boring log, the effective aquifer thickness at the Site is 50 feet, which yields a hydraulic conductivity of approximately 87.5 ft/day.
- The transmissivity, based on the TW-1 test results, is 5,190 ft²/day or 38,821 gallons per day per foot (gpd/ft). The storage coefficient value is 0.00121 ft³/ft³. Based on the boring log, the effective aquifer thickness at the Site is 50 feet, which yields a hydraulic conductivity of approximately 104 ft/day.

Sustainable Well Yield

The maximum sustainable pumping rate for a properly-designed well at the site was estimated using the Cooper-Jacob non-equilibrium equation (1946). This approach incorporates the calculated aquifer parameters, available drawdown, and time of pumping to develop an estimate of sustainable well yield.

The Cooper-Jacob non-equilibrium equation is presented as follows, and assumes consistent units:

$$S = \frac{2.3Q}{4\pi T \log} \frac{2.25Tt}{r^2 S}$$

Where:

s = aquifer drawdown (ft)
Q = pumping rate (ft³/day)
T = aquifer transmissivity (ft²/day)
t = time of pumping (days)
r = effective well radius (ft)
S = aquifer storage coefficient (ft³/ft³)

It was further assumed that a full-scale production well would be an 18-inch diameter well inside a 24-inch diameter borehole (effective radius of 1 foot), and consisting of 20 feet of well screen from 34 to 54 feet bgs. The design point for the pumping level in the well was set to a depth of 40 feet, which is conservative for a 54-foot deep well. The well was assumed to be 80 percent efficient, and the aquifer is assumed to achieve steady-state conditions after 30 days of pumping.

The maximum sustainable yield of a single well at the site, based on the above assumptions, is approximately 491 gallons per minute.

WELL AND WELLFIELD DESIGN

Wellfield Design

Assuming a design rate for the wellfield of 4,500 acre feet per year, this equates to 2,790 gpm when the wellfield is operating at full capacity. To achieve this capacity, and given the estimated maximum sustainable yield of any one well of 491 gpm, a minimum of six wells operating at flow rates of 465 gpm would be required. Under this scenario, a recommended minimum well spacing, based on the observed level of drawdown as witnessed during the aquifer testing, is 800 feet. This would accommodate approximately 5 feet of drawdown from adjacent wells as a result of well interference.

Under a reduced flow rate of 400 gpm, and allowing for similar levels of well interference, the wellfield spacing could be reduced to approximately 720 feet. It is recommended that WMU install seven wells to maintain the desired supply of water, along with two wells for reserve supply. With such a configuration, the seven wells operating at peak capacity (400 gpm) would be sufficient to provide the baseline water needs, with the two reserve wells available for peak conditions or for backup in the event maintenance is required on a given well.

The current land acquired by WMU for development of the wellfield appears capable of supporting the anticipated withdrawal of 4,500 acre feet per year by using seven wells located around the perimeter of the property, with a spacing of 720 feet. This accommodates the setback requirements outlined by WMU from roads, streams and property boundaries. The additional two reserve wells, located internal to the property, would have slightly tighter spacing (approximately 520 feet). A preliminary nine-well configuration is depicted on **Figure 10**.

Groundwater modeling is recommended prior to final well field design and well installation to verify the degree of interference associated with any given well/pumping rate configuration.

Well Design

With respect to individual well design, the results of the sieve analyses provided in **Appendix 5** suggest that an appropriate screen slot size is 0.120-inch (120-slot) with an appropriate sand pack material. A diameter of 18 inches is assumed based on WMU's preference and experience with other operating wells. Either plastic or steel well materials would be suitable for this application.

SCE will work with WMU as part of the design and bid procurement process to determine final well design elements. As each well is advanced, information from the pilot boring, and prior well completions/testing, should be used to modify the wellfield and individual well design elements.

SAMPLING AND ANALYSIS FOR WATER QUALITY

A series of water samples were obtained on June 17, 2008 during the aquifer test of TW-1 and submitted to Energy Laboratories in Rapid City, South Dakota. The purpose of the samples was to obtain some preliminary engineering information relative to potential water treatment requirements, and to eliminate possible nitrate contamination as a concern. The analytical laboratory report from this event is included in **Appendix 6**.

As noted in our previous report (**Appendix 1**), the nearest upgradient South Dakota Geological Survey (SDGS) monitoring location to the study area is located in the northwest corner of Section 21, approximately one mile to the northeast of the area of interest. A nest of wells was constructed at that location. The wells are identified as R20-89-40, R20-89-41 and R20-89-42. They are completed at depths of 32.5, 42.5 and 23 feet bgs, respectively.

A select listing of the parameters detected in groundwater samples collected from those monitoring wells, compared to those detected in raw water at the Town Plant, and these more recent results from TW-1, are provided on the following table.

<i>Parameter</i>	<i>Watertown Municipal Utilities Town Plant Raw Water (June, 2004 data) milligrams per liter (mg/L)</i>			<i>SDGS Monitoring Wells (average concentrations over time) (mg/L)</i>	<i>TW-1 Analytical Results June 17, 2008 (mg/L)</i>
<i>Nitrate/Nitrite</i>		<0.1		6.4	<0.1
<i>Fluoride</i>		0.22		.25	0.4
<i>Iron</i>		2.62		.058	2.43
<i>Calcium</i>		117		120	87
<i>Bicarbonate</i>		377		324	295
<i>Dissolved Solids</i>		641		580	480
<i>Hardness</i>		474		400	340

Evaluation of the analytical results with respect to engineering considerations is beyond the scope of our assessment. However, the Big Sioux Aquifer is moderately to highly vulnerable to contamination given its close proximity to the ground surface and its interaction with surface waters. General sources of pollution include but are not limited to: agricultural chemicals, industrial operations and proximity to infrastructure. Because of the high level of nitrate/nitrite reported in the SDGS monitoring events, sampling for nitrate/nitrite was conducted on the test well TW-1. The levels of nitrate/nitrite were non-detectable in the Rauville Wellfield sample, indicating that this potential contaminant is not of concern. As stated elsewhere in this report, the presence of a thin but laterally extensive clay layer within the Big Sioux Aquifer at this location effectively serves as a buffer to potential surface impacts.

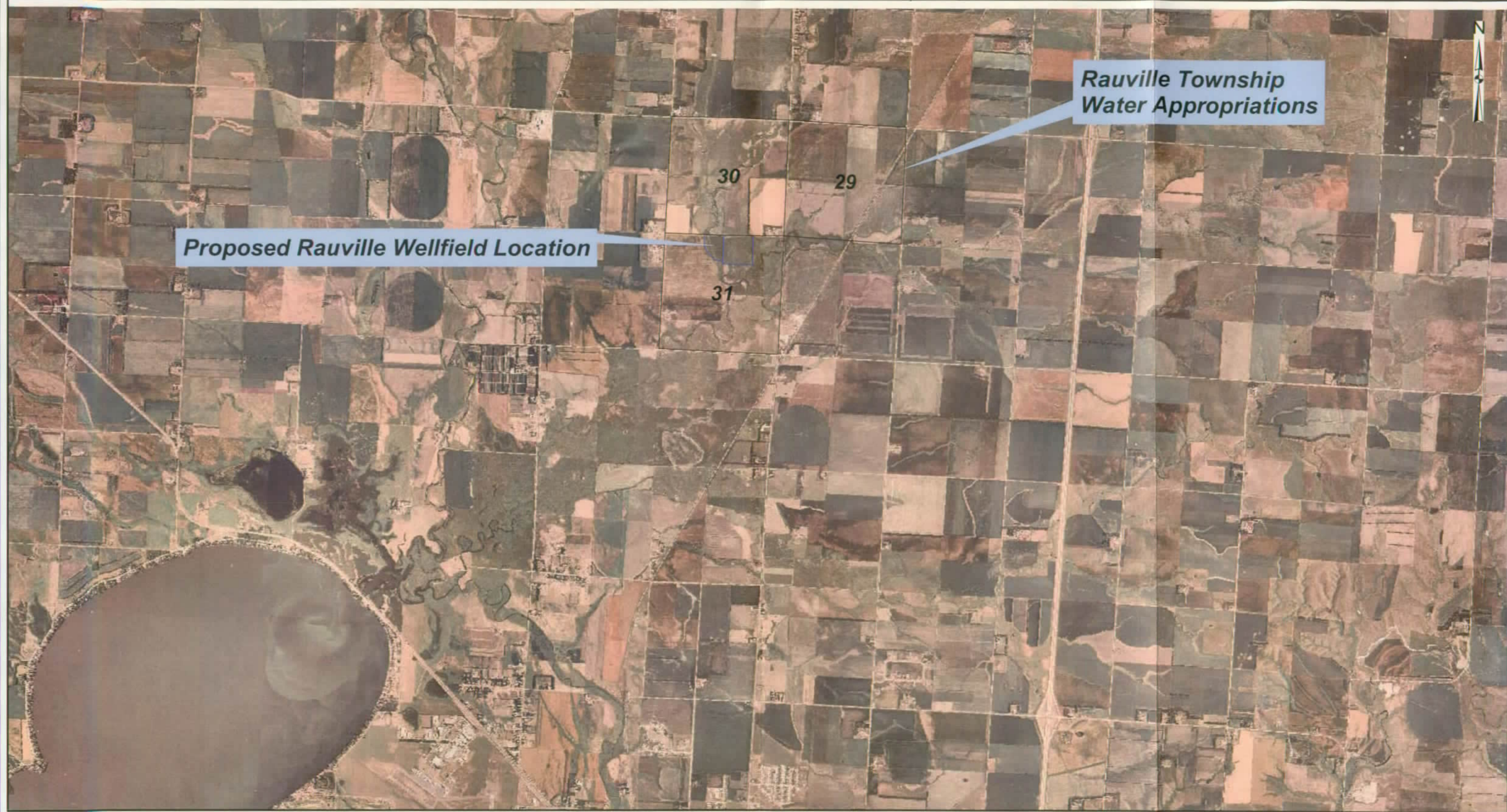
SUMMARY AND CONCLUSIONS

The following conclusions are supported by the information provided in this and previous reports.

1. Subsurface geology across the site area is generally consistent with prior test borings completed outside of the property acquired for the Rauville Wellfield, consisting of sand and gravel deposits with some lesser amounts of clay.
2. The thickness of the Big Sioux Aquifer within the study area of the Rauville Wellfield is approximately 50 feet. This is consistent with, though slightly less than, the thickness of 79 feet reported immediately to the north of the property acquired for the wellfield.
3. The estimated aquifer parameters based on two long-term aquifer tests are as follows:
 - a. The transmissivity, based on the TW-2 test results, is 4,380 ft²/day or 32,762 gallons per day per foot (gpd/ft). The storage coefficient value is 0.00149 ft³/ft³. Based on the boring log, the effective aquifer thickness at the Site is 50 feet, which yields a hydraulic conductivity of approximately 87.5 ft/day.
 - b. The transmissivity, based on the TW-1 test results, is 5,190 ft²/day or 38,821 gallons per day per foot (gpd/ft). The storage coefficient value is 0.00121 ft³/ft³. Based on the boring log, the effective aquifer thickness at the Site is 50 feet, which yields a hydraulic conductivity of approximately 104 ft/day.
4. The maximum sustainable yield of a single well at the site, based on the above assumptions, is approximately 491 gallons per minute.
5. A reported design rate for the wellfield of 4,500 acre feet per year equates to 2,790 gpm, assuming the wellfield is operating at full capacity. To achieve this capacity, and given the estimated maximum sustainable yield of any one well of 491 gpm, a total of six wells operating at flow rates of 465 gpm would be required, with a design spacing of 800 feet. Under a reduced flow rate of 400 gpm per well, and allowing for similar levels of well interference, the wellfield spacing could be reduced to approximately 720 feet.
6. With respect to individual well design, the results of the sieve analyses suggest that an appropriate screen slot size is 0.120-inch (120-slot) with an appropriate sand pack material. An 18-inch diameter well is assumed consistent with other WMU operating wells.
7. The levels of nitrate/nitrite were non-detectable in the TW-1 sample, indicating that this potential contaminant is not of concern for the Rauville Wellfield at this time. As stated elsewhere in this report, the presence of a thin but laterally extensive clay layer within the Big Sioux Aquifer at this location effectively serves as a buffer to potential surface impacts.

FIGURES

- Figure 1** – Site Location Map
- Figure 2** – Surficial Geology of South Dakota
- Figure 3** – Bedrock Elevation Contours
- Figure 4** – Aerial Extent of the Big Sioux Aquifer
- Figure 5** – USGS Topographic Map
- Figure 6** – Test Borings and Test Well Locations
- Figure 7** – Lithologic Section Location
- Figure 8** – NW-SE Lithologic Section
- Figure 9** – Aquifer Saturated Thickness
- Figure 10** – Proposed Production Well Locations



Legend

 Proposed Rauville Wellfield

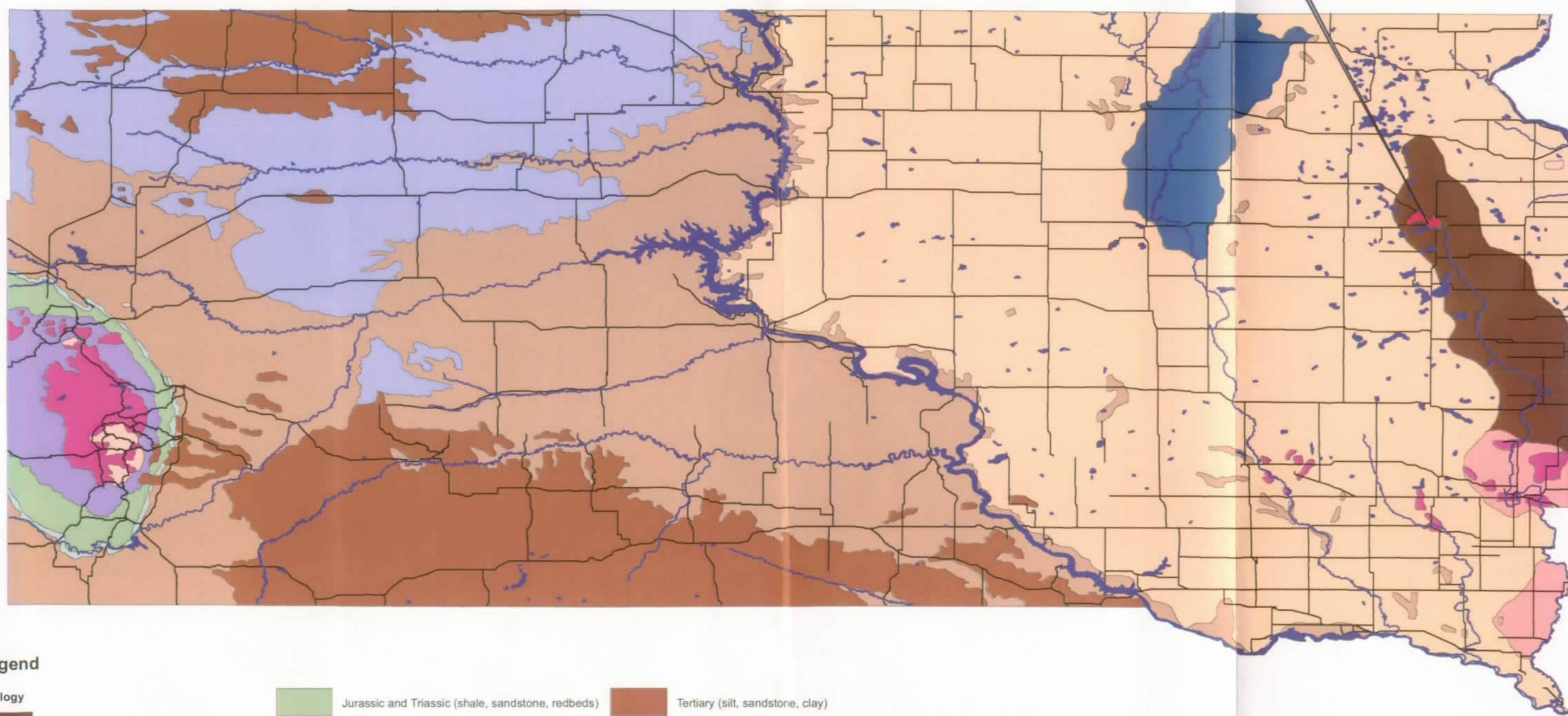
0 0.25 0.5 1
Miles

FIGURE 1
SITE LOCATION MAP
Watertown Municipal Utilities
Wellfield Expansion



State of South Dakota

City of Watertown



Legend

Geology

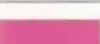
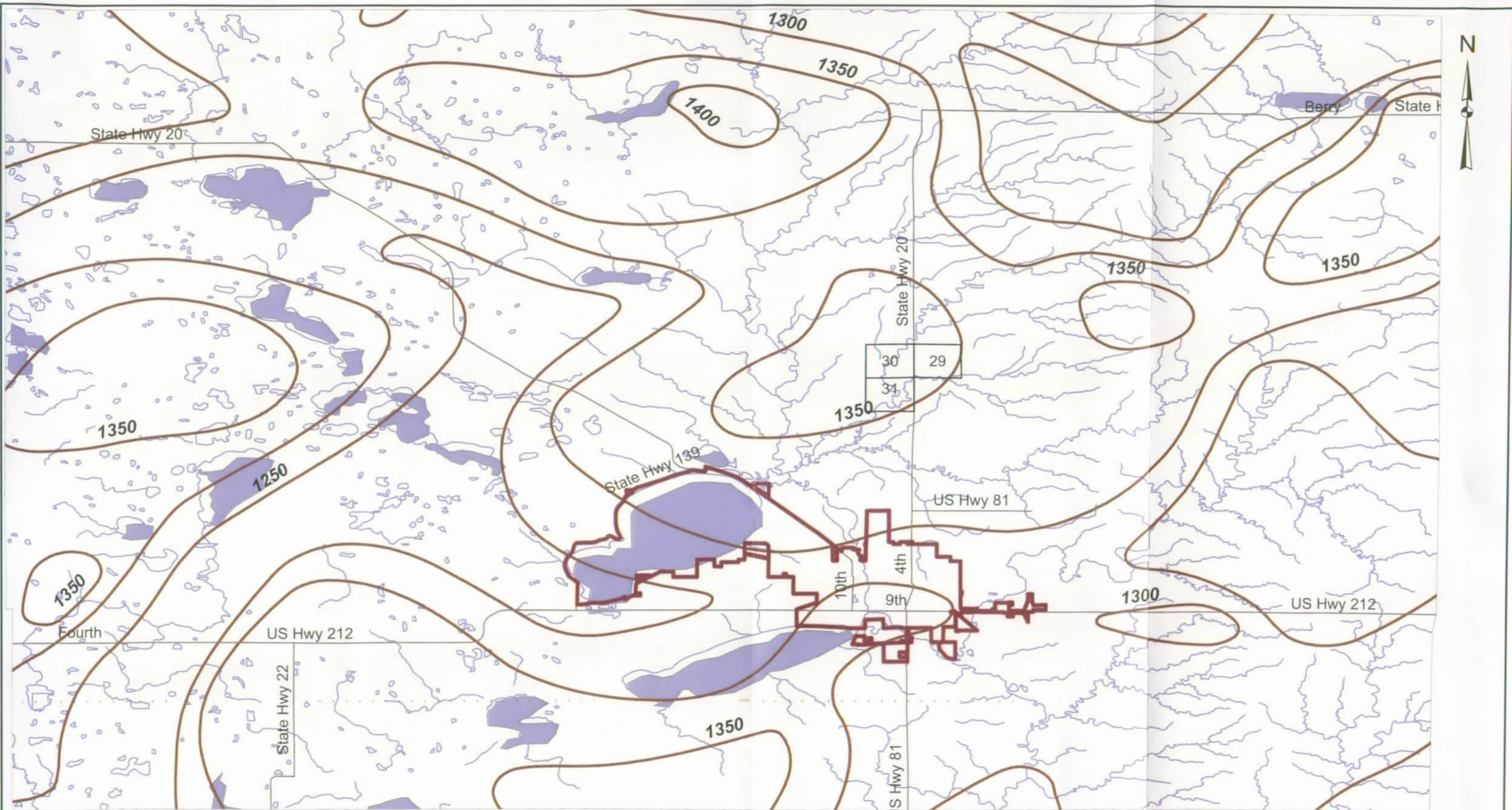
- | | | |
|--|---|--|
|  Early Wisconsin Glacial Sediments |  Jurassic and Triassic (shale, sandstone, redbeds) |  Tertiary (silt, sandstone, clay) |
|  Glacial Lake Deposit (silt, sand) |  Late Wisconsin Glacial Sediments |  Upper Cretaceous (sandstone, clay) |
|  Igneous Rocks (granite, rhyolite, phonolite) |  Lower Cretaceous (limestone, shale, sandstone) |  Upper Cretaceous (shale, chalk) |
|  Illinoian Glacial Sediments |  Metamorphic Rocks (schist, slate, quartzite) | |
| |  Paleozoic (limestone, sandstone, shale) | |

FIGURE 2
SURFICIAL GEOLOGY OF SOUTH DAKOTA

Watertown Municipal Utilities
Wellfield Expansion



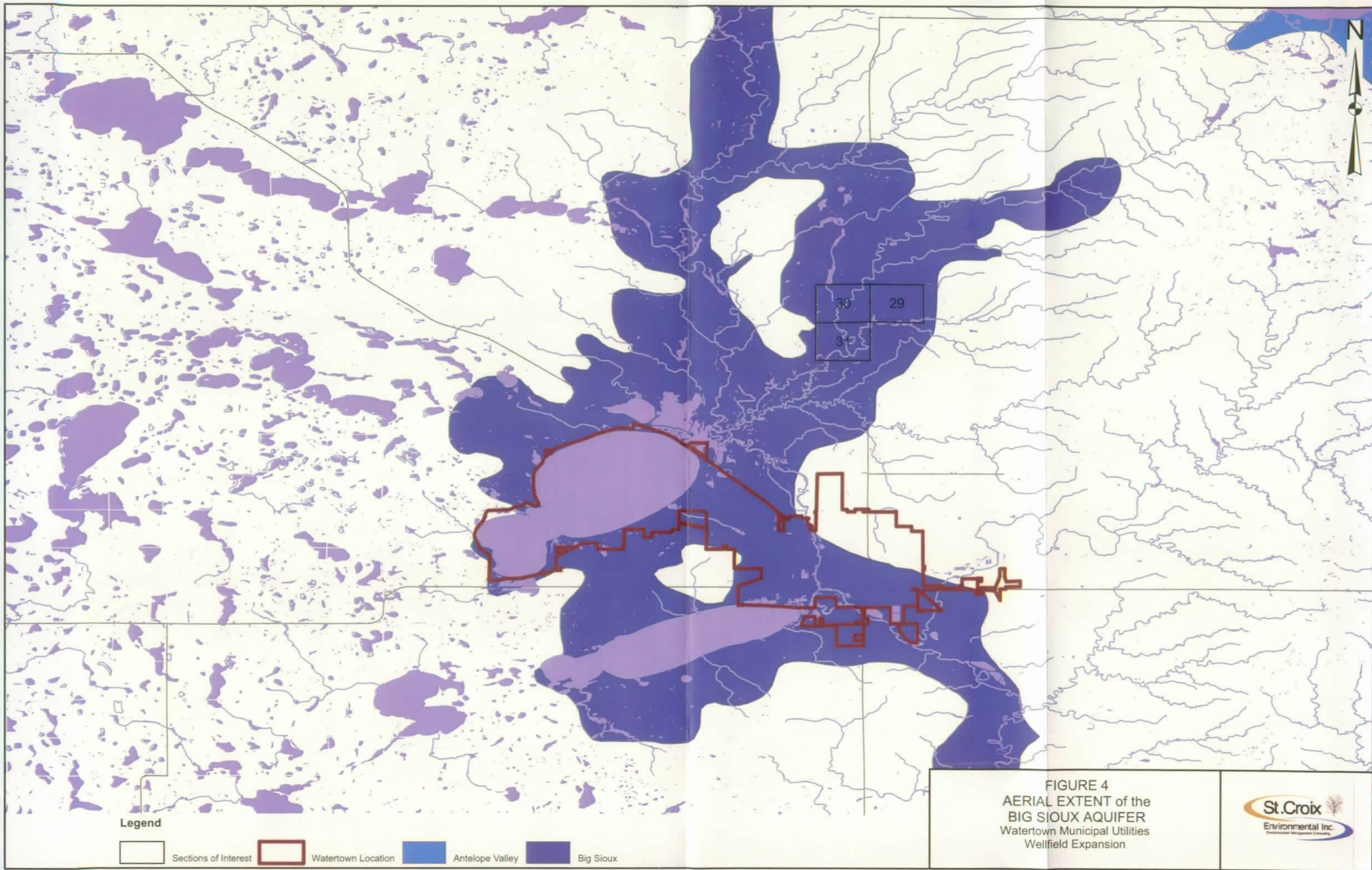


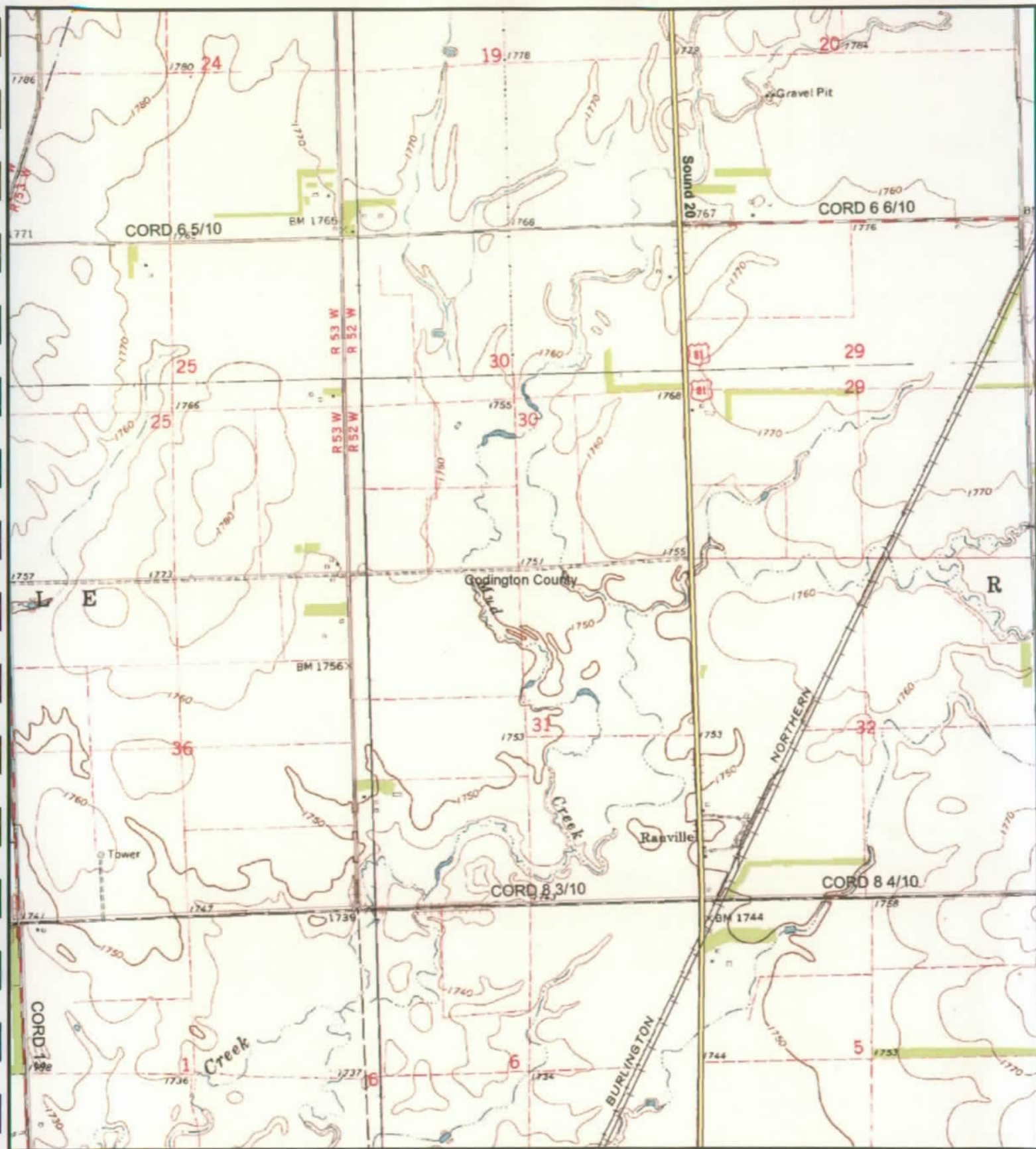
Legend

- Sections of Interest
- Watertown Location
- Bedrock Contour Line

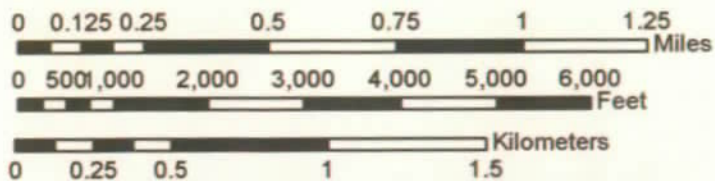
FIGURE 3
Bedrock Elevation Contours

Watertown Municipal Utilities
Wellfield Expansion

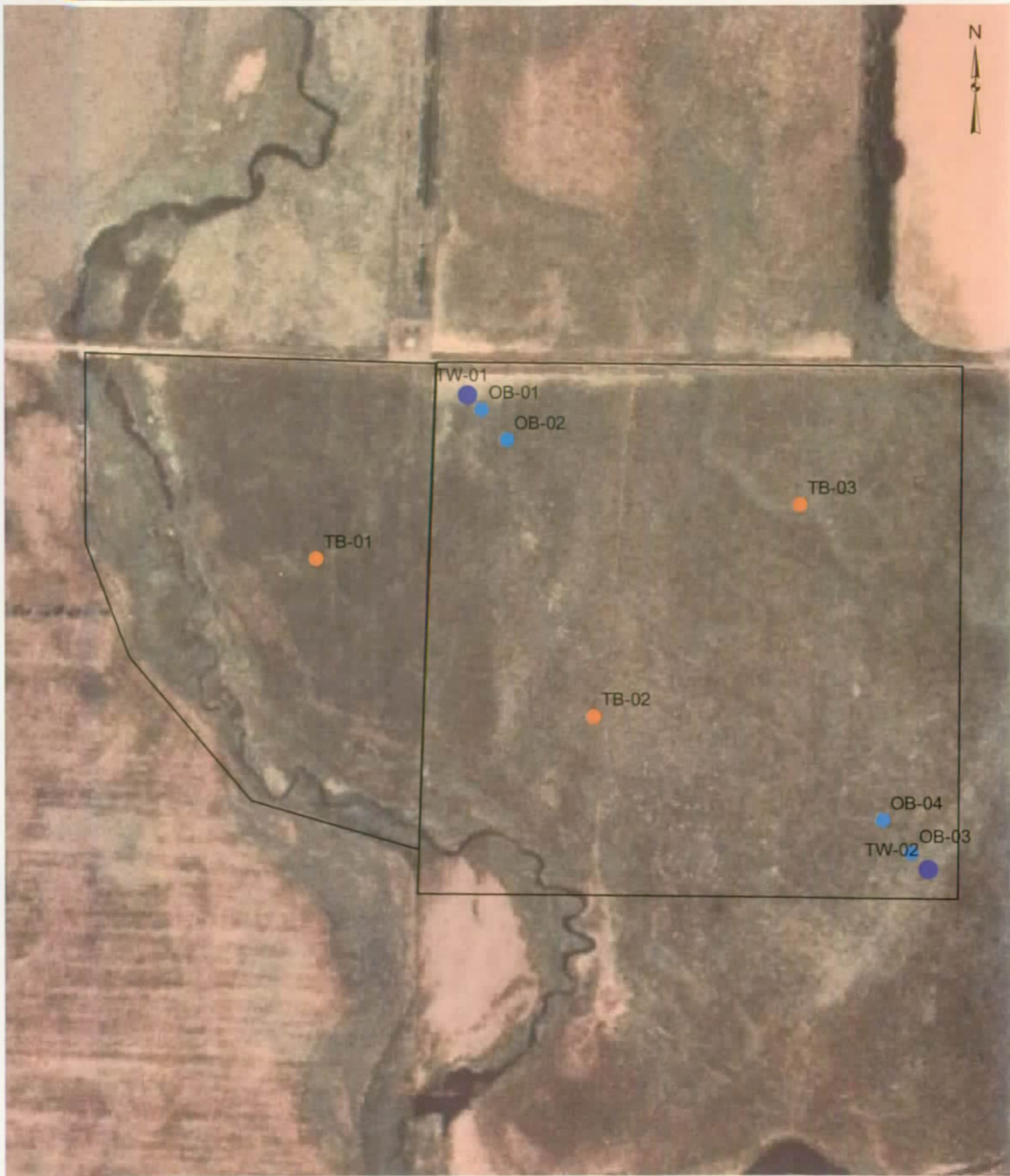




UNITED STATES GEOLOGICAL SURVEY 7.5 MINUTE SERIES TOPOGRAPHIC MAP 1:24,000 SCALE



STILL LAKE, STILL LAKE SE,
WATERTOWN EAST,
WATERTOWN WEST, SD
1970



Legend

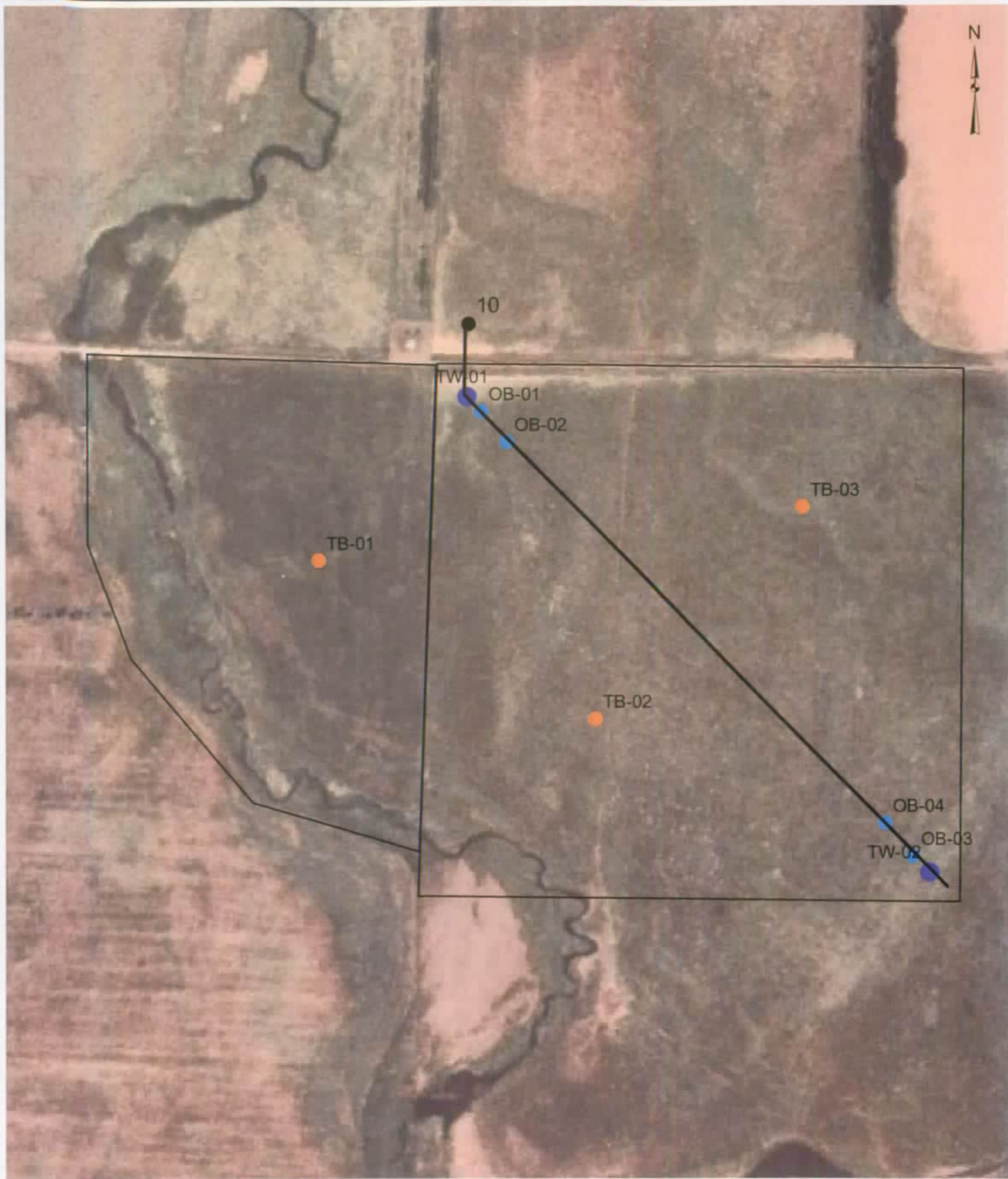
- In Fill Boring
- Observation Well
- Test Well

Property Outline

0 125 250 500 Feet

TEST WELL LOCATIONS
Watertown Municipal Utilities
Wellfield Expansion

Figure 6



Legend

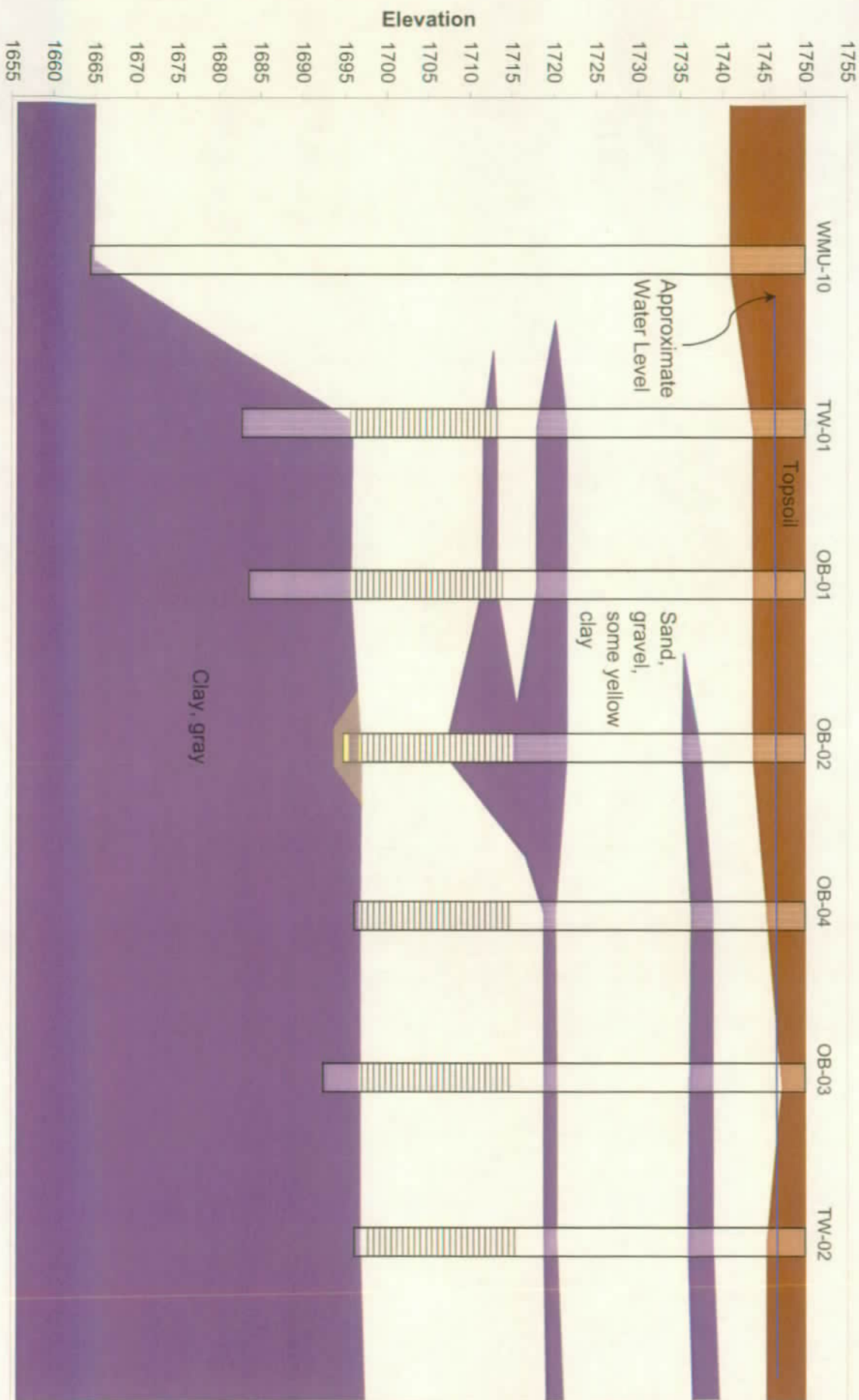
- In Fill Boring
- Observation Well
- Test Well
- Previous Boring Locations
- Property Outline

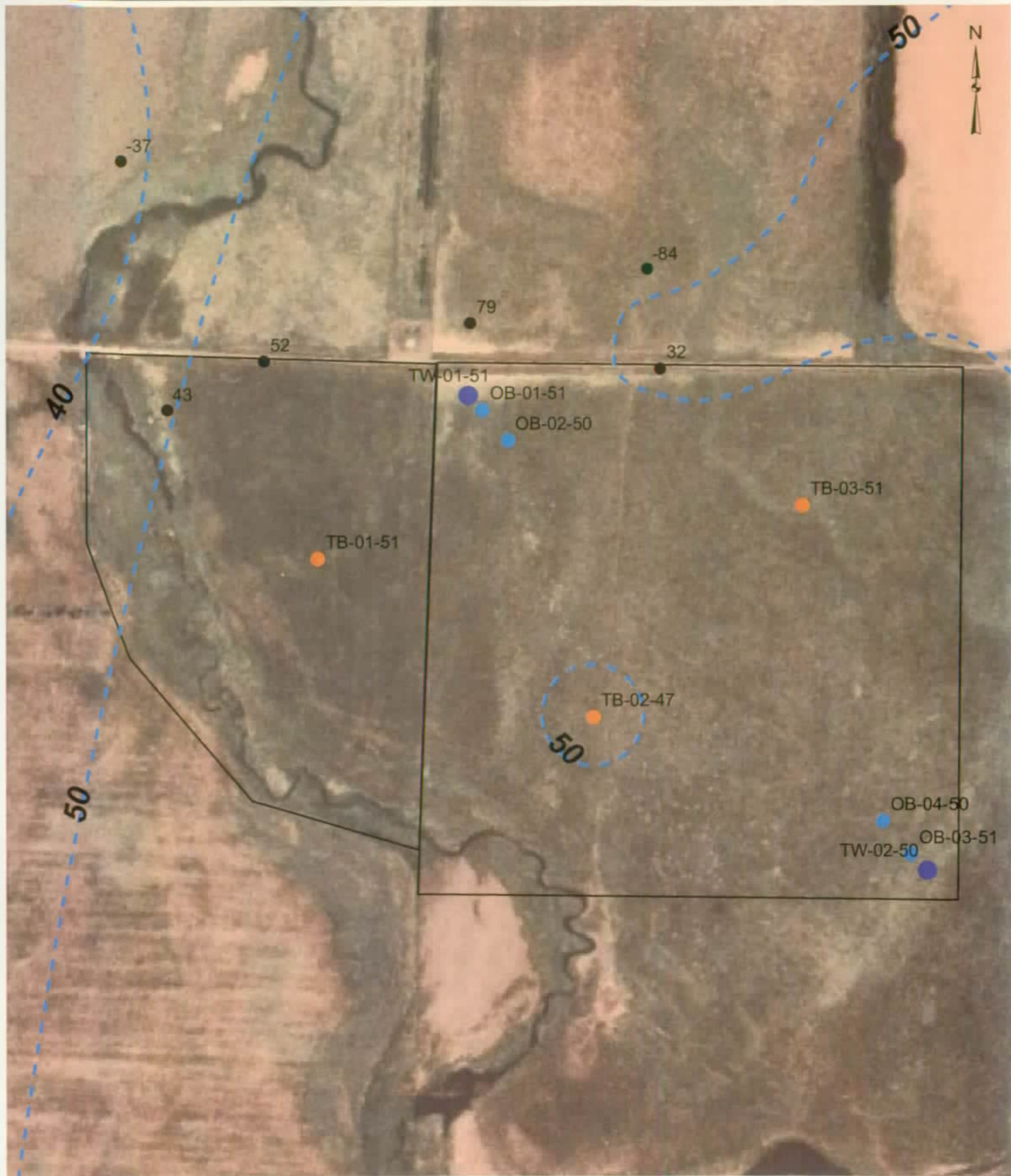
0 130 260 520 Feet

LITHOLOGIC SECTION LOCATION
Watertown Municipal Utilities
Wellfield Expansion

Figure 7

FIGURE 8
 Watertown Municipal Utilities
 Proposed Rauville Wellfield
 Aquifer Thickness
 NW - SE Lithologic Section





Legend

- In Fill Boring
- Previous Boring Locations
- Property Outline
- Observation Well
- 50 Aquifer Thickness Values
- Test Well
- - - Aquifer Thickness Contour

0 125 250 500 Feet

AQUIFER SATURATED THICKNESS
Waterown Municipal Utilities
Wellfield Expansion

Figure 9



Legend

-  Proposed Production Wells
-  Property Outline
-  Proposed Production Well Spacing

0 125 250 500 Feet

PROPOSED PRODUCTION WELL LOCATIONS
Waterown Municipal Utilities
Wellfield Expansion

Figure 10

APPENDICES

- Appendix 1** – Preliminary Hydrogeologic Evaluation Report (SCE 2007)
- Appendix 2** – Well Logs for Test Borings and Test Wells
- Appendix 3** – Aquifer Test Analytical Results for TW-1
- Appendix 4** – Aquifer Test Analytical Results for TW-2
- Appendix 5** – Sieve Analyses for TW-1 and TW-2 Samples
- Appendix 6** – Laboratory Analytical Results for TW-1 Sample

Appendix 1 – Preliminary Hydrogeologic Evaluation Report (SCE 2007)

**PRELIMINARY HYDROGEOLOGIC EVALUATION
PROPOSED RAUVILLE WELLFIELD**

WATERTOWN, SOUTH DAKOTA

Prepared for:

Watertown Municipal Utilities

901 4th Avenue Southwest
Watertown, South Dakota 57201

Prepared By:

St. Croix Environmental, Inc.

1094 Golden Oaks Drive
Hudson, Wisconsin 54016

December, 2007



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INTRODUCTION

Watertown Municipal Utilities (WMU) has historically obtained its water supply from a combination of Lake Kampeska and groundwater sources. Water supply wells, in the Conifer wellfield located in the Game Production Area northeast of Lake Kampeska and in the town wellfield located west of South Dakota Highway 20 near 6th Avenue, are used to extract groundwater.

Study Area Location

WMU has secured water rights approximately four miles north of the City in an area referred to as the Rauville wellfield. The new wellfield is intended to replace the need for removing and treating surface water from Lake Kampeska.

The water rights have been secured from the Big Sioux Aquifer, located in Sections 29, 30 and 31, Township 118 North, Range 52 West, Codington County, South Dakota. Two parcels of land within this area were identified to St. Croix Environmental, Inc. (SCE) as primary locations for potential wells, although additional land areas may be identified at a later date. The site is located near the town of Rauville (**Figure 1**).

Purposes and Objectives

The purpose of this assessment is twofold. First, to determine if the water rights secured within Sections 29, 30 and 31 can provide enough water to alleviate the need for water removal from Lake Kampeska and provide for future water capacity growth. Second, to determine if the land parcels being considered can support enough wells for this proposed wellfield, or whether additional land should be considered.

In order to meet this objective, WMU has identified the following preliminary criteria for the Rauville wellfield.

- The new wellfield should be capable of producing four million gallons per day (mgd) with expansion capability to 8 mgd within Sections 29, 30, and 31 of Rauville Township.
- Between six and twelve wells are estimated to constitute this wellfield. The yield is expected to be variable, and a rate of 250 to 600 gallons per minute (gpm) per well is desired.

These criteria may be modified as the project progresses, and/or the water supply's needs change.

Scope of Services

This assessment has been limited to a compilation and review of existing reports and data. SCE gathered and examined existing, publically available information regarding the proposed wellfield in Rauville Township in order to assess the yield potential of the proposed wellfield. The information included but was not limited to: reports, test drilling records, well records, geologic and hydrogeologic maps.

As part of this evaluation, several existing studies were collected and summarized. These studies and main topics are noted below and their findings are included in the text of this report:

- Hansen (1990, 1994) investigated the water resources of Codington and Grant Counties. The major sources of surface water, Lake Kampeska and Lake Pelican, and seven glacial and two bedrock aquifers were described. Surface water and ground water quality were also evaluated.
- Rukstad and Hedges (1964) presented an assessment of the groundwater supply possibilities that may be attained for the City of Watertown from the Big Sioux Aquifer.

- Barari (1991) discussed the hydrology of Lake Kampeska and Lake Pelican. The relationship between the Big Sioux River, and the recharge-discharge relationship between the river and the aquifer was discussed.

LOCAL SETTING

Climate

The climate of the Watertown area is classified as subhumid. The mean annual precipitation in Watertown from 1931-2006 was approximately 20.55 inches (South Dakota State University, 2007). Precipitation mainly occurs during the growing season and is normally heaviest in the late spring and early summer.

The mean annual temperature in Watertown South Dakota is 42.9° F. Over the period of record, the temperatures in Watertown have ranged from -36° F to 110° F (South Dakota State University, 2007).

Physiography

The area is located within the Coteau des Prairies area of the Central Lowlands Region of eastern South Dakota. The Coteau des Prairies is a highland area between the Minnesota-Red River Lowland to the east and the James River Lowland to the west. The Coteau des Prairie is part of a large plateau extending northward through North Dakota into Canada. Elevations range from 2,000 feet above sea level on the north to about 1,600 feet on the south. It is drained to the south by the Big Sioux River, whose tributary streams enter mainly from the east. West of the Big Sioux River, the surface of the Coteau is dotted with lakes and depressions, whereas very few lakes occur east of the river.

The Coteau des Prairie was formed as glaciers deposited drift over the surface during the last ice age. Bedrock beneath the surface is the Pierre Shale, which lies approximately 100 to 400 feet beneath the surface. The Pierre shale is composed of clay, including bentonite, with small amounts of quartz sand.

Geological Setting

The general geology of the area consists of glacial outwash, unconsolidated sand and gravel deposited by receding glacial activity (**Figure 2**). The outwash consists of stratified deposits of poor- to well-sorted sand and gravel. Underlying the sand and gravel is a till layer. This till is grayish blue clay, with silt and fine sand. The Pierre shale is the predominant bedrock in the area. It is composed of medium to dark gray shale. Depth to bedrock in the subject area averages about 400 feet below land surface (**Figure 3**).

Hydrogeologic Units

Three of the seven glacial aquifers in the Codington/Grant county area underlie the general area (USGS, 1994). These are the Big Sioux Aquifer, the Prairie Coteau Aquifer and the Altamont aquifer. The Big Sioux Aquifer, from which water rights have been secured, is the focus of this assessment.

Big Sioux Aquifer

The Big Sioux Aquifer is predominantly a water table aquifer. The Big Sioux Aquifer and associated subsurface drainage follow the Big Sioux River, Willow Creek, Lake Kampeska and Pelican Lake as shown on **Figure 4**. The aquifer is approximately 150 square miles in size and is confined to the floodplain of the Big Sioux River and its tributaries.

The Big Sioux Aquifer originates from glacial drift formations consisting of deposits of poorly to well-sorted surficial outwash. This outwash ranges from medium grained sand to medium gravel. In most areas the aquifer generally becomes coarser and more sorted with depth. The Big Sioux Aquifer is generally less than 10 feet below grade surface (bgs) and averages 22 feet in thickness, with a maximum observed thickness of 79 feet. The Big Sioux Aquifer is underlain by the till sequences of the Prairie Coteau Aquifer.

Prairie Coteau Aquifer

Underlying the Big Sioux Aquifer is the Prairie Coteau Aquifer. The Prairie Coteau underlies the majority of Codington County, except for a narrow north-south band along the center of the county and extreme eastern portions of the county. The aquifer covers an area of approximately 760 square miles.

The Prairie Coteau Aquifer consists of brown to gray, coarse grained, well-rounded sand and fine gravel. It is predominantly a confined aquifer, but may also be hydraulically connected to the Big Sioux Aquifer in places. The top of the aquifer ranges from 21 feet bgs to as much as 380 feet bgs. The average depth to the top of the Prairie Coteau Aquifer is 138 feet bgs. The average thickness of the aquifer is 21 feet, with a maximum observed thickness of 62 feet.

Altamont Aquifer

Underlying the Prairie Coteau Aquifer is the Altamont Aquifer, which is predominantly a confined aquifer. The Altamont underlies nearly all of Codington County and covers an area of approximately 840 square miles.

The Altamont Aquifer is composed of well-rounded, medium to coarse grained sand. The aquifer is interbedded with silt and clay layers. The top of the aquifer ranges from 319 to 668 feet bgs and averages 460 feet bgs. Its average thickness is 43 feet, with a maximum observed thickness of 132 feet.

BIG SIOUX AQUIFER

Recharge and Discharge

The general direction of water movement in the Big Sioux Aquifer is to the south and toward the Big Sioux River, which flows from north to south. Topography of the area is shown on **Figure 5**. Recharge to the Big Sioux Aquifer is by direct infiltration and percolation of rainfall and snowmelt through the overlying soil strata. Recharge ranges from 4 inches per year to as much as 10 inches per year.

Discharge from the Big Sioux Aquifer occurs through evapotranspiration, and through permitted withdrawals. Water is also discharged from the aquifer into lakes and the Big Sioux River. Lakes Kampeska and Pelican Lake are hydraulically connected to the Big Sioux Aquifer. In the spring and early summer, lake levels commonly exceed the water level in the aquifer, thus, the lakes recharge the aquifer. During the summer and fall, when evaporation exceeds precipitation, the lake levels drop below the water levels in the surrounding Big Sioux Aquifer and water from the aquifer discharges to the lakes.

Aquifer Hydraulic Properties

The overall hydraulic gradient of the Big Sioux Aquifer water table surface is generally about 6 to 10 feet per mile (ft/mi) (USGS, 1990). The estimated volume of water in storage within the Big Sioux is 320,000 acre-feet, or approximately 104,288 million gallons (USGS, 1994). The aquifer flows from north to south at an estimated rate of two million gallons per day with the water table fluctuating between three and thirty-three (33) feet below the ground surface.

Aquifer tests, referenced in Barari (1991), were performed within the Big Sioux Aquifer by the South Dakota Geological Survey and the United States Geological Survey in 1964 and 1965. The tests were run for 72 hours at an average rate of 260 gallons per minute. Results of the tests indicate the average transmissivity under field conditions to be 5.0×10^{-4} gal/day/ft, with an average thickness of saturated aquifer of approximately 23 feet. The permeability was 2.2×10^{-3} gal/day/ft².

PROPOSED RAUVILLE WELLFIELD

Anticipated Water Needs

Currently, WMU produces approximately 1,013 million gallons per year. The Conifer Wellfield and Town Wellfield produced 1,472 acre-feet or approximately 480 million gallons of water in 2000. Production from Lake Kampeska is approximately 533 million gallons per year, or approximately 1.5 million gallons per day (MGPD). In order to reduce the City's dependence upon surface water withdrawals from Lake Kampeska, additional groundwater resources will be needed.

In order to meet this objective and anticipate additional economic and population growth, WMU has identified the following preliminary criteria for the Rauville wellfield.

- The new wellfield should be capable of producing four million gallons per day (mgd) with expansion capability to 8 mgd within Sections 29, 30, and 31 of Rauville Township.
- Between six and twelve wells are estimated to constitute this wellfield. The yield is expected to be variable, and a rate of 250 to 600 gallons per minute (gpm) per well is desired.

Groundwater Elevation

The South Dakota Geological Survey (SDGS) maintains a groundwater monitoring network throughout the state. Monitoring well locations are shown on **Figure 6**. The nearest upgradient monitoring location to the study area is located in the northwest corner of Section 21, approximately one mile to the northeast. A nest of wells was constructed at that location and is maintained by the SDGS. The wells are identified as R20-89-40, R20-89-41 and R20-89-42. They are completed at depths of 32.5, 42.5 and 23 feet bgs, respectively.

Water records were available from the Geological Survey database from 1991 through July 2007. During this period, water levels fluctuated between elevations of approximately 1776 and 1785 feet. Static water levels, measured during most of the sampling events, were higher in the deeper wells than those measured in shallow well R20-89-40. This is indicative of higher pressure deeper in the aquifer and an upward movement of groundwater.

Aquifer Thickness

Boring log data provided by the City and compiled from the South Dakota Geological Survey indicate that sediments in this area consist primarily of surficial outwash deposits, consisting of unconsolidated sand and gravel. Boring log locations are shown on **Figure 7**.

Figure 7 also shows the saturated thickness of the aquifer in the area of interest. Saturated thicknesses range from approximately 10 feet to 80 feet across the study area. The aquifer is thinnest in the western portions of Section 31 and Section 30. Existing data indicate that the thickest portion of the aquifer, approximately 80 feet, occurs in a small, localized area in the southeast quarter of Section 30. Over the remaining study area, the Big Sioux Aquifer ranges in thickness from 30 to 60 feet. It should be noted, that nearly all borings have been advanced along the roadways. Therefore, aquifer thicknesses within the sections are estimates only.

Yield Potential

Available data was compiled in an attempt to determine potential yields for the Big Sioux Aquifer in this area. Given the variability of the nature of the sediments and the variability in the thickness of the aquifer, accurate yields cannot be predicted. However some general estimates were calculated based upon the equation below (Driscoll, 1986).

$$Q = \frac{16Kb^2}{6.3 + \log(Kb)}$$

Q = yield from pumping well, gpm

K = hydraulic conductivity of the aquifer media B = saturated aquifer thickness, feet

Hydraulic conductivities typical of the sediments present in this area were used in the calculations (adapted from Morris & Johnson, 1967).

<i>Material</i>	<i>K</i> <i>Hydraulic Conductivity</i> <i>cm/sec</i>	<i>b</i> <i>Saturated</i> <i>Thickness</i> <i>ft</i>	<i>Q</i> <i>Estimated Well Yield</i> <i>GPM</i>
Medium Sand	1.42E-02	30	34
Coarse Sand	5.20E-02	30	115
Sand and Gravel	1.56E-01	30	322
Medium Sand	1.42E-02	60	131
Coarse Sand	5.20E-02	60	441
Sand and Gravel	1.56E-01	60	1,236
Average			380

These estimates indicate that some wells may produce less water than the desired rate of 250 to 600 gpm, while others may produce more. The production from each future well will be dependant upon the sediments encountered and the aquifer thickness at each particular location. The installation of test wells and controlled pumping over extended intervals of time (i.e. an aquifer pumping test) would be necessary to verify well yield and ultimate suitability of a particular location.

Well Placement Limitations

According to a discussion with a representative of the South Dakota Geological Survey, it is recommended that wells within this aquifer be placed a minimum of 1,300 feet from any surface water, in order to alleviate any potential surface water effects from over pumping. Also, in order to attain a "zero drawdown" state between production wells (i.e. to minimize interference); a 1,000 foot spacing between wells is recommended.. The radius of influence is the radial distance from a well where pumping no longer lowers the water table. The radius of influence is aquifer and well dependant and is unique for each well situation.

Preliminary well locations are shown on **Figures 8 and 9**. **Figure 8** depicts well siting on a 600 to 650-foot spacing. Eight locations are plotted. **Figure 9** is a close-up version of Figure 8. Determining the actual radius of influence is a critical component of well siting. The radius of influence for a particular well location can be estimated by conducting a pumping test on test wells installed at or near the proposed well location. The radius of influence, combined with ground water modeling, would be necessary to estimate well location and spacing requirements. It should also be noted that some locations may be less desirable than others due to thinning or tightening of the aquifer. This could further reduce the area in which peak-performing (high-producing) wells can be placed.

MODIFYING WELL PLACEMENT CRITERIA

Land Use

SCE reviewed aerial photographs obtained from Historical Information Gatherers (HIG) of Hopkins, Minnesota, dated 1939, 1958, 1965, 1991, 2003 and 2004. The aerial photographs were reviewed with the intent to evaluate changes in land use and areas of potential environmental concern visible at the property and surrounding properties. The aerial photographs reviewed are included as **Figures 10, 11, 12, 13, 14 and 15**.

Review of the photographs indicates that the site is within an area of predominantly agricultural usage during the period of record. Based upon this land use category, agricultural chemical usage poses an environmental concern with respect to the proposed wellfield. Pesticides and other chemicals used in crop production can be long-lived in the ground water environment. Routine use of these substances has the potential to impact surface water quality and ground water quality. It is recommended that groundwater and surface water quality be monitored for the presence of agricultural chemicals in accordance with provisions of state and federal regulations regarding public water supplies.

Industrial or commercial operations at a location adjacent to one of the identified wellfield parcels (southwest corner of Section 32) may be a potential cause for concern. Operations at that location are unknown to SCE and identification of which are beyond our scope of services. The property, visible on **Figures 14 and 15**, is adjacent to Rauville Station mentioned below.

Water Quality

The Big Sioux Aquifer is moderately to highly vulnerable to contamination given its close proximity to the ground surface and its interaction with surface waters. General sources of pollution include but are not limited to: agricultural chemicals, industrial operations and proximity to infrastructure.

The State of South Dakota has developed a long-term water quality monitoring effort in order to meet the demands for water quality information by regulatory agencies. The monitoring network was designed and installed to examine the quality of shallow ground water with respect to nonpoint source pollution and long-term trends in water quality.

Because agriculture is the State's primary industry, pesticides and nitrogen are among the compounds being monitored. Water samples are also tested for major ions such as ammonia, calcium, chloride, iron, manganese, and sodium. Additional analytes include trace metals, cyanide, radionuclides, and volatile organic compounds.

As noted previously in this report, the nearest upgradient monitoring location to the study area is located in the northwest corner of Section 21, approximately one mile to the northeast of the area of interest. A nest of wells was constructed at that location. The wells are identified as R20-89-40, R20-89-41 and R20-89-42. They are completed at depths of 32.5, 42.5 and 23 feet bgs, respectively.

Water quality results, available from the Geological Survey database from 1991 through July 2007, are attached as tables. A select listing of the parameters detected in groundwater samples collected from the monitoring wells compared to those detected in raw water at the Town Plant are shown on the next page.

<i>Parameter</i>	<i>Watertown Municipal Utilities Town Plant Raw Water (June, 2004 data) milligrams per liter (mg/L)</i>	<i>SDGS Monitoring Wells (average concentrations over time) mg/L</i>
<i>Nitrate/Nitrite</i>	<i><0.1</i>	<i>6.4</i>
<i>Fluoride</i>	<i>0.22</i>	<i>.25</i>
<i>Iron</i>	<i>2.62</i>	<i>.058</i>
<i>Calcium</i>	<i>117</i>	<i>120</i>
<i>Bicarbonate</i>	<i>377</i>	<i>324</i>
<i>Dissolved Solids</i>	<i>641</i>	<i>580</i>
<i>Hardness</i>	<i>474</i>	<i>400</i>

Nitrate/Nitrite has been found in the monitoring wells located upgradient of the proposed Rauville Wellfield. Concentrations have ranged from 0.34 to 18.4 mg/L. Highest concentrations have generally been detected in shallow monitoring well R20-89-42. Additional analyses for nitrogen and ammonia levels should be strongly considered by WMU in accordance with public water supply regulations. Failure to do so may result in wells that are deemed unusable, or that require costly treatment.

Additional analyses have been performed on water samples collected from the monitoring wells over time. The following results should be noted.

- Arsenic was detected in 1999 at concentrations of 1.1 and 1.4 mg/L.
- Atrazine was detected between 1993 and 1995 at concentrations ranging between 0.11 and 0.2 ug/L (micrograms per liter).
- Well R20-89-42 was sampled on one occasion in 1994 for the presence of volatile organic compounds. No VOCs were detected in the sample.

Proximity of Known Sources of Pollution

As part of this evaluation, a regulatory database review was performed in order to identify release sites (i.e. potential sources of contamination) within the study area. The locations of identified release sites are shown on **Figure 16**, and the nearest sites are listed below.

1. Rauville Station (a restaurant/bar), located at 16588 455th Avenue in the southwest quarter of Section 32, reported a petroleum release in 1998. The site was granted closure in 2002.
2. Cross Country Carriers, located at 1425 9th Avenue Southwest, in the southern portion of Section 36, reported a 5 gallon spill of butanol in 1996. The site received closure in 1997.
3. The Big Sioux Nursery, located on Big Sioux Road, in the northeast quarter of Section 2, reported a waste oil release in 1994. The site was granted closure in 1999.

Based upon the closed status of these identified release sites and given that the releases occurred downgradient of the proposed location of the Rauville wellfield, these releases would not be expected to impact the site.

The nearest upgradient release site occurred from a farm tank, located at 16146 459th Avenue, approximately 5 miles northeast of the subject area. The site, listed as reporting a diesel fuel release in 1999, was closed in 2003. This release is not expected to pose a threat to the study area, given its distance and closed status.

The Burlington Northern Santa Fe Railroad operates a rail line within Sections 29 and 32, near the area of interest and is shown on **Figure 12**. The proximity of the railroad to the proposed wellfield does pose an

environmental risk, though minimal, based on the potential for spills or releases from rail operations to impact the aquifer in this area.

Competing Water Use

Groundwater wells withdraw water from the Big Sioux Aquifer for irrigation, domestic, municipal and stock-watering use. Ground water and surface water are primarily appropriated for irrigation use in this area of Codington County. Reported discharge from irrigation wells in the Big Sioux Aquifer has been shown to range from 50 gallons per minute (gal/min) to as much as 1,100 gal/min.

Water diversion records were obtained from the South Dakota Geological Survey. The locations of identified diversion locations are plotted on **Figure 17**. A review of the records indicates that there are several irrigation wells near the subject area. Most of these wells are located north-northeast (up-gradient), southwest (down-/cross-gradient), and southeast (down-gradient) of the subject area. Two commercial wells are located southeast (down-gradient) of the subject area. Based upon review of aerial photographs showing irrigated cropland, there may be additional water diversions not included in the database.

Existing wells and their respective production may impact the proposed placement and yield of any new wells. **Table 1** is a listing of the water diversions identified in the area, as well as their respective appropriations.

Flood Zone

A flood zone map is included as **Figure 18**. A portion of the proposed wellfield is located within Flood Zone A, which corresponds to the 100-year flood plain of Mud Creek and its tributaries. It will be necessary to construct future wells and system components to prevent flood waters from entering the water supply and distribution system.

SUMMARY AND CONCLUSIONS

The purpose of this assessment was to determine if the area secured, north of Watertown, has the potential to alleviate the need for water removal from Lake Kampeska and provide for future water supply needs. In order to meet this objective, WMU has identified the following criteria for the Rauville wellfield.

- The new wellfield should be capable of producing four million gallons per day (mgd) with expansion capability to 8 mgd within Sections 29, 30, and 31 of Rauville Township.
- Between six and twelve wells are estimated to constitute this wellfield. The yield is expected to be variable, and a rate of 250 to 600 gallons per minute (gpm) per well is desired.

This assessment has been limited to a compilation and review of existing reports and data. The information included but was not limited to: reports, test drilling records, well records, geologic and hydrogeologic maps.

Findings support the following conclusions:

1. The Big Sioux Aquifer is comprised primarily of surficial outwash, consisting of unconsolidated sand and gravel. Depth to top of the Big Sioux Aquifer ranges from three to 15 feet bgs and aquifer thickness ranges from approximately 10 feet to 80 feet in the study area.
2. The South Dakota Geological Survey recommends that wells be placed a minimum of 1,300 feet from any surface water, and that 1,000-foot spacing be maintained between wells.
3. The aquifer is thinnest in the western portions of Sections 30 and 31. Completion of wells within this area may result in lower yields, and higher radii of influence, per well.
4. The thickest portion of the aquifer, approximately 80 feet, occurs in a small, localized area in the southeast quarter of Section 30.
5. Over the remaining study area, the Big Sioux Aquifer ranges in thickness from 30 to 60 feet. Aquifer thicknesses within the sections are estimates only since data points were primarily limited to roadways, where test borings have been advanced.
6. Estimates of well yields indicate that some wells may produce less water than the desired 250 to 600 gpm range, while others may produce more. The production from each future well will be dependant upon the sediments encountered and the aquifer thickness at each particular location. Additional area-specific aquifer pumping data should be collected in an effort to adequately determine if sustainable yields are acceptable.
7. The findings of this study suggest that the water rights secured, within Sections 29, 30 and 31, have the potential to provide enough water to alleviate the need for water removal from Lake Kampeska and provide future water needs. Aquifer yield is highly dependant upon the thickness of the aquifer. As documented in available boring logs, the thickness of the aquifer varies significantly throughout this area. Since soil borings were primarily placed along roadways, the thickness of the aquifer within each section is only an estimate. In order to better quantify the aquifer thickness and yield, further testing would be required.
8. One possible well placement scenario, presented in this report, demonstrates that the 60 acres purchased in Section 31 can potentially support enough wells for the proposed wellfield. This scenario assumes a 600 to 650-foot well spacing. Field testing would be necessary to adequately measure the radius of influence and design the wellfield.

9. A review of the SDGS water diversions records indicates that there are several irrigation wells in the area. Many of the wells are located north-northeast (up-gradient) of the subject site. Furthermore, based upon aerial photographs, there may be additional water diversions not included in the SDGS database. Production from existing wells has the potential to significantly impact the yield of future wells.
10. The aquifer is observed to be very near the land surface and is protected only by a relatively thin layer of topsoil and overburden. Contaminants released to the ground surface can leach through this layer and present a potentially harmful impact to the aquifer. The surrounding agricultural land use, as well materials transported by rail in the area, present the potential for aquifer impairment.
11. Currently there is limited groundwater analytical data for the Big Sioux Aquifer in the study area. Non-point source pollution due to routine application of agricultural chemicals is of primary concern. It is recommended that groundwater and surface water quality be monitored for the presence of agricultural chemicals in accordance with public water supply testing requirements.
12. A portion of the proposed wellfield is located within Flood Zone A, which corresponds to the 100-year flood plain. It will be necessary to construct future wells and system components to prevent flood waters from entering the water supply and distribution system.

RECOMMENDATIONS

Based upon the information and conclusions presented above, SCE recommends the following recommendations be implemented prior to proceeding with the proposed wellfield expansion:

1. Infill test borings should be advanced. Since most boring locations have been limited to the roadways, subsurface conditions within the sections under consideration are unknown. Some of these areas include the thickest portions of the aquifer, but that has not been proven. It would be prudent to advance interior borings to determine the nature of the materials and thickness of the aquifer throughout the proposed wellfield. It is recommended that the borings be placed during winter months to minimize impacts to the ground surface.
2. Three test wells should be installed in separate areas within the proposed wellfield. Given the variability in the thickness and type of sediments present, at least three test wells are warranted. Installation of these test wells in the subject area is recommended in order to assess the sustainable yield of the aquifer. Two piezometers should be installed at different distances from each test well to be used as observation wells. Existing wells may also be used for this purpose.
3. Aquifer tests (72-hour tests) should be performed on each well to better define aquifer parameters at each location, to determine the radius of influence, and to provide a baseline for assessing future well and pump performance. Upon evaluation of the 72-hour pump test data, the test well showing the most promising aquifer characteristics should be subjected to a 10-day pumping test to provide a measure of long term aquifer sustainability.
4. Water quality samples should be collected from these wells during test pumping to assess for potential impact by agricultural and industrial chemicals. Two rounds of samples, one during the winter and the second during the growing season, are recommended. Analytical parameters should be determined based upon discussion with the City regarding specific treatment methods to be employed prior to distribution.
5. Data collected from the aquifer test should be used in the development of a groundwater model to more completely assess the hydraulic properties of the aquifer. Moreover, information acquired from this model can assist in determining adequate well numbers and their respective spacing. This will also verify that the secured land area is adequate for the necessary water production. In addition, the model will be used to assess potential wellfield sustainability when subjected to outside stresses such as high capacity irrigation and/or industrial well production.

This assessment has been limited to a compilation and review of existing, publicly available reports and data order to obtain information about the yield potential of the proposed Rauville wellfield. No testing was conducted as a part of this assessment.

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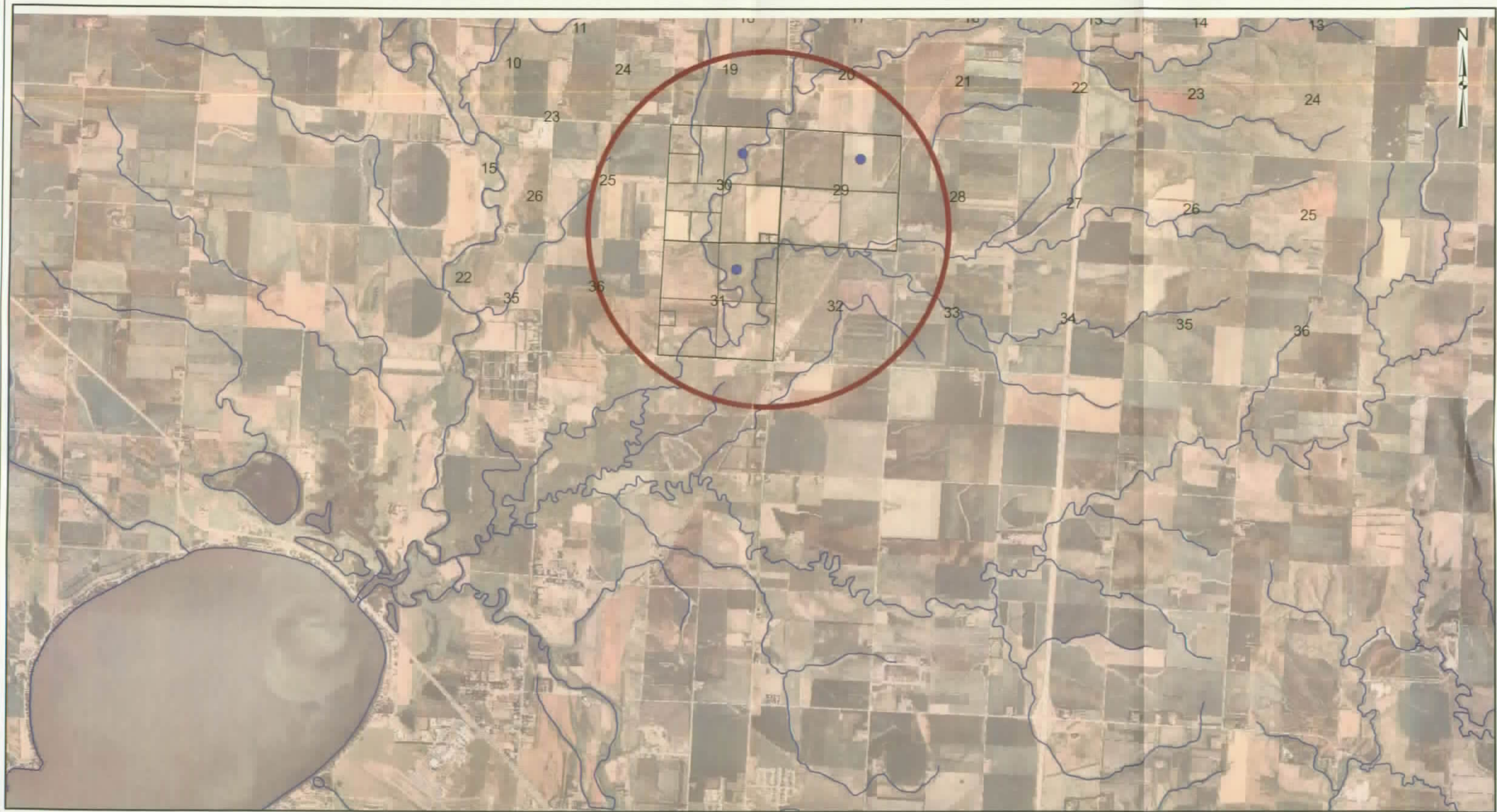
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FIGURES



Legend



Watertown Water Rights



Parcels of Interest



Proposed Rauville Wellfield



FIGURE 1
LOCATION OF STUDY AREA

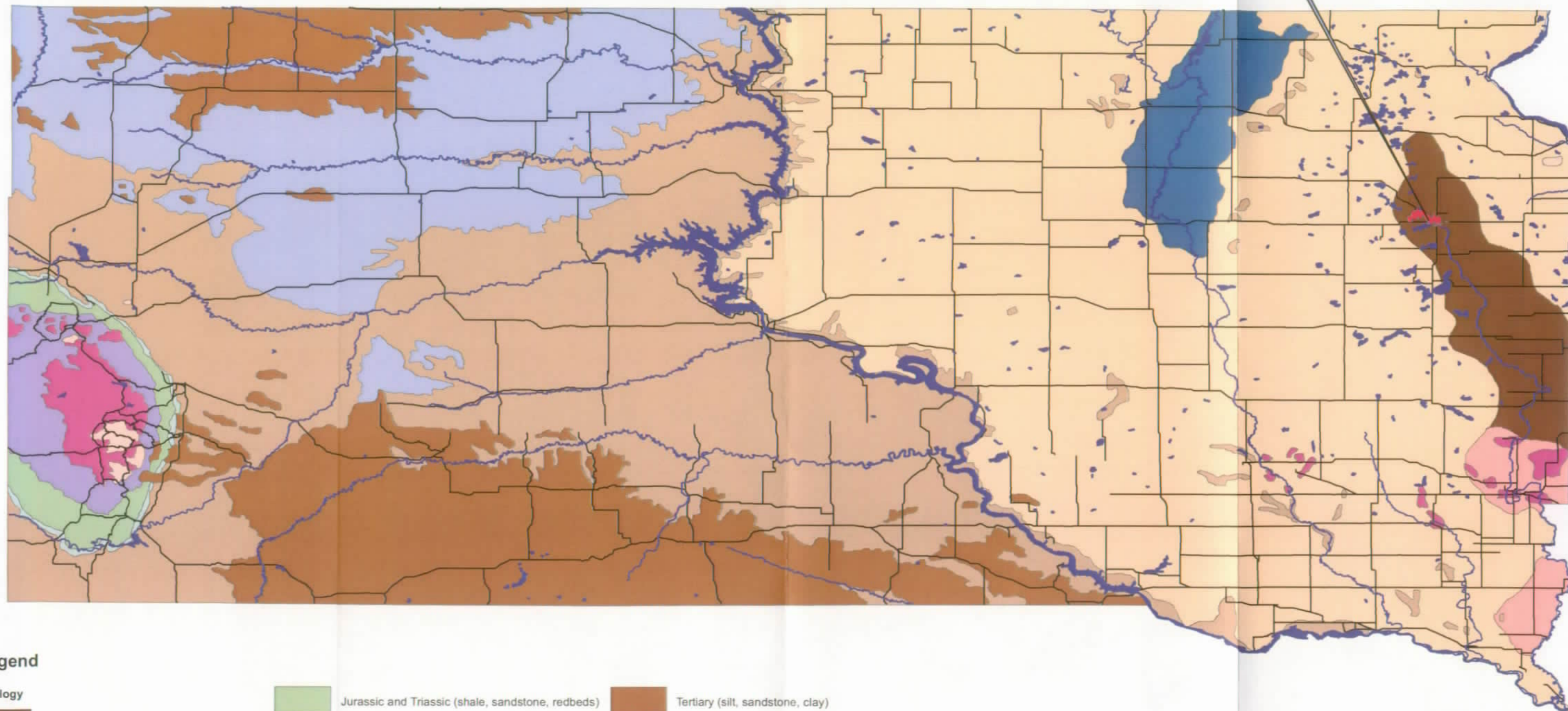
Watertown Municipal Utilities
Wellfield Expansion





State of South Dakota

City of Watertown



Legend

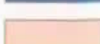
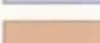
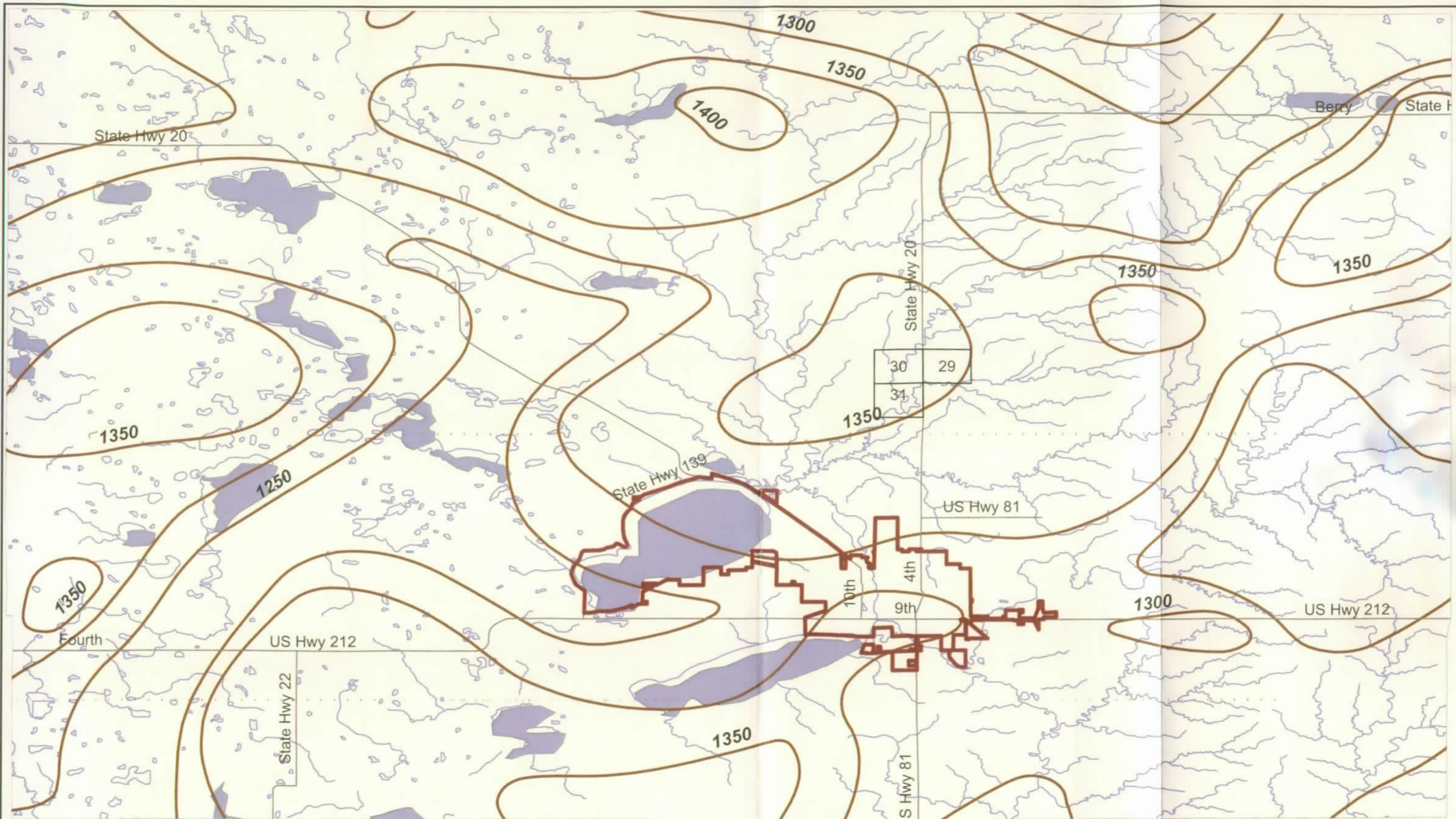
Geology		
	Early Wisconsin Glacial Sediments	 Jurassic and Triassic (shale, sandstone, redbeds)
	Glacial Lake Deposit (silt, sand)	 Late Wisconsin Glacial Sediments
	Igneous Rocks (granite, rhyolite, phonolite)	 Lower Cretaceous (limestone, shale, sandstone)
	Illinoian Glacial Sediments	 Metamorphic Rocks (schist, slate, quartzite)
		 Paleozoic (limestone, sandstone, shale)
		 Tertiary (silt, sandstone, clay)
		 Upper Cretaceous (sandstone, clay)
		 Upper Cretaceous (shale, chalk)

FIGURE 2
SURFICIAL GEOLOGY OF SOUTH DAKOTA
Watertown Municipal Utilities
Wellfield Expansion





Legend

-  Sections of Interest
-  Watertown Location
-  Bedrock Contour Line

FIGURE 3
Bedrock Elevation Contours
Watertown Municipal Utilities
Wellfield Expansion



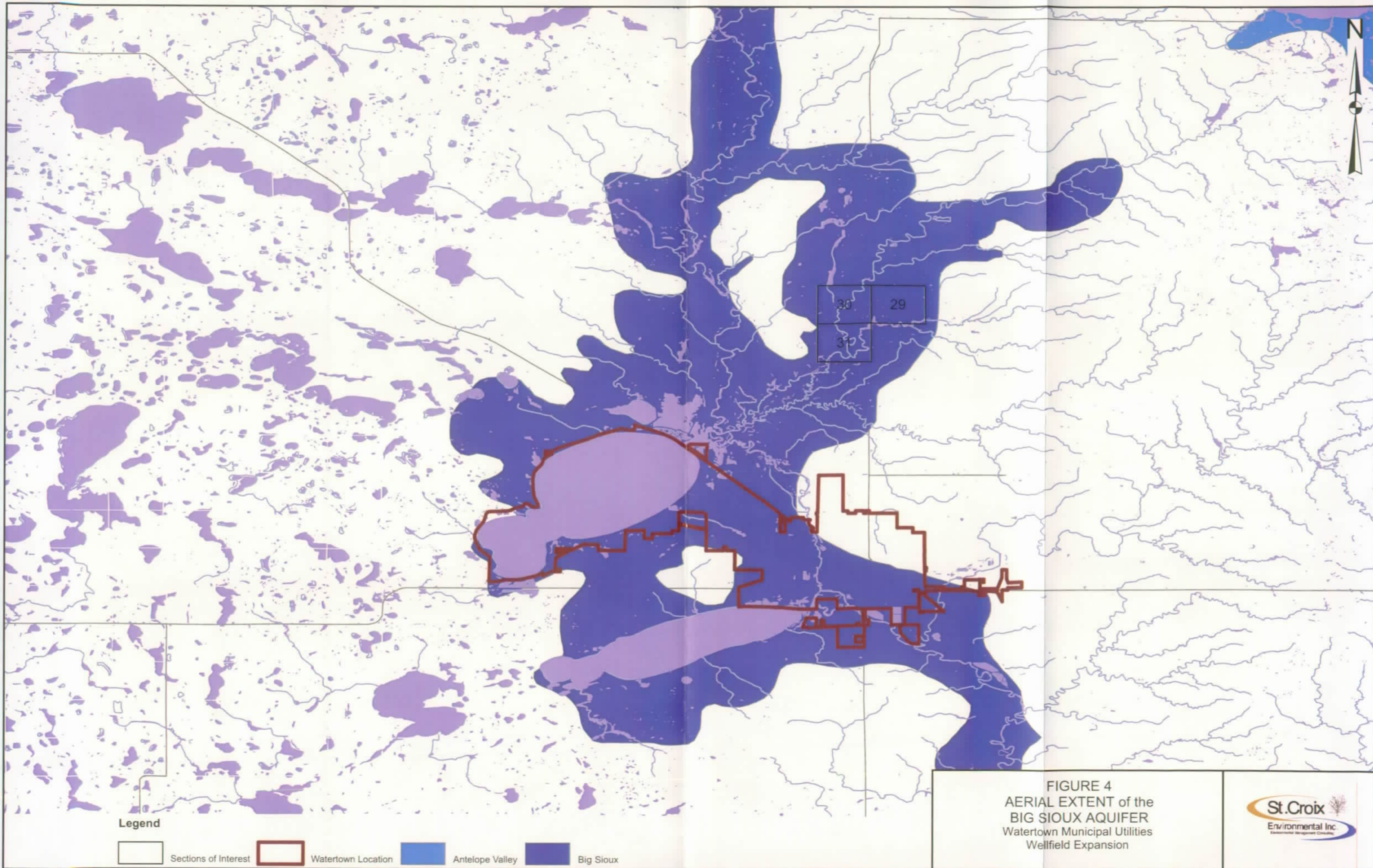
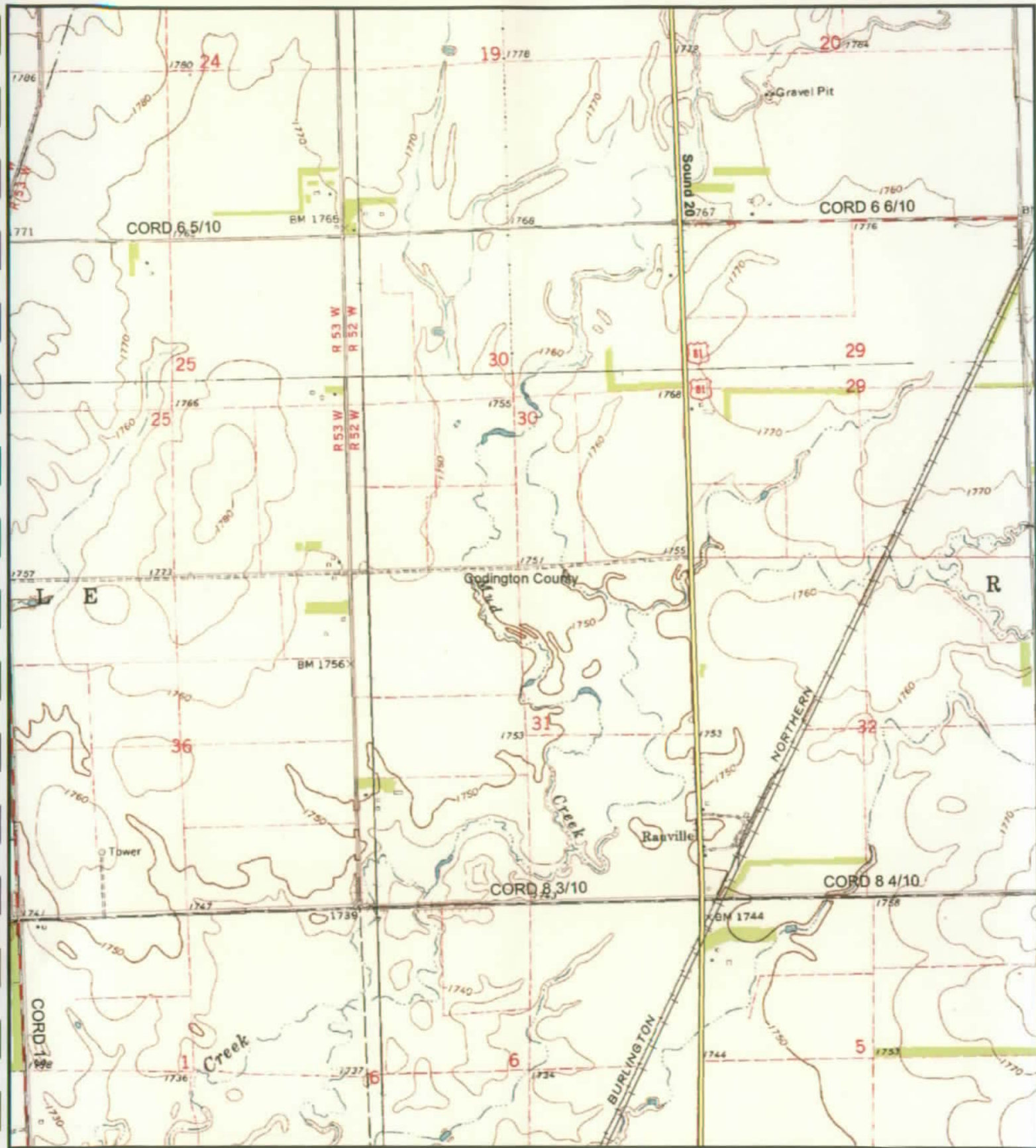
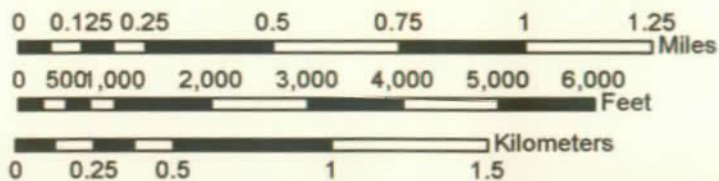


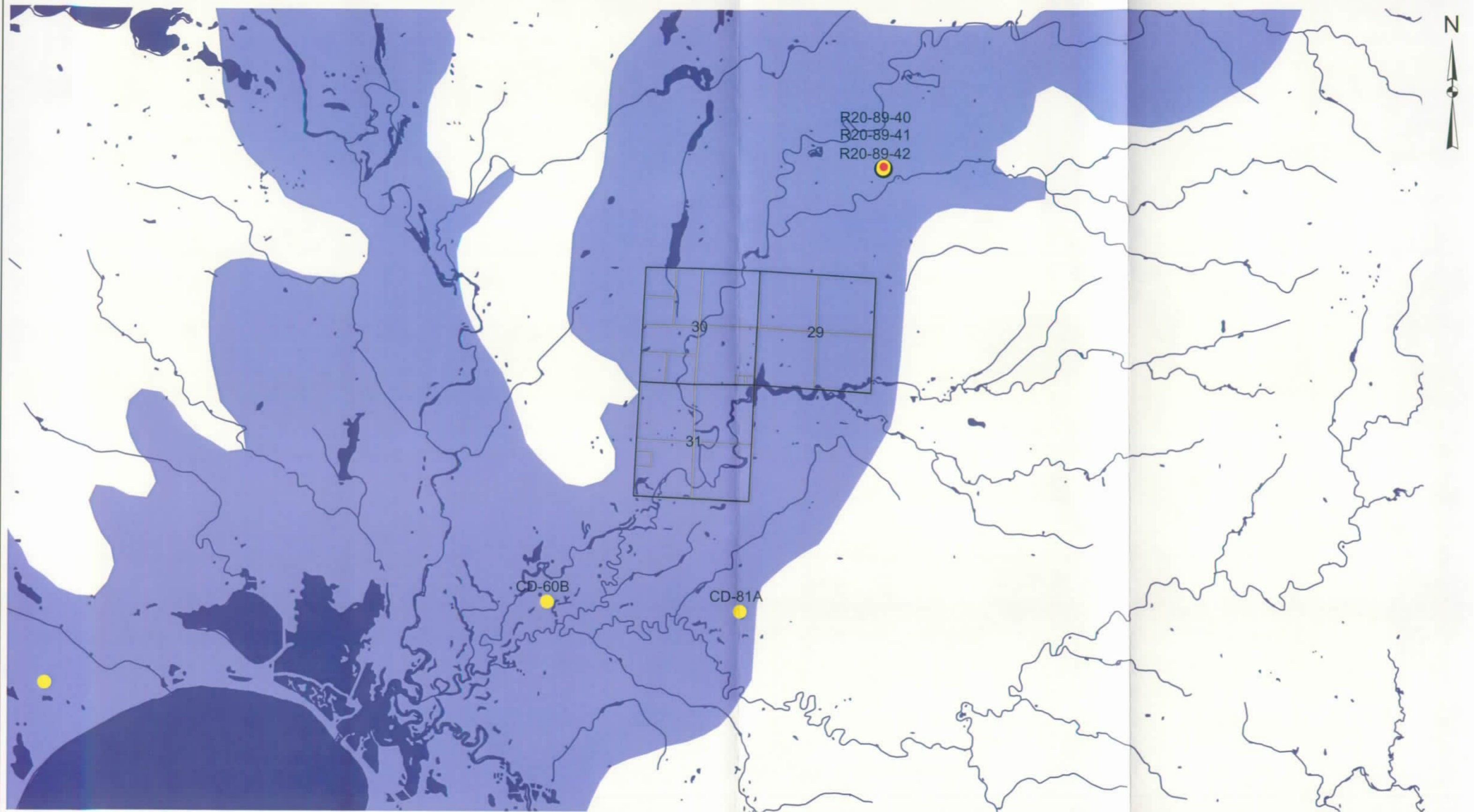
FIGURE 4
AERIAL EXTENT of the
BIG SIOUX AQUIFER
Watertown Municipal Utilities
Wellfield Expansion



UNITED STATES GEOLOGICAL SURVEY 7.5 MINUTE SERIES TOPOGRAPHIC MAP 1:24,000 SCALE



STILL LAKE, STILL LAKE SE,
WATERTOWN EAST,
WATERTOWN WEST, SD
1970



Legend

1 0.5 0 1 Miles

Pesticides Results

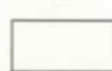


Organic Compounds



Big Sioux Aquifer

Inorganic Compounds

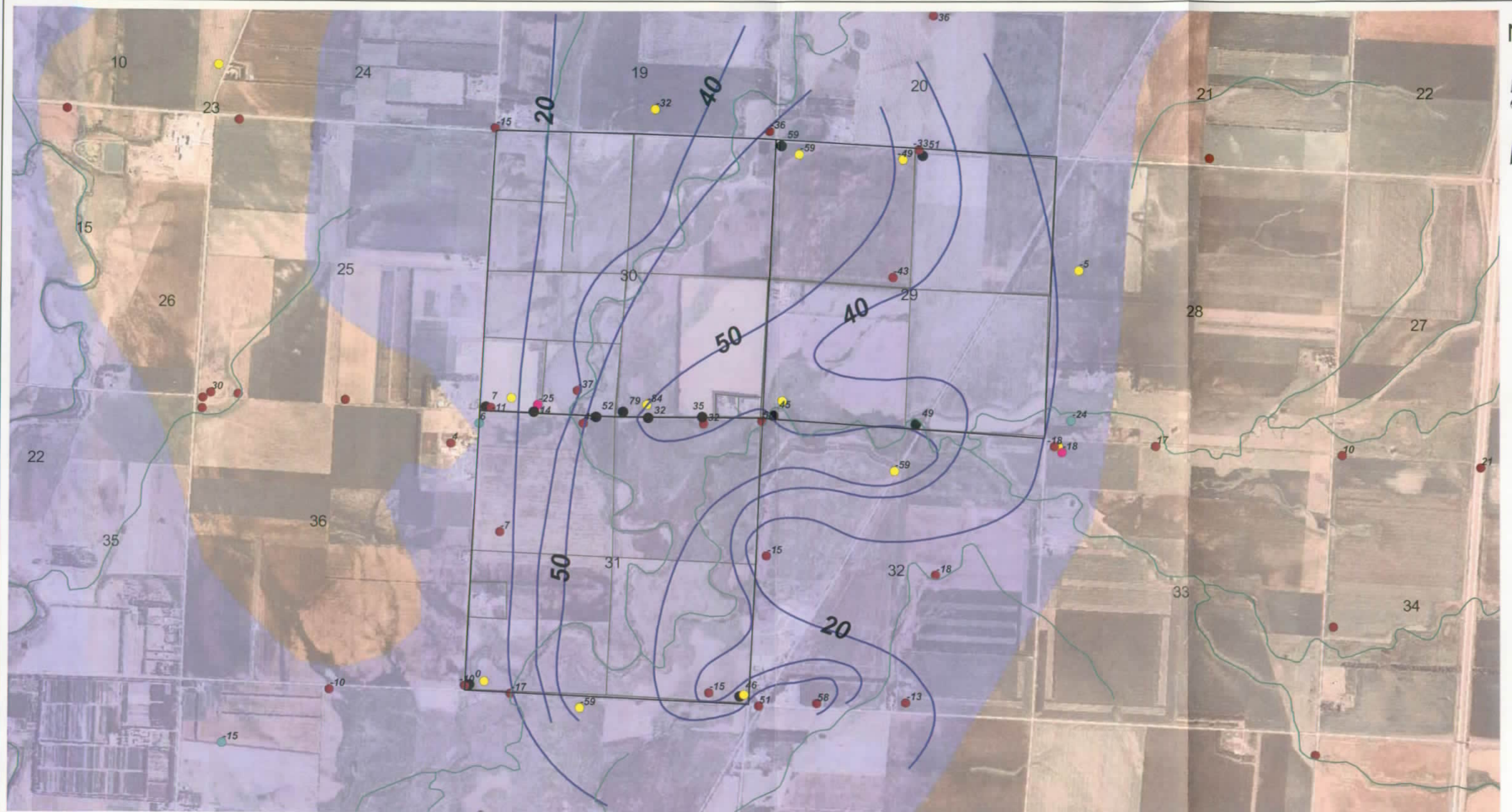


Parcels Of Interest

FIGURE 6
MONITORING LOCATIONS

Watertown Municipal Utilities
Wellfield Expansion





Legend

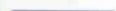
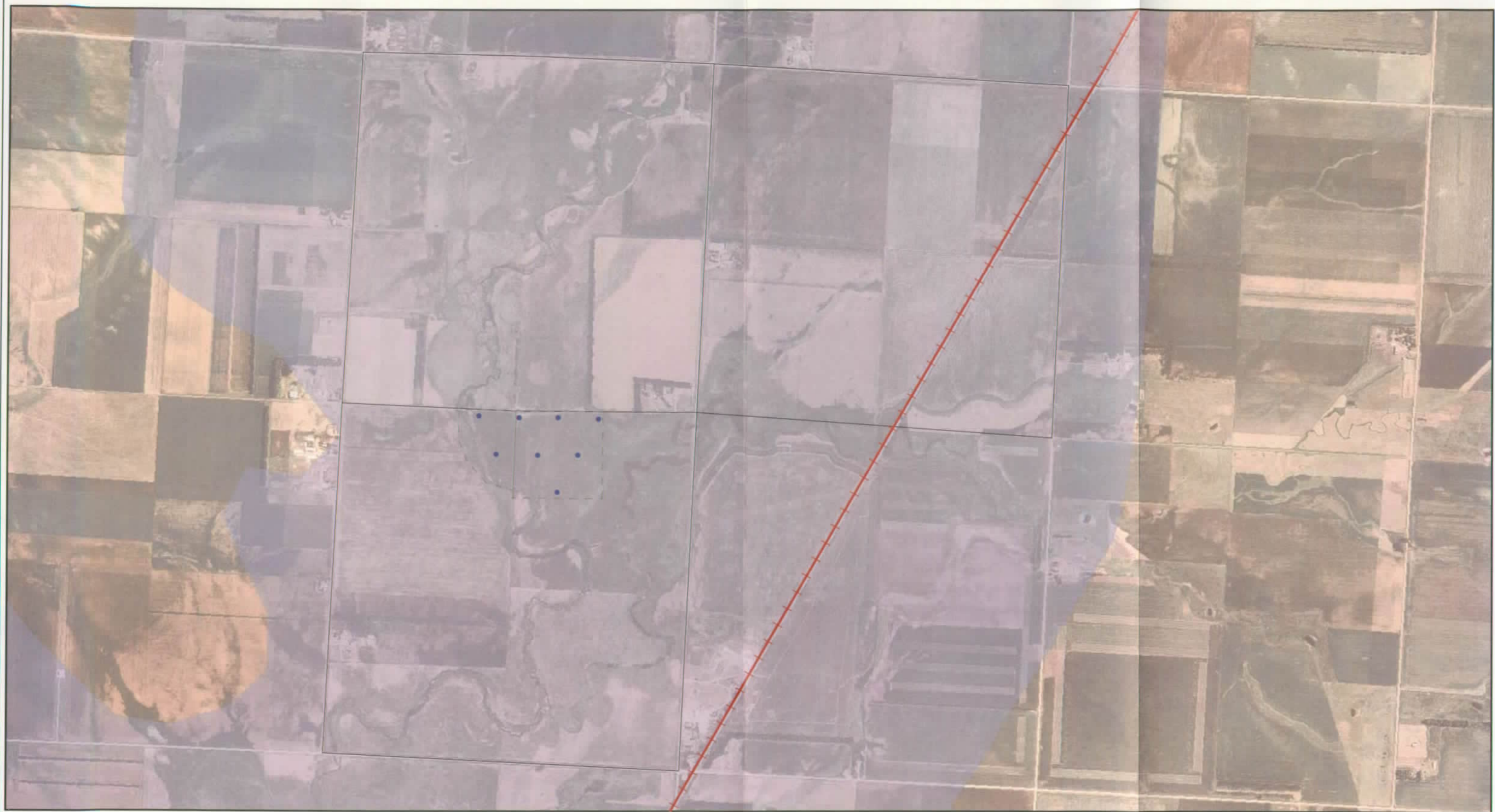
- | | | | |
|--|---|--|---|
|  Thickness Contour |  Other Wells |  Water Rights | 25 Aquifer Thickness |
|  Municipal Boring Locations |  Domestic Well |  Watertown City Study | -15 Interpreted Aquifer Thickness (where depth to water was not documented) |
|  Irrigation Well |  Parcels Of Interest | | |
| |  Big Sioux Aquifer | | |
- 

FIGURE 7
AQUIFER SATURATED THICKNESS

Watertown Municipal Utilities
Wellfield Expansion





Legend

• Preliminary Well Locations

Big Sioux Aquifer

0 750 1,500 3,000 Feet

FIGURE 8
PRELIMINARY WELL LOCATIONS

Watertown Municipal Utilities
Wellfield Expansion





Legend

● Preliminary Well Locations

--- Land Parcels

0 250 500 1,000 Feet

FIGURE 9
PRELIMINARY WELL LOCATIONS

Watertown Municipal Utilities
Wellfield Expansion





FIGURE 10
AERIAL PHOTOGRAPH
1939
Watertown Municipal Utilities
Wellfield Expansion



FIGURE 11
AERIAL PHOTOGRAPH
1958
Watertown Municipal Utilities
Wellfield Expansion



FIGURE 12
AERIAL PHOTOGRAPH
1965
Watertown Municipal Utilities
Wellfield Expansion



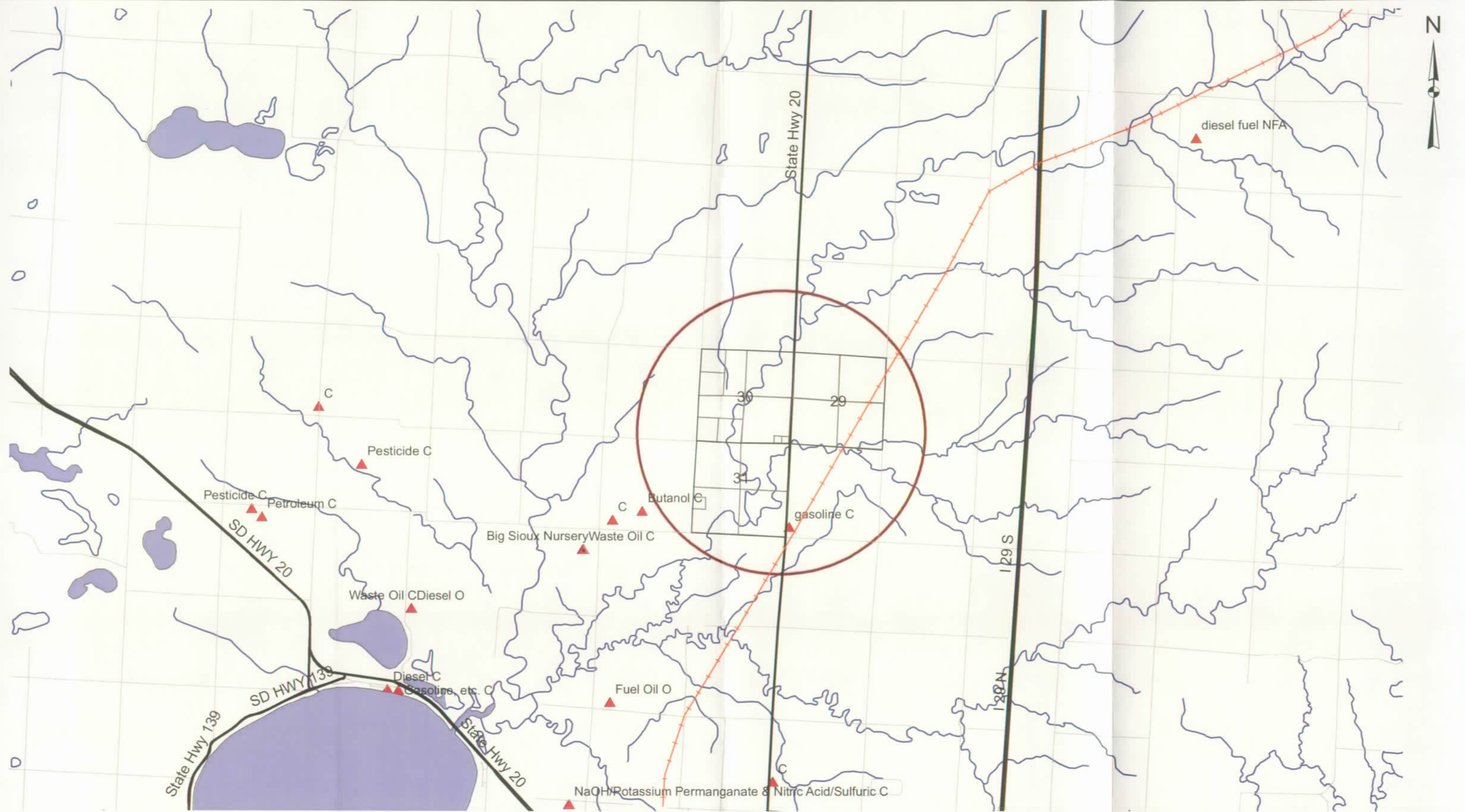
FIGURE 13
AERIAL PHOTOGRAPH
1991
Watertown Municipal Utilities
Wellfield Expansion



FIGURE 14
AERIAL PHOTOGRAPH
2003
Watertown Municipal Utilities
Wellfield Expansion



FIGURE 15
AERIAL PHOTOGRAPH
2004
Watertown Municipal Utilities
Wellfield Expansion



Legend

- | | | | |
|--|-----------------------------|--|------------------|
| | Parcels Of Interest | | Release - Status |
| | Proposed Rauville Wellfield | | Rail Road |

FIGURE 16
POTENTIAL CONTAMINANT SOURCES

Watertown Municipal Utilities
Wellfield Expansion



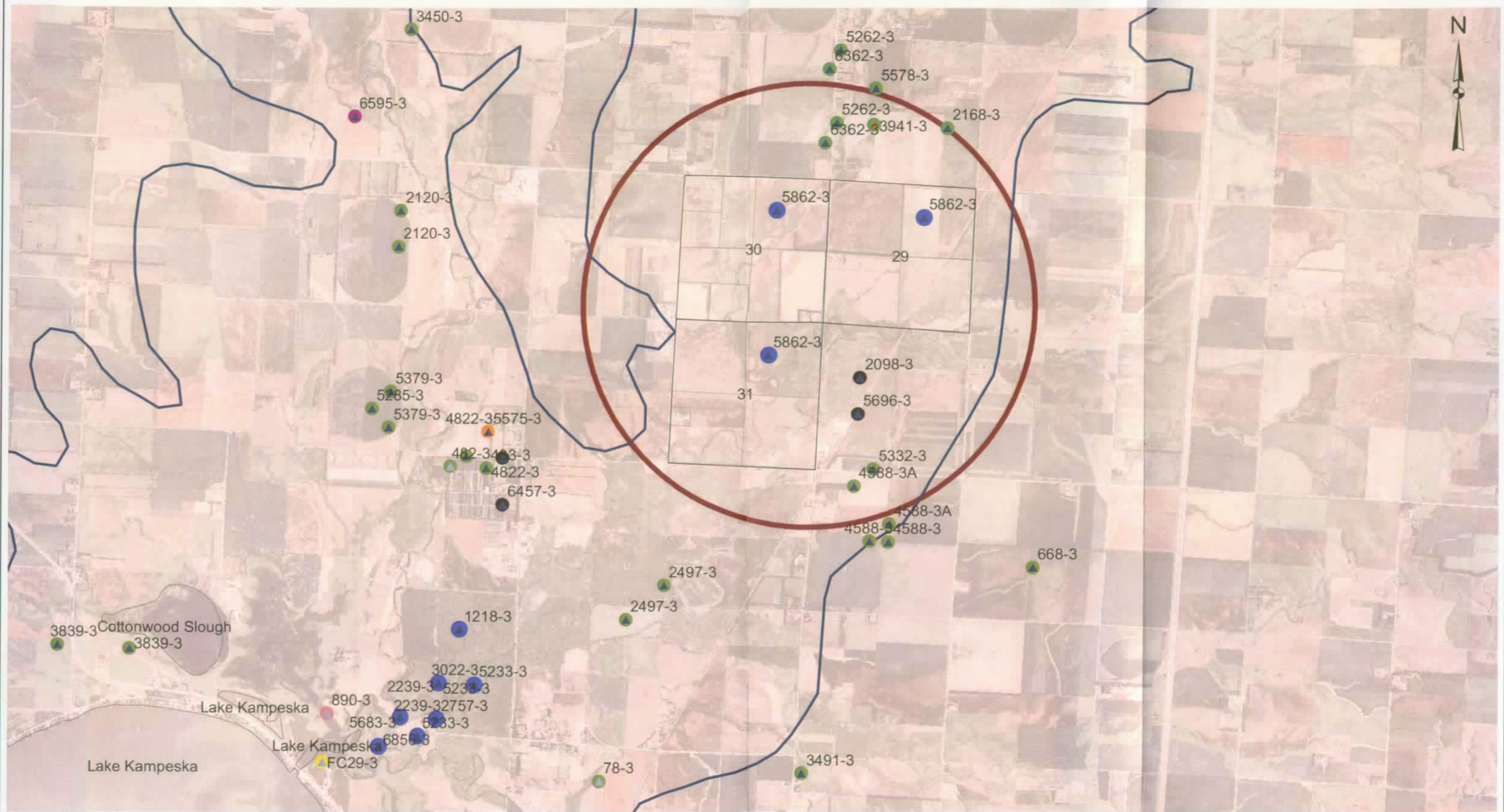


FIGURE 17
WATER DIVERSIONS
 Watertown Municipal Utilities
 Wellfield Expansion



Legend

 Floodzone A

0 0.125 0.25 0.5 0.75 1
Miles

FIGURE 18
FLOOD ZONE of the BIG SIOUX RIVER

Watertown Municipal Utilities
Wellfield Expansion



TABLE

Table 1
Water Diversions

PERMIT NO	LATITUDE	LONGITUDE	LAST NAME	FIRST NAME	ADDRESS2	CITY	PRIORDATE	STATUS	SOURCE	AQUIFER	DIVERSION1	USE TYPE1	PER CFS	PER CFS	PER ACRES	LOC	ACRES	CMPLTN	DTE	LOC	DTE
1108-3	45.02841	-97.10822	R.E. HUBBARD CO.			WATERTOWN	6/23/1964	CA	G		GROUNDWATER	IRR	2.200	0.000		154.00	0.00				
1218-3	44.95919	-97.15417	WATERTOWN	CITY OF	HWY 20 W 4TH ST	WATERTOWN	1/23/1956	FU	G	BS	GROUNDWATER	MUN	0.000	0.000		0.00	0.00				
151-3	44.91547	-97.13375	WATERTOWN	CITY OF	HWY 20 W 4TH ST	WATERTOWN	1/23/1956	FU	G	BS	GROUNDWATER	MUN	0.000	0.000		0.00	0.00				
2098-3	44.93186	-97.14851	ENGELHAET	KURT & JILL	2227 SIOUX CONIFER	WATERTOWN	3/24/1994	CA	G	BS	GROUNDWATER	IRR	0.420	0.420		31.40	0.00		11/16/1956	11/16/1956	
2107-3	44.94626	-97.10056	OLIN CORPORATION		BOX 935	WATERTOWN	6/14/1974	CA	G	BS	GROUNDWATER	IRR	0.020	0.020		0.00	0.00		8/17/1974	1/3/1979	
2120-3	44.94735	-97.15923	WATERTOWN	CITY OF	HWY 20 W 4TH AVE	WATERTOWN	8/26/1974	FU	G	BS	GROUNDWATER	MUN	0.000	0.000		0.00	0.00				
2120-3	45.00100	-97.16572	ENDRES	DON	919 CHRISTINE AVE	BROOKINGS	10/1/1974	CA	G	BS	GROUNDWATER	IRR	3.300	2.220		240.00	190.00		11/13/1979	8/12/1992	
2168-3	45.01202	-97.09035	ZEMILCOA	HARLEY/SHIRLEY	RR 5 BOX 48	WATERTOWN	12/16/1974	LC	G	BS	GROUNDWATER	IRR	3.250	0.000		228.00	0.00		11/13/1979	8/12/1992	
2203-3	45.03702	-97.07758	MCCELHANY	DAVID	HWY 20 W 4TH ST	WATERTOWN	2/18/1975	CA	G	BS	GROUNDWATER	IRR	4.100	0.000		289.00	0.00		11/22/1975	4/26/1999	
2239-3	44.95372	-97.15872	WATERTOWN	CITY OF	HWY 20 W 4TH AVE	WATERTOWN	9/21/1965	LC	G	BS	GROUNDWATER	MUN	2.700	2.230		0.00	0.00		11/22/1975	4/26/1999	
2293-3	44.95008	-97.15872	WATERTOWN	CITY OF	RR 5 BOX 48	WATERTOWN	12/22/1975	CA	G	BS	GROUNDWATER	IRR	1.000	0.000		69.00	0.00		5/22/1980	2/17/1992	
2293-3	44.95008	-97.15872	WATERTOWN	CITY OF	HWY 20 W 4TH AVE	WATERTOWN	12/22/1975	CA	G	BS	GROUNDWATER	IRR	4.400	2.200		311.00	298.00		1/22/1981	2/17/1992	
2293-3	44.95008	-97.15872	WATERTOWN	CITY OF	HWY 20 W 4TH AVE	WATERTOWN	9/21/1965	LC	G	BS	GROUNDWATER	MUN	2.000	1.450		0.00	0.00		10/22/1976	4/3/1979	
3022-3	44.95008	-97.15872	WATERTOWN	CITY OF	HWY 20 W 4TH AVE	WATERTOWN	9/21/1965	LC	G	BS	GROUNDWATER	MUN	2.000	1.450		0.00	0.00		10/22/1976	4/3/1979	
3022-3	44.95372	-97.15872	WATERTOWN	CITY OF	HWY 20 W 4TH AVE	WATERTOWN	9/21/1965	LC	G	BS	GROUNDWATER	MUN	0.140	0.140		10.00	10.00		9/30/1977	1/26/1979	
3231-3	45.02841	-97.07758	MCCELHANY	DAVID	HWY 20 W 4TH AVE	WATERTOWN	9/21/1965	LC	G	BS	GROUNDWATER	MUN	1.670	1.310		0.00	0.00		1/21/1977	4/3/1979	
3450-3	45.02285	-97.17583	LINDNER	MICHAEL/KATHLEEN	16405 452ND AVE	WATERTOWN	9/19/1976	CA	G	BS	GROUNDWATER	IRR	2.200	0.000		294.00	0.00		1/26/1982	4/3/1979	
3450-3	45.02285	-97.16572	LINDNER	MICHAEL/KATHLEEN	16405 452ND AVE	WATERTOWN	1/17/1977	CA	G	BS	GROUNDWATER	IRR	3.850	0.000		280.00	0.00		1/26/1982	4/3/1979	
3450-3	45.01921	-97.16572	LINDNER	MICHAEL/KATHLEEN	16405 452ND AVE	WATERTOWN	1/17/1977	CA	G	BS	GROUNDWATER	IRR	3.850	0.000		280.00	0.00		1/26/1982	4/3/1979	
3481-3	44.91365	-97.13120	WATERTOWN	CITY OF	HWY 20 W 4TH AVE	WATERTOWN	8/11/1932	LC	G	BS	GROUNDWATER	MUN	0.250	0.000		0.00	0.00		2/23/1976	1/14/1957	
3491-3	44.94643	-97.10567	FOX	EDWARD J	RR 1 BOX 79	WATERTOWN	12/27/1976	CA	G	BS	GROUNDWATER	IRR	0.800	0.000		18.00	0.00		1/14/1957	1/14/1957	
3501-3	44.91365	-97.13630	WATERTOWN	CITY OF	HWY 20 W 4TH AVE	WATERTOWN	1/11/1933	LC	G	BS	GROUNDWATER	MUN	0.800	0.800		0.00	0.00		1/14/1957	1/14/1957	
3745-3	45.05200	-97.14044	THACKER	OWEN	HWY 20 W 4TH AVE	WATERTOWN	12/27/1976	CA	G	BS	GROUNDWATER	MUN	2.200	0.000		160.00	0.00		7/28/1987	2/19/1992	
3839-3	44.95554	-97.20013	DUNN	DARLE E		WATERTOWN	3/21/1977	CA	G	BS	GROUNDWATER	IRR	1.810	0.000		127.00	0.00		7/28/1987	2/19/1992	
3839-3	44.95554	-97.20013	DUNN	DARLE E		WATERTOWN	3/21/1977	CA	G	BS	GROUNDWATER	IRR	1.810	0.000		127.00	0.00		7/28/1987	2/19/1992	
3941-3	45.07202	-97.10056	ZEMILCOA	HARLEY/SHIRLEY	RR 5 BOX 48	WATERTOWN	9/21/1965	LC	G	BS	GROUNDWATER	IRR	0.000	1.770		0.00	0.00		5/24/1981	3/25/1982	
4588-3	44.97012	-97.09801	CARR	ROBERT L	HWY 59 NORTH	MARSHALL	4/18/1977	CA	G	BS	GROUNDWATER	IRR	0.570	0.000		40.00	0.00		12/31/1986	8/5/1992	
4588-3	44.97012	-97.09801	CARR	ROBERT L	HWY 59 NORTH	MARSHALL	12/41/1980	LC	G	BS	GROUNDWATER	IRR	2.800	0.000		200.00	0.00		12/31/1986	8/5/1992	
4588-3	44.97558	-97.10056	ENDRES	DON	919 CHRISTINE AVE	BROOKINGS	12/41/1980	LC	G	BS	GROUNDWATER	IRR	2.800	0.000		200.00	0.00		6/28/1980	2/21/1993	
4588-3	44.97558	-97.10056	ENDRES	DON	919 CHRISTINE AVE	BROOKINGS	12/41/1980	LC	G	BS	GROUNDWATER	IRR	2.800	0.000		200.00	0.00		6/28/1980	2/21/1993	
4588-3	44.97558	-97.10056	ENDRES	DON	919 CHRISTINE AVE	BROOKINGS	12/41/1980	LC	G	BS	GROUNDWATER	IRR	2.800	0.000		200.00	0.00		6/28/1980	2/21/1993	
4588-3	44.97558	-97.10056	ENDRES	DON	919 CHRISTINE AVE	BROOKINGS	12/41/1980	LC	G	BS	GROUNDWATER	IRR	2.800	0.000		200.00	0.00		6/28/1980	2/21/1993	
4588-3	44.97558	-97.10056	ENDRES	DON	919 CHRISTINE AVE	BROOKINGS	12/41/1980	LC	G	BS	GROUNDWATER	IRR	2.800	0.000		200.00	0.00		6/28/1980	2/21/1993	
4588-3	44.97558	-97.10056	ENDRES	DON	919 CHRISTINE AVE	BROOKINGS	12/41/1980	LC	G	BS	GROUNDWATER	IRR	2.800	0.000		200.00	0.00		6/28/1980	2/21/1993	
4588-3	44.97558	-97.10056	ENDRES	DON	919 CHRISTINE AVE	BROOKINGS	12/41/1980	LC	G	BS	GROUNDWATER	IRR	2.800	0.000		200.00	0.00		6/28/1980	2/21/1993	
4588-3	44.97558	-97.10056	ENDRES	DON	919 CHRISTINE AVE	BROOKINGS	12/41/1980	LC	G	BS	GROUNDWATER	IRR	2.800	0.000		200.00	0.00		6/28/1980	2/21/1993	
4588-3	44.97558	-97.10056	ENDRES	DON	919 CHRISTINE AVE	BROOKINGS	12/41/1980	LC	G	BS	GROUNDWATER	IRR	2.800	0.000		200.00	0.00		6/28/1980	2/21/1993	
4588-3	44.97558	-97.10056	ENDRES	DON	919 CHRISTINE AVE	BROOKINGS	12/41/1980	LC	G	BS	GROUNDWATER	IRR	2.800	0.000		200.00	0.00		6/28/1980	2/21/1993	
4588-3	44.97558	-97.10056	ENDRES	DON	919 CHRISTINE AVE	BROOKINGS	12/41/1980	LC	G	BS	GROUNDWATER	IRR	2.800	0.000		200.00	0.00		6/28/1980	2/21/1993	
4588-3	44.97558	-97.10056	ENDRES	DON	919 CHRISTINE AVE	BROOKINGS	12/41/1980	LC	G	BS	GROUNDWATER	IRR	2.800	0.000		200.00	0.00		6/28/1980	2/21/1993	
4588-3	44.97558	-97.10056	ENDRES	DON	919 CHRISTINE AVE	BROOKINGS	12/41/1980	LC	G	BS	GROUNDWATER	IRR	2.800	0.000		200.00	0.00		6/28/1980	2/21/1993	
4588-3	44.97558	-97.10056	ENDRES	DON	919 CHRISTINE AVE	BROOKINGS	12/41/1980	LC	G	BS	GROUNDWATER	IRR	2.800	0.000		200.00	0.00		6/28/1980	2/21/1993	
4588-3	44.97558	-97.10056	ENDRES	DON	919 CHRISTINE AVE	BROOKINGS	12/41/1980	LC	G	BS	GROUNDWATER	IRR	2.800	0.000		200.00	0.00		6/28/1980	2/21/1993	
4588-3	44.97558	-97.10056	ENDRES	DON	919 CHRISTINE AVE	BROOKINGS	12/41/1980	LC	G	BS	GROUNDWATER	IRR	2.800	0.000		200.00	0.00		6/28/1980	2/21/1993	
4588-3	44.97558	-97.10056	ENDRES	DON	919 CHRISTINE AVE	BROOKINGS	12/41/1980	LC	G	BS	GROUNDWATER	IRR	2.800	0.000		200.00	0.00		6/28/1980	2/21/1993	
4588-3	44.97558	-97.10056	ENDRES	DON	919 CHRISTINE AVE	BROOKINGS	12/41/1980	LC	G	BS	GROUNDWATER	IRR	2.800	0.000		200.00	0.00		6/28/1980	2/21/1993	
4588-3	44.97558	-97.10056	ENDRES	DON	919 CHRISTINE AVE	BROOKINGS	12/41/1980	LC	G	BS	GROUNDWATER	IRR	2.800	0.000		200.00	0.00		6/28/1980	2/21/1993	
4588-3	44.97558	-97.10056	ENDRES	DON	919 CHRISTINE AVE	BROOKINGS	12/41/1980	LC	G	BS	GROUNDWATER	IRR	2.800	0.000		200.00	0.00		6/28/1980	2/21/1993	
4588-3	44.97558	-97.10056	ENDRES	DON	919 CHRISTINE AVE	BROOKINGS	12/41/1980	LC	G	BS	GROUNDWATER	IRR	2.800	0.000		200.00	0.00		6/28/1980	2/21/1993	
4588-3	44.97558	-97.10056	ENDRES	DON	919 CHRISTINE AVE	BROOKINGS	12/41/1980	LC	G	BS	GROUNDWATER	IRR	2.800	0.000		200.00	0.00		6/28/1980	2/21/1993	
4588-3	44.97558	-97.10056	ENDRES	DON	919 CHRISTINE AVE	BROOKINGS	12/41/1980	LC	G	BS	GROUNDWATER	IRR	2.800	0.000		200.00	0.00		6/28/1980	2/21/1993	
4588-3	44.97558	-97.10056	ENDRES	DON	919 CHRISTINE AVE	BROOKINGS	12/41/1980	LC	G	BS	GROUNDWATER	IRR	2.800	0.000		200.00	0.00		6/28/1980	2/21/1993	
4588-3	44.97558	-97.10056	ENDRES	DON	919 CHRISTINE AVE	BROOKINGS	12/41/1980	LC	G	BS	GROUNDWATER	IRR	2.800	0.000		200.00	0.00		6/28/1980	2/21/1993	
4588-3	44.97558	-97.10056	ENDRES	DON	919 CHRISTINE AVE	BROOKINGS	12/41/1980	LC	G	BS	GROUNDWATER	IRR	2.800	0.000		200.00	0.00		6/28/1980	2/21/1993	
4588-3	44.97558	-97.10056	ENDRES	DON	919 CHRISTINE AVE	BROOKINGS	12/41/1980	LC	G	BS	GROUNDWATER	IRR	2.800	0.000		200.00	0.00		6/28/1980	2/21/1993	
4588-3	44.97558	-97.10056	ENDRES	DON	919 CHRISTINE AVE	BROOKINGS	12/41/1980	LC	G	BS	GROUNDWATER	IRR	2.800	0.000		200.00	0.00		6/28/1980	2/21/1993	
4588-3	44.97558	-97.10056	ENDRES	DON	919 CHRISTINE AVE	BROOKINGS	12/41/1980	LC	G	BS	GROUNDWATER	IRR	2.800	0.000		200.00	0.00		6/28/1980	2/21/1993	
4588-3	44.97558	-97.10056	ENDRES	DON	919 CHRISTINE AVE	BROOKINGS	12/41/1980	LC	G	BS	GROUNDWATER	IRR	2.800	0.000		200.00	0.00		6/28/1980	2/21/1993	
4588-3	44.97558	-97.10056	ENDRES	DON	919 CHRISTINE AVE	BROOKINGS	12/41/1980	LC	G	BS	GROUNDWATER	IRR	2.800	0.000		200.00	0.00		6/28/1980	2/21/1993	
4588-3	44.97558	-97.10056	ENDRES	DON	919 CHRISTINE AVE	BROOKINGS	12/41/1980	LC	G	BS	GROUNDWATER	IRR	2.800	0.000		200.00	0.00		6/28/1980	2/21/1993	
4588-3	44.97558	-97.10056	ENDRES	DON	919 CHRISTINE AVE	BROOKINGS	12/41/1980	LC	G	BS	GROUNDWATER	IRR	2.800	0.000		200.00	0.00		6/28/1980	2/21/1993	
4588-3	44.97558	-97.10056	ENDRES	DON	919 CHRISTINE AVE	BROOKINGS	12/41/1980	LC	G	BS	GROUNDWATER	IRR	2.800	0.000		200.00	0.0				

Table 1
Water Diversions

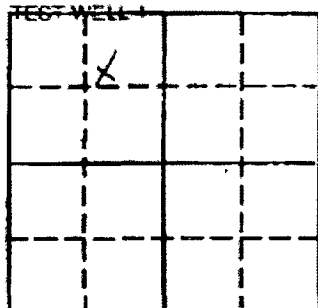
5883-3	44 93186	-97.15672 STEINBAUER	JOHN E	221 AIRPORT DR	WATERTOWN	9/1/1995 CA	G	PS	GROUNDWATER	IND	0.186	0.089	0.00	0.00	11/6/2000	1/19/1999
8270-3	44 92723	-97.16208 DAKOTA PLASTICS COMPANY		PO BOX 52	WATERTOWN	7/17/2001 LC	G	BS	GROUNDWATER	IND	0.220	0.214	0.00	0.00	9/10/2006	4/7/2006
6270-3	44 92723	-97.16208 DAKOTA PLASTICS COMPANY		PO BOX 52	WATERTOWN	7/17/2001 LC	G	BS	GROUNDWATER	IND	0.220	0.214	0.00	0.00	9/10/2006	4/7/2006
6308-3	44 97671	-97.15451 BIG SIOUX NURSERY INC		16613 SIOUX CONIFER RD	WATERTOWN	5/27/1997 LC	G	BS	GROUNDWATER	IRR	0.000	1.900	18.75	151.75	5/2/2007	6/12/2006
6362-3	45.00994	-97.10711 ZEMULICKA	RODNEY	45412 164TH ST	WATERTOWN	9/13/2002 PE	G	BS	GROUNDWATER	IRR	0.000	0.000	100.00	0.00	12/4/2007	
6457-3	45.01738	-97.10711 ZEMULICKA	RODNEY	45412 164TH ST	WATERTOWN	9/13/2002 PE	G	BS	GROUNDWATER	IRR	0.000	0.000	100.00	0.00	12/4/2007	
6555-3	44 91720	-97.14808 BIG SIOUX NURSERY INC		16613 SIOUX CONIFER RD	WATERTOWN	12/30/2003 LC	G	BS	GROUNDWATER	COM	0.044	0.040	0.00	0.00	2/26/2009	6/12/2006
6555-3	45.01020	-97.17301 CLARK RWS, INC		PO BOX 162	CLARK	11/26/2005 PE	G	BS	GROUNDWATER	RWS	0.560	0.000	0.00	0.00	6/9/2010	
688-3	44 98830	-97.07593 KRANZ INC	NICK & MATT	2137 20TH AVE SE	WATERTOWN	11/4/1999 LC	G	BS	GROUNDWATER	IRR	3.200	2.000	229.60	229.60	1/26/1965	7/7/1970
8750-3	44 97671	-97.14942 BIG SIOUX NURSERY INC		16613 SIOUX CONIFER RD	WATERTOWN	8/16/2006 PE	G	BS	GROUNDWATER	COM	0.055	0.000	0.00	0.00	10/9/2011	
8856-3	44 94702	-97.16470 WATERTOWN MUNICIPAL UTILITIES		901 4TH AVE SW	WATERTOWN	12/31/1992 CA	G	BS	GROUNDWATER	MUN	2.140	0.000	0.00	0.00	7/23/2012	
78-3	44 94461	-97.13375 TESCH	ARTHUR		WATERTOWN	9/24/1992 CA	S		BIG SIOUX RIVER	IRR	0.000	0.780	0.00	55.00		
80-3	45.03925	-97.16824 HURKEE	EDMUND & RICHARD		WATERTOWN	10/18/1992 CA	S		BIG SIOUX RIVER	IRR	1.000	0.000	70.00	0.00		
890-3	44 95008	-97.17205 GAME FISH & PARKS	DEPT OF	523 E CAPITOL	WATERTOWN	1889/01 LC	S		BIG SIOUX RIVER	REC	0.000	0.000	0.00	0.00		
FC29-3	44 94516	-97.17234 WATERTOWN	CITY OF	PO BOX 910	WATERTOWN	3/22/2000 PE	S		BIG SIOUX RIVER	FCP	0.000	0.000	0.00	0.00		12/27/1962

Appendix 2 – Well Logs for Test Borings and Test Wells

SD EForm - 1621 V1

SOUTH DAKOTA WATER WELL COMPLETION REPORT

11-02

Location NE 1/4 NW 1/4 Sec 31 Twp 118 Rg 52County
Codingtonb" well
Tw1 NorthPlease mark well
location with an "X"

Well Completion Date

1/31/2008

Distance to nearest potential pollution source (Septic tank, abandoned well, feed lot, etc.)

100.0 ft from State Well (identify source)

PROPOSED USE:

☐ Domestic/Stock Irrigation
 ☒ Municipal Industrial
 ☐ Business Institutional
 ☐ Test Holes Monitoring well

METHOD OF DRILLING:

Direct Rotary

CASING DATA:

☐ Steel
 ☒ Plastic
 ☐ Other

If other describe

PIPEWEIGHT	DIAMETER	FROM	TO	HOLE DIAMETER
40.0 LB/FT	6.00 IN	35.0 FT	55.0 FT	9.12 IN

LB/FT	IN	FT	FT	IN
LB/FT	IN	FT	FT	IN

GROUTING DATA:

Grout Type	No. of Sacks	Grout Weight	From	To
BenSeal	11	54.0 Lb/gal	0.0 Ft	30.0 Ft

Describe grouting procedure
pressure pull method

SCREEN:

☐ Perforated pipe
 ☒ Manufactured
 Diameter 6.00 Inches Length 20.0 FeetMaterial PlasticSlot Size .080 Set From 35.0 Feet to 55.0 Feet

Other information

WAS A PACKER OR SEAL USED?

☐ Yes
 ☒ No

If so, what material?

Describe packer(s) and location

DISINFECTION: Was well disinfected upon completion?

☐ Yes, How?

☐ No, Why Not?
 Lab sample sent to for
water quality analysisWell Owner: Watertown Municipal Utilities

Business Name:

Address: 901 4th Ave SWCity, State, Zip: Watertown, SD 57201

WELL LOG:

FORMATION	DEPTH	
	FROM	TO
Top Soil	0	6
yellow gravel	6	14
grey sand- fine to med w/ 4 links	14	27
blue clay	27	31
sand- fine	31	36
blue clay	36	38
yellow gravel- fine to med w/ 8 links	38	42
yellow gravel- med to coarse w/ 10 li	42	55
blue clay	55	70

STATIC WATER LEVEL 4.0 FEET

If flowing: closed in pressure _____ PSI

GPM flow _____ through _____ inch pipe

Controlled by ☐ Valve ☐ Reducers ☐ Other

Reduced flow rate _____ GPM

Can well be completely shut in?

WELL TEST DATA:

☒ Pumped Describe☐ Bailed☐ Other

Pumping Level Below Land Surface

21.0 Ft After 168.0 Hrs. pumped 300.0 GPM

_____ Ft After _____ Hrs. pumped _____ GPM

If pump installed, pump rate, _____ GPM

REMARKS

This well was drilled under license # 689

And this report is true and accurate

Drilling firm: Kaiser Well Drilling Inc

Signature of License Representative.

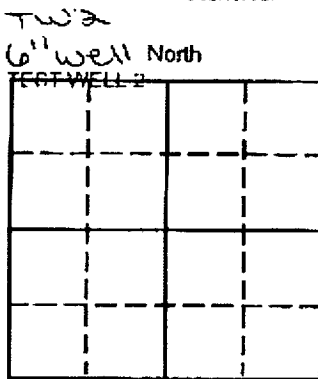
Signature of Well Owner or Equitable Property Holder

Date: _____

SD EForm - 1621 V1

SOUTH DAKOTA WATER WELL COMPLETION REPORT

11-02

Location NE 1/4 NW 1/4 Sec 31 Twp 118 Rg 52County
CodingtonPlease mark well
location with an "X"

Well Completion Date

1/31/2008

1 Mile

Distance to nearest potential pollution source (Septic tank, abandoned well, feed lot, etc.)

100.0 ft. from state well (Identify source)

PROPOSED USE:

☐ Domestic/Stock
☐ Irrigation
 ☒ Municipal
☐ Industrial
 ☐ Business
☐ Institutional
 ☒ Test Holes
☐ Monitoring well

METHOD OF DRILLING:

Direct Rotary

CASING DATA:

☐ Steel
 ☒ Plastic
 ☐ Other

If other describe

 PIPEWEIGHT 40.0 LB/FT DIAMETER 6.00 IN FROM 34.0 FT TO 54.0 FT HOLE DIAMETER 9.12 IN

 LB/FT IN FT FT IN
 LB/FT IN FT FT IN

GROUTING DATA:

 Grout Type BenSeal No. of Sacks 11 Grout Weight 54.0 Lb/gal From 0.0 Ft To 29.0 Ft
 Lb/gal Ft Ft
 Describe grouting procedure
pressure pull method

SCREEN:

☐ Perforated pipe
 ☒ Manufactured
 Diameter 6.00 Inches Length 20.0 Feet
 Material plasticSlot Size .080 Set From 34.0 Feet to 54.0 Feet

Other information

WAS A PACKER OR SEAL USED?

☐ Yes
 ☒ No

If so, what material?

Describe packer(s) and location

DISINFECTION: Was well disinfected upon completion?

☐ Yes, How?
 ☐ No, Why Not?
 Lab sample sent to for
water quality analysisWell Owner: Watertown Municipal Utilities

Business Name

Address: 901 4th Ave SWCity, State, Zip: Watertown, SD 57201

WELL LOG:

FORMATION	DEPTH	
	FROM	TO
Top Soil	0	4
gravel- med- coarse w/ 2links	4	8
blue clay	8	11
yellow sand- fine- med w/ 4links	11	28.5
blue clay	28.5	30
yellow fine sand w/ 4links	30	38
yellow soft clay	38	45
yellow gravel- med to coarse w/ 6lin	45	54
blue clay	54	55

STATIC WATER LEVEL 4.0 FEET

If flowing: closed in pressure _____ PSI

GPM flow _____ through _____ Inch pipe

Controlled by ☐ Valve ☐ Reducers ☐ Other

Reduced flow rate _____ GPM

Can well be completely shut in?

WELL TEST DATA:

☒ Pumped Describe:☐ Bailed☐ Other

Pumping Level Below Land Surface

21.0 Ft. After 72.0 Hrs. pumped 300.0 GPM

_____ Ft. After _____ Hrs. pumped _____ GPM

If pump installed, pump rate: _____ GPM

REMARKS

This well was drilled under license # 689

And this report is true and accurate.

Drilling firm: Kaiser Well Drilling, Inc.

Signature of License Representative

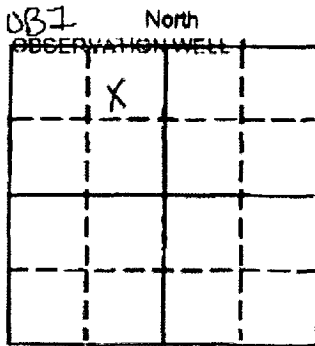
Signature of Well Owner or Equitable Property Holder

Date:

SD EForm - 1621 V1

SOUTH DAKOTA WATER WELL COMPLETION REPORT

11-02

Location NE 1/4 NW 1/4 Sec 31 Twp 118 Rg 52County
CodingtonPlease mark well
location with an "X"

1 Mile

Well Completion Date

1/31/2008

Distance to nearest potential pollution source (septic tank, abandoned well, feed lot, etc.)

? 100.0 ft from State Well (Identify source)

PROPOSED USE:

☐ Domestic/Stock
☐ Irrigation
 ☒ Municipal
☐ Industrial
 ☐ Business
☐ Institutional
 ☐ Test Holes
☒ Monitoring well

METHOD OF DRILLING:

Direct Rotary

CASING DATA:

☐ Steel
 ☒ Plastic
 ☐ Other

If other describe

PIPEWEIGHT	DIAMETER	FROM	TO	HOLE DIAMETER
40.0 LB/FT	3.00 IN	35.0 FT	55.0 FT	6.00 IN
LB/FT	IN	FT	FT	IN
LB/FT	IN	FT	FT	IN

GROUTING DATA:

Grout Type	No. of Sacks	Grout Weight	From	To
BenSeal	6	54.0 Lb/gal	0.0 Ft	30.0 Ft
		Lb/gal	Ft	Ft

Describe grouting procedure
pressure pull method

SCREEN: ☐ Perforated pipe ☒ Manufactured

Diameter 3.00 Inches Length 20.0 Feet

Material Plastic

Slot Size .035 Set From 35.0 Feet to 55.0 Feet

Other information

WAS A PACKER OR SEAL USED? ☐ Yes ☒ No

If so, what material?

Describe packer(s) and location

DISINFECTION: Was well disinfected upon completion?

☐ Yes, How?☐ No, Why Not?Lab sample sent to for
water quality analysisWell Owner: Watertown Municipal Utilities

Business Name:

Address: 901 4th Ave SWCity, State, Zip: Watertown, SD 57201

WELL LOG:

FORMATION	DEPTH	
	FROM	TO
Top Soil	0	6
yellow gravel	6	14
gray sand- fine to med w/ 4 links	14	27
blue clay	27	31
sand- fine	31	36
blue clay	36	38
yellow gravel- fine to med w/ 8 links	38	42
yellow gravel-med to coarse w/ 10 li	42	55
blue clay	55	70

STATIC WATER LEVEL 4.0 FEET

If flowing, closed in pressure _____ PSI

GPM flow _____ through _____ inch pipe

Controlled by ☐ Valve ☐ Reducers ☐ Other

Reduced flow rate _____ GPM

Can well be completely shut in?

WELL TEST DATA:

☒ Pumped Describe: air lift
☐ Bailed
☐ Other

Pumping Level Below (and Surface)

_____ Ft. After _____ Hrs. pumped 100 GPM

_____ Ft. After _____ Hrs. pumped _____ GPM

If pump installed, pump rate: _____ GPM

REMARKS

This well was drilled under license # 689

And this report is true and accurate.

Drilling firm: Kaiser Well Drilling Inc

Signature of License Representative:

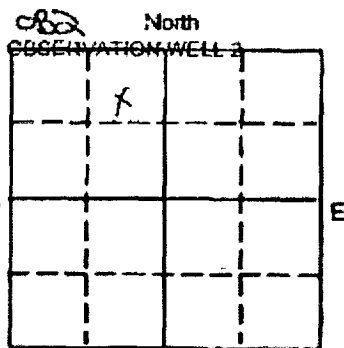
Signature of Well Owner or Equitable Property Holder:

Date

SD EForm - 1621 V1

SOUTH DAKOTA WATER WELL COMPLETION REPORT

11-02

Location NE 1/4 NW 1/4 Sec 31 Twp 118 Rg 52County
CodingtonPlease mark well
location with an "X"

1 Mile

Well Completion Date

1/31/2008

Distance to nearest potential pollution source (Septic tank, abandoned well, feed lot, etc.)

? 100.0 ft. from state well (identify source)

PROPOSED USE:

☐ Domestic/Stock Irrigation
 ☒ Municipal Industrial
 ☐ Business Institutional
 ☒ Test Hole Monitoring well

METHOD OF DRILLING:

Direct Rotary

CASING DATA:

☐ Steel
 ☒ Plastic
 ☐ Other

If other describe

PIPEWEIGHT	DIAMETER	FROM	TO	HOLE DIAMETER
LB/FT	IN	FT	FT	IN
40.0	3.00	34.0	54.0	6.00

GROUTING DATA:

Grout Type	No. of Sacks	Grout Weight	From	To
		Lb/gal	FT	FT
BenSeal	6	54.0	0.0	29.0

Describe grouting procedure
pressure pull method

SCREEN:

☐ Perforated pipe
 ☒ Manufactured
 Diameter 3.00 Inches Length: 20.0 FeetMaterial plasticSlot Size .035 Set From 35.0 Feet to 55.0 Feet

Other information

WAS A PACKER OR SEAL USED?

☐ Yes
 ☒ No

If so, what material?

Describe packer(s) and location

DISINFECTION: Was well disinfected upon completion?

☐ Yes, How?
 ☐ No, Why Not?
 Lab sample sent to for
water quality analysisWell Owner: Watertown Municipal Utilities

Business Name:

Address: 901 4th Ave SWCity, State, Zip: Watertown, SD 57201

WELL LOG:

FORMATION	DEPTH	
	FROM	TO
Top Soil	0	6
yellow sand fine	6	10
blue clay	10	12
gravel- med to coarse w/ 6 links	12	27
blue clay	27	33
yellow clay	33	43
gravel 10% fine 20% med 70% coarse		
w/ 16 link	43	54
yellow clay	54	57

STATIC WATER LEVEL 4.0 FEET

If flowing: closed in pressure _____ PSI

GPM flow _____ through _____ Inch pipe

Controlled by ☐ Valve ☐ Reducers ☐ Other

Reduced flow rate _____ GPM

Can well be completely shut in?

WELL TEST DATA:

☒ Pumped Describe: airlift☐ Bailed☐ Other

Pumping Level Below Land Surface

_____ Ft. After _____ Hrs. pumped 100.0 GPM

_____ Ft. After _____ Hrs. pumped _____ GPM

If pump installed, pump rate: _____ GPM

REMARKS

This well was drilled under license # 689

And this report is true and accurate.

Drilling firm: Kaiser Well Drilling, Inc.

Signature of License Representative:

Signature of Well Owner or Equitable Property Holder

Date

SD EForm - 1621 V1

SOUTH DAKOTA WATER WELL COMPLETION REPORT

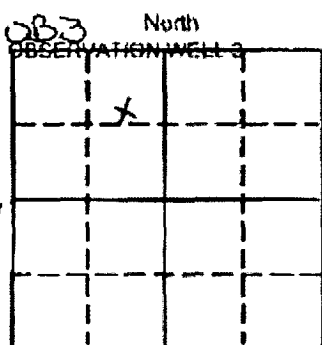
11-02

Location NE 1/4 NW 1/4 Sec 31 Twp 118 Rg 52

County

Codington

Please mark well location with an "X"



Well Completion Date

1/31/2008

Distance to nearest potential pollution source (Septic tank, abandoned well, feed lot, etc.)

100.0 ft. from state well (Identify source)

PROPOSED USE:

☐ Domestic/Stock Irrigation
 ☒ Municipal/Industrial
 ☐ Business/Institutional
 ☐ Test Holes
 ☒ Monitoring well

METHOD OF DRILLING:

Direct Rotary

CASING DATA:

☐ Steel
 ☒ Plastic
 ☐ Other

If other describe

PIPEWEIGHT	DIAMETER	FROM	TO	HOLE DIAMETER
40.0 LB/FT	3.00 IN	35.0 FT	55.0 FT	6.00 IN
LB/FT	IN	FT	FT	IN
LB/FT	IN	FT	FT	IN

GROUTING DATA:

Grout Type	No. of Sacks	Grout Weight	From	To
BenSeal	6	54.0 Lb/gal	0.0 Ft	30.0 Ft
		Lb/gal	Ft	Ft

Describe grouting procedure
pressure pull method

SCREEN:

☐ Perforated pipe
 ☒ Manufactured
Diameter 3.00 Inches Length 20.0 FeetMaterial plasticSlot Size .035 Set From 35.0 Feet to 55.0 Feet

Other information

WAS A PACKER OR SEAL USED?

☐ Yes
 ☒ No

If so, what material?

Describe packer(s) and location

DISINFECTION: Was well disinfected upon completion?

☐ Yes, How?

☐ No, Why Not?

Lab sample sent to for water quality analysis

Well Owner: Watertown Municipal Utilities

Business Name:

Address: 901 4th Ave SWCity, State, Zip: Watertown, SD 57201

WELL LOG:

FORMATION	DEPTH	
	FROM	TO
Top Soil	0	2.5
gravel- med- coarse w/ 2links	2.5	8
blue clay	8	11
yellow sand- fine- med w/ 9links	11	28.5
blue clay	28.5	30
yellow - fine to med w/ 6links	30	36
yellow soft clay	36	38
yellow fine sand	38	40
yellow soft clay	40	45

STATIC WATER LEVEL 4.0 FEET

If flowing: closed in pressure _____ PSI

GPM flow _____ through _____ Inch pipe

Controlled by ☐ Valve ☐ Reducers ☐ Other

Reduced flow rate _____ GPM

Can well be completely shut in?

WELL TEST DATA:

☒ Pumped Describe: airlift☐ Bailed☐ Other

Pumping Level Below Land Surface

_____ Ft. After _____ Hrs. pumped 100.0 GPM

_____ Ft. After _____ Hrs. pumped _____ GPM

If pump installed, pump rate: _____ GPM

REMARKS

yellow- fine - med w/ 4 links	45-49
blue clay firm	49-50
gravel- med- coarse	50-55
blue clay	55-60

This well was drilled under license # 689

And this report is true and accurate.

Drilling firm: Kaiser Well Drilling, Inc.

Signature of License Representative:

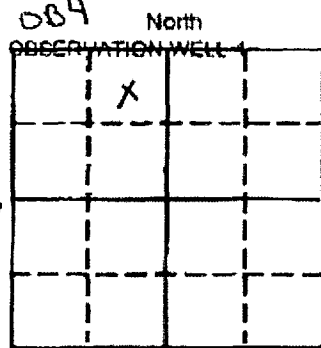
Signature of Well Owner or Equitable Property Holder:

Date

SD EForm - 1621 V1

SOUTH DAKOTA WATER WELL COMPLETION REPORT

11-02

Location NE 1/4 NW 1/4 Sec 31 Twp 118 Rg 52County
CodingtonPlease mark well
location with an "X"

1 Mile

Well Completion Date

1/31/2008

Distance to nearest potential pollution source (Septic tank, abandoned well, feed lot, etc.)

100.0 ft from state well (identify source)

PROPOSED USE:

☐ Domestic/Stock
☐ Irrigation
 ☒ Municipal
☐ Industrial
 ☐ Business
☐ Institutional
 ☒ Test Holes
☒ Monitoring well

METHOD OF DRILLING:

Direct Rotary

CASING DATA:

☐ Steel
 ☒ Plastic
 ☐ Other

If other describe _____

PIPEWEIGHT	DIAMETER	FROM	TO	HOLE DIAMETER
LB/FT	IN	FT	FT	IN
40.0	3.00	34.0	54.0	6.00

GROUTING DATA:

Grout Type	No of Sacks	Grout Weight	From	To
		Lb/gal	0.0 Ft	29.0 Ft
BenSeal	6	54.0		

Describe grouting procedure
pressure pull method

SCREEN:

☐ Perforated pipe
 ☒ Manufactured
 Diameter 3.00 Inches Length 20.0 FeetMaterial plasticSlot Size .035 Set From 34.0 Feet to 54.0 Feet

Other information _____

WAS A PACKER OR SEAL USED?

☐ Yes
 ☒ No

If so, what material? _____

Describe packer(s) and location _____

DISINFECTION: Was well disinfected upon completion?

☐ Yes, How? _____

☐ No, Why Not? _____
 Lab sample sent to for
water quality analysisWell Owner: Watertown Municipal Utilities

Business Name: _____

Address: 901 4th Ave SWCity, State, Zip: Watertown, SD 57201

WELL LOG:

FORMATION	DEPTH	
	FROM	TO
Top Soil	0	4
gravel- med- coarse w/ 2links	4	8
blue clay	8	11
yellow sand- fine med w/ 4links	11	28.5
blue clay	28.5	30
yellow fine sand w/ 4links	30	38
yellow soft clay	38	45
yellow gravel- med to coarse w/ 6lin	45	54
blue clay	54	55

STATIC WATER LEVEL 4.0 FEET

If flowing: closed in pressure _____ PSI

GPM flow _____ through _____ inch pipe

Controlled by ☐ Valve ☐ Reducers ☐ Other _____

Reduced flow rate _____ GPM

Can well be completely shut in?

WELL TEST DATA:

☒ Pumped Describe: airlift☐ Bailed☐ Other

Pumping Level Below Land Surface

_____ Ft. After _____ Hrs. pumped 100.0 GPM

_____ Ft. After _____ Hrs. pumped _____ GPM

If pump installed, pump rate: _____ GPM

REMARKS

This well was drilled under license # 689

And this report is true and accurate.

Drilling firm: Kaiser Well Drilling, Inc.

Signature of License Representative: _____

Signature of Well Owner or Equitable Property Holder: _____

Date: _____

SD EForm - 1621 V1

SOUTH DAKOTA WATER WELL COMPLETION REPORT

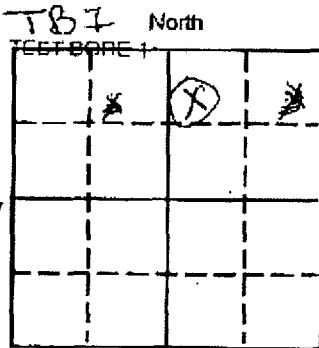
11-02

Location NW ¼ NE ¼ Sec 31 Twp 118 Rg 52

County

CODINGTON

Please mark well location with an "X"



1 Mile

Well Completion Date

1/31/2008

Distance to nearest potential pollution source (Septic tank, abandoned well, feed lot, etc.)

? 100.0 ft. from state well (Identify source)

PROPOSED USE:

☐ Domestic/Stock Irrigation
 ☒ Municipal Industrial
 ☐ Business Institutional
 ☒ Test Holes Monitoring well

METHOD OF DRILLING:

Direct Rotary

CASING DATA:

☐ Steel
 ☐ Plastic
 ☐ Other

If other describe

PIPEWEIGHT	DIAMETER	FROM	TO	HOLE DIAMETER
LB/FT	IN	FT	FT	IN
LB/FT	IN	FT	FT	IN
LB/FT	IN	FT	FT	IN

GROUTING DATA:

Grout Type	No. of Sacks	Grout Weight	From	To
BenScal	12	54.0 Lb/gal	0.0 Ft	74.0 Ft
		Lb/gal	Ft	Ft

Describe grouting procedure

SCREEN:

☐ Perforated pipe
 ☐ Manufactured

Diameter _____ Inches Length _____ Feet

Material

Slot Size _____ Set From _____ Feet to _____ Feet

Other information

WAS A PACKER OR SEAL USED?

☐ Yes
 ☐ No

If so, what material?

Describe packer(s) and location

DISINFECTION: Was well disinfected upon completion?

☐ Yes, How?

☐ No, Why Not?

Lab sample sent to for water quality analysis

Well Owner: Watertown Municipal Utilities

Business Name:

Address 901 4th Ave SWCity, State, Zip: Watertown, SD 57201

WELL LOG:

FORMATION	DEPTH	
	FROM	TO
Top Soil	0	6
yellow sand fine	6	8
grey gravel- med- coarse w/ 10links	8	24
yellow clay	24	26
fine sand w/ 8links	26	33
blue soft clay	33	43
yellow gravel- med-coarse w/ 18link	43	55
blue clay firm	55	74

STATIC WATER LEVEL

FEET

If flowing: closed in pressure

PSI

GPM flow

through

Inch pipe

Controlled by ☐ Valve ☐ Reducers ☐ Other

Reduced flow rate

GPM

Can well be completely shut in?

WELL TEST DATA:

☐ Pumped Describe:☐ Bailed☐ Other

Pumping Level Below Land Surface

_____ Ft. After _____ Hrs. pumped _____ GPM

_____ Ft. After _____ Hrs. pumped _____ GPM

If pump installed, pump rate: _____ GPM

REMARKS

This well was drilled under license # 689

And this report is true and accurate.

Drilling firm: Kaiser Well Drilling Inc

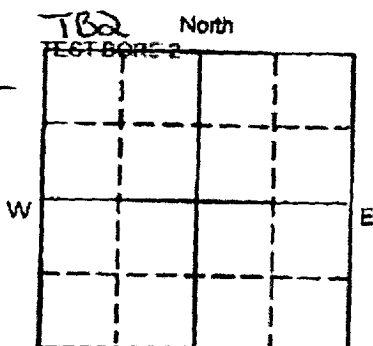
Signature of License Representative.

Signature of Well Owner or Equitable Property Holder.

Date:

SOUTH DAKOTA WATER WELL COMPLETION REPORT

11-02

Location NE 1/4 NW 1/4 Sec 31 Twp 118 Rg 52County
CODINGTONPlease mark well
location with an "X"

1 Mile

Well Completion Date

1/31/2008

Distance to nearest potential pollution source (Septic tank, abandoned well, feed lot, etc.)

100.0 ft. from state well (Identify source)

PROPOSED USE:

☐ Domestic/Stock Irrigation
☒ Municipal Industrial
☐ Business Institutional
☒ Test Holes Monitoring well

METHOD OF DRILLING:

Direct Rotary

CASING DATA:

☐ Steel ☐ Plastic ☐ Other

If other describe

PIPEWEIGHT	DIAMETER	FROM	TO	HOLE DIAMETER
LB/FT	IN	FT	FT	IN
LB/FT	IN	FT	FT	IN
LB/FT	IN	FT	FT	IN

GROUTING DATA:

Grout Type	No. of Sacks	Grout Weight	From	To
BonSeal	12	54.0 Lb/gal	0.0 ft	60.0 ft
		Lb/gal	ft	ft

Describe grouting procedure

SCREEN:

☐ Perforated pipe ☐ Manufactured

Diameter _____ inches Length _____ Feet

Material _____

Slot Size _____ Set From _____ Feet to _____ Feet

Other information

WAS A PACKER OR SEAL USED?

☐ Yes ☐ No

If so, what material?

Describe packer(s) and location

DISINFECTION: Was well disinfected upon completion?

☐ Yes, How?

☐ No, Why Not?

Lab sample sent to for water quality analysis

Well Owner: Watertown Municipal Utilities

Business Name:

Address: 901 4th Ave SWCity, State, Zip: Watertown, SD 57201

WELL LOG:

FORMATION	DEPTH	
	FROM	TO
Top Soil	0	6
yellow sandy clay	6	10
gravel- med- coarse w/ 12 links	10	24
blue clay soft	24	28
grey fine sand	28	31
blue clay	31	33
gravel- fine- med w/ 2 link	33	37
blue clay	37	42
rocks med - coarse w/ 10 links	42	51

STATIC WATER LEVEL

FEET

If flowing: closed in pressure

PSI

GPM flow

through

inch pipe

Controlled by ☐ Valve ☐ Reducers ☐ Other

Reduced flow rate

GPM

Can well be completely shut in?

WELL TEST DATA:

☐ Pumped Describe
☐ Bailed
☐ Other

Pumping Level Below Land Surface

_____ Ft After _____ Hrs. pumped _____ GPM

_____ FL After _____ Hrs. pumped _____ GPM

If pump installed, pump rate: _____ GPM

REMARKS

Blue Clay

51-60

This well was drilled under license # 689

And this report is true and accurate.

Drilling firm: Kaiser Well Drilling Inc

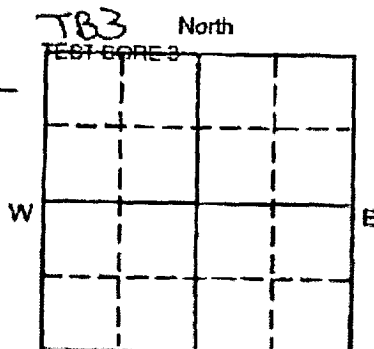
Signature of License Representative:

Signature of Well Owner or Equitable Property Holder

Date:

SOUTH DAKOTA WATER WELL COMPLETION REPORT

11-02

Location NE 1/4 NW 1/4 Sec 31 Twp 118 Rg 52County
CODINGTONPlease mark well
location with an "X"

Well Completion Date

1/31/2008

Distance to nearest potential pollution source (Septic tank, abandoned well, feed lot, etc.)

100.0 ft. from state well (Identify source)

PROPOSED USE:

☐ Domestic/Stock Irrigation
 ☒ Municipal Industrial
 ☐ Business Institutional
 ☒ Test Holes Monitoring well

METHOD OF DRILLING:

Direct Rotary

CASING DATA:

☐ Steel
 ☐ Plastic
 ☐ Other

If other describe

PIPEWEIGHT	DIAMETER	FROM	TO	HOLE DIAMETER
LB/FT	IN	FT	FT	IN
LB/FT	IN	FT	FT	IN
LB/FT	IN	FT	FT	IN

GROUTING DATA:

Grout Type	No. of Sacks	Grout Weight	From	To
BenSeal	12	54.0 Lb/gal	0.0 Ft	60.0 Ft
		Lb/gal	Ft	Ft

Describe grouting procedure

SCREEN:

☐ Perforated pipe
 ☐ Manufactured

Diameter _____ Inches Length _____ Feet

Material _____

Slot Size _____ Set From _____ Feet to _____ Feet

Other information

WAS A PACKER OR SEAL USED?

☐ Yes
 ☐ No

If so, what material?

Describe packer(s) and location

DISINFECTION: Was well disinfected upon completion?

☐ Yes, How?

☐ No, Why Not?

Lab sample sent to for water quality analysis

Well Owner: Watertown Municipal Utilities

Business Name:

Address: 901 4th Ave SWCity, State, Zip: Watertown, SD 57201

WELL LOG:

FORMATION	DEPTH	
	FROM	TO
Top Soil	0	3
soft black sandy soil	3	8
yellow sand- fine-med w/ 6links	8	15
grey fine-med w/ 4links	15	25
yellow clay	25	27
fine sand w/ 2links	27	31
yellow clay soft	31	39
grey fine-med w/ 2links	39	45
blue clay	45	47

STATIC WATER LEVEL _____ FEET

If flowing: closed in pressure _____ PSI

GPM flow _____ through _____ Inch pipe

Controlled by ☐ Valve ☐ Reducers ☐ Other _____

Reduced flow rate _____ GPM

Can well be completely shut in?

WELL TEST DATA:

☐ Pumped Describe:☐ Bailed☐ Other

Pumping Level Below Land Surface

_____ FL After _____ Hrs. pumped _____ GPM

_____ FL After _____ Hrs. pumped _____ GPM

If pump installed, pump rate: _____ GPM

REMARKS

grey- fine-med w/ 6links	47-55
blue clay	55-60

This well was drilled under license # 689

And this report is true and accurate.

Drilling firm: Kaiser Well Drilling Inc

Signature of License Representative:

Signature of Well Owner or Equitable Property Holder:

Date _____

Appendix 3 – Aquifer Test Analytical Results for TW-1



St. Croix Environmental, Inc.
Water Resource Division
1094 Golden Oaks Drive
Hudson, WI 54016

Wells

Project: WMU - Rauville Well Field

Number: 0001

Client: Watertown Municipal Utilities

Location: Rauville Well Field

Pumping Test: WMU LongTerm Aquifer Test on TW-1

Pumping Well: TW-1

Test Conducted by: Kevin Miller

Test Date: 6/12/2008

Aquifer Thickness: 50.00 ft

Discharge Rate: 290 [U.S. gal/min]

Analysis Name	Method name	Well	T [ft ² /d]	K [ft/d]	S
Cooper Jacob II	Cooper & Jacob II	multiple	5.19×10^3	1.04×10^2	1.21×10^{-3}
Cooper Jacob I	Cooper & Jacob I	OB-1	1.28×10^4	2.57×10^2	2.48×10^{-5}
Cooper Jacob I	Cooper & Jacob I	OB-2	2.34×10^4	4.67×10^2	1.76×10^{-6}
Cooper Jacob I	Cooper & Jacob I	OB-4	2.34×10^4	4.67×10^2	1.80×10^{-4}
Theis w/Jacob Correction	Theis with Jacob Correction	OB-1	9.52×10^3	1.90×10^2	1.36×10^{-4}
Theis w/Jacob Correction	Theis with Jacob Correction	OB-2	1.28×10^4	2.57×10^2	6.89×10^{-5}
Theis w/Jacob Correction	Theis with Jacob Correction	OB-4	2.34×10^4	4.67×10^2	2.70×10^{-4}
Boulton	Boulton	OB-1	1.28×10^4	2.57×10^2	1.75×10^{-5}
Boulton	Boulton	OB-2	1.73×10^4	3.46×10^2	1.65×10^{-5}
Boulton	Boulton	OB-4	1.28×10^4	2.57×10^2	1.64×10^{-2}
Average			1.53×10^4	3.07×10^2	1.83×10^{-3}



St. Croix Environmental, Inc.
Water Resource Division
1094 Golden Oaks Drive
Hudson, WI 54016

Pumping Test Analysis Report

Project: WMU - Rauville Well Field

Number: 0001

Client: Watertown Municipal Utilities

Location: Rauville Well Field

Pumping Test: WMU LongTerm Aquifer Test on TW-1

Pumping Well: TW-1

Test Conducted by: Kevin Miller

Test Date: 6/12/2008

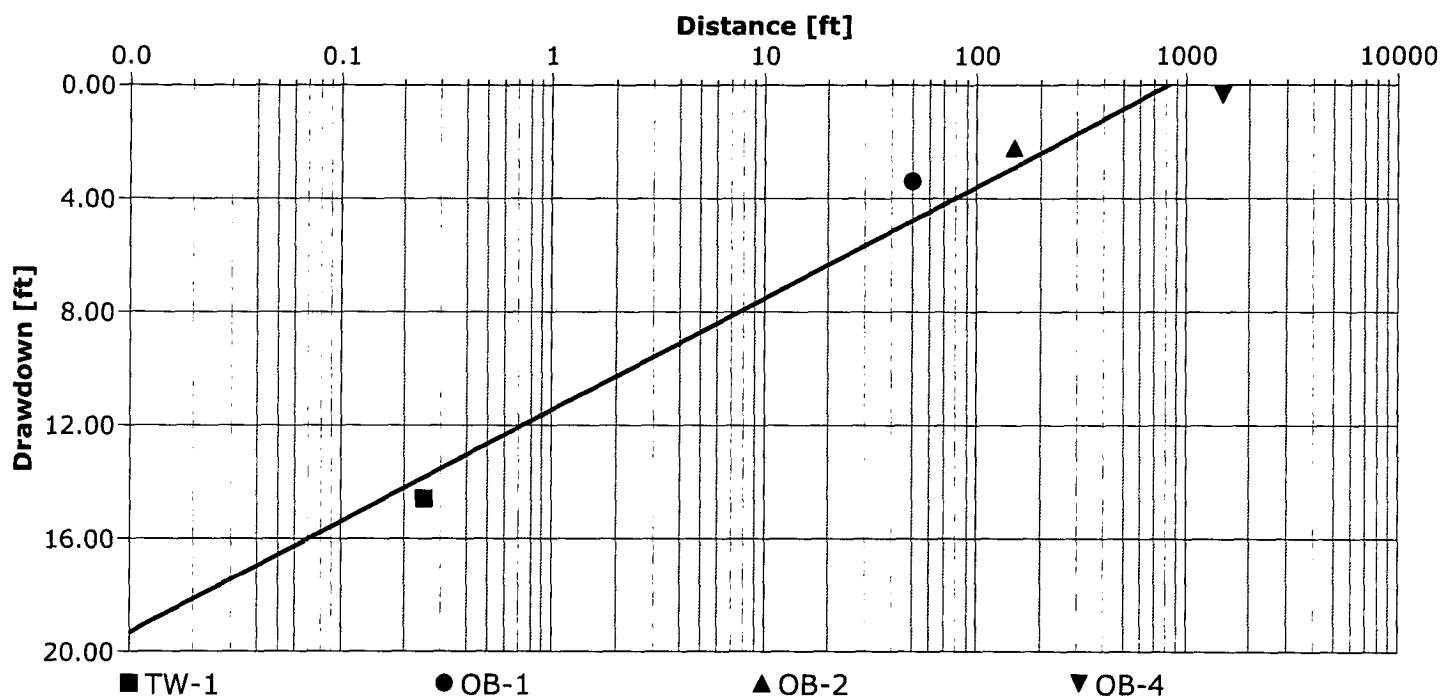
Analysis Performed by: Kevin Miller

Cooper Jacob II

Analysis Date: 3/15/2008

Aquifer Thickness: 50.00 ft

Discharge Rate: 290 [U.S. gal/min]



Calculation after Cooper & Jacob

	Transmissivity [ft ² /d]	Hydraulic Conductivity [ft/d]	Storage coefficient	
Point of time [min]: 100	5.19×10^{-3}	1.04×10^{-2}	1.21×10^{-3}	



St. Croix Environmental, Inc.
Water Resource Division
1094 Golden Oaks Drive
Hudson, WI 54016

Wells

Project: WMU - Rauville Well Field

Number: 0001

Client: Watertown Municipal Utilities

Location: Rauville Well Field

Pumping Test: WMU LongTerm Aquifer Test on TW-1

Pumping Well: TW-1

Test Conducted by: Kevin Miller

Test Date: 6/12/2008

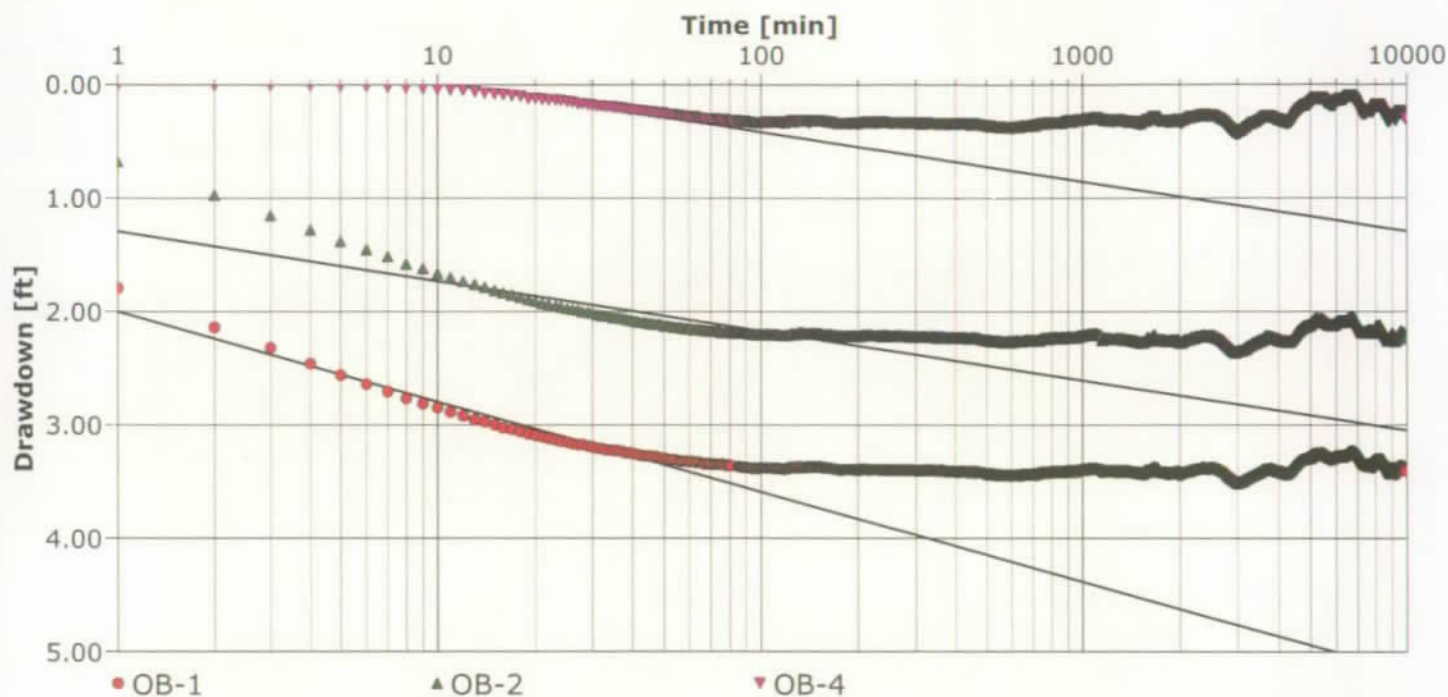
Analysis Performed by: Kevin Miller

Cooper Jacob I

Analysis Date: 2/24/2008

Aquifer Thickness: 50.00 ft

Discharge Rate: 290 [U.S. gal/min]



Calculation after Cooper & Jacob

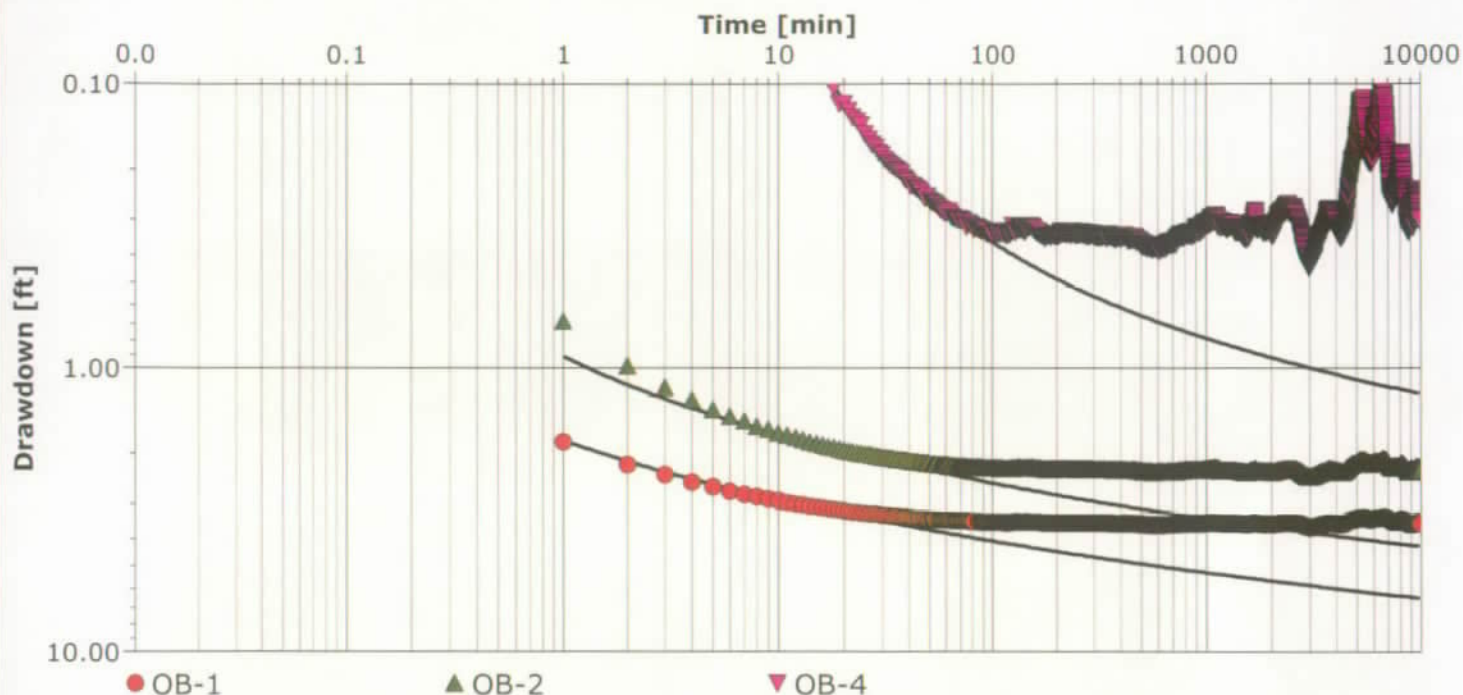
Observation Well	Transmissivity [ft ² /d]	Hydraulic Conductivity [ft/d]	Storage coefficient	Radial Distance to PW [ft]	
OB-1	1.28×10^{-4}	2.57×10^{-2}	2.48×10^{-5}	50.0	
OB-2	2.34×10^{-4}	4.67×10^{-2}	1.76×10^{-5}	150.0	
OB-4	2.34×10^{-4}	4.67×10^{-2}	1.80×10^{-4}	1500.0	
Average	1.99×10^{-4}	3.97×10^{-2}	6.88×10^{-5}		



St. Croix Environmental, Inc.
Water Resource Division
1094 Golden Oaks Drive
Hudson, WI 54016

Wells	I
Project:	WMU - Rauville Well Field
Number:	0001
Client:	Watertown Municipal Utilities

Location: Rauville Well Field	Pumping Test: WMU LongTerm Aquifer Test on TW-1	Pumping Well: TW-1
Test Conducted by: Kevin Miller		Test Date: 6/12/2008
Analysis Performed by: Kevin Miller	Theis w/Jacob Correction	Analysis Date: 2/24/2008
Aquifer Thickness: 50.00 ft	Discharge Rate: 290 [U.S. gal/min]	



Calculation after Theis with Jacob Correction

Observation Well	Transmissivity [ft ² /d]	Hydraulic Conductivity [ft/d]	Storage coefficient	Radial Distance to PW [ft]	
OB-1	9.52×10^3	1.90×10^2	1.36×10^{-4}	50.0	
OB-2	1.28×10^4	2.57×10^2	6.89×10^{-5}	150.0	
OB-4	2.34×10^4	4.67×10^2	2.70×10^{-4}	1500.0	
Average	1.52×10^4	3.05×10^2	1.59×10^{-4}		



St. Croix Environmental, Inc.
Water Resource Division
1094 Golden Oaks Drive
Hudson, WI 54016

Wells

Project: WMU - Rauville Well Field

Number: 0001

Client: Watertown Municipal Utilities

Location: Rauville Well Field

Pumping Test: WMU LongTerm Aquifer Test on TW-1

Pumping Well: TW-1

Test Conducted by: Kevin Miller

Test Date: 6/12/2008

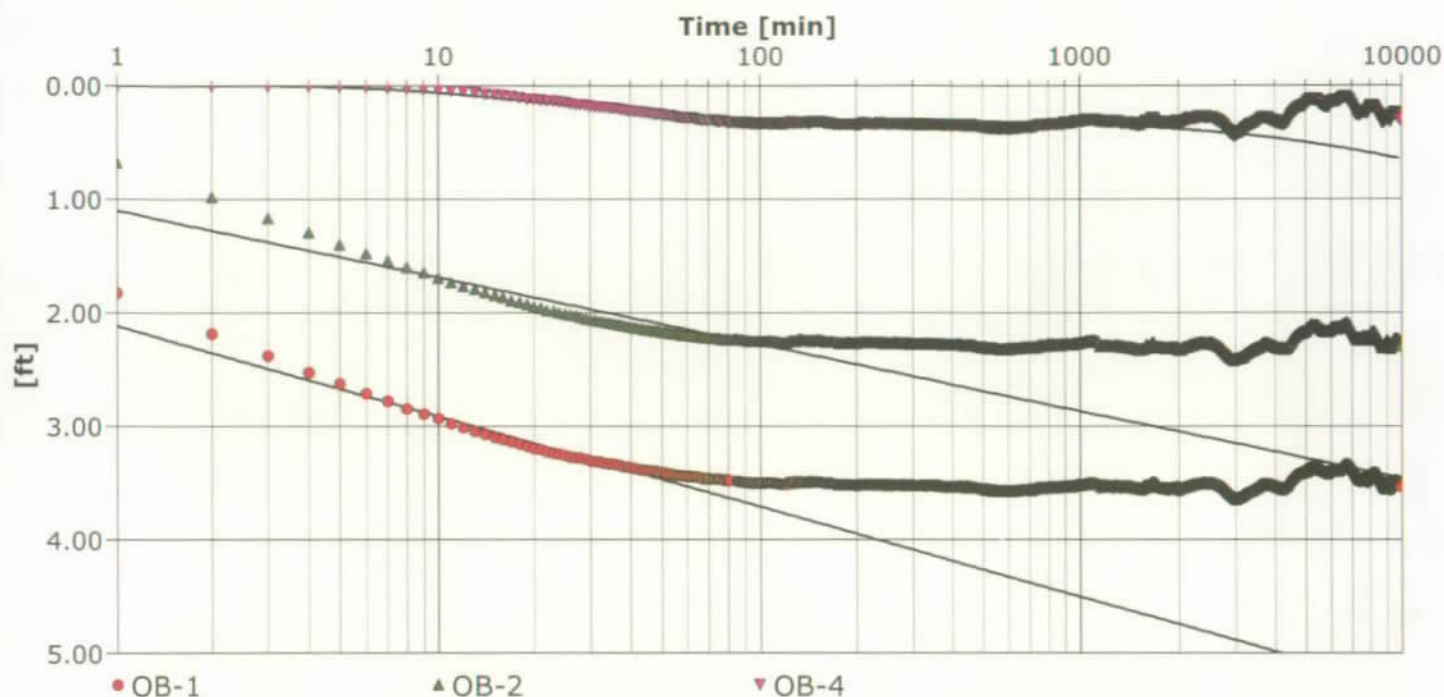
Analysis Performed by: Kevin Miller

Boulton

Analysis Date: 2/24/2008

Aquifer Thickness: 50.00 ft

Discharge Rate: 290 [U.S. gal/min]



Calculation after Boulton

Observation Well	Transmissivity [ft ² /d]	Hydraulic Conductivity [ft/d]	Specific Yield	Drainage factor	Ratio Sy/S	Radial Distance to PW [ft]
OB-1	1.28×10^{-4}	2.57×10^{-2}	1.75×10^{-5}	1.00×10^{-2}	1.00×10^{-2}	50.0
OB-2	1.73×10^{-4}	3.46×10^{-2}	1.65×10^{-5}	1.00×10^{-2}	1.00×10^{-2}	150.0
OB-4	1.28×10^{-4}	2.57×10^{-2}	1.64×10^{-2}	1.00×10^{-2}	1.00×10^{-2}	1500.0
Average	1.43×10^{-4}	2.87×10^{-2}	5.47×10^{-3}	1.00×10^{-2}	1.00×10^{-2}	



St. Croix Environmental, Inc.
Water Resource Division
1094 Golden Oaks Drive
Hudson, WI 54016

Wells

Project: WMU - Rauville Well Field

Number: 0001

Client: Watertown Municipal Utilities

Location: Rauville Well Field

Pumping Test: WMU LongTerm Aquifer Test on TW-1

Pumping Well: TW-1

Test Conducted by: Kevin Miller

Test Date: 6/12/2008

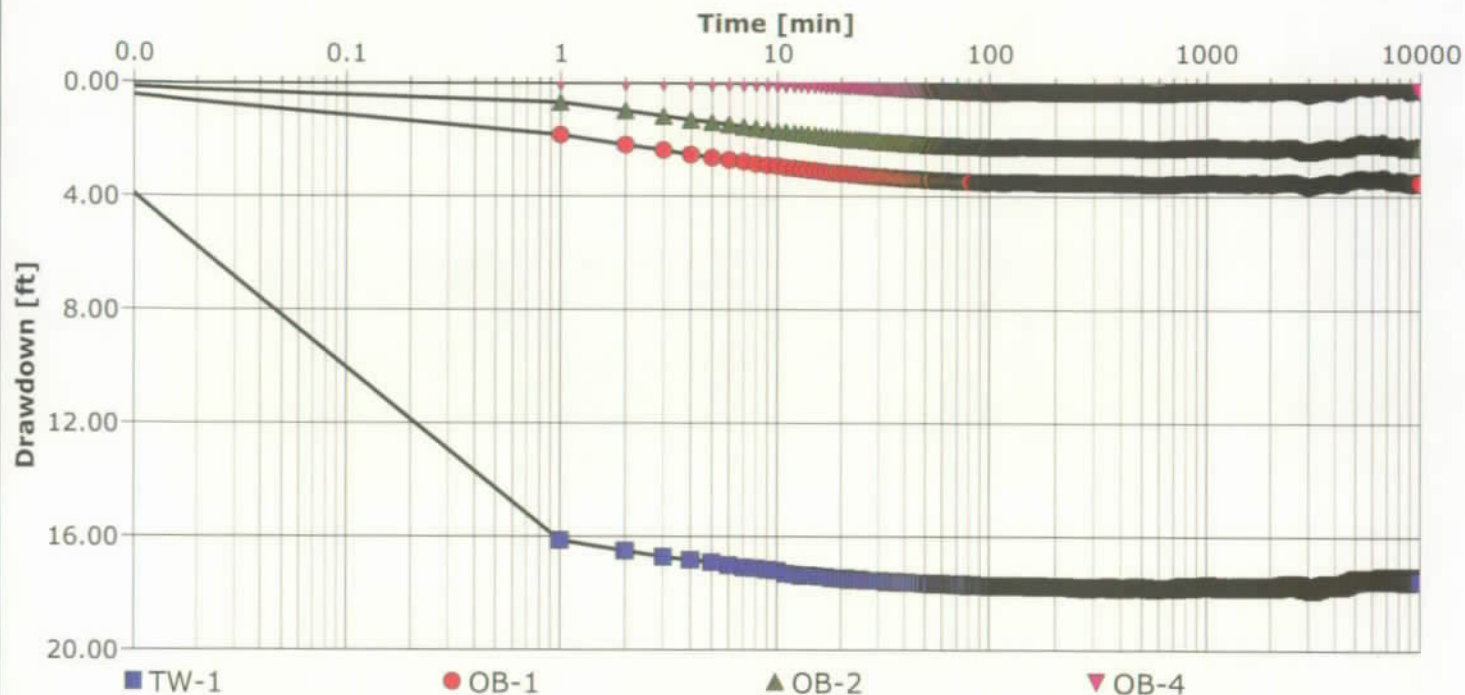
Analysis Performed by: Kevin Miller

Time-Drawdown Ob Wells

Analysis Date: 2/24/2008

Aquifer Thickness: 50.00 ft

Discharge Rate: 290 [U.S. gal/min]





St. Croix Environmental, Inc.
Water Resource Division
1094 Golden Oaks Drive
Hudson, WI 54016

Wells

Project: WMU - Rauville Well Field

Number: 0001

Client: Watertown Municipal Utilities

Location: Rauville Well Field

Pumping Test: WMU LongTerm Aquifer Test on TW-1

Pumping Well: TW-1

Test Conducted by: Kevin Miller

Test Date: 6/12/2008

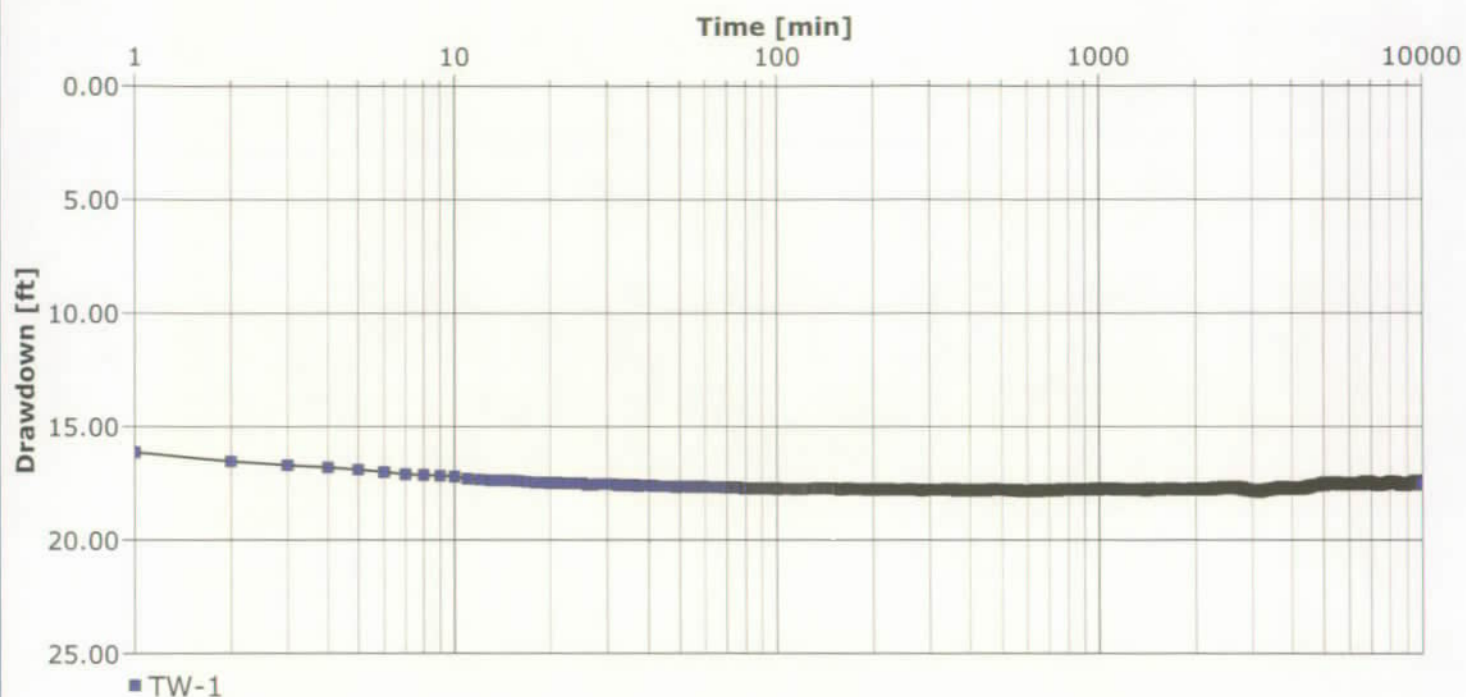
Analysis Performed by: Kevin Miller

Time-Drawdown Test Well

Analysis Date: 2/24/2008

Aquifer Thickness: 50.00 ft

Discharge Rate: 290 [U.S. gal/min]





St. Croix Environmental, Inc.
Water Resource Division
1094 Golden Oaks Drive
Hudson, WI 54016

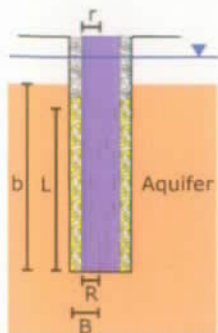
Wells

Project: WMU - Rauville Well Field

Number: 0001

Client: Watertown Municipal Utilities

Location: Rauville Well Field



Name	X [ft]	Y [ft]	Penetration	R [ft]	L [ft]	r [ft]	B [ft]	b [ft]
TW-1	0	0	Fully	0.25	20	0.25	0.38	50
OB-1	0	50	Fully	0.125	20	0.125	0.25	50
OB-2	0	150	Fully	0.125	20	0.125	0.25	50
OB-4	0	1500	Fully	0.125	20	0.125	0.25	50



St. Croix Environmental, Inc.
Water Resource Division
1094 Golden Oaks Drive
Hudson, WI 54016

Pumping Test Analysis Report

Project: WMU - Rauville Well Field

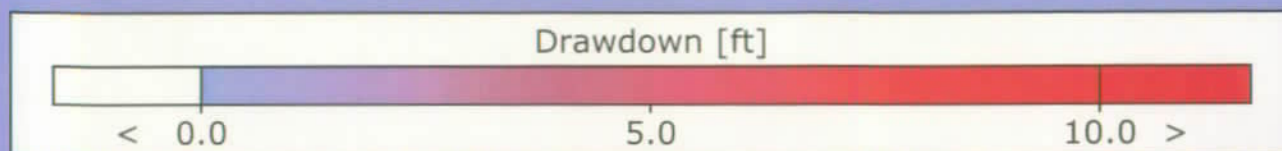
Number: 0001

Client: Watertown Municipal Utilities

Location: Rauville Well Field

Scale 1:2500

Map Origin [ft] X: -41.01 Y: -41.01



OB-4

1.0

1.0

1.0

1.0

1.0

2.0

2.0

2.0

3.0

3.0

4.0

5.0

6.0

8.0

OB-2

OB-1

TW-1

-41.01

164.04

369.09

574.15

779.2

984.25

1189.3

1394.36

-41.0
[ft]

Appendix 4 – Aquifer Test Analytical Results for TW-2



St. Croix Environmental, Inc.
Water Resource Division
1094 Golden Oaks Drive
Hudson, WI 54016

Wells

Project: WMU - Rauville Well Field

Number: 0001

Client: Watertown Municipal Utilities

Location: Rauville Well Field

Pumping Test: WMU LongTerm Aquifer Test on TW-2

Pumping Well: TW-2

Test Conducted by: Kevin Miller

Test Date: 2/22/2008

Aquifer Thickness: 50.00 ft

Discharge Rate: 333 [U.S. gal/min]

Analysis Name	Method name	Well	T [ft ² /d]	K [ft/d]	S
Cooper Jacob II	Cooper & Jacob II	multiple	4.38×10^3	8.75×10^1	1.49×10^{-3}
Cooper Jacob I	Cooper & Jacob I	OB-3	1.28×10^4	2.57×10^2	9.29×10^{-5}
Cooper Jacob I	Cooper & Jacob I	OB-4	1.28×10^4	2.57×10^2	9.29×10^{-5}
Cooper Jacob I	Cooper & Jacob I	OB-2	3.15×10^4	6.30×10^2	3.48×10^{-4}
Theis w/Jacob Correction	Theis with Jacob Correction	OB-3	1.73×10^4	3.46×10^2	1.75×10^{-5}
Theis w/Jacob Correction	Theis with Jacob Correction	OB-4	1.73×10^4	3.46×10^2	1.75×10^{-5}
Theis w/Jacob Correction	Theis with Jacob Correction	OB-2	3.15×10^4	6.30×10^2	2.70×10^{-4}
Boulton	Boulton	OB-3	1.73×10^4	3.46×10^2	8.85×10^{-6}
Boulton	Boulton	OB-4	1.73×10^4	3.46×10^2	1.75×10^{-5}
Boulton	Boulton	OB-2	9.52×10^3	1.90×10^2	3.24×10^{-2}
Average			1.72×10^4	3.44×10^2	3.48×10^{-3}



St. Croix Environmental, Inc.
Water Resource Division
1094 Golden Oaks Drive
Hudson, WI 54016

Pumping Test Analysis Report

Project: WMU - Rauville Well Field

Number: 0001

Client: Watertown Municipal Utilities

Location: Rauville Well Field

Pumping Test: WMU LongTerm Aquifer Test

Pumping Well: TW-2

Test Conducted by: Kevin Miller

Test Date: 2/22/2008

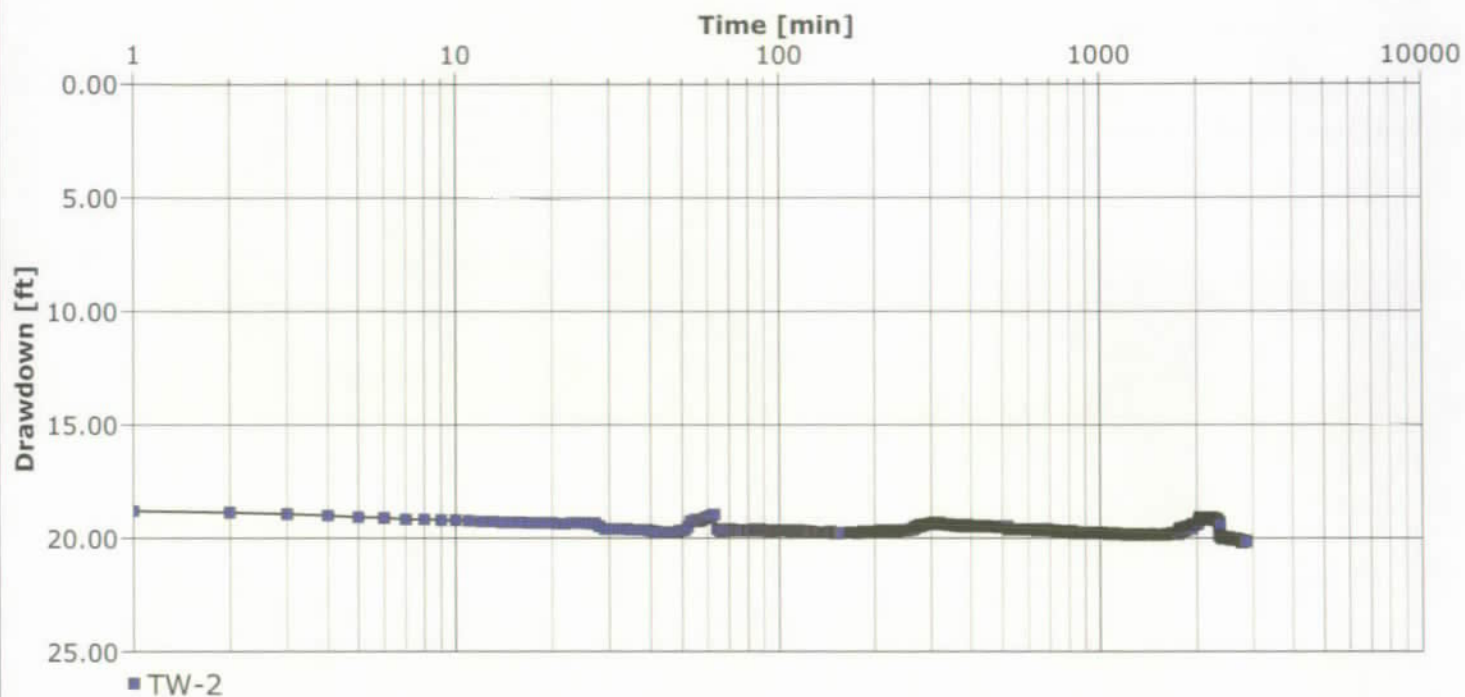
Analysis Performed by: Kevin Miller

Time-Drawdown Test Well

Analysis Date: 2/24/2008

Aquifer Thickness: 20.00 ft

Discharge Rate: 333 [U.S. gal/min]





St. Croix Environmental, Inc.
Water Resource Division
1094 Golden Oaks Drive
Hudson, WI 54016

Wells

Project: WMU - Rauville Well Field

Number: 0001

Client: Watertown Municipal Utilities

Location: Rauville Well Field

Pumping Test: WMU LongTerm Aquifer Test on TW-2

Pumping Well: TW-2

Test Conducted by: Kevin Miller

Test Date: 2/22/2008

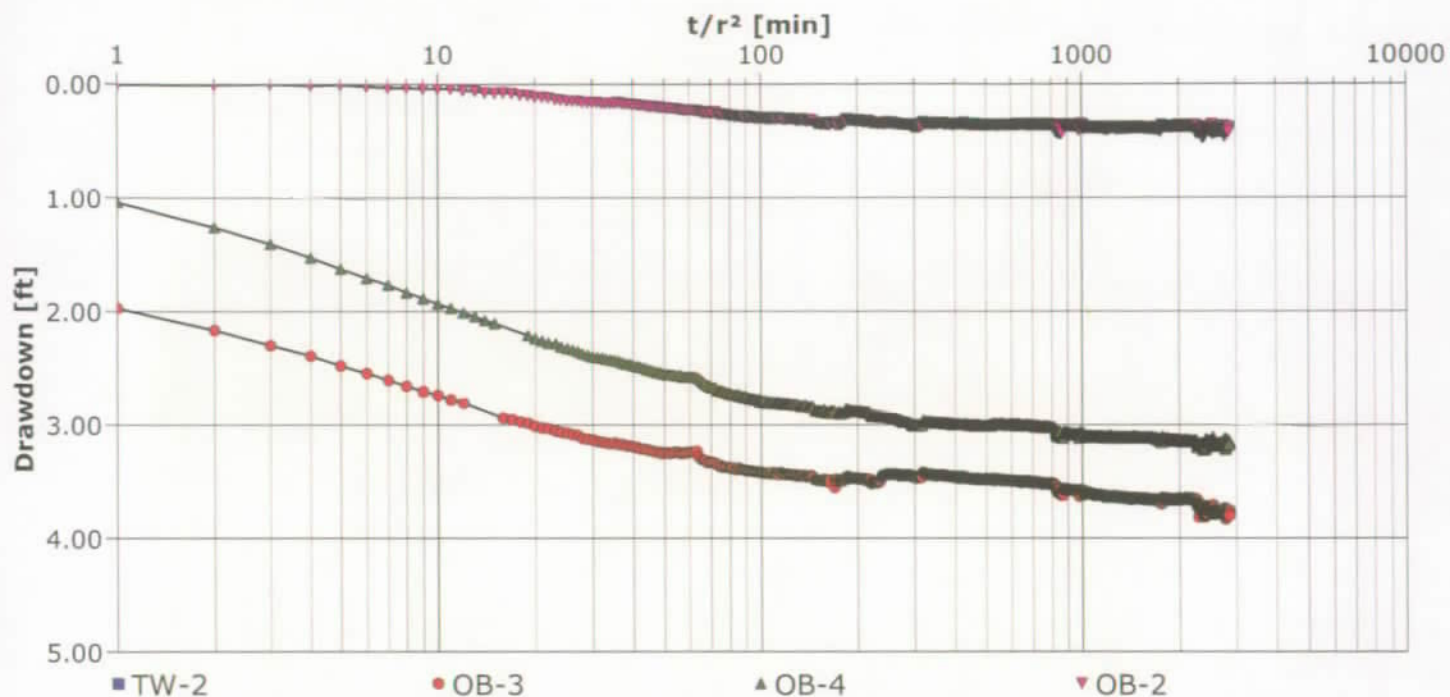
Analysis Performed by: Kevin Miller

Time-Drawdown Ob Wells

Analysis Date: 2/24/2008

Aquifer Thickness: 50.00 ft

Discharge Rate: 333 [U.S. gal/min]





St. Croix Environmental, Inc.
Water Resource Division
1094 Golden Oaks Drive
Hudson, WI 54016

Wells

Project: WMU - Rauville Well Field

Number: 0001

Client: Watertown Municipal Utilities

Location: Rauville Well Field

Pumping Test: WMU LongTerm Aquifer Test on TW-2

Pumping Well: TW-2

Test Conducted by: Kevin Miller

Test Date: 2/22/2008

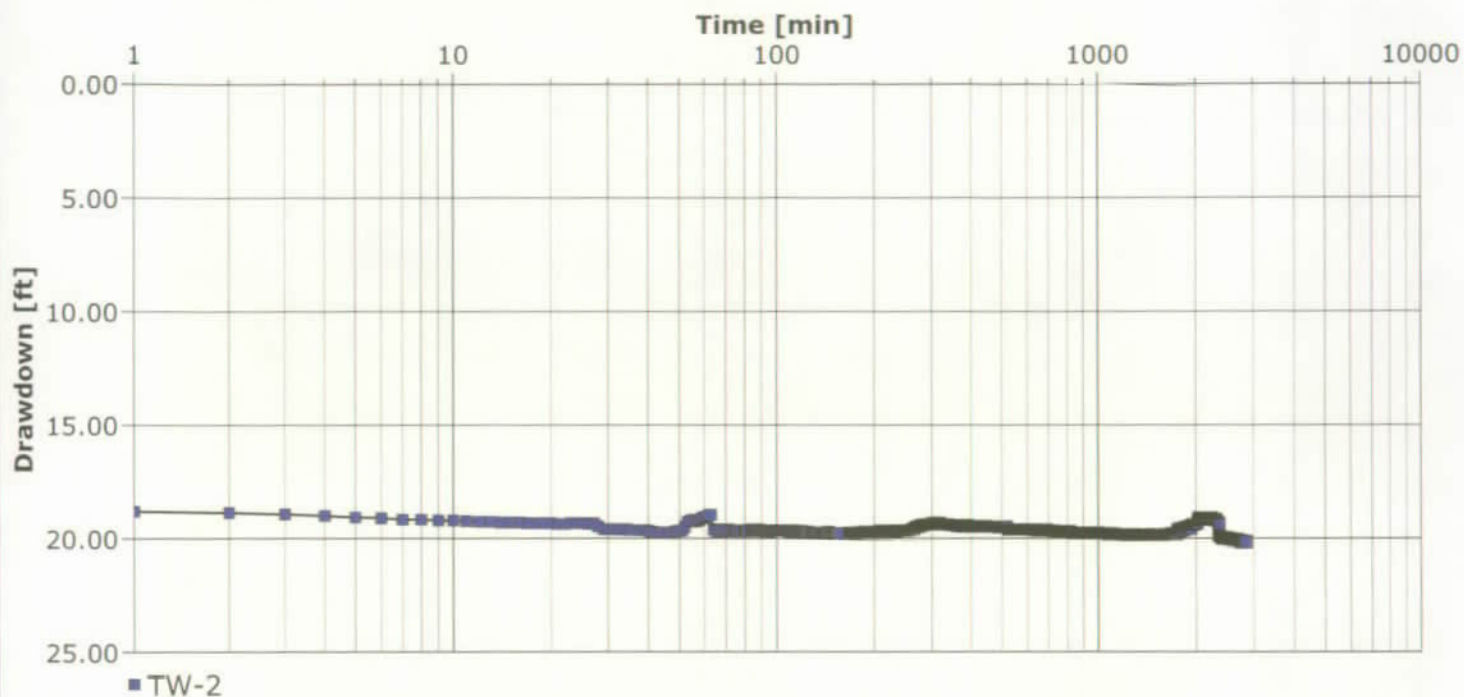
Analysis Performed by: Kevin Miller

Time-Drawdown Test Well

Analysis Date: 2/24/2008

Aquifer Thickness: 50.00 ft

Discharge Rate: 333 [U.S. gal/min]





St. Croix Environmental, Inc.
Water Resource Division
1094 Golden Oaks Drive
Hudson, WI 54016

Wells

Project: WMU - Rauville Well Field

Number: 0001

Client: Watertown Municipal Utilities

Location: Rauville Well Field

Pumping Test: WMU LongTerm Aquifer Test on TW-2

Pumping Well: TW-2

Test Conducted by: Kevin Miller

Test Date: 2/22/2008

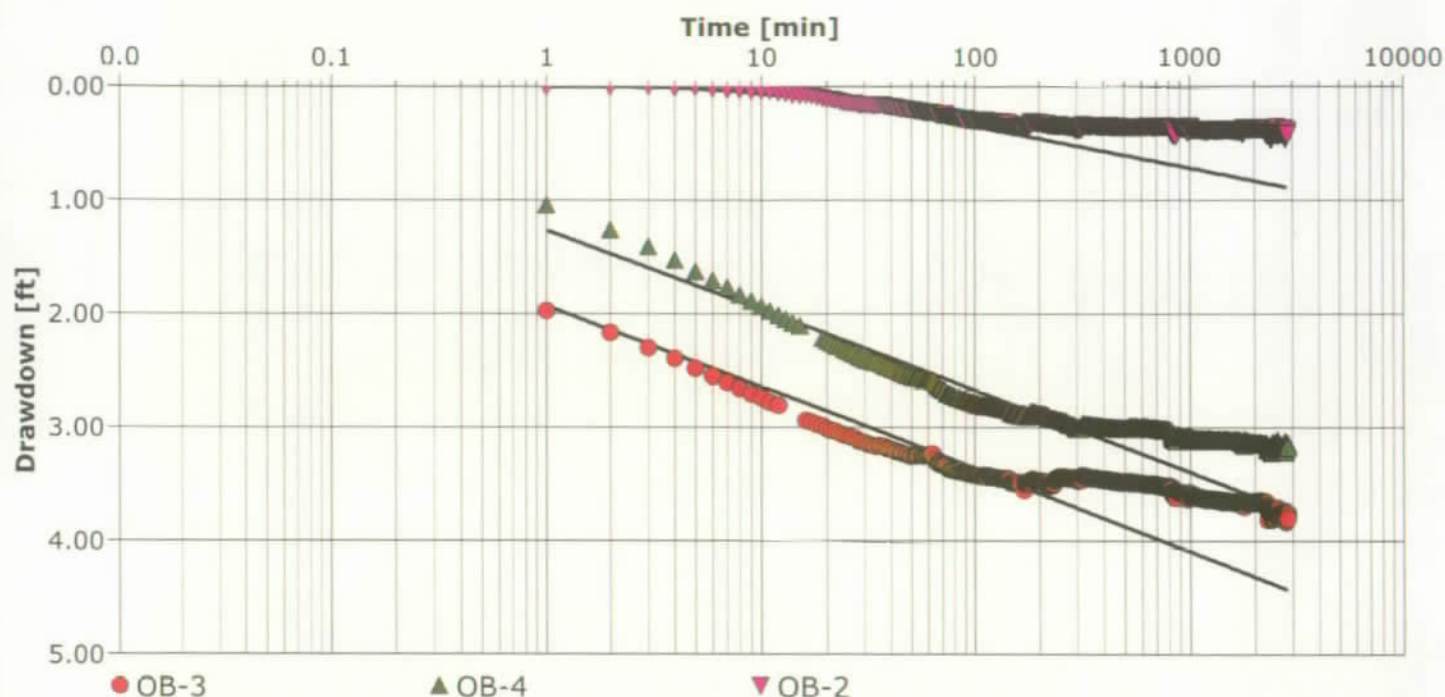
Analysis Performed by: Kevin Miller

Theis w/Jacob Correction

Analysis Date: 2/24/2008

Aquifer Thickness: 50.00 ft

Discharge Rate: 333 [U.S. gal/min]



Calculation after Theis with Jacob Correction

Observation Well	Transmissivity [ft ² /d]	Hydraulic Conductivity [ft/d]	Storage coefficient	Radial Distance to PW [ft]	
OB-3	1.73×10^{-4}	3.46×10^{-2}	1.75×10^{-5}	50.0	
OB-4	1.73×10^{-4}	3.46×10^{-2}	1.75×10^{-5}	150.0	
OB-2	3.15×10^{-4}	6.30×10^{-2}	2.70×10^{-4}	1500.0	
Average	2.20×10^{-4}	4.41×10^{-2}	1.02×10^{-4}		



St. Croix Environmental, Inc.
Water Resource Division
1094 Golden Oaks Drive
Hudson, WI 54016

Wells

Project: WMU - Rauville Well Field

Number: 0001

Client: Watertown Municipal Utilities

Location: Rauville Well Field

Pumping Test: WMU LongTerm Aquifer Test on TW-2 Pumping Well: TW-2

Test Conducted by: Kevin Miller

Test Date: 2/22/2008

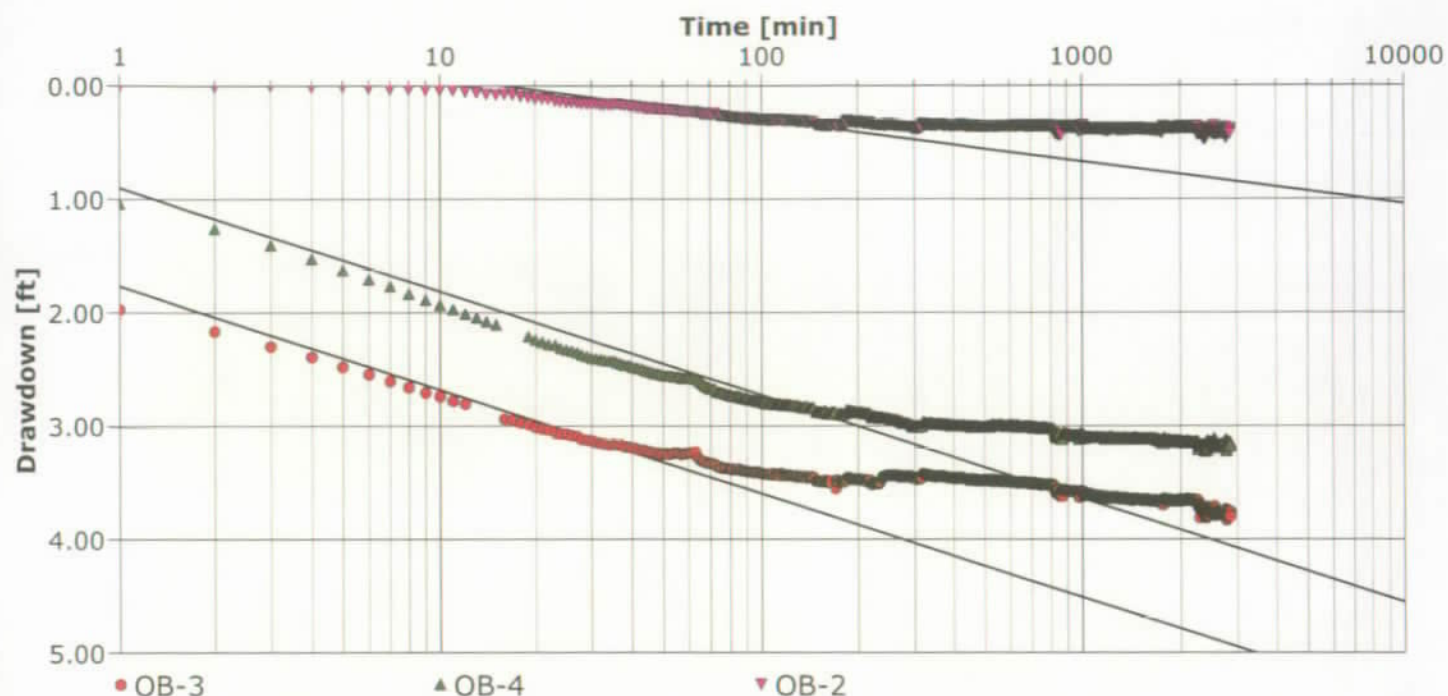
Analysis Performed by: Kevin Miller

Cooper Jacob I

Analysis Date: 2/24/2008

Aquifer Thickness: 50.00 ft

Discharge Rate: 333 [U.S. gal/min]



Calculation after Cooper & Jacob

Observation Well	Transmissivity [ft ² /d]	Hydraulic Conductivity [ft/d]	Storage coefficient	Radial Distance to PW [ft]	
OB-3	1.28×10^{-4}	2.57×10^{-2}	9.29×10^{-5}	50.0	
OB-4	1.28×10^{-4}	2.57×10^{-2}	9.29×10^{-5}	150.0	
OB-2	3.15×10^{-4}	6.30×10^{-2}	3.48×10^{-4}	1500.0	
Average	1.91×10^{-4}	3.81×10^{-2}	1.78×10^{-4}		



St. Croix Environmental, Inc.
Water Resource Division
1094 Golden Oaks Drive
Hudson, WI 54016

Wells

Project: WMU - Rauville Well Field

Number: 0001

Client: Watertown Municipal Utilities

Location: Rauville Well Field

Pumping Test: WMU LongTerm Aquifer Test on TW-2

Pumping Well: TW-2

Test Conducted by: Kevin Miller

Test Date: 2/22/2008

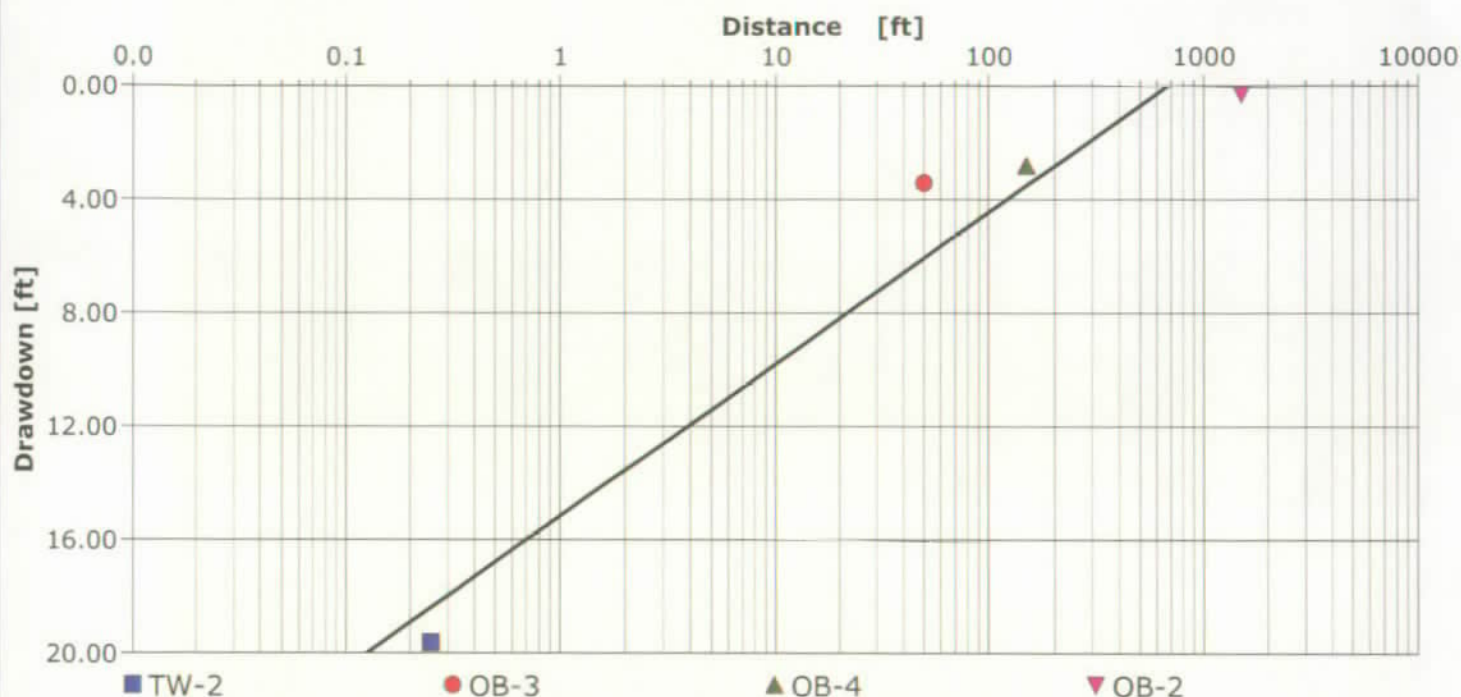
Analysis Performed by: Kevin Miller

Cooper Jacob II

Analysis Date: 3/15/2008

Aquifer Thickness: 50.00 ft

Discharge Rate: 333 [U.S. gal/min]



Calculation after Cooper & Jacob

	Transmissivity [ft ² /d]	Hydraulic Conductivity [ft/d]	Storage coefficient
Point of time [min]: 100	4.38×10^3	8.75×10^1	1.49×10^{-3}



St. Croix Environmental, Inc.
Water Resource Division
1094 Golden Oaks Drive
Hudson, WI 54016

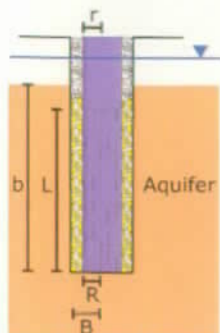
Wells

Project: WMU - Rauville Well Field

Number: 0001

Client: Watertown Municipal Utilities

Location: Rauville Well Field



Name	X [ft]	Y [ft]	Penetration	R [ft]	L [ft]	r [ft]	B [ft]	b [ft]
TW-2	0	0	Fully	0.25	20	0.25	0.38	50
OB-3	0	50	Fully	0.125	20	0.125	0.25	50
OB-4	0	150	Fully	0.125	20	0.125	0.25	50
OB-2	0	1500	Fully	0.125	20	0.125	0.25	50



St. Croix Environmental, Inc.
Water Resource Division
1094 Golden Oaks Drive
Hudson, WI 54016

Wells

Project: WMU - Rauville Well Field

Number: 0001

Client: Watertown Municipal Utilities

Location: Rauville Well Field

Pumping Test: WMU LongTerm Aquifer Test on TW-2

Pumping Well: TW-2

Test Conducted by: Kevin Miller

Test Date: 2/22/2008

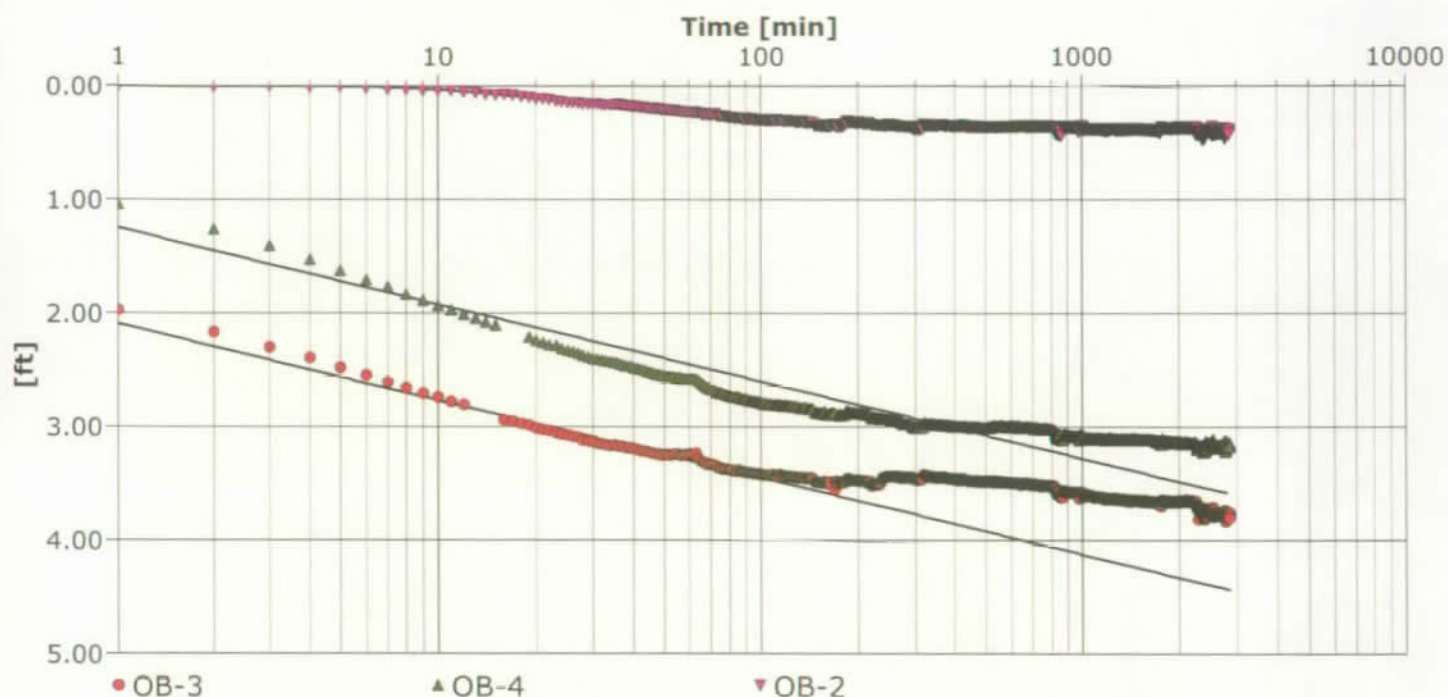
Analysis Performed by: Kevin Miller

Boulton

Analysis Date: 2/24/2008

Aquifer Thickness: 50.00 ft

Discharge Rate: 333 [U.S. gal/min]



Calculation after Boulton

Observation Well	Transmissivity [ft ² /d]	Hydraulic Conductivity [ft/d]	Specific Yield	Drainage factor	Ratio Sy/S	Radial Distance to PW [ft]
OB-3	1.73×10^{-4}	3.46×10^{-2}	8.85×10^{-6}	1.00×10^{-2}	1.00×10^{-2}	50.0
OB-4	1.73×10^{-4}	3.46×10^{-2}	1.75×10^{-5}	1.00×10^{-2}	5.62×10^{-3}	150.0
OB-2	9.52×10^{-3}	1.90×10^{-2}	3.24×10^{-2}	1.00×10^{-2}	1.58×10^{-2}	1500.0
Average	1.47×10^{-2}	2.94×10^{-2}	1.08×10^{-2}	1.00×10^{-2}	1.96×10^{-3}	



St. Croix Environmental, Inc.
Water Resource Division
1094 Golden Oaks Drive
Hudson, WI 54016

Site Plan

Project: WMU - Rauville Well Field

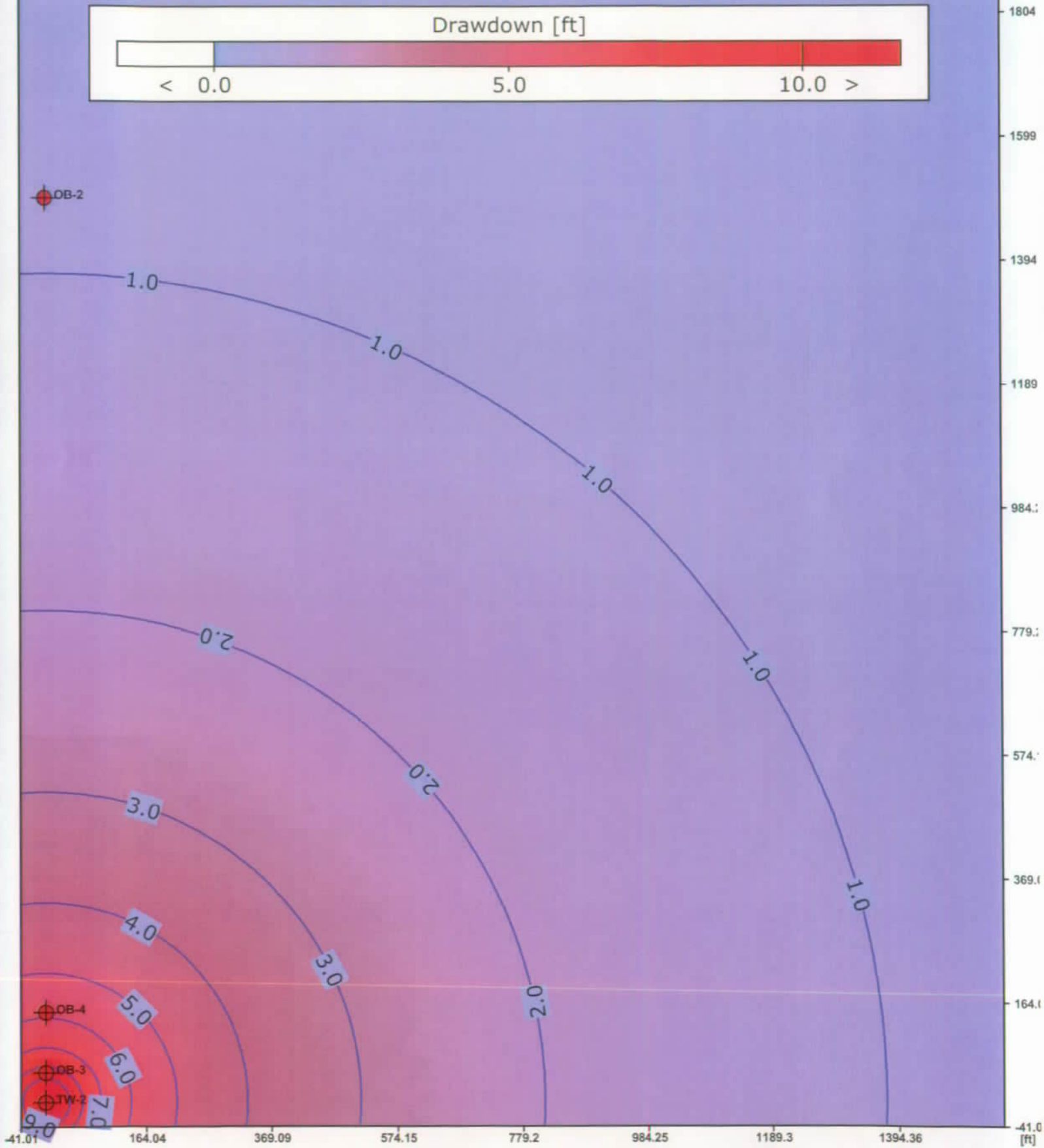
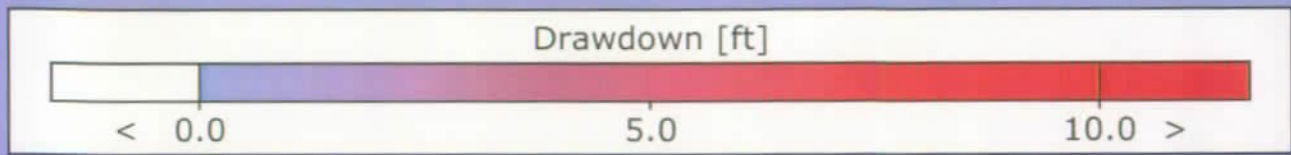
Number: 0001

Client: Watertown Municipal Utilities

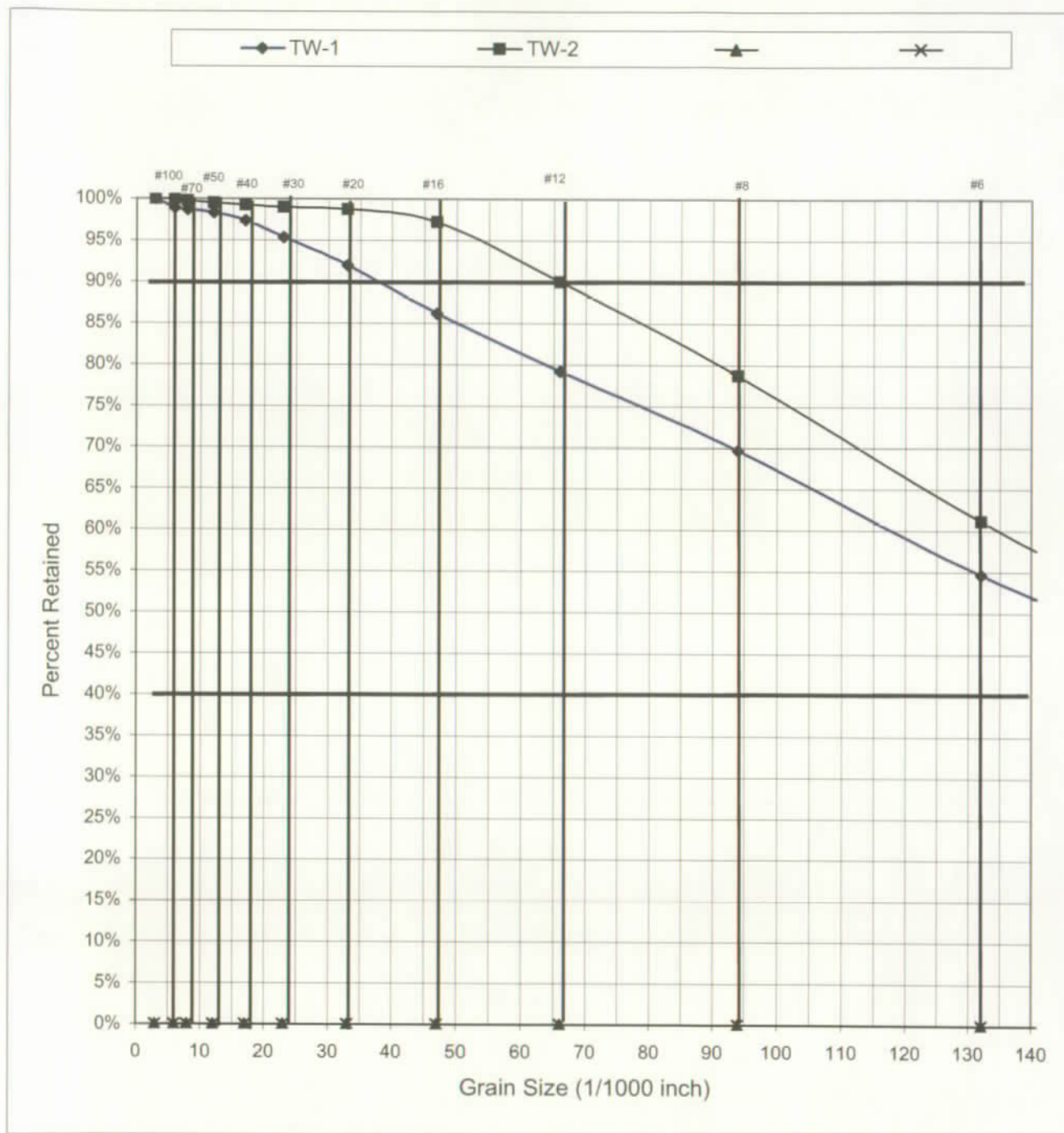
Location: Rauville Well Field

Scale 1:2500

Map Origin [ft] X: -41.01 Y: -41.01



Appendix 5 – Sieve Analyses for TW-1 and TW-2 Samples

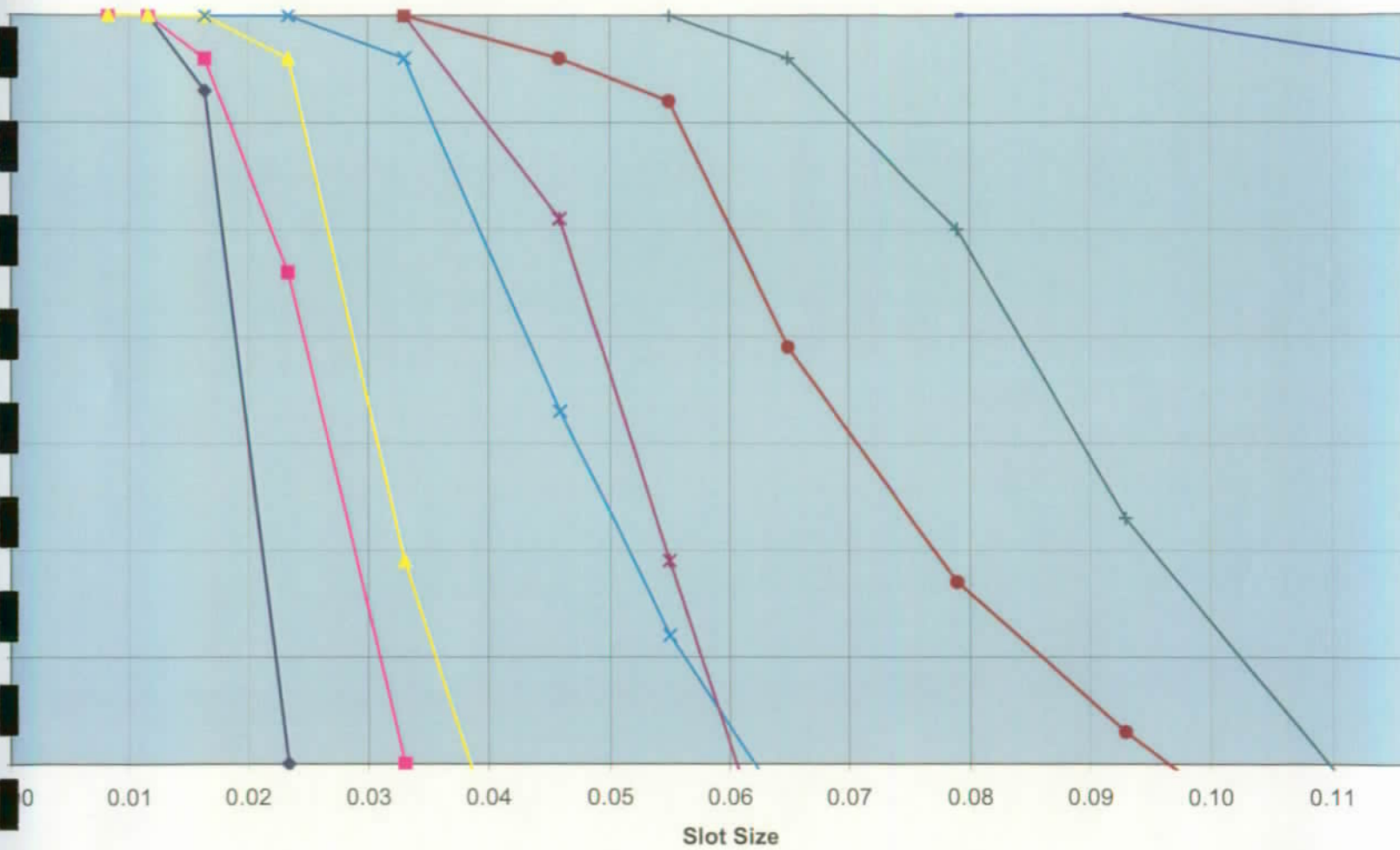


Project: Watertown
Engineer: St. Croix Environmental

Sieve Analysis ID # 073008-1
Well:
Contractor: Kaiser Well Drilling

Proposed Screen Diameter: 18" Pipe Size
Recommended Slot Size: 80 Slot From 30' - 60' 3/8" and Larger Removed
Recommended Gravel Pack: #120 Well Slot American Materials

American Materials Pack



#10 Well Slot #15 Well Slot #20 Well Slot #30 Well Slot #40 Well Slot #50 Well Slot
 #60 Well Slot #120 Well Slot

Sample Identification
Cumulative Percent Retained

US Sieve	IN	TW-1		TW-2	
		Cum Wt	Cum %Ret	Cum Wt	Cum %Ret
200	3	893	100%	399	100%
100	6	883	99%	399	100%
70	8	881	99%	398	100%
50	12	878	98%	397	99%
40	17	869	97%	396	99%
30	23	851	95%	395	99%
20	33	821	92%	394	99%
16	47	769	86%	388	97%
12	66	707	79%	359	90%
8	94	622	70%	314	79%
6	132	488	55%	244	61%
4	185	340	38%	161	40%
3/8"	375		0%		0%
1/2"	500		0%		0%
3/4"	750		0%		0%
1"	1000		0%		0%

Appendix 6 – Laboratory Analytical Results for TW-1 Sample



LABORATORY ANALYTICAL REPORT

Client: Watertown Municipal Utilities

Project: Ground Water for RO

Lab ID: R08060318-001

Client Sample ID: New Well Field

Report Date: 07/12/08

Collection Date: 06/17/08 14:00

Date Received: 06/18/08

Matrix: AQUEOUS

Analyses	Result	Units	Qual	RL	MCL/ QCL	DF	Method	Analysis Date / By
MICROBIOLOGICAL								
Bacteria, Fecal Coliform	ND	CFU/100ml	D	2		2	A9222 D	06/18/08 13:50/tb
Bacteria, Heterotrophic	ND	CFU/ml		10		1	A9215 B	06/18/08 13:30/jmh
Bacteria, Total Coliform	ND	mpn/100ml		1		0	A9223 B	06/18/08 13:15/jmh
PHYSICAL PARAMETERS								
Color	15	c.u.		5		1	A2120 B	06/24/08 07:30/eli-b
pH	7.82	s.u.		0.01		1	A4500-H B	06/19/08 12:06/tb
Solids, Total Dissolved TDS @ 180 C	480	mg/L		5		1	A2540 C	06/18/08 15:40/mb
Turbidity	33	NTU		0.10		1	A2130 B	06/24/08 09:00/jmh
Alkalinity, Total as CaCO3	242	mg/L		5		1	A2320 B	06/25/08 10:47/mb
Carbonate as CO3	ND	mg/L		5		1	A2320 B	06/25/08 10:47/mb
Bicarbonate as HCO3	295	mg/L		5		1	A2320 B	06/25/08 10:47/mb
INORGANIC PARAMETERS								
Sulfide	ND	mg/L		0.04		1	A4500 S-D	06/24/08 10:00/eli-b1
Hardness as CaCO3	340	mg/L		1		1	A2340 B	06/30/08 12:32/ADM
Bromide	ND	mg/L		1		1	E300.0	06/19/08 21:59/jmh
Chloride	7.3	mg/L		0.5		1	E300.0	06/19/08 21:59/jmh
Fluoride	0.4	mg/L		0.1		1	E300.0	06/19/08 21:59/jmh
Sulfate	122	mg/L		1		5	E300.0	06/21/08 00:05/jmh
Hardness as CaCO3 - Grains	20	grains/gal		0.06		1	A2340 B	06/30/08 12:32/ADM
PHYSICAL PROPERTIES								
Langelier Index	0.70					1	A203	06/30/08 00:00/jmh
ORGANIC CARBON PARAMETERS								
Organic Carbon, Total (TOC)	0.8	mg/L		0.1		1	A5310 C	07/07/08 20:30/eli-c
NUTRIENT PARAMETERS								
Phosphorus, Total as P	0.03	mg/L		0.01		1	E365.1	06/23/08 15:03/jmh
Nitrogen, Ammonia as N	ND	mg/L		0.1		1	A4500-NH3 G	06/19/08 12:08/jmh
Nitrogen, Nitrate as N	ND	mg/L		0.1		1	E300.0	06/19/08 21:59/jmh
Nitrogen, Nitrite as N	ND	mg/L		0.1		1	E300.0	06/19/08 21:59/jmh
METALS - SPECIATED								
Arsenic-III	4.1	ug/L		1.0		1	E1632AM	06/26/08 13:03/eli-h
Arsenic-V	ND	ug/L		1.0		1	E1632AM	06/26/08 13:03/eli-h

TOTAL METALS ANALYSES

Report RL - Analyte reporting limit.

Definitions: QCL - Quality control limit.

D - RL increased due to sample matrix interference.

MCL - Maximum contaminant level.

ND - Not detected at the reporting limit.

Page 1 of 2



LABORATORY ANALYTICAL REPORT

Client: Watertown Municipal Utilities

Project: Ground Water for RO

Lab ID: R08060318-001

Client Sample ID: New Well Field

Report Date: 07/12/08

Collection Date: 06/17/08 14:00

Date Received: 06/18/08

Matrix: AQUEOUS

Analyses	Result	Units	Qual	RL	MCL/		Method	Analysis Date / By
					QCL	DF		
TOTAL METALS ANALYSES								
Aluminum	ND	mg/L		0.1		2	E200.7	06/26/08 14:48/eli-b
Barium	0.1	mg/L		0.1		2	E200.7	06/24/08 21:57/eli-b
Boron	ND	mg/L		0.1		2	E200.7	06/24/08 21:57/eli-b
Iron	2.43	mg/L		0.03		2	E200.7	06/24/08 21:57/eli-b
Manganese	0.39	mg/L		0.01		2	E200.7	06/24/08 21:57/eli-b
Silicon	12.7	mg/L		0.1		2	E200.7	06/24/08 21:57/eli-b
Strontium	0.2	mg/L		0.1		2	E200.7	06/24/08 21:57/eli-b
Silicon as SiO2	27.2	mg/L		0.2		2	E200.7	06/24/08 21:57/eli-b
Silica	27.2	mg/L		0.2		2	E200.7	06/24/08 21:57/eli-b
DISSOLVED METALS ANALYSES								
Calcium	87	mg/L		1		2	E200.7	06/24/08 21:53/eli-b
Magnesium	31	mg/L		1		2	E200.7	06/24/08 21:53/eli-b
Potassium	3	mg/L		1		2	E200.7	06/27/08 23:26/eli-b
Sodium	8	mg/L		1		2	E200.7	06/24/08 21:53/eli-b

Report Definitions: RL - Analyte reporting limit.
QCL - Quality control limit.

MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

September 2, 2008

Watertown Municipal Utilities
Geoff Heig General Manager
901 4th Ave SW
Watertown SD 57201

Dear Mr. Heig:

The staff report and Chief Engineer's recommendation for Water Permit No. 7055-3 are enclosed.

Please review and contact us if you have any questions.

Sincerely:

Gail Jacobson
Water Rights Secretary
605-773-3352



DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

September 3, 2008

Roger Mohr
16416 459th Avenue
Watertown SD 57201

Dear Mr. Mohr:

Enclosed is the report, recommendation and public notice for a water permit application filed by Watertown Municipal Utilities to construct and place to beneficial use water reserved by their Future Use Permit No. 5862-3 from the Big Sioux:North Aquifer. You currently hold Temporary Use Permit No. 6540-3 from this aquifer.

The public notice on this application is scheduled to be published September 3 and 10, 2008 in the Watertown Public Opinion.

This information is being sent to you because you hold a temporary use water permit from this aquifer subject to the city's development of the reserved water supply. At this time, Watertown Municipal Utilities has not requested the entire amount held in reserved to be placed to beneficial use. Therefore, your temporary use permit is not subject to any action being taken due to Watertown's pending application.

Please feel free to contact me if you have any questions.

Sincerely,

Eric Gronlund
Water Rights Program
(605) 773-3352

enclosures



DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

September 3, 2008

Rodney Zemlicka
45412 164th Street
Watertown SD 57201

Dear Mr. Zemlicka:

Enclosed is the report, recommendation and public notice for a water permit application filed by Watertown Municipal Utilities to construct and place to beneficial use water reserved by their Future Use Permit No. 5862-3 from the Big Sioux:North Aquifer. You currently hold Temporary Use Permit No. 6362-3 from this aquifer.

The public notice on this application is scheduled to be published September 3 and 10, 2008 in the Watertown Public Opinion.

This information is being sent to you because you hold a temporary use water permit from this aquifer subject to the city's development of the reserved water supply. At this time, Watertown Municipal Utilities has not requested the entire amount held in reserved to be placed to beneficial use. Therefore, your temporary use permit is not subject to any action being taken due to Watertown's pending application.

Please feel free to contact me if you have any questions.

Sincerely,

Eric Gronlund
Water Rights Program
(605) 773-3352

enclosures

Gronlund, Eric

From: Jeff DeVille [jdeville@watertownmu.com]
Sent: Tuesday, August 12, 2008 11:49 AM
To: Gronlund, Eric
Subject: Corrected location for the new wells

Eric

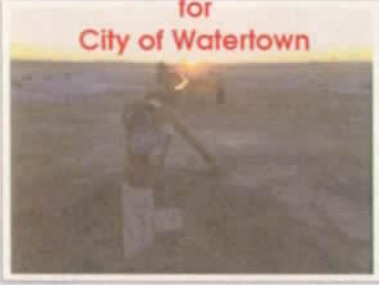
The application for the 9 new wells that we sent you had the wrong section listed on it. The wells will be located in the North 1/2 of section 31. If you need a corrected application let me know and I can send a new application.

Thank You

Jeff DeVille
Water Superintendent
Watertown Municipal Utilities Dept.
901 4th Ave SW
Watertown SD 57201
605-882-6233
605-882-6238 (Fax)

08/12/2008

**Water Permit Application No. 7055-3
 for
 City of Watertown**



Water Management Board Meeting
 10:00 am - October 2, 2008

Advanced Engineering and Environmental Services, Inc.

Need for Watertown Project

- ☐ Concerns with Suspected Health Risks
- ☐ Increasing Water Demands
- ☐ Redundancy, Reliability, and Aging Infrastructure

Advanced Engineering and Environmental Services, Inc.

Concerns Over Health Risks



Advanced Engineering and Environmental Services, Inc.

Concerns Over Health Risks

May 2006

Sample Location	West Branch	Town Plant	S. Lake Tanager	N. Lake Tanager
Average Location (m)	Average Location (m)	Average Location (m)	Average Location (m)	Average Location (m)
Chloroform (µg/L)	17.6	25.6	39.2	60.2
Bromochloroform (µg/L)	17.1	27	36.2	38.3
Dibromochloroform (µg/L)	16.2	13.7	16.5	16.9
Bromalene (µg/L)	9.788	1.65	1.24	1.2
THM (µg/L)	40.7	58.9	111.1	120.1

System Average THM (µg/L) = 85
Report this value on the TTHM Reporting Form



Advanced Engineering and Environmental Services, Inc.

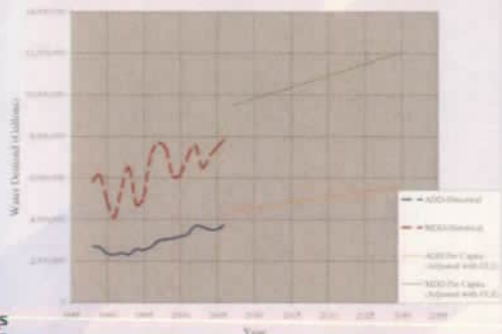
Other Risks

- ☐ Risks to surface water quality
 - ☐ Runoff from CAFOs
 - ☐ Sanitary sewer discharges
 - ☐ Accidental spills
- ☐ Surface water has higher TOC concentrations – precursor to DBPs



Advanced Engineering and Environmental Services, Inc.

Future Water Demands



Advanced Engineering and Environmental Services, Inc.

Redundancy, Reliability, and Aging Infrastructure

- ☐ Discontinued Use of Lake Kampeska WTP
 - ☐ Lack of redundancy in raw water supply source and transmission
- ☐ Aging Components
 - ☐ Increasing difficult to maintain, causing reliability concerns
- ☐ Lake Kampeska - Portions from Late 1800s



Advanced Engineering and Environmental Services, Inc.

Proposed Project

- ☐ New Rauville Wells
- ☐ New Rauville Raw Water Line
- ☐ Expanded and Optimized Town WTP



Advanced Engineering and Environmental Services, Inc.

New Wellfield Location



Advanced Engineering and Environmental Services, Inc.

New Rauville Wells

- ☐ 9 Wells @ 400 GPM
 - ☐ 2,800 gpm or 4 mgd total capacity
 - ☐ 4,500 acre-feet annual
 - ☐ 7 wells @ 720' spacing
 - ☐ 2 wells @ 520' spacing
 - ☐ 18-inch wells - 120-slot screen
- ☐ Water Quality
 - ☐ WQ testing indicates slightly better WQ than current Conifer Well Field



Advanced Engineering and Environmental Services, Inc.

Rauville Well Field Spacing Map

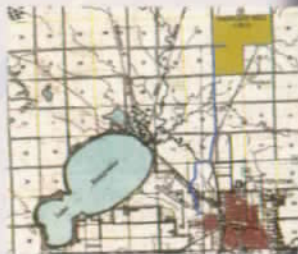
- 720'
- 520'



Advanced Engineering and Environmental Services, Inc.

New Rauville Raw Water Line

- ☐ Size = 24-inch Diameter
- ☐ Length $\approx$ 7 Miles



Advanced Engineering and Environmental Services, Inc.

WTP Expansion

- ☐ 4 MGD WTP Expansion
- ☐ Nanofiltration Membranes
 - ☐ Process to remove organics and lower DBP formation potential
 - ☐ Utilize after current treatment (poorer WQ than Rauville)
- ☐ Expand Lime Softening and Gravity Filtration



Advanced Engineering and Environmental Services, Inc.

Anticipated Total Project Costs

- ☐ Rauville Well Field - \$1,953,000 -
Assumed 8 wells
- ☐ Rauville Raw Water Transmission
Line - \$5,234,000
- ☐ WTP Expansion - \$14,213,000



Advanced Engineering and Environmental Services, Inc.



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

**RECOMMENDATION OF CHIEF ENGINEER FOR WATER PERMIT
APPLICATION NO. 7055-3, Watertown Municipal Utilities**

Pursuant to SDCL 46-2A-2, the following is the recommendation of the Chief Engineer, Water Rights Program, Department of Environment and Natural Resources concerning Water Permit Application No. 7055-3, Watertown Municipal Utilities, c/o Geoff Heig, General Manager, 901 4th Avenue SW, Watertown SD 57201.

The Chief Engineer is recommending APPROVAL of Application No. 7055-3 because 1) water has been appropriated and reserved by Future Use Permit No. 5862-3, 2) the proposed diversion can be developed without unlawful impairment of existing rights, 3) the proposed use is a beneficial use and 4) it is in the public interest with the following qualifications:

1. The wells approved under this Permit will be located near domestic wells and other wells which may obtain water from the same aquifer. The well owner under this Permit shall control his withdrawals so there is not a reduction of needed water supplies in adequate domestic wells or in adequate wells having prior water rights.
2. The wells authorized by Permit No. 7055-3 shall be constructed by a licensed well driller and construction of the well and installation of the pump shall comply with Water Management Board Well Construction Rules, Chapter 74:02:04 with the well casing pressure grouted (bottom to top) pursuant to Section 74:02:04:28.
3. Watertown Municipal Utilities Department shall report to the Chief Engineer annually the amount of water withdrawn from the Big Sioux:North Aquifer.

See report on application for additional information.

Garland Erbele, Chief Engineer
September 2, 2008

REPORT ON WATER PERMIT APPLICATION NO. 7055-3
For City of Watertown
August 26, 2008

Application No. 7055-3 proposes to construct and place to beneficial use water reserved by Future Use Permit No. 5862-3. This application proposes to place 4,500 acre-feet annually to beneficial use at a diversion rate of 8.0 cfs from nine wells to be completed to an approximate depth of 50 to 55 feet and located in the N ½ of section 31, T118N R52W in Codington County. The water is for municipal use by the City of Watertown.

AQUIFER – BIG SIOUX NORTH (BS-N)

The Big Sioux North is a predominantly surficial outwash (sand and gravel) that can be under water table or artesian conditions in this area. The aquifer underlies 150 square miles and contains an estimated 350,000 acre-feet of water in storage in Codington and Grant Counties (Hansen, 1990). The Big Sioux North management unit of the Big Sioux aquifer underlies 151,430 acres and contains an estimated 67,300 acre-feet of recoverable water in storage in Codington County (Hedges, 1982). The aquifer is hydraulically connected to the Big Sioux River and to Gravel Creek (Mud Creek) in the immediate area of this application. In general, the ground water movement is from the northeast to the southwest and toward the Big Sioux River.

Numerous test wells drilled by the applicant in section 31 indicate the presence of clay layers in the subsurface (two primary layers) with sand and gravel both above and below those layers. A total depth of 50 to 60 feet bottoms the test wells in clay and appears to penetrate the entire aquifer. Aquifer testing conducted by St. Croix Environmental for the City of Watertown indicates a sustainable pumping rate for a single well of about 491 gpm for this area. A design configuration for seven wells approximately 720 feet apart (each pumping 400 gpm) was chosen and could supply the 4,500 acre-feet need of the City of Watertown. Additionally two more wells are proposed to be held in reserve and this would tighten up the spacing between wells to 520 feet. These estimates are reasonable but will be dependent upon additional testing as wells are constructed and developed. However, it is highly unlikely that these seven wells would be pumped continuously for an entire year at the maximum rate to yield the 4,500 acre-feet under any plausible scenario. A copy of the study by St. Croix Environmental is included with the application.

The Water Right history is a matter of estimating the rate of recharge to the aquifer. The first Goodman report (Goodman, 1995) used an estimate of recharge of 4.0 inches per year (yielding 4,200 acre-feet from an aquifer area of 12,500 acres). The second Goodman report (Goodman, 2006) used an estimate of 5.53 inches per year (yielding 5,760 acre-feet per year from an aquifer area of 12,500 acres). The 5.53 inches per year estimate comes from the Putnam report for the entire Big Sioux Aquifer in Grant and Codington Counties (Putnam, 1996). The existing irrigation rights for the aquifer above the future use area are to be protected and that water use was estimated to approximate 500 acre-feet per year. That 500 acre-feet estimate remains the same for this report. The city is effectively requesting to develop 4,500 acre-feet of the 5,360 acre-feet reserved by future use permit No. 5862-3.

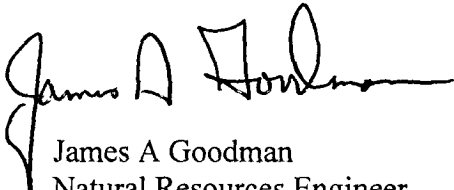
The Water Right Program monitors six observation wells within a three mile radius of this application and completed into the Big Sioux aquifer. These are CD-89A (located about two miles north), CD-89B (located about one mile north), CD-57A (located about two and one-half miles northeast), CD-81B (located about one and one-half miles east), CD-81A (located about two miles south) and CD-76B (about one-quarter mile west) all from this proposed well field. Hydrographs for these observation wells are included with this report (Water Rights, 2008). In general, the water level record indicates recharge occurs during wet periods or events and then the water level gradually declines until another precipitation event. The record indicates the aquifer is capable of sustaining additional withdrawals (Water Rights, 2008).

REVIEW OF EXISTING WATER PERMITS/RIGHTS

The nearest existing water right is Water Right No. 5696-3 Rauville Café for 0.022 cfs (9 gpm) and is located about one mile southeast of this proposed well field. The next closest existing Water Right No. 5262-3 (and Water Permit No. 6362-3) is about one and one-half miles north of this well field. Interference should not be a concern.

CONCLUSIONS

1. Water is available from the Big Sioux North aquifer.
2. This water has already been reserved by Future Use Permit No. 5862-3. Approval of this application will leave 760 acre-feet remaining in future use for the City of Watertown.
3. The wells authorized by this application must be constructed in accordance with SD Well Construction Standards.
4. There are currently two existing water permit Nos. 6362-3 and 6540-3 that have been issued in this area that are subject to the City of Watertown's future use permit.
5. This is a shallow and thin aquifer that historically has been subject to 4 to 12 feet changes in water levels from absolute highest to absolute lowest under more or less natural conditions. This could be a significant factor to well yields. During an extended drought water levels could change to the point that production from this well field could be seriously affected. This fact has nothing to do with estimated recharge or individual well capacity but is only related to climatic conditions combined with some potential pumping effects.

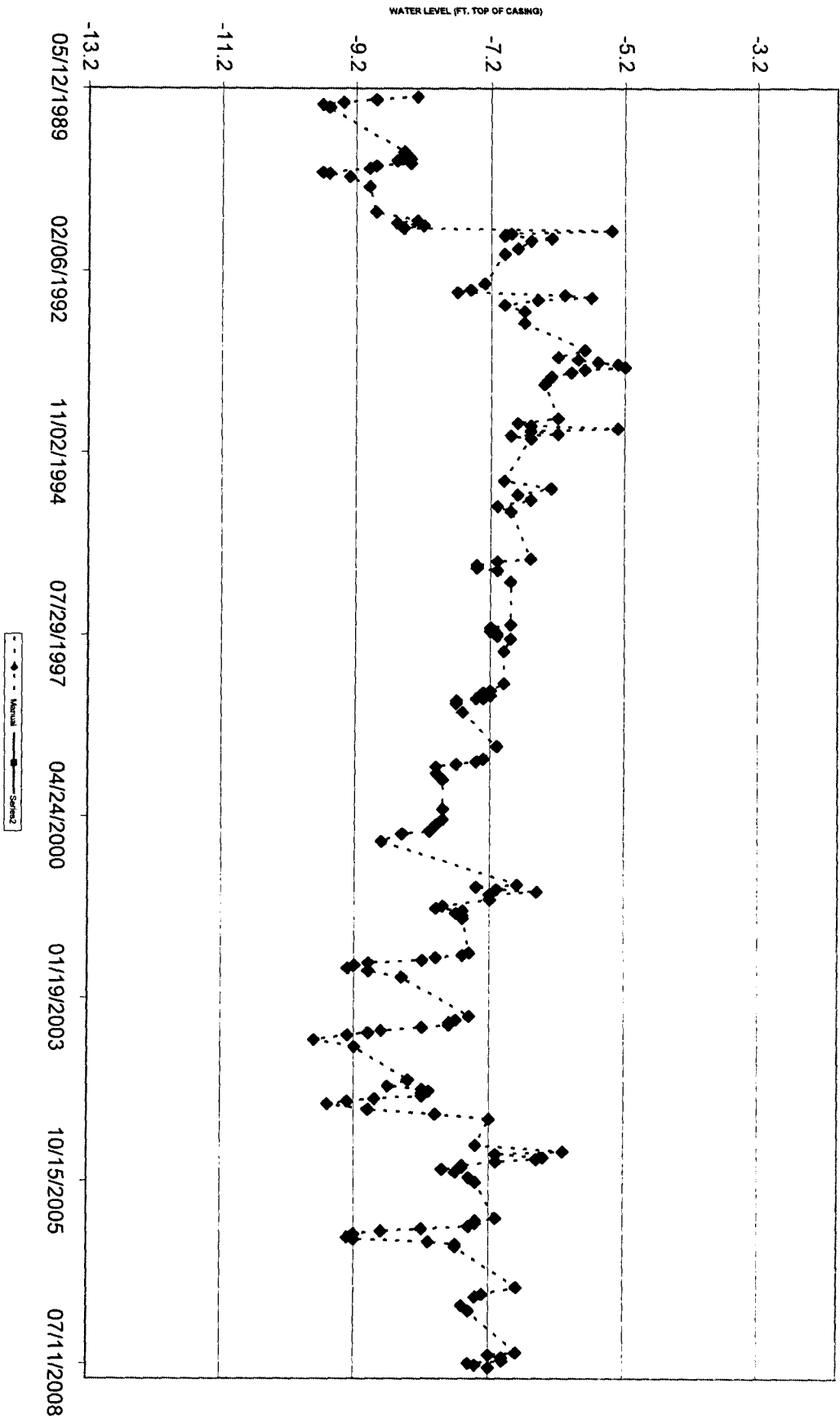


James A Goodman
Natural Resources Engineer

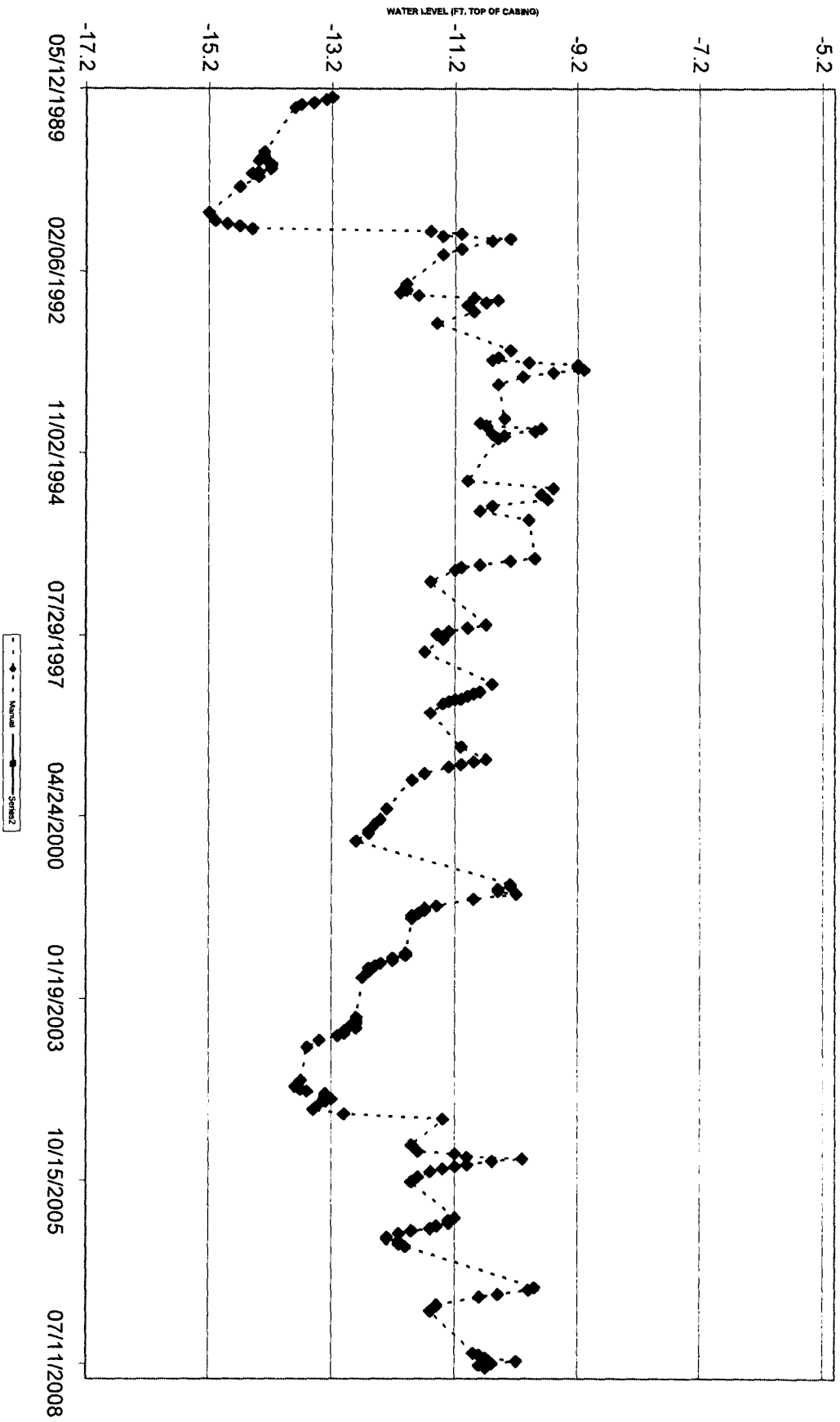
BIBLIOGRAPHY

- Goodman, J.A., 1995, Report on Water Permit Application No. 5862-3 for the City of Watertown, SD DENR, DES, Water Rights Program, Pierre, SD, 57501.
- Goodman, J.A., 2006, Report on Future Use Water Permit No. 5862-3 for the City of Watertown, SD DENR, DES, Water Rights Program, Pierre, SD, 57501.
- Hansen, D.S., 1990, Water Resources of Codington and Grant Counties, South Dakota, Water-Resources Investigations Report 89-4147, USGS, Huron, SD, 57350.
- Hedges, L.S., and others, 1982, Evaluation of Ground-Water Resources Eastern South Dakota and Upper Big Sioux River, South Dakota and Iowa, for US Army Corps of Engineers, SD DENR, SDGS, Vermillion, SD, 57069.
- Putnam, L.D., R.C. Thompson, 1996, Appraisal of the Water Resources of the Big Sioux Aquifer, Codington and Grant Counties, South Dakota, Water-Resources Investigations Report 96-4275, USGS, Rapid City, SD, 57702.
- Water Rights, 2008, Unpublished Observation Well Data for Codington County, SD DENR, DES, Water Rights Program, Pierre, SD, 57501.

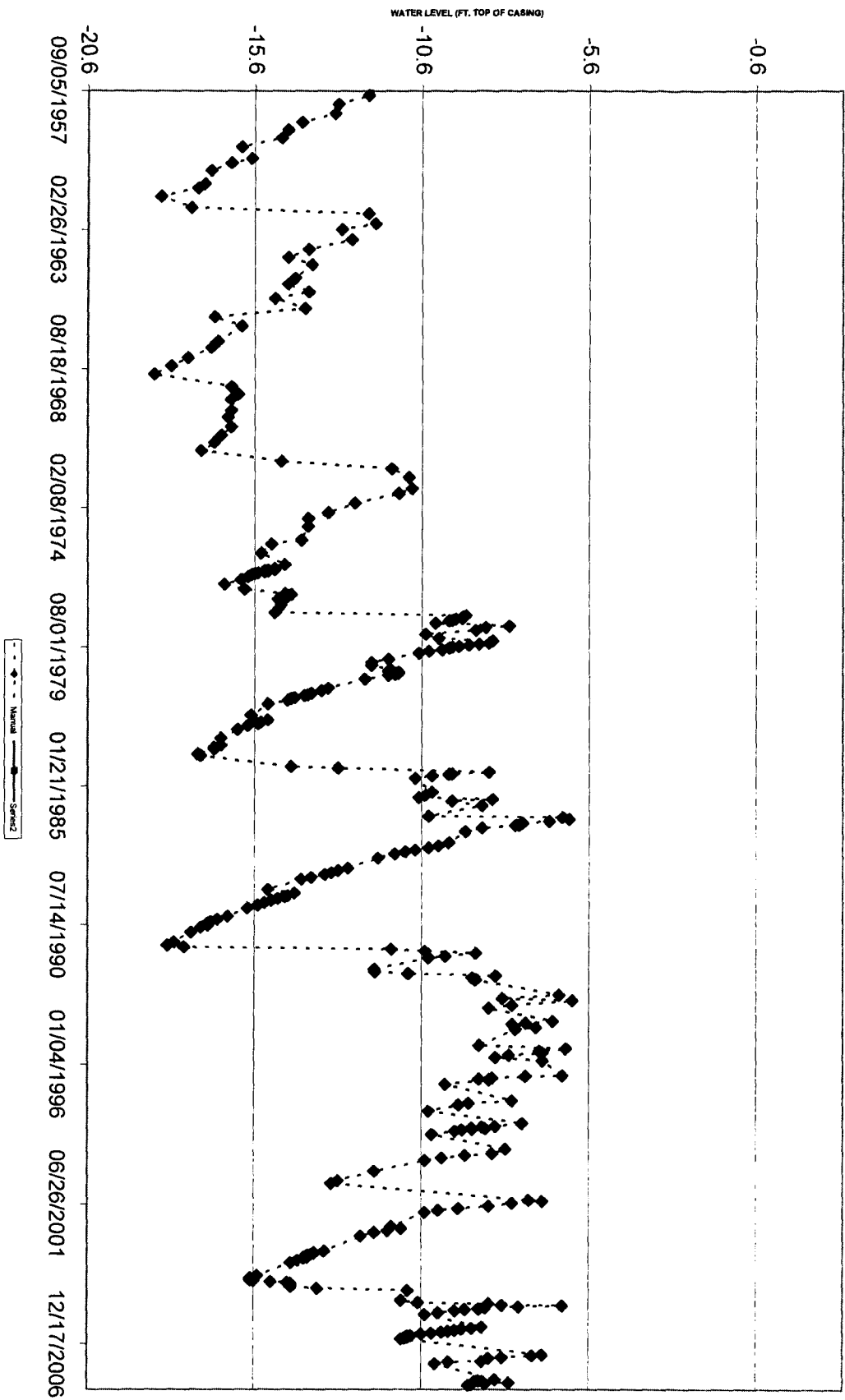
**WATER RIGHTS' OBSERVATION WELL
CD-89B**



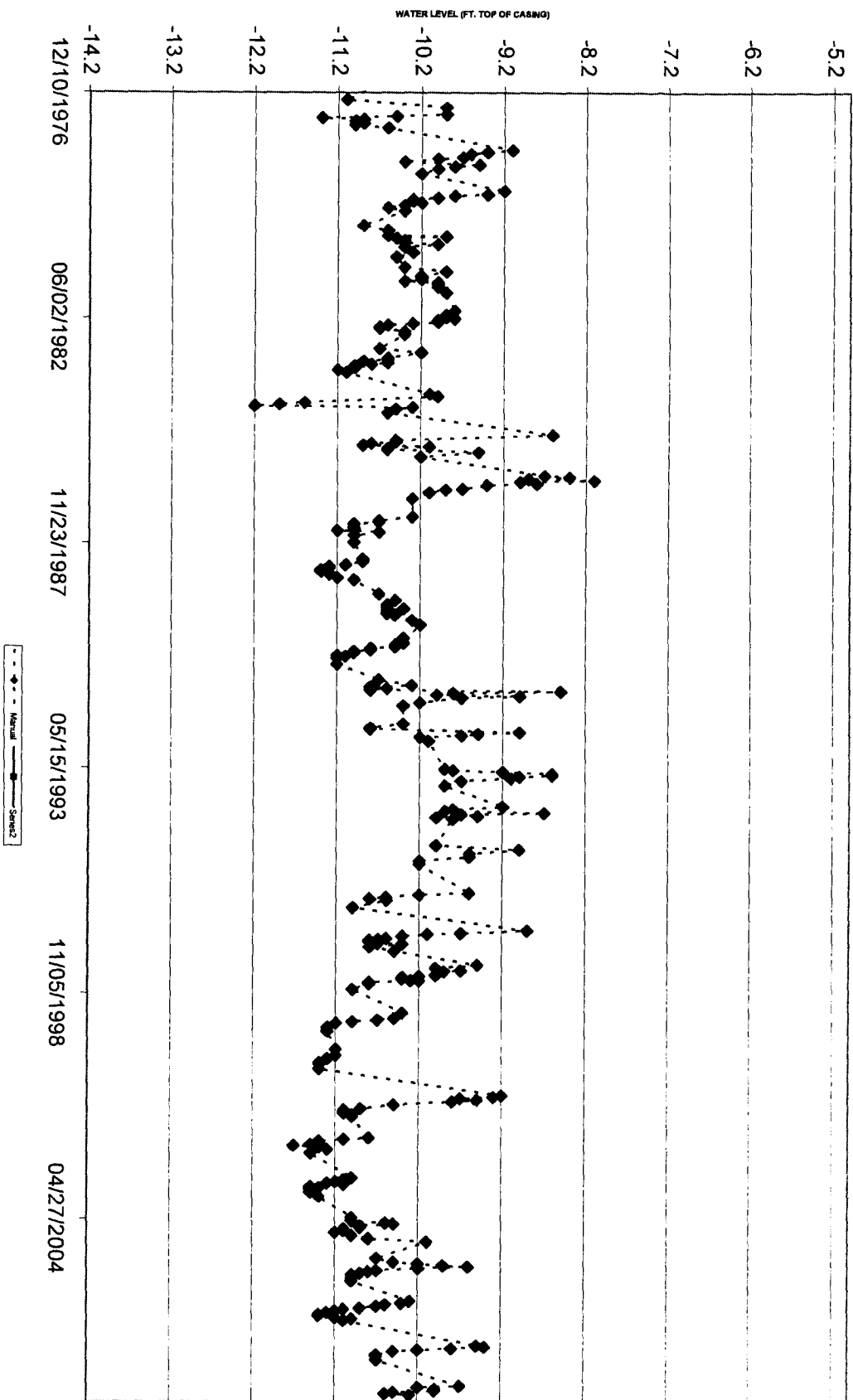
**WATER RIGHTS' OBSERVATION WELL
CD-89A**



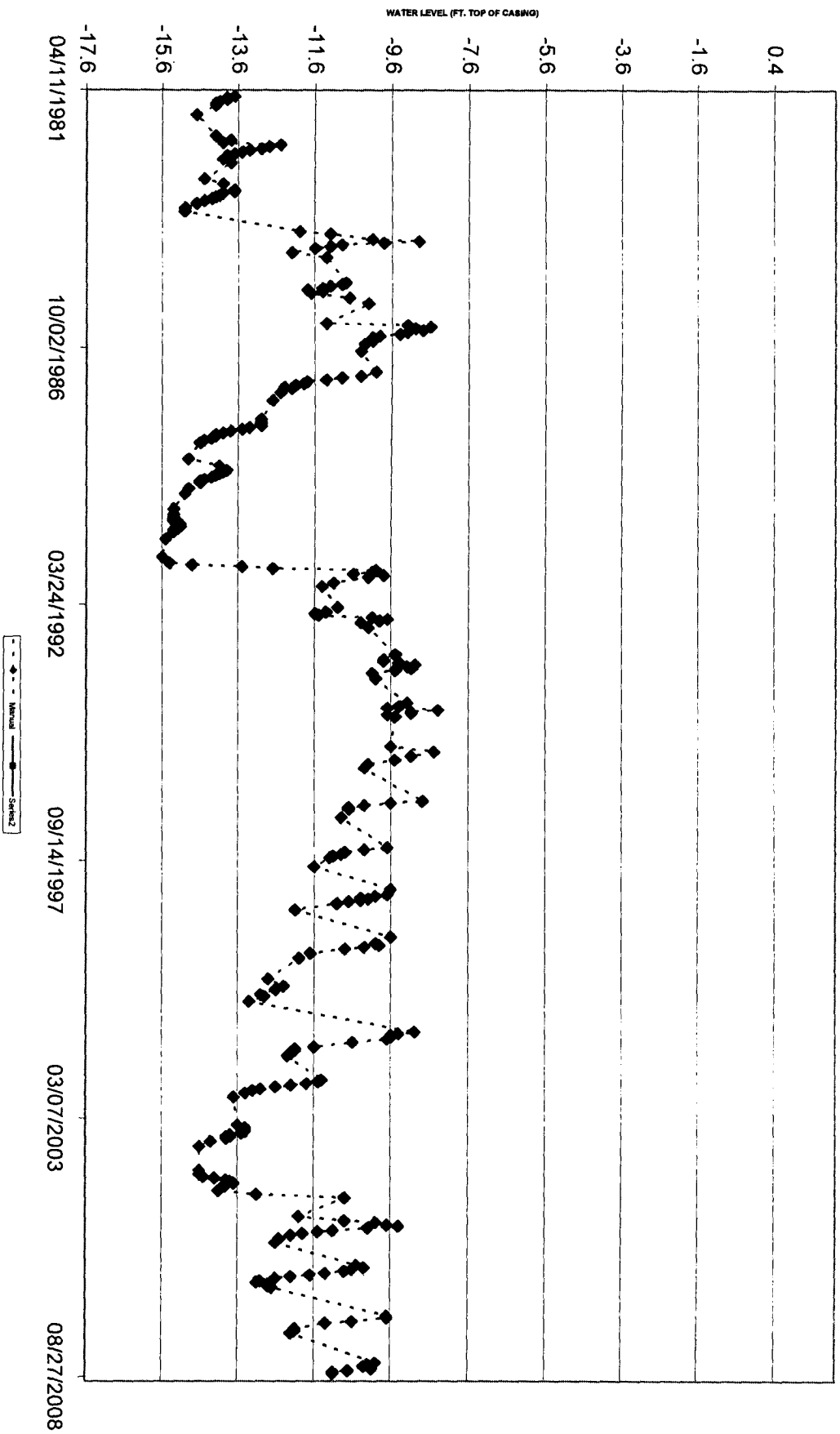
WATER RIGHTS' OBSERVATION WELL
CD-57A



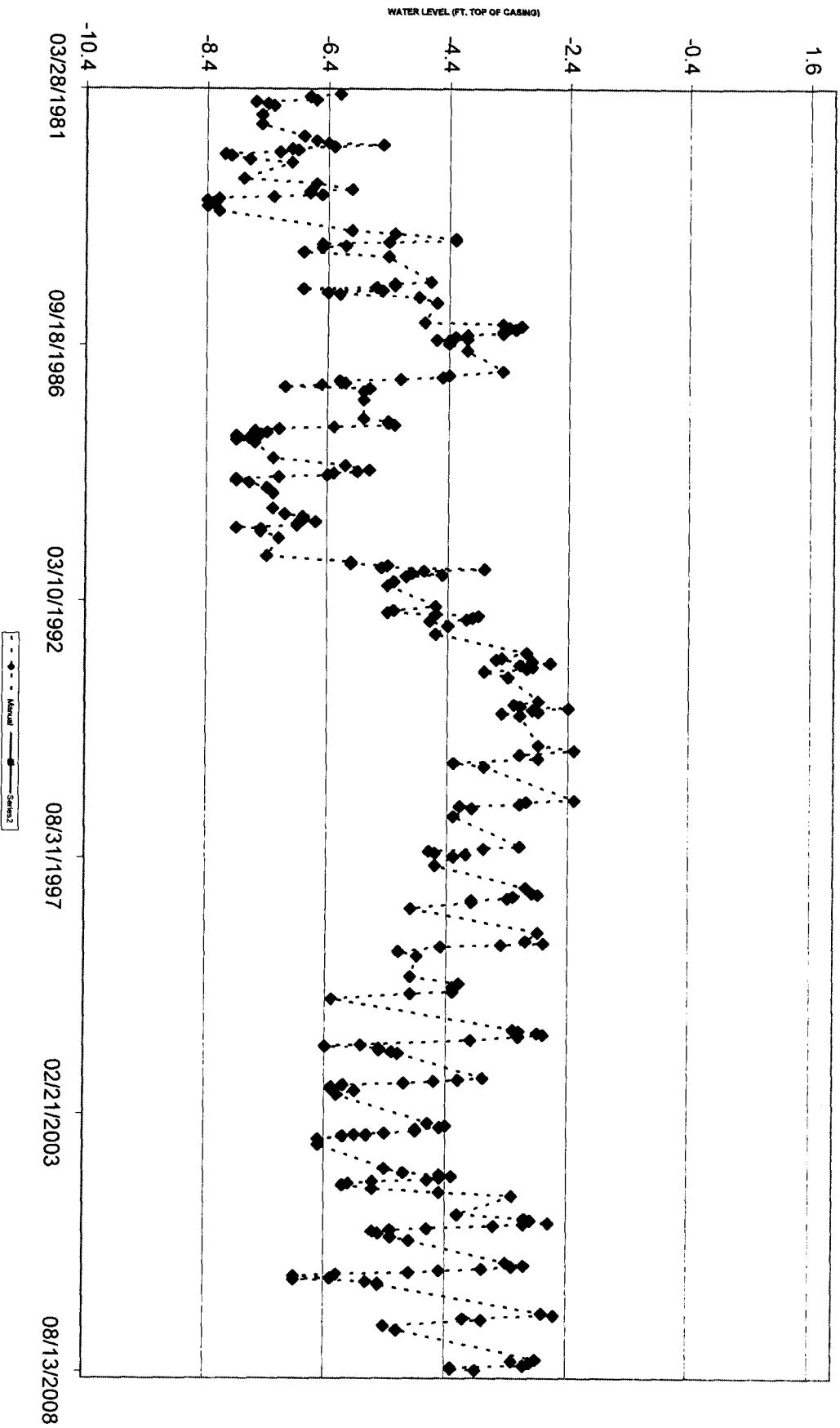
WATER RIGHTS' OBSERVATION WELL
CD-76B



**WATER RIGHTS' OBSERVATION WELL
CD-81B**



WATER RIGHTS' OBSERVATION WELL
CD-81A



RECEIVED

Form 8

SEP 17 2008

WATER RIGHTS
PROGRAM

PROOF OF PUBLICATION

STATE OF SOUTH DAKOTA)
) SS
County of CODINGTON)

I, MONICA K. SAATHOFF

certify that the attached printed Notice was
taken

from the WATERTOWN PUBLIC OPINION

printed and published in WATERTOWN

County of CODINGTON and

state of South Dakota. The notice was
published

in the newspaper on the following two dates:

SEPTEMBER 4th, 2008

SEPTEMBER 11th, 2008

Cost of Printing \$167.10

(Signature)

BOOKKEEPER

(Title)

SEPTEMBER 11th, 2008

(Date Signed)

DENR

NOTICE OF HEARING on
Application No. 7065-3 to
Appropriate Water

Notice is given that Watertown Municipal Utilities Department, Geoff Heig, General Manager, 901 4th Ave SW, Watertown SD 57201 has filed an application for a water permit to construct and place to beneficial use water reserved by Future Use Permit No. 5862-3. This application proposes to place 4,500 acre-feet annually to beneficial use at a diversion rate of 8.0 cubic feet of water per second from nine wells to be completed into the Sioux North Aquifer (approximately 50 feet deep) located in N1/2 Section 31-T118N-R52W. The water is for municipal use by the City of Watertown.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 7065-3 because 1) water has been appropriated and reserved by Future Use Permit No. 5862-3, 2) existing rights will not be unlawfully impaired, 3) it is a beneficial use of water, and 4) it is in the public interest.

Any person interested in opposing or supporting this application must file a written petition with BOTH the applicant and Chief Engineer. The applicant must also file a petition if opposed to the Chief Engineer's recommendation. The Chief Engineer's address is "Water Rights Program, Foss Building, 523 E Capitol, Pierre SD 57501 (805 773-3352)" and the applicant's mailing address is given above. A petition filed by either an interested person or the applicant must be filed by September 22, 2008. The petition may be informal, but must include a statement describing the petitioner's interest in the application, the petitioner's reasons for opposing or supporting the application, and the signature and mailing address of the petitioner or the petitioner's legal counsel, if legal counsel is obtained.

The Water Management Board will consider this application at 10:00 a.m. on October 2, 2008 at the Matthews Training Center, Joe Foss Building, 523 E. Capitol Ave., Pierre SD. The Chief Engineer's recommendation

is not final or binding upon the Board. The Board is authorized to 1) approve, 2) approve with qualifications, 3) defer, or 4) deny this application based on the facts presented at the public hearing. The October 2, 2008 hearing date will be automatically delayed for at least 20 days upon written request to the Chief Engineer from the applicant or any interested person opposing the application. The request for an automatic delay must be filed by September 22, 2008.

Any hearing will be an adversary proceeding. Any person filing a petition must also notify the right to be represented by a lawyer and may present evidence or cross-examine witnesses according to SDCL 1-26. These and other due process rights will be forfeited if not exercised. Decisions of the Board may be appealed to the Circuit Court and State Supreme Court as provided by law. Contact Eric Gronlund by September 22, 2008, at the above Water Rights Program address to request copies of information pertaining to this application. In addition, please notify the Department of Environment and Natural Resources at least 48 hours before the public hearing if you have a disability for which special arrangements must be made at the hearing.

Since this application does not involve a monetary controversy in excess of \$2,500.00 or termination of a property right in accordance with SDCL 1-26-18.3, the Chief Engineer has determined this contested case may not be referred to the Office of Hearing Examiners. If any party disagrees with this determination, the Chief Engineer shall be notified by September 22, 2008.

This application is made pursuant to SDCL 46-1-1 thru 46-1-9, 46-1-12 thru 46-1-16; 46-2-3.1, 46-2-9, 46-2-11, 46-2-13, 46-2-17; 46-2A-1 thru 46-2A-10, 46-2A-12, 46-2A-14, 46-2A-15, 46-2A-20, 46-2A-21; 46-5-1 thru 46-5-11, 46-5-13 thru 46-5-15, 46-5-24, 46-5-25, 46-5-30.2, 46-5-30.4, 46-5-31, 46-5-38 thru 46-5-40; 74:02:01:24 thru 74:02:01:25. Steven M. Pirner, Secretary, Department of Environment and Natural Resources.
(September 4 & 11, 2008)



DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

August 29, 2008

Public Opinion
PO Box 10
Watertown SD 57201

ATTENTION: Legal Public Notice

Enclosed is a Notice on Application No. 7055-3 to Appropriate Water to be published twice. Please publish the first notice on September 4, 2008 with the second publication 7 days later. The text of the notice can be e-mailed to your paper by contacting Karen Schlaak at (605) 773-3352.

The applicant must verify to you that the notice is to be published, before you make the first publication. **Please BILL the APPLICANT for the cost of publication.** The APPLICANT is Watertown Municipal Utilities, Geoff Heig, 901 4th Ave., SW, Watertown SD 57201(Ph # 605-882-6233).

Please send the Water Rights Program the first publication immediately. The publication is checked for accuracy so any corrections can be made in the second publication. You may use the form below or fax a copy of the first publication. Any fax should be sent to the attention of Karen Schlaak at (605) 773-4068. Publication errors can invalidate the public notice.

After the second publication, **please send us an affidavit or use the enclosed Proof of Publication form.** The applicant pays the cost of publication, but the Water Rights Program records require an affidavit or Proof of Publication. Delays in receiving the affidavit can be costly to the applicant.

Sincerely,

Eric Gronlund
Natural Resources Engineer
605 773-3352

enclosures

-----CUT HERE-----

No. 7055-3

TO: Eric Gronlund
Water Rights Program
Joe Foss Building
Pierre SD 57501-3181

Date _____

We are in receipt of your letter of August 29, 2008 enclosing Notice to Appropriate Water by Application No. 7055-3 which was first published in our issue of _____. ENCLOSED IS A COPY OF THIS FIRST PUBLICATION.

Name

Newspaper



DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

NOTE: TO BE SURE OF PUBLICATION ON
THE CORRECT DATES, CONTACT
THE NEWSPAPER RIGHT AWAY.

August 29, 2008

Watertown Municipal Utilities
Geoff Heig, General Manager
901 4th Ave SW
Watertown SD 57201

Dear Mr. Heig:

Water Permit Application No. 7055-3 for municipal use has been examined and found to comply with the South Dakota Water Laws and applicable rules. A notice has been sent to the Publisher of the Public Opinion printed at Watertown SD (Ph # 605-886-6901). You will need to contact the newspaper and authorize publication of this notice. A copy of the notice is enclosed. The staff report and Chief Engineer's recommendation will be sent to you in the near future. Please review the notice prior to publication and notify this office, if you have any corrections or questions.

Be sure to contact the above newspaper to authorize publication of your Notice and to arrange for payment. Early contact with the paper can eliminate delays. Upon receiving authorization, the publisher has been instructed to publish your notice once each week for two consecutive weeks. The newspaper has also been instructed to send us the Proof of Publication. We must receive Proof of Publication before action can be taken on the application.

Sincerely,

Eric Gronlund
Natural Resources Engineer
(605) 773-3352

enclosures

NOTE: If you plan to contest any part of the Chief Engineer's recommendation, you must file a petition pursuant to the procedures outlined in the attached notice of hearing. The Water Management Board will then consider your concerns during a hearing on the application.

Instruction to Newspaper - Publish first Notice on September 4, 2008 with the second publication 7 days later. The applicant is responsible for payment.

NOTICE OF HEARING on Application No. 7055-3 to Appropriate Water

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Any person interested in opposing or supporting this application must file a written petition with BOTH the applicant and Chief Engineer. The applicant must also file a petition if opposed to the Chief Engineer's recommendation. The Chief Engineer's address is "Water Rights Program, Foss Building, 523 E Capitol, Pierre SD 57501 (605 773-3352)" and the applicant's mailing address is given above. A petition filed by either an interested person or the applicant must be filed by September 22, 2008. The petition may be informal, but must include a statement describing the petitioner's interest in the application, the petitioner's reasons for opposing or supporting the application, and the signature and mailing address of the petitioner or the petitioner's legal counsel, if legal counsel is obtained.

The Water Management Board will consider this application at 10:00 a.m. on October 2, 2008 at the Matthews Training Center, Joe Foss Building, 523 E. Capitol Ave., Pierre SD. The Chief Engineer's recommendation is not final or binding upon the Board. The Board is authorized to 1) approve, 2) approve with qualifications, 3) defer, or 4) deny this application based on the facts presented at the public hearing. The October 2, 2008 hearing date will be automatically delayed for at least 20 days upon written request to the Chief Engineer from the applicant or any interested person opposing the application. The request for an automatic delay must be filed by September 22, 2008.

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This application is made pursuant to SDCL 46-1-1 thru 46-1-9, 46-1-12 thru 46-1-16; 46-2-3.1, 46-2-9, 46-2-11, 46-2-13, 46-2-17; 46-2A-1 thru 46-2A-10, 46-2A-12, 46-2A-14, 46-2A-15, 46-2A-20, 46-2A-21; 46-5-1 thru 46-5-11, 46-5-13 thru 46-5-15, 46-5-24, 46-5-25, 46-5-30.2, 46-5-30.4, 46-5-31, 46-5-38 thru 46-5-40; 74:02:01:24 thru 74:02:01:25. Steven M. Pirner, Secretary, Department of Environment and Natural Resources.

10/31/2008

PAYMENT REQUEST FORM

PAYEE: Watertown Municipal Utilities
Geoff Heig
901 4th Ave SW
Watertown SD 57201

FROM: DENR Water Rights Program
523 E. Capitol Ave
Pierre, SD 57501-3181

DESCRIPTION OF SERVICE, PRODUCE OR TRANSFER

Refund on Permit # 7055-3

AMOUNT: \$250.00

FUNDING SOURCE:

GENERAL: X

FEDERAL:

COMMENTS:

AUTHORIZATION:

Barbara E. Eide 10/31/08

I declare and affirm under the penalties of perjury that this claim is in all things, true and correct. I further agree to comply with the provisions of the Civil Rights Act of 1964 and regulations issued thereunder relating to nondiscrimination in federal assisted programs.



OCT 8 1 2008

**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

Watertown Municipal Utilities Dept.
c/o Geoff Heig
901 4th Ave SW
Watertown SD 57201

Dear Mr. Heig:

Enclosed is Water Permit No. 7055-3 authorizing construction of the city's water diversion system and beneficial use of the water, not exceeding the limits as specified in the Water Permit.

This application was submitted with a \$1425.00 fee. The correct fee is \$1175.00. Therefore, \$250.00 will be refunded to city. The refund check should be received within the next couple of weeks.

Form 10, *Notice of Completion of Works and Application of Water to Beneficial Use*, is enclosed. Please return this completed form after you have finished the system and have put the water to beneficial use. An investigation can then be scheduled so the water license may be issued, thus completing the acquisition of a water right.

An informational sheet ? *Common Water Right Questions?* is also enclosed. This sheet is intended to answer some of the questions associated with obtaining and keeping a water right.

Sincerely,

Garland Erbele, Chief Engineer
Water Rights Program
(605) 773-3352

enclosures

FAX COVER PAGE

FROM:

KAISER WELL DRILLING

45550 193RD ST
LAKE NORDEN, SD 57248
PHONE(605)785-3813
FAX(605)785-3812
TOLL FREE (877)200-0138

7055-3

TO: Ken Buhler

DATE: 8-27

FAX #:

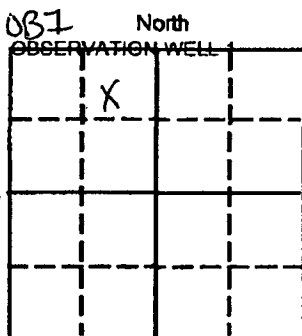
PAGES:10

MESSAGE:

Ken~ Here are signed copies of Watertowns logs. I had sent
copies
the other day but forgot to have John sign them.

SOUTH DAKOTA WATER WELL COMPLETION REPORT

11-02

Location NE $\frac{1}{4}$ NW $\frac{1}{4}$ Sec 31 Twp 118 Rg 52County
Codington

Well Completion Date

1/31/2008

Distance to nearest potential pollution source (Septic tank, abandoned well, feed lot, etc.)

? 100.0 ft. from State Well (Identify source)

PROPOSED USE:

☐ Domestic/Stock Irrigation
 ☒ Municipal Industrial
 ☐ Business Institutional
 ☐ Test Holes
 ☒ Monitoring well

METHOD OF DRILLING:

Direct Rotary

CASING DATA:

☐ Steel
 ☒ Plastic
 ☐ Other

If other describe

PIPEWEIGHT	DIAMETER	FROM	TO	HOLE DIAMETER
40.0 LB/FT	3.00 IN	35.0 FT	55.0 FT	6.00 IN
LB/FT	IN	FT	FT	IN
LB/FT	IN	FT	FT	IN

GROUTING DATA:

Grout Type	No. of Sacks	Grout Weight	From	To
BenSeal	6	54.0 Lb/gal	0.0 Ft	30.0 Ft
		Lb/gal	Ft	Ft

Describe grouting procedure
pressure pull method

SCREEN:

☐ Perforated pipe
 ☒ Manufactured
 Diameter 3.00 Inches Length 20.0 FeetMaterial PlasticSlot Size .035 Set From 35.0 Feet to 55.0 Feet

Other information

WAS A PACKER OR SEAL USED?

☐ Yes
 ☒ No

If so, what material?

Describe packer(s) and location

DISINFECTION: Was well disinfected upon completion?

☐ Yes, How?

☐ No, Why Not?
 Lab sample sent to for
water quality analysisWell Owner: Watertown Municipal Utilities

Business Name:

Address: 901 4th Ave SWCity, State, Zip: Watertown, SD 57201

WELL LOG:

FORMATION	DEPTH	
	FROM	TO
Top Soil	0	6
yellow gravel	6	14
grey sand- fine to med w/l 4links	14	27
blue clay	27	31
sand- fine	31	36
blue clay	36	38
yellow gravel- fine to med w/l 8 links	38	42
yellow gravel-med to coarse w/l 10 li	42	55
blue clay	55	70

STATIC WATER LEVEL

4.0 FEET

If flowing: closed in pressure _____ PSI

GPM flow _____ through _____ Inch pipe

Controlled by ☐ Valve ☐ Reducers ☐ Other

Reduced flow rate _____ GPM

Can well be completely shut in?

WELL TEST DATA:

☒ Pumped Describe: airlift

☐ Bailed

☐ Other

Pumping Level Below Land Surface

_____ Ft. After _____ Hrs. pumped 100 GPM

_____ Ft. After _____ Hrs. pumped _____ GPM

If pump installed, pump rate: _____ GPM

REMARKS

This well was drilled under license # 689

And this report is true and accurate.

Drilling firm: Kaiser Well Drilling Inc

Signature of License Representative:

Signature of Well Owner or Equitable Property Holder:

Date:

SOUTH DAKOTA WATER WELL COMPLETION REPORT

11-02

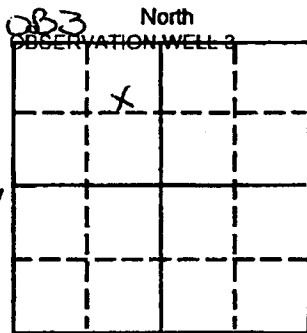
Location <u>NE</u> $\frac{1}{4}$ <u>NW</u> $\frac{1}{4}$ Sec <u>31</u> Twp <u>118</u> Rg <u>52</u>		Well Owner: <u>Watertown Municipal Utilities</u>																																	
County <u>Codington</u>		Business Name: _____																																	
Please mark well location with an "X"		Address: <u>901 4th Ave SW</u>																																	
		City, State, Zip: <u>Watertown, SD 57201</u>																																	
Well Completion Date <u>1/31/2008</u>		WELL LOG: <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">FORMATION</th> <th colspan="2">DEPTH</th> </tr> <tr> <th>FROM</th> <th>TO</th> </tr> </thead> <tbody> <tr><td>Top Soil</td><td>0</td><td>6</td></tr> <tr><td>yellow sand fine</td><td>6</td><td>10</td></tr> <tr><td>blue clay</td><td>10</td><td>12</td></tr> <tr><td>gravel- med to coarse w/ 6 links</td><td>12</td><td>27</td></tr> <tr><td>blue clay</td><td>27</td><td>33</td></tr> <tr><td>yellow clay</td><td>33</td><td>43</td></tr> <tr><td>gravel 10%fine 20%med 70%course</td><td></td><td></td></tr> <tr><td> w/ 16 link</td><td>43</td><td>54</td></tr> <tr><td>yellow clay</td><td>54</td><td>57</td></tr> </tbody> </table>		FORMATION	DEPTH		FROM	TO	Top Soil	0	6	yellow sand fine	6	10	blue clay	10	12	gravel- med to coarse w/ 6 links	12	27	blue clay	27	33	yellow clay	33	43	gravel 10%fine 20%med 70%course			w/ 16 link	43	54	yellow clay	54	57
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Distance to nearest potential pollution source (Septic tank, abandoned well, feed lot, etc.) ? <u>100.0</u> ft. from <u>state well</u> (identify source)		STATIC WATER LEVEL <u>4.0</u> FEET If flowing: closed in pressure _____ PSI GPM flow _____ through _____ Inch pipe Controlled by ☐ Valve ☐ Reducers ☐ Other _____ Reduced flow rate _____ GPM Can well be completely shut in? _____																																	
PROPOSED USE: ☐ Domestic/Stock Irrigation ☒ Municipal Industrial ☐ Business Institutional ☒ Test Holes Monitoring well		WELL TEST DATA: ☒ Pumped Describe: <u>airlift</u> ☐ Bailed ☐ Other Pumping Level Below Land Surface _____ Ft. After _____ Hrs. pumped <u>100.0</u> GPM _____ Ft. After _____ Hrs. pumped _____ GPM If pump installed, pump rate: _____ GPM																																	
METHOD OF DRILLING: <u>Direct Rotary</u>		REMARKS 																																	
CASING DATA: ☐ Steel ☒ Plastic ☐ Other If other describe _____		THIS WELL WAS DRILLED UNDER LICENSE # <u>689</u> And this report is true and accurate. Drilling firm: <u>Kaiser Well Drilling, Inc.</u> Signature of License Representative: _____ Signature of Well Owner or Equitable Property Holder: _____ Date: _____																																	
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GROUTING DATA: <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>Grout Type</th> <th>No. of Sacks</th> <th>Grout Weight</th> <th>From</th> <th>To</th> </tr> </thead> <tbody> <tr> <td>BenSeal</td> <td>6</td> <td>54.0 Lb/gal</td> <td>0.0 Ft</td> <td>29.0 Ft</td> </tr> <tr> <td></td> <td></td> <td>Lb/gal</td> <td>Ft</td> <td>Ft</td> </tr> </tbody> </table> Describe grouting procedure <u>pressure pull method</u>		Grout Type	No. of Sacks	Grout Weight	From	To	BenSeal	6	54.0 Lb/gal	0.0 Ft	29.0 Ft			Lb/gal	Ft	Ft																			
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SCREEN: ☐ Perforated pipe ☒ Manufactured Diameter <u>3.00</u> Inches Length <u>20.0</u> Feet Material <u>plastic</u> Slot Size <u>.035</u> Set From <u>35.0</u> Feet to <u>55.0</u> Feet Other information _____																																			
WAS A PACKER OR SEAL USED? ☐ Yes ☒ No If so, what material? _____ Describe packer(s) and location _____																																			
DISINFECTION: Was well disinfected upon completion? ☐ Yes, How? _____ ☐ No, Why Not? _____ Lab sample sent to for water quality analysis _____																																			

Aug 28 08 10:07a

Rx Date/Time AUG-28-2008 (THU) 09:00

SOUTH DAKOTA WATER WELL COMPLETION REPORT

11-02

Location NE $\frac{1}{4}$ NW $\frac{1}{4}$ Sec 31 Twp 118 Rg 52County
CodingtonPlease mark well
location with an "X"

Well Completion Date

1/31/2008

Distance to nearest potential pollution source (Septic tank, abandoned well, feed lot, etc.)

100.0 ft. from state well (Identify source)

PROPOSED USE:

☐ Domestic/Stock Irrigation
 ☒ Municipal Industrial
 ☐ Business Institutional
 ☐ Test Holes
 ☒ Monitoring well

METHOD OF DRILLING:

Direct Rotary

CASING DATA:

☐ Steel
 ☒ Plastic
 ☐ Other

If other describe

PIPEWEIGHT	DIAMETER	FROM	TO	HOLE DIAMETER
LB/FT	IN	FT	FT	IN
40.0 LB/FT	3.00 IN	35.0 FT	55.0 FT	6.00 IN

GROUTING DATA:

Grout Type	No. of Sacks	Grout Weight	From	To
		Lb/gal	0.0 Ft	30.0 Ft
BenSeal	6	54.0 Lb/gal		

Describe grouting procedure
pressure pull method

SCREEN:

☐ Perforated pipe
 ☒ Manufactured
 Diameter 3.00 Inches Length 20.0 FeetMaterial plasticSlot Size .035 Set From 35.0 Feet to 55.0 Feet

Other information

WAS A PACKER OR SEAL USED?

☐ Yes
 ☒ No

If so, what material?

Describe packer(s) and location

DISINFECTION: Was well disinfected upon completion?

☐ Yes, How?

☐ No, Why Not?
 Lab sample sent to for
water quality analysisWell Owner: Watertown Municipal Utilities

Business Name:

Address: 901 4th Ave SWCity, State, Zip: Watertown, SD 57201

WELL LOG:

FORMATION	DEPTH	
	FROM	TO
Top Soil	0	2.5
gravel- med- coarse w/l 2links	2.5	8
blue clay	8	11
yellow sand- fine- med w/l 9links	11	28.5
blue clay	28.5	30
yellow - fine to med w/l 6links	30	36
yellow soft clay	36	38
yellow fine sand	38	40
yellow soft clay	40	45

STATIC WATER LEVEL 4.0 FEET

If flowing: closed in pressure _____ PSI

GPM flow _____ through _____ Inch pipe

Controlled by ☐ Valve ☐ Reducers ☐ Other _____

Reduced flow rate _____ GPM

Can well be completely shut in?

WELL TEST DATA:

☒ Pumped Describe: airlift☐ Bailed☐ Other

Pumping Level Below Land Surface

_____ Ft. After _____ Hrs. pumped 100.0 GPM

_____ Ft. After _____ Hrs. pumped _____ GPM

If pump installed, pump rate: _____ GPM

REMARKS

yellow- fine - med w/l 4 links 45-49

blue clay firm 49-50

gravel- med- coarse 50-55

blue clay 55-60

This well was drilled under license # 689

And this report is true and accurate.

Drilling firm: Kaiser Well Drilling, Inc.

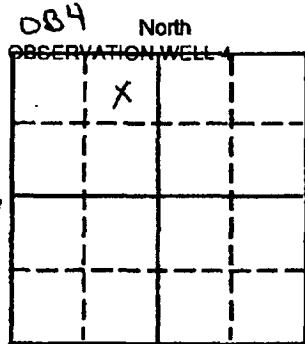
Signature of License Representative:

Signature of Well Owner or Equitable Property Holder:

Date:

SOUTH DAKOTA WATER WELL COMPLETION REPORT

11-02

Location NE $\frac{1}{4}$ NW $\frac{1}{4}$ Sec 31 Twp 118 Rg 52County
CodingtonPlease mark well
location with an "X"

1 Mile

Well Completion Date

1/31/2008

Distance to nearest potential pollution source (Septic tank, abandoned well, feed lot, etc.)

100.0 ft. from state well (identify source)

PROPOSED USE:

☐ Domestic/Stock Irrigation
 ☒ Municipal Industrial
 ☐ Business Institutional
 ☒ Test Holes Monitoring well

METHOD OF DRILLING:

Direct Rotary

CASING DATA:

☐ Steel
 ☒ Plastic
 ☐ Other

If other describe

PIPEWEIGHT	DIAMETER	FROM	TO	HOLE DIAMETER
40.0 LB/FT	3.00 IN	34.0 FT	54.0 FT	6.00 IN
LB/FT	IN	FT	FT	IN
LB/FT	IN	FT	FT	IN

GROUTING DATA:

Grout Type	No. of Sacks	Grout Weight	From	To
BenSeal	6	54.0 Lb/gal	0.0 Ft	29.0 Ft
		Lb/gal	Ft	Ft

Describe grouting procedure
pressure pull method

SCREEN:

☐ Perforated pipe
 ☒ Manufactured
Diameter 3.00 Inches Length 20.0 FeetMaterial plasticSlot Size .035 Set From 34.0 Feet to 54.0 Feet

Other information

WAS A PACKER OR SEAL USED?

☐ Yes
 ☒ No

If so, what material?

Describe packer(s) and location

DISINFECTION: Was well disinfected upon completion?

☐ Yes, How?

☐ No, Why Not?
Lab sample sent to for
water quality analysisWell Owner: Watertown Municipal Utilities

Business Name:

Address: 901 4th Ave SWCity, State, Zip: Watertown, SD 57201

WELL LOG:

FORMATION	DEPTH	
	FROM	TO
Top Soil	0	4
gravel- med- coarse w/l 2links	4	8
blue clay	8	11
yellow sand- fine- med w/l 4links	11	28.5
blue clay	28.5	30
yellow fine sand w/l 4links	30	38
yellow soft clay	38	45
yellow gravel- med to coarse w/l 6lin	45	54
blue clay	54	55

STATIC WATER LEVEL 4.0 FEET

If flowing: closed in pressure _____ PSI

GPM flow _____ through _____ Inch pipe

Controlled by ☐ Valve ☐ Reducers ☐ Other

Reduced flow rate _____ GPM

Can well be completely shut in?

WELL TEST DATA:

☒ Pumped Describe: airlift☐ Bailed☐ Other

Pumping Level Below Land Surface

_____ FL After _____ Hrs. pumped 100.0 GPM

_____ FL After _____ Hrs. pumped _____ GPM

If pump installed, pump rate: _____ GPM

REMARKS

This well was drilled under license # 689

And this report is true and accurate.

Drilling firm: Kaiser Well Drilling, Inc.

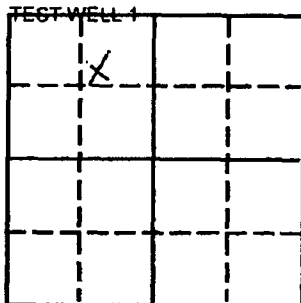
Signature of License Representative:

Signature of Well Owner or Equitable Property Holder:

Date:

SOUTH DAKOTA WATER WELL COMPLETION REPORT

11-02

Location NE 1/4 NW 1/4 Sec 31 Twp 118 Rg 52County
Codington6" well
TWI NorthPlease mark well
location with an "X"

Well Completion Date

1/31/2008

Distance to nearest potential pollution source (Septic tank, abandoned well, feed lot, etc.)

100.0 ft. from State Well (identify source)

PROPOSED USE:

☐ Domestic/Stock Irrigation
 ☒ Municipal Industrial
 ☐ Business Institutional
 ☐ Test Holes Monitoring well

METHOD OF DRILLING:

Direct Rotary

CASING DATA:

☐ Steel
 ☒ Plastic
 ☐ Other

If other describe

PIPEWEIGHT	DIAMETER	FROM	TO	HOLE DIAMETER
40.0 LB/FT	6.00 IN	35.0 FT	55.0 FT	9.12 IN
LB/FT	IN	FT	FT	IN
LB/FT	IN	FT	FT	IN

GROUTING DATA:

Grout Type	No. of Sacks	Grout Weight	From	To
BenSeal	11	54.0 Lb/gal	0.0 Ft	30.0 Ft
		Lb/gal	Ft	Ft

Describe grouting procedure
pressure pull method

SCREEN:

☐ Perforated pipe
 ☒ Manufactured
 Diameter 6.00 Inches Length 20.0 FeetMaterial PlasticSlot Size .080 Set From 35.0 Feet to 55.0 Feet

Other information

WAS A PACKER OR SEAL USED?

☐ Yes
 ☒ No

If so, what material?

Describe packer(s) and location

DISINFECTION: Was well disinfected upon completion?

☐ Yes, How?

☐ No, Why Not?
 Lab sample sent to for
water quality analysisWell Owner: Watertown Municipal Utilities

Business Name:

Address: 901 4th Ave SWCity, State, Zip: Watertown, SD 57201

WELL LOG:

FORMATION	DEPTH	
	FROM	TO
Top Soil	0	6
yellow gravel	6	14
grey sand- fine to med w/l 4links	14	27
blue clay	27	31
sand- fine	31	36
blue clay	36	38
yellow gravel- fine to med w/l 8 links	38	42
yellow gravel-med to coarse w/l 10 li	42	55
blue clay	55	70

STATIC WATER LEVEL

4.0 FEET

If flowing: closed in pressure

PSI

GPM flow through inch pipe

Controlled by ☐ Valve ☐ Reducers ☐ Other

Reduced flow rate GPM

Can well be completely shut in?

WELL TEST DATA:

☒ Pumped Describe:☐ Bailed☐ Other

Pumping Level Below Land Surface

21.0 Ft. After 168.0 Hrs. pumped 300.0 GPM

Ft. After Hrs. pumped GPM

If pump installed, pump rate: GPM

REMARKS

This well was drilled under license # 689

And this report is true and accurate.

Drilling firm: Kaiser Well Drilling Inc

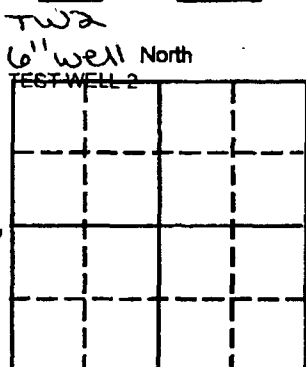
Signature of License Representative:

Signature of Well Owner or Equitable Property Holder:

Date:

SOUTH DAKOTA WATER WELL COMPLETION REPORT

11-02

Location NE 1/4 NW 1/4 Sec 31 Twp 118 Rg 52County
CodingtonPlease mark well
location with an "X"Well Completion Date
1/31/2008Distance to nearest potential pollution source (Septic tank, abandoned well, feed lot, etc.)
? 100.0 ft. from state well (identify source)

PROPOSED USE:

☐ Domestic/Stock Irrigation
☒ Municipal Industrial
☐ Business Institutional
☒ Test Holes Monitoring well

METHOD OF DRILLING:

Direct Rotary

CASING DATA:

☐ Steel ☒ Plastic ☐ Other

If other describe _____

PIPEWEIGHT	DIAMETER	FROM	TO	HOLE DIAMETER
40.0 LB/FT	6.00 IN	34.0 FT	54.0 FT	9.12 IN
LB/FT	IN	FT	FT	IN
LB/FT	IN	FT	FT	IN

GROUTING DATA:

Grout Type	No. of Sacks	Grout Weight	From	To
BenSeal	11	54.0 Lb/gal	0.0 Ft	29.0 Ft
		Lb/gal	Ft	Ft

Describe grouting procedure
pressure pull method

SCREEN:

☐ Perforated pipe ☒ Manufactured
 Diameter 6.00 Inches Length 20.0 Feet
Material plasticSlot Size .080 Set From 34.0 Feet to 54.0 Feet

Other information _____

WAS A PACKER OR SEAL USED?

☐ Yes ☒ No

If so, what material? _____

Describe packer(s) and location _____

DISINFECTION: Was well disinfected upon completion?

☐ Yes, How? _____
☐ No, Why Not? _____
Lab sample sent to for
water quality analysisWell Owner: Watertown Municipal Utilities

Business Name: _____

Address: 901 4th Ave SWCity, State, Zip: Watertown, SD 57201

WELL LOG:

FORMATION	DEPTH	
	FROM	TO
Top Soil	0	4
gravel- med- coarse w/l 2links	4	8
blue clay	8	11
yellow sand- fine- med w/l 4links	11	28.5
blue clay	28.5	30
yellow fine sand w/l 4links	30	38
yellow soft clay	38	45
yellow gravel- med to coarse w/l 6lin	45	54
blue clay	54	55

STATIC WATER LEVEL 4.0 FEET

If flowing: closed in pressure _____ PSI

GPM flow _____ through _____ Inch pipe

Controlled by ☐ Valve ☐ Reducers ☐ Other _____

Reduced flow rate _____ GPM

Can well be completely shut in?

WELL TEST DATA:

☒ Pumped Describe:☐ Bailed☐ Other

Pumping Level Below Land Surface

21.0 Ft. After 72.0 Hrs. pumped 300.0 GPM

_____ Ft. After _____ Hrs. pumped _____ GPM

If pump installed, pump rate: _____ GPM

REMARKS

This well was drilled under license # 689

And this report is true and accurate.

Drilling firm: Kaiser Well Drilling, Inc.

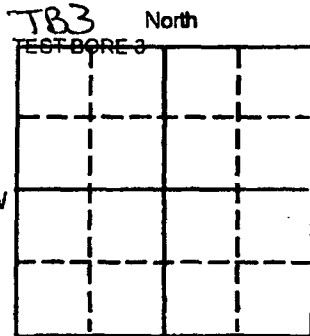
Signature of License Representative:

Signature of Well Owner or Equitable Property Holder:

Date: _____

SOUTH DAKOTA WATER WELL COMPLETION REPORT

11-02

Location NE ¼ NW ¼ Sec 31 Twp 118 Rg 52County
CODINGTON

Well Completion Date

1/31/2008

Distance to nearest potential pollution source (Septic tank, abandoned well, feed lot, etc.)

? 100.0 ft. from state well (Identify source)

PROPOSED USE:

☐ Domestic/Stock Irrigation
 ☒ Municipal Industrial
 ☐ Business Institutional
 ☒ Test Holes Monitoring well

METHOD OF DRILLING:

Direct Rotary

CASING DATA:

If other describe

☐ Steel
 ☐ Plastic
 ☐ Other

PIPEWEIGHT	DIAMETER	FROM	TO	HOLE DIAMETER
LB/FT	IN	FT	FT	IN
LB/FT	IN	FT	FT	IN
LB/FT	IN	FT	FT	IN

GROUTING DATA:

Grout Type	No. of Sacks	Grout Weight	From	To
		Lb/gal	0.0 Ft	60.0 Ft
BenSeal	12	54.0 Lb/gal		

Describe grouting procedure

SCREEN:

☐ Perforated pipe
 ☐ Manufactured

Diameter _____ Inches Length _____ Feet

Material _____

Slot Size _____ Set From _____ Feet to _____ Feet

Other information _____

WAS A PACKER OR SEAL USED?

☐ Yes
 ☐ No

If so, what material? _____

Describe packer(s) and location _____

DISINFECTION: Was well disinfected upon completion?

☐ Yes, How? _____

Lab sample sent to for water quality analysis

☐ No, Why Not? _____
Well Owner: Watertown Municipal Utilities

Business Name: _____

Address: 901 4th Ave SWCity, State, Zip: Watertown, SD 57201

WELL LOG:

FORMATION	DEPTH	
	FROM	TO
Top Soil	0	3
soft black sandy soil	3	8
yellow sand- fine-med w/l 6links	8	15
grey fine-med w/l 4links	15	25
yellow clay	25	27
fine sand w/l 2links	27	31
yellow clay soft	31	39
grey fine-med w/l 2links	39	45
blue clay	45	47

STATIC WATER LEVEL

FEET

If flowing: closed in pressure _____

PSI

GPM flow _____ through _____ Inch pipe

Controlled by ☐ Valve ☐ Reducers ☐ Other _____

Reduced flow rate _____ GPM

Can well be completely shut in?

WELL TEST DATA:

☐ Pumped Describe: _____☐ Bailed☐ Other

Pumping Level Below Land Surface

_____ Ft. After _____ Hrs. pumped _____ GPM

_____ Ft. After _____ Hrs. pumped _____ GPM

If pump installed, pump rate: _____ GPM

REMARKS

 grey- fine-med w/l 6links 47-55
 blue clay 55-60
This well was drilled under license # 689

And this report is true and accurate.

Drilling firm: Kaiser Well Drilling Inc

Signature of License Representative: _____

Signature of Well Owner or Equitable Property Holder: _____

Date: _____

SOUTH DAKOTA WATER WELL COMPLETION REPORT

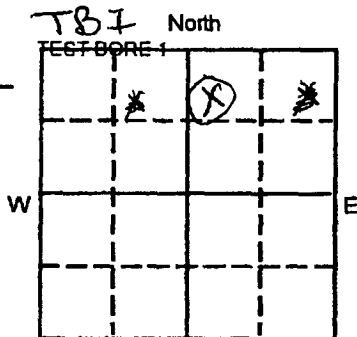
11-02

Location NW ¼ NE ¼ Sec 31 Twp 118 Rg 52

County

CODINGTON

Please mark well location with an "X"



Well Completion Date

1/31/2008

Distance to nearest potential pollution source (Septic tank, abandoned well, feed lot, etc.)

100.0 ft. from state well (Identify source)

PROPOSED USE:

☐ Domestic/Stock Irrigation
 ☒ Municipal Industrial
 ☐ Business Institutional
 ☒ Test Holes Monitoring well

METHOD OF DRILLING:

Direct Rotary

CASING DATA:

If other describe

☐ Steel
 ☐ Plastic
 ☐ Other

PIPEWEIGHT	DIAMETER	FROM	TO	HOLE DIAMETER
LB/FT	IN	FT	FT	IN

GROUTING DATA:

Grout Type	No. of Sacks	Grout Weight	From	To
		Lb/gal	0.0 Ft	74.0 Ft
BenSeal	12	54.0		

Describe grouting procedure

SCREEN:

☐ Perforated pipe
 ☐ Manufactured

Diameter _____ Inches Length _____ Feet

Material _____

Slot Size _____ Set From _____ Feet to _____ Feet

Other information _____

WAS A PACKER OR SEAL USED?

☐ Yes
 ☐ No

If so, what material? _____

Describe packer(s) and location _____

DISINFECTION: Was well disinfected upon completion?

☐ Yes, How? _____

☐ No, Why Not? _____

Lab sample sent to for water quality analysis

Well Owner: Watertown Municipal Utilities

Business Name: _____

Address: 901 4th Ave SWCity, State, Zip: Watertown, SD 57201

WELL LOG:

FORMATION	DEPTH	
	FROM	TO
Top Soil	0	6
yellow sand fine	6	8
grey gravel- med- coarse w/l 10links	8	24
yellow clay	24	26
fine sand w/l 8links	26	33
blue soft clay	33	43
yellow gravel- med-coarse w/l 18link	43	55
blue clay firm	55	74

STATIC WATER LEVEL

FEET

If flowing: closed in pressure

PSI

GPM flow

through

Inch pipe

Controlled by

☐ Valve☐ Reducers☐ Other

Reduced flow rate

GPM

Can well be completely shut in?

WELL TEST DATA:

☐ Pumped Describe:☐ Bailed☐ Other

Pumping Level Below Land Surface

Ft. After

Hrs. pumped

GPM

Ft. After

Hrs. pumped

GPM

If pump installed, pump rate:

GPM

REMARKS

This well was drilled under license #

689

And this report is true and accurate.

Drilling firm: Kaiser Well Drilling Inc

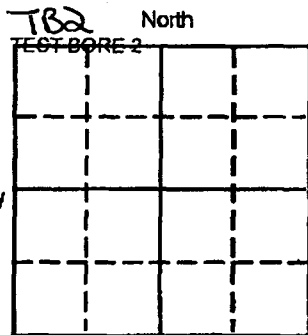
Signature of License Representative:

Signature of Well Owner or Equitable Property Holder:

Date: _____

SOUTH DAKOTA WATER WELL COMPLETION REPORT

11-02

Location NE $\frac{1}{4}$ NW $\frac{1}{4}$ Sec 31 Twp 118 Rg 52County
CODINGTON

Well Completion Date

1/31/2008Distance to nearest potential pollution source (Septic tank, abandoned well, feed lot, etc.)
? 100.0 ft. from state well (Identify source)

PROPOSED USE:

☐ Domestic/Stock Irrigation
☒ Municipal Industrial
☐ Business Institutional
☒ Test Holes Monitoring well

METHOD OF DRILLING:

Direct Rotary

CASING DATA:

☐ Steel ☐ Plastic ☐ Other

If other describe

PIPEWEIGHT	DIAMETER	FROM	TO	HOLE DIAMETER
LB/FT	IN	FT	FT	IN
LB/FT	IN	FT	FT	IN
LB/FT	IN	FT	FT	IN

GROUTING DATA:

Grout Type	No. of Sacks	Grout Weight	From	To
BenSeal	12	54.0 Lb/gal	0.0 Ft	60.0 Ft
		Lb/gal	Ft	Ft

Describe grouting procedure

SCREEN:

☐ Perforated pipe ☐ Manufactured

Diameter _____ Inches Length _____ Feet

Material _____

Slot Size _____ Set From _____ Feet to _____ Feet

Other information

WAS A PACKER OR SEAL USED?

☐ Yes ☐ No

If so, what material?

Describe packer(s) and location

DISINFECTION: Was well disinfected upon completion?

☐ Yes, How?

☐ No, Why Not?

Lab sample sent to for water quality analysis

Well Owner: Watertown Municipal Utilities

Business Name:

Address: 901 4th Ave SWCity, State, Zip: Watertown, SD 57201

WELL LOG:

DEPTH

FORMATION	FROM	TO
Top Soil	0	6
yellow sandy clay	6	10
gravel- med- coarse w/ 12 links	10	24
blue clay soft	24	28
grey fine sand	28	31
blue clay	31	33
gravel- fine-med w/ 2 link	33	37
blue clay	37	42
rocks med - coarse w/ 10 links	42	51

STATIC WATER LEVEL

FEET

If flowing: closed in pressure

PSI

GPM flow

through

Inch pipe

Controlled by

☐ Valve

☐ Reducers

☐ Other

Reduced flow rate

GPM

Can well be completely shut in?

WELL TEST DATA:

☐ Pumped Describe:

☐ Bailed

☐ Other

Pumping Level Below Land Surface

Ft. After

Hrs. pumped

GPM

Ft. After

Hrs. pumped

GPM

If pump installed, pump rate:

GPM

REMARKS

Blue Clay

51-60

This well was drilled under license #

689

And this report is true and accurate.

Drilling firm: Kaiser Well Drilling Inc

Signature of License Representative:

Signature of Well Owner or Equitable Property Holder:

Date:

**NOTICE OF COMPLETION OF WORKS AND
APPLICATION OF WATER TO BENEFICIAL USE**

Date 11/5/2010

TO: Water Rights Program, DENR
523 E. Capitol
Pierre, SD 57501-3181

FROM: Watertown Municipal Utilities

(name)

901 4th Ave NW

(address)

Watertown

SD

57201

(city, state, zip)

(605) 882-6233

(phone)

I have completed the construction of the water use system and I have put the water to beneficial use to the maximum extent it is going to be used.

Water Permit No. 7055-3 states that the water use system is to be constructed by

10/2/2013

(date)

, and water is to be put to beneficial use by

10/2/2017

(date)

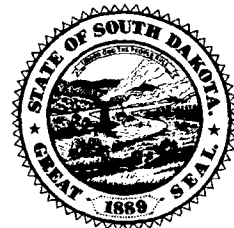
The water use system was completed on 10/6/2010

(date)

Applying the water to beneficial use was completed on 10/7/2010

(date)

You may schedule an investigation so that the water license may be issued.





**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

JOE FOSS BUILDING
PMB 2020
523 EAST CAPITOL
PIERRE SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

November 9, 2010

7055-3

Jeff DeVille
Watertown Municipal Utilities
901 4th Ave NW
Watertown SD 57201

Dear Mr. DeVille:

I am writing to acknowledge receipt of the "Notice of Completion of Works" form that you sent in to let us know that you are completed with the water use system authorized under Water Permit No. 7055-3.

The system is now ready for inspection. Inspections are done on a county-by-county basis as staff time permits. You have done everything you need to do and the intervening time between the completion of your project and the staff inspection has no bearing on your water permit.

Someone from our office will contact you prior to the inspection to set up a time that is convenient for you. If you have any questions, please contact me.

Sincerely,

A handwritten signature in black ink that reads 'Genny McMath'.

Genny McMath
Environmental Scientist
Water Rights Program
(605) 773-3352
email: genny.mcmath@state.sd.us

Permit No. 7055-3
Sioux River - Water District

Report of Examination of Works and/or Application of Water to Beneficial Use

TO: Chief Engineer, Water Rights Program, DENR, Foss Bldg., Pierre, SD 57501

I have made a thorough examination of the water use system constructed by **Watertown Municipal Utilities Dept.**, of **901 4th Ave., SW, Watertown, SD 57201** holder of Permit No. **7055-3**, bearing the priority of **April 6, 1995** authorizing the diversion of **8.0** cubic feet per second (cfs) and **4,500 acre-feet annually** of the waters of the **Big Sioux:North Aquifer** for **Municipal use** purposes, in **Codington** County.

Inspection contact & relationship **Jeff DeVille**
to permit holder, if applicable:

A. Works used to divert the water:

Well Information:

- 1) Well Drilling Firm: **Thein Well Company, Inc.**
- 2) No. of Wells **9**
- 3) Well log(s) available **Y**

Well 31:

Casing:

- 1) Diameter **18** inches
- 2) Length **36** feet
- 3) Type **Steel**

Screen:

- 1) Type **Stainless Steel**
- 2) Length **20** feet
- 3) Static water level **4** feet

Well 33:

Casing:

- 1) Diameter **18** inches
- 2) Length **40.5** feet
- 3) Type **Steel**

Screen:

- 1) Type **Stainless Steel**
- 2) Length **15** feet
- 3) Static water level **2.8** feet

Well 32:

Casing:

- 1) Diameter **18** inches
- 2) Length **40** feet
- 3) Type **Steel**

Screen:

- 1) Type **Stainless Steel**
- 2) Length **15** feet
- 3) Static water level **4** feet

Well 34:

Casing:

- 1) Diameter **18** inches
- 2) Length **42.6** feet
- 3) Type **Steel**

Screen:

- 1) Type **Stainless Steel**
- 2) Length **15** feet
- 3) Static water level **24.6** feet

Well 35:

Casing:

- 1) Diameter 18 inches
- 2) Length 43.5 feet
- 3) Type Steel

Screen:

- 1) Type Stainless Steel
- 2) Length 15 feet
- 3) Static water level 6.1 feet

Well 37:

Casing:

- 1) Diameter 18 inches
- 2) Length 49.8 feet
- 3) Type Steel

Screen:

- 1) Type Stainless Steel
- 2) Length 13 feet
- 3) Static water level 6.5 feet

Well 39:

Casing:

- 1) Diameter 18 inches
- 2) Length 42.5 feet
- 3) Type Steel

Screen:

- 1) Type Stainless Steel
- 2) Length 17 feet
- 3) Static water level 6.5 feet

Pump:

- 1) Make (9) Grundfos
- 2) Model 385S-150-2
- 3) Size 15 hp
- 4) Capacity 385 GPM

Well 36:

Casing:

- 1) Diameter 18 inches
- 2) Length 42 feet
- 3) Type Steel

Screen:

- 1) Type Stainless Steel
- 2) Length 20 feet
- 3) Static water level 6.2 feet

Well 38:

Casing:

- 1) Diameter 18 inches
- 2) Length 43.7 feet
- 3) Type Steel

Screen:

- 1) Type Stainless Steel
- 2) Length 15 feet
- 3) Static water level 13.7 feet

B. Compliance with Permit Requirements:

- 1) Permit qualifications being abided by Y
- 2) Irrigation Questionnaires checked to determine if permit owner started irrigation by the end of construction period NA
- 3) Exceptions to compliance are: None

The system is in Good condition with the point(s) of diversion located as follows:

Well 31:

Approximately 55 feet south and 1,980 feet east of the NW corner of Section 31-T118N-R52W
(N 44.99137, W -97.11866) (NE ¼ NW ¼)

Well 32:

Approximately 65 feet south and 2,555 feet east of the NW corner of Section 31-T118N-R52W
(N 44.99132, W -97.11652) (NE ¼ NW ¼)

Well 33:

Approximately 40 feet south and 1,970 feet west of the NE corner of Section 31-T118N-R52W
(N 44.99147, W -97.11367) (NW ¼ NE ¼)

Well 34:

Approximately 745 feet south and 2,145 feet east of the NW corner of Section 31-T118N-R52W
(N 44.98945, W -97.11811) (NE ¼ NW ¼)

Well 35:

Approximately 615 feet south and 2,475 feet west of the NE corner of Section 31-T118N-R52W
(N 44.98982, W -97.11577) (NW ¼ NE ¼)

Well 36:

Approximately 625 feet south and 1,905 feet west of the NE corner of Section 31-T118N-R52W
(N 44.99003, W -97.11333) (NW ¼ NE ¼)

Well 37:

Approximately 690 feet south and 1,350 feet west of the NE corner of Section 31-T118N-R52W
(N 44.98975, W -97.11142) (NW ¼ NE ¼)

Well 38:

Approximately 1,175 feet south and 2,245 feet west of the NE corner of Section 31-T118N-R52W
(N 44.98831, W -97.11487) (NW ¼ NE ¼)

Well 39:

Approximately 1,255 feet south and 1,600 feet west of the NE corner of Section 31-T118N-R52W
(N 44.98818, W -97.11239) (NW ¼ NE ¼)

Report of Examination of Works

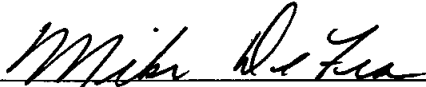
Permit No. 7055-3

The works are capable of diverting and conveying to the place of use 8.0 cfs and 4,500 acre-feet annually of water which is to be used for Municipal use. Water has been put to beneficial use to the maximum extent as follows:

The license should be issued for 8.0 cfs and 4,500 acre-feet annually.

All structures, wells and lands on map Y

Comments or other permit(s) associated with the project:



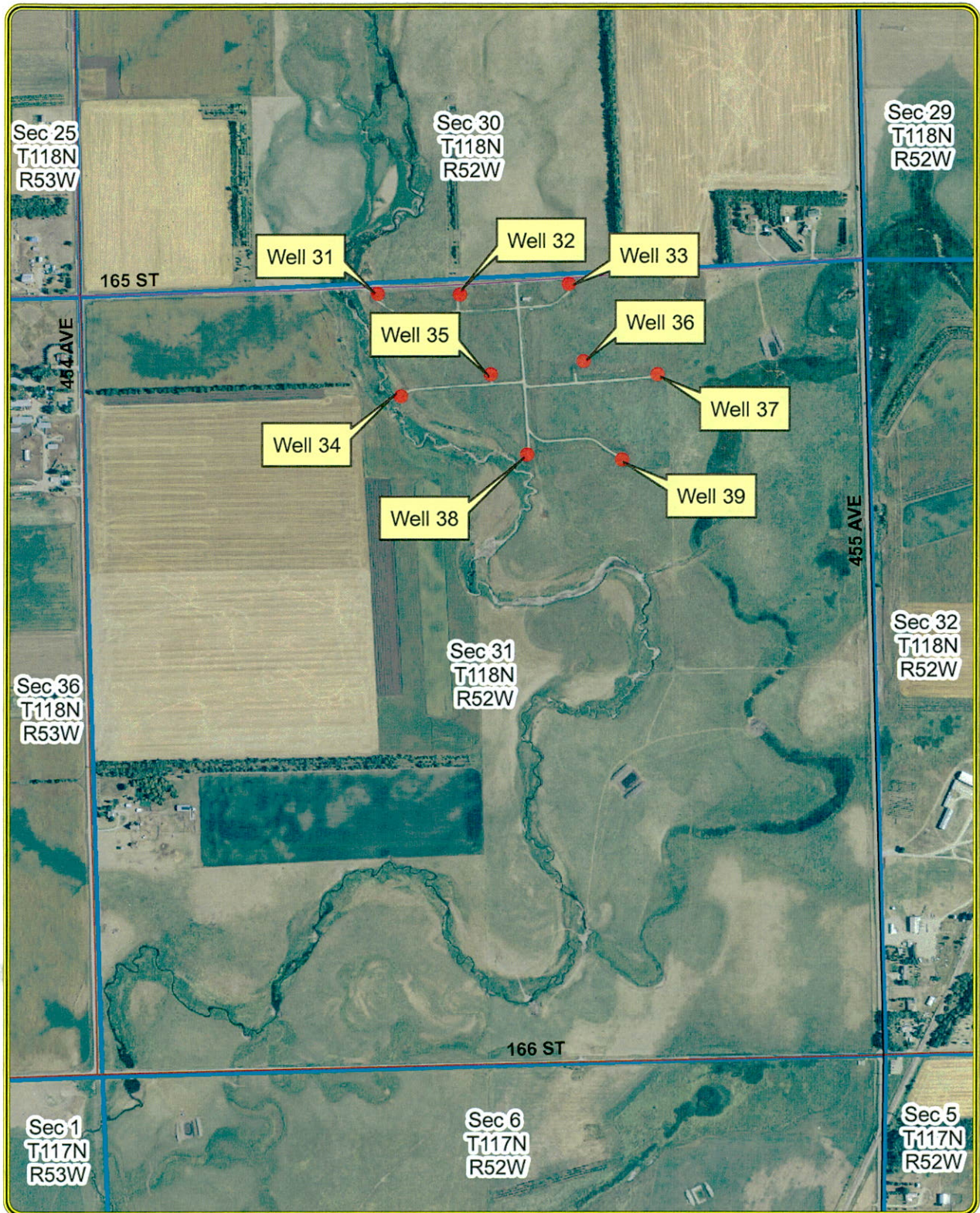
Mike DeFea

Natural Resources Engineer II

DENR, Water Rights Program

Date report completed: July 11, 2014

**Watertown Municipal Utilities Dept.
Water Permit No. 7055-3**



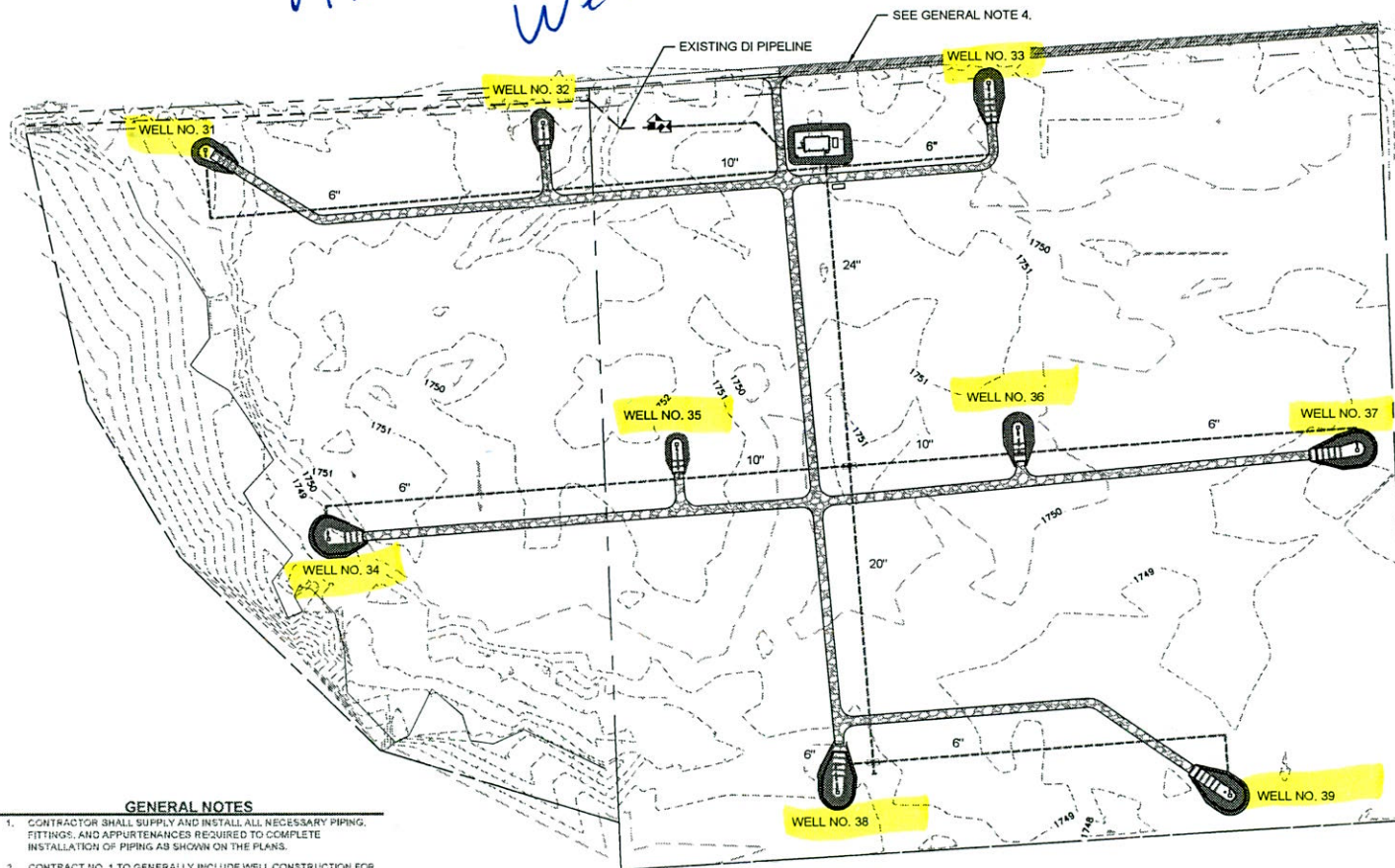
0 0.125 0.25 0.5 Miles


Mike DeFea
Natural Resources Engineer
DENR, Water Rights Program
July 10, 2014



South Dakota
Department of Environment
& Natural Resources
Protecting SD's Tomorrow... Today

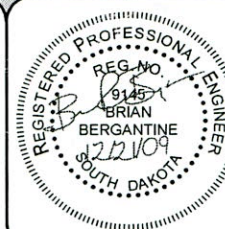
Rauville Field
 well 7055-3



GENERAL NOTES

1. CONTRACTOR SHALL SUPPLY AND INSTALL ALL NECESSARY PIPING, FITTINGS, AND APPURTENANCES REQUIRED TO COMPLETE INSTALLATION OF PIPING AS SHOWN ON THE PLANS.
2. CONTRACT NO. 1 TO GENERALLY INCLUDE WELL CONSTRUCTION FOR NINE (9) PRODUCTION WELLS AND ONE (1) OBSERVATION WELL.
3. CONTRACT NO. 2 TO GENERALLY INCLUDE CONSTRUCTION OF WELL SITE WORK AND EMBANKMENT, VALVE VAULTS, RAW WATER TRANSMISSION PIPELINES, VALVES, METER BUILDING, BUILDING SITE WORK AND EMBANKMENT, ROADS, AND CONNECTIONS.
4. CONTRACTOR SHALL OBTAIN ACCESS TO THE SITE BY USING THE TOWNSHIP ROAD TO THE WEST OF THE ENTRANCE, THE TOWNSHIP ROAD TO THE EAST OF THE ENTRANCE MAYBE USED ONLY WITH TOWNSHIP BOARD APPROVAL.

1
 C2 WELL SITE PLAN



RAUVILLE WELLFIELD CONSTRUCTION
 WATERTOWN MUNICIPAL UTILITIES
 WATERTOWN, SOUTH DAKOTA

OVERALL SITE PLAN

DRAWING TYPE	CONSTRUCTION
DRAWN BY	CDD
CHECKED/APPROVED	BRB
DATE	DEC 2009
PROJECT NUMBER	P00847-2007-02
SHEET	2 of 13

C2

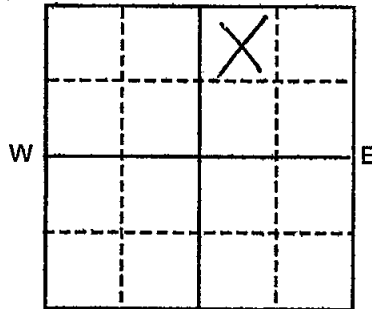
SOUTH DAKOTA WATER WELL COMPLETION REPORT

11-02

Location NW ¼ NE ¼ Sec 31 Twp 118N Rg 52W

County Codington

North

Please mark well
location with an "X"

Well Completion Date

April 20, 2010

1 Mile

Distance to nearest potential pollution source (septic tank, abandoned well, feed lot, etc.)?
ft. from None (Identify source)

PROPOSED USE:

☐ Domestic/Stock ☒ Municipal ☐ Business ☐ Test holes
☐ Irrigation ☐ Industrial ☐ Institutional ☐ Monitoring well

METHOD OF DRILLING:

Mud Rotary

CASING DATA:

☒ Steel ☐ Plastic ☐ Other

If other describe

PIPEWEIGHT	DIAMETER	FROM	TO	HOLE DIAMETER
LB/FT	18.00 IN	0.0 FT	36.3 FT	24.00 IN
LB/FT	IN	FT	FT	IN
LB/FT	IN	FT	FT	IN

GROUTING DATA:

Grout Type	No. of Sacks	Grout Weight	From	To
Neat cement	41	100.0 Lb/gal	2.3 Ft	32.3 Ft
		Lb/gal	Ft	Ft

Describe grouting procedure

Tremie piped

SCREEN:

☐ Perforated pipe ☒ Manufactured

Diameter 18.00 Inches Length 20.0 Feet

Material Stainless steel

Slot Size 30 Set From 36.3 Feet to 56.3 Feet

Other information

WAS A PACKER OR SEAL USED?

☐ Yes ☒ No

If so, what material?

Describe packer(s) and location

DISINFECTION: Was well disinfected upon completion?

☒ Yes, How? Chlorinated

☐ No, Why Not?
 Lab to which water
 quality sample sent for analysis

Well Owner: Watertown Municipal Utilities

Business Name:

Address: 901 4th Ave SW

City, State, Zip: Watertown SD 57201

WELL LOG:

FORMATION	DEPTH	
	FROM	TO
Berm fill	0	2.33
Silty sand - clay	2.33	26.33
Silty clay	26.33	27.33
Sand	27.33	34.33
Silty sand	34.33	42.33
Sand	42.33	57.33

STATIC WATER LEVEL

4.3 FEET

If flowing: closed in pressure PSI

GPM flow through Inch pipe

Controlled by ☐ Valve ☐ Reducers ☐ Other

Reduced flow rate GPM

Can well be completely shut in?

WELL TEST DATA:

☒ Pumped Describe:☐ Bailed☐ Other

Pumping Level Below Land Surface

36.5 Ft. After 5.0 Hrs. pumped 300.0 GPM

Ft. After Hrs. pumped GPM

If pump installed, pump rate: GPM

REMARKS

Well No. 31

N 44 59.479

W 097 07.126

This well was drilled under license # 475 and this report is true and accurate.

Drilling firm: Thein Well Company, Inc.

Signature of License Representative:

Signature of Well Owner or Equitable Property Holder:

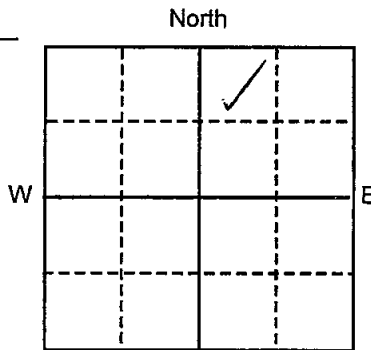
Date:

SOUTH DAKOTA WATER WELL COMPLETION REPORT

11-02

Location NW ¼ NE ¼ Sec 31 Twp 118N Rg 52WWell Owner: Watertown Municipal UtilitiesCounty Codington

Business Name: _____

Address: 901 4th Ave SWCity, State, Zip: Watertown SD 57201Please mark well
location with an "X"

Well Completion Date

4/8/10

← 1 Mile →

Distance to nearest potential pollution source (septic tank, abandoned well, feed lot, etc.)?
ft. from NONE (Identify source) _____

PROPOSED USE:

☐ Domestic/Stock ☒ Municipal ☐ Business ☐ Test holes
☐ Irrigation ☐ Industrial ☐ Institutional ☐ Monitoring well
METHOD OF DRILLING:
MUD ROTARY

CASING DATA:

☒ Steel ☐ Plastic ☐ Other

If other describe _____

PIPEWEIGHT	DIAMETER	FROM	TO	HOLE DIAMETER
LB/FT	18.00 IN	0.0 FT	40.0 FT	24.00 IN
LB/FT	IN	FT	FT	IN
LB/FT	IN	FT	FT	IN

GROUTING DATA:

Grout Type	No. of Sacks	Grout Weight	From	To
Neat cement	50	100.0 Lb/gal	0.0 Ft	36.0 Ft
		Lb/gal	Ft	Ft

Describe grouting procedure
tremie piped

SCREEN:

☐ Perforated pipe ☒ Manufactured
 Diameter 18.00 Inches Length 15.0 Feet
 Material stainless steel
 Slot Size 50 Set From 40.0 Feet to 55.0 Feet
 Other information _____

WAS A PACKER OR SEAL USED?

☐ Yes ☒ No

If so, what material? _____

Describe packer(s) and location _____

DISINFECTION: Was well disinfected upon completion?

☒ Yes, How? chlorinated
☐ No, Why Not? _____
Lab to which water
quality sample sent for analysis

WELL LOG:

FORMATION	DEPTH	
	FROM	TO
Sandy clay - sand	0	4
Wet sand - gravel	4	29
Silty clay	29	33
Silty clay - wet	33	36
Sand	36	38
Sand - gravel - silty clay	38	41
Wet sand	41	48
Wet sand - gravel	48	51
continued on next page		

STATIC WATER LEVEL 4.0 FEET

If flowing: closed in pressure _____ PSI

GPM flow _____ through _____ Inch pipe

Controlled by ☐ Valve ☐ Reducers ☐ Other _____

Reduced flow rate _____ GPM

Can well be completely shut in? _____

WELL TEST DATA:

☒ Pumped Describe: _____☐ Bailed☐ Other

Pumping Level Below Land Surface

20.1 Ft. After 5.0 Hrs. pumped 400.0 GPM

_____ Ft. After _____ Hrs. pumped _____ GPM

If pump installed, pump rate: _____ GPM

REMARKS

Well No. 32

N 44 59.481

W 097 06.994

This well was drilled under license # 475 and this
report is true and accurate.Drilling firm: Thein Well Co., Inc.

Signature of License Representative: _____

Signature of Well Owner or Equitable Property Holder: _____

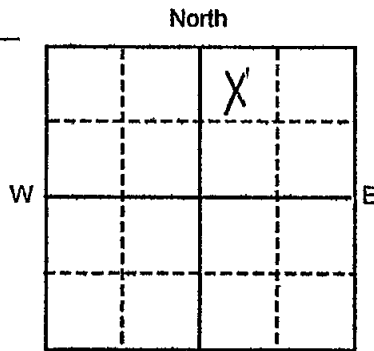
Date: _____

SOUTH DAKOTA WATER WELL COMPLETION REPORT

11-02

Location NW ¼ NE ¼ Sec 31 Twp 118N Rg 52W

County Codington

Please mark well
location with an "X"

Well Completion Date

April 22, 2010

1 Mile

Distance to nearest potential pollution source (septic tank, abandoned well, feed lot, etc.)?
ft. from None (identify source)

PROPOSED USE:

☐ Domestic/Stock ☒ Municipal ☐ Business ☐ Test holes
☐ Irrigation ☐ Industrial ☐ Institutional ☐ Monitoring well

METHOD OF DRILLING:

Mud Rotary

CASING DATA:

☒ Steel ☐ Plastic ☐ Other

If other describe

PIPEWEIGHT	DIAMETER	FROM	TO	HOLE DIAMETER
LB/FT	18.00 IN	0.0 FT	40.5 FT	24.00 IN
LB/FT	IN	FT	FT	IN
LB/FT	IN	FT	FT	IN

GROUTING DATA:

Grout Type	No. of Sacks	Grout Weight	From	To
Neat cement	50	100.0 Lb/gal	0.5 Ft	36.5 Ft
		Lb/gal	Ft	Ft

Describe grouting procedure

Tremie piped

SCREEN:

☐ Perforated pipe ☒ Manufactured

Diameter 18.00 Inches Length 15.0 Feet

Material Stainless steel

Slot Size 50 Set From 40.5 Feet to 55.5 Feet

Other information

WAS A PACKER OR SEAL USED?

☐ Yes ☒ No

If so, what material?

Describe packer(s) and location

DISINFECTION: Was well disinfected upon completion?

☐ Yes, How? Chlorinated

☐ No, Why Not?
Lab to which water
quality sample sent for analysis

Well Owner: Watertown Municipal Utilities

Business Name:

Address: 901 4th Ave SW

City, State, Zip: Watertown SD 57201

WELL LOG:

FORMATION	DEPTH	
	FROM	TO
Berm fill	0	.5
Clay - sand	.5	5.5
Wet sand - gravel	5.5	31.5
Seemed silty	31.5	33.5
Silty clay	33.5	38.5
Wet sand - gravel	38.5	48.5
Sand - silt layers	48.5	51.5
Sand - gravel - clay	51.5	54.5
Dense clay till	54.5	56.5

STATIC WATER LEVEL

2.8 FEET

If flowing: closed in pressure

PSI

GPM flow

through

Inch pipe

Controlled by ☐ Valve ☐ Reducers ☐ Other

Reduced flow rate

GPM

Can well be completely shut in?

WELL TEST DATA:

☒ Pumped Describe:☐ Bailed☐ Other

Pumping Level Below Land Surface

34.5 Ft. After 5.0 Hrs. pumped 300.0 GPM

Ft. After Hrs. pumped GPM

If pump installed, pump rate: GPM

REMARKS

Well No. 33

N 44 59.488

W 097 06.820

This well was drilled under license # 475 and this report is true and accurate.

Drilling firm: Thein Well Company, Inc.

Signature of License Representative:

Signature of Well Owner or Equitable Property Holder:

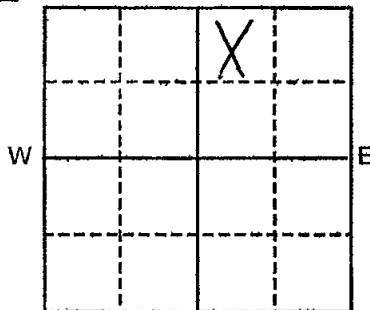
Date:

SOUTH DAKOTA WATER WELL COMPLETION REPORT

11-02

Location NW ¼ NE ¼ Sec 31 Twp 118N Rg 52WCounty Codington

North

Please mark well
location with an "X"

Well Completion Date

April 13, 2010

← 1 Mile →

Distance to nearest potential pollution source (septic tank, abandoned well, feed lot, etc.)?
ft. from None (identify source)

PROPOSED USE:

☐ Domestic/Stock ☒ Municipal ☐ Business ☐ Test holes
☐ Irrigation ☐ Industrial ☐ Institutional ☐ Monitoring well

METHOD OF DRILLING:

Mud Rotary

CASING DATA:

☒ Steel ☐ Plastic ☐ Other

If other describe

PIPEWEIGHT	DIAMETER	FROM	TO	HOLE DIAMETER
LB/FT	18.00 IN	0.0 FT	42.6 FT	24.00 IN
LB/FT	IN	FT	FT	IN
LB/FT	IN	FT	FT	IN

GROUTING DATA:

Grout Type	No. of Sacks	Grout Weight	From	To
Neat cement	43	100.0 Lb/gal	7.6 Ft	38.6 Ft
		Lb/gal	Ft	Ft

Describe grouting procedure

Tremie piped

SCREEN:

☐ Perforated pipe ☒ Manufactured
Diameter 18.00 Inches Length 15.0 FeetMaterial Stainless steelSlot Size 50 Set From 42.6 Feet to 57.6 Feet

Other information

WAS A PACKER OR SEAL USED? ☐ Yes ☒ No

If so, what material?

Describe packer(s) and location

DISINFECTION: Was well disinfected upon completion?

☒ Yes, How? Chlorinated
☐ No, Why Not?

Lab to which water quality sample sent for analysis

Well Owner: Watertown Municipal Utilities

Business Name:

Address: 901 4th Ave SWCity, State, Zip: Watertown SD 57201

WELL LOG:

FORMATION	DEPTH	
	FROM	TO
Berm fill	0	7.625
Silty clay	7.625	8.625
Sand	8.625	37.625
Sand-silt	37.625	42.625
Sand	42.625	44.625
Sand - silt	44.625	47.625
Silt	47.625	49.625
Gravel w/silt	49.625	52.625

continued on page 2

STATIC WATER LEVEL 24.6 FEET

If flowing: closed in pressure _____ PSI

GPM flow _____ through _____ Inch pipe

Controlled by ☐ Valve ☐ Reducers ☐ Other _____

Reduced flow rate _____ GPM

Can well be completely shut in?

WELL TEST DATA:

☒ Pumped Describe:☐ Bailed☐ Other

Pumping Level Below Land Surface

41.8 Ft. After 5.0 Hrs. pumped 575.0 GPM

_____ Ft. After _____ Hrs. pumped _____ GPM

If pump installed, pump rate: _____ GPM

REMARKS

Well No. 34N 44 59.369W 097 07.086This well was drilled under license # 475 and this report is true and accurate.Drilling firm: Thein Well Company, Inc.

Signature of License Representative:

Signature of Well Owner or Equitable Property Holder:

Date: _____

Date:

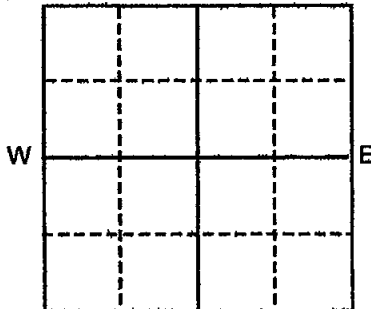
SOUTH DAKOTA WATER WELL COMPLETION REPORT

11-02

Location NW ¼ NE ¼ Sec 31 Twp 118N Rg 52W

County Codington

North

Please mark well
location with an "X"

Well Completion Date

April 6, 2010

1 Mile

Distance to nearest potential pollution source (septic tank, abandoned well, feed lot, etc.)?
ft. from NONE (identify source)

PROPOSED USE:

☐ Domestic/Stock ☒ Municipal ☐ Business ☐ Test holes
☐ Irrigation ☐ Industrial ☐ Institutional ☐ Monitoring well

METHOD OF DRILLING:

Mud Rotary

CASING DATA:

☒ Steel ☐ Plastic ☐ Other

If other describe

PIPEWEIGHT	DIAMETER	FROM	TO	HOLE DIAMETER
LB/FT	18.00 IN	0.0 FT	43.5 FT	24.00 IN
LB/FT	IN	FT	FT	IN
LB/FT	IN	FT	FT	IN

GROUTING DATA:

Grout Type	No. of Sacks	Grout Weight	From	To
Neat cement	52	100.0 Lb/gal	1.5 Ft	39.5 Ft
		Lb/gal	Ft	Ft

Describe grouting procedure

Tremie piped

SCREEN:

☐ Perforated pipe ☒ Manufactured
 Diameter 18.00 Inches Length 15.0 Feet
 Material Stainless steel
 Slot Size 50 Set From 43.5 Feet to 58.5 Feet
 Other information

WAS A PACKER OR SEAL USED?

☐ Yes ☒ No

If so, what material?

Describe packer(s) and location

DISINFECTION: Was well disinfected upon completion?

☒ Yes, How? Chlorinated

☐ No, Why Not?

Lab to which water quality sample sent for analysis

Well Owner: Watertown Municipal Utilities

Business Name:

Address: 901 4th Ave SW

City, State, Zip: Watertown SD 57201

WELL LOG:

FORMATION	DEPTH	
	FROM	TO
Berm fill	0	1.5
Silty clay	1.5	8.5
Silty sand	8.5	10.5
Sand	10.5	38.5
Sand - silt	38.5	41.5
Sand - silt - clay	41.5	43.5
Sand - silt - gravel	43.5	46.5
Sand - gravel	46.5	56.5

continued on page 2

STATIC WATER LEVEL 6.1 FEET

If flowing: closed in pressure PSI

GPM flow through Inch pipe

Controlled by ☐ Valve ☐ Reducers ☐ Other

Reduced flow rate GPM

Can well be completely shut in?

WELL TEST DATA:

☒ Pumped Describe:☐ Bailed☐ Other

Pumping Level Below Land Surface

30.5 Ft. After 5.0 Hrs. pumped 400.0 GPM

Ft. After Hrs. pumped GPM

If pump installed, pump rate: GPM

REMARKS

Well No. 35

N 44 59.393

W 097 06.949

This well was drilled under license # 475 and this report is true and accurate.

Drilling firm: Thein Well Company, Inc.

Signature of License Representative:

Signature of Well Owner or Equitable Property Holder:

Date:

Date:

SOUTH DAKOTA WATER WELL COMPLETION REPORT

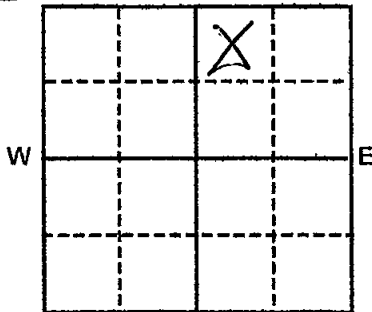
11-02

Location NW ¼ NE ¼ Sec 31 Twp 118N Rg 52W

County Codington

North

Please mark well location with an "X"



Well Completion Date

April 15, 2010

1 Mile

Distance to nearest potential pollution source (septic tank, abandoned well, feed lot, etc.)?

ft. from NONE

(Identify source)

PROPOSED USE:

☐ Domestic/Stock ☒ Municipal ☐ Business ☐ Test holes
☐ Irrigation ☐ Industrial ☐ Institutional ☐ Monitoring well

METHOD OF DRILLING:

Mud Rotary

CASING DATA:

☒ Steel ☐ Plastic ☐ Other

If other describe

PIPEWEIGHT	DIAMETER	FROM	TO	HOLE DIAMETER
LB/FT	18.00 IN	0.0 FT	42.0 FT	24.00 IN
LB/FT	IN	FT	FT	IN
LB/FT	IN	FT	FT	IN

GROUTING DATA:

Grout Type	No. of Sacks	Grout Weight	From	To
Neat cement	48	100.0 Lb/gal	3.0 Ft	38.0 Ft
		Lb/gal	Ft	Ft

Describe grouting procedure

Tremie piped

SCREEN:

☐ Perforated pipe ☒ Manufactured
 Diameter 18.00 Inches Length 20.0 Feet

Material Stainless steel

Slot Size 50 Set From 42.0 Feet to 62.0 Feet

Other Information

WAS A PACKER OR SEAL USED?

☐ Yes ☒ No

If so, what material?

Describe packer(s) and location

DISINFECTION: Was well disinfected upon completion?

☒ Yes, How? Chlorinated

☐ No, Why Not?

Lab to which water quality sample sent for analysis

Well Owner: Watertown Municipal Utilities

Business Name:

Address: 901 4th Ave SW

City, State, Zip: Watertown SD 57201

WELL LOG:

FORMATION	DEPTH	
	FROM	TO
Berm fill	0	3.0
Sandy clay	3.0	8.0
Wet sand - gravel	8	33
Sand - clay	33	35
Silty clay	35	45
Sand - gravel	45	58
Sand - dense clay	58	60
Dense clay till	60	62

STATIC WATER LEVEL 6.2 FEET

If flowing: closed in pressure PSI

GPM flow through Inch pipe

Controlled by ☐ Valve ☐ Reducers ☐ Other

Reduced flow rate GPM

Can well be completely shut in?

WELL TEST DATA:

☒ Pumped Describe:

☐ Bailed

☐ Other

Pumping Level Below Land Surface

34.5 Ft. After 5.0 Hrs. pumped 400.0 GPM

Ft. After Hrs. pumped GPM

If pump installed, pump rate: GPM

REMARKS

Well No. 36

N 44 59.393

W 097 06.817

This well was drilled under license # 475 and this report is true and accurate.

Drilling firm: Thein Well Company, Inc.

Signature of License Representative:

Signature of Well Owner or Equitable Property Holder:

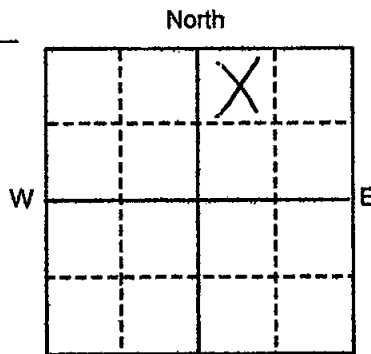
Date:

SOUTH DAKOTA WATER WELL COMPLETION REPORT

11-02

Location NW ¼ NE ¼ Sec 31 Twp 118N Rg 52W

County Codington

Please mark well
location with an "X"

Well Completion Date

July 22, 2010

Distance to nearest potential pollution source (septic tank, abandoned well, feed lot, etc.)?
ft. from NONE (identify source)

PROPOSED USE:

☐ Domestic/Stock ☒ Municipal ☐ Business ☐ Test holes
☐ Irrigation ☐ Industrial ☐ Institutional ☐ Monitoring well

METHOD OF DRILLING:

Mud Rotary

CASING DATA:

☒ Steel ☐ Plastic ☐ Other
 If other describe

PIPEWEIGHT	DIAMETER	FROM	TO	HOLE DIAMETER
LB/FT	18.00 IN	0.0 FT	49.8 FT	24.00 IN
LB/FT	IN	FT	FT	IN
LB/FT	IN	FT	FT	IN

GROUTING DATA:

Grout Type	No. of Sacks	Grout Weight	From	To
Neat cement	59	100.0 Lb/gal	2.8 Ft	45.8 Ft
		Lb/gal	Ft	Ft

Describe grouting procedure

Tremie piped

SCREEN:

☐ Perforated pipe ☒ Manufactured
 Diameter 18.00 Inches Length 13.0 Feet
 Material Stainless steel
 Slot Size 60 Set From 49.8 Feet to 62.8 Feet
 Other information

WAS A PACKER OR SEAL USED?

☐ Yes ☒ No

If so, what material?

Describe packer(s) and location

DISINFECTION: Was well disinfected upon completion?

☒ Yes, How? Chlorinated

☐ No, Why Not?
 Lab to which water
 quality sample sent for analysis

Well Owner: Watertown Municipal Utilities

Business Name:

Address: 901 4th Ave SW

City, State, Zip: Watertown SD 57201

WELL LOG:

FORMATION	DEPTH	
	FROM	TO
Berm fill	0	2.75
Sandy clay	2.75	7.75
Wet sand gravel	7.75	32.75
Fine sand	32.75	36.75
Fine-med sand-silt-silty sand	36.75	40.75
Silty sand-med to coarse sand	40.75	44.75
Silt-med to coarse sand	44.75	48.75
Med to coarse sand & gravel	48.75	52.75

continued on page 2

STATIC WATER LEVEL 6.5 FEET

If flowing: closed in pressure PSI

GPM flow through Inch pipe

Controlled by ☐ Valve ☐ Reducers ☐ Other

Reduced flow rate GPM

Can well be completely shut in?

WELL TEST DATA:

☒ Pumped Describe:
☐ Balled
☐ Other

Pumping Level Below Land Surface

39.8 Ft. After 5.0 Hrs. pumped 350.0 GPM

Ft. After Hrs. pumped GPM

If pump installed, pump rate: GPM

REMARKS

Well No. 37

N 44 59.384

W 097 06.687

This well was drilled under license # 475 and this report is true and accurate.

Drilling firm: Thein Well Company, Inc.

Signature of License Representative:

Signature of Well Owner or Equitable Property Holder:

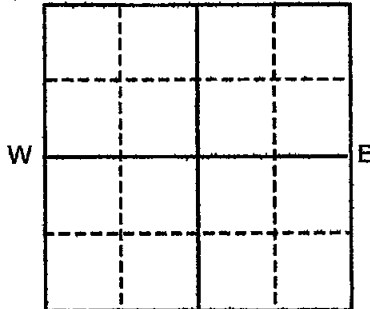
Date:

SOUTH DAKOTA WATER WELL COMPLETION REPORT

11-02

Location $\frac{1}{4}$ $\frac{1}{4}$ Sec Twp Rg

County _____ North

Please mark well
location with an "X"

Well Completion Date _____

1 Mile

Distance to nearest potential pollution source (septic tank, abandoned well, feed lot, etc.)?
ft. from _____ (identify source)

PROPOSED USE:

☐ Domestic/Stock ☐ Municipal ☐ Business ☐ Test holes
☐ Irrigation ☐ Industrial ☐ Institutional ☐ Monitoring well

METHOD OF DRILLING:

CASING DATA:

☐ Steel ☐ Plastic ☐ Other

If other describe _____

PIPEWEIGHT	DIAMETER	FROM	TO	HOLE DIAMETER
LB/FT	IN	FT	FT	IN
LB/FT	IN	FT	FT	IN
LB/FT	IN	FT	FT	IN

GROUTING DATA:

Grout Type	No. of Sacks	Grout Weight	From	To
		Lb/gal	Ft	Ft
		Lb/gal	Ft	Ft

Describe grouting procedure _____

SCREEN:

☐ Perforated pipe ☐ Manufactured

Diameter _____ Inches Length _____ Feet

Material _____

Slot Size _____ Set From _____ Feet to _____ Feet

Other information _____

WAS A PACKER OR SEAL USED?

☐ Yes ☐ No

If so, what material? _____

Describe packer(s) and location _____

DISINFECTION: Was well disinfected upon completion?

☐ Yes, How? _____

☐ No, Why Not? _____
Lab to which water
quality sample sent for analysis

Well Owner: Watertown Municipal Utilities

Business Name: _____

Address: 901 4th Ave SW

City, State, Zip: Watertown SD 57201

WELL LOG:

FORMATION	DEPTH	
	FROM	TO
continued from page 1		
Med to coarse sand with silt layers	52.75	56.75
Med to coarse sand - clay	56.75	60.75
Clay	60.75	64.75

STATIC WATER LEVEL

If flowing: closed in pressure _____ FEET

GPM flow _____ through _____ PSI

Controlled by ☐ Valve ☐ Reducers ☐ Other _____

Reduced flow rate _____ GPM

Can well be completely shut in? _____

WELL TEST DATA:

☐ Pumped Describe: _____

☐ Bailed

☐ Other

Pumping Level Below Land Surface

_____ Ft. After _____ Hrs. pumped _____ GPM

_____ Ft. After _____ Hrs. pumped _____ GPM

If pump installed, pump rate: _____ GPM

REMARKS

Well No. 37

N 44 59.384

W 097 06.687

This well was drilled under license # 475 and this report is true and accurate.

Drilling firm: Thein Well Company, Inc.

Signature of License Representative: _____

Signature of Well Owner or Equitable Property Holder: _____

Date: _____

SOUTH DAKOTA WATER WELL COMPLETION REPORT

11-02

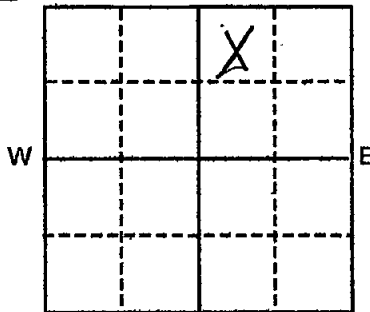
Location NW ¼ NE ¼ Sec 31 Twp 118N Rg 52W

County Codington

North

Please mark well location with an "X"

Rov



Well Completion Date

June 3, 2010

1 Mile

Distance to nearest potential pollution source (septic tank, abandoned well, feed lot, etc.)?
ft. from NONE (Identify source)

PROPOSED USE:

☐ Domestic/Stock ☒ Municipal ☐ Business ☐ Test holes
☐ Irrigation ☐ Industrial ☐ Institutional ☐ Monitoring well

METHOD OF DRILLING:

Mud Rotary

CASING DATA:

☒ Steel ☐ Plastic ☐ Other

If other describe

PIPEWEIGHT	DIAMETER	FROM	TO	HOLE DIAMETER
LB/FT	18.00 IN	0.0 FT	43.7 FT	24.00 IN
LB/FT	IN	FT	FT	IN
LB/FT	IN	FT	FT	IN

GROUTING DATA:

Grout Type	No. of Sacks	Grout Weight	From	To
Neat cement	48	100.0 Lb/gal	4.7 Ft	39.7 Ft
		Lb/gal	Ft	Ft

Describe grouting procedure

Tremie piped

SCREEN:

☐ Perforated pipe ☒ Manufactured

Diameter 18.00 Inches Length 15.0 Feet

Material Stainless steel

Slot Size 40 Set From 43.7 Feet to 58.7 Feet

Other information

WAS A PACKER OR SEAL USED?

☐ Yes ☒ No

If so, what material?

Describe packer(s) and location

DISINFECTION: Was well disinfected upon completion?

☒ Yes, How? Chlorinated

☐ No, Why Not?

Lab to which water quality sample sent for analysis

Well Owner: Watertown Municipal Utilities

Business Name:

Address: 901 4th Ave SW

City, State, Zip: Watertown SD 57201

WELL LOG:

FORMATION	DEPTH	
	FROM	TO
Berm fill	0	4.67
Silty clay	4.67	6.67
Sand	6.67	41.67
Silt	41.67	46.67
Gravel	46.67	49.67
Sand - gravel	49.67	51.67
Sand - clay	51.67	54.67
Clay	54.67	58.67

STATIC WATER LEVEL

13.7 FEET

If flowing: closed in pressure

PSI

GPM flow

through

Inch pipe

Controlled by ☐ Valve ☐ Reducers ☐ Other

Reduced flow rate GPM

Can well be completely shut in?

WELL TEST DATA:

☒ Pumped Describe:

☐ Bailed

☐ Other

Pumping Level Below Land Surface

42.0 Ft. After 5.0 Hrs. pumped 250.0 GPM

Ft. After Hrs. pumped GPM

If pump installed, pump rate: GPM

REMARKS

Well No. 38

N 44 59.294

W 097 06.890

This well was drilled under license # 475 and this report is true and accurate.

Drilling firm: Thein Well Company, Inc.

Signature of License Representative:

Signature of Well Owner or Equitable Property Holder:

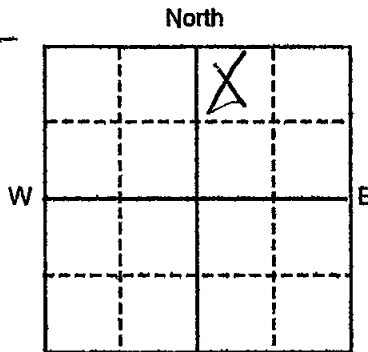
Date:

SOUTH DAKOTA WATER WELL COMPLETION REPORT

11-02

Location NW ¼ NE ¼ Sec 31 Twp 118N Rg 52W

County Codington

Please mark well
location with an "X"

Well Completion Date

June 2, 2010

1 Mile

Distance to nearest potential pollution source (septic tank, abandoned well, feed lot, etc.)?
ft. from NONE (Identify source)

PROPOSED USE:

☐ Domestic/Stock ☒ Municipal ☐ Business ☐ Test holes
☐ Irrigation ☐ Industrial ☐ Institutional ☐ Monitoring well

METHOD OF DRILLING:

Mud Rotary

CASING DATA:

☒ Steel ☐ Plastic ☐ Other

If other describe

PIPEWEIGHT	DIAMETER	FROM	TO	HOLE DIAMETER
LB/FT	18.00 IN	0.0 FT	42.5 FT	24.00 IN
LB/FT	IN	FT	FT	IN
LB/FT	IN	FT	FT	IN

GROUTING DATA:

Grout Type	No. of Sacks	Grout Weight	From	To
Neat cement	48	100.0 Lb/gal	3.5 Ft	38.5 Ft
		Lb/gal	Ft	Ft

Describe grouting procedure

Tremie piped

SCREEN:

☐ Perforated pipe ☒ Manufactured
 Diameter 18.00 Inches Length 17.0 Feet
 Material Stainless steel
 Slot Size 60 Set From 42.5 Feet to 59.5 Feet
 Other information

WAS A PACKER OR SEAL USED?

☐ Yes ☒ No

If so, what material?

Describe packer(s) and location

DISINFECTION: Was well disinfected upon completion?

☒ Yes, How? Chlorinated

☐ No, Why Not?
Lab to which water
quality sample sent for analysis

Well Owner: Watertown Municipal Utilities

Business Name:

Address: 901 4th Ave SW

City, State, Zip: Watertown SD 57201

WELL LOG:

FORMATION	DEPTH	
	FROM	TO
Berm fill	0	3.5
Silty clay	3.5	10.5
Sand	10.5	38.5
Sand - silt	38.5	40.5
Silt - sand	40.5	45.5
Sand	45.5	57.5
Sandy clay	57.5	60.5

STATIC WATER LEVEL 6.5 FEET

If flowing: closed in pressure PSI

GPM flow through Inch pipe

Controlled by ☐ Valve ☐ Reducers ☐ Other

Reduced flow rate GPM

Can well be completely shut in?

WELL TEST DATA:

☒ Pumped Describe:☐ Bailed☐ Other

Pumping Level Below Land Surface

28.6 Ft. After 5.0 Hrs. pumped 400.0 GPM

Ft. After Hrs. pumped GPM

If pump installed, pump rate: GPM

REMARKS

Well No. 39

N 44 59.290

W 097 06.741

This well was drilled under license # 475 and this report is true and accurate.

Drilling firm: Thein Well Company, Inc.

Signature of License Representative:

Signature of Well Owner or Equitable Property Holder:

Date:



DEPARTMENT OF ENVIRONMENT
and NATURAL RESOURCES

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
denr.sd.gov



JUL 24 2014

7055-3

Jeff DeVille
Watertown Municipal Utilities Department
901 4th Ave SW
Watertown SD 57201

Dear Mr. DeVille:

Enclosed is Water License No. 7055-3. This is the final water right document completing the process of obtaining a Water Right. Included with the license is a map prepared by the staff engineer who conducted the field investigation.

For your information SDCL 46-6-27 requires that if the owner of an existing well, such as the wells authorized by Water Right No. 7055-3, constructs a replacement well and does not plan to use the old well, the old well is considered abandoned and must be plugged. Also, any well that is being used or is not considered abandoned must be valved and controlled, if flowing, or sealed and capped so that no leaking occurs either underground or at the surface.

As long as you use the water beneficially, as stated in the Water License, the State Water Laws provide that you have a continuing right to use the water. If you have any questions, please contact our office.

Sincerely,

Jeanne Goodman, Chief Engineer
Water Rights Program
(605) 773-3352

enclosures

STATE OF SOUTH DAKOTA

WATER LICENSE NO. 7055-3

(1) The Watertown Municipal Utilities Department, 901 4th Ave SW, Watertown SD 57201 made Application No. 7055-3, August 11, 2008 for a water permit to place to beneficial use 4,500 acre feet of water annually appropriated and reserved by Future Use Permit No. 5862-3. Permit No. 7055-3 authorizes a diversion rate of 8.00 cubic feet of water per second from ground water (nine wells into the Big Sioux North Aquifer), Codington County, South Dakota for municipal purposes. Permit No. 7055-3, with a priority date of April 6, 1995 (established by Future Use Permit No. 5862-3) was approved October 2, 2008 and issued to the applicant for diversion of water with construction of the described water supply system to be completed on or before October 2, 2013 and for the application to beneficial use of said water on or before October 2, 2017.

(2) It is certified that the permit holder has complied with the provisions of South Dakota State Law relating to completion of the water supply system and is entitled to divert 8.00 cubic feet of water per second with an annual volume of 4,500 acre feet of water for beneficial use.

The location of the diversion points in the Rauville Well Field are:

Well 31: 55 feet south and 1,980 feet east of the NW corner of Section 31-T118N-R52W (NE ¼ NW ¼)
(N 44.99137, W -97.11866)

Well 32: 65 feet south and 2,555 feet east of the NW corner of Section 31-T118N-R52W (NE ¼ NW ¼)
(N 44.99132, W -97.11652)

Well 33: 40 feet south and 1,970 feet west of the NE corner of Section 31-T118N-R52W (NW ¼ NE ¼)
(N 44.99147, W -97.11367)

Well 34: 745 feet south and 2,145 feet east of the NW corner of Section 31-T118N-R52W (NE ¼ NW ¼)
(N 44.98945, W -97.11811)

Well 35: 615 feet south and 2,475 feet west of the NE corner of Section 31-T118N-R52W (NW ¼ NE ¼)
(N 44.98982, W -97.11577)

Well 36: 625 feet south and 1,905 feet west of the NE corner of Section 31-T118N-R52W (NW ¼ NE ¼)
(N 44.99003, W -97.11333)

Well 37: 690 feet south and 1,350 feet west of the NE corner of Section 31-T118N-R52W (NW ¼ NE ¼)
(N 44.98975, W -97.11142)

Well 38: 1,175 feet south & 2,245 feet west of the NE corner of Section 31-T118N-R52W (NW ¼ NE ¼)
(N 44.98831, W -97.11487)

Well 39: 1,255 feet south & 1,600 feet west of the NE corner of Section 31-T118N-R52W (NW ¼ NE ¼)
(N 44.98818, W -97.11239)

(3) The permit holder has complied with the provisions of South Dakota State Law relating to the application of water to beneficial use.

continued

(4) Pursuant to South Dakota Water Law 46-5-30.1 the Watertown Municipal Utilities Department, 901 4th Ave SW, Watertown SD 57201 the holder and/or owner of Water Right No. 7055-3 is issued a license to appropriate water, the right to use 8.00 cubic feet of water per second, with an annual volume of 4,500 acre feet of water from ground water (9 wells – Big Sioux North Aquifer) with a priority date of April 6, 1995 from the locations specified in (2) of this license for municipal purposes.

This license is subject to South Dakota Water Law, any limitations or conditions listed in Water Right No. 7055-3 and subject to the following qualifications:

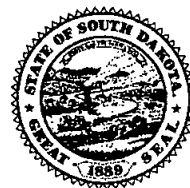
- The wells approved under this Permit will be located near domestic wells and other wells which may obtain water from the same aquifer. The well owner under this Permit shall control his withdrawals so there is not a reduction of needed water supplies in adequate domestic wells or in adequate wells having prior water rights.
- The wells authorized by Permit No. 7055-3 shall be constructed by a licensed well driller and construction of the well and installation of the pump shall comply with the Water Management Board Well Construction Rules, Chapter 74:02:04 with the well casing pressure grouted (bottom to top) pursuant to Section 74:02:04:28. *All wells were drilled in 2010 by Thein Well Company Inc. Copies of the logs are on file with the Water Rights Program.*
- Watertown Municipal Utilities Department shall report to the Chief Engineer annually the amount of water withdrawn from the Big Sioux North Aquifer.



Jeanne Goodman, Chief Engineer
Water Rights Program
Department of Environment and Natural Resources

JUL 24 2014

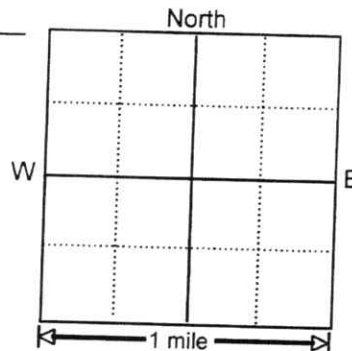
date



7055-3

SD EForm - 1622LD V1

SOUTH DAKOTA WELL AND TEST HOLE PLUGGING REPORT 11-02

Location NW $\frac{1}{4}$ NE $\frac{1}{4}$ Sec 31 Twp 118 Rg 25County CODINGTONPlease mark well
location with an "X"Plugging Completion Date 5/7/2025

Well Owner:

Name: WATERTOWN MUNICIPAL UTILITIESAddress: 901 4TH AVE SWCity, State, Zip: WATERTOWN SD 57201

Comments:

WELL # 39 RAUVILLE MUNICIPAL WELL
GPS N 44 59.290 W 097 06.741

CHECK APPROPRIATE BOX

EXISTING WELL ☒TEST HOLE ☐Well depth 59.5Casing material STEELCasing size(s) 18"Casing condition POOR

Hole depth _____

Hole size _____

Describe plugging procedure:

GRAVEL PACKED FROM BOTTOM TO 19' TREMMIED VOLCLAY FORM 19' TO SURFACE

Describe grout or plugging material:

GRAVEL PACK / VOLCLAY

RECEIVED

OCT 06 2025

OFFICE OF
WATER

Type of non-slip plug: _____

This well or test hole was plugged under license # 475 and this report is true and accurate.Drilling firm: THEIN WELL COMPANY, INC.Signature of Licensed Representative: Michael TheinSignature of Well Owner: W. G. Love Jr.Date: 6-24-25

7055-3

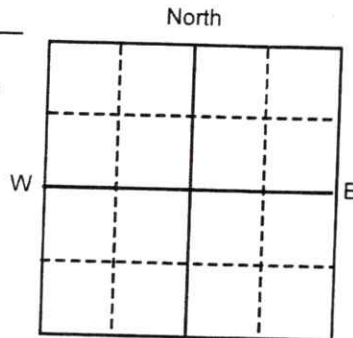
SD EForm - 1621LD V1

SOUTH DAKOTA WATER WELL COMPLETION REPORT

11-02

Location NW ¼ NE ¼ Sec 31 Twp 118 Rg 25County CODINGTON

Please mark well location with an "X"



Well Completion Date

June 4, 2025

1 Mile

Distance to nearest potential pollution source (septic tank, abandoned well, feed lot, etc.)?
1,600.0 ft. from SEPTIC (identify source)

PROPOSED USE:

☐ Domestic/Stock
☐ Irrigation
☒ Municipal
☐ Industrial
☐ Business
☐ Institutional
☐ Test holes
☐ Monitoring well

METHOD OF DRILLING:

MUD ROTARY

CASING DATA:

☒ Steel
☐ Plastic
☐ Other

If other describe

PIPEWEIGHT	DIAMETER	FROM	TO	HOLE DIAMETER
LB/FT	18.00 IN	0.0 FT	43.0 FT	24.00 IN
LB/FT	IN	FT	FT	IN
LB/FT	IN	FT	FT	IN

GROUTING DATA:

Grout Type	No. of Sacks	Grout Weight	From	To
BENTONITE	15	Lb/gal	0.0 Ft	38.0 Ft
		Lb/gal	Ft	Ft

Describe grouting procedure
TREMIE PIPED

SCREEN:

☐ Perforated pipe
☒ Manufactured
Diameter 18.00 Inches Length 20.0 FeetMaterial STAINLESS STEELSlot Size .080 Set From 43.0 Feet to 63.0 Feet

Other information

WAS A PACKER OR SEAL USED?

☐ Yes
☒ No

If so, what material?

Describe packer(s) and location

DISINFECTION: Was well disinfected upon completion?

☒ Yes, How? CHLORINATED
☐ No, Why Not?
Lab to which water quality sample sent for analysis
MVT & PEIRRE SDWell Owner: WATERTOWN MUNICIPAL UTILITIES

Business Name:

Address: 901 4TH AVE SWCity, State, Zip: WATERTOWN SD 57201-4107

WELL LOG:

FORMATION	DEPTH	
	FROM	TO
TOP SOIL	0	3
YELLOW CLAY	3	5
SAND MED/ FINE	5	35
GRAY CLAY W/SAND	35	38
GRAY CLAY	38	39
MED SAND / SOME GRAVEL	39	47.5
MED SAND/ GRAVEL	47.5	54.5
GRAY CLAY	54.5	63

STATIC WATER LEVEL 14.7 FEET

If flowing: closed in pressure _____ PSI

GPM flow _____ through _____ Inch pipe

Controlled by ☐ Valve ☐ Reducers ☐ Other _____

Reduced flow rate _____ GPM

Can well be completely shut in?

WELL TEST DATA:

☒ Pumped Describe: TEST PUMP PRIOR TO BERM/PITLESS INSTALL
☐ Bailed

☐ Other

Pumping Level Below Land Surface

40.6 Ft. After 24.0 Hrs. pumped 400.0 GPM

_____ Ft. After _____ Hrs. pumped _____ GPM

If pump installed, pump rate: _____ GPM

REMARKS

RECEIVED

WELL # 39R GPS N 44 59.3000 W 97 6.7340

OCT 06 2025

OFFICE OF
WATERThis well was drilled under license # 475 and this report is true and accurate.Drilling firm: THEIN WELL COMPANY, INCORPORATED

Signature of License Representative:

Michael Thein

Signature of Well Owner or Equitable Property Holder:

*Wayne Lhi*Date: 6-24-25

Watertown SD Well 39 and 39R

RECEIVED
JUL 21 2025
OFFICE OF
WATER

Legend

165th St

165th St

County Rd 11 4/10

CITY OF WATERTOWN WELL # 39R 18" DIA 63' DEPTH 2025 N 44 59.3000 W 97 6.7340
Well # 39 OLD WELL 39 SEALED

Google Earth

Image © 2025 Airbus



1000 ft