

Considered: _____

WATER PERMIT NO. 5120-3

MAP No. same

Name of Applicant Town of Iroquois

Post Office Address PO Box 186, Iroquois SD 57353

Amount of Water Claimed 0.44 cfs, 38 ac-Ft annually Total Acres NA

Source of Water Supply ground water Floyd - Pearl Creek Aquifer

Water to be used for municipal purposes County Beadle & Kingsbury

About 4 miles W of Iroquois

PROOF OF PUBLICATION: Received _____ Not Received _____

APPLICATION: Approved _____ Subject to _____

F.F. & C.L. Adopted _____ Not Approved _____ Deferred _____

PRIORITY _____ Date Received Jan. 21, 1987 Fee \$150.00 Remarks _____

1/21/87

Corrected Application Received Jan 26, 1987 Period of Annual Use Jan 1 - Dec 31

WATER QUALITY APPROVAL RECEIVED NA APPROVED/CONDITIONAL (Circle one)

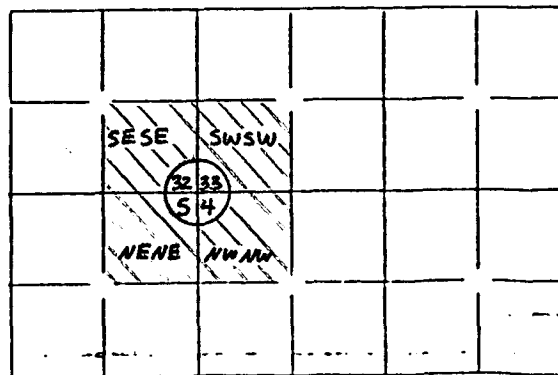
WI-1 Description same as Application YES _____ NO _____ REMARKS _____

Diversion Point 1 well: NW 1/4 NW 1/4 sec 4; NE 1/4 NE 1/4

sec 5; T110N-R59W; SE 1/4 SE 1/4 sec 32; SW 1/4 SW 1/4

sec 33; T111N-R59W

Land to be Irrigated NA



Well Log: Driller well not constructed Licensed YES _____ NO _____

Depth of Well approx 70 feet REMARKS _____

Type of Map topo PREPARED BY Ron Duvall Reviewed and the Number

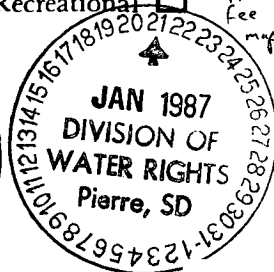
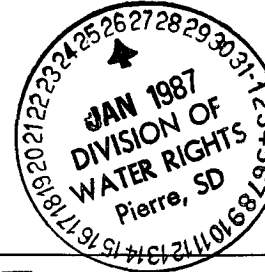
assigned on February 24, 1987 By Ron Duvall

No. 5120-3 Hydrologic Unit 10160006
 Map No. same Basin James River
 Newspaper Daily Plainsman, 49 3rd St. SE, Huron
De Smet News, Box 69 (Wed)

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

Check use of water: Industrial ☐ Commercial ☐ Municipal ☒ Other Common Distribution System ☐
 Rural Water System ☐ Suburban Housing ☐ Geothermal Heat ☐ Institutional ☐ Recreational ☐
 Domestic ☐ (above 18gpm) Other ☐

Type of Application: Check one or more of the following

New ☒ Vested Right ☐ Future Use ☐ Change Use ☐☐ Amend Permit No. _____ with old priority date retainedChange diversion point(s) ☐ Add diversion point(s) ☐ Other ☐☐ Application to: Change diversion point(s) ☐ Add diversion point(s) ☐ on Permit No. _____☐ Construction to use water reserved by Future Use Permit No. _____

- Name of Applicant Town of Iroquois Phone No. 546-2232
 Post Office Address PO Box 186 State SD Zip Code 57353
(Street, RR or Box) Zip Code
- Amount of water claimed (c.f.s.) 0.44 cfs (200 gpm) 38 acre-feet annually
- Source of water supply groundwater - 1 well Floyd Aquifer
- Location of point of diversion NW $\frac{1}{4}$ NW $\frac{1}{4}$ Section 4; NE $\frac{1}{4}$ NE $\frac{1}{4}$ Section 5; both in T110N, R59W;
SE $\frac{1}{4}$ SE $\frac{1}{4}$ Section 32; SW $\frac{1}{4}$ SW $\frac{1}{4}$ Section 33; both in T111N, R59W
_____ County Beadle
- Counties where water will be used Beadle, Kingsbury
- Annual period during which water is to be used Jan 1 - Dec 31
- Give a brief description of proposed 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 project includes this well along with 3½ miles of transmission pipeline. A "Study and Report" of the "Water System Requirements" is included. Additional reference reports: Open-File Report No. 36-UR "Ground Water Study for the Town of Iroquois SD.
 Geology and Water Resources of Beadle County, South Dakota

Attachments: Attach Form 2A if diversion from a well or dugout, or if storage of water, is proposed. Attach map (see instruction)

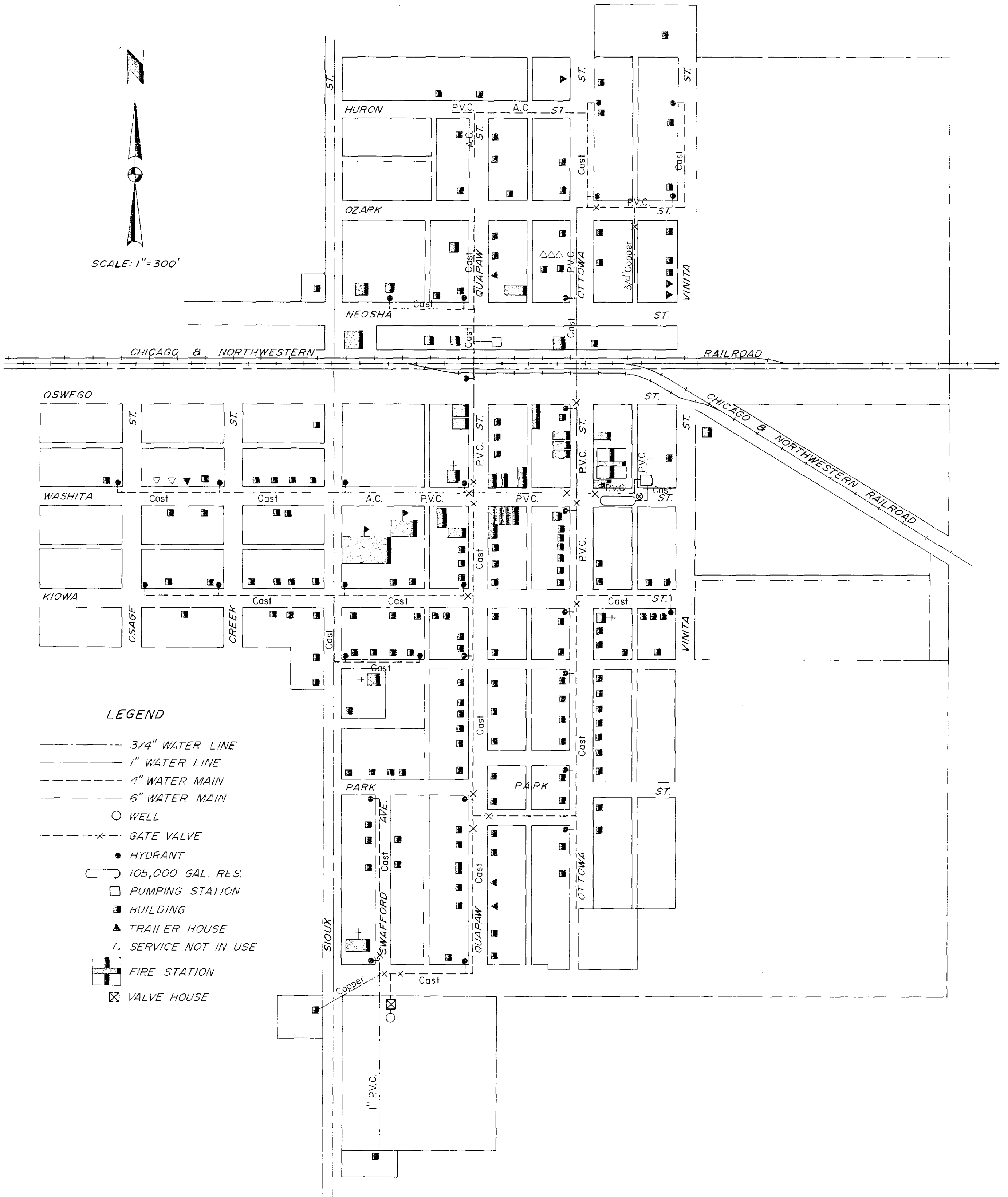
STATE OF SOUTH DAKOTA)
 County of Beadle)^{ss}

I, Robert A. Rounds, Mayor, City of Iroquois the applicant, certify that I have read the foregoing application, have examined the attached map and that the matters therein stated are true and that I intend, and am able to complete the necessary construction.

Signed Robert A. RoundsSubscribed and sworn to before me this 20th day of January 1987

Attest: Curtis E. Kludt
 Finance Officer

Curtis E. Kludt
 Notary Public (or other qualified officer)



EXISTING WATER SYSTEM

IROQUOIS, S.D.

5120-3

FIGURE 1

WATER PERMIT

The Water Management Board hereby approves Water Permit Application No. _____

(Applicant)

(Post Office Address)

(State)

(Zip Code)

With the following qualifications.

Date of first receipt of application _____, 19____.

Date of return to applicant for correction, amendments or changes required _____, 19____.

Date of receipt of corrected application _____, 19____. Approved _____, 19____.

The Water Management Board hereby approves this Water Permit No. _____ authorizing the construction of the water use system and the placing of water to beneficial use as stated in the Application and as qualified in the Water Permit approval, subject, however, to the following limitations and conditions:

1. The date from which applicant may claim right is _____, 19____.
2. The equivalent of at least one-fifth of the specified work is to be completed on or before _____, 19____.
3. The whole of said work is to be completed on or before _____, 19____.
4. The limit of time from proof of beneficial use of water appropriated in accordance herewith is _____, 19____.
5. The water appropriated shall be used for the purpose of _____

6. The prior right of all persons who, by compliance with the laws of the State of South Dakota, have acquired a right to the use of water must not be unlawfully impaired by this appropriation.
7. The amount of the appropriation herein granted shall not exceed _____ cubic feet per second; neither shall it exceed the capacity of the above described water supply system nor shall it exceed the amount of water needed for beneficial uses served and to which water is actually and beneficially applied for _____ on or before _____, 19____; said water to be used during the following described annual period: _____

WATER MANAGEMENT BOARD

By: _____
Chief Engineer

Division of Water Rights
Dept. of Water and Natural Resources

_____, 19____

WATER PERMIT

The Water Management Board hereby approves Water Permit Application No. 5120-3

Town of Iroquois

P.O. Box 186

(Applicant)

(Street, RR or Box)

Iroquois, South Dakota

57353

With the following qualifications.

(City)

(State)

(Zip Code)

1. The well 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 domestic wells or in adequate wells having prior water rights.

2. The city of Iroquois shall report to the Chief Engineer annually the amount of water withdrawn each year.

3. Approval of this permit authorizes a maximum annual withdrawal of 38 acre feet.

Date of first receipt of application January 21, 1987

Date of return to applicant for correction, amendments or changes required January 23, 1987

Date of receipt of corrected application January 26, 1987. Approved September 9, 1987

The Water Management Board approved this Water Permit No. 5120-3 authorizing the construction of the water use system and the placing of water to beneficial use as stated in the Application and as qualified in the Water Permit approval, subject, however, to the following limitations and conditions:

1. The date from which applicant may claim right is January 21, 1987

2. The equivalent of at least one-fifth of the specified work is to be completed on or before March 9, 1990

3. The whole of said work is to be completed on or before September 9, 1992

4. The limit of time for proof of beneficial use of water appropriated in accordance herewith is September 9, 1996

5. The water appropriated shall be used for the purpose of municipal use by the town of Iroquois

6. The prior right of all persons who, by compliance with the laws of the State of South Dakota, have acquired a right to the use of water must not be unlawfully impaired by this appropriation.

7. The amount of the appropriation granted shall not exceed 0.44 (38 AF annually) cubic feet per second; neither shall it exceed the amount of water needed for the beneficial uses served and to which water is actually and beneficially applied for municipal use on or before September 9, 1996. The water is to be used during the following described annual period: January 1 - December 31

WATER MANAGEMENT BOARD

By: John Hatch

Chief Engineer

JOHN HATCH

Division of Water Rights

Dept. of Water and Natural Resources

OCT 20 1987

, 19

1. Well Information - Proposed construction

- a) Drill Hole Diameter 12" Depth 70'±
- b) Casing Type PVC Diameter 8" Thickness Class 200
- c) Screen Type Stainless Steel Diameter 8" Thickness 304 Stainless
- d) Gravel Pack Thickness 4" Length of Gravel Pack 30'
- e) Depth to Top of Water Bearing Material 15'
- f) Depth of Water (ground surface to water level) 12'±
- g) Distance to nearest existing domestic well:
On applicants property greater than 1 mile On property owned by others greater than 1 mile

2. Dugout Information Estimates NA

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

3. Water Storage Dams NA

If the proposed water use system contains one or more storage dams, please furnish the information requested below. The locations of each dam should 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) Outlet Dimensions:
Pipe diameter _____

Spillway width _____

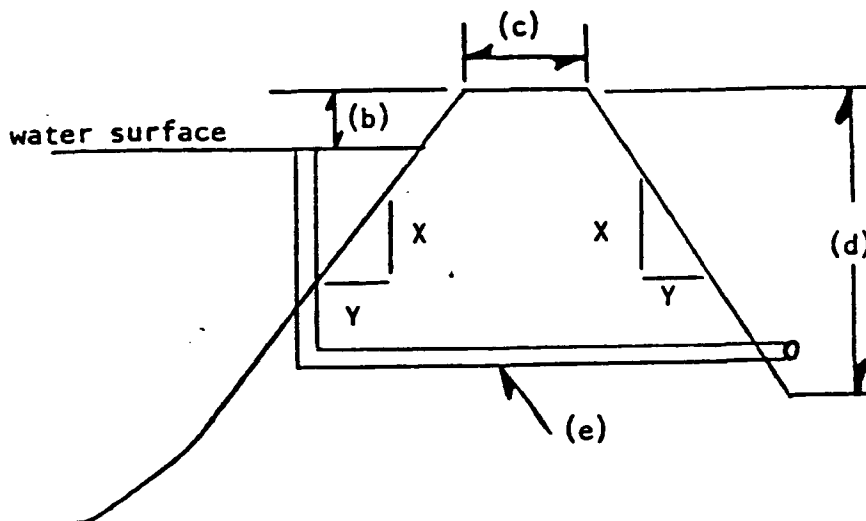
f) X & Y Slope
Upstream _____

Downstream _____

Surface Area of Impoundment _____

Storage _____ acre feet

Drainage area above dam _____

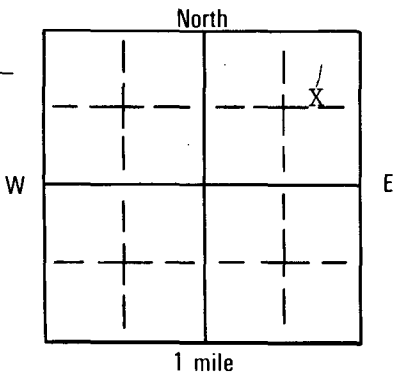


SOUTH DAKOTA WATER WELL COMPLETION REPORT

10-85

Location NE 1/4 NE 1/4 Sec 8 5 Twp T110N Rg R59W

County

KingsburyPlease mark well
location with
an "X"Well Completion Date 12-3-87

PROPOSED USE:

☐ Domestic ☐ Municipal ☒ Test Holes
☐ Irrigation ☐ Industrial ☐ Stock

Method of Drilling:

Forward Rotary

CASING DATA:

☐ Steel ☒ Plastic ☐ Other

If other describe _____

PIPEWEIGHT	DIAMETER	FROM	TO	HOLE DIAMETER
____ LB/FT	<u>3</u> IN	<u>0</u> FT	<u>70</u> FT	<u>6 1/4</u> IN
____ LB/FT	____ IN	____ FT	____ FT	____ IN
____ LB/FT	____ IN	____ FT	____ FT	____ IN
____ LB/FT	____ IN	____ FT	____ FT	____ IN

GROUT:

Was the well grouted? ☒ YES ☐ NOTo what depth? 50 FEETWhat is grouting material? CementIf cement, number of sacks? 5Describe grouting procedure line

What was grout weight? _____ LB/GAL

SCREEN: ☐ Perforated pipe ☒ ManufacturedDiameter _____ IN Length 10 FEET

Material _____

Slot Size 0.25 Set From 60 Feet To 70 Feet

Slot Size _____ Set From _____ Feet To _____ Feet

Slot Size _____ Set From _____ Feet To _____ Feet

Other information _____

Was a packer or seal used? ☒ YES ☐ NOIf so, what material? Sand

Describe packer(s) and location? _____

Was well disinfected upon completion? ☒ YES ☐ NO

Explain _____

Bacteriological analysis ☒ YES ☐ NOLaboratory sent to Pierre

Well Owner:

Name

Town of Iroquois

Address

Well Log:

Depth

Formation	From	To
top soil	0	2
yellow clay	2	15
Brown sand	15	20
Brown med. sand	20	27
med gray sand	27	36
blue clay	36	38
med. sand	38	50
med. fine sand	50	62
Coal	62	65
Med. some coarse coal	65	70
shale	70	

STATIC WATER LEVEL 18 Feet

If flowing: closed in pressure _____ PSI

GPM flow _____ through _____ inch pipe

Controlled by ☐ Valve ☐ Reducers ☐ Other

If other; specify _____

Can well be completely shut in? _____

WELL TEST DATA:

☒ Pumped☐ Bailed☐ Other

Describe:

50 g.p.m. w/air

Pumping Level Below Land Surface

_____ ft. After _____ Hrs. pumped _____ GPM

_____ ft. After _____ Hrs. pumped _____ GPM

_____ ft. After _____ Hrs. pumped _____ GPM

REMARKS:

This well was drilled under license # 440

And this report is true and accurate.

Drilling firm

Signature of License Representative:

Raymond Pullman

Signature of Well Owner:

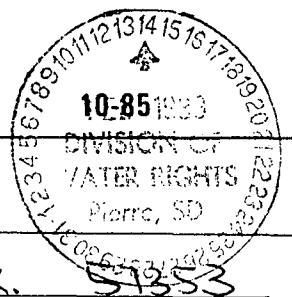
X Raymond Pullman, Mayor

Date

4 apr 88

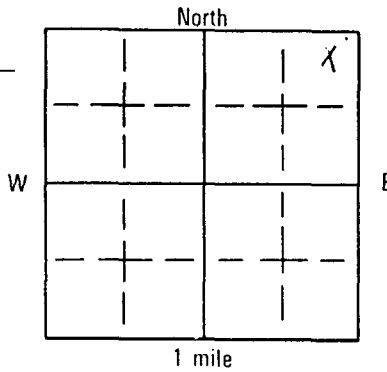
SOUTH DAKOTA WATER WELL COMPLETION REPORT

5120-3



Location NE 1/4 NE 1/4 Sec 15 Twp 110 N Rg 59 W

County Beadle



Please mark well location with an "X"

Well Completion Date _____

PROPOSED USE:

- ☐ Domestic ☒ Municipal ☐ Test Holes
☐ Irrigation ☐ Industrial ☐ Stock

Method of Drilling:

Reverse

CASING DATA:

- ☐ Steel ☐ Plastic ☐ Other

If other describe _____

PIPEWEIGHT	DIAMETER	FROM	TO	HOLE DIAMETER
_____ LB/FT	<u>8</u> IN	<u>0</u> FT	<u>63</u> FT	_____ IN
_____ LB/FT	_____ IN	_____ FT	_____ FT	_____ IN
_____ LB/FT	_____ IN	_____ FT	_____ FT	_____ IN
_____ LB/FT	_____ IN	_____ FT	_____ FT	_____ IN

GROUT:

Was the well grouted? ☒ YES ☐ NO

To what depth? 58 FEET

What is grouting material? Cement

If cement, number of sacks? 78

Describe grouting procedure tremie line

What was grout weight? 1 sack - 60 gals water LB/GAL

SCREEN: ☐ Perforated pipe ☒ Manufactured

Diameter 8 IN Length 10 FEET

Material Stainless Steel Johnson

Slot Size .30 Set From 63 Feet To 73 Feet

Slot Size _____ Set From _____ Feet To _____ Feet

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? _____

Was well disinfected upon completion? ☒ YES ☐ NO

Explain _____

Bacteriological analysis ☐ YES ☒ NO

Laboratory sent to _____

Well Owner:

Name Troquois City

Address Troquois S. Dak.

Well Log:

Depth

Formation

From

To

yellow clay	0	14
brown sand & gravel	14	20
yellow clay w/white sand	20	30
whitish sand	30	37
blue clay	37	38
sand	38	40
med. sand	40	46
coarse sand & gravel	46	50
med. sand	50	55
fine sand	55	57
med sand w/coal streaks	57	60
med. sand & coarse sand	60	72
shale	72	73
TD 72		

STATIC WATER LEVEL 19'6" Feet

If flowing: closed in pressure _____ PSI

GPM flow _____ through _____ inch pipe

Controlled by ☐ Valve ☐ Reducers ☐ Other

If other; specify _____

Can well be completely shut in? _____

WELL TEST DATA:

☒ Pumped

☐ Bailed

☐ Other

Describe: Sub pump

Pumping Level Below Land Surface

22'6" ft. After 6 Hrs. pumped 110 GPM

_____ ft. After _____ Hrs. pumped _____ GPM

_____ ft. After _____ Hrs. pumped _____ GPM

REMARKS:

This well was drilled under license # 440

And this report is true and accurate.

Drilling firm Pullman Well Drilling

Signature of License Representative:

Ralph Pullman

Signature of Well Owner:

Date _____

01/13/89

**STUDY AND REPORT
WATER SYSTEM REQUIREMENTS
IROQUOIS, SOUTH DAKOTA**

**PREPARED FOR:

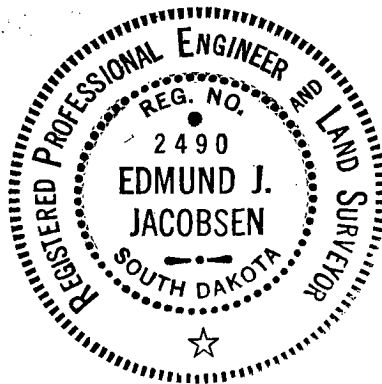
IROQUOIS, SOUTH DAKOTA**

**PREPARED BY:

CLARK ENGINEERING COMPANY
1011 FIRST AVE. S.E.
P. O. BOX 20
ABERDEEN, SOUTH DAKOTA**

AUGUST 1985

STUDY AND REPORT
WATER SYSTEM REQUIREMENTS
IROQUOIS, SOUTH DAKOTA



I hereby certify that this Study and Report was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of South Dakota

Edmund J. Jacobsen

Date 08-16-85 Reg. No. 2490

WATER SYSTEM REQUIREMENTS

IROQUOIS, SOUTH DAKOTA

INDEX

- I. EXECUTIVE SUMMARY REPORT**
- II. SCOPE OF ENGINEERING STUDY**
- III. EXISTING CONDITIONS**
 - 1. General
 - 2. Water Source
 - 3. Storage Facilities
 - 4. Distribution System
- IV. DESIGN CRITERIA**
 - 1. General
 - 2. Design Period
 - 3. Design Population
 - 4. Fire Flows
- V. DESIGN IMPROVEMENTS**
 - 1. Water Source
 - 2. Storage Facilities
 - 3. Distribution System
 - 4. Treatment
- VI. ESTIMATES AND BUDGET**
- VII. METHODS OF FINANCING**
 - 1. Cash From Budget
 - 2. FmHA Financing
 - 3. General Obligation Bonds
 - 4. Revenue Bonds
 - 5. CDBG Through HUD

APPENDIX

I. EXECUTIVE SUMMARY REPORT

The following recommendations are presented as a summary report for the Water Study which makes up the following sections of this report. CLARK ENGINEERING COMPANY's RECOMMENDATIONS are based on the findings of the Study and are opinions based on the Engineering Judgment of CLARK ENGINEERING COMPANY.

1. SOURCE.

Two alternative sources were studied: Alternate -1- is for the Town of Iroquois to develop its own well, construct a relatively short transmission line to town, construct a water treatment plant, and upgrade the town's distribution system. Alternate -2- is for the Town of Iroquois to purchase its water from the Kingbrook Rural Water System, construct a much longer transmission line, and upgrade the Town's distribution system. Both alternates would make use of the present storage facilities.

Based on the test well information, projected monthly water bill, and ease of treatment, it is CLARK ENGINEERING COMPANY's RECOMMENDATION that Iroquois pursue Alternate -1-, the development of its own well.

2. STORAGE.

Evaluation of the water usage of Iroquois and their existing Storage Facilities finds that with either Alternate -1- or Alternate -2- as a source, the existing ground level reservoir should be reconditioned, a high service pump installed, and used both during peak demand but more importantly as a reservoir for emergencies such as when the source is out-of-service or at times of fire fighting. The piping and valving between the reservoir, hydro-pneumatic tank, and distribution system should be replaced. With Alternate -1- the ground level reservoir and high service pump become an integral part of the treatment system during the filter backwash cycle.

3. DISTRIBUTION SYSTEM.

Evaluation of the existing 65+ year old distribution system finds that the Town of Iroquois has done a very commendable job in the last few years by undertaking an annual water main replacement program. Prior to their capital improvement program, the water distribution system was very inadequate and in danger of failing to the point Iroquois could have been without water. It is CLARK ENGINEERING COMPANY's RECOMMENDATION that the replacement and extensions of water mains, as outlined in the study, be completed.

4. PLAN OF ACTION.

The Town of Iroquois should use this Study and Report to pursue getting on the State Water Plan, apply for a 60 percent CDBG Grant and apply for a FmHA Loan and Grant. The Town should hold a Public Hearing to present the alternatives and then form a plan of action in accordance with the wishes of the people.

II. SCOPE OF ENGINEERING STUDY

The Scope of the Engineering Study was to collect the available data and evaluate the present system. The Study includes preliminary design of recommended improvements for alternative design along with cost estimates for the alternatives. The alternatives were evaluated based on estimated cost. Ideas for financing the improvements are presented which take into account the monthly water bills.

III. EXISTING CONDITIONS

1. GENERAL.

The Town of Iroquois is located on the Beadle-Kingsbury County line 17 miles east of Huron on U.S. Highway 14. Iroquois' present population is 354 with 150

water services (120 residential and 30 business or commercial).

2. WATER SOURCE.

Iroquois presently obtains its water from two wells constructed into the Dakota Formation. Iroquois is presently obtaining 90 percent of its water from the "South" well which was constructed in 1981 after a well at this same location failed. Ten percent (10%) of the water is obtained from the "North" well which was constructed in 1952 and formerly owned by the railroad. The quality of water from both of these sources is very poor. Review of the Water Use Records also gives a real good indication of the quality in that the average is 94 gpcpd. If the water was a high quality water, it wouldn't be surprising to have an average of 130 gpcpd. This low average indicates that very little water is being used for yard watering which supports the fact that the water isn't fit for watering. See the Appendix for the water quality data as published by the S.D. Department of Water & Natural Resources.

3. STORAGE FACILITIES.

The Town of Iroquois has two storage reservoirs: a 20,000 gallon hydro-pneumatic tank constructed in 1946 and a 2-cell 100,000 gallon concrete ground storage reservoir which was constructed in 1920.

4. DISTRIBUTION SYSTEM.

The Town of Iroquois' distribution system as shown on Figure -1- was constructed in 1920. The distribution system is now 65 years old and in very poor condition with the Town experiencing a high frequency of water main breaks. The Town has undertaken a program of replacing water mains annually. The condition of the removed water mains verifies the extremely poor condition of the system. Figure -1- indicates the replacement program followed by the Town with the lines labeled PVC or AC being the ones which have been replaced.

IROQUOIS 1984-1985 WATER USAGE

Month	Monthly Gals.		Daily Average GPD	Peak Day GPD	Min. Day GPD	Daily Average GPCPD
	South Well	Town Total				
<u>1984</u>						
Aug.	1,003,900	1,104,290	35,620	55,110	22,660	103
Sept.	951,600	1,046,760	34,890	43,560	25,850	99
Oct.	801,900	882,090	28,450	33,330	24,750	80
Nov.	822,800	905,080	30,170	41,250	24,310	85
Dec.	801,300	881,430	28,430	38,060	18,920	80
<u>1985</u>						
Jan.	809,300	890,230	28,720	39,710	24,310	81
Feb.	821,800	903,980	32,290	56,100	25,190	91
Mar.	891,400	980,540	31,630	38,500	25,520	89
April	854,300	939,730	31,320	54,450	23,540	88
May	1,018,000	1,119,800	36,120	48,620	25,740	102
June	1,047,500	1,152,250	38,408	63,580	23,100	108
July	1,174,900	1,292,390	41,690	58,630	26,400	118
Annual	10,998,700	12,098,570	33,150			94

Based on a present population of 354

IV. DESIGN CRITERIA

1. GENERAL.

The Town Officials of Iroquois have been exploring the various alternatives for the past several years. This study has been undertaken to evaluate the different possibilities using good Engineering practices.

2. DESIGN PERIOD.

The design period for the different alternatives is 40 years. This does not mean that other factors will not affect this time period. For example, the existing cast iron water mains have been in use for approximately 65 years. The materials being used today should last 100 years, but these materials haven't been in use for 100 years so it is impossible to say just how long they will last. The main factor affecting the design period is the debt payback of the financing.

3. DESIGN POPULATION.

The present population of Iroquois is 354. It is projected that the population will remain constant for the near future. The system as designed would support any foreseeable growth Iroquois is likely to experience in the next 25 to 50 years. The Town presently has a modern sewer system, an active school system and a healthy business and commercial community.

4. FIRE FLOWS.

The business district, the industrial district and the school are all served with 6 inch water mains and a looped system. The remainder of the system is looped 4 inch with only just a couple of dead end lines. The system as proposed (see Figure 2) has 29 fire hydrants with 6 being on the 6 inch portion. All structures in the Town are within 300 feet of a hydrant with most within 300 feet of 2 hydrants. When completed, the hydrants shall be color coded to indicate which hydrants could be used to supply a pumper engine. A separate high service pump should be installed at the ground level reservoir for filling tank trucks directly

or pressurize the mains at a time of emergency. The Insurance Service Office in Minneapolis, Minnesota rates towns for fire insurance purposes. This new system and its features may help the insurance rates in the community.

V. DESIGN IMPROVEMENTS

1. WATER SOURCE.

The various "Sources" of water were investigated by reviewing the following data:

- Open-File Report No. 36-UR "Ground Water Study for the Town of Iroquois, South Dakota"
- Geology and Water Resources of Beadle County, South Dakota
- Kingbrook II Rural Water System

Review of this data indicates there are two alternate sources for Iroquois.

ALTERNATE 1 - The Town of Iroquois would develop a Town well $3\frac{1}{2}$ miles west of Iroquois.

ALTERNATE 2 - The Town of Iroquois would hook up to the Kingbrook Rural Water Systems.

Alternate -1- Review of the data indicates that a production well could be drilled $3\frac{1}{2}$ miles west of Iroquois. The proposed location would be on the north-south quarter line of Section 4, just south of the railroad, Township 110 North, Range 59 West, Beadle County. The Town of Iroquois has applied for a water rights permit at this location.

Based on the information we have at this time, the following is the proposed procedure for developing this well:

Source - 13,000,000 gallons per year with a maximum of 1,200,000 gallons any single month pumped at a rate of 200 gpm for an average of approximately 34,000 gallons per day.

STEP 1 - Drill a 5" test well with the idea of developing it into a production well.

"E" log the test hole to determine aquifer characteristics. Take sediment samples to size well screen. Test pump to determine quantity, pump size, and water sample.

STEP 2 - Construct the production well.

The following is an estimate of the well based on present test hole data:

A well 70' deep using an 8" Class 200 PVC casing with 40' of 304 stainless steel screen. A submersible (200 gpm) pump on a 4" PVC drop pipe, 8" pitless well adapter, gravel pack, cement pack.

Alternate -2- The second alternate is for the Town of Iroquois to use the Kingbrook Rural Water System as a source. The Town could be served as a bulk user at a rate of approximately \$1.10 per 1,000 gallons or the individual household could be served as individual hookups at a minimum rate of \$16 per month and \$2.25 per 1,000 gallons. Alternate -2- requires the construction of 16 miles of transmission pipeline from DeSmet. The pipeline should be sized adequately to provide 200 gpm and a peak day of 60,000 gallons.

The following table compares the various water qualities from the different sources.

2. STORAGE FACILITIES.

The existing 100,000 gallon 2-cell ground level concrete reservoir and the 20,000 gallon hydro-pneumatic tank combined with an adequate source should adequately meet Iroquois' storage needs as well as provide fire protection. To meet the fire needs, a high-service pump should be installed in the ground level reservoir capable of pumping 750 gpm.

WATER QUALITY COMPARISON

Chemical Constituent (ppm)	Iroquois Existing South Well	Test Hole #24 Sample 11	Kingbrook II Rural Water System DeSmet
Calcium	10.0	57.0	77.0
Sodium	645	53	13.2
Magnesium	3.0	11.3	28.3
Potassium	6.1		4.0
Iron (0.3) ²	0.36	2.70	0.29
Manganese (0.05) ²	0.09	1.17	0.50
Chloride (250) ²	163	11.0	5.3
Fluoride (2.4) ¹	2.10	0.18	0.24
Nitrate (10.0) ¹	1.3	0.50	<0.1
Sulfate (250) ²	982	250	104
Total Dissolved Solids (500) ²	2057	344	441
Alkalinity - M CaCO ₃	232		227
Bicarbonate	283		277
Hardness (CaCO ₃)	37.3	188	309
pH (6.5-8.5)	8.23		7.2
Langelier Index	-0.29		-0.35
Spec. Cond. umhos/cm	3000	700	603

1 United States Environmental Protection Agency "National Interim Drinking Water Regulations", 12-24-75 (Enforceable Limits)

2 United States Environmental Protection Agency "National Interim Drinking Water Regulations", 07-19-79 (Recommended Limits)

3. DISTRIBUTION SYSTEM.

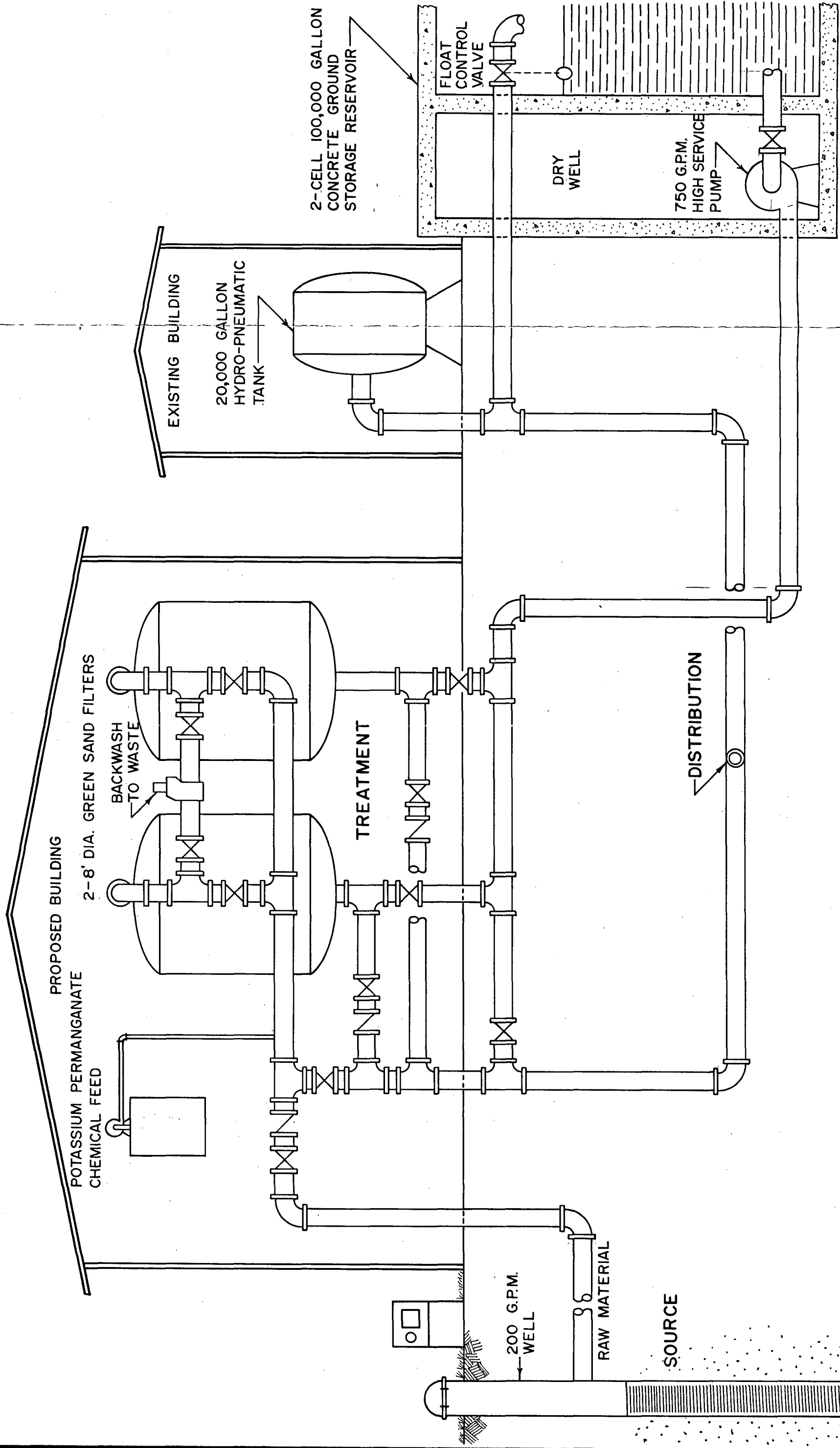
The Town of Iroquois has undertaken an aggressive water main replacement program the last few years. The existing system is shown in Figure -1-. The new distribution system (Figure 2) is the replacement of the remaining cast iron lines and the looping of the few remaining dead end lines.

4. TREATMENT.

A review of the water quality for the source of Alternate -1- shows that the quality is excellent with the exception of Iron (2.70 ppm) and Manganese (1.17). Both these chemical constituents exceed the recommended limits of the U.S. Environmental Protection Agency "National Interim Drinking Water Regulations" of 0.3 ppm and 0.05 ppm respectively. Both Iron and Manganese can be removed relatively easily and inexpensively. The treatment can be handled by installing two - 8 foot diameter rapid green sand filters with a potassium permanganate chemical feeder.

The filters would be operated at 2 gpm/ft² and backwashed at 15 gpm/ft². The 750 gpm high-service pump, pumping out of the ground storage, would be used to backwash the filters. A schematic of the filter is shown in Figure -3-.

The chemical feed is at a rate of 1:1, 2.70 + 1.17 is approximately 4 pounds per million pounds of water or 120,000 gallons which results in 400 pounds of chemicals per year. Potassium permanganate costs approximately \$140/100#; therefore the chemical cost would be \$560 per year plus \$500 per year for fluoride. The treatment system should be constructed in a building with adequate storage space to store chemicals and the rest of the water department's inventory and provide shop facilities for water department maintenance.



PROPOSED ALTERNATE 1
WATER SYSTEM

VI. ESTIMATES AND BUDGET

1. Cost Estimate for Development of Source:

• Alternate -1- Construct New Well & Transmission Line

ITEM	UNIT	UNIT COST	TOTAL COST
1. Drill & Develop Production Well	1 L.S.	12,000.00	\$12,000.00
2. 4" Ø Transmission Line	18,500 L.F.	4.30	<u>79,550.00</u>
Total Construction Project	Alternate -1-		\$ 91,550.00
Administration Expense	3%		2,746.50
Engineering Design	6%		5,793.00
Engineering Inspection	5%		4,577.50
Legal	5%		4,577.50
Contingencies	15%		<u>13,732.50</u>
TOTAL ALTERNATE -1- (Source)			\$122,977.00

• Alternate -2- Construct Transmission Line from Kingbrook Rural Water System at DeSmet

ITEM	UNIT	UNIT COST	TOTAL COST
1. 4" Ø Transmission Line	84,480 L.F.	2.00	\$168,960.00
2. Road Crossings	9 Ea.	1,500.00	13,500.00
3. 4" Ø Valve	3 Ea.	500.00	1,500.00
4. Master Meter & Pit	1 Ea.	4,000.00	<u>4,000.00</u>
Total Construction Project	Alternate -1-		\$187,960.00
Administration Expense	2%		3,759.20
Engineering Design	4%		7,518.40
Engineering Inspection	4%		7,518.40
Legal	4%		7,518.40
Contingencies	10%		<u>18,796.00</u>
TOTAL ALTERNATE -1- (Source)			\$233,070.40

2. Cost Estimate For Distribution System

ITEM	UNIT	UNIT COST	TOTAL COST
1. 6" Ø Water Main Replacement	600 L.F.	8.00	\$ 4,800.00
2. 4" Ø Water Main Replacement	13,000 L.F.	6.00	78,000.00
3. Connections (Complete)	100 Ea.	200.00	20,000.00
4. Fire Hydrants	4 Ea.	800.00	3,200.00
5. 4" Gate Valves	4 Ea.	500.00	2,000.00
6. Boring	200 L.F.	80.00	16,000.00
7. Street Repair	1 L.S.	35,000.00	<u>35,000.00</u>

Total Construction Project	Distribution System	\$159,000.00
Administration Expense	3%	4,770.00
Engineering Design	6%	9,540.00
Engineering Inspection	6%	9,540.00
Legal and Easements	5%	7,950.00
Contingencies	15%	<u>23,850.00</u>

TOTAL DISTRIBUTION SYSTEM \$214,650.00

3. Cost Estimate For Treatment

ITEM	UNIT	UNIT COST	TOTAL COST
1. 8' Ø Rapid Green Sand & Filter	2 Ea.	24,000.00	\$ 48,000.00
2. Chemical Feed System	1 Ea.	1,000.00	1,000.00
3. Floridation System	1 Ea.	1,000.00	1,000.00
4. 30'x40' Building	1 Ea.	50,000.00	<u>50,000.00</u>
Total Construction Project	Treatment		\$100,000.00
Administration Expense	3%		3,000.00
Engineering Design	6%		6,000.00
Engineering Inspection	6%		6,000.00
Legal	2%		2,000.00
Contingencies	15%		<u>15,000.00</u>

TOTAL TREATMENT \$132,000.00

4. TOTAL PROJECT ESTIMATED CONSTRUCTION COST

ALTERNATE -1-	Source	\$122,977.00
	Distribution System	214,650.00
	Treatment System	<u>132,000.00</u>
	TOTAL	\$469,627.00
ALTERNATE -2-	Source	\$233,070.40
	Distribution System	<u>214,650.00</u>
	TOTAL	\$447,720.40

5. OPERATING BUDGET (Based on 150 hookups)

• ALTERNATE -1- Well-Treatment-Distribution

Estimated Yearly Pump Cost

12,000,000 gal. annually pumped at a rate of 200 gal. per minute
requires 1,000 hours of pumping

5 H.P. x .746 KW/H.P. x 1,000 hours x \$0.08 per KWH = \$0.17
Monthly pumping cost = \$298 ÷ 12 mo./yr. ÷ hookups

Estimated Replacement Cost

\$470,000 ÷ 100 yrs. ÷ 12 mo./yr ÷ 150 hookups = 2.60
Monthly Minimum Charge

Treatment Cost

Annual Chemical Cost = \$1060 ÷ 12 mo./yr. ÷ 150 hookups 0.60

Administrative Cost

Monthly = \$1.00 per month per hookup = 1.00

ALTERNATE -1- Total Monthly Payment Without Debt Repayment \$4.37

• ALTERNATE -2- Kingbrook - Distribution

Based on water rates from Kingbrook Rural Water System of
\$1.10 per 1,000 gal. for bulk users

Annual water costs 12,000,000 gal. x \$1.10/1,000 gal. = \$13,200.00
Monthly water costs = 1,100.00

Example

1 Person Household Using
50 gallons per day
(not including lawn watering) = 1,500 gal. per month
Water Use at \$1.10 per 1,000 gal. = 1.50 per month

4 Person Household Using
50 gallons per day per person
(not including lawn watering) = 6,000 gal. per month
Water Use at \$1.10 per 1,000 gal. = 6.60 per month

Estimated Replacement Cost

\$450,000 ÷ 100 years ÷ 12 mo./yr. ÷ 150 hookups
Monthly Minimum Charge = \$2.50

Administrative Cost

Monthly = \$1.00 per month per hookup	=	\$1.00
---------------------------------------	---	--------

ALTERNATE -2- Total Monthly Payment Without Debt Repayment

1 person household	=	\$5.00
--------------------	---	--------

4 person household	=	\$10.10
--------------------	---	---------

NOTE: Alternate -2- uses 50 gpcpd while the present water records indicate
that 94 gpcpd are being used.

VII. METHODS OF FINANCING

Some of the different possibilities for funding the improvements are:

1. Cash from Budget
2. FmHA Financing
3. General Obligation Bonds
4. Revenue Bonds
5. CDBG through HUD

1. CASH FROM BUDGET

Money obtained by levying taxes could be put in a sinking fund so that improvements to the system can take place as they are needed. It is realized that there are many needs other than water needs that are in competition with the tax dollar. Therefore, the Town must choose where the greatest needs are before making this choice.

2. FmHA FINANCING

The Farmers Home Administration may help towns, such as Iroquois, under 10,000 population either with a loan and/or grant depending on a number of factors. The interest rate on a loan is usually below that on bonds.

3. GENERAL OBLIGATION BONDS

General Obligation Bonds are guaranteed by the taxing power of the community. These usually have the most desirable interest rate of bonds. However, they still can be paid off by revenues from water sales.

4. REVENUE BONDS

These bonds are paid off by the revenue producing capabilities of the Town. Again, the water rates have to be high enough that there is money to pay off the interest and principle required to amortize the bonds. The customer is billed as per his use of the facility which is usually equitable. Interest rates here are usually higher than General Obligation Bonds.

5. CDBG THROUGH HUD

The State of South Dakota administers these funds through a detailed formula which rates the towns and cities throughout South Dakota. These funds are grants dispersed to the towns and cities which usually amount to just a portion of the construction cost.

A fiscal agent should be selected by the Town if the Town chooses to fund any part of the recommended improvements with bonds. This agent will analyze

and recommend to the Town the details of each method of funding.

As an Example of financing using a combination of these different possibilities, CLARK ENGINEERING COMPANY is putting forth the following Example:

The Town of Iroquois, using this report, should make application to be put on the South Dakota State Water Plan. By being on the State Water Plan, this makes Iroquois eligible to apply for a CDBG Grant. The history of the CDBG grants' program, indicates that to be successful, the Town of Iroquois should not apply for a grant in excess of 60 percent of the project cost. It is therefore recommended that Iroquois apply for a grant in the amount of 60 percent of the project cost.

The 40 percent portion of the project which the Town would be responsible for could be paid for from a combination of ways. The Town of Iroquois should apply for a combination grant/loan from the FmHA. The loan portion would be between 5 and 7 percent interest depending upon how the Town rates in regard to Town indebtedness, income level, and other factors. The Town of Iroquois has budgeted \$20,000 for the water improvement project.

Example (1) Using Alternative -1- CDBG Grant & FmHA Loan & Local Cash

Total Project Cost		\$469,627.00
60% CDBG Grant		281,776.00
Local Cash		<u>20,000.00</u>
Balance to be Financed by FmHA		\$167,851.00
Repayment 40 Year Loan @ 5%		
(58.28/\$1,000.00)	=	\$9,782.34/Yr.
	=	\$ 815.20/Mo.
With 150 hookups		\$ 5.43 Ea. per month

Estimated Monthly Water Cost

	1-person hookup	4-person hookup
Water Cost	\$4.37	\$4.37
Financing	<u>5.43</u>	<u>5.43</u>
Total	\$9.80	\$9.80

Example (2) Using Alternative -1- CDBG Grant & FmHA Loan & FmHA Grant & Local Cash

Total Project Cost	\$469,627.00
60% CDBG Grant	281,776.00
Local Cash	20,000.00
FmHA Grant	<u>10,000.00</u>

Balance to be Financed by FmHA \$157,851.00

Repayment 40 year loan @ 5%
 (58.28/\$1,000.00) = \$9,199.56/Yr.
 = \$ 766.62/Mo.

With 150 hookups \$ 5.11 Ea. per month

Estimated Monthly Water Cost

	1-person hookup	4-person hookup
Water Cost	\$4.37	\$4.37
Financing	<u>5.11</u>	<u>5.11</u>
Total	\$9.48	\$9.48

Example (3) Using Alternative -2- CDBG Grant & FmHA Loan & Local Cash

Total Project Cost	\$447,721.00
60% CDBG Grant	268,633.00
Local Cash	<u>20,000.00</u>

Balance to be Financed by FmHA \$159,088.00

Repayment 40 year loan @ 5%
 (58.28/\$1,000.00) = \$9,271.65/Yr.
 = \$ 772.64/Mo.

With 150 hookups \$ 5.15 Ea. per month

Estimated Monthly Water Cost

	1-person hookup	4-person hookup
Water Cost	\$ 5.00	\$10.10
Financing	<u>5.15</u>	<u>5.15</u>
Total	\$10.15	\$15.25

Example (4) Using Alternative -2- CDBG Grant & FmHA Loan & FmHA Grant
& Local Cash

Total Project Cost	\$447,721.00
60% CDBG Grant	268,633.00
Local Cash	20,000.00
FmHA Grant	<u>10,000.00</u>

Balance to be Financed by FmHA \$149,088.00

Repayment 40 year loan @ 5%
(58.28/\$1,000.00) = \$8,688.85/Yr.
= \$ 724.07/Mo.

With 150 hookups \$ 4.83 Ea. per month

Estimated Monthly Water Cost

	1-person hookup	4-person hookup
Water Bill	\$5.00	\$10.10
Financing	<u>4.83</u>	<u>4.83</u>
Total	\$9.83	\$14.93

IROQUOIS FINANCING SUMMARY TABLE

Example and Alternate	Total Project Cost	60% CDBG Grant	Local Cash (1)	FmHA Grant	FmHA Financed Loan (2)	Monthly Water Bill (3)	
						1-person	4-person
1/1	\$469,627.00	\$281,776.00	\$20,000.00	-----	\$167,851.00	\$ 9.80	\$ 9.80
2/1	469,627.00	281,776.00	20,000.00	\$10,000.00	157,851.00	9.48	9.48
3/2	447,721.00	268,633.00	20,000.00	-----	159,088.00	10.15	15.25
4/2	447,721.00	268,633.00	20,000.00	10,000.00	149,088.00	9.83	14.93

1. Local Cash from \$20,000 Budgeted
2. 40 year loan @ 5% interest
3. 50 gal. per day per person (no lawn watering, etc.)

APPENDIX

APPENDIX

SOUTH DAKOTA PUBLIC WATER SYSTEM DATA

NOVEMBER, 1983

Water Supply	Iroquois	
City/Town	Iroquois	
Population	354	
Storage:	Hydro-pneumatic tank	20,000 gal.
	Concrete Ground	100,000 gal.
Treatment	None	

Inorganic Chemicals:

Sample Date	12-16-83
Sample Type	Raw Water
Source	Well -1- Built 1981 860' deep 2" dia.
Arsenic	6.2 ug/l
Barium	<50 ug/l
Cadmium	<1.0 ug/l
Chromium	1.0 ug/l
Lead	3.0 ug/l
Mercury	<0.20 ug/l
Nitrate-N	2.8 mg/l
Selenium	6.5 ug/l
Silver	<1.0 ug/l
Fluoride	2.07 mg/l

Common Ion

Sample Date	05/24/83
Sample Type	Raw Water
Chloride	165.0 mg/l
Copper	—
Iron	0.28 mg/l
Manganese	0.07 mg/l
Sulfate	1025 mg/l
Zinc	—
Total Dissolved Solids	2051 mg/l
pH	8.24
M ALK (CaCO_3)	252 mg/l
P ALK (CaCO_3)	0 mg/l
Bicarbonates	307 mg/l
Carbonates	0 mg/l
Spec Cond UMHOS/CM	2912
Calcium	16.5 mg/l
Magnesium	4.6 mg/l
Hardness CaCO_3	60 mg/l
Lang Index	-0.03
Sodium	675.0 mg/l
Potassium	7.7 mg/l
Nitrate-N	0.2 mg/l
Fluoride	2.13 mg/l

INORGANIC AND RADIOLOGICAL CHEMICALS

ARSENIC - Although arsenic compounds may occasionally contaminate water sources as the result of industrial discharges or pesticide use, the occurrence of arsenic in drinking water is usually the result of ground waters being drawn from mineral formations containing natural arsenic ores. Arsenic occurs in both trivalent and pentavalent states, as well as in organic forms. Trivalent compounds are more toxic than pentavalent compounds. The pentavalent state appears to predominate in foods, particularly seafood. Arsenic has been considered by certain researchers to be an etiological factor in epidemiod carcinoma of the skin and lungs and precancerous dermal keratoses. At this time, there is not an acceptable animal model demonstrating carcinogenic potential of arsenic. The current maximum contaminant level (MGL) for arsenic of 0.05 mg/l was derived from toxicity considerations other than carcinogenicity.

BARIUM - Barium is a natural mineral and deposits appear to be concentrated in the midwest. The MCL for barium of 1 mg/l was based on projected effects on the peripheral nervous and cardiovascular systems. Preliminary experimental findings have revealed that chronic, low-level barium ingestion produced increased blood pressure and EKG abnormalities in rats.

CADMIUM - The presence of cadmium in drinking water is normally the result of corrosion of galvanized pipes and fittings. Also, cadmium may occasionally be present as the result of contamination of the water sources. The MCL for cadmium was based on the intake necessary to produce proteinuria; while a significant source of intake could be cigarette smoking, this was not taken into account. The current drinking water standard is 0.010 mg/l.

CHROMIUM - The occurrence of excess chromium in drinking water is relatively infrequent and the result of contamination of water sources or use of chromates as corrosion inhibitors. The MCL for total chromium (trivalent and hexavalent) was based on the toxicity of hexavalent chromium. Hexavalent chromium exerts adverse effects on the renal, hepatic and gastrointestinal systems and the skin. Carcinogenic and mutagenic potential of this form of chromium has been shown. The current MCL for total chromium is 0.05 mg/l.

LEAD - The occurrence of lead in drinking water is normally the result of corrosive action of water on pipe, fittings, and solder. Studies on humans have demonstrated that infants and young children are more susceptible than adults to biochemical effects of lead. Excessive lead intake results primarily in adverse effects on gastrointestinal, nervous, hematopoietic, renal and immunological systems. Of major concern are the reported subtle effects of lead on behavior in infants and young children. Carcinogenic and teratogenic potential of lead has been reported. In addition to drinking water, primary sources of exposure include food, air, dust and paint. The current drinking water standard for lead is 0.05 mg/l.

MERCURY - The major source of mercury in drinking water sources is natural mineralization or discharges from chlorinealkali manufacture, although there may be some instances of well contamination from mercury-sealed well pumps. The MCL for mercury of 0.002 mg/l was based on the neurological effects associated with the ingestion of alkyl mercury. Because inorganic mercury can be converted to alkyl mercury in the environment, the MCL was expressed in terms of total mercury.

SELENIUM - Nearly all selenium found in drinking water sources is from natural minerals. In areas where selenium is present in drinking water in significant concentrations, it is likely that the soil is seleniferous and that food produced in the area has a higher selenium

concentration than that of an average food supply. The adverse health effects from chronic ingestion of selenium range from gastro-intestinal problems to dental damage. The MCL for selenium is 0.01 mg/l.

SILVER - Silver generally could occur at elevated levels in drinking water as the result of photographic industry discharges or as the result of using silver as a bacteriostat. Silver accumulates to some degree in the human body and can produce argyria, a blue-gray discoloration of the skin and mucous membranes. While this effect appears to be entirely cosmetic, some adverse health effects have been reported in animals drinking water containing silver. The current MCL is 0.05 mg/l.

NITRATE - Most nitrate that occurs in drinking water is the result of contamination of ground water supplies by septic systems, feed lots and agricultural fertilizers. Occasionally, ground water contamination results from decomposition of natural organic matter. The MCL for nitrate was intended solely to protect infants from methemoglobinemia, or "blue baby" syndrome. The mechanism of toxicity involves the reduction of nitrate which in turn affects the oxygen-carrying capacity of the blood. Infants in the first few months of life are particularly susceptible to this disease. The MCL is 10 mg/l (as nitrogen).

FLUORIDE - Fluoride is an ubiquitous component of drinking water, and is beneficial at certain concentrations although it causes dose-related dental fluorosis as levels in drinking water increase. Fluoride minerals are widespread, and most fluoride in drinking water comes from this source. MCLs for fluoride were based on the occurrence and severity of dental fluorosis, a condition manifested by both cosmetic and physiological alternations in tooth enamel. The standard was designed to protect against severe fluorosis which is manifested by pits and destruction of dental enamel. Skeletal fluorosis can occur at higher levels. The MCL for fluoride in South Dakota is 2.4 mg/l.

GROSS ALPHA PARTICLE ACTIVITY - The gross alpha particle activity measurement is intended as a screening mechanism to determine if any of the approximately 20 alpha emitting natural radionuclides are present in drinking water. If the gross alpha particle activity exceeds 15 pCi/l and is not radium, uranium or radon, the situation is handled on a case-by-case basis. The health effects of exposure and available treatment for control depend on the specific radionuclide present.

GROSS RADIUM - High total dissolved solids (TDS) can cause interferences of the gross alpha test. The gross radium analytical procedure is used when the TDS is above 500 mg/l. When the gross radium exceeds 3 pCi/l additional testing for radium is performed.

RADIUM 226/228 - Radium-226 and 228 occur mainly in ground water. Radium-226 (an alpha emitter) is part of the uranium naturally radioactive series. Radium-228 (a beta emitter) is the first daughter product of thorium-232. Radium is a bone seeker and the health effects of lifetime ingestion include bone cancer and leukemia. These effects have been demonstrated in both humans and animals. The individual risk rate for ingesting 5 pCi radium/liter for a lifetime is 4.4×10^5 excess cancers.

BETA PARTICLE RADIOACTIVITY - For beta particle radioactivity from man-made radionuclides, requirements were based upon annual average concentrations of individual isotopes yielding 4 millirem per year for a two-liter daily intake of water. The health effects and treatment methods depend upon the type and quantity of radionuclides present.

URANIUM - The Regulations for gross alpha particle activity did not include uranium.

Uranium was excluded because of uncertainties concerning its occurrence in water, and the disagreement on the significance of its chemical versus radiotoxicity. Based upon new information regarding the occurrence and potential health effects of uranium in drinking water, consideration is being given to establishing an MCL for uranium based upon carcinogenic and/or chemical toxicity potential.

COMMON IONS

CHLORIDE - Chlorides in drinking water are generally not harmful to human beings until high concentrations are reached, although chlorides may be injurious to some people suffering from diseases of heart or kidneys. Restrictions on chloride concentrations in drinking water are generally based on taste requirements rather than on health. The source of chlorides may be a more important factor than the quantity of chloride, in that any sudden increase in the chloride content should be suspected as a possible indication of pollution and should be investigated further. Chlorides should not exceed 250 mg/l.

COPPER - Copper is currently regulated because of its effect on taste of drinking water. It is commonly found in drinking water from corrosion of copper pipes. Copper is an essential nutrient, but there is no evidence of copper deficiency in the U.S. population. Toxic effects from elevated drinking water levels have been reported especially for infants. Copper imparts an unpleasant taste to drinking water, which along with an emetic effect, served to limit the amount of copper which can be ingested from drinking water. The occurrence of copper in drinking water is usually a result of corrosion. The recommended maximum limit is 1 mg/l.

IRON AND MANGANESE - Iron and manganese are nuisance chemicals which cause troublesome stains and deposits on light colored clothes, on plumbing fixtures and in pipes. Iron can be removed in a zeolite softener equipped with a special resin or by small treatment systems involving aeration, filtration, and chlorination. Manganese in excess of 0.05 mg/l will more than likely cause problems. Iron problems arise with levels greater than 0.3 mg/l.

SULFATE - Sulfate is a common water contaminant and in some cases it occurs at concentrations high enough to cause laxative effects, particularly in those not acclimated to use of high-sulfate waters. Sulfate has been suspected as a contributing factor in the formation of various organ or duct calculi. Sulfate is extremely difficult to remove from drinking water. Anion exchange and reverse osmosis are reasonably effective. The maximum recommended limit is 250 mg/l.

ZINC - Zinc is currently regulated based upon taste considerations. Zinc occurrence in drinking water is most frequently due to the corrosion of galvanized iron pipe and fittings. Zinc is relatively non-toxic and is an essential trace element. At drinking water concentrations high enough to cause gastrointestinal disturbances, zinc would impart a strong astringent taste and milky appearance to the water. The recommended maximum limit is 5 mg/l.

SOLIDS (TOTAL) - This refers to the amount of total solid matter suspended and dissolved in water. Water with a high solids count generally are of poor drinking water quality. A limit of 500 mg/l for drinking water is recommended with 4000 mg/l as a maximum.

pH - The pH indicates the acidity of your drinking water. The pH scale is from 0 to 14 units with a value of 7 being neutral (equal amounts of acid and base). pH values less than 7 are acidic, and pH values above 7 are basic. The recommended limit for pH is 6.5-8.5.

ALKALINITY - Alkalinity is not considered to be detrimental to humans, but is generally associated with hardness, high pH values and excessive dissolved solids, all of which may be undesirable. No recommended standard has been set.

BICARBONATES - Excessive bicarbonates add to the salinity and total solids content of

water, and at high temperature tend to form scale deposits on faucets. No recommended standard has been set.

CARBONATE - This term is also called temporary hardness because heating will remove it. When the water is heated, bicarbonates break down into carbonates that form solid particles which stick to the inside of pipes or a heated surface.

CONDUCTIVITY - This measures the ability of water to conduct electric current, and is related to the type and amount of dissolved chemicals in the water. In general, waters having a conductivity of less than 1000 micromhos may have slight hardness as well as taste and odor problems. Dependent upon the particular chemicals dissolved in the water, these problems may become more pronounced with increasing conductivity to the extent that levels greater than 3000 micromhos may make the water objectionable for human use.

CALCIUM - Calcium content is not a health hazard, but contributes to hardness and is disadvantageous for household uses such as washing, bathing, and laundering. It tends to cause incrustations on cooking utensils and water heaters. No recommended standard for calcium has been set.

MAGNESIUM - Magnesium is considered relatively non-toxic to man, and not a public health hazard because before toxic concentrations are reached in water, the taste becomes quite unpleasant. At high concentrations, magnesium salts have a laxative effect, particularly upon new users, although the human body can develop a tolerance to magnesium over a period of time.

HARDNESS - Hardness is the soap-consuming capacity of water, that is, the more soap required to produce lather, the harder the water. Hard water also causes greasy rings on bathtubs and sinks, chemical deposits in pipes and faucets, greasy films on dishes or on hair after washing and poor laundry results.

The hardness of South Dakota waters may be ranked as follows:

0-3 gpg	Soft water
4-10 gpg	Reasonably soft
11-25 gpg	Fairly hard, less than average for SD
26-50 gpg	Average hardness for SD
51-75 gpg	Very hard
over 75 gpg	Extremely hard

LANGELIER INDEX - This value indicates whether the water tends to be corrosive (-) or deposit (+) forming.

SODIUM - Sodium may be of health significance to persons on a low-salt diet for medical reasons. The sodium content is increased when water is passed through an ion exchange water softener.

POTASSIUM - In public drinking water supplies, potassium is an essential nutritional element, but in excessive quantities it acts as a laxative, and 1000 mg/l to 2000 mg/l is regarded as the extreme limit of potassium permissible in drinking water.

SOUTH DAKOTA STATE DRINKING WATER STANDARDS

<u>Substance</u>	<u>Maximum Contaminant Level (MCL)</u>	
	<u>mg/l</u>	<u>ug/l</u>
<u>Inorganic Chemicals</u>		
Arsenic	0.05	50.
Barium	1.	1000
Cadmium	0.010	10.
Chromium	0.05	50
Lead	0.05	50
Mercury	0.002	2.
Nitrate (as N)	10.	-
Selenium	0.01	10.
Silver	0.05	50
Fluoride	2.4	-
<u>Organic Chemicals</u>		
Endrin	0.0002	0.2
Lindane	0.004	4
Methoxychlor	0.1	100
Toxaphene	0.005	5.
2,4-D	0.1	100
Silvex	0.01	10
TTHM	0.10	100
<u>Radiological Chemicals</u>		
Radium-226 and 228 (Combined)	<u>pCi/l</u>	
Gross alpha particle activity	5	
(including Ra-226 but excluding Rn and U)	15	

mg/l = milligrams per liter

ug/l = micrograms per liter (ug/l are reported for the inorganic chemicals in the Data Book except for nitrate and fluoride)

pCi/l = picocuri per liter

Milligrams per liter are approximately equal to parts per million (ppm).

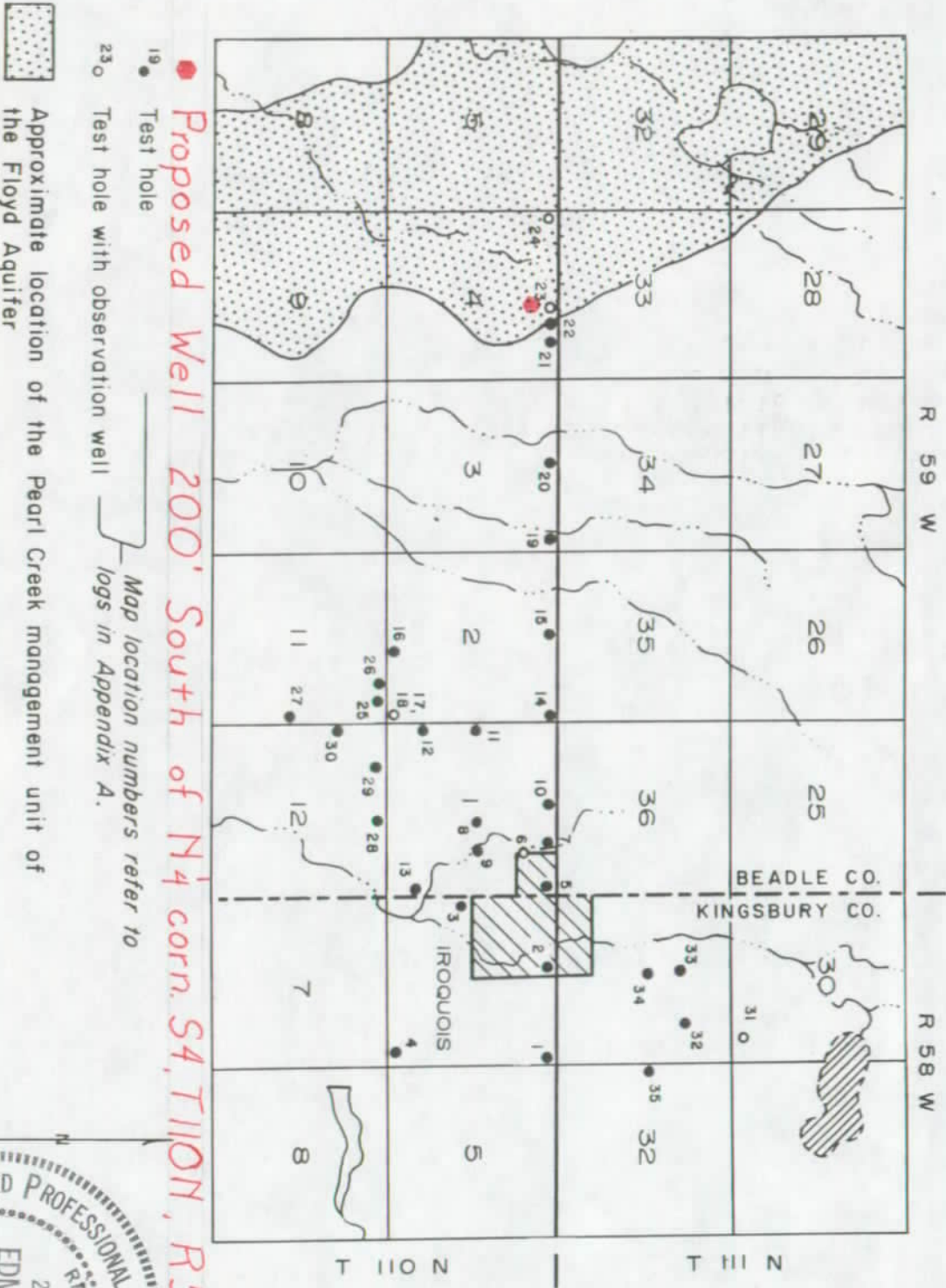
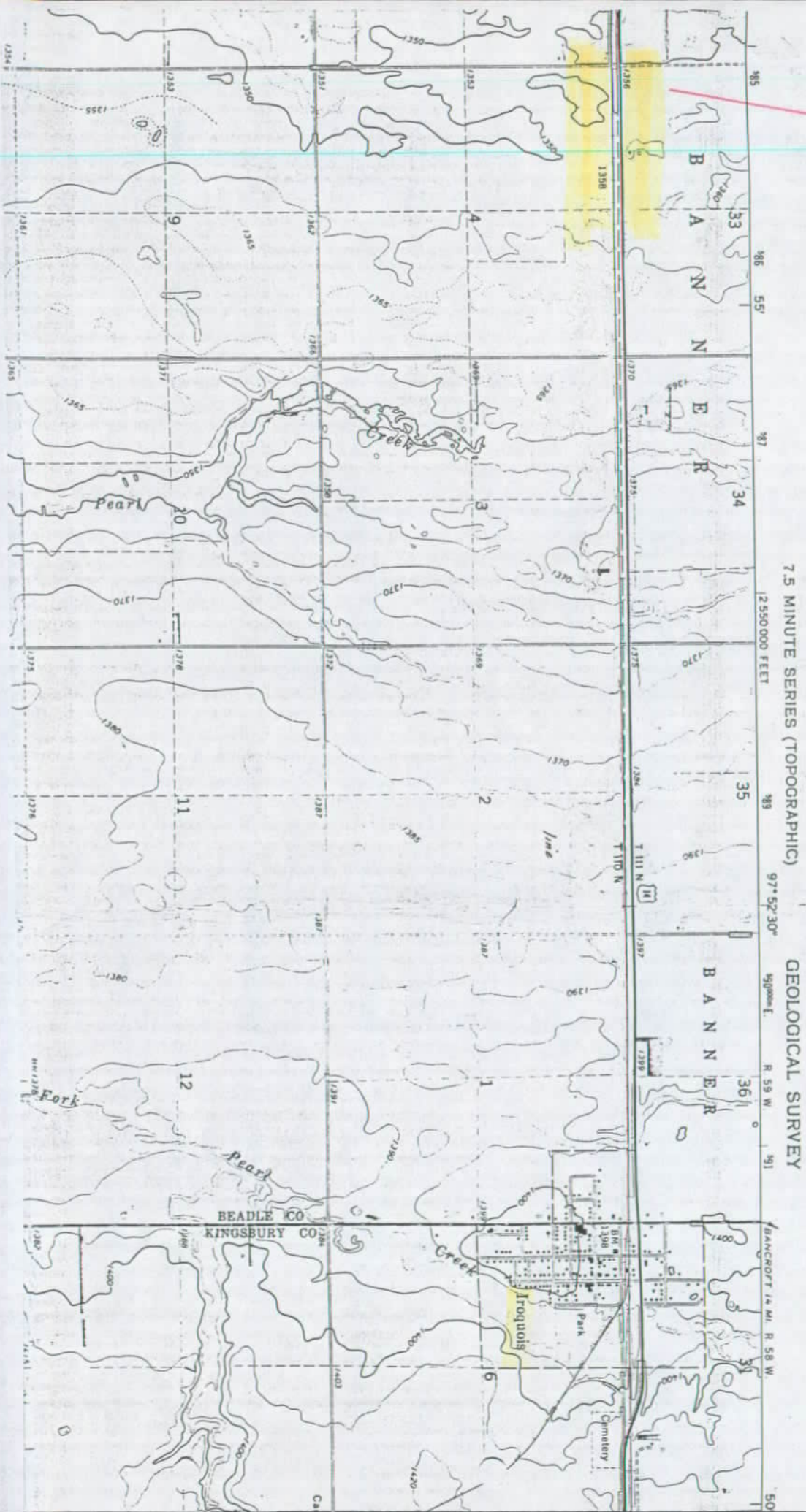
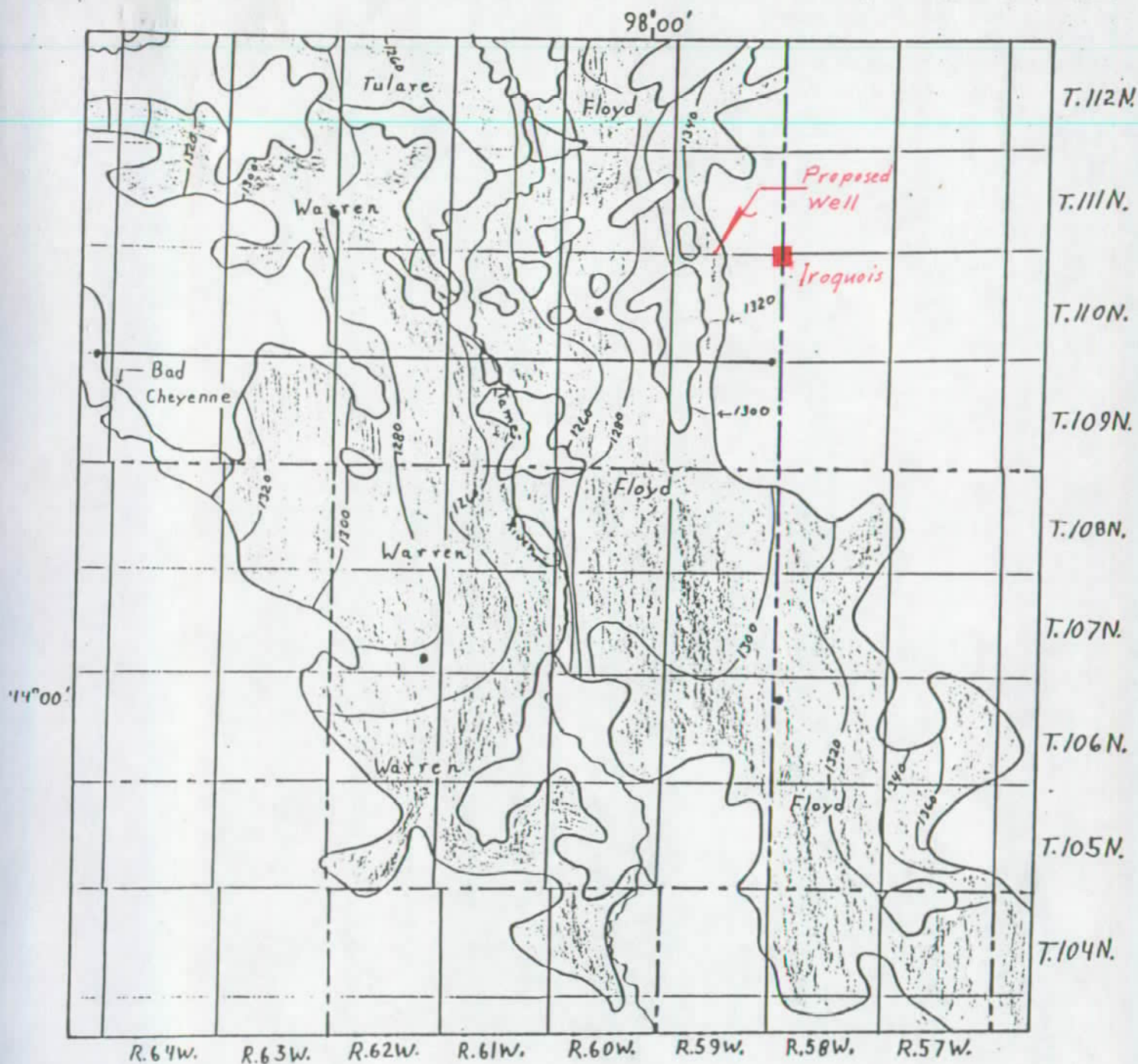


Figure 1. Test hole and observation well locations

Proposed Well 200' South of N4 corn. S4, T110N, R59W
 08-23-85 Edmund J. Jacobsen
 REGISTERED PROFESSIONAL ENGINEER
 REG. NO. 2490
 EDMUND J. JACOBSEN
 LAND SURVEYOR
 SOUTH DAKOTA

Proposed Well Field





EXPLANATION

- Tulare TULARE AQUIFER
- Bad Cheyenne BAD-CHEYENNE AQUIFER
- Warren WARREN AQUIFER
- Floyd FLOYD AQUIFER
- APPROXIMATE LIMITS OF AQUIFER
- LINE OF GEHYDROLOGIC SECTION SHOWN ON FIGURE 4
- 1300 — POTENTIOMETRIC CONTOUR -- Shows altitude of potentiometric surface in May, 1980. Interval is 20 feet. Datum is sea level.
- LOCATION OF HYDROGRAPHS SHOWN ON FIGURE 8

0 1 2 3 4 5 6 MILES
0 1 2 3 4 5 6 KILOMETERS
After Helges and others, 1981

Figure 3.-- Location and potentiometric surface of the aquifers in the glacial outwash.

WATER RIGHTS NARRATIVE

TOWN OF IROQUOIS

JANUARY 16, 1987

The Town of Iroquois has two Alternatives for obtaining an adequate water source as outlined in the August 1985 Study and Report prepared by Clark Engineering Company.

Alternate -1- was for the Town of Iroquois to develop its own well and treatment plant about 3.5 miles west of town.

Alternate -2- was for the Town of Iroquois to purchase water from the Kingbrook Rural Water System about 19 miles east at the Kingbrook water treatment plant near DeSmet.

In November 1986, Jerry L. Siegel, Manager of the East Dakota Water Development District prepared a summary report using the following two reports:

- Preliminary Feasibility Study, Water Service to Iroquois from Kingbrook Rural Water System, prepared by DeWild, Grant, Reckert & Association, November 1986.
- Alternative Water Sources for Iroquois, South Dakota and 65 New Rural Users in the Iroquois Area, prepared by Clark Engineering Company, October, 1986.

The findings of the East Dakota Report using the updated data is attached.

As the table shows, Iroquois' estimated cost for the original alternative water source is:

Alternate -1-	\$152,625
Alternate -2-	\$320,300

If the rural water system was to develop to handle the 65 new rural users, the estimate costs would be:

Alternate -1-	Iroquois Cost	\$112,200
	Rural Cost	<u>741,200</u>
	Total Cost	\$853,400
Alternate -2-	Iroquois Cost	\$ 249,000
	Rural Cost	<u>822,547</u>
	Total Cost	\$1,071,547

A point which has not been addressed to this time is that the 65 rural users have not been contacted since 1974 and at this time there is no where near 65 users available and the

ones which have been unofficially contacted by the Town indicated that they are not interested at this time.

The only feasible alternate to pursue at this time is the Alternate -1- for an estimated cost of \$152,625.

The Water Rights Application is for future use from the point that the exact location has not yet been determined. It will be from 3.5 to 4 miles west of Iroquois and either north of Highway 14 or south of the railroad. The exact location will be dependent upon the test well results and the landowners. The Town of Iroquois had let bids for test well exploration but was stopped by the South Dakota Department of Water & Natural Resources for not having a permit. It had been the thoughts of the Town that a permit wasn't required for exploration. It is the intent of the Town to apply for a water right and construct the well as soon as possible after determining the exact location. Attached is preliminary aquifer information. The Town's permit is for 38 acre-feet annually at a rate of 34,000 gallons per day.

ALTERNATIVE CAPITAL COSTS SUMMARY

Service to Iroquois only and allocated costs to Iroquois
and 65 new rural users (RU) for a joint project

Two water sources are compared - Kingbrook RWS DeSmet Plant and new Iroquois wells

Cost Allocations for Water Service to	Allocated Costs Based on Water Service from	
	Kingbrook RWS DeSmet Plant	Iroquois New Well
Iroquois only	\$320,300.00 (see p. 4, DGR report)	Wells/trans. line - \$ 64,425.00 Treatment - 88,200.00 (see page 4) <u>\$152,625.00</u>
Town of Iroquois (a joint project with 65 RU sharing costs)	249,000.00 (see p. 6, DGR report)	Wells/trans. line - 51,700.00 Treatment - 60,500.00 (see page 5) <u>\$112,200.00</u>
65 rural users (a joint project with Iroquois sharing costs)	Wells/treatment Transmission Line Distribution System (see page 3) - \$ 55,100.00 - 148,170.00 - 619,277.00 <u>\$822,547.00</u>	Treatment - 60,500.00 Wells/trans. line - 51,700.00 Distribution System <u>629,000.00</u> (see pages 5 & 6) <u>\$741,200.00</u>

TOTAL DRILL HOLE DEPTH: 16.0 TEST HOLE NUMBER: IR-32
SDGS WELL NAME: IR-32 WATER RIGHTS WELL NAME:
AQUIFER: FLOYD BASIN: JAMES
MANAGEMENT UNIT: PEARL CREEK
SCREEN TYPE: PVC, MFG. SCREEN LENGTH: 3.0
CASING TYPE: PVC CASING DIAMETER: 2.0
CASING TOP ELEVATION:
CASING STICK-UP: TOTAL CASING AND SCREEN: 9.0
WELL MAINTENANCE DATE:

0 - 2 SILT, BROWN, SANDY
2 - 9 SAND, COARSE GRADING TO MEDIUM
9 - 16 SHALE, BLACK (PIERRE SHALE)

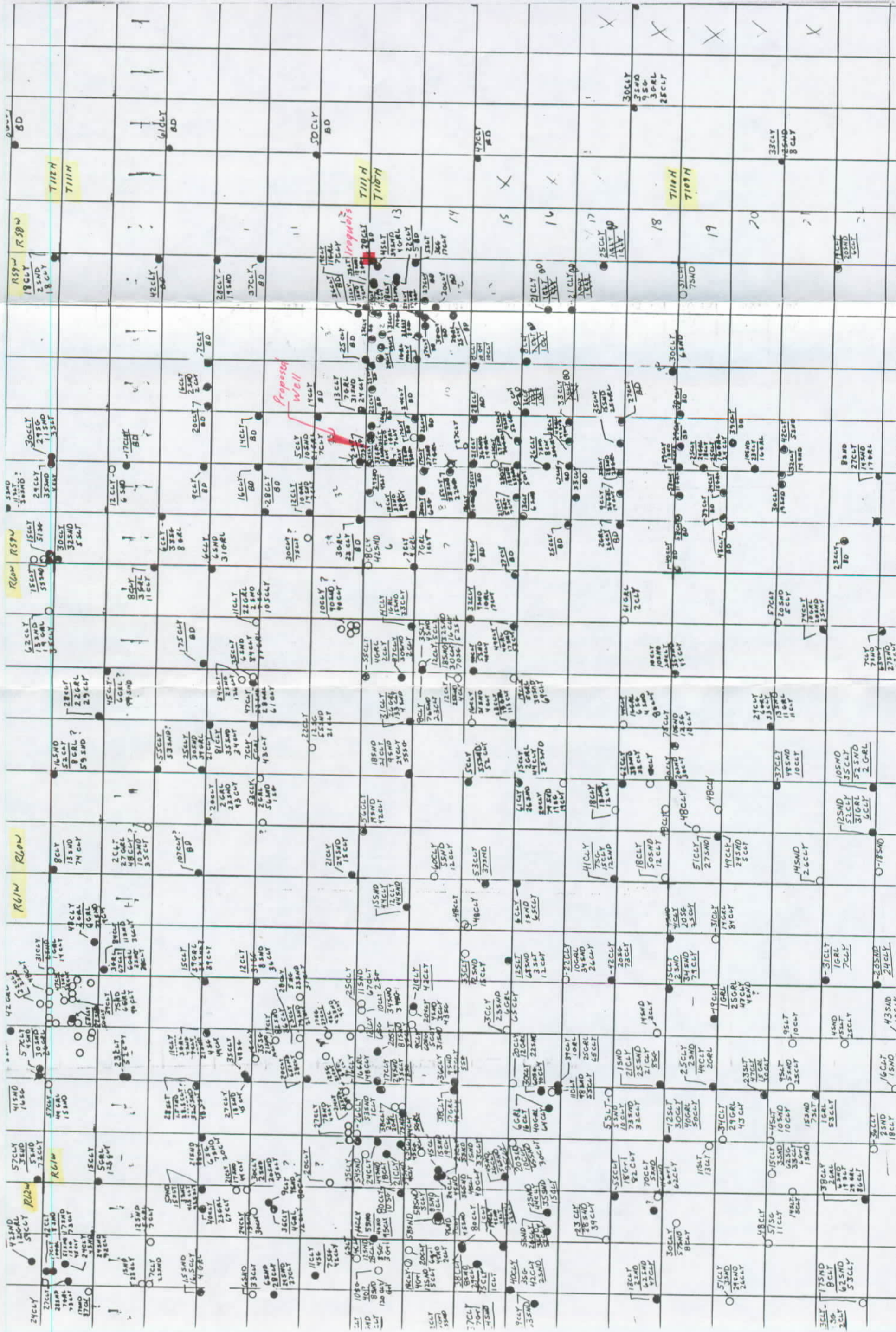
DRY HOLE. EASTERN MARGIN OF THE PEARL CREEK
AQUIFER.

Iroquois Study * * * * *UR-36*
COUNTY: BEADLE LOCATION: 110N-59W-04BBBB
MAP LOCATION: 24
LEGAL LOCATION: NW NW NW NW SEC. 04, T. 110 N., R. 59 W.
LATITUDE: 44.2207 LONGITUDE: 97.5600
LAND OWNER:

PROJECT: IROQUOIS CITY STUDY
DRILLING COMPANY: SDGS
DRILLER: B. GARRISON DRILLER'S LOG:
GEOLOGIST: S. GREEN GEOLOGIST'S LOG: X
DATE DRILLED: 07-16-1980 DRILLING METHOD: ROTARY
E-LOG: NO SAMPLES: NO GROUND SURFACE ELEVATION: 1343.00 T
TOTAL DRILL HOLE DEPTH: 70.0 TEST HOLE NUMBER: IR-29
SDGS WELL NAME: IR-29 WATER RIGHTS WELL NAME:
AQUIFER: FLOYD BASIN: JAMES
MANAGEMENT UNIT: PEARL CREEK
SCREEN TYPE: PVC, MFG. SCREEN LENGTH: 5.0
CASING TYPE: PVC CASING DIAMETER: 2.0
CASING TOP ELEVATION:
CASING STICK-UP: 3.0 TOTAL CASING AND SCREEN: 56.0
WELL MAINTENANCE DATE:

DEPTH TO WATER: 18 FEET ON 7-17-80.

0 - 2 SILT, BROWN
2 - 11 CLAY, YELLOW-BROWN, SILTY, SANDY, PEBBLY
(TILL)
11 - 12 GRAVEL, MEDIUM
12 - 25 SAND, COARSE AND GRAVEL, FINE, SILTY
25 - 36 GRAVEL, MEDIUM
36 - 47 GRAVEL, COARSE GRADING TO MEDIUM
47 - 57 GRAVEL, COARSE, WELL-ROUNDED; COAL
STRINGERS
57 - 60 CLAY(?); NO SAMPLE
60 - 70 GRAVEL, MEDIUM GRADING TO FINE, SANDY
70 - 71 ROCK; NO PENETRATION



Test Well Data

RECEIPT

Division of Water Rights

South Dakota Department of Water and Natural Resources

410730

Pierre, January 22, 1987

RECEIVED OF Town of Iroquois, PO Box 186, Iroquois, SD 57353

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

Fee for Application for Permit No. <u>5120-3</u> to Appropriate Water, to construct works and to put water to beneficial use	150	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. _____		
Fee for Filing Transfer Form _____		
Fee for Filing Extension Request _____		
Fee for Certified Copy of _____		
Fee for Print Copy of Map _____		
Fee for Certifying _____		
Fee for _____		
(Any Other Work Provided by Law)	Total	150 00

By

Chief Engineer

JOHN HATCH

ms

EAST DAKOTA WATER DEVELOPMENT DISTRICT

Office
524 Seventeenth Avenue
BROOKINGS, SOUTH DAKOTA 57006
TELEPHONE (605) 692-5185

BOARD OF DIRECTORS

EARL ACHESON, CHAIRMAN, Chester
JOHN L. WIERSMA, VICE-CHAIRMAN, Brookings
GARRY L. SCHOLZ, SECRETARY, Chancellor
WILLIAM DEMPSEY, White

RICHARD E. BROWN, Sioux Falls
ARTHUR B. DEWIT, Sioux Falls
TOM L. KOMMES, Madison
WALLACE L. REDLIN, Watertown
HOBERT STORER, Colman

JERRY L. SIEGEL
Manager-Treasurer

MEMORANDUM TO: Iroquois City Council (3 copies)
Molly Cowan, DWNR
James Madsen, FmHA
Willis Nelson, Kingbrook RWS
Earl Acheson, EDWDD
Gary Patton, DGR
Ed Jacobsen, Clark Engineering

FROM: Jerry L. Siegel, Manager-Treasurer

SUBJECT: Engineering Studies of Water Service to Iroquois and
Surrounding Rural Area

DATE: November 14, 1986

RECEIVED NOV 18 1986

1. You are all aware that Ed Jacobsen of Clark Engineering prepared an engineering study and report of water supply improvements for Iroquois dated August, 1985.
2. On July 29, the Water Development District Board of Directors decided to contract with DeWild Grant Reckert and Associates (DGR) for preparation of an engineering feasibility study of Kingbrook Rural Water System service to Iroquois. Meetings involving various interests established the work plan. Gary Patton of DGR presented preliminary findings to the Kingbrook RWS Board of Directors on September 15 and to the Iroquois Council on October 6. A copy of DGR's study report is enclosed. The Background and Scope section provides a good explanation of the phased approach and the design criteria.
3. Ed Jacobsen prepared some additional information following the October 16 meeting. His purpose was to (a) revise cost estimates for Iroquois' proposed water treatment plant and the transmission line from the new well 3½ miles west into Iroquois and (b) prepare alternative costs for service to the 65 new rural customers utilizing Iroquois proposed new water source rather than Kingbrook's DeSmet wellfield. The estimated cost of Iroquois' new well source was reduced from \$254,977 to \$152,625.

I rearranged and expanded on ClarkEngineering's draft report and am enclosing a copy. Page 2 of that report summarizes costs of the various alternatives for serving Iroquois and the rural users.

4. Please contact me if you have any questions.

JLS/kah

Enclosures

ALTERNATIVE WATER SOURCES
FOR
IROQUOIS, SOUTH DAKOTA
AND
65 NEW RURAL USERS IN THE IROQUOIS AREA

PREPARED FOR:
IROQUOIS, SOUTH DAKOTA
AND
EAST DAKOTA WATER DEVELOPMENT DISTRICT

PREPARED BY:
ED JACOBSEN
CLARK ENGINEERING COMPANY
1011 FIRST AVENUE SE
P.O. BOX 20
ABERDEEN, SOUTH DAKOTA
PHONE 225-3494

OCTOBER, 1986

I. EXECUTIVE SUMMARY REPORT

- A. Revisions to "STUDY AND REPORT, WATER SYSTEM REQUIREMENTS, IROQUOIS, SOUTH DAKOTA" August, 1985. CLARK ENGINEERING CO.

Alternate -1- Construct new well and transmission line - page 13

the unit cost for CL 200 4" line was revised from \$4.30 per foot to \$1.95 per foot, the unit cost used in DGR's estimated cost.

* Cost estimate for treatment. Item 4. 30' x 40' building - page 14

Iroquois has constructed a building which can be remodeled for \$20,000 rather than the original estimate of \$50,000 for a new building.

- B. Additions to "COST ESTIMATE WATER SERVICE TO IROQUOIS" October 6, 1986. DeWild Grant Reckert & Associates Co.

Cost estimates were prepared to service 65 rural connections from DeSmet WTP by expanding on the data presented in Table 2, page 6 in DGR's report.

Cost estimates were prepared to service 65 rural connections using Iroquois' new well source by utilizing the design layout in Figure 2 in DGR's report (see page 7 of this report).

- C. This preliminary summary has been prepared at this time so that the parties interested can review, evaluate, and agree upon the estimated cost used, so that the most cost-effective source for the town of Iroquois can be developed. The first table summarizes the cost estimates for various alternatives. The following tables explain how the various cost estimates were derived.

- * Presently, Iroquois is letting bids to drill test wells and conduct test pumping and water analysis at the town's well site. After the completion of this work, the actual cost for the treatment facility can be more closely estimated. It is felt that the cost for the treatment facility at Iroquois will be less than is presently estimated.

ALTERNATIVE CAPITAL COSTS SUMMARY

Service to Iroquois only and allocated costs to Iroquois
and 65 new rural users (RU) for a joint project

Two water sources are compared - Kingbrook RMS DeSmet Plant and new Iroquois wells

Cost Allocations for Water Service to	Allocated Costs Based on Water Service from	
	Kingbrook RMS DeSmet Plant	Iroquois New Well
Iroquois only	\$320,300.00 (see p. 4, DGR report)	Wells/trans. line - \$ 64,425.00 Treatment - 88,200.00 (see page 4) <u>\$152,625.00</u>
Town of Iroquois (a joint project with 65 RU sharing costs)	249,000.00 (see p. 6, DGR report)	Wells/trans. line - 51,700.00 Treatment - 60,500.00 (see page 5) <u>\$112,200.00</u>
65 rural users (a joint project with Iroquois sharing costs)	- \$ 55,100.00 - 148,170.00 - 619,277.00 <u>\$822,547.00</u> (see page 3)	Treatment - 60,500.00 Wells/trans. line - 51,700.00 Distribution System <u>629,000.00</u> (see pages 5 & 6) <u>\$741,200.00</u>

CAPITAL COST ESTIMATE
Allocated Cost of Water Service
to 65 Rural Connections from Kingbrook Rural Water System

DeSmet WTP Expansion, including storage,
addition, and new well, 280,000 gpd -- Total Cost = \$417,000
(see DGR report, p. 4)

65 Rural Connections - average water use

$$\frac{17,000 \text{ gal/mo/user} \times 65 \text{ users}}{30 \text{ day/mo}} = 37,000 \text{ gpd}$$

$$65 \text{ users share} = \frac{37,000 \text{ gpd}}{280,000 \text{ gpd}} \times \$417,000 = \$55,100$$

Main Transmission Line (see DGR report, p. 6)

15,900' - 6" CL 200 @ \$3.20 = \$50,880 x .66	33,580
5,300' - 6" CL 160 @ \$2.80 = \$14,840 x .66	9,840
5,300' - 6" CL 160 @ \$2.80 = \$14,840 x .65	9,640
15,900' - 5" CL 150 @ \$2.30 = \$36,570 x .65	23,770
26,500' - 4" CL 200 @ \$1.95 = \$51,675 x .46	23,775
5,300' - 4" CL 200 @ \$1.95 = \$10,335 x .38	3,935
26,500' - 4" CL 160 @ \$1.80 = \$47,700 x .38	<u>18,100</u>
65 connections share Transmission Pipe Line	122,640
Crossing, Valves and Appurtenances @ 20%	<u>25,530</u>

65 Rural Connections Share \$148,170

Distribution System for New Rural Users

29,000' - 1" CL 160 @ \$1.00 x 1.00	\$ 29,000
105,900' - 1.5" CL 160 @ \$1.10 x 1.00	116,490
87,120' - 2" CL 160 @ \$1.20 x 1.00	104,544
110,900' - 2.5" CL 160 @ \$1.30 x 1.00	144,170
31,700' - 3" CL 160 @ \$1.40 x 1.00	44,380
26,400' - 4" CL 160 @ \$1.95 x 1.00	51,480

65 Connections share, Distribution System 490,064

65 hookups, meters @ \$400 26,000

Total Distribution Construction Cost 516,064

Other Project Costs at 20% 103,213

65 Rural Connections Share \$619,277

Total Cost for 65 New Rural Users - Kingbrook RWS Service \$822,547

CAPITAL COST ESTIMATES

Development of New Well 3 miles west of Iroquois
to serve Iroquois only

Well/Transmission Line

ITEM	UNIT	UNIT COST	TOTAL COST	
1. Drill & Develop Production Well No. 1 Well	1 L.S.	12,000	\$12,000.00	
2. 4" dia. Transmission line	18,500 LF	1.95	<u>36,075.00</u>	
Well & Transmission Line construction cost			48,075.00	
Other project costs, contingencies, etc. @ 34%			<u>16,350.00</u>	
Total Cost - Development of New Well/Transmission Line				\$64,425.00

Water Treatment Plant

ITEM	UNIT	UNIT COST	TOTAL COST	
1. 8' dia. Rapid Green sand filter	2 ea.	24,000	48,000.00	
2. Chemical feed system	1 ea.	1,000	1,000.00	
3. Floridation system	1 ea.	1,000	1,000.00	
4. Building, remodeling	1 ea.	20,000	<u>20,000.00</u>	
Treatment construction costs			\$70,000.00	
Other project costs @ 26%			<u>18,700.00</u>	
Total cost - treatment plant for new well source				<u>88,200.00</u>
Total Cost - New Well, Transmission Line and Treatment Plant				\$152,625.00

CAPITAL COST ESTIMATES

For Joint Facilities for a Project Serving 65 New Rural Users and Iroquois
From New Wells Developed by Iroquois

Note: Capital costs for joint facilities were allocated equally between the rural users and Iroquois because average water use was similar as shown below:

65 rural users - $\frac{17,000 \text{ gal/mo/user} \times 65 \text{ users}}{30 \text{ day/mo}}$ = 37,000 gpd

Iroquois use - (from earlier Clark Eng. report) = 34,000 gpd

Water Source - New wells and main transmission line to Iroquois

ITEM	UNIT	UNIT COST	TOTAL COST
1. Drill & develop production well			
No. 1 well	1 L.S.	12,000	\$ 12,000.00
No. 2 well	1 L.S.	6,000	6,000.00
2. 6" dia. transmission line	18,500 LF	3.20	<u>59,200.00</u>
Well & transmission line construction cost			77,200.00
Other project costs, contingencies, @ 34%			<u>26,200.00</u>
Total cost estimate for development of source			\$103,400.00
50% allocation to rural users and Iroquois			\$ <u>51,700.00</u>

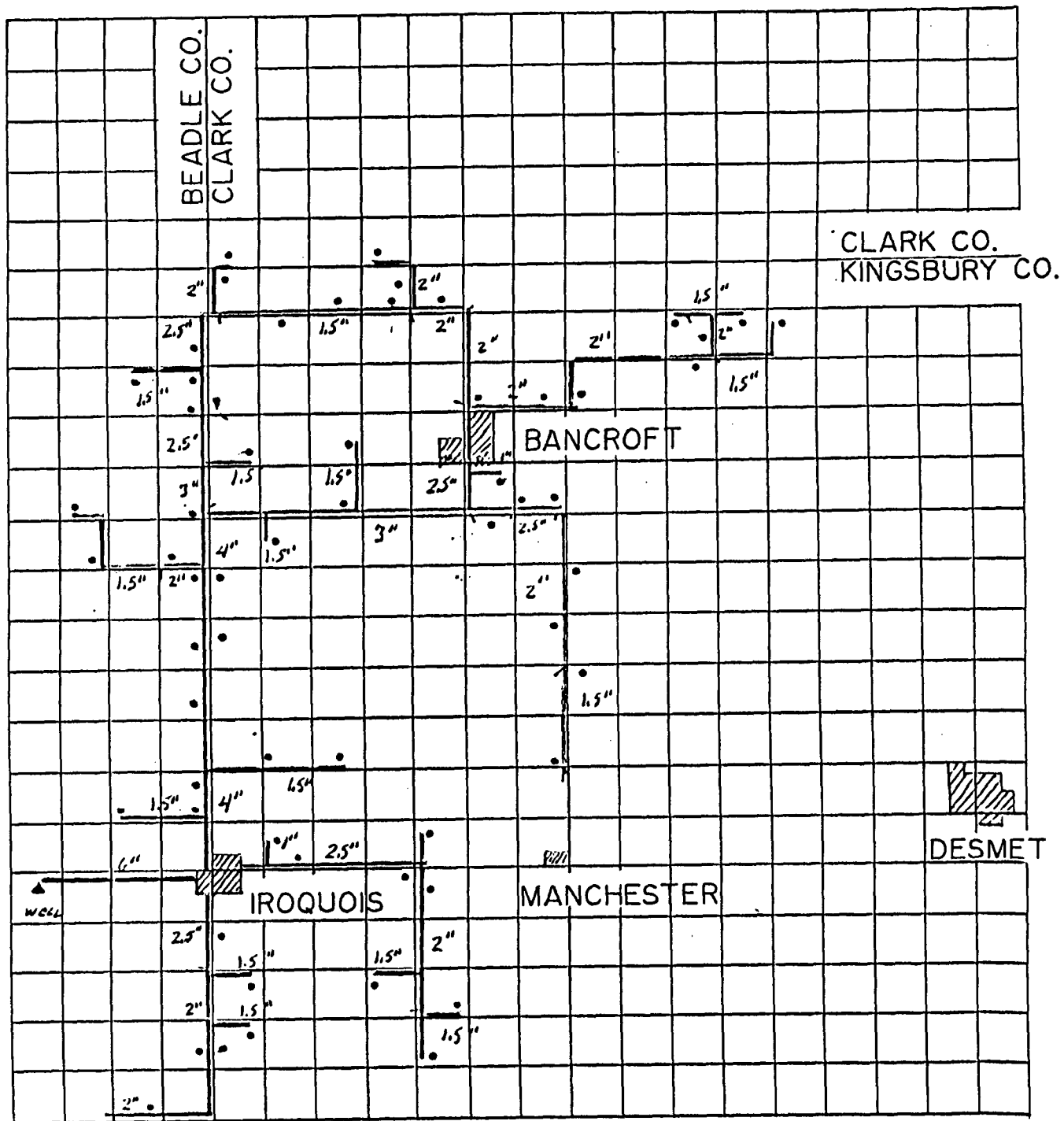
Treatment Plant

ITEM	UNIT	UNIT COST	TOTAL COST
1. 8' dia. Rapid Green sand filter	3 ea.	24,000	\$ 72,000.00
2. Chemical Feed System	1 ea.	2,000	2,000.00
3. Fluoridation System	1 ea.	2,000	2,000.00
4. Building, remodeling	1 ea.	20,000	<u>20,000.00</u>
Treatment construction costs			\$ 96,000.00
Other project costs @ 26%			<u>25,000.00</u>
Total cost estimate for treatment			\$121,000.00
50% allocation to rural users and Iroquois			\$ <u>60,500.00</u>

CAPITAL COST ESTIMATES

For Distribution System to Serve 65 New Rural Users
as Part of a Joint Project to Serve Rural Users and Iroquois
from New Wells Developed by Iroquois
(see map on following page)

A. Distribution System for Town of Iroquois	
No change from earlier Clark Engineering Report (100% to town of Iroquois)	
B. 65 Rural Connections (100% to rural connections)	
37,000' - 4" CL 200 @ \$1.95	\$ 72,150.00
31,000' - 3" CL 160 @ \$1.40	44,380.00
68,700' - 2.5" CL 160 @ \$1.30	89,310.00
136,000' - 2" CL 160 @ \$1.20	163,200.00
108,300' - 1.5" CL 160 @ \$1.10	119,130.00
10,000' - 1" CL 160 @ \$1.00	<u>10,000.00</u>
65 rural connections distribution system	\$489,170.00
65 hook-ups, meters @ \$400	<u>26,000.00</u>
Distribution construction cost	524,170.00
Other project costs @ 20%	<u>104,830.00</u>
Total distribution cost, 65 connections	<u>\$629,000.00</u>



ALTERNATIVE -3-
SERVICE TO 65 RURAL CONNECTIONS
FROM IROQUOIS

PRELIMINARY FEASIBILITY STUDY

WATER SERVICE TO IROQUOIS
FROM KINGBROOK RURAL WATER SYSTEM

Prepared For

EAST DAKOTA WATER DEVELOPMENT DISTRICT
BROOKINGS, SOUTH DAKOTA

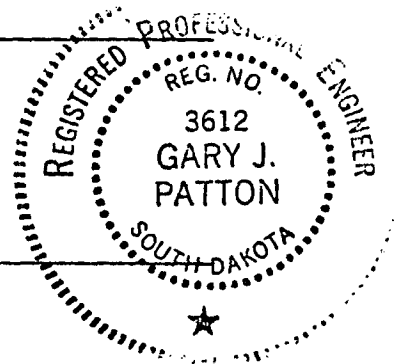
DGR Project No. 36197

I hereby certify that this plan, specification
or report was prepared by me or under my direct
personal supervision and that I am a duly
Registered Professional Engineer under the
laws of the State of South Dakota and that I am
competent to prepare this document.

By *Gary Patton*
Gary Patton, P.E.

South Dakota Registration No. 3612

Date November 4, 1986



DEWILD GRANT RECKERT AND ASSOCIATES COMPANY
ARCHITECTURE - ENGINEERING - PLANNING
ROCK RAPIDS, IOWA
SIOUX FALLS, SOUTH DAKOTA
DENVER, COLORADO

PRELIMINARY FEASIBILITY STUDY
WATER SERVICE TO IROQUOIS
FROM KINGBROOK RURAL WATER SYSTEM

BACKGROUND AND SCOPE

On July 23, 1986 the City of Iroquois made a written request for a proposal from the Kingbrook Rural Water System to provide the City's water supply needs. On July 28, representatives of the East Dakota Water Development District (EDWDD), Kingbrook Rural Water System (RWS) and Farmer's Home Administration (FmHA) met with City officials in Iroquois to discuss arrangements for an engineering feasibility study. The next day, the EDWDD Board approved a grant to fund the study.

A meeting was held in Iroquois on August 12 which involved representatives of Iroquois, Kingbrook RWS, EDWDD, Clark Engineering and DeWild Grant Reckert and Associates (DGR). The purpose of the meeting was to develop a study work plan and establish appropriate design criteria.

It was agreed by all parties that the study would involve an initial phase which would provide a preliminary indication of project feasibility. If the first phase would show that the project appears to be feasible, a second phase could be entered which would involve a Kingbrook signup effort in the rural area around Iroquois.

Phase I of the study would develop cost estimates for service to Iroquois under two rural supply alternatives:

1. Alternative 1 would assume service to no new rural customers in the Iroquois area.

2. Alternative 2 would assume service to the rural locations (approximately 65) which expressed interest in water service during a signup effort in the Iroquois area conducted in 1980.

Phase II of the study would include an extensive survey of interest among potential rural users in western Kingsbury and eastern Beadle counties. The results would be used to develop a revised costs estimate for service to Iroquois, as well as cost estimates for the rural portions of the project.

Design criteria for water service to Iroquois from Kingbrook were agreed to as follows:

1. Maximum day delivery of 60,000 gallons. (170 gallons per capita per day at present population of 354).
2. Average delivery rate of 50 gpm over 20-hour delivery period.
3. 60 psi delivery pressure, with alternative delivery pressure proposed if feasible.
4. Provisions for future increase in delivery capacity were to be considered.

This study represents Phase I of the work plan developed at the August 12 meeting.

PRELIMINARY DESIGN AND COST ESTIMATES

In accordance with the study work plan, two alternatives were considered for water supply to Iroquois. Both alternatives included a pipeline extending 19 miles from Kingbrook's DeSmet Water Treatment Plant. Alternative 1 considered service to

Iroquois only and Alternative 2 additionally considered service to the 65 rural locations which had indicated interest in rural water service in 1980.

Alternative 1:

Figure 1 shows the proposed pipeline sized to serve Iroquois alone. Two miles of 4-inch pipe and 17 miles of 3-inch pipe of pressure class ranging from 160 to 250 psi were designed to carry the 20-hour design flow of 50 gpm.

A breakdown of estimated project costs for this alternative is shown in Table 1. The cost of expanding the DeSmet WTP to provide additional capacity of 280,000 gallons per day was estimated in a previous study, done in 1984. Proposed improvements included a new well, raw water piping, a building addition to house new pressure filters, high service pump improvements, and additional ground storage capacity. Updating the 1984 study, the treatment expansion is estimated to cost \$417,000. As calculated in Table 1, Iroquois would require about 21 percent of this added capacity and is therefore assigned 21 percent of the cost or \$89,400. Adding the estimated distribution cost of \$230,900 the City's share of the total estimated capital cost is \$320,300.

Alternative 2:

A proposed pipeline network designed to serve the 65 rural locations as well as Iroquois is shown in Figure 2. The same 19-mile route to Iroquois is used, but mainline to the city has been increased to 4-inch to 6-inch diameter pipe. This is to provide the additional capacity required for the rural demands.

Estimated project costs for Alternative 2 are shown in Table 2. Pipeline segments A thru D of the transmission pipeline to Iroquois are identified in Figure 2. The cost of each pipe size

TABLE 1

ALTERNATIVE 1 - SERVICE TO IROQUOIS ONLY

<u>Description</u>	<u>Estimated Cost</u>
37,100' - 3" CL 160 @ \$1.40	\$ 51,940
42,400' - 3" CL 200 @ \$1.50	63,600
10,600' - 3" CL 250 @ \$1.65	17,490
10,600' - 4" CL 200 @ \$1.95	<u>20,670</u>
Subtotal, Pipeline	\$153,700
Crossings, Valves & Appurtenance @ 20%	\$ 30,700
Meter and Valve Pit	<u>8,700</u>
Total Distribution Construction Cost	\$192,400
Other Project Costs @ 20%	<u>38,500</u>
Total Distribution Cost	<u><u>\$230,900</u></u>
DeSmet WTP Expansion, including storage addition and new well, 280,000 gpd, construction cost	\$334,000
Other Project Costs, Contingencies @ 25%	<u>83,000</u>
Total Treatment Cost	\$417,000
Iroquois Share of Treatment Cost	
$\frac{60,000 \text{ gpd}}{280,000 \text{ gpd}} \times \$417,000$	<u>\$ 89,400</u>
IROQUOIS SHARE OF TOTAL CAPITAL COST	\$320,300

and class in each segment is estimated separately in Table 2. The cost is then multiplied by the percentage of the capacity of each segment which is dedicated to Iroquois. This determines the City's share of the 19-mile transmission pipeline cost. The cost of the distribution lines which branch from the transmission main are not developed herein. These costs would be assigned entirely to the rural use.

The total distribution cost of \$159,600 developed in this manner can be compared to the \$230,900 distribution cost developed in Table 1 for service to Iroquois only. A savings of about 30 percent in the City's transmission line cost is realized by sharing pipeline capacity with new rural users in the area. Adding the City's share of treatment costs as developed previously, the total capital cost to Iroquois under Alternative 2 is estimated to be \$249,000.

The transmission pipeline under Alternative 2 is sized to meet instantaneous peak rural demands while delivering 50 gpm to Iroquois. An increased off-peak delivery rate to Iroquois would be possible, allowing the delivery of an additional 10,000 to 20,000 gallons per day above the design maximum day delivery of 60,000 gallons. Extending the delivery time from 20 to 24 hours would add another 10,000 to 15,000 gallons per day supply capacity, resulting in a possible maximum delivery to Iroquois of approximately 90,000 gallons per day.

TABLE 2

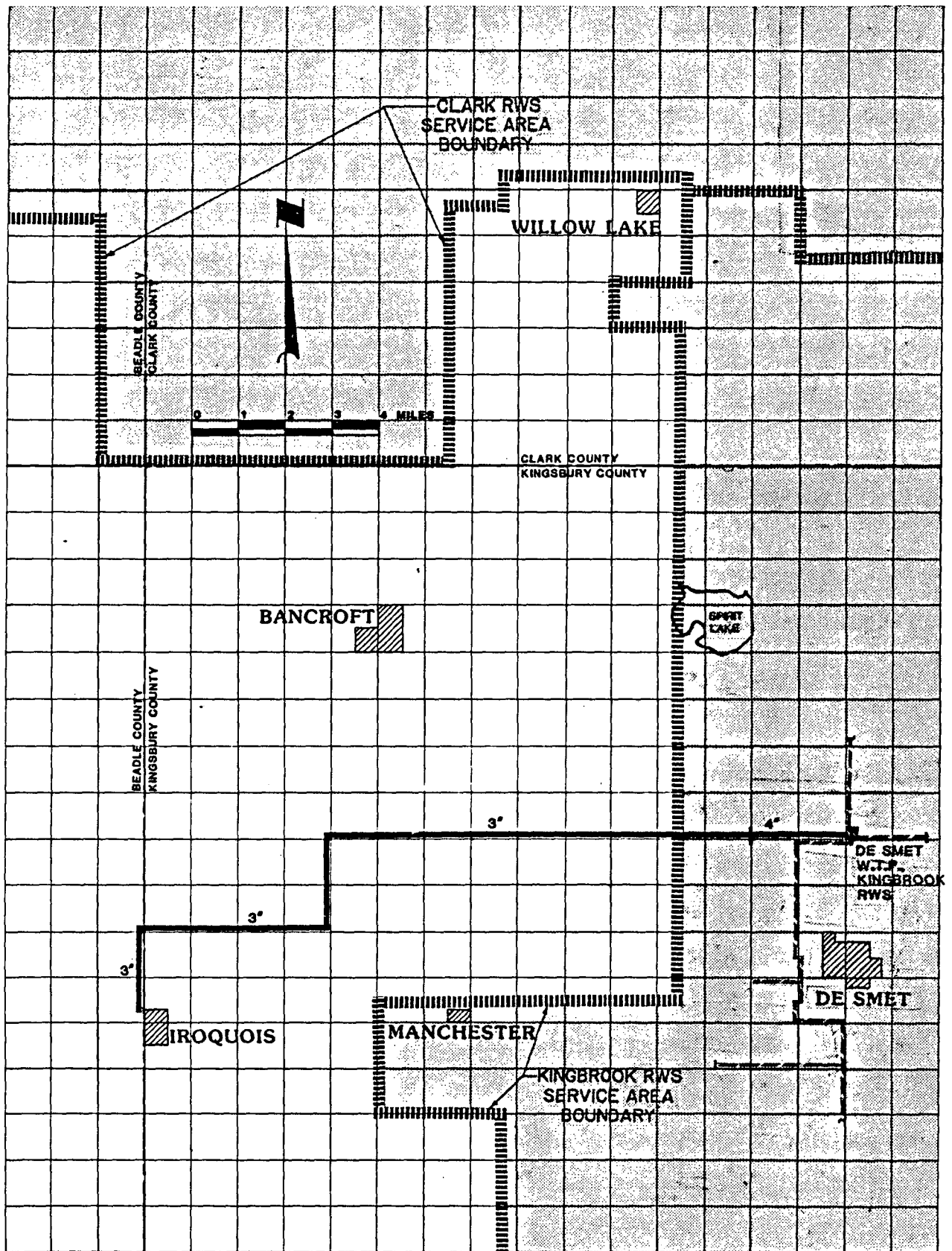
ALTERNATIVE 2 - SERVICE TO IROQUOIS
AND 65 NEW RURAL CONNECTIONS

<u>Estimated Description</u>	<u>Total Estimated Cost</u>	<u>Iroquois Share of Capacity, Percent</u>	<u>Iroquois Share of Cost</u>
Segment A:			
15,900' - 6" CL 200 @ \$3.20	\$50,880	34	\$ 17,300
5,300' - 6" CL 160 @ \$2.80	14,840	34	5,000
Segment B:			
5,300' - 6" CL 160 @ \$2.80	14,840	35	5,200
15,900' - 5" CL 160 @ \$2.30	36,570	35	12,800
Segment C:			
26,500' - 4" CL 200 @ \$1.95	51,675	54	27,900
Segment D:			
5,300' - 4" CL 200 @ \$1.95	10,335	62	6,400
26,500' - 4" CL 160 @ \$1.80	47,700	62	29,600
Iroquois Share of Transmission Pipeline Cost			\$104,200
Crossings, Valves and Appurtenances @ 20%			20,800
Meter and Valve Pit			<u>8,000</u>
Iroquois Share of Total Distribution Construction Cost			\$133,000
Other Project Costs, Contingencies @ 20%			<u>26,600</u>
Iroquois Share of Total Distribution Cost			<u>\$159,600</u>
Iroquois Share of Transmission Cost (From Table 1)			<u>\$ 89,400</u>
IROQUOIS SHARE OF TOTAL CAPITAL COST			\$249,000

DISCUSSION

It has been shown that, when both municipal and rural water needs are met, the City's share of transmission pipeline cost is about 30 percent lower than when pipeline is sized for the water needs of Iroquois only. The cost of the rural distribution system shown in Figure 2 has not been presented in this report. However, preliminary estimates indicate that the total rural distribution system cost to serve 65 customers would be reduced by approximately \$70,000 if service to Iroquois is provided. This represents a savings in project costs of over \$1,000 per rural customer'.

It can be seen that both Iroquois and the rural customers would benefit from the economy of scale in sharing the cost of a transmission pipeline sized to serve all of the area's water supply needs.



ALTERNATIVE 1 - SERVICE TO IROQUOIS ONLY

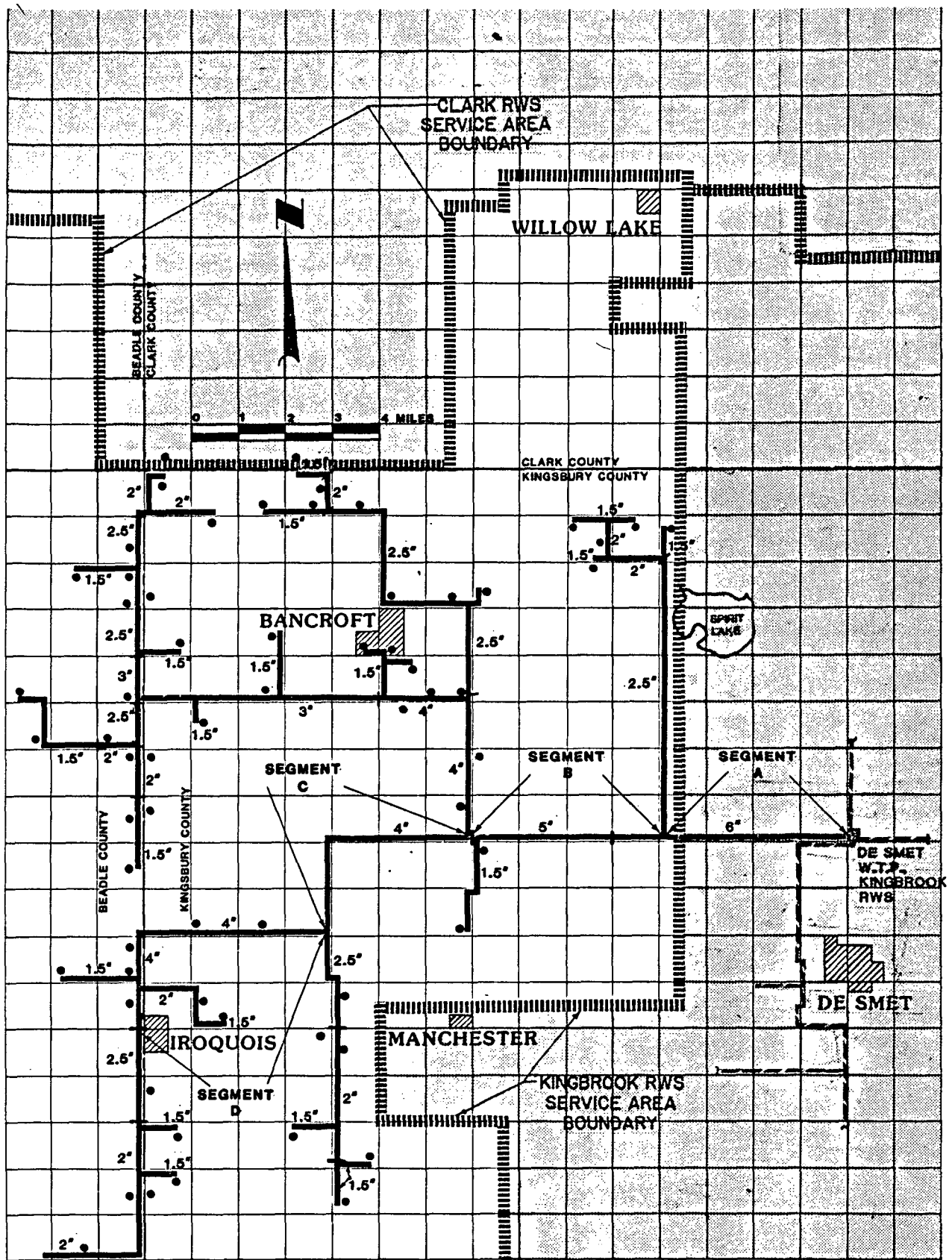
FIGURE 1



DeWild Grant Recker & Associates, Inc.
Architecture Engineering Planning
Rock Rapids, Iowa
Sioux City, Iowa
Sioux Falls, South Dakota

Date
Drawn by
Approved
Revised

**WATER SERVICE TO IROQUOIS
FROM KINGBROOK RWS**



**ALTERNATIVE 2 - SERVICE TO IROQUOIS
AND 65 NEW RURAL CONNECTIONS**

FIGURE 2



DeWid Grant Reckert & Associates Co.
Architecture Engineering Planning

Rock Rapids, Iowa
Sioux City, Iowa
Sioux Falls, South Dakota

Date
Drawn by
Approved
Revised

**WATER SERVICE TO IROQUOIS
FROM KINGBROOK RWS**

SOUTH Dakota Department of
Water & Natural Resources

Joe Foss Building
523 East Capitol
Pierre, South Dakota 57501-3181

January 23, 1987

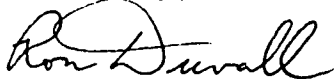
Robert A Rounds, Mayor
Town of Iroquois
PO Box 186
Iroquois SD 57353

Dear Mr. Rounds:

This letter is in response to our telephone conversation on January 22, 1987 regarding the water permit application for the Town of Iroquois.

Enclosed are permit application forms completed according to our conversation. I also contacted Ed Jacobsen regarding the amount of water to be claimed. Mr. Jacobsen indicated that a pumping rate of 200 gpm was needed for efficient operation of a treatment process. Contact Mr. Jacobsen if you have any further questions about the pumping rate. Please review the applications and then sign and notarize the forms. I have also enclosed a copy of a location map. If any errors are found on the map, please inform us and contact us if you have any questions.

Sincerely,

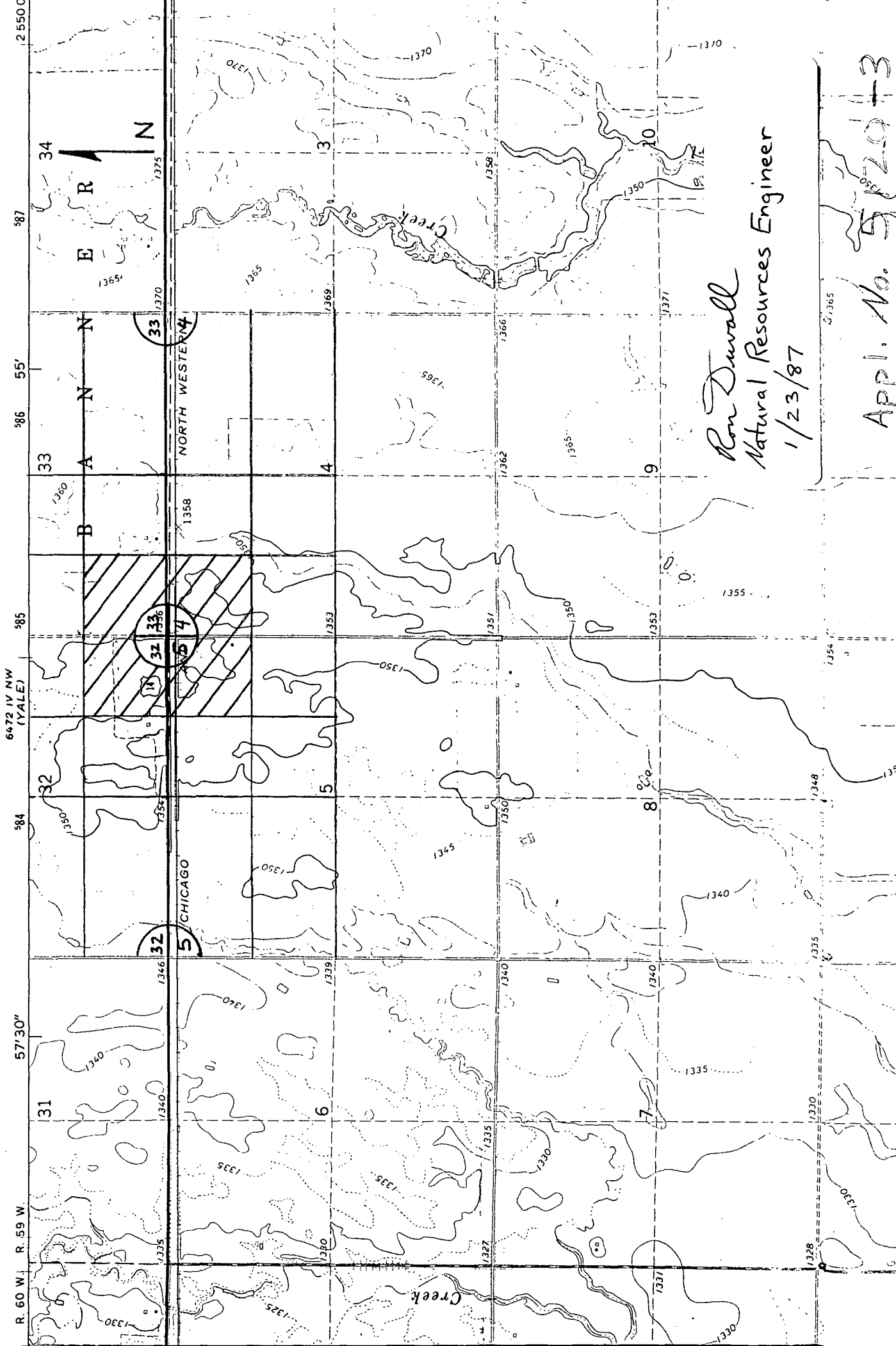


RON DUVALL
Natural Resources Engineer

RD:ks

enclosures

PEARL CR
SOUT
7.5 MINU



Ron Duwall
Natural Resources Engineer
1/23/87

Appl. No. 51201-3

OBSERVATION WELL WATER LEVELS

OBS_WELL	LOCATION	DATE	READING
----------	----------	------	---------

13:43 TUESDAY, MARCH 3, 1987 1

BD-76R	110N-59W-08AAAA	10/08/76	-14.2
BD-76R	110N-59W-08AAAA	11/30/76	-14.5
BD-76R	110N-59W-08AAAA	01/20/77	-14.7
BD-76R	110N-59W-08AAAA	04/04/77	-14.7
BD-76R	110N-59W-08AAAA	06/08/77	-14.9
BD-76R	110N-59W-08AAAA	06/23/77	-15.0
BD-76R	110N-59W-08AAAA	07/08/77	-15.2
BD-76R	110N-59W-08AAAA	07/22/77	-15.2
BD-76R	110N-59W-08AAAA	08/09/77	-15.3
BD-76R	110N-59W-08AAAA	08/19/77	-15.7
BD-76R	110N-59W-08AAAA	08/30/77	-15.7
BD-76R	110N-59W-08AAAA	09/16/77	-15.7
BD-76R	110N-59W-08AAAA	10/04/77	-15.9
BD-76R	110N-59W-08AAAA	11/02/77	-15.9
BD-76R	110N-59W-08AAAA	11/30/77	-16.2
BD-76R	110N-59W-08AAAA	01/20/78	-16.2
BD-76R	110N-59W-08AAAA	03/15/78	-16.4
BD-76R	110N-59W-08AAAA	05/08/78	-16.6
BD-76R	110N-59W-08AAAA	06/14/78	-16.5
BD-76R	110N-59W-08AAAA	06/28/78	-16.5
BD-76R	110N-59W-08AAAA	07/12/78	-16.6
BD-76R	110N-59W-08AAAA	07/31/78	-16.4
BD-76R	110N-59W-08AAAA	08/23/78	-16.8
BD-76R	110N-59W-08AAAA	09/13/78	-16.9
BD-76R	110N-59W-08AAAA	10/02/78	-17.0
BD-76R	110N-59W-08AAAA	10/25/78	-17.0
BD-76R	110N-59W-08AAAA	11/27/78	-17.2
BD-76R	110N-59W-08AAAA	01/29/79	-17.1
BD-76R	110N-59W-08AAAA	05/03/79	-17.1
BD-76R	110N-59W-08AAAA	05/24/79	-17.2
BD-76R	110N-59W-08AAAA	06/05/79	-17.2
BD-76R	110N-59W-08AAAA	06/26/79	-17.2
BD-76R	110N-59W-08AAAA	07/10/79	-17.2
BD-76R	110N-59W-08AAAA	07/26/79	-17.2
BD-76R	110N-59W-08AAAA	08/09/79	-17.3
BD-76R	110N-59W-08AAAA	08/20/79	-17.4
BD-76R	110N-59W-08AAAA	09/07/79	-17.5
BD-76R	110N-59W-08AAAA	09/27/79	-17.6
BD-76R	110N-59W-08AAAA	10/18/79	-17.6
BD-76R	110N-59W-08AAAA	12/13/79	-17.8
BD-76R	110N-59W-08AAAA	02/14/80	-18.0
BD-76R	110N-59W-08AAAA	04/02/80	-18.0
BD-76R	110N-59W-08AAAA	05/20/80	-18.1
BD-76R	110N-59W-08AAAA	06/03/80	-18.1
BD-76R	110N-59W-08AAAA	06/17/80	-18.1
BD-76R	110N-59W-08AAAA	07/01/80	-18.3
BD-76R	110N-59W-08AAAA	07/16/80	-18.2
BD-76R	110N-59W-08AAAA	07/31/80	-18.3
BD-76R	110N-59W-08AAAA	08/12/80	-18.4
BD-76R	110N-59W-08AAAA	09/10/80	-18.5
BD-76R	110N-59W-08AAAA	10/09/80	-18.7
BD-76R	110N-59W-08AAAA	11/18/80	-18.9
BD-76R	110N-59W-08AAAA	02/25/81	-19.0

BD-76R	110N-59W-08AAAA	03/25/81	-19.2
BD-76R	110N-59W-08AAAA	05/05/81	-19.3

OBSERVATION WELL WATER LEVELS

13:43 TUESDAY, MARCH 3, 1987 2

OBS_WELL	LOCATION	DATE	READING
BD-76R	110N-59W-08AAAA	05/26/81	-19.2
BD-76R	110N-59W-08AAAA	06/09/81	-19.2
BD-76R	110N-59W-08AAAA	06/23/81	-19.3
BD-76R	110N-59W-08AAAA	07/13/81	-19.3
BD-76R	110N-59W-08AAAA	07/28/81	-19.4
BD-76R	110N-59W-08AAAA	08/11/81	-19.4
BD-76R	110N-59W-08AAAA	08/25/81	-19.6
BD-76R	110N-59W-08AAAA	09/16/81	-19.7
BD-76R	110N-59W-08AAAA	10/28/81	-20.0
BD-76R	110N-59W-08AAAA	12/09/81	-20.1
BD-76R	110N-59W-08AAAA	03/02/82	-20.3
BD-76R	110N-59W-08AAAA	04/27/82	-20.2
BD-76R	110N-59W-08AAAA	05/24/82	-20.4
BD-76R	110N-59W-08AAAA	06/22/82	-20.4
BD-76R	110N-59W-08AAAA	07/07/82	-20.4
BD-76R	110N-59W-08AAAA	07/21/82	-20.4
BD-76R	110N-59W-08AAAA	08/03/82	-20.5
BD-76R	110N-59W-08AAAA	08/24/82	-20.6
BD-76R	110N-59W-08AAAA	09/16/82	-20.6
BD-76R	110N-59W-08AAAA	10/19/82	-20.6
BD-76R	110N-59W-08AAAA	04/05/83	-20.8
BD-76R	110N-59W-08AAAA	05/04/83	-20.7
BD-76R	110N-59W-08AAAA	05/18/83	-20.8
BD-76R	110N-59W-08AAAA	06/08/83	-20.8
BD-76R	110N-59W-08AAAA	07/06/83	-20.8
BD-76R	110N-59W-08AAAA	07/21/83	-20.8
BD-76R	110N-59W-08AAAA	08/10/83	-20.7
BD-76R	110N-59W-08AAAA	09/01/83	-21.0
BD-76R	110N-59W-08AAAA	09/13/83	-21.1
BD-76R	110N-59W-08AAAA	10/05/83	-21.1
BD-76R	110N-59W-08AAAA	12/13/83	-20.1
BD-76R	110N-59W-08AAAA	03/20/84	-21.0
BD-76R	110N-59W-08AAAA	05/01/84	-20.7
BD-76R	110N-59W-08AAAA	05/28/84	-20.6
BD-76R	110N-59W-08AAAA	06/11/84	-20.5
BD-76R	110N-59W-08AAAA	06/26/84	-20.0
BD-76R	110N-59W-08AAAA	07/09/84	-19.7
BD-76R	110N-59W-08AAAA	07/23/84	-19.6
BD-76R	110N-59W-08AAAA	08/06/84	-19.5
BD-76R	110N-59W-08AAAA	08/20/84	-19.3
BD-76R	110N-59W-08AAAA	09/19/84	-19.2
BD-76R	110N-59W-08AAAA	10/23/84	-19.5
BD-76R	110N-59W-08AAAA	03/20/85	-18.9
BD-76R	110N-59W-08AAAA	04/16/85	-19.0
BD-76R	110N-59W-08AAAA	05/21/85	-18.7
BD-76R	110N-59W-08AAAA	06/04/85	-18.7
BD-76R	110N-59W-08AAAA	06/18/85	-18.7
BD-76R	110N-59W-08AAAA	07/02/85	-18.6
BD-76R	110N-59W-08AAAA	07/17/85	-18.5
BD-76R	110N-59W-08AAAA	07/31/85	-18.5
BD-76R	110N-59W-08AAAA	08/13/85	-18.6
BD-76R	110N-59W-08AAAA	09/11/85	-18.4
BD-76R	110N-59W-08AAAA	10/01/85	-18.6

BD-76R	110N-59W-08AAAA	11/05/85	-18.4
BD-76R	110N-59W-08AAAA	03/12/86	-18.3

OBSERVATION WELL WATER LEVELS

13:43 TUESDAY, MARCH 3, 1987 3

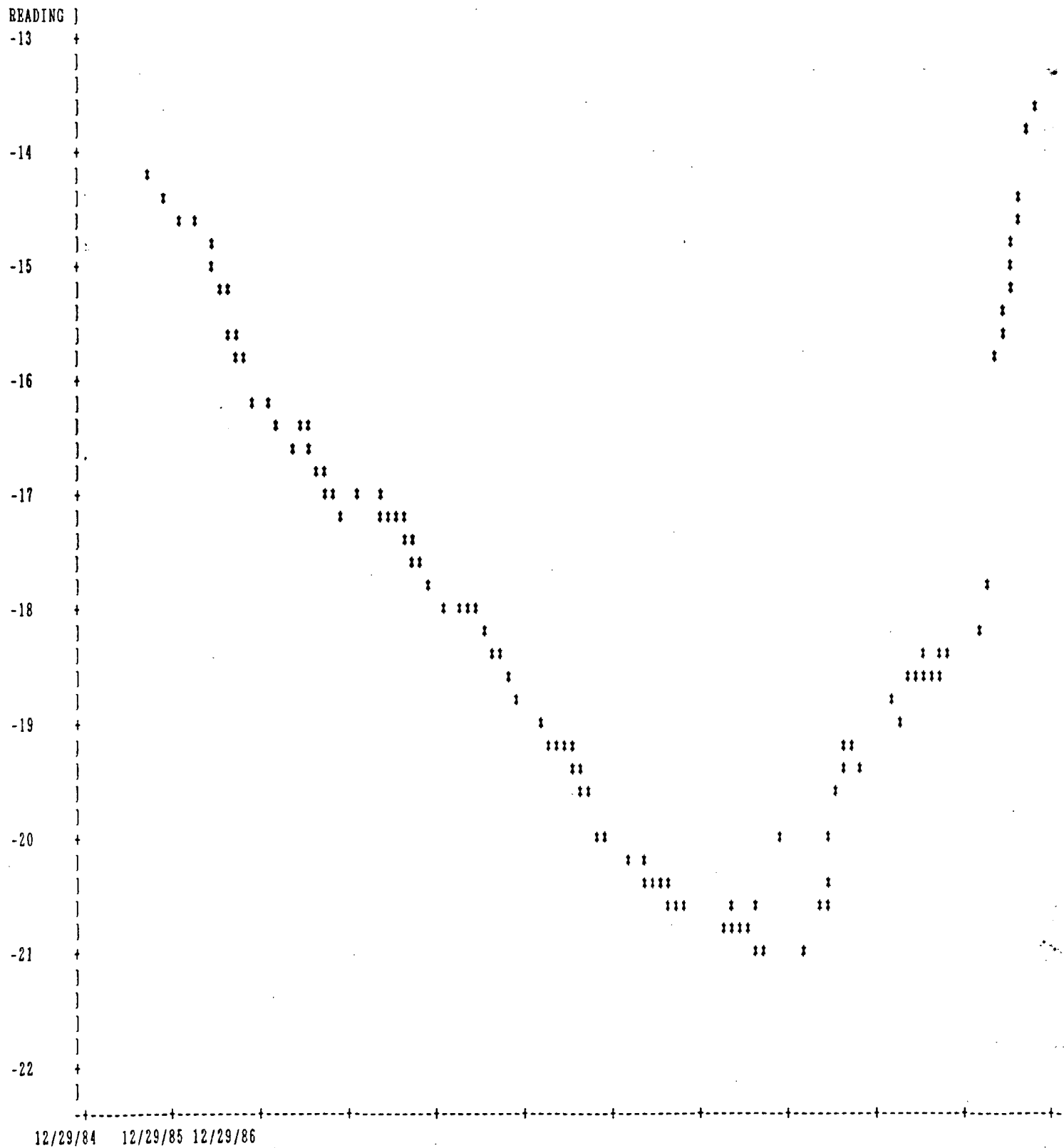
OBS_WELL	LOCATION	DATE	READING
BD-76R	110N-59W-08AAAA	04/08/86	-17.8
BD-76R	110N-59W-08AAAA	05/22/86	-15.9
BD-76R	110N-59W-08AAAA	06/02/86	-15.6
BD-76R	110N-59W-08AAAA	06/17/86	-15.4
BD-76R	110N-59W-08AAAA	06/30/86	-15.2
BD-76R	110N-59W-08AAAA	07/15/86	-15.1
BD-76R	110N-59W-08AAAA	07/24/86	-15.0
BD-76R	110N-59W-08AAAA	07/28/86	-14.9
BD-76R	110N-59W-08AAAA	08/12/86	-14.6
BD-76R	110N-59W-08AAAA	08/25/86	-14.5
BD-76R	110N-59W-08AAAA	10/07/86	-13.8
BD-76R	110N-59W-08AAAA	11/05/86	-13.7

N= 122

OBSERVATION WELL WATER LEVELS
OBS_WELL=BD-76R

13:43 TUESDAY, MARCH 3, 1987 4

PLOT OF READING*DATE SYMBOL USED IS *



OBSERVATION WELL WATER LEVELS

14:19 TUESDAY, MARCH 3, 1987 1

OBS_WELL	LOCATION	DATE	READING
BD-77B	110N-59W-16BBBB	11/30/77	-24.7
BD-77B	110N-59W-16BBBB	06/01/78	-24.7
BD-77B	110N-59W-16BBBB	06/14/78	-24.5
BD-77B	110N-59W-16BBBB	06/28/78	-24.5
BD-77B	110N-59W-16BBBB	07/12/78	-24.7
BD-77B	110N-59W-16BBBB	08/01/78	-25.0
BD-77B	110N-59W-16BBBB	08/22/78	-25.3
BD-77B	110N-59W-16BBBB	09/13/78	-25.4
BD-77B	110N-59W-16BBBB	10/03/78	-25.4
BD-77B	110N-59W-16BBBB	10/25/78	-24.9
BD-77B	110N-59W-16BBBB	11/28/78	-25.2
BD-77B	110N-59W-16BBBB	05/03/79	-25.3
BD-77B	110N-59W-16BBBB	05/24/79	-25.3
BD-77B	110N-59W-16BBBB	06/05/79	-25.4
BD-77B	110N-59W-16BBBB	06/26/79	-25.2
BD-77B	110N-59W-16BBBB	07/10/79	-25.4
BD-77B	110N-59W-16BBBB	07/26/79	-25.6
BD-77B	110N-59W-16BBBB	08/09/79	-25.8
BD-77B	110N-59W-16BBBB	08/20/79	-26.0
BD-77B	110N-59W-16BBBB	09/06/79	-26.1
BD-77B	110N-59W-16BBBB	09/27/79	-26.2
BD-77B	110N-59W-16BBBB	10/18/79	-26.1
BD-77B	110N-59W-16BBBB	12/13/79	-26.1
BD-77B	110N-59W-16BBBB	02/14/80	-26.2
BD-77B	110N-59W-16BBBB	04/02/80	-26.2
BD-77B	110N-59W-16BBBB	05/20/80	-26.5
BD-77B	110N-59W-16BBBB	06/03/80	-26.5
BD-77B	110N-59W-16BBBB	06/18/80	-26.6
BD-77B	110N-59W-16BBBB	07/01/80	-26.6
BD-77B	110N-59W-16BBBB	07/16/80	-26.6
BD-77B	110N-59W-16BBBB	07/31/80	-26.9
BD-77B	110N-59W-16BBBB	08/12/80	-27.0
BD-77B	110N-59W-16BBBB	08/26/80	-27.1
BD-77B	110N-59W-16BBBB	09/10/80	-27.2
BD-77B	110N-59W-16BBBB	10/07/80	-27.5
BD-77B	110N-59W-16BBBB	11/18/80	-27.5
BD-77B	110N-59W-16BBBB	02/25/81	-27.4
BD-77B	110N-59W-16BBBB	03/25/81	-27.4
BD-77B	110N-59W-16BBBB	05/05/81	-27.5
BD-77B	110N-59W-16BBBB	05/26/81	-27.5
BD-77B	110N-59W-16BBBB	06/09/81	-27.6
BD-77B	110N-59W-16BBBB	06/23/81	-27.6
BD-77B	110N-59W-16BBBB	07/14/81	-27.9
BD-77B	110N-59W-16BBBB	07/28/81	-28.0
BD-77B	110N-59W-16BBBB	08/11/81	-28.1
BD-77B	110N-59W-16BBBB	08/25/81	-28.4
BD-77B	110N-59W-16BBBB	09/16/81	-28.8
BD-77B	110N-59W-16BBBB	10/28/81	-28.7
BD-77B	110N-59W-16BBBB	12/09/81	-28.8
BD-77B	110N-59W-16BBBB	03/02/82	-28.8
BD-77B	110N-59W-16BBBB	04/27/82	-28.8
BD-77B	110N-59W-16BBBB	05/24/82	-28.8
BD-77B	110N-59W-16BBBB	06/22/82	-28.7

BD-77B	110N-59W-16BBBB	07/07/82	-28.8
BD-77B	110N-59W-16BBBB	07/21/82	-28.8

OBSERVATION WELL WATER LEVELS

OBS_WELL	LOCATION	DATE	READING
----------	----------	------	---------

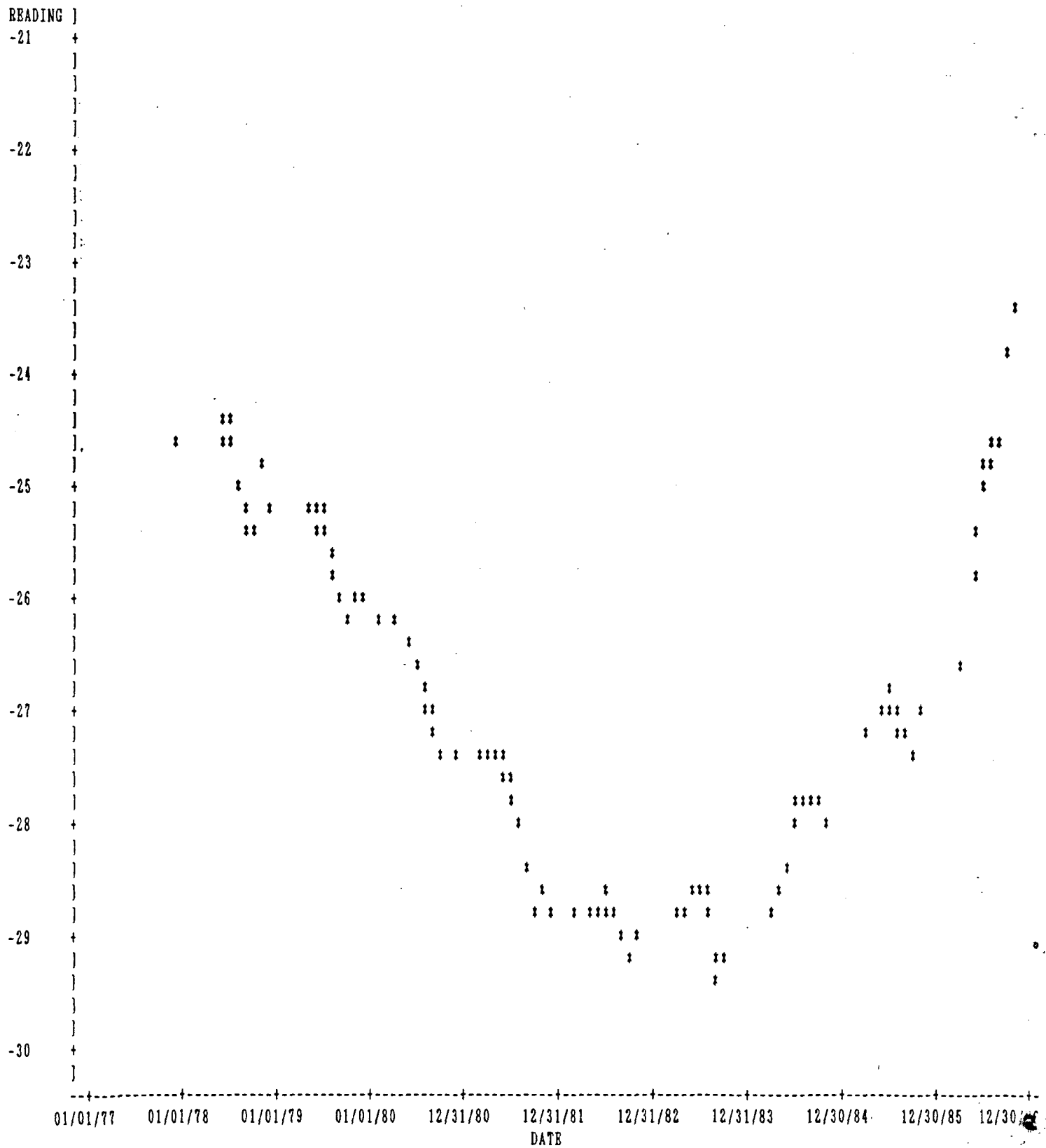
14:19 TUESDAY, MARCH 3, 1987 2

BD-77B	110N-59W-16BBBB	08/03/82	-28.8
BD-77B	110N-59W-16BBBB	08/24/82	-29.1
BD-77B	110N-59W-16BBBB	09/16/82	-29.2
BD-77B	110N-59W-16BBBB	10/19/82	-29.0
BD-77B	110N-59W-16BBBB	04/05/83	-28.8
BD-77B	110N-59W-16BBBB	05/04/83	-28.8
BD-77B	110N-59W-16BBBB	05/18/83	-28.7
BD-77B	110N-59W-16BBBB	06/08/83	-28.6
BD-77B	110N-59W-16BBBB	07/06/83	-28.7
BD-77B	110N-59W-16BBBB	07/21/83	-28.7
BD-77B	110N-59W-16BBBB	08/10/83	-28.9
BD-77B	110N-59W-16BBBB	09/01/83	-29.3
BD-77B	110N-59W-16BBBB	09/13/83	-29.5
BD-77B	110N-59W-16BBBB	10/05/83	-29.3
BD-77B	110N-59W-16BBBB	03/20/84	-28.9
BD-77B	110N-59W-16BBBB	05/01/84	-28.6
BD-77B	110N-59W-16BBBB	05/28/84	-28.5
BD-77B	110N-59W-16BBBB	06/11/84	-28.4
BD-77B	110N-59W-16BBBB	06/26/84	-28.1
BD-77B	110N-59W-16BBBB	07/09/84	-27.9
BD-77B	110N-59W-16BBBB	07/23/84	-27.8
BD-77B	110N-59W-16BBBB	08/06/84	-27.8
BD-77B	110N-59W-16BBBB	08/20/84	-27.8
BD-77B	110N-59W-16BBBB	09/19/84	-27.9
BD-77B	110N-59W-16BBBB	10/23/84	-28.0
BD-77B	110N-59W-16BBBB	03/20/85	-27.2
BD-77B	110N-59W-16BBBB	05/21/85	-27.1
BD-77B	110N-59W-16BBBB	06/04/85	-27.1
BD-77B	110N-59W-16BBBB	06/18/85	-27.0
BD-77B	110N-59W-16BBBB	07/02/85	-26.9
BD-77B	110N-59W-16BBBB	07/17/85	-27.0
BD-77B	110N-59W-16BBBB	07/31/85	-27.2
BD-77B	110N-59W-16BBBB	08/13/85	-27.3
BD-77B	110N-59W-16BBBB	09/11/85	-27.2
BD-77B	110N-59W-16BBBB	10/01/85	-27.4
BD-77B	110N-59W-16BBBB	11/06/85	-27.0
BD-77B	110N-59W-16BBBB	04/08/86	-26.7
BD-77B	110N-59W-16BBBB	05/22/86	-25.8
BD-77B	110N-59W-16BBBB	06/02/86	-25.4
BD-77B	110N-59W-16BBBB	06/17/86	-25.0
BD-77B	110N-59W-16BBBB	06/30/86	-24.9
BD-77B	110N-59W-16BBBB	07/15/86	-24.8
BD-77B	110N-59W-16BBBB	07/28/86	-24.8
BD-77B	110N-59W-16BBBB	08/05/86	-24.7
BD-77B	110N-59W-16BBBB	08/12/86	-24.7
BD-77B	110N-59W-16BBBB	08/25/86	-24.6
BD-77B	110N-59W-16BBBB	10/07/86	-23.8
BD-77B	110N-59W-16BBBB	11/05/86	-23.5

OBS WELL=BD-77B

14:19 TUESDAY, MARCH 3, 1987 3

PLOT OF READING:DATE SYMBOL USED IS :



OBS_WELL	LOCATION	DATE	READING
BD-77E	111N-59W-29DDDD	11/30/77	-19.9
BD-77E	111N-59W-29DDDD	06/01/78	-18.3
BD-77E	111N-59W-29DDDD	06/14/78	-18.2
BD-77E	111N-59W-29DDDD	06/28/78	-18.3
BD-77E	111N-59W-29DDDD	07/12/78	-18.4
BD-77E	111N-59W-29DDDD	08/23/78	-18.8
BD-77E	111N-59W-29DDDD	09/13/78	-19.0
BD-77E	111N-59W-29DDDD	10/03/78	-19.1
BD-77E	111N-59W-29DDDD	10/25/78	-19.2
BD-77E	111N-59W-29DDDD	11/28/78	-19.4
BD-77E	111N-59W-29DDDD	05/04/79	-18.8
BD-77E	111N-59W-29DDDD	05/24/79	-18.8
BD-77E	111N-59W-29DDDD	06/05/79	-18.9
BD-77E	111N-59W-29DDDD	06/26/79	-18.9
BD-77E	111N-59W-29DDDD	07/10/79	-19.0
BD-77E	111N-59W-29DDDD	07/26/79	-19.2
BD-77E	111N-59W-29DDDD	08/09/79	-19.3
BD-77E	111N-59W-29DDDD	08/20/79	-19.4
BD-77E	111N-59W-29DDDD	09/06/79	-19.5
BD-77E	111N-59W-29DDDD	09/27/79	-19.7
BD-77E	111N-59W-29DDDD	10/18/79	-19.7
BD-77E	111N-59W-29DDDD	12/13/79	-20.0
BD-77E	111N-59W-29DDDD	02/14/80	-20.4
BD-77E	111N-59W-29DDDD	04/02/80	-20.5
BD-77E	111N-59W-29DDDD	05/20/80	-20.7
BD-77E	111N-59W-29DDDD	06/03/80	-20.6
BD-77E	111N-59W-29DDDD	06/18/80	-20.6
BD-77E	111N-59W-29DDDD	07/01/80	-20.7
BD-77E	111N-59W-29DDDD	07/17/80	-20.7
BD-77E	111N-59W-29DDDD	07/31/80	-20.8
BD-77E	111N-59W-29DDDD	08/12/80	-20.9
BD-77E	111N-59W-29DDDD	08/26/80	-20.7
BD-77E	111N-59W-29DDDD	09/10/80	-20.9
BD-77E	111N-59W-29DDDD	10/07/80	-21.1
BD-77E	111N-59W-29DDDD	11/18/80	-21.2
BD-77E	111N-59W-29DDDD	02/25/81	-21.3
BD-77E	111N-59W-29DDDD	03/25/81	-21.5
BD-77E	111N-59W-29DDDD	05/05/81	-21.6
BD-77E	111N-59W-29DDDD	05/27/81	-21.6
BD-77E	111N-59W-29DDDD	06/09/81	-21.6
BD-77E	111N-59W-29DDDD	06/23/81	-21.7
BD-77E	111N-59W-29DDDD	07/14/81	-21.7
BD-77E	111N-59W-29DDDD	07/28/81	-21.6
BD-77E	111N-59W-29DDDD	08/11/81	-21.4
BD-77E	111N-59W-29DDDD	08/25/81	-21.7
BD-77E	111N-59W-29DDDD	09/16/81	-21.8
BD-77E	111N-59W-29DDDD	10/28/81	-21.8
BD-77E	111N-59W-29DDDD	12/09/81	-21.9
BD-77E	111N-59W-29DDDD	04/27/82	-20.4
BD-77E	111N-59W-29DDDD	06/22/82	-19.5
BD-77E	111N-59W-29DDDD	07/07/82	-19.8
BD-77E	111N-59W-29DDDD	07/21/82	-19.8
BD-77E	111N-59W-29DDDD	08/03/82	-20.1

14:25 TUESDAY, MARCH 3, 1987 1

BD-77B	111N-59W-29DDDD	04/05/83	-20.7
BD-77B	111N-59W-29DDDD	05/04/83	-20.4

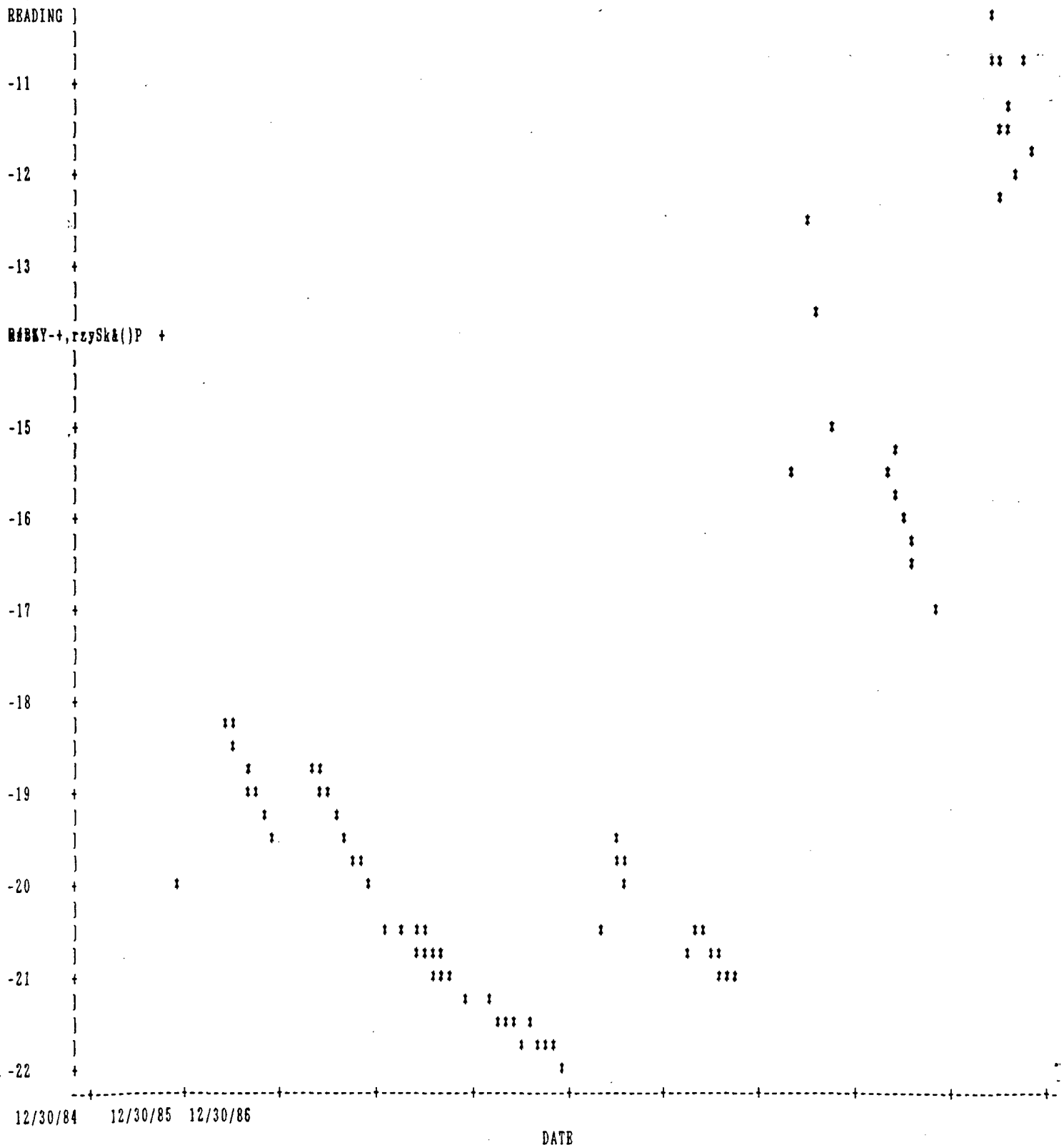
OBS_WELL	LOCATION	DATE	READING
BD-77E	111N-59W-29DDDD	05/18/83	-20.4
BD-77E	111N-59W-29DDDD	06/08/83	-20.5
BD-77E	111N-59W-29DDDD	07/06/83	-20.7
BD-77E	111N-59W-29DDDD	07/21/83	-20.7
BD-77E	111N-59W-29DDDD	08/10/83	-20.9
BD-77E	111N-59W-29DDDD	09/01/83	-21.0
BD-77E	111N-59W-29DDDD	09/20/83	-20.9
BD-77E	111N-59W-29DDDD	10/05/83	-21.1
BD-77E	111N-59W-29DDDD	05/01/84	-15.5
BD-77E	111N-59W-29DDDD	07/09/84	-12.5
BD-77E	111N-59W-29DDDD	07/23/84	-13.4
BD-77E	111N-59W-29DDDD	08/06/84	-13.8
BD-77E	111N-59W-29DDDD	09/19/84	-15.0
BD-77E	111N-59W-29DDDD	04/16/85	-15.4
BD-77E	111N-59W-29DDDD	05/21/85	-15.3
BD-77E	111N-59W-29DDDD	06/04/85	-15.8
BD-77E	111N-59W-29DDDD	06/18/85	-16.0
BD-77E	111N-59W-29DDDD	07/02/85	-16.0
BD-77E	111N-59W-29DDDD	07/17/85	-16.2
BD-77E	111N-59W-29DDDD	07/31/85	-16.4
BD-77E	111N-59W-29DDDD	08/13/85	-16.5
BD-77E	111N-59W-29DDDD	11/06/85	-17.0
BD-77E	111N-59W-29DDDD	05/22/86	-10.2
BD-77E	111N-59W-29DDDD	06/02/86	-10.7
BD-77E	111N-59W-29DDDD	06/17/86	-10.8
BD-77E	111N-59W-29DDDD	06/30/86	-11.6
BD-77E	111N-59W-29DDDD	07/15/86	-12.2
BD-77E	111N-59W-29DDDD	08/05/86	-11.2
BD-77E	111N-59W-29DDDD	08/12/86	-11.6
BD-77E	111N-59W-29DDDD	08/25/86	-12.0
BD-77E	111N-59W-29DDDD	10/07/86	-10.8
BD-77E	111N-59W-29DDDD	11/05/86	-11.8

OBSERVATION WELL WATER LEVELS

14:25 TUESDAY, MARCH 3, 1987 3

OBS_WELL=BD-77E

PLOT OF READING*DATE SYMBOL USED IS *



OBSERVATION WELL WATER LEVELS

OBS_WELL	LOCATION	DATE	READING
----------	----------	------	---------

14:41 TUESDAY, MARCH 3, 1987 1

BD-77F	110N-59W-29DDDD	11/30/77	-27.2
BD-77F	110N-59W-29DDDD	01/20/78	-27.0
BD-77F	110N-59W-29DDDD	03/15/78	-26.3
BD-77F	110N-59W-29DDDD	06/01/78	-23.8
BD-77F	110N-59W-29DDDD	06/14/78	-24.0
BD-77F	110N-59W-29DDDD	06/28/78	-33.1
BD-77F	110N-59W-29DDDD	07/12/78	-27.5
BD-77F	110N-59W-29DDDD	08/01/78	-33.7
BD-77F	110N-59W-29DDDD	08/22/78	-33.7
BD-77F	110N-59W-29DDDD	09/13/78	-29.5
BD-77F	110N-59W-29DDDD	10/03/78	-28.9
BD-77F	110N-59W-29DDDD	10/25/78	-28.3
BD-77F	110N-59W-29DDDD	11/28/78	-28.0
BD-77F	110N-59W-29DDDD	01/29/79	-27.6
BD-77F	110N-59W-29DDDD	03/22/79	-26.5
BD-77F	110N-59W-29DDDD	05/02/79	-25.6
BD-77F	110N-59W-29DDDD	05/24/79	-27.1
BD-77F	110N-59W-29DDDD	06/04/79	-29.6
BD-77F	110N-59W-29DDDD	06/26/79	-33.3
BD-77F	110N-59W-29DDDD	07/10/79	-33.5
BD-77F	110N-59W-29DDDD	07/26/79	-32.7
BD-77F	110N-59W-29DDDD	08/09/79	-33.8
BD-77F	110N-59W-29DDDD	08/20/79	-34.6
BD-77F	110N-59W-29DDDD	09/06/79	-34.3
BD-77F	110N-59W-29DDDD	09/27/79	-34.1
BD-77F	110N-59W-29DDDD	10/18/79	-30.4
BD-77F	110N-59W-29DDDD	12/13/79	-29.8
BD-77F	110N-59W-29DDDD	02/14/80	-29.2
BD-77F	110N-59W-29DDDD	04/02/80	-28.7
BD-77F	110N-59W-29DDDD	05/20/80	-34.1
BD-77F	110N-59W-29DDDD	06/03/80	-30.5
BD-77F	110N-59W-29DDDD	06/17/80	-29.7
BD-77F	110N-59W-29DDDD	07/01/80	-29.9
BD-77F	110N-59W-29DDDD	07/16/80	-28.9
BD-77F	110N-59W-29DDDD	07/31/80	-33.4
BD-77F	110N-59W-29DDDD	08/11/80	-33.9
BD-77F	110N-59W-29DDDD	08/28/80	-34.3
BD-77F	110N-59W-29DDDD	09/10/80	-31.1
BD-77F	110N-59W-29DDDD	10/07/80	-30.5
BD-77F	110N-59W-29DDDD	11/18/80	-30.2
BD-77F	110N-59W-29DDDD	02/24/81	-29.5
BD-77F	110N-59W-29DDDD	03/25/81	-29.5
BD-77F	110N-59W-29DDDD	05/05/81	-32.6
BD-77F	110N-59W-29DDDD	05/26/81	-32.9
BD-77F	110N-59W-29DDDD	06/09/81	-34.6
BD-77F	110N-59W-29DDDD	06/23/81	-35.2
BD-77F	110N-59W-29DDDD	07/13/81	-35.9
BD-77F	110N-59W-29DDDD	07/28/81	-36.5
BD-77F	110N-59W-29DDDD	08/11/81	-36.6
BD-77F	110N-59W-29DDDD	08/25/81	-37.1
BD-77F	110N-59W-29DDDD	09/16/81	-36.7
BD-77F	110N-59W-29DDDD	10/28/81	-34.7
BD-77F	110N-59W-29DDDD	12/09/81	-34.0

BD-77F	110N-59W-29DDDD	03/02/82	-32.3
BD-77F	110N-59W-29DDDD	04/27/82	-31.6

OBSERVATION WELL WATER LEVELS

OBS_WELL	LOCATION	DATE	READING
----------	----------	------	---------

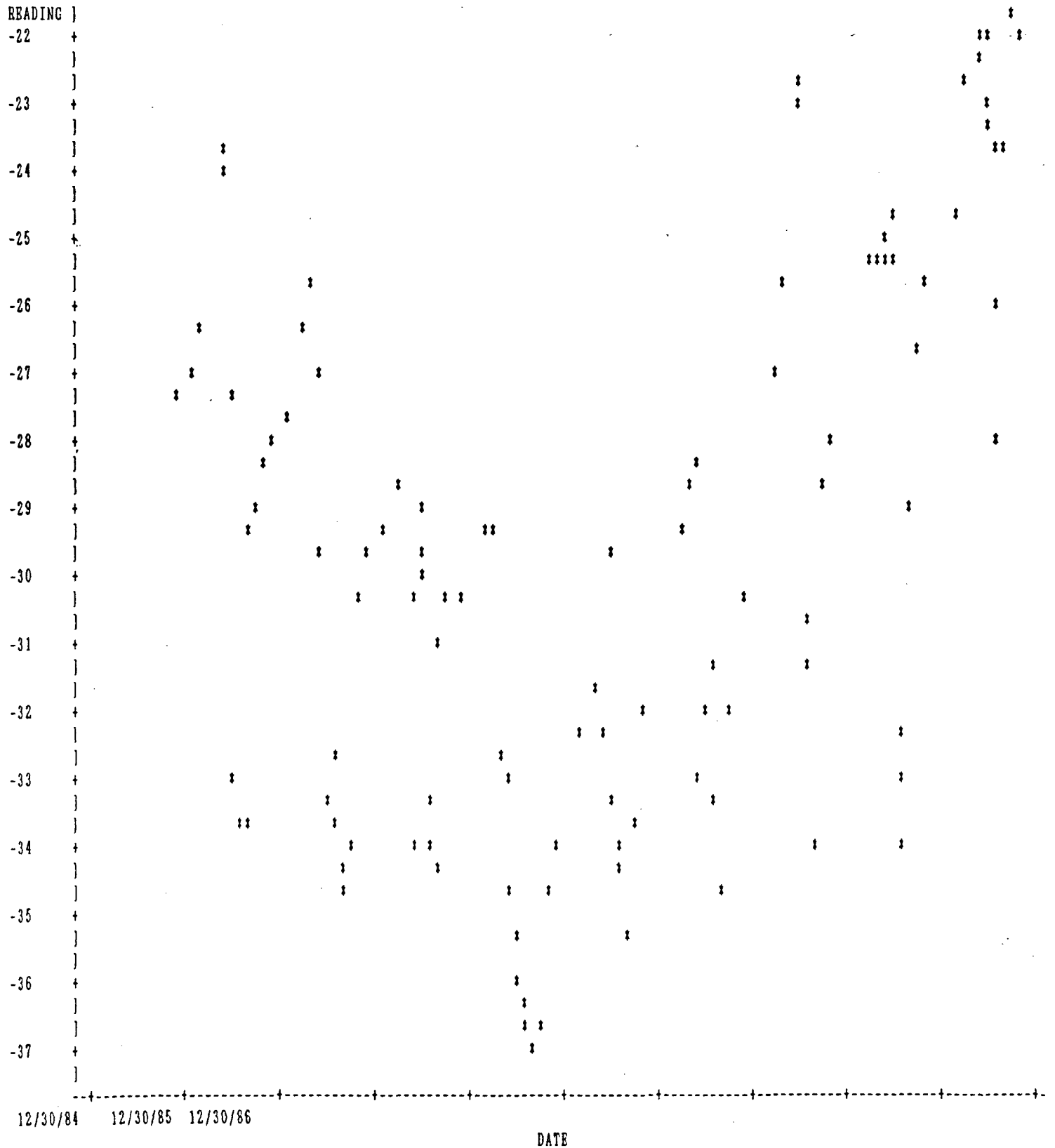
14:41 TUESDAY, MARCH 3, 1987 2

BD-77F	110N-59W-29DDDD	05/24/82	-32.2
BD-77F	110N-59W-29DDDD	06/22/82	-29.7
BD-77F	110N-59W-29DDDD	07/07/82	-33.3
BD-77F	110N-59W-29DDDD	07/21/82	-33.9
BD-77F	110N-59W-29DDDD	08/03/82	-34.4
BD-77F	110N-59W-29DDDD	08/24/82	-35.2
BD-77F	110N-59W-29DDDD	09/16/82	-33.7
BD-77F	110N-59W-29DDDD	10/19/82	-31.9
BD-77F	110N-59W-29DDDD	04/06/83	-29.3
BD-77F	110N-59W-29DDDD	05/04/83	-28.7
BD-77F	110N-59W-29DDDD	05/18/83	-28.5
BD-77F	110N-59W-29DDDD	06/08/83	-33.1
BD-77F	110N-59W-29DDDD	07/06/83	-32.1
BD-77F	110N-59W-29DDDD	07/21/83	-31.3
BD-77F	110N-59W-29DDDD	08/10/83	-33.4
BD-77F	110N-59W-29DDDD	09/01/83	-34.7
BD-77F	110N-59W-29DDDD	10/05/83	-32.0
BD-77F	110N-59W-29DDDD	12/13/83	-30.2
BD-77F	110N-59W-29DDDD	03/20/84	-27.1
BD-77F	110N-59W-29DDDD	05/01/84	-25.6
BD-77F	110N-59W-29DDDD	06/26/84	-22.8
BD-77F	110N-59W-29DDDD	07/09/84	-22.9
BD-77F	110N-59W-29DDDD	07/23/84	-31.3
BD-77F	110N-59W-29DDDD	08/06/84	-30.7
BD-77F	110N-59W-29DDDD	08/20/84	-34.0
BD-77F	110N-59W-29DDDD	09/19/84	-28.7
BD-77F	110N-59W-29DDDD	10/23/84	-27.9
BD-77F	110N-59W-29DDDD	03/20/85	-25.3
BD-77F	110N-59W-29DDDD	04/16/85	-25.2
BD-77F	110N-59W-29DDDD	05/21/85	-25.5
BD-77F	110N-59W-29DDDD	06/04/85	-24.9
BD-77F	110N-59W-29DDDD	06/18/85	-24.7
BD-77F	110N-59W-29DDDD	07/02/85	-25.4
BD-77F	110N-59W-29DDDD	07/17/85	-33.0
BD-77F	110N-59W-29DDDD	07/31/85	-34.1
BD-77F	110N-59W-29DDDD	08/13/85	-32.5
BD-77F	110N-59W-29DDDD	09/11/85	-28.9
BD-77F	110N-59W-29DDDD	10/01/85	-26.6
BD-77F	110N-59W-29DDDD	11/06/85	-25.8
BD-77F	110N-59W-29DDDD	03/12/86	-24.6
BD-77F	110N-59W-29DDDD	04/08/86	-22.6
BD-77F	110N-59W-29DDDD	05/22/86	-21.9
BD-77F	110N-59W-29DDDD	06/02/86	-22.2
BD-77F	110N-59W-29DDDD	06/17/86	-21.9
BD-77F	110N-59W-29DDDD	06/30/86	-23.1
BD-77F	110N-59W-29DDDD	07/15/86	-23.2
BD-77F	110N-59W-29DDDD	07/28/86	-25.9
BD-77F	110N-59W-29DDDD	08/05/86	-23.8
BD-77F	110N-59W-29DDDD	08/12/86	-28.0
BD-77F	110N-59W-29DDDD	08/25/86	-23.7
BD-77F	110N-59W-29DDDD	10/07/86	-21.7
BD-77F	110N-59W-29DDDD	11/05/86	-22.1

OBSERVATION WELL WATER LEVELS
OBS_WELL=BD-77F

14:41 TUESDAY, MARCH 3, 1987 3

PLOT OF READING*DATE SYMBOL USED IS *



REPORT ON APPLICATION NO. 5120-3
CITY OF IROQUOIS
March 22, 1987

This application proposes to appropriate 0.44 cfs (38 acre-feet annually) from one well approximately 70 feet deep to be located in one of the following locations, the NW 1/4 NW 1/4 of Section 4 or the NE 1/4 NE 1/4 Section 5, Both in T110N, R59W or the SE 1/4 SE 1/4 Section 32 or the SW 1/4 SW 1/4 Section 33, both in T111N, R59W. The water is to be used for municipal purposes by the town of Iroquois.

Aquifer - Floyd-Pearl Creek (F-PC)

Geology and Aquifer Characteristics

The Floyd-Pearl Creek (F-PC) is a glacial aquifer which can be under either artesian or water table conditions. The aquifer underlies 11,000 acres and contains an estimated 45,000 acre-feet of recoverable water all in Beadle County (Hedges, etal., 1982). The SDGS (Hedges, 1983) estimated recharge rates to range between 0.22 inches per year to 0.90 inches per year (200 to 825 acre-feet per year). Water use from the F-PC (Water Rights Division Irrigation Reports, 1987) are as follows:

<u>Year</u>	<u>Total Water Use by Irrigation (reported)</u>
1979	247 acre-feet
1980	267 acre-feet
1981	242 acre-feet
1982	593 acre-feet
1983	1293 acre-feet
1984	932 acre-feet
1985	997 acre-feet

There are a total of 10 irrigation permits from the F-PC aquifer with a total appropriation of 4118 acre-feet per year. The Division of Water Rights records indicate 50-60% of the total appropriated water would be used any given year. For example, irrigation water use data indicates in a normal year an irrigator will use 12-16 inches of the 24 inches (or 36 inches) which is allocated. Also, the data presented in the table will reflect dry and wet years, but mostly reflects the fact that a good share of the irrigators did not report that given year. The years 1983, 1984 and 1985 should be representative of the normal water use.

The Division of Water Rights monitors 4 observation wells (BD-76R, BD-77B, BD-77E, BD-77F) in the F-PC aquifer. Water levels were declining for the period of record until 1984. Since that time water levels have risen to levels which are the highest ever recorded. This is due to recharge from the wet years of 1984, 1985 and especially 1986 (Water Rights Division, 1987).

Conclusions

1. It appears the F-PC aquifer is fully appropriated based upon water use.
2. The F-PC does recharge. It will require further evaluation to quantify the recharge; however, it appears the range estimated by SDGS is conservative.
3. The Water Management Board has denied an application No. 4889-3 for the City of Huron for 15 cfs (annual withdrawal, up to 10,857 acre feet) from the F-PC Aquifer because the aquifer would not supply that amount of water. Also, Permit No. 4854A-3 for an extension of time for Wendell Fenner was denied at the March 4, 1987 Board meeting.
4. The town of Iroquois would benefit by using the F-PC. The water is of a better quality than the present supply. This alternative is apparently more cost effective (see engineer's report with application).
5. If this application were approved the additional withdrawal of 38 acre-feet per year would not seriously affect water availability from the aquifer.
6. The town of Iroquois should be applying for at least 2 wells to have a backup capability.
7. The town of Iroquois also has the option of obtaining the water needed from one of the existing irrigation permits. This could be done by legal action or obtaining an agreement from one of the permit holders.

James Goodman
JAMES GOODMAN
Hydrologist

Bibliography

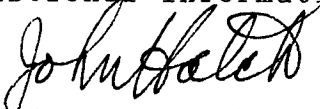
- Hedges, L.S., S. L. Burch, D.L. Iles, R.A. Barari, R.A. Schoon, 1982, Evaluation of Groundwater Resources Eastern South Dakota and Upper Big Sioux River, South Dakota and Iowa, for US Army Corp of Engineers, DWNr, SDGS, Vermillion SD 57069.
- Hedges, L.S., 1983, Task 7: Ground Water Recharge, For US Army Corps of Engineers, DWNr, SDGS, Vermillion SD 57069.
- Water Rights Irrigation Reports, 1987, Irrigation Reports for 1979, 1980, 1981, 1982, 1983, 1984, 1985, DWNr, Division of Water Rights, Joe Foss Building, Pierre SD 57501.
- Water Rights Division, 1987, Observation Well Files BD-76R, BD-77B, BD-77B, BD-77E, BD-77F, DWNr, Division of Water Rights, Joe Foss Building, Pierre SD 57501.

RECOMMENDATION OF CHIEF ENGINEER FOR WATER PERMIT
APPLICATION NO. 5120-3

Pursuant to SDCL 46-2A-2, the following is the recommendation of the Chief Engineer, Water Rights Division, Department of Water and Natural Resources concerning Water Permit Application No. 5120-3, Town of Iroquois, Box 186, Iroquois SD.

The Chief Engineer is recommending DENIAL of Application No. 5120-3 because there is reasonable probability that unappropriated water is not available for the applicant's proposed use.

See the attached report for additional information.


JOHN HATCH, Chief Engineer
March 23, 1987



Department of Water & Natural Resources

Joe Foss Building
523 East Capitol
Pierre, South Dakota 57501-3181

April 3, 1987

Robert Rounds, Mayor
Town of Iroquois
PO Box 186
Iroquois SD 57353

Dear Mayor:

We have reviewed your Application No. 5120-3 to appropriate 0.44 cfs from a new well to be located in the Floyd-Pearl Creek Aquifer. The enclosed Report and Recommendation recommends denial of Application No. 5120-3.

You can oppose the Recommendation to Deny Application No. 5120-3 by instructing the newspaper to publish the Publication Notice and appear before the Water Management Board May 6, 1987. If the Board denies Application No. 5120-3, 75 percent of the \$150.00 fee will be refunded. If you need more time, you can also delay publication and consideration of Application No. 5120-3 until the meeting July 8 & 9, 1987.

If you are not going to oppose Denial of Application No. 5120-3, tell the newspapers not to publish the notice. Notify us and the entire fee will be refunded. A notice of your intent to appropriate water has been sent to the Publishers of the DAILY PLAINSMAN printed at Huron SD and the DESMET NEWS printed at DeSmet SD, in the event you wish to proceed with this application.

The publishers have been instructed to publish your notice once each week for two consecutive weeks with the last publication to occur at least twenty days before the board meeting. We must receive Proof of Publication before the application can be considered by the Water Management Board.

Please contact us, if you have any questions.

Very truly yours,

A handwritten signature in dark ink, appearing to read "John Hatch".

JOHN HATCH, Chief Engineer
Water Rights Division
605 773-3352

cc: Curtis Kludt, Finance Officer



Department of Water & Natural Resources

Joe Foss Building
523 East Capitol
Pierre, South Dakota 57501-3181

April 6, 1987

Wendell Fenner
Rt 2, Box 97
Iroquois SD 57353

Dear Mr. Fenner:

Enclosed is a legal notice for your information to be published in the DeSmet News and the Daily Plainsman, if Iroquois pursues the water permit application.

Sincerely,

A handwritten signature in cursive script, reading "Ron Duvall". The signature is written in dark ink and is positioned below the word "Sincerely,".

RON DUVALL
Natural Resources Engineer

RD:ks

enclosure

No. 5120-3

Instruction to Newspaper - Publish first publication of the following Notice on or before April 8, 1987 with 2nd publication 1 week later. The applicant is responsible for payment.

NOTICE OF HEARING on Application No. 5120-3 to Appropriate Water
~~and/or to Amend Water Permit or Water Right No. _____~~

Notice is hereby given that the Town of Iroquois whose mailing address is PO Box 186, Iroquois, South Dakota has made an application for a permit

to appropriate 0.44 cubic feet of water per second (38 acre-feet annually) from one well (Floyd-Pearl Creek Aquifer) approximately 70 feet deep to be located in one of the following locations: the NW $\frac{1}{4}$ NW $\frac{1}{4}$ Section 4 or NE $\frac{1}{4}$ NE $\frac{1}{4}$ Section 5 both in T110N-R59W or SE $\frac{1}{4}$ SE $\frac{1}{4}$ Section 32 or SW $\frac{1}{4}$ SW $\frac{1}{4}$ Section 33 both in T111N-R59W. Water is to be used for municipal purposes by the Town of Iroquois.

Pursuant to SDCL 46-2A-2 the Chief Engineer of the Water Rights Division recommends

DENIAL of Application No. 5120-3 because ~~it~~ ^{not} unappropriated water is available, ~~2) will be no unlawful impairment of existing rights, 3) is beneficial use of water and 4) is in the public interest.~~

This application will be considered by the Water Management Board at room 216, Joe Foss Building, 523 E. Capitol, Pierre, South Dakota, May 6 19 87 at 10:00 am.

The recommendation of the Chief Engineer is not final or binding upon the Board and the Board is authorized to 1) approve, 2) approve with qualifications, 3) defer, or 4) deny this application after it reaches a conclusion based upon facts presented at the public hearing. Any interested person who may be affected by a Board decision and who intends to participate in the hearing before the Board and present evidence or cross-examine witnesses according to SDCL 1-26, must file a written petition with BOTH the applicant and the Chief Engineer by April 24, 1987. The petition may be informal, but it must include a statement describing the petitioners interest in the application, the reasons for the petitioner's opposition to or support of the application, and the signature and mailing address of the petitioner or his legal counsel if legal counsel is obtained. The applicant need not file a petition.

This application is made pursuant to the provisions of SDCL 46-1-1 thru 46-1-9, 46-1-12 thru 46-1-15; 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; 46-5-1 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; ~~(ground)~~ 46-6-3, 46-6-3.1, 46-6-6.1, 46-6-10, 46-6-13, 46-6-14; ~~(future use)~~ 46-5-38 thru 46-5-40; ~~(transfer lands)~~ 46-5-30.4, 46-5-33 thru 46-5-35; ~~(10,000 AFA)~~ 46-5-20.1, 46-5-8.1; and Board Rules ARSD 74:02:01:01 thru 74:02:01:15. ~~(future use)~~ 74:02:01:24 thru 74:02:01:25; ~~(10,000 AFA)~~ 74:02:01:15.02 thru 74:02:01:15.05.

This hearing is an adversary proceeding. The applicant or any person, after filing a petition, has the right to be present or to be represented by a lawyer. These and other due process rights will be forfeited if they are not exercised. Decisions of the Board may be appealed to the Circuit Court and the State Supreme Court as provided by law.

Any person wishing a copy of the Chief Engineer's recommendation, further information on this application or to assure access to the hearing by the handicapped can contact the Water Rights Division, DWNR, Joe Foss Bldg, Pierre SD (605 773-3352) for assistance prior to the hearing date. The time of the hearing will be automatically extended for at least twenty days upon written request of the applicant or any person who has filed a petition to oppose or support the application. The request for extension must be filed with the Chief Engineer by April 24, 1987.

STATE OF SOUTH DAKOTA)
) ss.
County Beadle)

I, James L. Hein hereby

certify that the annexed printed copy of Notice of Intent to Appropriate

Water was taken from the Huron Daily Plainsman

A newspaper which during the whole time of publication of said notice herein after stated, has been and is printed and published in the _____

City of Huron

County of Beadle and State of South Dakota;
that the said notice was published in said newspaper on the following
two dates:

April 8, 1987

April 15, 1987

(Signature)

(Title)

April 15, 1987

(Date Signed)

Cost of Printing: \$74.80

WNR-808-7/79
Proof of Publication

F.P. 4-8-87 L.P. 4-15-87
NOTICE OF HEARING ON
APPLICATION NO. 5120-3
TO APPROPRIATE WATER
 Notice is hereby given that the Town of Iroquois, whose mailing address is P.O. Box 106, Iroquois, South Dakota, has made an application for a permit to appropriate 0.44 cubic feet of water per second (38 acre-feet annually) from one well, (Floyd-Pearl Creek Aquifer) approximately 70 feet deep to be located in one of the following locations: the NW¼NW¼ Section 4 or NE¼NE¼ Section 5 both in T110N-R59W or SE¼SE¼ Section 32 or SW¼SW¼ Section 33 both in T111N-R59W. Water is to be used for municipal purposes by the Town of Iroquois.

Pursuant to SDCL 46-2A-2 the Chief Engineer of the Water Rights Division recommends **DENIAL** of Application No. 5120-3 because **unappropriated** water is not available.

This application will be considered by the Water Management Board at Room 216, Joe Foss Building, 523 E. Capitol, Pierre, South Dakota, May 6, 1987, at 10:00 a.m. The recommendation of the Chief Engineer is not final or binding upon the Board and the Board is authorized to 1) approve, 2) approve with qualifications, 3) defer, or 4) deny this application after it reaches a conclusion based upon facts presented at the public hearing. Any interested person who may be affected by a Board decision and who intends to participate in the hearing before the Board and present evidence or cross-examine witnesses according to SDCL 1-26, must file a written petition with BOTH the applicant and the Chief Engineer by April 24, 1987. The petition may be informal, but it must include a statement describing the petitioner's interest in the application, the reasons for the petitioner's opposition to or support of the application, and the signature and mailing address of the petitioner or his legal counsel if legal counsel is obtained. The applicant need not file a petition.

This application is made pursuant to the provisions of SDCL 46-1-1 thru 46-1-9, 46-1-12 thru 46-1-15; 46-2-3, 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; 46-5-1 thru 46-5-11, 46-5-13 thru 46-5-15, 46-5-24, 46-5-25, 46-5-30, 46-5-30.4, 46-5-31; 46-6-3, 46-6-3.1, 46-6-6.1, 46-6-10, 46-6-13, 46-6-14; and Board Rules ARSD 74:02:01:01 thru 74:02:01:15.

This hearing is an adversary proceeding. The applicant or any person, after filing a petition, has the right to be present or to be represented by a lawyer. These and other due process rights will be forfeited if they are not exercised. Decisions of the Board may be appealed to the Circuit Court and the State Supreme Court as provided by law.

Any person wishing a copy of the Chief Engineer's recommendation, further information on this application or to assure access to the hearing by the handicapped can contact the Water Rights Division, DWNWR, Joe Foss Bldg., Pierre, S.D. (605 773-3352) for assistance prior to the hearing date. The time of the hearing will be automatically extended for at least twenty days upon written request of the applicant or any person who has filed a petition to oppose or support the application. The request for extension must be filed with the Chief Engineer by April 24, 1987.

No. 182 (adv.)

$$11\frac{1}{4} \text{ (2)} \times 3.40 = 74.80$$

Affidavit of Publication

STATE OF SOUTH DAKOTA,
County of Kingsbury.

Dale Blegen

of said county being first duly sworn, on oath says that

he is the publisher of

of **THE DE SMET NEWS**, a weekly newspaper printed and published in De Smet in said County of Kingsbury and has full and personal knowledge of all the facts herein stated; that said newspaper is a legal newspaper and has a bona-fide circulation of at least two hundred copies weekly, and has been published within said County for fifty-two successive weeks next prior to the publication of the notice herein mentioned, and was and is printed wholly or in part in an office maintained at

said place of publication; that the Notice of

Hearing on Applic. No. 5120-3

, a printed copy of which, taken from the paper in which the same was published, is attached to this sheet, and is made a part of this Affidavit, was published in said newspaper at least once in each

week for two successive weeks, on the day of each week on which said newspaper was regularly published, to-wit:

April 8 19 87; 19

April 15 19 87; 19

19; 19

19; 19

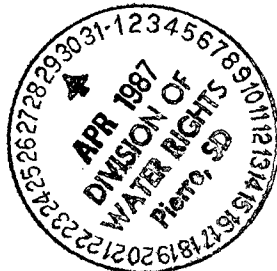
that the full amount of the fee charged for the publication of said notice inures to the benefit of the publisher of said newspaper; that no agreement or understanding for the division thereof has been made with any other person; and that no part thereof has been agreed to be paid to any person whomsoever, and that the fees

charged for the publication thereof are \$ 36.94

Subscribed and sworn to before me this 28

day of April A. D., 19 87

Dale Blegen
Notary Public
County of Kingsbury, South Dakota.



NOTICE OF HEARING ON

Application No. 5120-3 to

Appropriate Water

Notice is hereby given that the Town of Iroquois whose mailing address is PO Box 186, Iroquois, South Dakota has made an application for a permit to appropriate 0.44 cubic feet of water per second (38 acre-feet annually) from one well (Floyd-Pearl Creek Aquifer) approximately 70 feet deep to be located in one of the following locations: the NW $\frac{1}{4}$ NW $\frac{1}{4}$ Section 4 or NE $\frac{1}{4}$ NE $\frac{1}{4}$ Section 5 both in T110N-R59W or SE $\frac{1}{4}$ SE $\frac{1}{4}$ Section 32 or SW $\frac{1}{4}$ SW $\frac{1}{4}$ Section 33 both in T111N-R59W. Water is to be used for municipal purposes by the Town of Iroquois.

Pursuant to SDCL 46-2A-2 the Chief Engineer of the Water Rights Division recommends DENIAL of Application No. 5120-3 because unappropriated water is not available.

This application will be considered by the Water Management Board at Room 216, Joe Foss Building, 523 E. Capitol, Pierre, South Dakota, May 6, 1987 at 10:00 a.m.

The recommendation of the Chief Engineer is not final or binding upon the Board and the Board is authorized to 1) approve, 2) approve with qualifications, 3) defer, or 4) deny this application after it reaches a conclusion based upon facts presented at the public hearing. Any interested person who may be affected by a Board decision and who intends to participate in the hearing before the Board and present evidence or cross-examine witnesses according to SDCL 1-26, must file a written petition with BOTH the applicant and the Chief Engineer by April 24, 1987. The petition may be informal, but it must include a statement describing the petitioner's interest in the application, the reasons for the petitioner's opposition to or support of the application, and the signature and mailing address of the petitioner or his legal counsel if legal counsel is obtained. The applicant need not file a petition.

This application is made pursuant to the provisions of SDCL 46-1-1 thru 46-1-9, 46-1-12 thru 46-1-15; 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; 46-5-1 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; 46-6-3, 46-6-3.1, 46-6-6.1, 46-6-10, 46-6-13, 46-6-14; and Board Rules ARSD 74:02:01:01 thru 74:02:01:15.

This hearing is an adversary proceeding. The applicant or any person, after filing a petition, has the right to be present or to be represented by a lawyer. These and other due process rights will be forfeited if they are not exercised. Decisions of the Board may be appealed to the Circuit Court and the State Supreme Court as provided by law.

Any person wishing a copy of the Chief Engineer's recommendation, further information on this application or to assure access to the hearing by the handicapped can contact the Water Rights Division DWRN, Joe Foss Bldg., Pierre, SD (605 773-3352) for assistance prior to the hearing date. The time of the hearing will be automatically extended for at least twenty days upon written request of the applicant or any person who has filed a petition to oppose or support the application. The request for extension must be filed with the Chief Engineer April 24, 1987.

May 6, 1987
(date)

page 1 of 1

Parties of Record before Water Management Board on Water
Permit Application No. 5120-3, Town of Inoquois

FOR:

AGAINST:

1. Robert Branda, Mayor
Town of Inoquois
P.O. Box 186
Inoquois, SD 57353

2. Curtis Kludt, Finance Officer
Town of Inoquois
P.O. Box 186
Inoquois, SD 57353

3. _____

4. _____

5. _____



Department of Water & Natural Resources

Joe Foss Building
523 East Capitol
Pierre, South Dakota 57501-3181

May 12, 1987

NOTICE

TO: Robert Rounds, Mayor
Town of Iroquois
PO Box 186
Iroquois SD 57353
and Parties of Record (see attached)

FROM: John Hatch, Chief Engineer
Water Rights Division
605 773-3352 

SUBJECT: Reconsideration of Deferred Water Permit Application
No. 5120-3 Town of Iroquois

The Water Management Board will reconsider Water Permit Application No. 5120-3 at 11:30 am, July 8, 1987 in Room 216, Joe Foss Building, 523 East Capitol, Pierre SD. Application No. 5120-3 was deferred May 6, 1987, to allow time for negotiations between the Town of Iroquois and irrigators using water from the Pearl Creek Aquifer. Applicable provisions of the Notices published in the Huron Daily Plainsman and the DeSmet News on April 8 and April 15, 1987 will still apply at this hearing. The agenda time is an estimate. The actual time of the hearings may be later than 11:30 am due to prior agenda items.

cc: Kenroy Janzen, Clark Engineering
Wendell Fenner
Jerry Siegel, East Dakota Water Development District
Harold Deering, Assistant Attorney General
John Guhin, Assistant Attorney General

CERTIFICATION

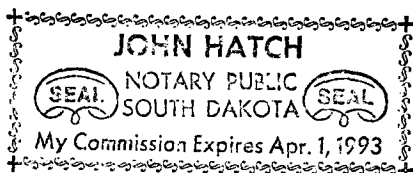
I hereby certify that on May 12, 1987 I have personally deposited with the U.S. Mail, postage prepaid envelopes containing Notice of Reconsideration of Deferred Application No. 5120-3 to the Parties of Record and:

Kenroy Janzen, Clark Engineering, Box 20, Aberdeen SD 57402-0020
Wendell Fenner, RR 2, Box 97, Iroquois SD 57353
Jerry Siegel, Manager, East Dakota Water Development District,
524 17th Ave, Brookings SD 57006

Karen Schlaak
KAREN SCHLAACK
Senior Secretary

STATE OF SOUTH DAKOTA)
) SS
COUNTY OF HUGHES)

Sworn to, before me, this 12th day of May, 1987.



John Hatch
Notary Public



Department of Water & Natural Resources

Joe Foss Building
523 East Capitol
Pierre, South Dakota 57501-3181

June 15, 1987

Don Ownes
RR 1, Box 156
Iroquois SD 57353

Dear Mr. Ownes:

As requested, enclosed is a draft copy of the minutes of the Water Management Board meeting May 6, 1987 pertaining to Application No. 5120-3. This draft is subject to Board approval at the July 8, 1987 meeting.

Sincerely,

KAREN SCHLAAK
Senior Secretary

enclosure

The City of Iroquois

Public Park &
Playground
Sewer System
Waterworks

Iroquois, South Dakota
57353

On Main
Railroad Line
Central Location
Reorganized School

July 3, 1987

SD Dept of Water & Natural Resources
Water Rights Division
Joe Foss Building
523 East Capitol
Pierre, SD 57501-3181



Dear Sir;

We are experiencing some difficulty in obtaining water rights for the Iroquois City water project from irrigators in the Pearl Creek Aquifer for the following reasons. First, there are only three irrigators with nine wells instead of ten irrigators as was first thought. The Nenabor Bros. with two, Victor Gravel with one and the Hutterite Colony with the remaining six.

The following scenario exists at this time. In an early conversation with the Colony, Mr. Paul Waldner, colony manager, stated that they would not be interested in selling any water rights. One of their pumps, located on the east edge of the Pearl Creek Aquifer, was already pumping air and he did not believe there would be enough water to operate the irrigation system if they were to sell any portion of their permit.

The Nenabor Bros. are in Chapter 12 bankruptcy and it would not be to their advantage to sell water rights at this time.

Mr. Gravel, of Seward, Nebraska was approached by Mayor Rounds through B.C. Aughenbaugh, the operator, and he was receptive until the confusion between the C.F.S. rate and acre feet arose. The City was under the impression that we were dealing in acre feet only. The irrigator operator was told that he would have to reduce his diversion rate if he sold the city 38 acre feet of their rights. This was impossible for him to do because of his pump size, well and motor R.P.M., and other factors of his system. Under these conditions Mr. Gravel and Mr. Aughenbaugh would not negotiate for the sale of any of their water rights.

The City immediately took action via telephone with your office to solve the C.F.S.-acre feet dilemma.

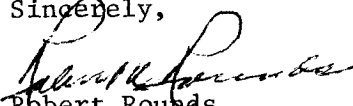
The above scenario leaves the city incapable of negotiations with the Pearl Creek irrigators for the acquisition of water rights.

The solution to the problem is perhaps the recomputation of aquafier area, or recharge rate which might come up with an additional 38 acre feet for the city.

We believe the following factors should be reviewed: 1) The area of the aquafier in acres. 2) The annual average recharge rate. 3) The total acre feet of water allocated to present irrigators.

Thank you for your help in this matter.

Sincerely,



Robert Rounds
Mayor

10

50

52

Page 10

T.107N.

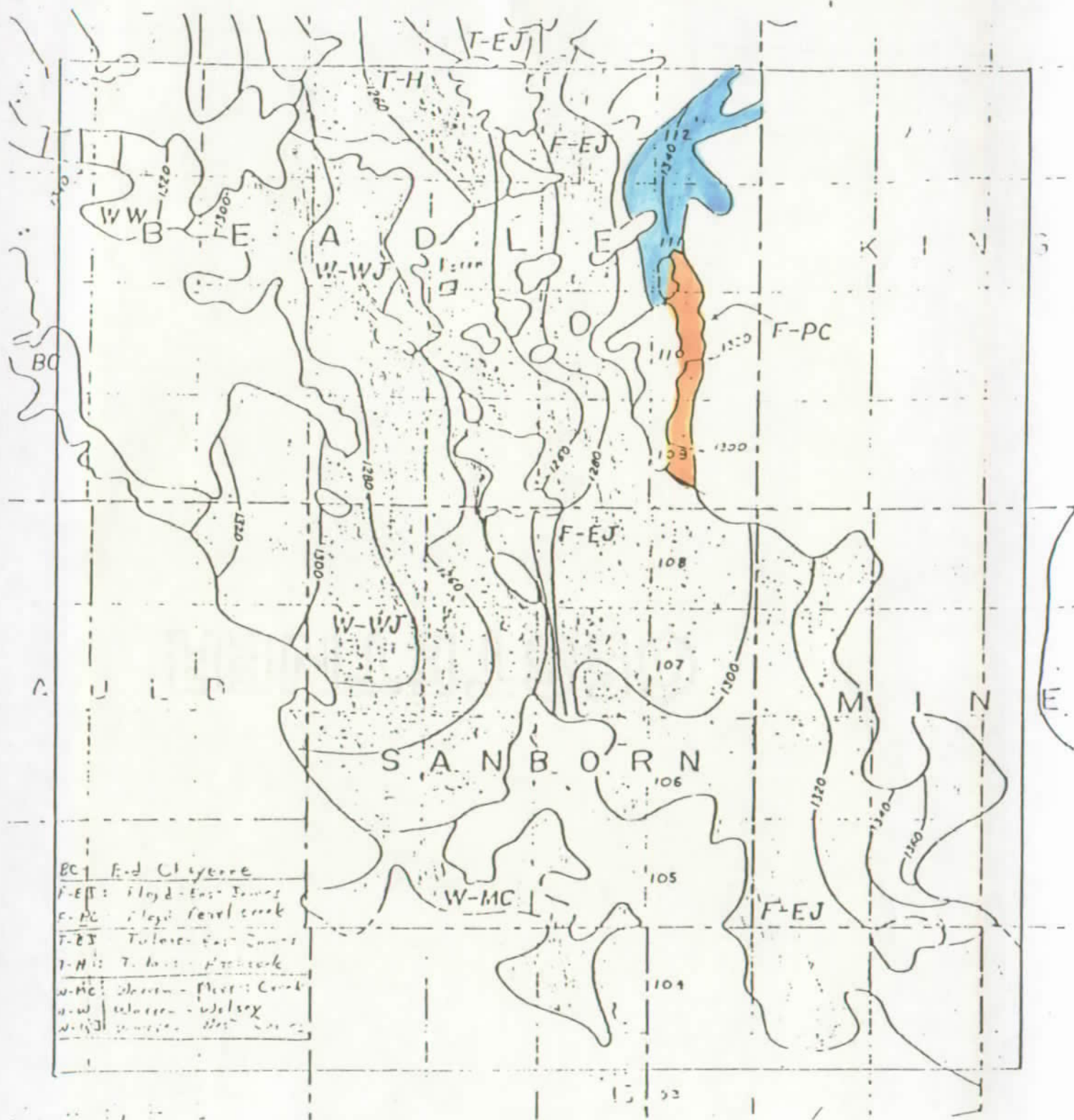


Plate 5. Map of the Sanborn District showing location and water level contours for the Basal Aquifer System, (May, 1980)

FLOYD PEARL CK.

57 10

57 20

62 20

57 20

45 29

67 10

72 10

62 20

60

$$1192 \div 33 \div 100 \times 7 = 2.53$$

47

60

52

45

47

55

25

35

37

12

12

25

20

10

12

20

DATE

DRAWN

DESIGN

CHECK

FLOYD PEARL CK

AQUIFER

RECHARGE

SHEET
NUMBER

OF ____ SHTS.



FLOYD PEARL CK. EXTENDED

62
62
70
50
62
62
37
60
57
25
62
40
37
50
37
50
42
50
25
62
75
25
67
85
42
75
57
42

$$\begin{array}{r} 1470 \\ 1192 \\ \hline 2662 \end{array} \div \begin{array}{r} 28 \\ 33 \\ \hline 61 \end{array} \div 100 \times 7 = 3.05$$

DATE

DRAWN

DESIGN

CHECK

FLOYD PEARL CK. AQUIFER EXTENDED

RECHARGE

SHEET
NUMBER

OF ___ SHTS.



FLOYD PEARL CK AQUIFER

$$\text{USING } 11,000 \text{ AC} \times \frac{2.53 \text{ IN}}{12 \frac{\text{IN}}{\text{FT}}} = 2294 \text{ AC-FT}$$

FLOYD PEARL CK AQUIFER EXTENDED

$$28,800 \text{ AC} \times \frac{3.05 \text{ IN}}{12 \frac{\text{IN}}{\text{FT}}} = 7320 \text{ AC-FT}$$

NOTE: CALC USE 0.15 SPECIFIC YIELD

DATE		SHEET NUMBER	
DRAWN			
DESIGN			
CHECK			
		OF ___ SHTS.	

SEP 1987
DIVISION OF
WATER RIGHTS
Pierre, SD

FINDINGS OF FACT, 49578
CONCLUSIONS OF LAW AND
FINAL DECISION

5. A very recent digital simulation done by USGS estimates a higher recharge rate for the Floyd-Pearl Creek aquifer than the 1983 estimate. Manipulation of the digital simulation data indicates a present estimate by USGS of 2.53

inches of recharge or 2,294 acre feet of recharge across the aquifer, assuming an 11,000 acre aquifer.

6. If the boundaries of the aquifer are larger than previously assumed, i.e., are 28,800 acres as indicated on the exhibit submitted by the city, the recharge rate is found to be 3.05 inches. The recharge across the aquifer would total 7,320 acre feet. The Board makes no finding on whether these additional acres should be included in the aquifer.

7. Due to wet conditions, water levels have been rising in the aquifer in the 1983 to 1985 period despite the fact that water use has also been rising.

8. It has not been shown, upon the best information reasonably available, that it is probable that the quantity of water withdrawn annually from the aquifer (i.e. 38 acre feet in addition to the present withdrawals) will exceed the quantity of average estimated annual recharge of water to the aquifer. This finding takes into consideration the relatively insignificant amount of water applied for here, the estimated annual withdrawals, the estimated 45,000 acre feet of recoverable water, and the available studies of recharge.

9. The Board does not make any final determination in these findings as to the total average annual recharge except as set out in paragraph eight. Specifically, the Board declines to find the present total annual recharge in the aquifer.

10. No objection has been heard from any of the surrounding irrigators or water users with regard to the grant of this permit.

11. There are a total of ten irrigation permits from the Floyd-Pearl Creek aquifer with the total appropriation right of 4,118 acre feet per year. Actual irrigation use is shown, however, in paragraph two. In determining the rate of recharge as compared to the rate of water use pursuant to SDCL 46-6-3.1, the appropriate figure for water use is actual use and not permitted rights.

12. The proposed diversion can be developed without unlawful impairment of existing rights.

13. The proposed use for municipal purposes is a beneficial use and is in the public interest.

CONCLUSIONS OF LAW

1. The Board has jurisdiction over this matter.

2. All notices required by statute and constitution have been given.

3. According to the best information reasonably available, the quantity of water withdrawn annually from the Floyd-Pearl Creek aquifer will not exceed the quantity of average estimated annual recharge of water to the groundwater source, assuming this permit is granted.

4. There is a reasonable probability that unappropriated water is available for the appropriation.

5. The proposed diversion can be developed without unlawful impairment of existing rights assuming the permit is properly conditioned.

6. The proposed use for municipal purposes is a beneficial use and is in the public interest.

FINAL DECISION

The application for Water Permit No. 5120-3 is approved with the following qualifications:

1. The well 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 withdrawal so there is not a reduction of needed water supplies in domestic wells or in adequate wells having prior water rights.

2. The city of Iroquois shall report to the Chief Engineer annually the amount of water withdrawn each year.

3. Approval of this permit authorizes a maximum annual withdrawal of 38 acre feet.

Dated and signed this 29 day of September, 1987.

BY THE BOARD:

Marian S. Sunderson



Department of Water & Natural Resources

Joe Foss Building

523 East Capitol

Pierre, South Dakota 57501-3181

October 1, 1987

NOTICE

TO: Robert Rounds, Mayor
Town of Iroquois
PO Box 186
Iroquois SD 57353
and Parties of Record (see attached)

FROM: John Hatch, Chief Engineer *John Hatch*
Water Rights Division
605 773-3352

SUBJECT: Adoption of Findings of Fact, Conclusions of Law and
Final Decision

This is to notify you that a final Decision including Findings of Fact and Conclusions of Law were adopted by the Water Management Board for approval of Water Permit No. 5120-3 which was considered at the July 8, 1987 meeting.

The final Decision, Findings and Conclusion are on file in this office and signed copies will be furnished upon request. South Dakota Statutes provide that the decisions of the Board may be appealed to the Courts.

CERTIFICATION

I hereby certify that on October 2, 1987 I have personally deposited with the U.S. Mail, postage prepaid envelopes containing a Notice pertaining to Water Permit No. 5120-3 addressed as stated on the Parties of Record.

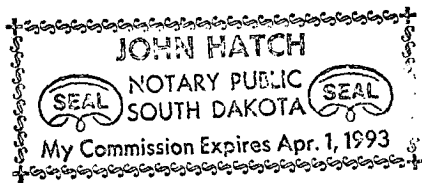
Harmon Schickel

KAREN SCHLAAK
Senior Secretary

STATE OF SOUTH DAKOTA)
) SS
COUNTY OF HUGHES)

Sworn to, before me, this 5th day of October, 1987.

John H. Bates
Notary Public





Department of Water & Natural Resources

Joe Foss Building
523 East Capitol
Pierre, South Dakota 57501

Water Rights Division
605 773-3352

OCT 20 1987

Town of Iroquois
P.O. Box 186
Iroquois, South Dakota 57353

Dear Sir:

Enclosed herewith is your Water Permit No. 5120-3 as approved by the Water Management Board authorizing you to construct your water diversion system and the water to beneficial use, not exceeding the limits as specified in said Water Permit No. 5120-3.

Also enclosed is Form 10, Notice of Completion of Works and Application of Water to Beneficial Use, which you are to complete and submit to the Chief Engineer when you have completed the system and/or have put the water to beneficial use. An inspection can then be scheduled so that your Water License may be issued to you, thus completing your acquisition of a Water Right.

Very truly yours,

JOHN HATCH, Chief Engineer
Water Rights Division

JH: ms

enclosure

PLEASE NOTE: Certain changes can be made in your permit within the five year construction period, usually without affecting the priority date provided an application to amend your permit is made within the five year period-i.e. changes in location or number of diversion points (wells) or location of land to be irrigated. Well locations for wells into the same aquifer can be moved up to 660 feet without application.

Applications to amend a permit after the five year construction period will be assigned a new priority date. Applications to change water sources, to add lands or increase original diversion rates, if approved will usually receive the date of the new application as a priority date regardless of the five year construction period.

The City of Iroquois

P.O. Box 127, 120 Ottawa St. S.

Iroquois, S.D. 57353-0127

March 12, 1989



John Hatch
Water Rights Division
Dept of Water & Natural Resources
Joe Foss Building
Pierre, SD 57501-3181

Dear Mr. Hatch:

In response to your letter of February 14, 1989 requesting a report of water pumped by the City of Iroquois on water permit No. 5120-3 the following information is given.

The well authorized by permit No. 5120-3 was developed in November of 1988. No water was pumped in 1988 because the water system filter plant is not yet complete. Hopefully, this should be complete by March 20, 1989 and we will supply your office with the gallons pumped in 1989.

Any questions you may have will be answered to the best of our ability and knowledge.

Very Truly Yours,

Robert Rounds
Mayor

The City of Iroquois

P.O. Box 127, 120 Ottawa St. S.

Iroquois, S.D. 57353-0127

January 2, 1990



SD Dept of Water
John Hatch, Chief Engineer
Pierre, SD 57501

Dear Sir;

As requested I am sending the reading for gallons used from the City's west well. Our figures show the City used 7,558,400 gallons as of December 31, 1989. If you are going to need this information for the year 1990, please let me know.

Sincerely,

Mary S Owens
Mary S. Owens
Finance Officer



Department of Water & Natural Resources

Joe Foss Building
523 East Capitol
Pierre, South Dakota 57501-3181

March 5, 1990

5120-3

Mary S Owens
Finance Officer
City of Iroquois
PO Box 127
Iroquois, SD 57353-0127

Dear Ms. Owens:

On January 4, 1990, we received a letter from you with the City's water use records for 1989. You inquired in your letter as to whether or not this information would be needed for 1990.

Water Permit No. 5120-3 was approved with the qualification that the City shall report to the Chief Engineer, annually the amount of water withdrawn each year. Enclosed is a copy of the permit as approved by the Water Management Board.

If you have any questions, please contact us.

Sincerely,

A handwritten signature in cursive script that reads "Genny McMATH". The signature is written in dark ink and is positioned above the printed name and title.

GENNY MCMATH
Natural Resources Analyst
(605) 773-3352

enclosure

**SOUTH Dakota Department of
Water & Natural Resources**

Joe Foss Building
523 East Capitol
Pierre, South Dakota 57501-3181

December 3, 1990

TOWN OF IROQUOIS
LEORE NIXON
PO BOX 127
IROQUOIS SD 57353

Dear MS. NIXON:

Pursuant to a qualification on Water Permit/Right No(s).
5120-3, we are requesting that the TOWN OF IROQUOIS report
to the Chief Engineer the amount of water withdrawn for
the year 1990. Please respond by JANUARY 31, 1991.

If you have any questions concerning this or other water
rights questions, please contact Regan Fanning, Natural
Resource Analyst, (605) 773-3352.

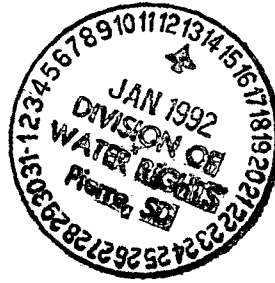
Very truly yours,



Ron Duvall,
Natural Resource Engineer
for JOHN HATCH, Chief Engineer
Water Rights Division

filtered 12,198,700
boosted 11,064,000





5120-3

**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE SOUTH DAKOTA 57501-3181

January 7, 1992

Town of Iroquois
Leore Nixon
PO Box 127
Iroquois SD 57353

Dear Ms. Nixon:

Pursuant to a qualification on Water Permit/Right No(s). 5120-3, we are requesting that the Town of Iroquois report to the Chief Engineer the amount of water withdrawn for the year 1991. Please respond by February 10, 1992.

If you have any questions concerning this or other water rights questions, please contact Don Frye, Natural Resources Analyst, (605) 773-3352.

Very truly yours,

Ron Duvall,
Natural Resources Engineer
for JOHN HATCH, Chief Engineer
Water Rights Division

filtered 15,217,900
boostered 13,286,100



5120-3

**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE SOUTH DAKOTA 57501-3181

December 23, 1992

Leore Nixon
Town of Iroquois
PO Box 127
Iroquois SD 57353

Dear Ms. Nixon:

Pursuant to a qualification on Water Permit/Right No(s). 5120-3, I am requesting that the Town of Iroquois report the amount of water diverted under the permit(s) during 1992. Please respond by January 15, 1993.

If you have any questions concerning this or other water rights questions, please contact Barry McLaury, Natural Resources Analyst, (605) 773-3352.

Very truly yours,

RON DUVALL, Natural Resources Engineer
for JOHN HATCH, Chief Engineer
Water Rights Division

Filtered in 1992 13,183,700 gallons:



5120-3

**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE SOUTH DAKOTA 57501-3181

January 13, 1994

Leore Nixon
Town of Iroquois
PO Box 127
Iroquois, SD 57353

Dear Ms. Nixon:

Pursuant to a qualification on Water Permit/Right Nos. 5120-3 & 5623-3, I am requesting that the Town of Iroquois report the total amount of water diverted during 1993. Please respond by January 31, 1994.

If you have any questions concerning this or other water rights questions, please contact Barry McLaury, Natural Resources Analyst, (605) 773-3352.

Sincerely,

RON DUVALL, Natural Resources Engineer
for JOHN HATCH, Chief Engineer
Water Rights Division

~~Water usage for the City of Iroquois for 1993 is 13, 127, 350~~

COMMUNITY-RURAL WATER SYSTEMS

PERMIT # 5120-3
FACILITY TOWN OF IROQUOIS

SALUTATION MS.

FIRST NAME LEORE

LAST NAME NIXON

ADDRESS PO BOX 127

CITY/STATE IROQUOIS SD

ZIP CODE 57353

WATER USE MUN

ACRE*FT/YR ALLOWED 38

ACRE*FT/YR USED 37.4

→ 1990

RESPOND BY JANUARY 31, 1991

1990 REPT. REC'D 2/7/91

REMARKS BOOSTERED 11,064,000, FILTERED 12,198,700



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3181

July 28, 1995

Permit No. 5623-3

Leore Nixon, Finance Officer
City of Iroquois
P.O. Box 127
Iroquois, SD 57353

Dear Ms. Nixon:

The inspection of your water use system and the inspection of the extent of application of water to beneficial use, as developed under Water Permit Nos. 5120-3 and 5623-3, has been completed. Your final water right document, the Water License, can now be issued. Upon licensing, the applicable portions of Water Permit No. 5120-3 will be incorporated into 5623-3.

Statutes require that we charge a \$50.00 fee for the inspection and issuance of the Water License. Upon receipt of the \$50.00 fee from you, we will begin processing your Water License.

Please Remit fee to:
Department of Environment & Natural Resources
Water Rights Program
523 E. Capitol
Pierre, SD 57501-3181

South Dakota Water Law 46-5-30.1 requires that a permit holder may not divert water until the \$50.00 license fee has been paid. Please contact us if you have any questions.

Sincerely,

Cheryl F. Frost
Secretary
Water Rights Program
(605) 773-3352

NOTE: On check or money order, please specify your permit number. This will insure proper handling of the fee.



5120-3

**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3181

SEP 6 1995

5623-3

Leore Nixon, Finance Officer
Town of Iroquois
P.O. Box 127
Iroquois, SD 57353

Dear Ms. Nixon:

Enclosed is Water License No. 5623-3. This is the final water right document completing your process of obtaining a Water Right. Enclosed is Receipt No. 414594 in the amount of \$50.00 which you paid for the inspection and issuance of the Water License.

For your information SDCL 46-6-27 requires that if the owner of an existing well, such as the well authorized by Water Right No. 5623-3, 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.

Very truly yours,

JOHN HATCH, Chief Engineer
Water Rights Program
(605) 773-3352

rd
enclosures

NOTE: The applicable portions of Water Permit No. 5120-3 have been incorporated into this Water License No. 5623-3.