

WATER PERMIT NO. 1610-1

Phone: _____

Name of Applicant: City of Whitewood

Post Office Address: PO Box 36, Whitewood SD 57793

Amount of Water Claimed: 1.11 cfs (500 gpm) Total Acres: _____

Source of Water Supply: groundwater

Water to be used for: municipal use County: Lawrence

Location: within city limits

PRIORITY Date Received: 10-6-94 Fee: _____

Corrected Application Received: _____ Period of Annual Use: Jan 1 - Dec 31

Remarks: _____

Diversion Point: NW 1/4 SE 1/4 Sec 21-T6N-R4E

Land to be Irrigated: _____

			21		
			⊗		

Well Log: Driller: _____ Licensed: YES _____ NO _____

Depth of Well: 1200 feet REMARKS: well has not yet been constructed

Type of Map: plat Prepared By: Dan Ferber Reviewed and the Number

Assigned on: 10-6-94 By: Karen Schlaak

**SOUTH DAKOTA
WATER PERMIT NO. 1610-1**

Date of first receipt of application October 6, 1994.

Date of return to applicant for corrections, amendments or changes October 6, 1994.

Date of receipt of corrected application October 31, 1994.

The Water Management Board approved Water Permit Application No. 1610-1 on November 30, 1994 for the City of Whitewood, PO Box 36, Whitewood SD 57793 authorizing the construction of the water use system and the placing of water to beneficial use subject to the following limitations, conditions and qualifications:

1. Water Permit No. 1610-1 appropriates 1.11 cubic feet of water per second (500 gallons per minute) from one well approximately 1200 feet deep (Madison Formation) located in the NW 1/4 SE 1/4 Section 21-T6N-R4E.
2. The water appropriated shall be used for the purpose of supplying water to the City of Whitewood and may not exceed the amount of water needed for beneficial use for municipal purposes.
3. The water is to be used during the following described annual period: January 1 - December 31.
4. The date from which applicant may claim right is October 6, 1994.
5. One-fifth of the construction is to be completed on or before May 30, 1997.
6. All construction is to be completed on or before November 30, 1999.
7. Water is to be put to beneficial use on or before November 30, 2003.
8. Water rights obtained in compliance with the laws of the State of South Dakota may not be unlawfully impaired by this appropriation.

QUALIFICATIONS

1. In accordance with SDCL 46-1-14 and 46-2A-20, Permit No. 1610-1 is issued for a twenty year term. Pursuant to SDCL 46-2A-21, the twenty year term may be deleted at any time during the twenty year period or following its expiration. If the twenty year term is not deleted at the end of the term, the permit may either be cancelled or amended with a new term limitation of up to twenty years. Permit No. 1610-1 may also be cancelled for nonconstruction, forfeiture, abandonment or three permit violations pursuant to SDCL 46-1-12, 46-5-37, 46-5-37.1, and Board Rule ARSD 74:02:01:37.
2. 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 adequate domestic wells or in adequate wells having prior water rights.

(continued)

3. The well authorized by Permit No. 1610-1 shall be constructed by a licensed well driller and construction shall comply with Water Management Board Well Construction Rules, Chapter 74:02:04 with the well casing pressure grouted (bottom to top) from the producing formation to the surface pursuant to Section 74:02:04:28.

WATER MANAGEMENT BOARD

By: 
John Hatch, Chief Engineer
Water Rights Division
Department of Environment and Natural Resources

DEC 28 1994
date

FORM 2: Application for uses other than irrigation

(type or print)

Mail to:
Water Rights Division
Joe Foss Building
523 E Capitol
Pierre SD 57501-3181
605 773-3352

No. 11010-1 Hydrologic Unit 10120202
Basin Belle Fourche River
Newspaper Black Hills Pioneer, Box 7, Spearfish
(office use only)



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

Check use of water:

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

Type of Application: ☒ New ☐ Vested Right (Use predates Mar 2, 1955) ☐ Future Use Reservation
(check one) ☐ Place to Beneficial Use Water Reserved by Future Use Permit No. _____
☐ Amendment/Correction to Permit No. _____

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

- Name of Applicant City of Whitewood Phone _____
(check one) ☐ Owner ☐ Tenant/lessee
Mailing Address P.O. Box 36 Whitewood State SD 57793
(Street, RR, or Box) (City) (Zip Code)
- Amount of water claimed 1.11 *CFS or 500 **GPM _____ ***AF
(*Cubic Feet per Second) (**Gallons per Minute) (***)Acre Feet - storage capacity of dam/dugout or annual use if applicable)
- Source of water supply New well into Madison Aquifer.
- Location of point of diversion (example - 3 wells in SW1/4 NE1/4 section 12-T104N-R53W) New well located
in the city of Whitewood, NW1/4 SE1/4, Sec 21, T6N, R4E, BHM, Lawrence Co. SD
County Lawrence Co., SD
- County or counties where water will be used Lawrence Co. SD
- Annual period during which water is to be used Jan 1. - Dec 31
- Give a description of the project. When available include any preliminary engineering report or other reports or information that will help explain the project. (Attach sheet if more space is needed)

See attached copy of Prel Engr Report.

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

STATE OF SOUTH DAKOTA)

County of Lawrence)^{SS}

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

Signed T.J. Mc Glade

Subscribed and sworn to before me this 10 day of Oct 19 94

Rudith A. Husenga
Mx Comm. expires 6-14-99

Supplemental Information

(type or print in ink)

1. Well Information - Proposed Construction

- a) Drill Hole Diameter 14" Depth 1200'
- b) Casing Type Steel Diameter 10" Diam. Thickness 1/4"
- c) Screen Type None Diameter _____ Thickness _____
- d) Gravel Pack Thickness _____ Length of Gravel Pack _____
- e) Depth to Top of Water Bearing Material 825'
- f) Depth to Water (ground surface to water level) 120-150'
- g) Distance to nearest existing domestic well:
On applicants property 200' + On property owned by others 1/2 mile

2. Dugout Information

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

3. Water Storage Dams

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

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

b) Freeboard _____

c) Crest Width _____

Crest Length _____

d) Height _____

e) Primary Outlet Capacity _____

If pipe, diameter _____

f) Secondary Spillway Capacity _____

Spillway Width _____

g) X & Y Slope

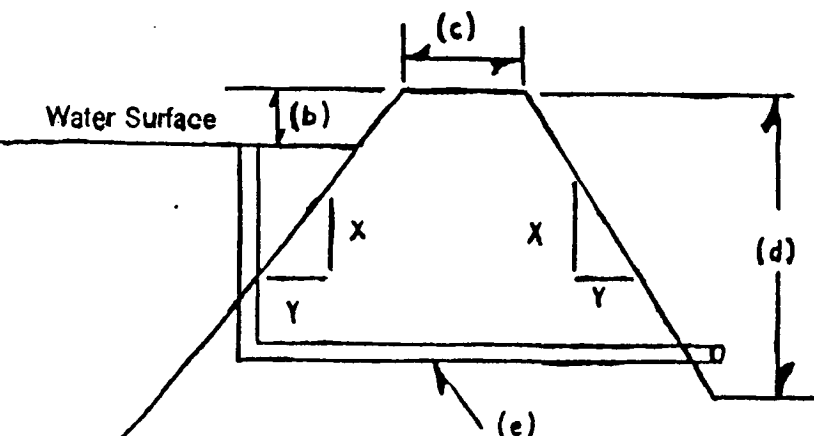
Upstream _____

Downstream _____

h) Surface Area of Impoundment _____

i) Storage _____ Acre Feet

j) Drainage Area Above Dam _____ Acres



RECEIPT

414290

Division of Water Rights

South Dakota Department of Environment and Natural Resources

Pierre, _____, October 6, 19 94

RECEIVED OF City of Whitewood, PO Box 36, Whitewood, SD 57793-0036

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

Fee for Application for Permit No. <u>11610-1</u> to Appropriate Water, to construct and to put water to beneficial use _____	35	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 _____		

(Any Other Work Provided by Law)	Total	35 00

By John Hatch
Chief Engineer

07-92

Date: _____

LAUREL STREET

BALL PARK FENCE

PROPOSED WELL HOUSE

100'

SWING SET

GAS PUMP HOUSE

FIRE STATION

ASPHALT PARKING

310'

EXISTING WELL HOUSE

SCALE 1"=60'

GARFIELD

1/4 SEC LINE

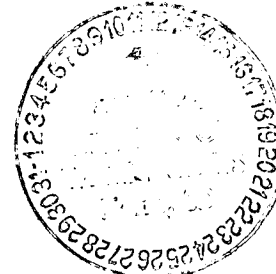
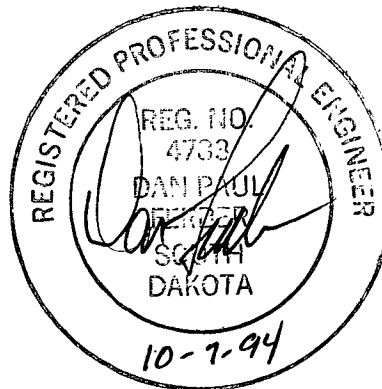
S 1 50' W
1614'

SEC

LINE

SEC 21

SEC 28



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INTRODUCTION

The City of Whitewood is located in the northeast portion of Lawrence County, South Dakota. The City of Whitewood water utility provides water service to 380 customers in the incorporated and adjacent unincorporated area of Whitewood, South Dakota. The users are primarily single family residential, with a density of approximately one dwelling unit per acre, and commercial / industrial users, including three wood products companies, and a feed mill.

The City of Whitewood meters all water users, and bills based upon metered consumption. The average daily use for domestic consumption during the seven year period from 1987 through 1993 was 64 gpm, with the monthly maximum daily use being 102 gpm. Commercial / industrial detailed records were only available for 1993. The commercial / industrial average daily use for 1993 was 31.5 gpm, with the monthly maximum daily use being 55.2 gpm. Total average daily use was 95.5 gpm and the monthly maximum average daily use was 157.2 gpm. Peak hourly flows are estimated to be 315 gpm.

The City of Whitewood contracted with Ferber Engineering Company to provide base mapping of the existing water system, to provide a distribution network analysis of the existing system and to make recommendations in the form of a preliminary engineering report. This report has been prepared to comply with FmHA Instruction 1942-A.

PROJECT PLANNING AREA

The Whitewood water utility provides water for domestic, commercial, irrigation, and fire protection to the incorporated City of Whitewood, South Dakota. The city is located in Sections 21 and 28, Township 6 North, Range 4 East, Black Hills Meridian, in the Northeast corner of Lawrence County. The City also provides water for domestic consumption, irrigation, and fire protection to an area known as Whitewood Forest Acres located northwest of town in the northwest quarter of Section 21, and the east half of Section 20. The Community is located at the northern edge of the Black Hills, approximately seven miles west of Sturgis, South Dakota. Figure 1 is a portion of the USGS 7.5 minute quad map, showing the planning area.

The topography of the area is rolling prairie rising on the south to the foothills of the Black Hills. Elevations range from 3430 MSL at the northeast city limits to 3710 MSL at the southwest city limits. The City of Whitewood is located approximately one-half mile west of Whitewood Creek. The City is located along Interstate Highway 90, between Sturgis, and Spearfish.

The City of Whitewood has experienced a steady population growth since the 1950 U.S. Census. The 1990 population within the City totaled 905 persons. This does not include the approximately 20 houses located in the Whitewood Forest Acres. By the year 2000, the Whitewood water service area could easily see this population grow to total 1100. See Table 1 below. Water usage would increase proportionately from 157 gpm to approximately 175 gpm.

Table 1
U.S. Census Data
Whitewood, SD

YEAR	POPULATION		%CHANGE
	CITY	AREA	
1950	304		
1960	470		55%
1970	689		47%
1980	821		19%
1990	905	950	16%
2000*	1,000	1102	10%

*Projected

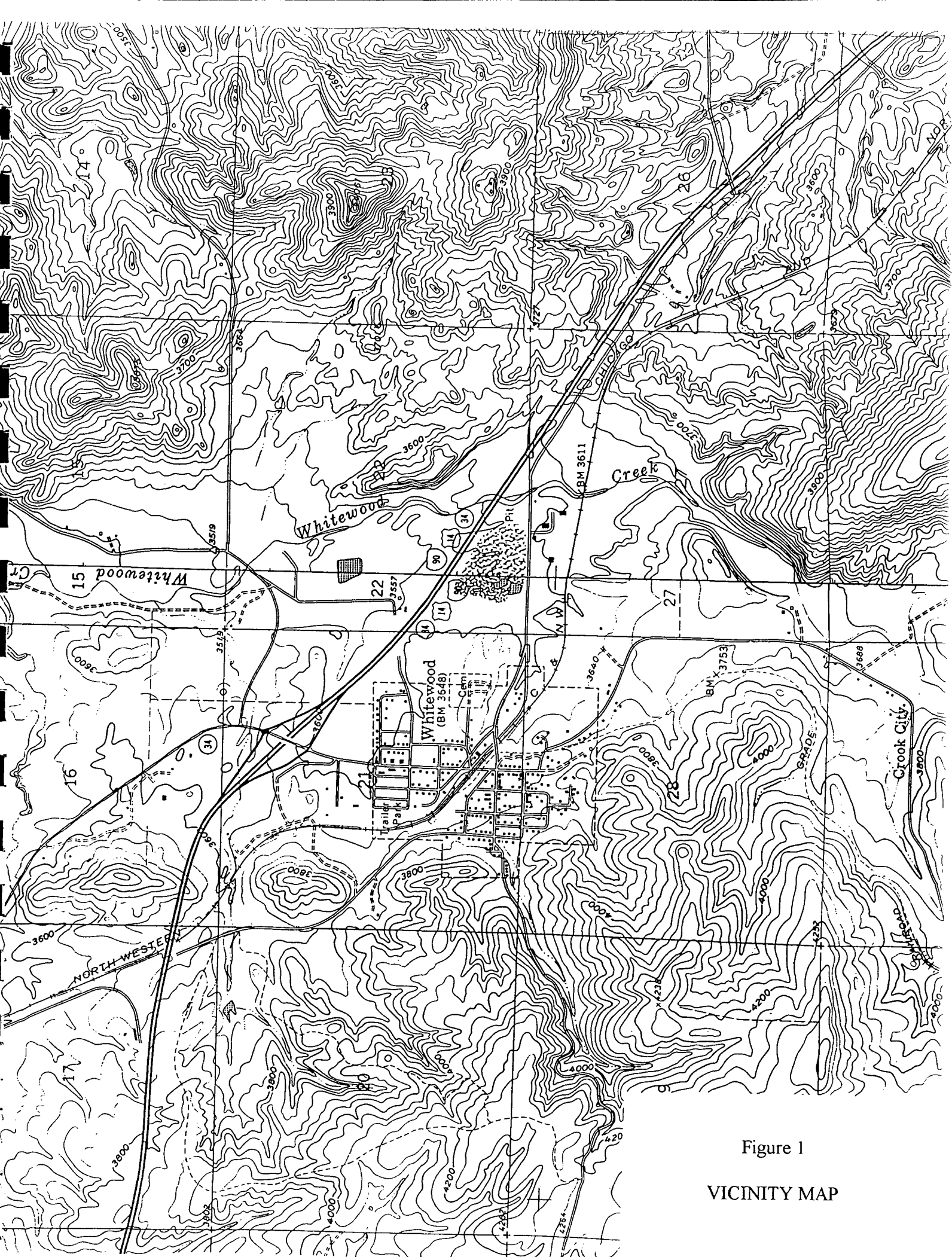


Figure 1
VICINITY MAP

While the City's population has grown steadily during this time period, the retail business community has declined due to the proximity to Spearfish and Sturgis. The community's industrial base has held relatively steady, with three major wood products companies and the Hubbard Crystallyx Feed Mill located in town.

Residential expansion in Whitewood will probably take place to the east and to the southeast of the City due to the gently rolling topography. These areas will be the easiest to develop a high density residential and industrial area. Some development could also occur to the south and west, however the steep topography in this area will limit development to low density residential. The Whitewood Forest Acres will see continued expansion.

The existing two raw water storage reservoirs are located within the southwest city limits at a top of water elevation of approximately 3607 MSL and the existing treated water storage reservoir is located approximately 700 feet south of the raw water storage reservoirs on high ground at a top of water elevation of approximately 3722 MSL.

EXISTING FACILITIES

The Whitewood water system is divided into two closed loops. The first loop is the Raw (untreated) Water Loop which includes the two existing wells, the raw water feed line, and the raw water storage reservoirs. This loop terminates at the pumping station where water is treated with chlorine and fluoride. The second loop includes the treated water storage, and the distribution system. Figure 2 is a map of the existing water system.

I. Raw Water System

A.) Water Supply

The City of Whitewood has two (2) wells which provide the water supply for the system. Well Number 1 ("Ballpark Well") is located on the corner of Garfield and Ash Streets. The pump in this well was replaced in December 1993. Well Number 2 ("West Well") is located on the west side of town south of Park Street. The pump in this well was replaced in January 1994. See Table 2 below for well details. Water Rights have been acquired for these two wells, 110-1, and 588-1.

Table 2
Water Supply Wells

Well No.	Year Drilled	Ground Elev.	Static Water Depth	Aquifer	Bore Depth	Case. Depth	Pump Depth	Case. Diam.	Pump Type
1	1961	3465	190'	Minnelusa	680'	680'	360'	8" to 520' 6" to 680'	Grundfos 225 GPM 30 HP Submersible
2	1960	3586	40'	Sundance	116'	116'	90'	6"	Grundfos 80 GPM 5 HP Submersible

Well Number 1 has the greatest capacity, supplying, on average, 160 GPM from the Minnelusa Formation. Water is pumped by a 30 horsepower submersible pump rated at 225 GPM at 400 feet of head. It is the primary source of water for the system. Pump operation is automatic and is tied to the static water level in the raw water reservoirs. This well operates an average of 16 hours per day during the peak summer demand period.

Water from Well No. 1 is transported to the raw water storage reservoirs via a 6 inch cast iron dedicated raw water feed line. The raw water line was constructed in 1979.

Well Number 2 has a capacity of approximately 65 GPM from the Sundance Sandstone Formation. Water is pumped with a 5 horsepower submersible pump rated at 80 GPM at 180 feet of head. It is a secondary source of water for the system. Pump operation is automatic and is also tied to the static water level in the raw water reservoirs, however, this well must be manually switched into operation, and is normally used only as a back-up source.

Raw water from Well No. 2 is transported to the raw water storage reservoirs via an aged 2.1/2 inch galvanized pipe. This line was constructed in 1960 with the well.

Water is pumped from the two existing wells into the lower concrete Raw Water Storage Reservoirs. The east reservoir has a capacity of 35,000 gallons and the west reservoir has a capacity of 65,000 gallons. Static water level when full is approximately 3,607 MSL. Both reservoirs were constructed by the Works Projects Administration during the 1930's. The reservoirs appear to be in good condition, with only some superficial concrete damage to the tops. The static level of the raw water reservoirs controls the operation of the well pumps. The normal operating range is 18", i.e. when the level in the reservoirs drops 18", the pumps turn on and stay on until the reservoirs are full.

The raw water is pumped through a Booster Pump Station to the treatment process, where chlorine and fluoride are injected. The Booster Pump Station consists of two (2) 30 horsepower centrifugal pumps rated at 375 GPM at 230 feet of head. The pumps alternate operation. A low level shut-off will automatically shut down the booster pumps when water in the raw water reservoirs drops too low for safe operation.

B.) Water Quality

The primary source of water for the Whitewood water utility is Well Number 1. This well utilizes water from the Minnelusa Aquifer. The water is tested for compliance with the South Dakota Drinking Water Standards regularly. The water meets all required standards for inorganic chemicals, organic chemicals, radionuclides, and coliform bacteria. Water Quality Test results for this well are summarized in Table 3.

Table 3
Whitewood, South Dakota - East Well
Raw Water Quality Test Results

Parameter	Limit	Average	High
Nitrate (as N)	10 mg/l	0.405	0.55
Fluoride	4.0 mg/l	0.253	0.36
Arsenic*	0.05 mg/l		0.0094
Barium*	1.0 mg/l		<0.1
Cadmium*	0.01 mg/l		0.00152
Chromium*	0.05 mg/l		<0.005
Lead*	0.05 mg/l		<0.005
Mercury*	0.002 mg/l		0.0011
Selenium*	0.01 mg/l		0.0064
Chloride	250 mg/l	2	3
Iron	0.3 mg/l	0.145	0.66
Manganese	0.05 mg/l	0.023	0.14
Sulfate	250 mg/l	83	95
Tot. Diss. Solids (TDS)	500 mg/l	349	390
pH	6.5-8.5	7.46	8.2
Alkalinity - M		191	216
Bicarbonate		233	264
Spec. Cond. (umhos/cm)		562	580
Calcium		93	184
Magnesium		24	28
Hardness		335	563
Langelier Index		(0.14)	0.62
Sodium		2.6	3
Potassium		2.6	3.1
Copper*			<0.005
Zinc*			0.06
* Tested once			

Water obtained from Well No. 2 is from the Sundance Sandstone Formation. This well is also tested in accordance with the requirements of the South Dakota Department of Environment and Natural Resources. Test results from Well No. 2 are contained in Table 4.

Table 4
Whitewood, South Dakota - West Well
Raw Water Quality Test Results

Parameter	Limit	Average	High
Nitrate (as N)	10 mg/l	0.07	0.14
Fluoride	4.0 mg/l	0.31	0.49
Arsenic*	0.05 mg/l		0.0112
Barium*	1.0 mg/l		<0.1
Cadmium*	0.01 mg/l		0.00337
Chromium*	0.05 mg/l		<0.005
Lead*	0.05 mg/l		<0.005
Mercury*	0.002 mg/l		0.00045
Selenium*	0.01 mg/l		0.0053
Chloride	250 mg/l	3	4
Iron	0.3 mg/l	0.10	0.5
Manganese	0.05 mg/l	0.00	0
Sulfate	250 mg/l	80	91
Tot. Diss. Solids (TDS)	500 mg/l	374	414
pH	6.5-8.5	7.37	8.03
Alkalinity - M		214	260
Bicarbonate		260	317
Spec. Cond. (umhos/cm)		592	675
Calcium		97	178
Magnesium		28	34
Hardness		355	544
Langelier Index		(0.09)	0.55
Sodium		3.3	4
Potassium		6.1	8.3
Copper*			<0.005
Zinc*			0.029
* Tested once			

Water Treatment provided consists of chlorine disinfection, and fluoride addition. This treatment is automatic and is input at the booster pump station as it is pumped to the upper concrete storage reservoir. Water Quality Test results of the treated water are summarized in Table 5.

Table 5
Whitewood, South Dakota
Treated Water Quality Test Results

Parameter	Limit	Average	High
Nitrate (as N)	10 mg/l	0.47250	0.8
Fluoride	4.0 mg/l	0.75750	1.76
Arsenic	0.05 mg/l	0.00355	0.006
Barium	1.0 mg/l	0.03250	0.08
Cadmium	0.01 mg/l	0.00039	0.00157
Chromium	0.05 mg/l	0.00275	0.011
Lead	0.05 mg/l	0.00168	0.00553
Mercury	0.002 mg/l	0.00016	0.00042
Selenium	0.01 mg/l	0.00184	0.003
Silver	0.05 mg/l	0.00030	0.00119
Gross Alpha (pCi/l)	15 pCi/l	7.025	10.2
Radium 226 (pCi/l)	5 pCi/l	0.675	0.9
Endrin*	0.0002 mg/l		<0.0002
Lindane*	0.004 mg/l		<0.004
Methoxychlor*	0.1 mg/l		<0.1
Toxaphene*	0.005 mg/l		<0.005
2,4-D*	0.1 mg/l		<0.1
2, 4, 5-TP*	0.01 mg/l		<0.01
* Tested once			

II. Water Distribution System

The Whitewood water distribution system consists of a 275,000 gal. concrete storage reservoir, and a two zone distribution system, with pipelines ranging from 4" to 6" diameter, with 3/4" to 2 1/2" service lines. Figure 2 shows the existing distribution system.

A. Water Storage Reservoir

Treated water is pumped into the upper concrete distribution reservoir. Static water level in the reservoir when full is approximately 3,722 MSL. The static level of the treated water storage reservoir controls the operation of the booster pump. The normal range of operation is 12", i.e. when the level in the reservoir drops

12", the pump turns on and stays on until the reservoir is full. This reservoir has a capacity of 275,000 gallons. The concrete water distribution reservoir was constructed in 1979.

B. Water Distribution System

There are two pressure zones within the water distribution system, each with corresponding service levels. The two zones are separated by 6" pressure reducing valves (PRVs), on 6" mains, located along South Street at the intersections with Maple, Laurel, and Custer Streets. At one time the system was divided into three pressure zones with an additional 6" pressure reducing valve located on the main water distribution line from the reservoir approximately 500 ft. east of the reservoir. This PRV has been abandoned and is currently set fully opened.

The lower pressure zone, is located north of South Street. Static pressures within this zone range from 60 psi near the railroad tracks to 90 psi at the northeast corner of town. Pressures in this area are reduced by the PRV's. Currently, the PRV at South and Maple Street is inoperable and thus closed. The other two PRV's are set to maintain a constant downstream pressure of 58 psi. This setting ignores the approximately 21 feet of elevation difference between the PRV locations. This combination of closed and incorrectly set PRV's causes a disproportionate amount of flow through the PRV on Custer Street, and significant reduces the available water flows in this zone.

The "South", or high pressure zone, is located south of South Street. Static pressures within this zone range from 45psi near the reservoir to 100 psi in the downtown area.

The separate connection of the wells to raw water storage reservoirs means that the pressures in either system are not significantly affected when the well pumps or booster pump are on line, since they are separated from the distribution system.

FINDINGS AND ANALYSIS

Ferber Engineering Company has completed a computer model analysis of the existing water system, using the Kentucky Pipe Network Analysis Program (KYPIPE). For this analysis we created a computer model of the existing system including all of the existing lines, reservoirs, booster pump and wells. Line sizes were input, pipe roughness was assumed and demands were calculated based upon records from 1987 through 1993. Elevations of well heads, storage reservoirs and junction nodes were field surveyed. The results of the computer analysis were used to evaluate the existing supply and distribution system, and in the formulation and evaluation of improvement plans.

The existing water supply is of good quality. Historic and recent testing parameters for compliance with the Safe Drinking Water Act and State requirements have shown that only trace amounts, far below the maximum limits, are present. Samples have been submitted to the Department of Environment and Natural Resources since 1983, and there has never been an unsafe sample result.

During our computer simulation, the need for additional well capacity became evident early on in the analysis of the system. With a primary well capacity of 160 GPM and a maximum average daily demand of 160 GPM, the well has to operate nearly continuously on high demand days. This provides very little time for resting the pump, and creates problems providing routine maintenance. The backup well capacity of only 60 GPM is insufficient to supply even emergency water supplies. As evidenced during the shut down in December 1993, the loss of the primary well has a significant impact upon the commercial and industrial sector of the community. The system will empty if the primary well is out of operation for any extended period.

The South Dakota Department of Environment and Natural Resources (DENR) recommends that community water systems have reservoir capacity equal to peak daily demand. Based on seven years of water use records, the peak daily demand for the Whitewood water system was 230,000 gallons. The current combined capacity of the raw water and treated water storage reservoirs is 375,000 gallons.

As part of our analysis, we checked the need for additional reservoir capacity by running twenty-four (24) hour extended period simulations on the KYPIPE model. These runs were based upon average daily use, and peak daily use, with and without fire flows, and

with the primary well on-line and also out of service. The results indicate that the current reservoir system is capable of providing peak day/peak hour flows and fire flows concurrently. However, the current water supply is incapable of recovering for several days.

The existing distribution system adequately provides for domestic use and irrigation. Pressures within the system range from 46 psi to 100 psi. These pressures are adequate to supply all users except the very highest areas within Whitewood Forest Acres. The major deficiencies appear to be fire protection and back-up supply.

The current configuration of the PRVs creates uneven flow patterns within the system, and should be changed. First, the defective PRV at South and Maple Streets should be replaced or repaired so that the 6" line serving the lower system can be opened. The downstream pressure for all of the PRV's should be set at an equal hydraulic grade line. From our analysis, a grade of 3635.2 MSL will work well. This can be obtained by setting the PRV at South and Maple to 57 psi, changing the PRV at Laurel and South to 58 psi, and the PRV at Custer and South to 68 psi. Water supply to the lower system will improve significantly with the slight modification of the PRVs.

The placement of fire hydrants on water mains with diameters of less than 6" and on "dead end" mains creates serious constraints on the community fire department to adequately protect the residents from fire losses. The Insurance Service Office (ISO) recommends that hydrants be placed on mains of no less than 6" diameter. They should also not be placed on dead end main of less than 8" diameter.

A typical problem observed during preliminary studies is a lack of adequate "looping" in some areas of the distribution system. In Whitewood, the most significant problems lie in the east side of town. There is a 6" PVC main off of the PRV at Custer and South Street which is extended east to Wheeler Lumber, but this line is connected to a 4" Transite line into the lower system. This limits fire flows to the lower pressure zone. The lines extended to the area extending north and east of the new elementary school are looped back onto themselves, but are not adequately looped into the balance of the system. This lack of a 6" loop on the extreme east side of Whitewood limits the fire fighting capability for the fire hydrants in this area including the hydrant at the school.

Dead end lines on the south east part of the city also severely limit the fire fighting capability. The two fire hydrants serving the area are both located on 2" service lines. The maximum flow available from these hydrants maintaining a 20 psi residual pressure is 90 gal/min.

There are also several places within the existing distribution system where minor cross connections will provide for improved flow efficiencies, and will remove potential disconnects within the system in the event of main breaks, or other maintenance repairs. The existing 6" mains in Meade Street and Laurel Street are not connected to the 6" mains from the reservoirs. The 6" main extending to the Hills Materials Wood Products plant is disconnected from the 6" mains serving the lower pressure system.

RECOMMENDATIONS

While the existing water supply is of high quality, there is currently not a back-up supply should the main well shut down for repairs or even routine maintenance. In December of 1993, the main well pump broke down and had to be replaced. This took approximately one week to complete. During this time, school and industrial users were forced to close in order to ration the water supplied from the storage reservoirs and the west well. A new source of raw water should be developed in order to insure continued use should another problem arise.

We recommend that the City of Whitewood drill a new well into the Madison Formation. Whitewood's main well now draws water from the Minnelusa Formation. This well is capable of providing 160 gallons per minute (gpm). This is very high capacity for a Minnelusa well. A new Minnelusa well could hopefully be expected to produce similar results. We are recommending a Madison well because recent experience in the Black Hills area show that Madison wells have water quality equal to that from the Minnelusa, and the potential for a significant increase in capacity. In addition, the static level in a Madison well could be expected to be higher, reducing pumping costs. We recommend a well with a capacity of approximately 300 - 400 gpm.

The well location would be determined during final design and bid document preparation. The Madison Formation is a karstic formation, with water contained in the fault zones and in the underground caves. The major producing wells into this formation are located

along the fault zones. It is also important to locate the new well near the existing raw water lines to hold down costs.

During our investigation, one project which was discussed was the replacement of the existing 2" galvanized line from Well No. 2 to the raw water reservoirs. The estimated cost of replacing this line is \$22,000.00. The replacement of this line would increase the capacity of this well from 60 gpm to 110 gpm. This increase may not be sustainable due to drawdown of the water level. From discussions with USGS, and the State DENR, a Sundance well probably is not capable of 110 gpm sustained yield. If a new Madison Well is developed, we recommend that this well be used only for backup operations, and this line not be replaced.

In addition to the water supply improvements, several improvements to the distribution system were investigated. The simplest improvement we recommend is to repair the broken pressure reducing valve on South and Maple Street. The repair will greatly improve the low pressure zone efficiency. All of the PRVs should also be set to provide an equal hydraulic grade line to further improve the low pressure zone.

The addition of looping to the system will increase fire fighting capabilities in the high and low pressure zones. We recommend the addition of a 6" loop along the entire east side of the city. This line would connect the existing low pressure zone north of the elementary school to the existing line extending east to Wheeler Lumber. A 6" loop should also be added to the southeastern end of the upper system. This southeast loop will provide realistic fire protection to the residents of this area. Fire hydrants should be added to this loop and the existing fire hydrants that are connected to 2" lines relocated, or kept for line flushing purposes only.

Population growth in Whitewood will occur in two areas. The expansion of the Whitewood Forest Acres area, and the relatively gentle sloping lands along the eastern edge of the City. The addition of a 6" loop around the entire eastern edge of the City will not only provide increased fire flow capabilities for the existing residents, it will also provide capacity for expansion of service to serve future growth in this area.

We recommend the construction of a number of small improvements within the existing service area. These include installation of fire hydrants at the intersections of Walnut and

Filmore, Sherman and O'Dea, Custer and Pine, and Custer and Pell. These areas are currently not within 300 ft. radius of the existing hydrants.

We also recommend replacement of the existing 4" steel main with a 6" pvc main in Custer Street between Arthur and Pell, the replacement of the existing 4" steel main with a 6" pvc main in Laurel Street between Meade Street and Logan Street, and the construction of new 6" pvc mains in Meade Street between Arthur Street and Oak Street, and in Sherman Street between Pine Street and Laurel Street.

Figure 3 is a revised map of the Whitewood Water System. This map includes all of the distribution system improvements discussed in this report. The construction of all of the improvements identified and recommended in this report will improve fire flow capabilities to the north end of the low pressure zone approximately 26 percent, from 675 gpm to 850 gpm.

Ferber Engineering Comapny has prepared Engineers Estimates of Probable Construction Costs for all of the improvements evaluated. The detailed estimates are included in the appendix to this report. Table 6 includes a summary of total estimated project costs. The table is listed in order of descending priority.

Table 6
City of Whitewood
Preliminary Engineering Study
Prioritized Water System Improvements
Engineers Estimate of Probable Construction Costs

PROJECT	CONST. COST	ENG., CONST., & LEGAL	TOTAL COST	AGG. TOTAL COST
NEW WELL INTO MADISON	\$111,352.50	\$13,362.30	\$124,714.80	\$124,714.80
IMPROVE EX. DISTRIBUTION SYSTEM	\$35,574.00	\$5,336.10	\$40,910.10	\$165,624.90
SOUTHEAST LOOP	\$93,093.00	\$11,171.16	\$104,264.16	\$269,889.06
NORTHEAST LOOP	\$56,710.50	\$6,805.26	\$63,515.76	\$333,404.82
LINE FROM WEST WELL TO STORAGE	\$19,432.88	\$2,331.95	\$21,764.82	\$355,169.64
TOTALS	\$316,162.88	\$39,006.77	\$355,169.64	

Ferber Engineering Company recommends tht the City of Whitewood construct all of the improvements listed except the Line from West Well to Storage. With the construction of the new well, the added cost of replacing this well to obtain 25-30 additional gpm is not warranted. The total cost of our recommendations is \$333,404.82.

CITY OF

WHITEWOOD
SOUTH DAKOTA

JANUARY 1994

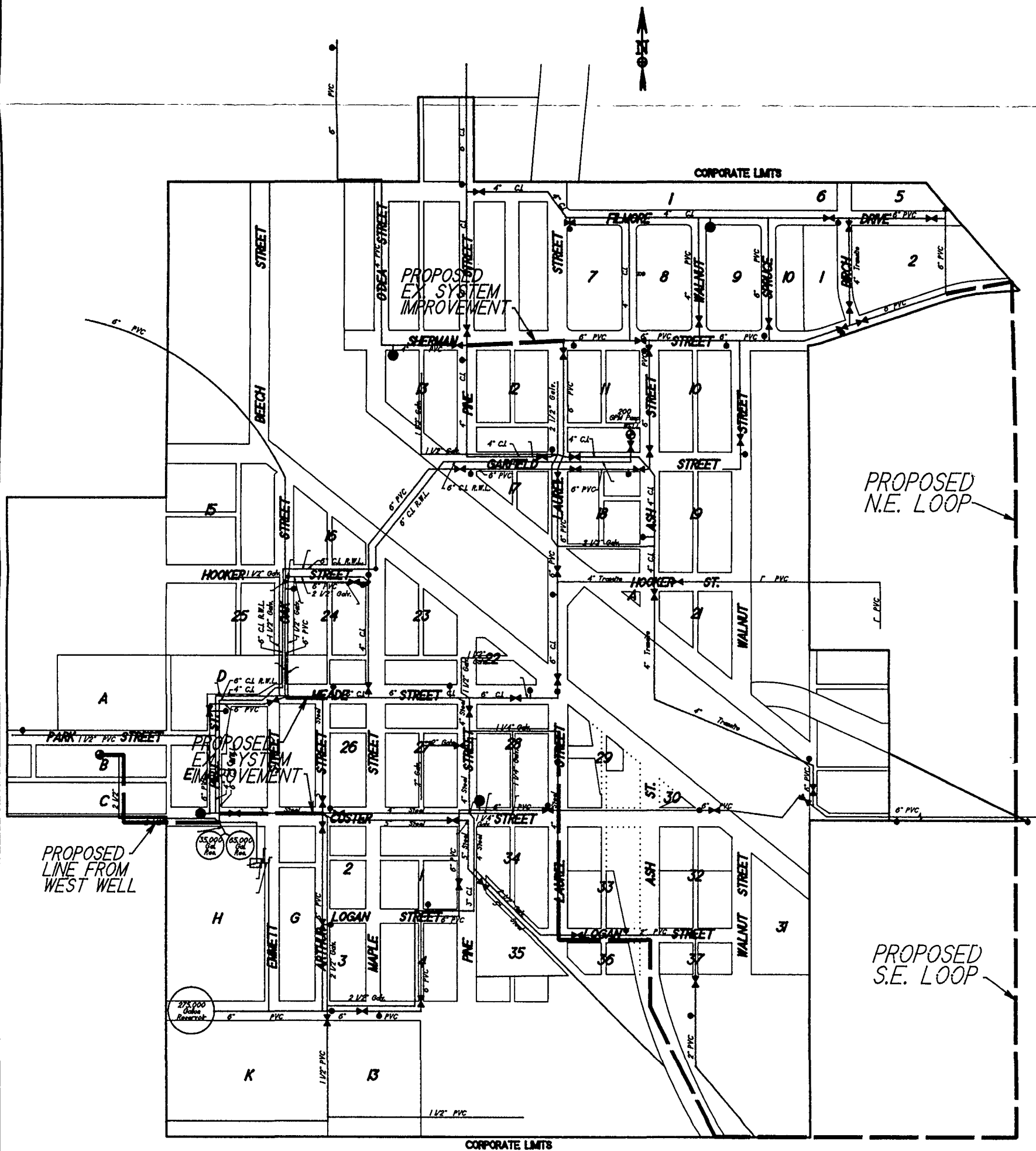
PROPOSED
IMPROVEMENTS

PROPOSED 6" PVC
PROPOSED HYDRANT



FIGURE 3

FERBER ENGINEERING CO.



FINANCIAL STATUS

The City of Whitewood water system is set up to serve the incorporated city and also the surrounding unincorporated area. As of December 1993, the water utility served 380 customers. The largest individual water accounts are the industrial accounts. These include Hubbard Milling Company, Wheeler Lumber, and Hills Materials.

Water sales are metered to each user using the same rates for domestic as commercial use. The rates are:

\$12.00 minimum charge for first 4,500 gallons used each month	4.00
\$1.30 per 1,000 gallon from 4,501 to 10,000 gallons/month	1.30
\$1.50 per 1,000 gallon from 10,001 to 20,000 gallons/month	1.50
\$1.00 per 1,000 gallon greater than 20,000 gallons/month	1.00

The breakdowns for commercial water usage, and domestic water usage are shown on Tables 7 and 8. Table 9 shows the total average annual water usage, approximately 45,163,000 gallons. Of this total, approximately 33,782,000 gallons are used by residential customers and approximately 11,381,000 gallons are used by commercial customers.

Income and Operation and Maintenance (O & M) costs were only available through 1992. Total income from water sales in 1992 was \$75,348. Total O & M cost in 1992 was \$43,567. Total income from water sales in 1991 was \$74,946. Total O & M cost in 1991 was \$46,060. Total income from water sales in 1990 was \$75,748. Total O & M cost in 1990 was \$40,951. The average operating surplus from water operations for the three years was \$31,821.33.

Table 7
Commercial Water Usage
(Gallons)
Whitewood, SD

	Hubbard Milling Plant			Wheeler Lumber			Hills Materials			The Winer & Diner			Laundromat			Hubbard Barrel Wash			Total
	Monthly Total	Average Daily	Average Hourly	Monthly Total	Average Daily	Average Hourly	Monthly Total	Average Daily	Average Hourly	Monthly Total	Average Daily	Average Hourly	Monthly Total	Average Daily	Average Hourly	Monthly Total	Average Daily	Average Hourly	
JAN	134,800	6,740	281	110,000	5,500	229	73,000	3,650	365	42,500	1,371	76	41,000	1,323	132	18,400	920	102	439,367
FEB	53,000	2,650	110	95,800	4,790	200	100,000	5,000	500	37,000	1,321	73	37,000	1,321	132	12,900	645	72	351,798
MAR	865,500	27,919	1,163	50,200	2,510	105	100,000	5,000	500	31,200	1,006	56	37,000	1,194	119	103,700	3,345	209	1,227,173
APR	1,026,400	34,213	1,426	84,000	4,200	175	118,000	5,900	437	33,700	1,123	62	43,000	1,433	143	167,600	5,587	349	1,521,813
MAY	584,500	18,855	786	80,300	4,015	167	156,000	7,800	578	35,700	1,152	64	50,000	1,613	161	83,200	2,684	168	1,024,890
JUN	153,000	7,650	319	72,200	3,610	150	185,000	9,250	685	36,200	1,207	67	47,000	1,567	157	14,800	740	82	532,861
JUL	171,200	8,560	357	66,800	3,340	139	150,000	7,500	556	33,700	1,087	60	47,000	1,516	152	300	15	2	492,267
AUG	163,700	8,185	341	121,800	6,090	254	178,000	8,900	659	48,000	1,548	86	71,000	2,290	229	100	5	1	611,183
SEP	307,900	15,395	641	105,200	5,260	219	146,000	7,300	541	82,700	2,757	153	43,000	1,433	143	3,500	175	19	722,143
OCT	948,800	30,606	1,275	99,000	4,950	206	160,000	8,000	593	95,900	3,094	172	45,000	1,452	145	20,700	1,035	115	1,419,893
NOV	1,090,900	36,363	1,515	83,800	4,190	175	141,000	7,050	522	32,300	1,077	60	39,000	1,300	130	32,300	1,615	179	1,471,682
DEC	1,200,300	38,719	1,613	126,900	6,345	264	73,000	3,650	365	38,800	1,252	70	33,000	1,065	106	40,100	2,005	223	1,565,549
TOT	6,700,000			1,096,000			1,580,000			547,700			533,000			497,600			11,380,619
	Average GPM		13.6	Average GPM		3.2	Average GPM		8.8	Average GPM		1.4	Average GPM		2.4	Average GPM		2.1	31.5
	Max Ave. GPM		26.9	Max Ave. GPM		4.4	Max Ave. GPM		11.4	Max Ave. GPM		2.9	Max Ave. GPM		3.8	Max Ave. GPM		5.8	55.2
	Max Ave. Daily		38,719	Max Ave. Daily		6345	Max Ave. Daily		9,250	Max Ave. Daily		3,094	Max Ave. Daily		2,290	Max Ave. Daily		5,587	65,285

Table 8
Domestic Water Usage
Whitewood, South Dakota
(Gallons)

	Monthly	Average Daily	Average Hourly
January	2,867,919	92,514	3,855
February	2,667,487	95,267	3,969
March	2,158,399	69,626	2,901
April	1,857,472	61,916	2,580
May	2,328,681	75,119	3,130
June	3,358,853	111,962	4,665
July	4,286,591	138,277	5,762
August	4,541,960	146,515	6,105
September	3,522,714	117,424	4,893
October	2,302,679	74,280	3,095
November	2,159,033	71,968	2,999
December	1,730,165	55,812	2,325
Total	33,781,953		
	Average Hourly		3,857
	Average GPM		64
	Max. Ave. Hourly		6,105
	Max. Ave. GPM		102
	Max. Ave. Daily		146,515

Table 9
Total Monthly Water Usage
Whitewood, South Dakota
(Gallons)

	1987	1988	1989	1990	1991	1992	1993	Average	Ave. Daily
January	2,593,000	2,800,000	4,420,000	2,849,000	3,492,000	3,314,000	3,683,000	3,307,286	106,687
February	2,319,000	2,671,000	4,275,000	2,553,000	2,925,000	3,160,000	3,232,000	3,019,286	107,832
March	2,497,000	3,046,000	4,600,000	2,898,000	3,214,000	3,419,000	4,025,000	3,385,571	109,212
April	2,879,000	3,023,000	3,464,000	3,323,000	3,089,000	3,754,000	4,123,000	3,379,286	112,643
May	3,539,000	3,168,000	2,491,000	3,252,000	3,334,000	4,149,000	3,542,000	3,353,571	108,180
June	4,134,000	5,910,000	3,954,000	2,576,000	3,501,000	3,932,000	3,235,000	3,891,714	129,724
July	4,935,000	5,840,000	5,029,000	5,371,000	5,341,000	3,665,000	3,271,000	4,778,857	154,157
August	4,021,000	5,321,000	6,226,000	5,800,000	5,480,000	5,202,000	4,022,000	5,153,143	166,230
September	3,318,000	4,402,000	4,358,000	5,350,000	4,104,000	4,404,000	3,778,000	4,244,857	141,495
October	3,166,000	3,777,000	3,576,000	3,787,000	3,749,000	3,791,000	4,212,000	3,722,571	120,083
November	3,114,000	4,273,000	3,101,000	3,281,000	3,730,000	4,011,000	3,905,000	3,630,714	121,024
December	2,544,000	3,884,000	3,390,000	3,362,000	3,235,000	2,915,000	3,740,000	3,295,714	106,313
Total	39,059,000	48,115,000	48,884,000	44,402,000	45,194,000	45,716,000	44,768,000	45,162,571	

APPENDIX

APPENDIX A

Detailed Cost Estimates for Recommended Improvements

**CITY OF WHITEWOOD
PRELIMINARY ENGINEERING STUDY
WATER SYSTEM IMPROVEMENTS
NEW WELL INTO MADISON
ENGINEERS OPINION OF PROBABLE COST**

ITEM NO.	DESCRIPTION OF ITEM	APPROXIMATE QUANTITY	UNIT PRICE	EXTENDED PRICE
	Mobilization	1 lump sum	\$5,050.00	\$5,050.00
	6" PVC Water Main	200 l.f.	\$10.00	\$2,000.00
	6"x6"x6" Tee	1 each	\$200.00	\$200.00
	Gate Valve	3 each	\$500.00	\$1,500.00
	Type I Bedding	25 ton	\$12.00	\$300.00
	Drill and Case 8" Well 1,200'	1 lump sum	\$80,000.00	\$80,000.00
	40 hp Submersible Pump	1 lump sum	\$17,000.00	\$17,000.00
			Sub Total	\$106,050.00
			5% Cont.	<u>\$5,302.50</u>
			TOTAL CONST.	\$111,352.50
			12% Eng., Legal, Const.	<u>\$13,362.30</u>
			TOTAL ESTIMATE	\$124,714.80

**CITY OF WHITEWOOD
PRELIMINARY ENGINEERING STUDY
WATER SYSTEM IMPROVEMENTS
IMPROVEMENTS TO EXISTING DISTRIBUTION SYSTEM
ENGINEERS OPINION OF PROBABLE COST**

ITEM NO.	DESCRIPTION OF ITEM	APPROXIMATE QUANTITY	UNIT PRICE	EXTENDED PRICE
1	Mobilization	1 lump sum	\$1,540.00	\$1,540.00
2	6" PVC Water Main	1,000 l.f.	\$10.00	\$10,000.00
3	6"x6"x6" Tee	5 each	\$200.00	\$1,000.00
4	Gate Valve	6 each	\$500.00	\$3,000.00
5	Fire Hydrant w/ Aux Valve	4 each	\$1,800.00	\$7,200.00
6	6"x6" Cross	1 each	\$500.00	\$500.00
7	Type I Bedding	50 ton	\$12.00	\$600.00
8	AASHTO T-180 Soil Test	1 each	\$100.00	\$100.00
9	2" Gravel Surfacing	125 ton	\$12.00	\$1,500.00
10	2" A.C. Pavement	130 ton	\$30.00	\$3,900.00
11	Incidental	1 lump sum	\$3,000.00	\$3,000.00
Sub Total				\$32,340.00
10% Cont.				<u>\$3,234.00</u>
TOTAL CONST.				\$35,574.00
15% Eng., Legal, Const.				<u>\$5,336.10</u>
TOTAL ESTIMATE				\$40,910.10

**CITY OF WHITEWOOD
PRELIMINARY ENGINEERING STUDY
WATER SYSTEM IMPROVEMENTS
SOUTHEAST LOOP
ENGINEERS OPINION OF PROBABLE COST**

ITEM NO.	DESCRIPTION OF ITEM	APPROXIMATE QUANTITY	UNIT PRICE	EXTENDED PRICE
1	Mobilization	1 lump sum	\$4,030.00	\$4,030.00
2	6" PVC Water Main	4,400 l.f.	\$10.00	\$44,000.00
3	6"x6"x6" Tee	3 each	\$200.00	\$600.00
4	Gate Valve	3 each	\$500.00	\$1,500.00
5	Fire Hydrant w/ Aux Valve	6 each	\$1,800.00	\$10,800.00
6	6" PRV Manhole	1 each	\$3,500.00	\$3,500.00
7	6" 90 deg. Bend	4 each	\$150.00	\$600.00
8	Type I Bedding	225 ton	\$12.00	\$2,700.00
9	AASHTO T-180 Soil Test	2 each	\$100.00	\$200.00
10	Rock Excavation	100 c.y.	\$35.00	\$3,500.00
11	Seed, Fertilize and Mulch	13,000 s.y.	\$0.40	\$5,200.00
12	R.R. Track Push Casing	100 l.f.	\$50.00	\$5,000.00
13	Incidental	1 lump sum	\$3,000.00	\$3,000.00
			Sub Total	\$84,630.00
			10% Cont.	<u>\$8,463.00</u>
			TOTAL CONST.	\$93,093.00
			12% Eng., Legal, Const.	<u>\$11,171.16</u>
			TOTAL ESTIMATE	\$104,264.16

CITY OF WHITEWOOD
PRELIMINARY ENGINEERING STUDY
WATER SYSTEM IMPROVEMENTS
NORTHEAST LOOP
ENGINEERS OPINION OF PROBABLE COST

ITEM NO.	DESCRIPTION OF ITEM	APPROXIMATE QUANTITY	UNIT PRICE	EXTENDED PRICE
1	Mobilization	1 lump sum	\$2,455.00	\$2,455.00
2	6" PVC Water Main	2,500 l.f.	\$10.00	\$25,000.00
3	6"x6"x6" Tee	2 each	\$200.00	\$400.00
4	Gate Valve	4 each	\$500.00	\$2,000.00
5	Fire Hydrant w/ Aux Valve	4 each	\$1,800.00	\$7,200.00
6	6" Water Main Plug	1 each	\$200.00	\$200.00
7	6"x6" Cross	1 each	\$500.00	\$500.00
8	Type I Bedding	125 ton	\$12.00	\$1,500.00
9	AASHTO T-180 Soil Test	2 each	\$100.00	\$200.00
10	Rock Excavation	100 c.y.	\$35.00	\$3,500.00
11	Seed, Fertilize and Mulch	14,000 s.y.	\$0.40	\$5,600.00
12	Incidental	1 lump sum	\$3,000.00	\$3,000.00
Sub Total				\$51,555.00
10% Cont.				<u>\$5,155.50</u>
TOTAL CONST.				\$56,710.50
12% Eng., Legal, Const.				<u>\$6,805.26</u>
TOTAL ESTIMATE				\$63,515.76

**CITY OF WHITEWOOD
PRELIMINARY ENGINEERING STUDY
WATER SYSTEM IMPROVEMENTS
LINE FROM WEST WELL TO RAW WATER STORAGE
ENGINEERS OPINION OF PROBABLE COST**

ITEM NO.	DESCRIPTION OF ITEM	APPROXIMATE QUANTITY	UNIT PRICE	EXTENDED PRICE
1	Mobilization	1 lump sum	\$841.25	\$841.25
2	6" PVC Water Main	1,000 l.f.	\$10.00	\$10,000.00
3	6"x6"x6" Tee	1 each	\$200.00	\$200.00
4	Gate Valve	3 each	\$500.00	\$1,500.00
5	6" 90 deg. Bend	1 each	\$150.00	\$150.00
6	Type I Bedding	50 ton	\$12.00	\$600.00
7	Rock Excavation	25 c.y.	\$35.00	\$875.00
8	Seed, Fertilize and Mulch	5,000 s.y.	\$0.40	\$2,000.00
9	Incidental	1 lump sum	\$1,500.00	\$1,500.00
Sub Total				\$17,666.25
10% Cont.				<u>\$1,766.63</u>
TOTAL CONST.				\$19,432.88
12% Eng., Legal, Const.				<u>\$2,331.95</u>
TOTAL ESTIMATE				\$21,764.82

FERBER ENGINEERING COMPANY

4901 Heights Drive
Rapid City, SD 57702
(605) 343-3311

LETTER OF TRANSMITTAL

TO Dept. of Envir & Natural Resources
Rapid, SD 57501

DATE: 10/7/94	JOB NO. 94-118
ATTENTION: Karen Schlak	
RE: Whitewood Water Permit	

WE ARE SENDING YOU ☒ Attached ☐ Under separate cover via _____ the following items:

- ☐ Shop drawings ☐ Prints ☒ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change order ☐ _____

COPIES	DATE	NO.	DESCRIPTION
1	10/7/94		Sealed site plan Whitewood Waterwell #3

THESE ARE TRANSMITTED as checked below:

- ☒ For approval ☐ Approved as submitted ☐ Resubmit _____ copies for approval
☐ For your use ☐ Approved as noted ☐ Submit _____ copies for distribution
☐ As requested ☐ Returned for corrections ☐ Return _____ corrected prints
☐ For review and comment ☐ _____
☐ FOR BIDS DUE _____ 19____ ☐ PRINTS RETURNED AFTER LOAN TO US

REMARKS: Sorry about forgetting to seal this drawing in
the first place.

COPY TO File 94-118 SIGNED [Signature]



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



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

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

October 6, 1994

Dan Ferber
Ferber Engineering Co.
4901 Heights Dr.
Rapid City SD 57702

Dear Mr. Ferber

In regard to the water permit application received on October 6, 1994 for the City of Whitewood, the following needs to be submitted to complete the application.

1. Enclosed is the map showing the well location. This map needs to be signed by you or one of the following: Registered Land Surveyor, Registered Professional Engineer or by any other government employee who normally prepares maps as a part of his assigned duties.
2. As you are aware, an additional application fee of \$315.00 is also required.

We are proceeding with the processing of the City's application at this time. If you have any questions, please contact this office.

Sincerely,

Karen Schlaak

Karen Schlaak
Environmental Scientist
605 773-3352

enclosure

REPORT ON WATER PERMIT APPLICATION NO. 1610-1
for the City of Whitewood
October 13, 1994

Application No. 1610-1 proposes to appropriate 1.11 cfs (500 gpm) from one well approximately 1200 feet deep located in the NW 1/4 SE 1/4 of section 21, T6N R4E in Lawrence County. The water is for municipal purposes.

AQUIFER - MADISON (MDSN)

The Madison Formation consists of massive gray to buff limestone which is locally dolomitic. The upper part of the Madison is typically cavernous with enhanced permeability from fractures and solution openings (Peter, 1987). The Madison is about 400 feet thick in this area, underlies 314,880 acres and contains approximately 9.4 million acre feet of recoverable water in storage in Lawrence County (Allen, 1984). The aquifer is areally extensive around the entire Black Hills and is hydraulically connected into Meade County to the east and into Wyoming to the west. The aquifer is confined and under artesian conditions at this site. The well is not expected to be free flowing at the land surface, however, the static water level should be within 100 feet of the land surface.

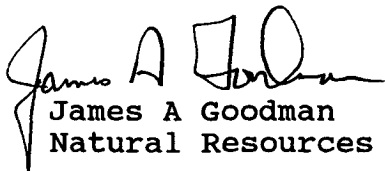
The closest Madison Formation observation well monitored by the Division of Water Rights is LA-90A located about 4 miles southeast of this application. Water levels for this well show good response to climatic conditions, that is rising water levels during wet years and gradually declining water levels during dry years. For the period of record the observation well has reached a high of about 205 feet below land surface and a low of about 232 feet below land surface. The record indicates that the aquifer is capable of sustaining additional withdrawals (Water Rights, 1994).

REVIEW OF EXISTING PERMITS/RIGHTS

There are no other Madison aquifer water permits/rights in this area. The nearest permitted Madison water use is about 4 miles south of this application. Interference is not expected to be a concern. Drawdown will be created by this diversion but is not expected to cause adverse effects. The City of Whitewood has an existing Minnelusa Formation well (Water Right No. 588-1) 310 feet from this proposed well. It is not expected that diversions from the Madison will cause any adverse effect on the Minnelusa Formation. The City of Whitewood will be in position to monitor any potential effects after completion of the production well. There is one other Minnelusa Water Right No. 1144-1 (Hubbard Milling) located about 800 feet south of the proposed well. Also, the Minnelusa is used for domestic purposes in the area and there are a few Madison domestic wells.

CONCLUSIONS

1. Water is available from the Madison Formation.
2. The aquifer is confined and under artesian conditions. Drawdown can be expected as a result of pumping. The information available at this time from other areas of the Black Hills indicates that pumping from the Madison Formation does not impact water levels from the Minnelusa Formation. It is expected that this will hold true for this area. In any event the City will be able to monitor this situation closely when the new well is completed and tested.
3. The well authorized by this application must be completed in accordance with SD Well Construction Standards.
4. In accordance with SDCL 46-2A-20 this application should contain a term limitation of 20 years.


James A Goodman
Natural Resources Engineer

BIBLIOGRAPHY

- Allen, J.C., D.L. Iles, A.K. Petres, 1984, Analysis of Groundwater and Streamflow Data Western Dakotas Region of South Dakota, for US Army Corps of Engineers, SD DENR, SDGS, Vermillion, SD, 57069.
- Peter, K.D., D.P. Kyllonen, 1987, Geohydrology and Water Quality of the Inyan Kara, Minnelusa, and Madison Aquifers of the Northern Black Hills, South Dakota and Wyoming, and Bear Lodge Mountains, Wyoming, USGS WRI 86-4158, USGS, Rapid City, SD, 57701.
- Water Rights, 1994, Unpublished Observation Well Data for the Madison Formation, SD DENR, Division of Water Rights, Pierre, SD, 57501.

RECOMMENDATION OF CHIEF ENGINEER FOR WATER PERMIT
APPLICATION NO. 1610-1, City of Whitewood

Pursuant to SDCL 46-2A-2, the following is the recommendation of the Chief Engineer, Water Rights Division, Department of Environment and Natural Resources concerning Water Permit Application No. 1610-1, City of Whitewood, c/o T. J. McGlade, PO Box 36, Whitewood, SD 57793.

The Chief Engineer is recommending APPROVAL of Application No. 1610-1 for a 20-year term pursuant to SDCL 46-1-14 and 46-2A-20 because 1) although evidence is not available to justify issuing this permit without a 20-year term limitation, there is reasonable probability that there is unappropriated water available for the applicant's proposed use, 2) the proposed diversion can be developed without unlawful impairment of existing rights, 3) the proposed use is a beneficial use, and 4) it is in the public interest with the following qualifications:

1. In accordance with SDCL 46-1-14 and 46-2A-20, Permit No. 1610-1 is issued for a twenty-year term. Pursuant to SDCL 46-2A-21, the twenty-year term may be deleted at any time during the twenty year period or following its expiration. If the twenty-year term is not deleted at the end of the term, the Permit may either be cancelled or amended with a new term limitation of up to twenty years. Permit No. 1610-1 may also be cancelled for nonconstruction, forfeiture, abandonment or three permit violations pursuant to SDCL 46-1-12, 46-5-37, 46-5-37.1, and Board Rule ARSD 74:02:01:37.
2. 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 adequate domestic wells or in adequate wells having prior water rights.
3. The well authorized by Permit No. 1610-1 shall be constructed by a licensed well driller and construction shall comply with Water Management Board Well Construction Rules, Chapter 74:02:04 with the well casing pressure grouted (bottom to top) from the producing formation to the surface pursuant to Section 74:02:04:28.

See report on application for additional information.


JOHN HATCH, Chief Engineer
October 26, 1994



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

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

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

October 28, 1994

T. J. McGlade
City of Whitewood
PO Box 36
Whitewood, SD 57793

Dear Mr. McGlade:

Water Permit Application No. 1610-1 for municipal use has been examined and found to comply with the South Dakota Water Laws and applicable rules. A notice of hearing has been sent to the Publisher of the Black Hills Pioneer, printed at Spearfish, SD (Ph # 605-642-2761). For your information, a copy of the notice, the recommendation of the Chief Engineer and a report on the application are enclosed. Please review the notice prior to publication and notify this office, if you have any corrections or questions.

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

Sincerely,


Eric Gronlund
Natural Resources Engineer
605 773-3352

enclosures

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

c: Dan Ferber, Ferber Engineering Co., 4901 Heights Dr., Rapid City, SD 57702



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

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

October 28, 1994

Black Hills Pioneer
Box 7
Spearfish, SD 57783-0007

ATTENTION: Legal Department

Enclosed is a Notice of Hearing on Application No. 1610-1 to be published twice. Please publish the first notice on November 2, 1994, with the second publication 7 days later.

The APPLICANT MUST VERIFY TO YOU THAT THE NOTICE IS TO BE PUBLISHED, before you make the first publication. Please BILL the APPLICANT for the cost of publication. The APPLICANT is City of Whitewood, c/o T. J. McGlade, PO Box 36, Whitewood, SD 57793 (Ph # 605-269-2247).

A copy of BOTH publications must be SENT to the WATER RIGHTS DIVISION. IMMEDIATELY return the FIRST publication with the FIRST Transmittal form on the bottom of this page. The first copy is needed to check the publication for errors so any corrections can be made in the second publication. Publication errors can invalidate the public notice and cause the applicant costly delays.

Please be sure the SECOND publication is returned IMMEDIATELY with the enclosed Proof of Publication form. DO NOT WAIT until the end of the month or the billing cycle. No action may be taken on the permit application until proof of publication has been received.

Sincerely,

Eric Gronlund
Eric Gronlund
Natural Resources Engineer
605 773-3352

enclosures

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

FIRST TRANSMITTAL NOTICE

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

No. _____

Date _____

We are in receipt of your letter of _____ enclosing Notice of
Hearing to Appropriate Water by Application No. _____ which was first
published in our issue of _____. ENCLOSED IS A COPY OF THIS
FIRST PUBLICATION.

Name

Newspaper

Instruction to Newspaper - Publish first Notice on November 2, 1994, with the second publication 7 days later. The applicant is responsible for payment.

NOTICE OF HEARING on Application No. 1610-1 to Appropriate Water

Notice is given that the City of Whitewood, PO Box 36, Whitewood, SD 57793 has filed an application for a water permit to appropriate 1.11 cubic feet of water per second (500 gallons per minute) from one well approximately 1200 feet deep (Madison Formation) located in the NW 1/4 SE 1/4 Section 21-T6N-R4E. Water is to be used for municipal purposes.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 1610-1 for a 20-year term pursuant to SDCL 46-1-14 and 46-2A-20 because 1) although evidence is not available to justify issuing this permit without a 20-year term limitation, there is reasonable probability that there is unappropriated water available for the applicant's proposed use, 2) existing right will not be unlawfully impaired, 3) it is a beneficial use of water, and 4) it is in the public interest.

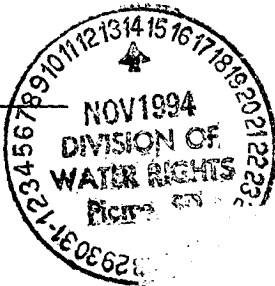
Any person interested in opposing or supporting this application must file a written petition with BOTH the applicant and Chief Engineer. The applicant must also file a petition if opposed to the Chief Engineer's recommendation. The Chief Engineer's address is "Water Rights Division, Foss Building, 523 E Capitol, Pierre SD 57501 (605 773-3352)" and the applicant's mailing address is given above. A petition filed by either an interested person or the applicant must be filed by November 21, 1994. The petition may be informal, but must include a statement describing the petitioner's interest in the application, the petitioner's reasons for opposing or supporting the application, and the signature and mailing address of the petitioner or the petitioner's legal counsel, if legal counsel is obtained.

The Water Management Board will consider this application at 10:00 a.m., Wednesday, November 30, 1994, Gallery E, Ramkota Inn Best Western, 920 West Sioux, Pierre, SD. The Chief Engineer's recommendation is not final or binding upon the Board. The Board is authorized to 1) approve, 2) approve with qualifications, 3) defer, or 4) deny this application based on the facts presented at the public hearing. The November 30, 1994, hearing date will be automatically delayed for at least 20 days upon written request to the Chief Engineer from the applicant or any interested person opposing the application. The request for an automatic delay must be filed by November 21, 1994.

Any hearing will be an adversary proceeding. Any person filing a petition and/or the applicant have the right to be represented by a lawyer and may present evidence or cross-examine witnesses according to SDCL 1-26. These and other due process rights will be forfeited if not exercised. Decisions of the Board may be appealed to the Circuit Court and State Supreme Court as provided by law. Contact Eric Gronlund by November 21, 1994, at the above Water Rights Division address to request copies of information pertaining to this application, to assure access to the hearing by the handicapped or to obtain an interpreter for the hearing impaired.

This application is made pursuant to SDCL 46-1-1 thru 46-1-9, 46-1-12 thru 46-1-16; 46-2-3.1, 46-2-9, 46-2-11, 46-2-13, 46-2-17; 46-2A-1 thru 46-2A-10, 46-2A-12, 46-2A-14, 46-2A-15, 46-2A-20, 46-2A-21; 46-5-1 thru 46-5-11, 46-5-13 thru 46-5-15, 46-5-24, 46-5-25, 46-5-30.2, 46-5-30.4, 46-5-31; 6-6-3, 46-6-3.1, 46-6-6.1, 46-6-10, 46-6-13, 46-6-14, 46-6-26; and Board Rules ARSD 74:02:01:01 thru 74:02:01:15. Robert E. Roberts, Secretary, Department of Environment and Natural Resources.

46-6-3



PROOF OF PUBLICATION

STATE OF SOUTH DAKOTA)
County of Lawrence) ss

I, Laurie Hardin

certify that the attached printed Notice was

taken from the Division of
Water

printed and published in BH Pioneer

County of Lawrence and State of

South Dakota. The notice was published in
the newspaper on the following two dates:

11-2-94

11-9-94

Cost of Printing: \$57.89

Laurie Hardin
(Signature)

Accounts Receivable
(Title)

11-10-94
(Date Signed)

NOTICE OF HEARING
On Application No. 1610-1
to Appropriate Water

NOTICE IS GIVEN THAT the City of Whitewood, PO Box 36, Whitewood, SD 57793 has filed an application for a water permit to appropriate 1.11 cubic feet of water per second (500 gallons per minute) from one well approximately 1200 feet deep (Madison Formation) located in the NW 1/4 SE 1/4 Section 21-T6N-R4E. Water is to be used for municipal purposes.

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3) it is a beneficial use of water, and 4) it is in the public interest.

Any person interested in opposing or supporting this application must file a written petition with BOTH the applicant and Chief Engineer. The applicant must also file a petition if opposed to the Chief Engineer's recommendation. The Chief Engineer's address is "Water Rights Division, Foss Building, 523 E Capitol, Pierre, SD 57501 (605 773-3352)" and the applicant's mailing address is given above. A petition filed by either an interested person or the applicant must be filed by November 21, 1994. The petition may be informal, but must include a statement describing the petitioner's interest in the application, the petitioner's reasons for opposing or supporting the application, and the signature and mailing address of the petitioner or the petitioner's legal counsel, if legal counsel is obtained.

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This application is made pursuant to SDCL 46-1-1 thru 46-1-9, 46-1-12 thru 46-1-16, 46-2-3.1, 46-2-9, 46-2-11, 46-2-13, 46-2-17, 46-2A-1 thru 46-2A-10, 46-2A-12, 46-2A-14, 46-2A-15, 46-2A-20, 46-2A-21; 46-5-1 thru 46-5-11, 46-5-13 thru 46-5-15, 46-5-24, 46-5-25, 46-5-30.2, 46-5-30.4; 46-5-31; 46-6-3, 46-6-3.1, 46-6-6.1, 46-6-10, 46-6-13, 46-6-14, 46-6-26; and Board Rules ARSD 74:02:01:01 thru 74:02:01:15.

Robert E. Roberts,
Secretary,
Department of Environment
and Natural Resources;

#852
Nov. 2, 9



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

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

DEC 28 1994

T. J. McGlade
City of Whitewood
PO Box 36
Whitewood, SD 57793

Dear Mr. McGlade:

Enclosed is Water Permit No. 1610-1 authorizing construction of your water diversion system and beneficial use of the water, not exceeding the limits as specified in the Water Permit.

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 the Water License may be issued, thus completing your acquisition of a Water Right.

Very truly yours,

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

enclosures

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.

Permit No. 1610-1
Belle Fourche River - Water District

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

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

I have this day, 29 August 2007, made a thorough examination of the water use system constructed by City of Whitewood of PO Box 36, Whitewood SD. 57793 holder of Permit No. 1610-1, bearing the priority of 06 October 1994 authorizing the diversion of 1.11 cu. ft. per second of the waters of the Madison formation for municipal use in Lawrence County.

A. Works used to divert the water:

Well Information:

- 1) Well Drilling Firm: Taylor
- 2) No. of Wells: 1
- 3) Depth(s) 1024 feet
- 4) Well log is available Y
- 5) Comment:

Casing:

- 1) Diameter 16 / 10 ¾ inches
- 2) Length 43 / 900 feet
- 3) Type steel

Screen:

- 1) Type none
- 2) Static water level 152 feet

Pump:

- 1) Make Grundfos
- 2) Model unknown
- 3) Capacity 500 GPM

Motor:

- 1) Make Franklin
- 2) Model No.: unknown
- 3) Horsepower rating 40 hp

B. Compliance with Permit Requirements:

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

The system is in good condition with the point(s) of diversion located as follows: NW ¼ SE ¼ Sec 21-T6N-R4E approximately 1712 feet north and 2290 feet west of the south east corner of section 21, N 44. 46427 Latitude and W -103.63811 Longitude. The works are capable of diverting and conveying to the place of use 1.11 cu. ft. per second of water which is to be used for supplying water to the City of Whitewood.

The license should be issued for 1.11 cfs.

All structures, wells and lands on map Y

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



Mark Costello
Natural Resources Engineer
DENR, Water Rights Program

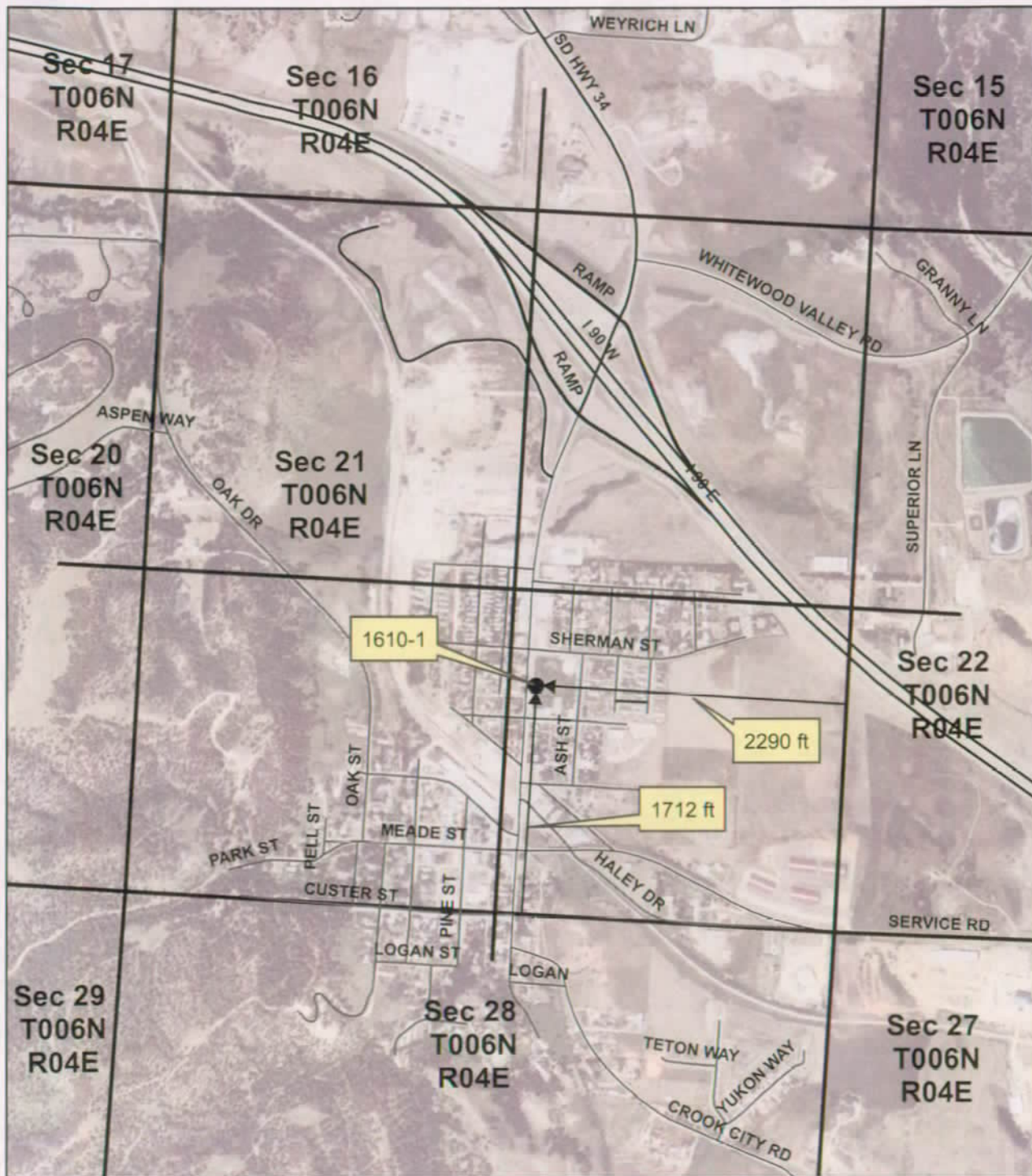
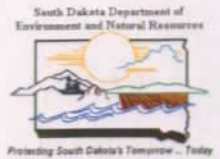
Date report completed: 26 February 2008



South Dakota

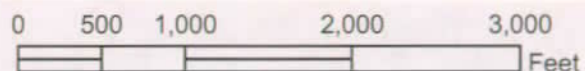
1610-1

City of Whitewood
PO Box 36
Whitewood, SD. 57793



Mark Costello

Mark Costello
Natural Resources Engineer
SD DENR, Water Rights
26 February 2008





DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

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

March 3, 2008

1610-1

Brenda Lindstrom, Finance Officer
City of Whitewood
1025 Meade St
Whitewood SD 57793-3053

Dear Ms. Lindstrom:

The City of Whitewood holds Water Permit No. 1610-1 which authorizes diversion of ground water for municipal purposes. On August 29, 2007, the investigation of the water use system, including the extent of application of water to beneficial use, as developed under Water Permit No. 1610-1, was completed by Mark Costello, a staff engineer with our program. The final water right document, the water license, can now be issued.

State law requires that we charge a \$50.00 fee for the investigation and issuance of the water license. Upon receipt of the \$50.00 fee from you, we will complete processing the water license. The check or money order for the fee should be made payable to the "**Water Rights Program**".

The city's licensed water right will be similar to a property right that can not be lost as long as the water use continues and you abide by the permit requirements.

If you have any questions regarding the water permit, investigation of the water use system or payment of the fee, please contact me.

Sincerely,

Genny McMath
Environmental Scientist
Water Rights Program
(605) 773-3352

RECEIPT

WATER RIGHTS PROGRAM

South Dakota Department of Environment and Natural Resources

Date 3/24, 20 08

RECEIVED OF City of Whitewood PO Box 36 Whitewood SD 57793

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

Fee for Application for Permit No. _____ to Appropriate Water, to construct and to put water to beneficial use		
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. <u>1610-1</u>	50	00
Fee for Filing Transfer Form _____		
Fee for _____		
Fee for Issuing New Well Driller's License No. _____ for C.Y. _____		
Fee for Renewal of Well Driller's License No. _____ for C.Y. _____		
Fee for Issuing Well Pump Installer's License No. _____ for C.Y. _____		
Fee for Renewal of Well Pump Installer's License No. _____ for C.Y. _____		
(Any Other Work Provided by Law)	TOTAL	50 00

No.

03594

By

Lutal Erbe
Chief Engineer



DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

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

APR 08 2008

1610-1

Brenda Lindstrom, Finance Officer
City of Whitewood
1025 Meade St
Whitewood SD 57793-3053

Dear Ms. Lindstrom:

Enclosed is Water License No. 1610-1. This is the final water right document completing the city's process of obtaining a Water Right. Enclosed is Receipt No. 03594 in the amount of \$50.00 which you paid for the investigation and issuance of the Water License. Also included with the license is a copy of the map prepared by the staff engineer who conducted the field investigation.

For your information SDCL 46-6-27 requires that if the owner of an existing well, such as the well authorized by Water Right No. 1610-1, constructs a replacement well and does not plan to use the old well, the old well is considered abandoned and must be plugged. Also, any well that is being used or is not considered abandoned must be valved and controlled, if flowing, or sealed and capped so that no leaking occurs either underground or at the surface.

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

Sincerely,

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

enclosures

STATE OF SOUTH DAKOTA

WATER LICENSE NO. 1610-1

(1) The City of Whitewood, 1025 Meade St., Whitewood SD 57793-3053 made Application No. 1610-1, October 6, 1994 for a water permit to divert 1.11 cubic feet of water per second (500 gallons per minute) from ground water (one well – Madison Formation), Lawrence County, South Dakota for municipal purposes. Permit No. 1610-1, with a priority date of October 6, 1994 was approved November 30, 1994 and issued to the applicant for diversion of water with construction of the described water supply system to be completed on or before November 30, 1999 and for the application to beneficial use of said water on or before November 30, 2003.

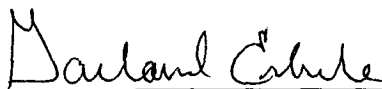
(2) It is certified that the permit holder has complied with the provisions of South Dakota State Law relating to completion of the construction of the water supply system and is entitled to divert 1.11 cubic feet of water per second for beneficial use. The location of the diversion point is 1,712 feet north and 2,290 feet west of the SE corner of Section 21, T6N, R4E (NW ¼ SE ¼).

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

(4) Pursuant to South Dakota Water Law 46-5-30.1 the City of Whitewood, 1025 Meade St., Whitewood SD 57793-3053 the holder and/or owner of Water Right No. 1610-1 is issued a license to appropriate water, the right to use 1.11 cubic feet of water per second from ground water (one well – Madison Formation) with a priority date of October 6, 1994 from the location specified in (2) of this license for municipal purposes.

This license is subject to South Dakota Water Law, any limitations or conditions listed in Water Right No. 1610-1 and subject to the following qualifications:

- In accordance with SDCL 46-1-14 and 46-2A-20, Permit No. 1610-1 is issued for a 20-year term. Pursuant to SDCL 46-2A-21, the 20-year term may be deleted at any time during the 20-year period or following its expiration. If the 20-year term is not deleted at the end of the term, the permit may either be cancelled or amended with a new term limitation of up to twenty years. Permit No. 1610-1 may also be cancelled for non-construction, forfeiture, abandonment, or three permit violations pursuant to SDCL 46-1-12, 46-5-37, 46-5-37.1 and ARSD 74:02:01:37.
- 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 adequate domestic wells or in adequate wells having prior water rights.
- The well authorized by Permit No. 1610-1 shall be constructed by a licensed well driller and construction shall comply with Water Management Board Well Construction Rules, Chapter 74:02:04 with the well casing pressure grouted (bottom to top) from the producing formation to the surface pursuant to Section 74:02:04:28 (*well log submitted by Taylor Drilling in February, 1996*).



Garland Erbe, Chief Engineer
Water Rights Program
Department of Environment and Natural Resources

APR 08 2008

date

