DOE/ID/12736--2

DE92 006630

STUDY OF THE GEOTHERMAL PRODUCTION POTENTIAL IN THE WILLISTON BASIN, NORTH DAKOTA

Final Report

Volume 2
Engineering Report

by

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Idaho Falls, ID 83402

September 10, 1991

Work Performed Under Cooperative Grant No. DE-FG07-88ID12736

DISCLAIMER

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACKNOWLEDGEMENTS

The writer especially thanks Mark Elliott and Hung Yang, graduate students at the University of North Dakota, for their interest and active participation in this project. The North Dakota Geological Survey (NDGS) provided oil well geophysical logs, and Dewight Energydata, Ltd., of Oklahoma City, provided the Dakota Formation water chemistry data for reservoir evaluations. The Department of Energy, Division of Geothermal Energy, provided financial support for this study, which is gratefully acknowledged.

DISCLAIMER

STUDY OF THE GEOTHERMAL PRODUCTION POTENTIAL IN THE WILLISTON BASIN, NORTH DAKOTA

ABSTRACT

Preliminary studies of geothermal production potential for the North Dakota portion of the Williston Basin have been carried out. Reservoir data such as formation depth, subsurface temperatures, and water quality were reviewed for geothermal brine production predictions. This study, in addition, provides important information about net pay thickness, porosity, volume of geothermal water available, and productivity index for future geothermal direct-use development.

Preliminary results show that the Inyan Kara Formation of the Dakota Group is the most favorable geothermal resource in terms of water quality and productivity. Inyan Kara Formation water is available at depths ranging from 2,000 to 6,500 ft; water chemistry ranges from 3,000 to more than 20,000 mg/L in the western parts of the Basin; the porosities are normally higher than 20%, and the net pay thicknesses are generally greater than 100 ft. The estimated water productivity index of the most productive well is 41 bbl/day/psi, which is equivalent to 17,800 bbl/day at a pressure drawdown of 433 psi; this is excellent.

The Madison, Duperow, and Red River Formations are deeper formations at depths ranging from 2,000 to 14,000 ft, with warmer water temperatures in the range of 35°-117°C, 34°-127°C, and 39°-138°C, respectively. However, because of their low permeability and great depth, the potential flow rates from these three formations are considerably less than those of the Inyan Kara Formation. Also, poor water quality and low porosity will make those formations less favorable for geothermal direct-use development.

Unfortunately, well testing and fluid flow tests data obtained from the Inyan Kara Formation were not available at the time of this study. Well testing and fluid flow tests could provide useful information necessary to assess long-term well production performance. The preliminary results of this study, however, do provide reasonable interpretations of water chemistry and short-term flow rate predictions for the wells analyzed.

STUDY OF THE GEOTHERMAL PRODUCTION POTENTIAL IN THE WILLISTON BASIN, NORTH DAKOTA

1.0 INTRODUCTION

The use of low (less than 90°C) and intermediate temperature (90° to 150°C) geothermal resources for greenhouse, space heating, and aquaculture has expanded significantly since the 1970s. At the same time, in the oil fields of North and South Dakota, Wyoming, and Montana, geothermal fluids produced with the oil is reinjected to the oil formation to recover some additional oil. In 1988, the contribution from geothermal fluid injection recovered is estimated at 8156 x 10^9 Btu/year for the four oil-producing states (Lienau and Lunis, 1989).

Sorey (1983) classified low-temperature geothermal resources as hydrothermal convection systems and conduction-dominated systems. Low-temperature geothermal resources in conduction-dominated systems occur primarily in regional aquifers within sedimentary basins. Identified geothermal resource areas in this category include aquifers in the Great Plains province where thick and impermeable layers of shale with low thermal conductivity and temperature gradients higher than 25°C/km overlie carbonate and sandstone aquifers.

In the western parts of North Dakota, most areas are underlain by deep sedimentary rocks with potential of producing low- and intermediate-temperature geothermal energy. Recent studies of geothermal resources assessed within an area of about 130,000 km^2 in the Williston Basin estimate the recoverable resources at 1.35 x 10^{19} J, which is equivalent to 2.22 x 10^9 barrels of crude oil (Gosnold, 1984).

Identified low- and intermediate-temperature geothermal resources in North Dakota exist in the aquifers of the Dakota, Mission Canyon, Duperow, and Red River Formations. At depths between 2,000 to 14,000 ft, the Inyan Kara

Formation of Dakota aquifer is the shallowest and the most important geothermal aquifer for direct-use development (Harris and others, 1982).

The anticipated flow rate from a potential aquifer is a criterion that determines the development and operation costs of a potential geothermal reservoir. Therefore, it is important to estimate the potential flow rate for geothermal direct-use development.

The overall objective of this study is to provide detailed reservoir, water chemistry, and productivity information needed for the actual development of geothermal direct-use in the Williston Basin, North Dakota. The objectives of this study are to:

- Evaluate the geologic and reservoir data from the potential geothermal aquifers in the Williston Basin, North Dakota.
- Estimate the water chemical quality for the geothermal water from the Inyan Kara Formation.
- Estimate the quantity of geothermal water stored in the aquifers.
- Estimate the potential productivity for wells producing from the potential geothermal aquifers.

2.0 PREVIOUS INVESTIGATIONS

A geothermal reservoir is a rock formation which may contain hot water. An economically feasible geothermal reservoir must have sufficient porosity to contain a large amount of hot water and the capacity to produce fluids at a desired rate when the reservoir is fully developed.

Figure 1 shows at least four major low- and intermediate-temperature geothermal aquifers that exist in the Williston Basin, North Dakota. Harris and others (1980, 1981, 1982) conducted a preliminary evaluation of hydrothermal resources in the Williston Basin, North Dakota. A highly accessible computer file entitled "Well File" was created to contain the

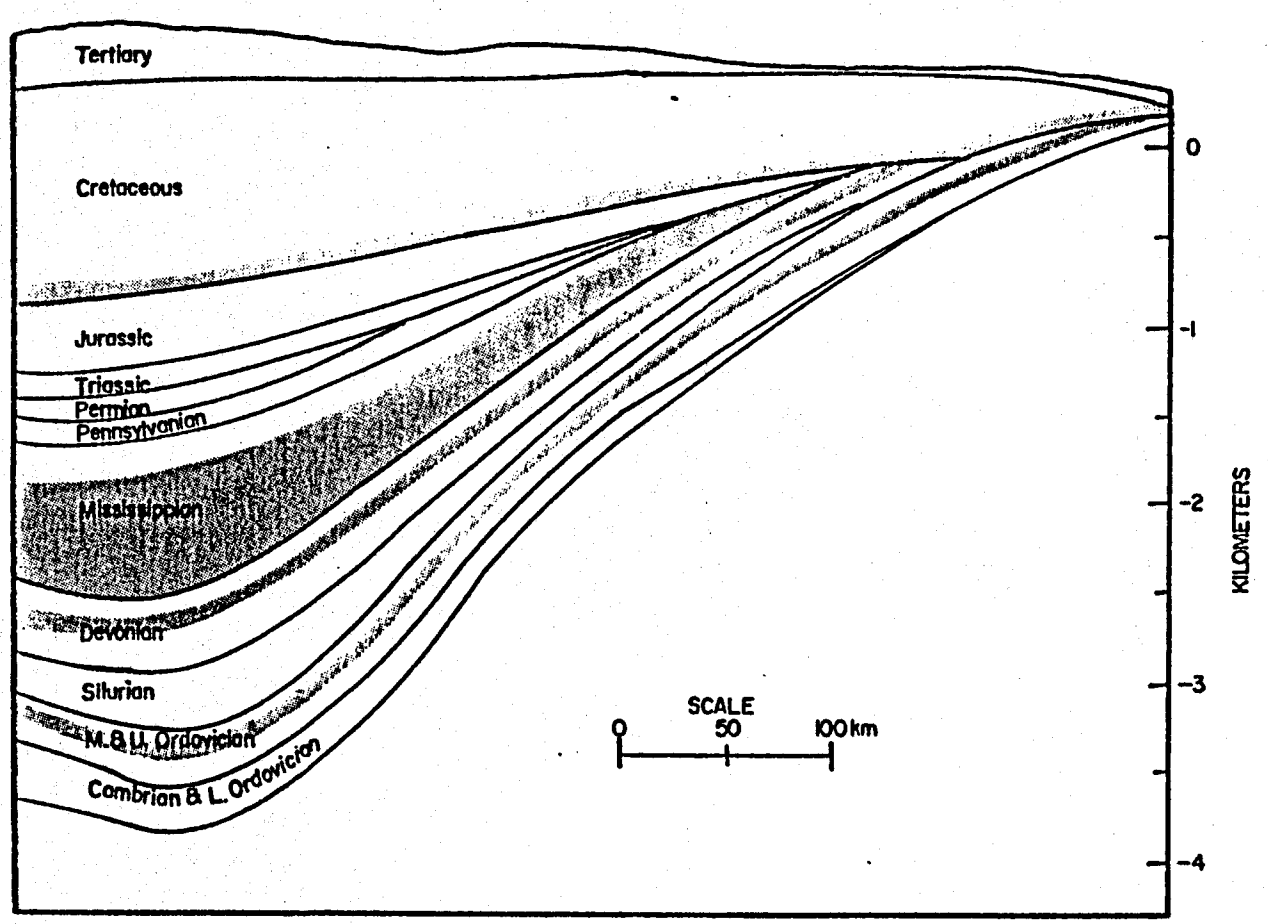

Figure 1. Geologic cross section of the Williston Basin, North Dakota. Four geothermal aquifers are shown by the shaded areas (Gosnold, 1984).

stratigraphic data and temperature-depth data for all oil and gas wells that exist in North Dakota. Another computer file entitled "Watercat" is a computer library system containing water chemistry data for all water wells drilled in North Dakota.

These computer files contain the information needed for an initial evaluation of the geothermal resources in North Dakota. They also indicate that most of the water from the Madison Formation is of relatively poor quality, with the total dissolved solids (TDS) as high as 350,000 mg/L. The great formation depth and poor water quality make it impractical for geothermal direct-use development.

Sorey and others (1983) suggested that two major low-temperature geothermal resources exist in the Williston Basin, North Dakota: one in the carbonate rocks of the Madison aquifer and the other in the sandstone of the Dakota aquifer. The geothermal resources for the Madison and the Dakota aquifers in North Dakota are estimated at 7.5×10^{18} J and 2.3×10^{18} J, respectively.

MacCary and others (1983) studied the potential water supply required for coal development in the region of the northern Great Plains, including western North Dakota. Figure 2 indicates the areas that have the potential to produce more than 500 gal/min (17,142 bbl/day) per well in the Red River Formation. However, Figure 3 indicates that no well in western North Dakota can produce more than 500 gal/min from the Madison Formation.

Wartman (1986) conducted a detailed study on the geology and hydrology of the Inyan Kara Formation, which is the lowest Cretaceous unit of the Dakota aquifer and the shallowest geothermal aquifer in North Dakota. His results show that the Inyan Kara aquifer has permeability from 20 to 30 ft/day, water chemistry from 2,000 to 19,000 mg/L, and potentiometric head from 800 to

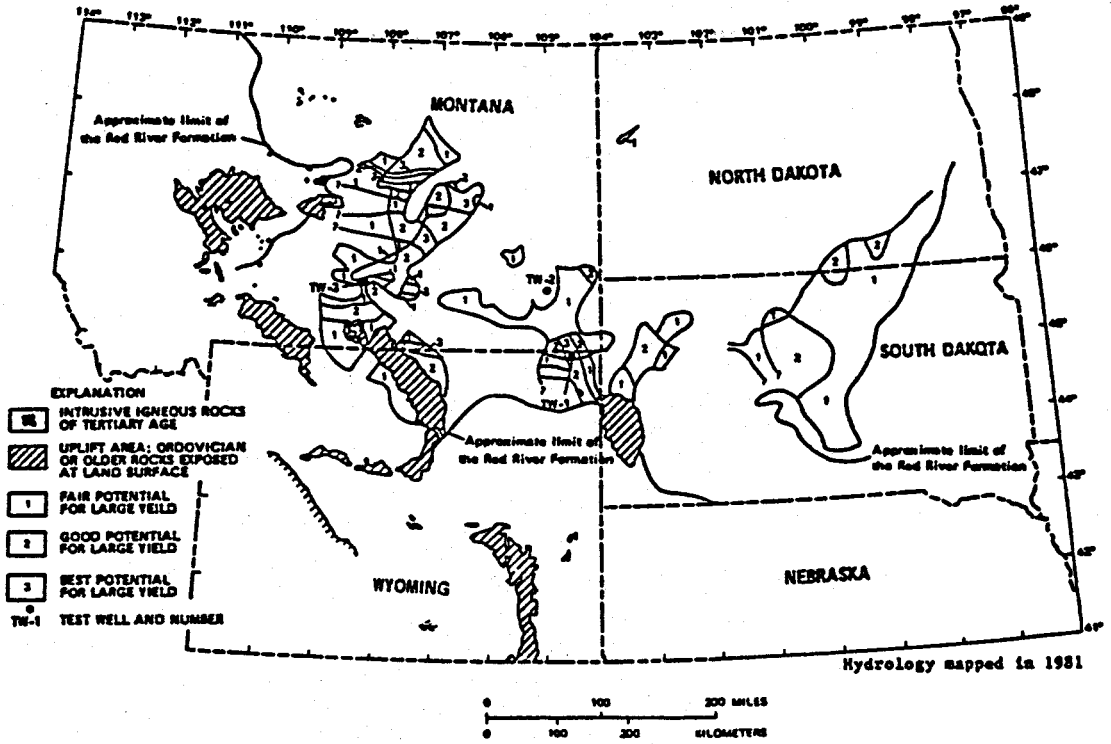

Figure 2. Potentially favorable areas for wells producing more than 500 gal/min from the Red River Formation (MacCary and others, 1983).

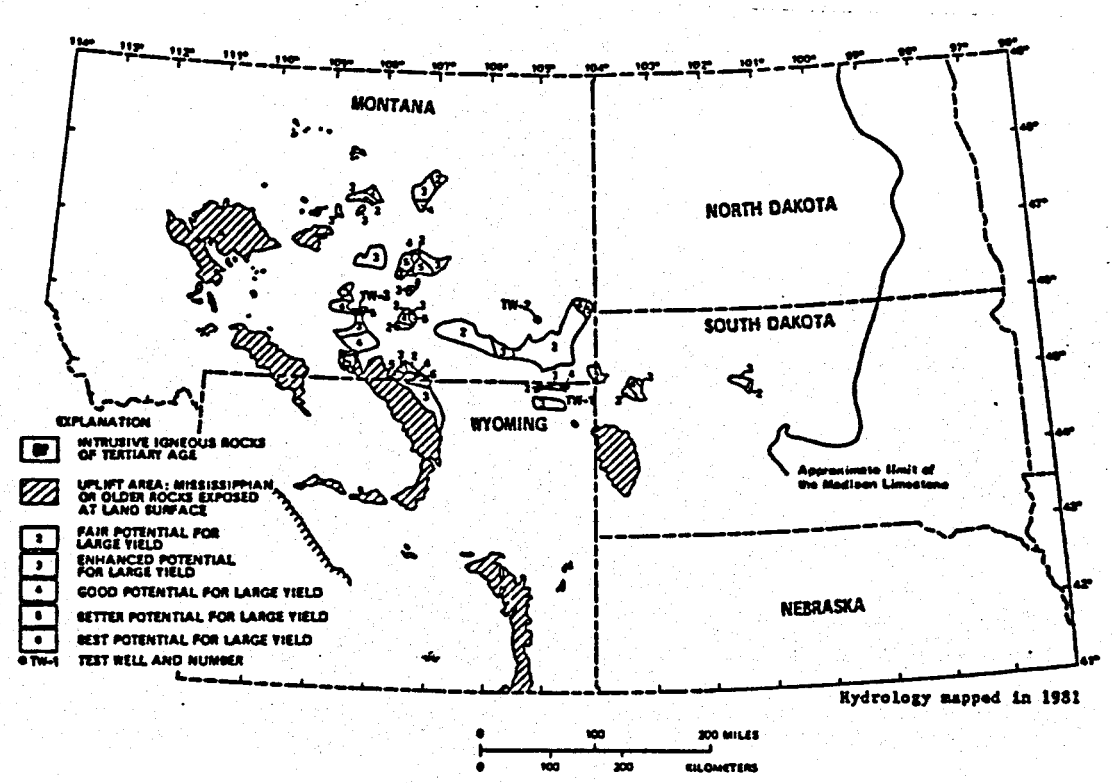

Figure 3. Potentially favorable areas for wells producing more than 500 gal/min from both the Red River Formation and the Madison Formation (MacCary and others, 1983).

2,000 ft. These characteristics make this aquifer a good candidate for geothermal direct-use development.

Recently, Gosnold (1984) reassessed the geothermal resources for North Dakota by determining the thermal conductivities and calculating the heat flow of four principal lithologies in the sedimentary basin. These rock types and their estimated average conductivities are Tertiary silts and sands (1.6 W/m/K), Cretaceous shales (1.2 W/m/K), Upper Paleozoic limestones (3.2 W/m/K), and Lower Paleozoic dolomites (3.5 W/m/K). He used these data to determine the subsurface temperatures of four major geothermal aquifers. His results show that the temperature-depth curve for the Williston Basin, North Dakota, is a multicomponent curve (Figure 4). In addition, he assessed the geothermal resources in four major aquifers (Table 1).

Zink (1982) and Fossum and others (1982) conducted economic feasibility studies for prospective geothermal direct-use projects in North Dakota. Zink evaluated the economics of using geothermal fluids as a source to replace the existing oil-fired boiler system used in a concrete production company in the Bismarck area where the Madison and Inyan Kara Formations are potential

TABLE 1

Geothermal Resources in the Williston Basin, North Dakota (Gosnold, 1984)

Formation	Mean Temp., °C	Max. Temp., °C	Minimum Temp., °C	Mean Reservoir Area, km^2	Mean Reservoir Thickness, km	Mean Accessible Base, 10^{18} J
Inyan Kara	51	84	25	128,000	0.091	1,100
Madison	69	117	31	128,000	0.366	6,600
Duperow	81	127	34	128,000	0.100	2,200
Red River	87	138	35	128,000	0.150	3,600
					Total	13,500

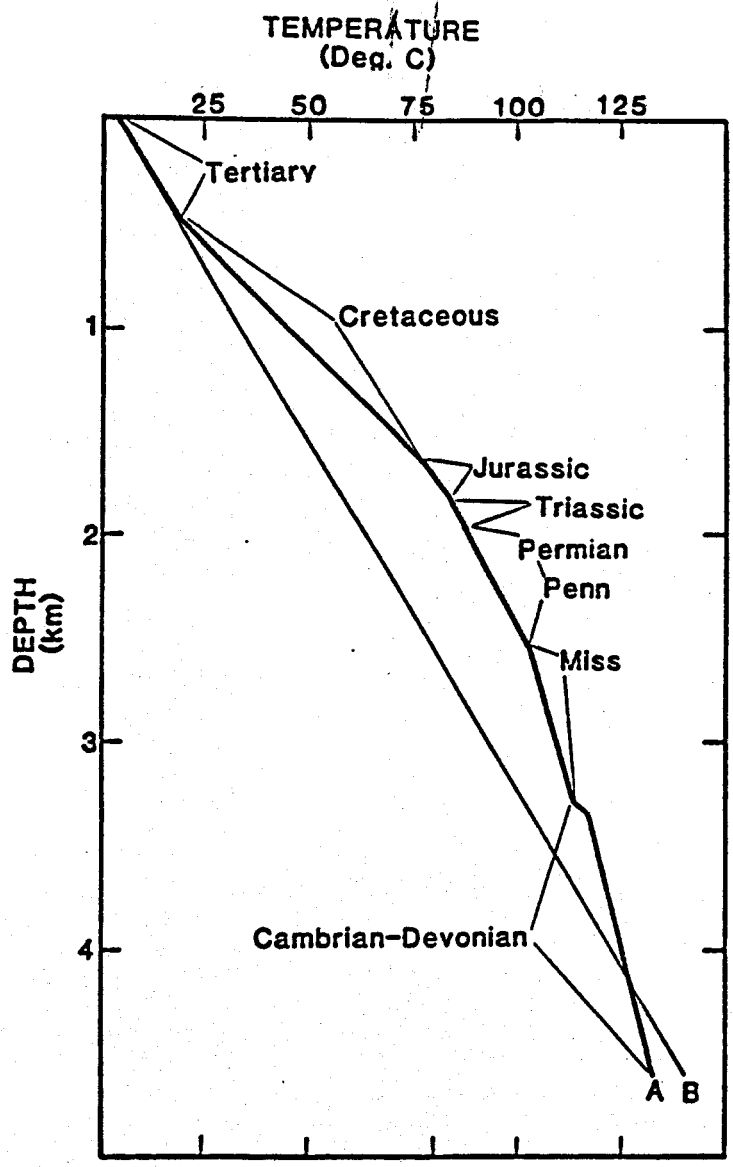

Figure 4. Calculated temperature-depth curves for the Williston Basin, North Dakota (Gosnold, 1984).

geothermal resources. The depth of the Madison Formation in the study area is 5400 ft below the ground surface, and the water temperature is 120 degrees Fahrenheit. However, the water chemistry with the TDS in the range of 250,000 to 350,000 ppm could cause problems in geothermal direct-use. Therefore, the Inyan Kara Formation, an aquifer of moderate depth and better water quality with a TDS of 2500 ppm, was selected as the potential geothermal resource for Zink's study. However, his results indicated that, based on 1982 economics, the operating cost savings of the geothermal system over the cost of the existing oil-fired boiler system is insufficient to obtain an acceptable rate of return on the investment.

Another study carried out by Fossum and others (1982) determined the feasibility of using the geothermal energy from the Inyan Kara Formation water for space heating and domestic water heating in the city of Dickinson, North Dakota. The results of this study show that the economic feasibility is reasonable if the water temperature is indeed 71°C and a water-producing rate of 4542 liter/min is obtainable.

Solheim (1989) performed an economic analysis for utilization of Inyan Kara Formation water as a space-heating alternative at NDSU-Bottineau, North Dakota. His results show that the economic feasibility of this project depends on the costs of spent geothermal water injection wells. In this study, he concludes that one or two spent water injection wells may be required for each producing well. Therefore, costs of spent water disposal may play an important role in the geothermal development.

It is clear from previous studies conducted by Harris and others (1980), Zink (1982), Fossum and others (1983), MacCary and others (1983), and Wartman (1986) that the Red River and Duperow aquifers are less favorable for geothermal production because of their great depth, low porosity, and low permeability. Also, the poor quality of the Madison water may present problems in direct-use applications. Therefore, the Inyan Kara aquifer was selected as a major geothermal aquifer for detailed study because its reservoir characteristics are more favorable for geothermal direct-use development in western North Dakota.

3.0 ACQUISITION OF RESERVOIR DATA FOR GEOTHERMAL PRODUCTION PREDICTION

The data acquisition phase of this project involved collecting reservoir data from potential geothermal aquifers in the Williston Basin, North Dakota. The reservoir data evaluated included net pay thickness, porosity, and water chemistry. General steps of this study are as follows:

1. Identifying geothermal formations to be studied;
2. Choosing study areas near four major cities in western North Dakota where adequate geothermal resources are likely to exist;
3. Selecting wells and geophysical well logs from which necessary reservoir data could be collected for productivity evaluations;
4. Calculating reservoir data such as net pay thickness, average porosity, and water chemistry to predict production;
5. Calculating the productivity index, aquifer capacity, and the volume of the water in place for each of the wells analyzed.

The most important factors to be considered in the development of geothermal resources are the amount of water available, the rate of production per well, the water temperature, the water quality, and the distance to the user site. Some specific procedures and criteria used in the selection of formations, study areas, well log types, and reservoir data are explained below.

3.1 Selection of Geothermal Formations

The criteria used to select geothermal formations are that the net pay thickness be 100 ft or thicker and the average porosity be 20% or higher. Based on the results indicated in the previous studies, the Inyan Kara Formation was selected as the major aquifer for this study because of its high porosity and thick pay zones, both of which are essential for geothermal production.

3.2 Selection of Study Areas

Four study areas were selected for evaluation of the potential geothermal resources located in the underlying Inyan Kara Formation. Selection of the areas was based mainly on economic criteria. In order to

meet the economic criteria, each of the four study areas had to occur near a major city in western North Dakota.

The four major cities chosen as potential geothermal energy users are: Williston, Watford City, New Town, and Dickinson. Each study area is roughly circular and includes all of the townships that fall within a 26-mile radius of one of the four cities in western North Dakota.

3.3 Selection of Wells

Oil or gas wells chosen for geothermal studies are located in one of the four study areas. Only wells with dual Laterolog (D_{11}), gamma ray (GR), and borehole-compensated (BHC) sonic logs running through the Inyan Kara Formation were chosen for analysis. Because the Inyan Kara Formation is not a hydrocarbon-producing formation, the number of wells meeting these criteria is limited. However, as many as 4-6 wells per township were analyzed in some of the areas adjacent to major cities in the four study areas.

3.4 Selection of Well Log Types

Three types of well logs were used as part of data collection procedures. A combination of gamma ray and dual Laterolog was used to identify clean sand zones and to determine the total net pay zone thickness within the Inyan Kara Formation. The porosity data of the Inyan Kara Formation at each well was calculated from BHC sonic porosity logs. The resistivity data used to estimate water chemistry was obtained from the deep Laterologs.

The reason for using the Laterologs to estimate formation resistivity is that the Laterolog is the most accurate log type for the formation resistivity, R_t, measurements. The resistivity data collected were then used to determine the apparent resistivity, R_{wa}, at surface temperature 75°F, and this value was used to estimate formation water quality. In fact, in the

study areas, Laterologs are the most common type of resistivity log run through the Inyan Kara Formation.

Acoustic transit time values taken from BHC sonic logs were used for porosity calculations. This type of porosity log was chosen over other types of porosity logs primarily because of availability. Because the Inyan Kara Formation is not a hydrocarbon-producing formation, other types of logs such as density and neutron porosity logs are seldom run through the Inyan Kara Formation. Fortunately, a relatively large number of wells did have BHC sonic logs running through the Inyan Kara Formation. For this reason, BHC sonic logs were used for determining porosity.

4.0 IDENTIFICATION OF PRODUCTIVE INTERVALS

Identification of productive intervals or clean sands within the formation were accomplished by using the gamma ray log. Because shale is more radioactive than sand or carbonate rocks, the gamma ray log can be used to determine the volume of shale in a formation.

In order to determine the volume of shale in a formation, the gamma ray index, I_{gr}, was calculated from:

$$I_{gr} = \frac{GR_{log} - GR_{min}}{GR_{max} - GR_{min}} \qquad \text{[Eq. 1]}$$

where:

I_{gr} = gamma ray index

GR_{log} = gamma ray reading from the log

GR_{min} = minimum gamma ray reading from the cleanest sand

GR_{max} = maximum gamma ray reading from the thick shale zone near the zone of interest

After the I_{gr} at a given spot in the formation was determined, the volume of shale was found from a shale volume versus gamma ray graph (Figure 5). To use Equation 1 for identifying productive intervals, two assumptions needed to be made. First, any interval was assumed to be productive if the volume of shale in the zone, as determined by the above method, is less than 20%. The second assumption made was that the Inyan Kara is a consolidated sandstone formation. Based on these assumptions, it was possible to define Igr as 0.3 for a shale percentage of 20%.

Using an I_{gr} value of 0.3, Equation 1 can be rearranged as follows:

$$GR_{log} < (GR_{max} - GR_{min}) * 0.3 + GR_{min} \qquad \text{[Eq. 2]}$$

A vertical line was drawn along the calculated critical GRlog value in the well logs. Productive intervals were then selected by shading in any section in which the gamma ray log line crossed to the left of the vertical line drawn along the GRlog value.

After the productivity intervals were identified, resistivity and porosity data were chosen from the productive intervals only. Acoustic transit times and true resistivity values were taken at 5-ft intervals within each productive zone.

4.1 Determination of Net Pay Zones

The thickness of the net pay zone for each well is the sum of each productive zone that has a thickness greater than 5 ft and a porosity greater than 10%. However, for the Inyan Kara Formation, only the wells with a net pay zone greater than 100 ft, or if less than 100 ft but with a porosity greater than 20%, were chosen for the study. Well data are summarized in Appendix A.

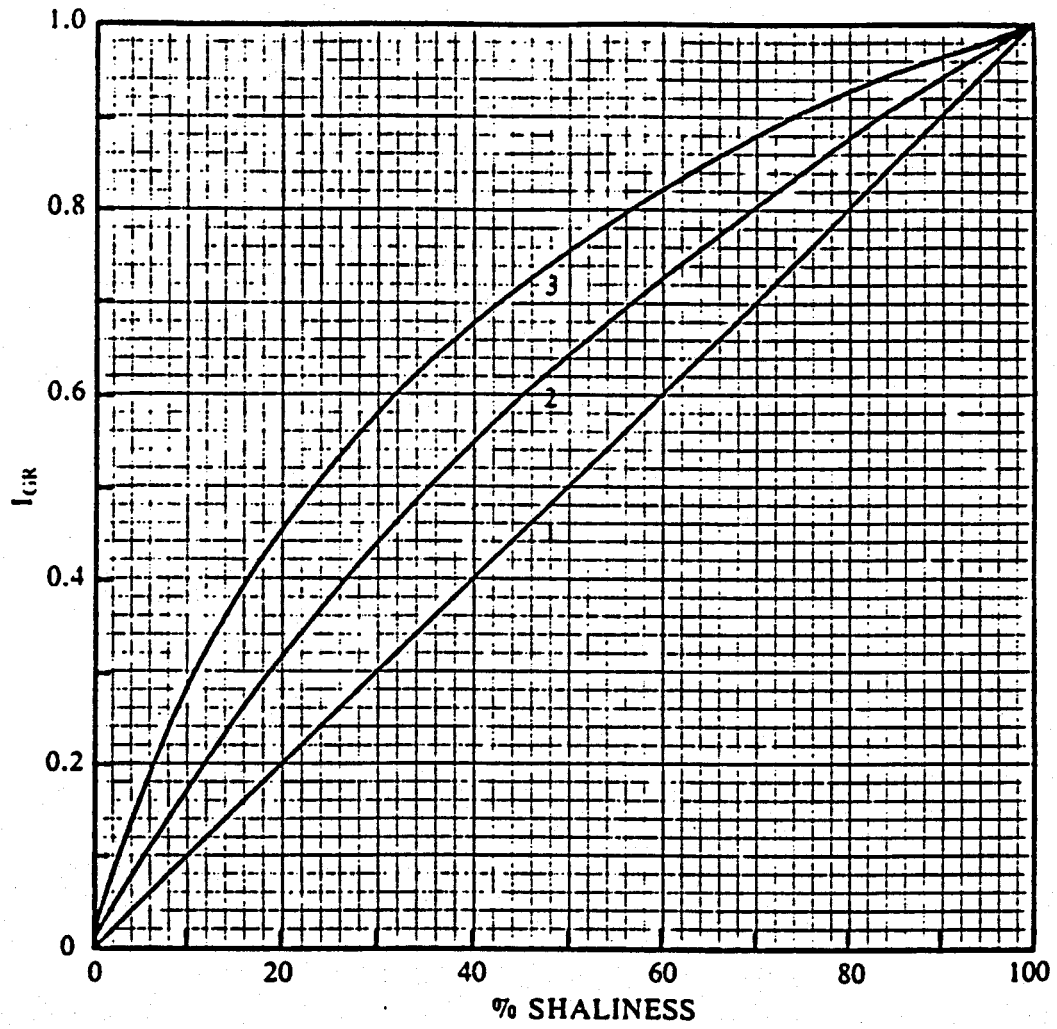

Figure 5. Shale volume versus gamma ray index (Brock, 1986).

4.2 Determination of Porosity

Acoustic transit time values measured in μ sec/ft were used to estimate porosity. Equation 3 was used to calculate sonic porosity values.

$$\phi\ sonic = \frac{(\Delta t_{log} - \Delta t_{ma})}{(\Delta t_f - \Delta t_{ma})} \qquad \text{[Eq. 3]}$$

where:

ϕsonic = sonic-derived porosity

Δt_{ma} = interval transit time of matrix

Δt_{log} = interval transit time of formation

Δt_f = interval transit time of fluid in the wellbore (fresh mud = 189, and salt mud = 185)

The porosity was calculated at each 5-ft interval, and the average porosity of the entire productive zone of each well was determined.

4.3 Determination of Apparent Water Resistivity

Resistivity data for productive intervals were obtained from Laterolog curves. These data were then used to calculate the apparent resistivity, (R_{wa}), in ohm -meters of formation water at formation temperature. Equation 4 was used for the resistivity calculations.

$$R_w = \frac{\phi^m R_t}{a} \qquad \text{[Eq. 4]}$$

where:

ϕ = formation porosity

R_w = resistivity of formation water at formation temperature

R_t = true formation resistivity (R_t=R_o, when the formation is fully saturated)

a = lithology coefficient (1.0 for carbonate and 0.62 for sandstone)

m = cementation exponent (2.0 for carbonates and 2.15 for sandstone)

When measuring the formation resistivity of a saturated matrix, it is reasonable to assume that R_t is approximately equal to R_o, and R_{wa} is approximately equal to R_w. Equation (4) can then be rearranged to calculate R_{wa} if the porosity is given.

$$R_{wa} = \frac{\phi^m * R_o}{a} \qquad \text{[Eq. 5]}$$

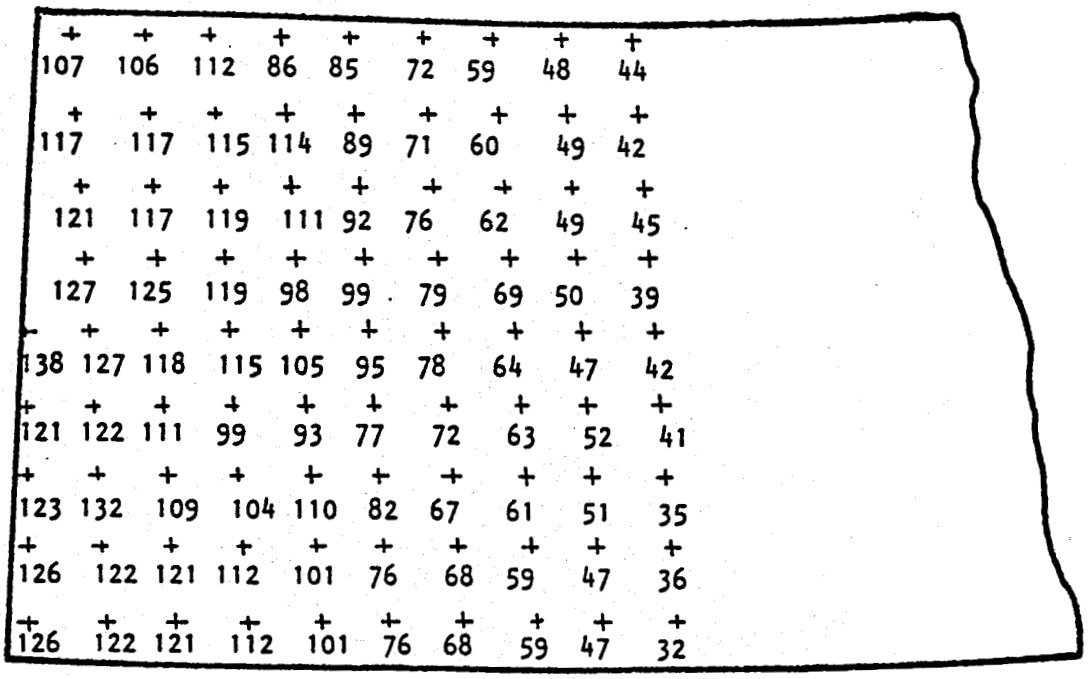

Figure 7. Calculated temperatures on top of the Red River aquifer (Gosnold, 1984).

4.4 Estimation of Water Quality from Well Logs

Water quality is one of the primary criteria that determines the potential use of geothermal waters. Although analysis of actual water samples taken from the formation will provides the best water chemistry information for studies, in some instances, like the Inyan Kara Formation, water chemistry data were not available for this study. Fortunately, in such a case, well logs are useful for estimating water quality. Geological logs, such as deep-focused Laterologs, can be used to estimate total dissolved solids (MacCary, 1980). This geophysical method usually does not give specific ion concentrations, but does characterize water quality.

Table 2 shows the Dakota Formation water chemistry provided by Dwight Energydata Inc., for this study. With the water chemistry data listed in Table 2 and the corresponding water resistivity data, a graph showing the relationship between water resistivity and total dissolved solids was constructed, as shown in Figure 6. This graph was used for the estimation of the total dissolved solids, assuming that R_{wa} is given. Equation 7, using least squares regression analysis, was derived to achieve the best possible fit to the observed data on Figure 8.

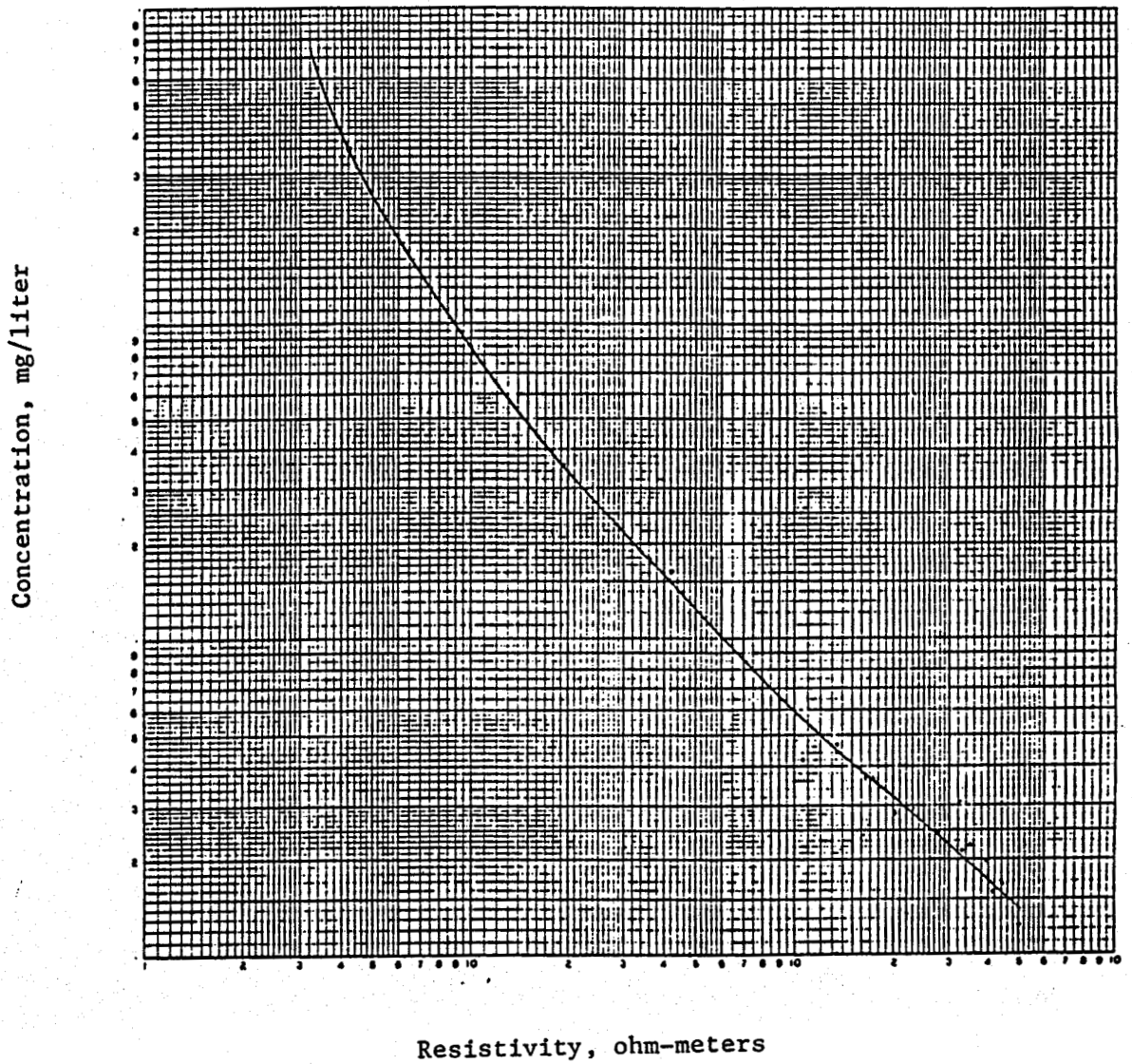

Figure 8. Total dissolved solids concentration and water resistivity for Dakota Formation.

Equation 7 was used for water chemistry calculations in this study. When water chemistry was calculated from resistivity values (R_{was}) ranging from 0.192 to 1.646 ohm-meters, the maximum error for Equation 7 was 264 mg/L.

$$TDS = -20{,}658.246(R_{wa})^3 + 93{,}064.781(R_{wa})^2 - 150{,}734.06(R_{wa}) + 106{,}889.28 - 26{,}822.637(1/R_{wa}) + 4009.8608(1/R_{wa}^2) - 101.9975(1/R_{wa}^3) \quad \text{[Eq. 7]}$$

5.0 Estimations of Productivity Index and Original Water in Place

The knowledge of the geothermal water reserve and the production anticipated is crucial to sound development of geothermal resources. By knowing the geothermal water temperature and water production rate for each well, the gross energy production potential for each well can be calculated. Also, a knowledge of water reserves is necessary to estimate the producing life of geothermal resources.

5.1 Estimation of Productivity Index

Although Chu (1988) has suggested that the method of either Jones and others (1976) or Fetkovich (1973) can provide more accurate flow rate predictions than those estimated with the productivity index (PI) method, unfortunately, at the time of this study, the flow test data from the Inyan Kara Formation was not available for the study. Therefore, the PI method was used for flow rate predictions.

In the oil industry, the PI method has been used for predicting oil flow rate for many years. The PI is the ratio of the flow rate to the pressure drawdown at the producing interval. Thus a geothermal well's productivity index can be calculated by using Equation 8 as follows:

$$PI = \frac{7.08Kh}{\mu B[\ln(\gamma_e/\gamma_w) - 0.5]} \quad \text{[Eq. 8]}$$

TABLE 2

Dakota Formation Water Chemistry Data

T-R-S	Depth (ft)	HCO_3	Ca	CO_3	Cl	Fe	Mg	K	Na	SO_4	TDS(mg/L)
161-79-21	2192-2203	971	24	0	1,753	0	5	0	1,705	501	4,466
161-79-21	2192-2203	578	9	96	1,405	0	2	0	1,418	479	3,694
164-80-35	2109-2213	827	76	0	1,592	0	9	0	1,381	273	4,196
163-92		1,210	32	0	7,870	0	7	0	5,957	940	16,016
145-101-32	5350-5390	1,086	259	0	10,600	0	57	408	7,114	1,000	19,973
158-81-7	2700	1,122	11	48	1,900	0	0	0	1,847	351	4,710
155-95-5	4860-5030	220	1,213	0	209,521	0	154	0	138,540	9,004	358,543
155-96-14	4750-4925	815	68	0	9,395	0	29	0	6,797	1,113	17,803
156-95-18	4702-5180	1,509	13	0	419	0	13	0	1,118	662	3,737
159-103-20		1,122	762	0	2,100	0	116	350	12,845	265	35,897
149-052-21		19	298	0	1,860	0	116	52	1,360	1,560	5,300
150-051-08		325	326	0	1,460	0	104	27	1,160	1,410	4,758
150-051-18		345	328	0	1,620	0	127	33	1,110	1,210	4,640
160-054-31		285	309	0	6,600	0	142	44	4,410	1,090	12,800
163-056-11		184	1,190	0	15,900	8	442	150	8,830	2,300	28,900

where:

PI = productivity index, bbl/day/psi

K = formation permeability, darcy

h = net pay thickness, ft

μ = fluid viscosity, cp

B = water formation volume factor

γ_e = external drainage radius, ft

γ_w = well-bore radius, ft

Assumptions made for the calculations of geothermal flow rate are:

- Formation flow is a single phase flow.
- Radial flow.
- The producing well is located at the center of a circular reservoir.

5.2 Estimation of Original Water in Place

The volume of the water in the reservoir was estimated by using the following equation:

$$OWIP = 7758 * \phi * S_w * h * A \qquad \text{[Eq. 9]}$$

where:

OWIP = original water in place, bbls

ϕ = average porosity, %

h = net pay thickness, ft

A = reservoir area, acres

S_w = water saturation (in this case, $S_w = 1$).

An assumption made for the calculations of original water in place is that the reservoir is a homogeneous reservoir with uniform reservoir properties such as pay zone, thickness, porosity, and water saturation.

6.0 RESULTS

This study has concentrated on the collecting and interpretation of geophysical data obtained from the well logs running through the Inyan Kara Formation. Unfortunately, no well test or flow test data were available for the long-term production performance predictions. However, the productivity index method was used for the prediction of the geothermal well's production performance.

The value of permeability of the formation can be either measured from the core samples or obtained from the pressure testing. However, the only permeability data available for this study is from one small section of an Inyan Kara core sample available in the NDGS Core Library, and the average permeability of this Inyan Kara core sample was 537 md.

Knowledge of the water formation volume factor, B_w, is need for predicting the PI of each well. B_w is the ratio of the water volume under reservoir conditions to the water volume under surface conditions. The value of the B_w at elevated temperature and pressure conditions can be calculated from an existing correlation (Kutasov, 1989). For the Inyan Kara Formation water, the water formation volume factors are in the range of 0.9972 to 1.02.

In order to calculate the productivity index of each well analyzed, the following assumptions must be made. In this study, the PI is calculated by assuming that γ_e is 1300 ft, which is equivalent to a well spacing of 120 acres; the drill bit size is 9 inches; the water viscosity is 1 cp; the water formation volume factor is 1.0; and the permeability of the formation is 100

md. The results of the PI, aquifer capacity, and the volume of the water in place are summarized in Tables 3 through 9.

TABLE 3

Geothermal Resources of Stark County

County: Stark Area: Dickinson Formation: Inyan Kara

Well No.	Aquifer Capacity (ϕ x h)	Productivity Index (bbl/day/psi)	Volume of Water in Place ($1x10^6$ bbl)
5548	19.1	11.4	17.8
5606	30.4	13.72	28.3
5911	29.9	17.1	27.9
6243	53.8	19.1	50.1
6307	16.5	14.9	15.3
6449	16.1	10.4	15.0
6682	25.1	12.9	23.3
6691	30.6	14.7	28.5
7007	26.2	16.6	24.4
7212	12.1	6.2	11.2
7247	19.6	13.1	18.3
8132	39.1	23.2	36.4
8665	63.6	27.4	59.2
9244	21.1	11.1	19.7
9257	49.9	24.3	46.5
9322	23.0	11.7	21.4
9670	29.8	18.3	27.7
9684	31.2	20.8	29.0
10570	27.1	15.9	25.2
11260	32.1	16.5	30.0
11913	33.7	16.7	31.4
12370	28.4	14.4	26.5
12453	34.2	16.9	31.7

TABLE 4

Geothermal Resources of Williams County

County: Williams Area: Williston Formation: Inyan Kara

Well No.	Aquifer Capacity (ϕ x h)	Productivity Index (bbl/day/psi)	Volume of Water in Place ($1x10^6$ bbl)
6789	37.8	16.3	35.1
6876	42.8	17.0	39.8
6975	23.7	11.0	22.0
7004	28.0	13.0	26.1
7054	17.2	6.6	16.0
7285	13.5	6.8	12.6
7405	25.1	11.5	23.3
7504	19.0	8.0	17.7
7578	16.2	7.1	15.1
7692	23.0	10.0	21.3
8413	33.1	16.1	30.7
8730	27.2	11.2	25.3
6783	10.0	19.2	37.3
11097	29.5	13.5	27.5
11139	13.7	7.0	12.8
11166	10.7	6.1	10.0
11190	25.4	12.6	23.7
11420	45.1	18.0	42.0
11453	22.2	10.5	20.7
11455	15.0	7.2	14.0
11602	26.3	9.3	24.5
11657	20.0	9.5	18.6
11674	38.7	16.4	36.0
11757	26.9	10.1	25.0
11932	22.8	9.6	21.2
11954	14.2	7.0	13.2
11965	20.5	9.9	19.0
12060	16.6	8.0	15.4
12131	17.7	9.0	16.5
12146	45.2	23.8	42.0
NEL-44-25	18.6	9.5	17.3
TPX-34-36	31.9	13.2	29.6

TABLE 5

Geothermal Resources of McKenzie County

County: McKenzie Area: Watford City Formation: Inyan Kara

Well No.	Aquifer Capacity (ϕ x h)	Productivity Index (bbl/day/psi)	Volume of water in Place ($1x10^6$ bbl)
6826	21.0	10.8	19.5
6925	15.81	10.4	14.7
7226	23.94	13.8	22.3
7743	16.12	8.0	15.0
7854	14.38	7.4	13.4
7943	24.74	11.6	23.0
8092	11.46	8.0	10.7
8130	15.66	9.0	14.6
8171	35.37	16.6	32.9
8631	20.39	10.5	19.0
8678	15.55	7.3	14.5
8681	16.59	9.9	15.4
8747	15.45	10.3	14.4
8872	16.6	7.1	15.4
8945	24.0	14.1	7.5
9180	11.1	6.4	10.4
9920	24.6	11.2	22.9
9433	17.2	10.2	16.0
9619	11.8	7.0	11.0
9793	17.0	7.5	15.8
10104	16.5	8.3	15.4
10427	16.0	9.3	14.8
10527	13.1	6.1	12.2
10689	41.0	17.3	38.0
10853	25.8	12.3	24.0
11204	18.0	9.6	16.6
11228	15.2	8.3	14.2
11322	11.5	6.1	10.7
11416	23.0	11.3	21.3
11920	35.0	14.0	32.7
11963	26.2	11.5	24.4
11990	31.1	14.6	29.0
11995	52.0	26.5	48.3
12288	40.0	20.0	37.2
12498	21.0	12.1	19.6

TABLE 6

Geothermal Resources of Bottineau County

County: Bottineau Area: Bottineau Formation: Inyan Kara

Well No.	Aquifer Capacity (ϕ x h)	Productivity Index (bbl/day/psi)	Volume of Water in Place (1×10^6 bbl)
9302	16.0	4.0	14.8
9521	30.4	7.1	28.3
9747	42.3	9.9	39.3
10097	92.0	25.4	85.5
10236	27.4	6.9	25.5
10246	38.5	10.6	35.8
10251	71.5	18.0	66.5
10443	33.3	10.0	31.0
10452	80.8	21.3	75.2
11373	53.9	14.5	50.2
11448	53.6	15.3	49.8
11531	35.4	9.2	32.9
11632	31.5	9.0	29.3
11940	45.7	12.9	42.5

TABLE 7

Geothermal Resources of Dunn County

County: Dunn Area: Dickinson Formation: Inyan Kara

Well No.	Aquifer Capacity (ϕ x h)	Productivity Index (bbl/day/psi)	Volume of Water in Place (1×10^6 bbl)
5621	26.0	11.2	24.1
7360	29.0	12.2	26.9
8491	50.0	22.9	46.5
8754	46.8	21.4	43.5
8896	33.2	15.3	30.9

TABLE 8

Geothermal Resources of Mountrail County

County: Mountrail Area: New Town Formation: Inyan Kara

Well No.	Aquifer Capacity (ϕ x h)	Productivity Index (bbl/day/psi)	Volume of Water in Place ($1x10^6$ bbl)
7414	101.6	39.5	94.5
8069	52.6	20.9	48.9
8213	63.7	26.5	59.3
10692	100.6	41.0	93.6
10850	26.1	10.6	24.3

TABLE 9

Geothermal Resources of McKenzie County

County: McKenzie Area: Watford City Formation: Red River

Well No.	Aquifer Capacity (ϕ x h)	Productivity Index (bbl/day/psi)	Volume of Water in Place ($1x10^6$ bbl)
4439	3.58	3.1	1.85
6775	1.88	5.6	3.31
7422	5.02	5.6	4.7
7929	5.17	8.1	4.8
8530	4.53	5.6	4.2
9006	1.04	1.6	1.0
9102	6.18	9.2	5.8
9377	5.92	8.1	5.5
9403	3.63	5.6	3.4
9702	3.17	4.1	3.0
10186	6.05	7.6	5.6
10285	1.49	3.1	1.4
11416	5.06	7.1	4.7
11980	2.16	3.6	2.0

7.0 CONCLUSIONS

The results of this study have led to the following conclusions:

- The Inyan Kara Formation is the most important geothermal resource in terms of flow rate and water quality. The results indicate that the Inyan Kara Formation, in many areas, contains a net pay zone of more than 100 ft, with average porosities greater than 20%. The results also indicate that the water quality from the Inyan Kara Formation is substantially better than that of the deep formations.
- The Madison Formation is less favorable for geothermal direct-use development because most of the water from this formation may contain TDS as high as 350,000 mg/L. The disposal and operation of the highly saline waters, which are critically important, may limit the economic use of the geothermal waters.
- The Duperow and Red River Formations are not considered good geothermal aquifers at the present time because their great depth, low porosity, and low permeability are unlikely to yield a sufficient amount of water for direct-use development.

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APPENDIX A

Tables of Well Numbers, Locations, Depths to Formation Top and Bottom, Producing Intervals, Average Porosity, and Water Chemistry

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 6789

LOCATION: AREA: WILLISTON
COUNTY: WILLIAMS
SW1/4, SW1/4, 1/4
SEC.23, T156N, R103W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5460 ft
BOTTOM: 5917 ft

PAY THICKNESS: 160 ft
AVE. POROSITY: 23.6%
WATER CHEMISTRY: 16936 mg/L
AVE. RESISTIVITY: 0.389 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5478	27.0	18638
5500-5504		
5502	19.0	18004
5512-5517		
5515	19.0	25931
5527-5530		
5528	15.8	10591
5545-5563		
5545	15.0	15573
5550	15.0	47790
5555	19.8	45330
5560	23.0	32743
5641-5644		
5642	23.0	55341
5651	39.7	5493
5709-5720		
5710	14.2	54985
5715	22.2	94649
5731	25.4	12719
5747-5757		
5750	19.0	76099
5755	23.0	40390
5770-5778		
5670	17.4	55378
5781	29.4	14641
5804-5828		
5805	15.0	19238
5810	23.0	21527
5815	21.4	21143
5820	21.4	21953
5825	42.1	11217
5829-5835		
5830	24.6	12013
5835	19.0	12582

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5840-5853		
5840	19.0	22633
5845	19.0	25327
5850	19.0	33244
5854-5872		
5855	19.8	13755
5860	19.0	31114
5865	17.4	66371
5870	21.4	33288
5880-5886		
5880	23.8	20967
5885	24.6	20598
5890-5905		
5890	25.4	20332
5895	22.2	27493
5900	23.8	19317
5905	19.0	35540
5911	22.2	17964

GEOTHERMAL RESERVOIR DATA

WELL NUMBER:6876

LOCATION: AREA: WILLISTON
COUNTY: WILLIAMS
SW1/4, SE1/4, 1/4
SEC.6, T155N, R101W

FORMATION: INYAN KARAPAY
AGE: LOWER CRETACEOUS
DEPTH: TOP:5480 ft
BOTTOM: 5970 ft

THICKNESS: 167 ft
AVE. POROSITY: 25.6 ft
WATER CHEMISTRY: 20757 mg/L
AVE. RESISTIVITY: 0.302 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5545-5549		
5547	27.1	20310
5619-5630		
5620	15.0	116553
5625	15.0	87041
5630	15.7	85116
5641	18.0	25995
5712-5722		
5715	39.3	4410
5720	18.0	183041
5767-5770		
5768	17.3	24028
5782-5772		
5785	24.1	20618
5790	24.1	54100
5795	24.1	20607
5800	22.6	34110
5805	22.6	17581
5810	22.6	70809
5815	20.3	111533
5820	21.1	35367
5825	21.8	81806
5830	21.8	81757
5835	22.6	49717
5840	24.1	24057
5845	24.1	20552
5850	21.8	24096
5855	24.1	25731
5860	26.4	21070
5865	22.6	26400
5870	20.3	110800

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5879-5889		
5885	43.1	5221
5900-5930		
5905	21.1	43212
5910	21.1	43189
5915	20.3	39859
5920	27.9	15970
5925	19.5	45941
5930	16.5	44093
5953-5960		
5955	26.4	37645
5960	25.6	23714

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 6975

LOCATION: AREA: WILLISTON
COUNTY: WILLIAMS
SE1/4, SE1/4, 1/4
SEC.16, T155N, R100W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5290 ft
BOTTOM: 5720 ft

PAY THICKNESS: 109 ft
AVE. POROSITY: 21.7%
WATER CHEMISTRY: 19093 mg/L
AVE. RESISTIVITY: 0.333 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5301	19.8	32825
5313-5320		
5315	23.0	37345
5320	13.4	78416
5484	29.4	7791
5490-5494		
5492	38.9	3020
5503-5518		
5505	23.0	16380
5510	20.6	133179
5515	19.0	90795
5537	23.8	29539
5572	21.4	18394
5613-5617		
5615	19.0	33975
5623-5626		
5624	19.8	29835
5637-5647		
5640	21.4	14010
5645	23.0	12662
5650-5653		
5652	23.0	13990
5660-5678		
5660	23.8	13056
5665	23.0	17141
5670	23.0	12642
5675	22.2	13923
5679-5716		
5680	23.0	12318
5685	19.0	18574
5690	34.2	5936
5695	35.8	5231
5700	19.8	29645
5705	37.4	7050
5710	27.8	9828
5715	22.2	26070

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 7004

LOCATION: AREA: WILLISTON
COUNTY: WILLIAMS
NE1/4, SE1/4, 1/4
SEC.30, T155N, R100W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5220 ft
BOTTOM: 5709 ft

PAY THICKNESS: 123 ft
AVE. POROSITY: 22.8%
WATER CHEMISTRY: 18459 mg/L
AVE. RESISTIVITY: 0.348 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5264-5266		
5255	19.0	15184
5278-5316		
5280	23.0	23053
5285	21.4	34594
5290	20.6	19749
5295	19.0	20073
5300	19.8	21253
5305	21.4	31692
5310	23.0	21937
5315	25.4	90197
5340-5350		
5340	25.4	11742
5345	23.8	16316
5350	22.2	96966
5355-5369		
5355	24.6	22085
5360	25.4	24843
5365	27.0	12904
5373-5383		
5375	25.4	13273
5380	27.0	17130
5386-5400		
5390	17.4	26462
5395	23.8	16281
5400	23.8	25199
5477-5479		
5478	31.0	9943
5530-5536		
5530	26.2	12733
5535	25.4	14893
5541	18.2	13659
5546-5550		
5548	21.4	20553
5560-5565		
5560	14.2	58570
5565	17.4	20791

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5590-5592		
5591	21.4	28757
5602-5614		
5605	23.8	21120
5610	23.8	21114
5640-5643		
5642	26.2	13988

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 7054

LOCATION: AREA: WILLISTON
COUNTY: WILLIAMS
NE1/4, NW1/4, 1/4
SEC.14, T156N, R102W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5300 ft
BOTTOM: 5920 ft

PAY THICKNESS: 65 ft
AVE. POROSITY: 26.5%
WATER CHEMISTRY: 17919 mg/L
AVE. RESISTIVITY: 0.361 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5307	25.9	19249
5458-5467		
5460	19.2	26478
5465	20.9	23605
5476	9.9	200000
5502	19.2	33118
5523	19.2	19622
5536-5542		
5538	81.6	2300
5545	60.5	5098
5561-5567		
5563	21.7	17919
5597	20.9	24498
5620	20.0	13588
5629	20.9	16944
5631-5638		
5634	21.7	14512
5646-5658		
5650	20.0	61262
5655	17.5	45233
5660-5667		
5660	24.2	14808
5665	25.9	19760
5697	28.5	23909

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 7285

LOCATION: AREA: WILLISTON
COUNTY: WILLIAMS
NE1/4, SE1/4, 1/4
SEC.18, T154N, R100W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5415 ft
BOTTOM: 5870 ft

PAY THICKNESS: 67 ft
AVE. POROSITY: 20.2%
WATER CHEMISTRY: 30725 mg/L
AVE. RESISTIVITY: 0.213 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5682	18.2	45798
5685-5692		
5685	15.8	82185
5690	15.8	144667
5698-5705		
5700	12.6	54701
5705	17.4	45758
5740-5750		
5740	20.6	15485
5745	16.6	91108
5750	17.4	59802
5772-5814		
5780	23.8	16968
5785	19.8	39570
5790	25.4	22642
5795	25.4	18630
5805	23.0	25033
5810	28.6	25724

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 7405

LOCATION: AREA: WILLISTON
COUNTY: WILLIAMS
SW1/4, NE1/4, 1/4
SEC.8, T155N, R99W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5400 ft
BOTTOM: 5850 ft

PAY THICKNESS: 113 ft
AVE. POROSITY: 22.2%
WATER CHEMISTRY: 22859 mg/L
AVE. RESISTIVITY: 0.272 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5458	21.2	21985
5462-5480		
5465	22.1	31217
5470	23.9	23635
5475	29.2	7024
5480	29.2	28275
5584-5591		
5585	19.9	11988
5590	19.9	34061
5676-5740		
5680	19.0	105964
5685	22.7	28610
5690	19.7	18689
5695	17.5	36699
5700	17.5	84300
5705	17.5	95855
5710	18.2	46152
5715	18.2	80232
5720	19.0	23815
5725	17.5	29370
5730	19.0	28382
5735	16.8	45966
5740	23.4	76221
5760-5768		
5760	30.0	15479
5765	27.1	21415
5777-5780		
5785	23.4	12166
5795-5802		
5795	21.9	16733
5800	21.9	38043
5820-5825		
5820	23.4	51298
5825	17.5	94877

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 7504

LOCATION: AREA: WILLISTON
COUNTY: WILLIAMS
SE1/4, SE1/4, 1/4
SEC.16, T154N, R100W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5300 ft
BOTTOM: 5920 ft

PAY THICKNESS: 78 ft
AVE. POROSITY: 24.4%
WATER CHEMISTRY: 19106 mg/L
AVE. RESISTIVITY: 0.333 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5723-5768		
5725	24.2	15617
5730	20.0	38445
5735	20.9	36498
5740	22.6	26553
5745	25.9	18838
5750	22.6	10723
5755	25.1	25116
5760	24.2	22381
5765	18.3	168757
5781	24.2	14717
5817-5824		
5821	24.2	12385
5827	25.1	19878
5831-5846		
5835	34.4	14828
5840	31.8	17876
5845	20.9	30547
5878-5885		
5880	24.2	20200
5885	26.8	13760

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 7578

LOCATION: AREA: WILLISTON
COUNTY: WILLIAMS
SE1/4, NW1/4, 1/4
SEC.34, T155N, R100W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5528 ft
BOTTOM: 6000 ft

PAY THICKNESS: 70 ft
AVE. POROSITY: 23.2%
WATER CHEMISTRY: 16503 mg/L
AVE. RESISTIVITY: 0.294 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5584-5588		
5586	18.3	44825
5687-5698		
5690	17.5	33827
5695	14.1	178147
5830-5841		
5830	31.0	0
5835	16.7	78556
5840	19.2	43937
5848-5862		
5850	22.6	21169
5855	10.8	355074
5860	19.2	43816
5870-5880		
5870	20.0	20156
5875	21.7	48637
5880	36.9	4808
5900	31.0	7832
5906-5912		
5909	36.9	11848
5939-5946		
5940	25.1	29246
5945	25.1	29231
5990-5994		
5992	28.5	16503

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 7692

LOCATION: AREA: WILLISTON
COUNTY: WILLIAMS
SW1/4, SE1/4, 1/4
SEC.24, T155N, R102W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5560 ft
BOTTOM: 5980 ft

PAY THICKNESS: 98 ft
AVE. POROSITY: 23.3%
WATER CHEMISTRY: 22843 mg/L
AVE. RESISTIVITY: 0.272 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5810-5871		
5810	20.9	22421
5815	28.5	18525
5820	20.9	19090
5825	15.8	53485
5830	18.3	103362
5835	20.0	53692
5840	24.2	25562
5845	22.6	34421
5850	24.2	14003
5855	20.0	38697
5860	25.9	20744
5865	28.5	15553
5870	28.5	34944
5879-5881		
5880	37.7	13346
5898-5917		
5900	23.4	24296
5905	24.2	20378
5910	24.2	17604
5915	20.0	32602
5920-5936		
5920	24.2	16550
5925	20.0	35234
5930	20.9	24275
5935	20.0	42335

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 8413

LOCATION: AREA: WILLISTON
COUNTY: WILLIAMS
SE1/4, NW1/4, 1/4
SEC.14, T156N, R97W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 4870 ft
BOTTOM: 5255 ft

PAY THICKNESS: 159 ft
AVE. POROSITY: 20.80%
WATER CHEMISTRY: 33957 mg/L
AVE. RESISTIVITY: 0.199 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
4900-4906		
4900	18.0	28212
4905	18.8	56427
4979-5002		
4980	16.5	122188
4985	20.3	41252
4990	22.6	27055
4995	24.9	25927
5000	23.3	110198
5004-5008		
5006	23.3	34007
5040-5112		
5040	25.6	28153
5045	22.6	37940
5050	20.3	50601
5055	19.5	59066
5060	18.8	45625
5065	20.3	75514
5070	21.8	27660
5075	22.6	25291
5080	18.0	59125
5085	18.8	105123
5090	19.5	180071
5095	20.3	31929
5100	18.0	58992
5105	20.3	28136
5110	24.9	203415
5134	23.3	30585
5142-5146		
5145	14.2	22491
5292-5200		
5195	18.0	33711
5200	22.6	79521
5203-5244		
5205	21.8	19492
5210	18.0	92967

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5215	22.6	28514
5220	22.6	28503
5225	18.0	41014
5230	21.8	29230
5235	21.8	42169
5240	23.3	57101

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 8730

LOCATION: AREA: WILLISTON | FORMATION: INYAN KARA | PAY THICKNESS: 110 ft

COUNTY: WILLIAMS | AGE: LOWER CRETACEOUS | AVE. POROSITY: 24.7%

DEPTH: TOP: 5590 ft | WATER CHEMISTRY: 16978 mg/L

SEC.24, T154N, R103W | BOTTOM: 6042 ft | AVE. RESISTIVITY: 0.388 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5633-5635		
5635	13.6	29469
5860-5870		
5860	21.9	21989
5865	21.2	42961
5870	20.5	48788
5880-5885		
5880	22.5	16807
5885	22.5	16385
5891-5902		
5895	19.7	30180
5900	23.5	15674
5908-5958		
5910	30.1	16075
5915	28.2	20977
5920	28.2	11078
5925	28.2	15782
5930	30.1	16833
5935	24.4	19334
5940	26.3	11730
5945	19.7	37558
5950	23.5	30235
5955	26.3	14361
5965-5995		
5965	28.2	4547
5970	23.5	21684
5975	22.5	19956
5980	25.4	17456
5985	20.6	22849
5990	19.7	34489
5995	21.6	17964
6003	19.7	32013
6015	25.4	18769

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 9783

LOCATION: AREA: WILLISTON
COUNTY: WILLIAMS
NE1/4, SW1/4, 1/4
SEC.11, T156N, R97W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 4900 ft
BOTTOM: 5290 ft

PAY THICKNESS: 189 ft
AVE. POROSITY: 21.19%
WATER CHEMISTRY: 27624 mg/L
AVE. RESISTIVITY: 0.23 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
4920	22.6	19503
4944	21.8	22398
4980-4987		
4980	17.3	17743
4985	11.2	324917
4988-4995		
4990	21.1	36238
4995	18.0	26121
4997-5000		
4999	26.4	26689
5067-5140		
5070	20.3	27785
5075	23.3	9393
5080	22.6	13829
5085	20.3	20097
5090	20.3	40883
5095	21.1	30365
5100	20.3	40840
5105	19.5	79097
5110	19.5	79048
5115	21.8	25731
5120	21.8	25722
5125	22.6	192135
5130	22.6	18704
5135	21.8	38693
5140	20.3	36977
5193-5290		
5195	17.3	100045
5200	25.6	28457
5205	19.5	42152
5210	21.8	49370
5215	21.1	24991
5220	22.6	34110
5225	20.3	40312
5230	19.5	32761
5235	21.1	24956
5240	21.8	29104

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5245	24.9	23924
5250	19.5	77715
5255	21.8	100829
5260	21.8	19720
5265	19.5	28728
5270	19.5	28717
5275	24.9	22441
5280	20.3	40084
5285	22.6	42902
5290	27.9	22883

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 11097

LOCATION: AREA: WILLISTON
COUNTY: WILLIAMS
SW1/4, SW1/4, 1/4
SEC.26, T156N, R103W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5500 ft
BOTTOM: 5920 ft

PAY THICKNESS: 133 ft
AVE. POROSITY: 22.2%
WATER CHEMISTRY: 19052 mg/L
AVE. RESISTIVITY: 0.334 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5508-5516		
5510	21.4	31874
5515	23.8	13600
5527-5533		
5530	21.4	27542
5536-5540		
5538	19.0	28710
5548	19.8	21265
5551	19.8	15365
5642-5647		
5645	20.6	26773
5662-5670		
5665	21.4	112070
5670	26.2	77655
5702	16.6	18828
5749	22.2	10698
5753	24.6	21820
5760-5768		
5765	25.4	20487
5769-5783		
5770	21.4	18238
5775	19.8	27817
5780	19.0	19770
5788-5809		
5790	27.0	4793
5795	23.8	11285
5800	23.8	12263
5805	28.6	14180
5815	18.2	19076
5818-5825		
5820	19.0	38809
5825	25.4	12649
5834-5839		
5836	18.2	27109
5855-5872		
5855	23.8	15188

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5860	21.4	20367
5865	22.2	32378
5870	23.8	40315
5879	30.2	14477
5890-5913		
5890	23.8	15153
5895	22.2	45370
5900	19.8	62612
5905	20.6	46775
5910	23.0	35151

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 11139

LOCATION: AREA: WILLISTON
COUNTY: WILLIAMS
NW1/4, NW1/4, 1/4
SEC.23, T156N, R100W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5335 ft
BOTTOM: 5800 ft

PAY THICKNESS: 69 ft
AVE. POROSITY: 19.9%
WATER CHEMISTRY: 29678 mg/L
AVE. RESISTIVITY: 0.256 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5367	22.2	21328
5382	18.2	31573
5389	18.2	22188
5394-5402		
5395	19.8	24269
5400	18.2	51767
5528-5532		
5530	19.8	40947
5536	21.4	37946
5640-5657		
5640	23.0	29083
5645	16.6	64387
5650	22.2	18235
5655	23.8	26543
5682-5691		
5685	15.8	73040
5690	17.4	95958
5734-5760		
5735	19.0	19157
5740	19.0	30975
5745	18.2	36309
5750	19.8	22551
5755	19.8	19514
5760	19.0	22503
5780	27.0	23222

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 11166

LOCATION: AREA: WILLISTON
COUNTY: WILLIAMS
SW1/4, NW1/4, 1/4
SEC.4, T153N, R102W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5600 ft
BOTTOM: 6035 ft

PAY THICKNESS: 60 ft
AVE. POROSITY: 17.9%
WATER CHEMISTRY: 35083 mg/L
AVE. RESISTIVITY: 0.195 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5616-5625		
5620	19.5	70428
5625	20.2	32546
5760	16.7	32282
5767	16.7	22669
5777-5788		
5780	18.1	25604
5785	20.9	28819
5880-5886		
5880	20.9	15751
5885	13.9	63575
5935-5966		
5935	17.4	20616
5940	18.1	50752
5945	17.4	66232
5950	17.4	66181
5955	16.7	70799
5960	17.4	45238
5965	16.7	113153

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 11190

LOCATION: AREA: WILLISTON
COUNTY: WILLIAMS
NW1/4, SE1/4, 1/4
SEC.36, T156N, R101W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5270 ft
BOTTOM: 5690 ft

PAY THICKNESS: 124 ft
AVE. POROSITY: 20.5%
WATER CHEMISTRY: 20075 mg/L
AVE. RESISTIVITY: 0.313 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5285-5288		
5287	19.0	25266
5292-5298		
5295	19.0	25252
5317-5332		
5320	17.4	70891
5325	24.6	17007
5330	27.8	23808
5431	23.8	15107
5455-5465		
5455	23.8	29744
5460	23.8	29731
5465	24.6	10936
5484-5490		
5485	21.4	29352
5490	14.2	307977
5525-5534		
5525	15.8	26019
5530	19.8	41116
5548	24.6	14541
5555-5574		
5555	29.4	7740
5560	18.2	29045
5565	16.6	44745
5570	23.0	13373
5596-5608		
5600	11.8	73638
5605	19.8	11619
5618-5625		
5620	15.8	25840
5625	19.0	12745
5342-5650		
5645	19.0	31705
5650	19.0	17879
5653-5682		
5655	23.8	21227

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5660	16.6	22943
5665	20.6	30152
5670	22.2	21401
5675	20.6	15612
5680	21.4	19328

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 11420

LOCATION: AREA: WILLISTON
COUNTY: WILLIAMS
NW1/4, NW1/4, 1/4
SEC.2, T153N, R102W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5505 ft
BOTTOM: 5955 ft

PAY THICKNESS: 177 ft
AVE. POROSITY: 25.5%
WATER CHEMISTRY: 16828 mg/L
AVE. RESISTIVITY: 0.392 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5547-5630		
5550	23.8	15423
5555	22.2	121838
5560	19.0	34151
5565	23.0	10366
5570	19.0	17946
5575	19.0	30028
5580	20.6	55296
5585	19.0	90018
5590	19.8	75376
5595	23.0	41069
5600	22.2	54473
5605	23.0	29733
5610	19.8	88209
5615	19.0	181937
5620	25.4	14488
5625	19.0	22200
5630	41.3	9907
5658-5667		
5660	22.2	24666
5665	38.9	13519
5691	38.9	4549
5708	38.9	3879
5716-5725		
5720	37.4	16894
5725	35.0	4843
5728	35.0	11992
5742	30.2	10095
5750	29.4	15976
5759	37.4	4111
5800	13.4	30156
5805-5812		
5805	25.4	10439
5810	31.0	6657
5847-5851		
5849	19.0	19685

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5869	15.8	15599
5872-5898		
5875	14.2	106066
5880	16.6	133123
5885	15.8	42694
5890	23.0	53785
5895	27.0	41407
5913	23.8	19305
5918-5933		
5920	26.2	26414
5925	25.4	32146
5930	25.4	22611
5950	21.4	23771

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 11453

LOCATION: AREA: WILLISTON
COUNTY: WILLIAMS
SE1/4, SE1/4, 1/4
SEC.11, T153N, R100W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5600 ft
BOTTOM: 5986 ft

PAY THICKNESS: 103 ft
AVE. POROSITY: 21.6%
WATER CHEMISTRY: 14504 mg/L
AVE. RESISTIVITY: 0.472 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5615	19.8	29858
5621	15.8	14928
5629	17.4	18922
5637	19.0	31728
5643	15.0	31996
5660-5664		
5662	15.0	19375
5674-5682		
5675	22.2	46565
5680	25.4	37667
5785	15.8	22508
5817	15.8	13975
5824-5830		
5825	15.8	17612
5830	19.0	27849
5850	27.0	13597
5860-5866		
5860	18.2	16011
5865	15.8	48870
5869-5875		
5870	15.8	38032
5875	21.4	11604
5883-5889		
5885	31.8	7349
5918	15.8	17537
5941-5983		
5945	19.8	20713
5950	19.0	30874
5955	19.0	18726
5960	19.0	38254
5965	19.0	8783
5970	19.8	10293
5975	15.8	18710
5980	15.0	19336

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 11455

LOCATION: AREA: WILLISTON
COUNTY: WILLIAMS
NE1/4, NW1/4, 1/4
SEC.4, T153N, R99W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5775 ft
BOTTOM: 6200 ft

PAY THICKNESS: 71 ft
AVE. POROSITY: 21.1%
WATER CHEMISTRY: 19464 mg/L
AVE. RESISTIVITY: 0.325 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
6012	15.3	27877
6050	18.4	15768
6061	18.4	10609
6108-6118		
6110	19.2	17431
6115	26.1	8931
6120-6161		
6120	28.5	8318
6125	23.0	7333
6130	19.2	25771
6135	19.2	37245
6140	18.4	52393
6145	18.4	65662
6150	19.2	49338
6155	34.7	20722
6160	20.7	82936
6170-6187	27.7	20204
6175	20.7	33627
6180	16.8	67566
6185	16.8	193877

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 11602

LOCATION: AREA: WILLISTON
COUNTY: WILLIAMS
NE1/4, SW1/4, 1/4
SEC.2, T153N, R102W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5467 ft
BOTTOM: 5706 ft

PAY THICKNESS: 92 ft
AVE. POROSITY: 22.5%
WATER CHEMISTRY: 50682 mg/L
AVE. RESISTIVITY: 0.307 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5475	19.0	12863
5498-5544		
5500	22.2	55112
5515	22.2	30616
5520	19.0	90739
5525	22.2	65006
5530	20.6	35717
5535	23.8	19672
5540	23.8	58392
5586-5591		
5600	17.4	8637
5603-5606		
5623	19.0	24678
5636-5657		
5640	19.0	85000
5645	19.0	85000
5650	21.4	74825
5680-5689		
5680	21.4	14589
5685	16.6	9500

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 11657

LOCATION: AREA: WILLISTON
COUNTY: WILLIAMS
SW1/4, SW1/4, 1/4
SEC.35, T154N, R102W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5550 ft
BOTTOM: 5848 ft

PAY THICKNESS: 93 ft
AVE. POROSITY: 21.5%
WATER CHEMISTRY: 22856 mg/L
AVE. RESISTIVITY: 0.272 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5566-5584		
5570	20.2	20451
5575	19.5	95705
5580	22.3	40931
5612-5653		
5615	20.9	27403
5620	18.1	83944
5625	19.5	61044
5630	23.7	21506
5635	20.2	52705
5640	25.8	23842
5645	24.4	19503
5734-5741		
5735	22.3	45690
5764-5776		
5765	20.9	15193
5775	43.4	19618
5785-5787		
5786	17.4	13120
5800-5802		
5801	16.7	30540
5836-5847		
5840	18.8	14004
5845	20.9	13650

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 11674

LOCATION: AREA: WILLISTON
COUNTY: WILLIAMS
SW1/4, NE1/4, SW1/4
SEC.4, T152N, R104W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5370 ft
BOTTOM: 5840 ft

PAY THICKNESS: 162 ft
AVE. POROSITY: 23.9%
WATER CHEMISTRY: 17451 mg/L
AVE. RESISTIVITY: 0.374 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5404-5407		
5406	16.8	31949
5427-5467		
5430	22.8	30812
5435	25.4	20823
5440	25.4	13759
5445	23.7	24086
5450	20.3	14736
5455	24.5	14666
5460	19.4	62604
5465	25.4	45354
5493-5495		
5494	17.7	12796
5502-5507		
5504	16.0	22259
5521	17.7	17008
5551-5553		
5552	17.7	12750
5590-5607		
5590	17.7	71087
5595	20.3	34373
5600	21.1	32600
5605	22.8	68825
5610-5612		
5611	22.8	26040
5614-5621		
5615	23.7	22533
5620	22.0	31237
5622-5624		
5623	22.8	16475
5650-5660		
5650	22.8	6841
5655	16.8	63140
5660	19.4	36450

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5669-5678		
5670	18.5	42833
5675	18.5	42810
5735-5754		
5735	26.2	8925
5740	25.4	8347
5745	27.1	16854
5750	27.1	16850
5757-5761		
5759	26.2	19284
5764-5780		
5765	17.7	26872
5770	18.5	51263
5775	20.3	50588
5780	26.2	17737
5792	27.1	6746
5820	23.7	19542
5822-5829		
5826	16.0	17231

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 11757

LOCATION: AREA: WILLISTON
COUNTY: WILLIAMS
NE1/4, NW1/4, 1/4
SEC.20, T154N, R101W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5460 ft
BOTTOM: 5860 ft

PAY THICKNESS: 100 ft
AVE. POROSITY: 26.9%
WATER CHEMISTRY: 11145 mg/L
AVE. RESISTIVITY: 0.614 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5473-5475		
5474	18.2	34918
5512-5514		
5513	21.4	21564
5516-5518		
5517	19.0	23157
5525-5531		
5525	25.4	13734
5530	23.8	19723
5533-5543		
5535	25.4	19827
5540	27.0	14867
5673-5679		
5675	19.0	31668
5710-5713		
5712	21.4	23053
5721-5727		
5725	39.7	7784
5761	15.8	17664
5766-5770		
5768	15.8	22528
5789	15.0	16190
5793-5796		
5795	21.4	13015
5797-5806		
5800	20.6	22870
5805	19.0	17092
5818-5822		
5820	16.6	18676
5824	16.6	17346
5838-5854		
5840	19.0	38653
5845	21.4	21089
5850	25.4	13434

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 11932

LOCATION: AREA: WILLISTON
COUNTY: WILLIAMS
SW1/4, SW1/4, 1/4
SEC.11, T156N, R102W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5295 ft
BOTTOM: 5720 ft

PAY THICKNESS: 95 ft
AVE. POROSITY: 24%
WATER CHEMISTRY: 25881 mg/L
AVE. RESISTIVITY: 0.287 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5303	23.8	24254
5320	18.2	97318
5457-5470		
5460	23.8	20353
5465	28.6	26569
5470	26.2	19743
5473-5480		
5475	30.2	25374
5480	28.6	17821
5549	23.0	21042
5557	20.6	57137
5595-5600		
5595	15.0	71506
5600	39.7	6929
5627-5679		
5630	23.0	42522
5635	25.4	49415
5640	27.8	18973
5645	21.4	18670
5650	28.6	18870
5655	22.2	34252
5660	21.4	61938
5665	21.4	56138
5670	19.8	40638
5675	19.8	24733
5701-5708		
5705	25.4	33321

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 11954

LOCATION: AREA: WILLISTON
COUNTY: WILLIAMS
SE1/4, NE1/4, 1/4
SEC.36, T156N, R100W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5540 ft
BOTTOM: 6000 ft

PAY THICKNESS: 69 ft
AVE. POROSITY: 20.6%
WATER CHEMISTRY: 19265 mg/L
AVE. RESISTIVITY: 0.33 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5586-5592		
5598	20.9	16017
5602-5620		
5605	22.6	21772
5610	25.9	13125
5615	24.2	34306
5620	20.0	18245
5655	20.9	17008
5833	20.0	25486
5855	21.7	7073
5860	14.1	29666
5865	15.8	42638
5870	18.3	25397
5875	18.3	53227
5926-5932		
5928	21.7	25517
5939-5958		
5940	22.6	17450
5945	20.9	25181
5950	20.9	18338
5955	20.9	18811

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 11965

LOCATION: AREA: WILLISTON
COUNTY: WILLIAMS
NE1/4, NE1/4, 1/4
SEC.10, T156N, R99W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5490 ft
BOTTOM: 5892 ft

PAY THICKNESS: 97 ft
AVE. POROSITY: 21.1%
WATER CHEMISTRY: 21539 mg/L
AVE. RESISTIVITY: 0.29 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5531	18.2	19299
5538-5548		
5540	11.6	260358
5545	19.0	32203
5551-5563		
5553	13.1	79411
5560	21.2	21913
5662	39.6	2000
5764	24.9	5251
5770-5777		
5770	22.7	13593
5775	27.8	7394
5810-5856		
5810	24.9	14008
5815	19.0	35822
5820	20.4	63527
5825	21.2	19476
5830	16.0	43100
5835	19.7	74044
5840	17.5	35681
5845	19.7	63880
5850	19.0	38607
5855	27.1	26701
5860-5886		
5860	32.2	12019
5865	21.9	24956
5870	18.2	37866
5875	17.5	52399
5880	17.5	52361
5885	18.2	67808

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 12060

LOCATION: AREA: WILLISTON
COUNTY: WILLIAMS
NW1/4, NW1/4, 1/4
SEC.25, T156N, R100W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5450 ft
BOTTOM: 5680 ft

PAY THICKNESS: 79 ft
AVE. POROSITY: 21%
WATER CHEMISTRY: 19698 mg/L
AVE. RESISTIVITY: 0.321 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5483-5531		
5485	25.4	18996
5490	21.4	22347
5495	19.8	19058
5500	21.4	18431
5505	21.4	18425
5510	19.8	18202
5515	20.6	19144
5520	21.4	19448
5525	23.0	21832
5530	23.0	24150
5565-5575		
5565	19.8	11611
5570	19.0	36531
5575	18.2	17544
5605-5612		
5605	23.8	18854
5610	23.0	21694
5638-5642		
5640	19.0	42823
5648-5653		
5650	20.6	30000
5665-5670		
5665	18.2	19136
5670	19.8	20929

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 12131

LOCATION: AREA: WILLISTON
COUNTY: WILLIAMS
SEC.15, T156N, R79W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5550 ft
BOTTOM: 5910 ft

PAY THICKNESS: 89 ft
AVE. POROSITY: 19.9%
WATER CHEMISTRY: 21430 mg/L
AVE. RESISTIVITY: 0.291 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5562-5568		
5565	16.1	40587
5573	18.6	24080
5591	15.3	43552
5664-5670		
5667	27.5	16382
5672-5686		
5575	25.1	11580
5680	25.1	13391
5685	24.3	20262
5721	17.8	26549
5800	19.4	29054
5803-5806		
5804	20.2	27415
5809	21.0	27758
5850	17.8	16761
5856	16.1	14882
5862	18.6	11673
5863-5867		
5865	17.8	13598
5872	19.4	13505
5875-5886		
5875	20.2	6625
5880	20.2	15177
5885	20.2	14176
5890	19.4	13072
5894	16.9	13517
5896-5910		
5900	21.8	13065
5905	16.9	18054
5910	23.5	14046
5945-5966		
5945	25.9	6272
5950	21.0	12557
5955	12.0	30196

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 12146

LOCATION: AREA: WILLISTON | FORMATION: INYAN KARA | PAY THICKNESS: 234 ft

COUNTY: WILLIAMS | AGE: LOWER CRETACEOUS | AVE. POROSITY: 19.3%

SE1/4, NW1/4, 1/4 | DEPTH: TOP: 5317 ft | WATER CHEMISTRY: 20101 mg/L

SEC.10, T152N, R104W | BOTTOM: 5815 ft | AVE. RESISTIVITY: 0.313 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5334	17.3	16998
5388-5394		
5391	22.6	22501
5413-5420		
5415	14.2	20383
5420	15.0	27746
5430-5437		
5430	15.7	17127
5435	16.5	22019
5441-5459		
5445	18.8	12770
5450	17.3	40186
5455	18.0	37086
5460-5508		
5460	15.0	14816
5465	15.7	15153
5470	18.8	23792
5475	17.3	56696
5480	23.3	14754
5485	19.5	47468
5490	20.3	25819
5495	16.5	38307
5500	18.0	18660
5505	21.1	17986
5531-5552		
5535	20.3	23379
5540	19.5	20451
5545	18.8	20818
5550	21.1	23556
5560-5600		
5560	18.8	20802
5565	18.8	22069
5570	18.0	22588
5575	18.8	23640
5580	18.0	24135
5585	18.0	43018

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5590	18.8	37016
5595	19.5	32418
5600	24.1	19633
5627-5660		
5630	27.1	21412
5635	21.1	12729
5640	19.5	16540
5645	18.0	24038
5650	20.3	23220
5655	21.1	29802
5660	24.1	19578
5699-5733		
5700	21.8	16822
5705	20.3	26908
5710	24.1	8412
5715	23.3	8493
5720	20.3	11094
5725	15.7	35051
5730	18.0	22385
5748-5757		
5750	20.3	18921
5755	19.5	23122
5783	22.6	15831
5786-5793		
5790	21.1	15769
5804-5806		
5805	13.5	19405

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: NEL-44-25

LOCATION: AREA: WILLISTON
COUNTY: WILLIAMS
SE1/4, SE1/4, 1/4
SEC.25, T156N, R100W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5552 ft
BOTTOM: 6000 ft

PAY THICKNESS: 93 ft
AVE. POROSITY: 20%
WATER CHEMISTRY: 38320 mg/L
AVE. RESISTIVITY: 0.184 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5577	21.8	14868
5581-5587		
5585	23.3	31496
5720-5730		
5720	18.8	20295
5725	22.6	28767
5730	21.8	25720
5783	22.6	34206
5830-5859		
5830	22.6	24844
5835	19.5	51852
5840	18.0	128345
5845	17.3	211876
5850	18.8	107675
5855	20.3	77113
5917-5946		
5920	20.3	23458
5925	19.5	34826
5930	21.8	56273
5935	18.8	48110
5940	18.0	81203
5945	18.8	183330
5948-5965		
5950	17.3	31258
5955	18.8	31952
5960	18.0	39378
5965	20.3	49263

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: TPX 34-36

LOCATION: AREA: WILLISTON
COUNTY: WILLIAMS
SW1/4, SE1/4, 1/4
SEC.36, T155N, R100W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5650 ft
BOTTOM: 6050 ft

PAY THICKNESS: 130 ft
AVE. POROSITY: 24.5%
WATER CHEMISTRY: 11571 mg/L
AVE. RESISTIVITY: 0.595 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5660	15.0	16509
5687-5690		
5688	19.2	13693
5705-5711		
5705	20.0	13716
5710	22.6	13300
5725-5728		
5726	27.6	9403
5760-5763		
5762	19.2	21213
5819-5823		
5820	31.0	9962
5828-5830		
5829	22.6	16398
5832-5840		
5835	22.6	13203
5840	24.2	12926
5860-5862		
5861	22.6	13183
5867-5892		
5870	20.0	10615
5875	20.0	10207
5880	20.0	18550
5885	18.3	13662
5890	20.0	10195
5903-5960		
5910	31.0	8950
5915	28.5	10404
5920	25.1	5707
5925	20.9	28877
5930	22.6	5292
5935	25.9	13846
5940	26.8	17901
5945	22.6	18133

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5950	24.2	20389
5955	22.6	28633
5960	17.5	22029
5962-5966		
5964	27.6	10367
5970-5988		
5970	26.8	17187
5975	25.1	16633
5980	25.1	13837
5985	22.6	11287
5991-6000		
5995	24.2	11081
6000	25.9	12504
6005-6030		
6005	28.5	9503
6010	27.6	7574
6015	27.6	11164
6020	26.8	14338
6025	26.8	10397
6030	32.7	7921
6037	28.5	10308

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 6826

LOCATION: AREA: WATFORD CITY
COUNTY: MCKENZIE
NE1/4, NW1/4
SEC.19, T149N, R97W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5556 ft
BOTTOM: 5852 ft

PAY THICKNESS: 106 ft
AVE. POROSITY: 19.8%
WATER CHEMISTRY: 18966 mg/L
AVE. RESISTIVITY: 0.336 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5556-5563		
5559	21.1	14665
5577	14.2	20782
5627-5635		
5630	16.5	53817
5635	20.3	15591
5710-5732		
5710	18.8	19648
5715	18.0	38093
5720	18.8	23343
5725	20.3	10367
5730	19.5	73057
5733-5745		
5735	19.5	33570
5740	18.8	74590
5745	18.8	65054
5752-5764		
5755	16.5	18407
5760	18.8	27622
5767-5808		
5770	18.8	13603
5775	13.5	19941
5780	18.0	14705
5785	21.8	13546
5790	24.9	15913
5795	27.1	16346
5800	24.1	14465
5805	27.9	18534
5850-5853		
5852	23.3	26744

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 6925

LOCATION: AREA: WATFORD CITY
COUNTY: MCKENZIE
SE1/4, SE1/4
SEC.3, T149N, R99W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5597 ft
BOTTOM: 5732 ft

PAY THICKNESS: 102 ft
AVE. POROSITY: 15.5%
WATER CHEMISTRY: 35601 mg/L
AVE. RESISTIVITY: 0.193 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5597-5698		
5600	17.3	39602
5605	18.0	36570
5610	17.3	42699
5615	17.3	50689
5620	18.0	39424
5625	16.5	60849
5630	17.3	78028
5635	18.0	28546
5640	18.8	44055
5645	18.8	26781
5650	20.3	33418
5655	20.3	20111
5660	21.1	17863
5665	18.0	64728
5670	18.0	39235
5675	17.3	61544
5680	15.7	39372
5685	20.3	22248
5690	20.3	81693
5695	18.0	18869
5732	16.5	24846

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 7226

LOCATION AREA: WATFORD CITY FORMATION: INYAN KARA THICKNESS: 136 ft

COUNTY: MCKENZIE AGE: LOWER CRETACEOUS POROSITY: 17.6%

NE1/4, NW1/4 DEPTH: TOP 5668 WATER CHEMISTRY: 30706 mg/L

SEC.10, T149N, R99W BOTTOM 5804 AVE. RESISTIVITY: 0.213 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5668-5731		
5670	15.7	39410
5675	17.3	75000
5680	16.5	77000
5685	18.0	42589
5690	18.8	54404
5695	18.8	36657
5700	19.5	20290
5705	18.8	77000
5710	19.5	80683
5715	20.3	83000
5720	18.0	51341
5725	18.0	42419
5730	21.8	72212
5734-5760		
5734	20.3	28580
5740	18.8	36506
5745	18.0	28311
5750	20.3	50756
5755	25.6	22401
5760	22.6	62286
5783-5795		
5785	12.7	19284
5790	20.3	93000
5795	16.5	59716
5834-5850		
5835	20.3	12243
5840	19.5	8961
5845	18.8	36158
5850	27.9	28723
5900-5908		
5904	21.8	26509
5915-5917		
5916	20.3	16675
5961-5968		
5964	22.6	30436
5980-5982		
5981	24.1	13948

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 7743

LOCATION: AREA: WATFORD CITY
COUNTY: MCKENZIE
NW1/4, SE1/4
SEC.3, T150N, R97W

FORMATION: INYAN KARAPAY
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5272 ft
BOTTOM: 5550 ft

THICKNESS: 79 ft
AVE. POROSITY: 20.4%
WATER CHEMISTRY: 20438 mg/L
AVE. RESISTIVITY: 0.307 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5272-5311		
5275	18.3	29346
5280	17.5	41108
5285	22.9	22682
5290	22.2	5458
5295	20.6	17150
5300	19.1	37824
5305	20.6	18365
5310	23.7	26719
5459-5461		
5460	29.1	14108
5464-5470		
5467	16	13456
5473-5482		
5475	15.2	42968
5480	16.8	61143
5494-5512		
5495	19.8	35587
5500	17.5	31242
5505	19.8	35553
5510	20.6	40999
5526-5528		
5527	24.5	20510
5538	22.9	22345
5548-5550		
5549	22.9	22331

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 7854

LOCATION: AREA: WATFORD CITY
COUNTY: MCKENZIE
SE1/4, NE1/4, 1/4
SEC.33, T152N, R102W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5635 ft
BOTTOM: 6075 ft

PAY THICKNESS: 73 ft
AVE. POROSITY: 19.7%
WATER CHEMISTRY: 32031 mg/L
AVE. RESISTIVITY: 0.207 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5732-5736		
5734	18.8	54450
5743-5783		
5745	22.6	19190
5750	21.1	27980
5755	20.3	23626
5760	21.8	67000
5765	21.8	25458
5770	21.8	15988
5775	21.8	24088
5780	21.8	29009
5786-5791		
5788	18.0	30763
5875-5877		
5876	18.8	32058
6002-6012		
6005	15.0	140000
6010	15.0	85000
6032-6044		
6035	21.1	18942
6040	15.7	60000

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 7943

LOCATION: AREA: WATFORD CITY
COUNTY: MCKENZIE
NE1/4, NW1/4
SEC.23, T149N, R99W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5792 ft
BOTTOM: 6238 ft

PAY THICKNESS: 114 ft
AVE. POROSITY: 21.7%
WATER CHEMISTRY: 18616 mg/L
AVE. RESISTIVITY: 0.344 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5792	20.3	9914
5851	15.7	19376
5892	18.8	14319
5900-5927		
5900	20.3	21988
5905	20.3	57424
5910	16.5	65154
5915	16.5	83000
5920	22.6	61198
5925	18.8	78000
5933	15.7	23688
5970-5972		
5971	20.3	25012
5983	12.7	25083
6017-6025		
6020	16.5	29487
6033-6061		
6035	15.0	16072
6040	19.5	21199
6045	12.7	10897
6050	20.3	21812
6055	27.1	22454
6060	25.6	23610
6071-6076		
6074	23.3	33509
6077-6080		
6078	23.3	33498
6080-6086		
6083	21.8	26188
6097-6100		
6098	18.0	12994
6106-6108		
6107	15.7	20933
6116-6118		
6117	16.5	19207

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6126-6128		
6127	16.5	15343
6149-6158		
6150	21.8	24500
6155	20.3	19089
6163-6171		
6165	12.7	18956
6170	17.3	20349
6212-6214		
6213	22.6	21519
6236-6238		
6237	26.4	13124

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 8092

LOCATION: AREA: WATFORD CITY
COUNTY: MCKENZIE
SW1/4, SW1/4
SEC.27, T151N, R99W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5662 ft
BOTTOM: 6078 ft

PAY THICKNESS: 79 ft
AVE. POROSITY: 14.5%
WATER CHEMISTRY: 38817 mg/L
AVE. RESISTIVITY: 0.183 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5803-5811		
5805	13.5	31346
5811	16.5	33110
5816-5821		
5818	19.5	20173
5828-5833		
5830	20.3	28377
5834-5836		
5835	19.5	29655
5842-5848		
5845	16.5	29889
5856-5902		
5860	18.0	82498
5865	19.5	31694
5870	17.3	75932
5875	16.5	72769
5880	16.5	29808
5885	15.0	53245
5890	16.5	59099
5895	16.5	72606
5900	18.0	100000
5910-5913		
5912	16.5	95000
5952-5954		
5953	19.5	22860
5958-5960		
5959	17.3	16537

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 8130

LOCATION: AREA: WATFORD CITY
COUNTY: MCKENZIE
SW1/4, SW1/4
SEC.10, T151N, R99W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5805 ft
BOTTOM: 6112 ft

PAY THICKNESS: 88 ft
AVE. POROSITY: 17.8%
WATER CHEMISTRY: 20672 mg/L
AVE. RESISTIVITY: 0.303 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5810-5812		
5811	15.7	23863
5828-5831		
5830	14.2	33750
5833	16.5	33048
5840-5847		
5840	18.0	13179
5845	18.0	72035
5914-5948		
5915	22.6	10588
5920	19.5	16019
5925	19.5	45361
5930	18.0	41573
5935	19.5	17740
5940	17.3	18936
5945	18.0	55825
5990-6024		
5990	14.2	46772
5995	16.5	38996
6000	17.3	53561
6005	17.3	66345
6010	18.8	17040
6015	18.0	41232
6020	18.0	18233
6059-6066		
6060	17.3	44306
6065	16.5	71244
6070	19.5	17637

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 8171

LOCATION: AREA: WATFORD CITY
COUNTY: MCKENZIE
SW1/4, NW1/4
SEC.23, T149N, R100W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5612 ft
BOTTOM: 5919 ft

PAY THICKNESS: 163 ft
AVE. POROSITY: 21.7%
WATER CHEMISTRY: 22231 mg/L
AVE. RESISTIVITY: 0.280 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5612-5634		
5615	19.0	27394
5620	19.0	35499
5625	19.0	35483
5630	20.0	19530
5663-5765		
5665	19.5	26846
5670	20.0	35067
5675	18.0	34054
5680	19.5	28380
5685	19.0	30610
5690	18.5	14872
5695	20.0	34989
5700	18.5	57869
5705	21.0	24706
5710	18.5	46394
5715	21.0	17907
5720	21.5	19884
5725	19.5	38084
5730	18.5	15351
5735	19.5	16867
5740	20.0	17226
5745	19.5	16205
5750	19.5	16856
5755	20.0	19417
5760	20.5	27768
5765	12.0	59068
5771-5816		
5775	25.5	17697
5780	22.0	30516
5785	22.5	15925
5790	19.5	19227
5795	21.0	69893
5800	18.5	17634

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5805	20.0	11452
5810	20.0	14871
5815	20.5	92000
5915-5919		
5817	16.5	17933

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 8631

LOCATION: AREA: NEW TOWN
COUNTY: MCKENZIE
SE1/4, NW1/4
SEC.5, T151N, R95W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 4940 ft
BOTTOM: 5354 ft

PAY THICKNESS: 103 ft
AVE. POROSITY: 19.8%
WATER CHEMISTRY: 21714 mg/L
AVE. RESISTIVITY: 0.287 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
4968-4973		
4970	23.3	17293
5068-5090		
5070	21.8	38792
5075	25.6	13363
5080	22.6	13150
5085	23.3	15855
5090	25.6	26070
5095-5098		
5096	20.3	22861
5134	15.0	29614
5174-5197		
5175	26.4	21145
5180	23.3	43887
5185	23.3	11840
5190	21.8	29127
5195	24.1	34231
5200-5210		
5200	17.3	24719
5205	15.7	75000
5210	18.8	37353
5212-5215		
5215	18.8	12920
5220	15.0	35808
5225	18.0	47303
5230	18.0	95000
5235	15.0	46491
5240	17.3	31606
5252-5254		
5253	16.5	78000
5263-5268		
5266	13.5	76817

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5271-5300		
5275	18.8	28681
5280	18.8	20074
5285	21.8	28903
5290	18.8	70000
5295	19.5	34956
5300	17.3	95000

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 8678

LOCATION: AREA: WATFORD CITY
COUNTY: MCKENZIE
1/4, 1/4, 1/4
SEC.25, T152N, R99W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5525 ft
BOTTOM: 5875 ft

PAY THICKNESS: 72 ft
AVE. POROSITY: 21.6%
WATER CHEMISTRY: 17291 mg/L
AVE. RESISTIVITY: 0.379 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5534	16.5	30632
5551	19.5	17794
5617-5620		
5619	15.7	20680
5623-5625		
5624	15.7	20675
5669	31.7	29629
5681-5691		
5685	20.3	78038
5690	27.9	27891
5759	14.2	34605
5765-5768		
5767	37.8	7807
5798	12.0	22978
5804	16.5	32849
5807-5810		
5809	15.0	22585
5815-5826		
5815	20.3	14393
5820	12.7	85000
5825	25.6	15481
5829-5831		
5830	22.6	21311
5837-5842		
5839	24.9	25551
5845-5872		
5845	24.1	11173
5850	26.4	12380
5855	25.6	13178
5860	26.4	12372
5865	18.0	36796
5870	27.9	12656

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 8681

LOCATION: AREA: WATFORD CITY
COUNTY: MCKENZIE
NW1/4, NW1/4
SEC.3, T150N, R99W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5645 ft
BOTTOM: 5972 ft

PAY THICKNESS: 97 ft
AVE. POROSITY: 17.1%
WATER CHEMISTRY: 27537 mg/L
AVE. RESISTIVITY: 0.231 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5645-5650		
5645	19.1	34798
5650	21.4	25025
5696-5698		
5697	16.8	17500
5702-5704		
5703	16	20728
5747-5798		
5750	22.2	22859
5755	20.6	18458
5760	19.1	95000
5765	19.1	45193
5770	19.8	19751
5775	19.1	21112
5780	19.1	56917
5785	22.2	40953
5790	15.2	84834
5795	19.1	34338
5820-5850		
5820	18.3	19956
5825	19.1	21058
5830	17.5	63937
5835	17.5	46985
5840	18.3	39682
5845	18.3	18273
5850	30.6	36189
5860-5863		
5862	14.5	29493
5917	25.2	15068
5933	20.6	33926
5970-5972		
5971	21.4	32746

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 8747

LOCATION: AREA: WATFORD CITY
COUNTY: MCKENZIE
SW1/4, SW1/4
SEC.4, T150N, R98W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5212 ft
BOTTOM: 5726 ft

PAY THICKNESS: 101 ft
AVE. POROSITY: 15.3%
WATER CHEMISTRY: 24384 mg/L
AVE. RESISTIVITY: 0.256 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5512-5518		
5515	20.6	27296
5524-5531		
5525	18.3	47379
5530	16	95000
5610-5628		
5610	19.1	13271
5615	19.8	16938
5620	17.5	22649
5625	15.2	170000
5632-5647		
5635	17.5	15603
5640	16	66971
5645	16.8	85000
5649-5665		
5650	14.5	15963
5655	16	24027
5660	16.8	59889
5665	16	24012
5670-5677		
5670	19.1	29627
5675	17.5	61861
5682-5686		
5684	20.6	26956
5688-5697		
5690	22.9	12295
5695	20.6	18972
5702-5713		
5705	19.8	13427
5710	17.5	24757
5718-5726		
5720	15.2	75268
5725	17.5	19944

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 8872

LOCATION: AREA: MCKENZIE
COUNTY: MCKENZIE
SEC.9, T146N, R104W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5500 ft
BOTTOM: 5680 ft

PAY THICKNESS: 50 ft
AVE. POROSITY: 23.71%
WATER CHEMISTRY: 19377 mg/L
AVE. RESISTIVITY: 0.327 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5500-5540		
5500	23.3	29250
5510	20.9	40205
5520	22.6	28386
5530	20.1	39723
5540	17.8	18609
5670-5680		
5670	39.3	5896
5680	22.0	43494

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 8945

LOCATION: AREA: WATFORD CITY
COUNTY: MCKENZIE
NE1/4, NE1/4
SEC.6, T150N, R100W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5618 ft
BOTTOM: 5996 ft

PAY THICKNESS: 139 ft
AVE. POROSITY: 17.3%
WATER CHEMISTRY: 30706 mg/L
AVE. RESISTIVITY: 0.213 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5617	16.8	21059
5630-5643		
5630	15.2	26334
5635	18.3	69188
5640	19.1	76523
5689-5695		
5690	14.5	47596
5695	12.9	77195
5740-5750		
5740	12.9	51125
5745	19.1	29987
5750	19.8	43932
5752-5758		
5755	25.2	18063
5761-5811		
5765	22.2	25605
5770	16.8	28572
5775	19.8	19746
5780	19.8	19742
5785	19.8	35911
5790	19.1	25410
5795	16.8	31367
5800	18.3	23850
5805	20.6	21462
5810	24.5	29459
5813-5846		
5815	24.5	29448
5820	23.7	26821
5825	20.6	63681
5830	21.4	64283
5835	19.1	120000
5840	18.3	53099
5856-5858		
5857	16	32895
5908	21.4	22293
5927	20.6	21327

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5937-5940		
5938	12.9	24290
5946-5950		
5948	19.8	30255
5957-5960		
5958	20.6	31107
5984	19.1	20889
5991-5996		
5994	22.2	20637

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 9180

LOCATION: AREA: WATFORD CITY
COUNTY: MCKENZIE
E1/4, SE1/4
SEC.3, T149N, R98W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5723 ft
BOTTOM: 5900 ft

PAY THICKNESS: 63 ft
AVE. POROSITY: 17.6%
WATER CHEMISTRY: 30706 mg/L
AVE. RESISTIVITY: 0.213 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5723-5731		
5725	17.3	23171
5730	8.9	10430
5733-5738		
5736	18.8	21833
5853-5903		
5855	18.8	41425
5860	15.0	86224
5865	17.3	40687
5870	18.0	44153
5875	18.0	44130
5880	18.8	45438
5885	18.0	87522
5890	19.5	18205
5895	16.5	77219
5900	17.3	95000

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 9220

LOCATION: AREA: MCKENZIE
COUNTY: MCKENZIE
SEC.5, T145N, R103W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5520 ft
BOTTOM: 5870 ft

PAY THICKNESS: 110 ft
AVE. POROSITY: 22.36%
WATER CHEMISTRY: 25166 mg/L
AVE. RESISTIVITY: 0.249 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5520-5590		
5520	19.0	31385
5530	21.8	28003
5540	20.7	27569
5550	19.9	53964
5560	21.8	20703
5570	20.1	55238
5580	21.4	19088
5590	22.0	24811
5830-5870		
5830	26.2	15748
5840	28.7	22996
5850	25.0	44532
5860	24.1	40305
5870	19.9	19195

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 9433

LOCATION: AREA: WATFORD CITY
COUNTY: MCKENZIE
SE1/4, SE1/4
SEC.31, T151N, R98W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5496 ft
BOTTOM: 5773 ft

PAY THICKNESS: 100 ft
AVE. POROSITY: 17.2%
WATER CHEMISTRY: 22546 mg/L
AVE. RESISTIVITY: 0.276 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5535	15.0	28665
5538-5548		
5540	17.3	66469
5545	18.0	45688
5648-5685		
5650	27.9	19663
5655	26.4	19579
5660	26.4	17234
5665	27.9	17035
5670	29.4	13075
5675	25.6	18072
5680	26.4	12095
6585	14.2	49382
5690-5710		
5690	18.8	29304
5695	18.0	35520
5700	14.2	66574
5705	15.0	80017
5710	15.7	39012
5713-5736		
5715	15.7	24845
5720	17.3	38420
5725	17.3	27654
5730	17.3	53087
5735	18.0	87000
5749-5754		
5752	14.2	90000
5776-5780		
5778	18.8	22480

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 9619

LOCATION: AREA: WATFORD CITY
COUNTY: MCKENZIE
SW1/4, NE1/4
SEC.34,T152N, R100W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5634 ft
BOTTOM: 6020 ft

PAY THICKNESS: 69 ft
AVE. POROSITY: 17.1%
WATER CHEMISTRY: 19888 mg/L
AVE. RESISTIVITY: 0.317 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5644	14.2	31764
5682-5689		
5685	20.3	28688
5737-5749		
5840	15.7	47256
5845	16.5	73015
5753	12.7	25462
5878-5889		
5880	14.2	50237
5885	16.5	29796
5910-5913		
5911	16.5	21463
5920-5930		
5920	17.3	16565
5925	12.7	100000
5930	16.5	15481
5949-5970		
5950	20.3	9799
5955	20.3	32561
5960	21.8	33915
5965	12.7	45855
5970	21.8	16625
5993-5996		
5995	21.1	34420

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 9793

LOCATION: AREA: WATFORD CITY
COUNTY: MCKENZIE
SE1/4, NE1/4, 1/4
SEC.30, T152N, R100W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5478 ft
BOTTOM: 5886 ft

PAY THICKNESS: 74 ft
AVE. POROSITY: 22.9%
WATER CHEMISTRY: 17656 mg/L
AVE. RESISTIVITY: 0.368 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5480	15.8	27659
5514-5521		
5515	14.1	36335
5520	14.1	110000
5648-5650		
5649	19.1	22364
5742	21.7	25812
5755-5763		
5755	15.8	15628
5760	19.2	12335
5778-5781		
5779	27.6	12047
5784-5796		
5785	39.4	6782
5790	25.1	19096
5795	22.6	23483
5798-5830		
5800	29.3	7616
5805	22.6	23468
5810	25.1	17117
5815	20.0	70000
5820	26.8	11561
5825	20.0	55000
5830	18.3	24442
5837	25.9	19590
5842	29.3	9458
5864-5870		
5865	26.8	25018
5870	25.1	20776

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 10104

LOCATION: AREA: WATFORD CITY
COUNTY: MCKENZIE
SW1/4, SW1/4
SEC.35, T151N, R96W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5126 ft
BOTTOM: 5350 ft

PAY THICKNESS: 81 ft
AVE. POROSITY: 20.4%
WATER CHEMISTRY: 18207 mg/L
AVE. RESISTIVITY: 0.354 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5205-5257		
5205	18.8	25076
5210	21.8	17621
5215	22.6	16653
5220	24.9	16862
5225	22.6	19171
5230	22.6	49634
5235	21.8	22944
5240	21.8	17597
5245	21.8	21103
5250	24.1	14465
5255	26.4	56612
5260-5280		
5260	28.7	16603
5265	26.4	11992
5270	23.3	20867
5275	24.9	19383
5280	21.8	85000
5306-5315		
5310	16.5	14405
5315	21.1	105000

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 10427

LOCATION: AREA: WATFORD CITY
COUNTY: MCKENZIE
SW1/4, NE1/4
SEC.30, T150N, R100W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5813 ft
BOTTOM: 6263 ft

PAY THICKNESS: 91 ft
AVE. POROSITY: 17.5%
WATER CHEMISTRY: 18204 mg/L
AVE. RESISTIVITY: 0.354 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5813	16.8	17411
5912-5927		
5915	21.4	63681
5920	22.2	12265
5925	23.7	50194
5929-5942		
5930	20.6	14603
5935	19.8	14193
5940	22.2	32139
5945-5960		
5945	22.9	8835
5950	15.2	83000
5955	16.0	43952
5960	16.0	24093
5968-5970		
5969	17.5	13891
6011	26.0	6864
6088-6092		
6090	24.5	12603
6098-6120		
6100	19.1	20769
6105	19.8	42415
6110	16.8	17190
6115	19.8	15533
6122-6134		
6125	9.1	12067
6130	12.9	24008
6162	18.3	22558
6236	9.1	95000
6260-6263		
6262	20.6	14372
5920	22.5	21361

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5926-5945		
5930	17.0	41874
5935	19.4	33120
5940	17.0	29561
5945	25.6	13098
5947-5962		
5950	18.6	23532
5955	20.9	28018
5960	22.5	17498

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 10527

LOCATION: AREA: WATFORD CITY
COUNTY: MCKENZIE
SE1/4, NW1/4, 1/4
SEC.6, T152N, R101W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5490 ft
BOTTOM: 5885 ft

PAY THICKNESS: 60 ft
AVE. POROSITY: 21.8%
WATER CHEMISTRY: 23346 mg/L
AVE. RESISTIVITY: 0.267 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5540-5558		
5540	22.6	31203
5545	20.2	38011
5550	23.5	16195
5555	21.8	100000
5644	21.8	17695
5724	17.8	19974
5729	16.9	30537
5751	25.9	16839
5758	19.4	29441
5771-5773		
5772	36.5	8661
5794-5800		
5795	19.4	36091
5800	19.4	60364
5832	23.5	15555
5844-5869		
5845	21.0	18678
5850	21.0	32319
5855	19.4	35883
5860	20.2	36839
5865	18.6	71811
5871	21.8	25241
5880-5883		
5882	25.1	17642

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 10689

LOCATION: AREA: MCKENZIE

COUNTY: MCKENZIE

SEC.7, T145N, R103W

FORMATION: INYAN KARA

AGE: LOWER CRETACEOUS

DEPTH: TOP: 5660 ft

BOTTOM: 6040 ft

PAY THICKNESS: 170 ft

AVE. POROSITY: 24.04%

WATER CHEMISTRY: 9494 mg/L

AVE. RESISTIVITY: 0.698 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5660-5730		
5660	16.1	9326
5670	22.2	18560
5680	20.9	16775
5690	18.8	3400
5700	19.7	3250
5710	18.8	3400
5720	18.4	43400
5730	19.2	3000
5850-5910		
5850	18.6	30913
5860	20.3	3000
5870	19.5	34516
5880	23.0	2700
5890	18.8	26908
5900	16.5	165455
5910	18.4	51471
6000-6040		
6000	26.2	2500
6010	40.0	2900
6020	41.2	3168
6030	43.1	3100
6040	41.2	4543

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 10853

LOCATION: AREA: WATFORD CITY
COUNTY: MCKENZIE
SW1/4, SW1/4, 1/4
SEC.21, T152N, R101W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5555 ft
BOTTOM: 5960 ft

PAY THICKNESS: 121 ft
AVE. POROSITY: 21.3%
WATER CHEMISTRY: 19149 mg/L
AVE. RESISTIVITY: 0.332 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5597-5600		
5598	16.5	33476
5602-5608		
5605	23.3	22081
5695-5704		
5695	23.3	8500
5700	27.1	9000
5789-5797		
5790	15.7	20493
5795	18.8	10899
5807-5809		
5808	14.2	18576
5847-5860		
5850	15.7	38366
5855	19.5	45891
5860	27.9	18081
5877-5940		
5880	27.9	9963
5885	20.3	30796
5890	21.8	37716
5895	22.6	48947
5900	21.8	42341
5905	24.1	22477
5910	18.8	47991
5915	23.3	13713
5920	18.0	32183
5925	22.6	17419
5930	18.8	39780
5935	21.8	20201
5940	24.9	16723
5941-5943		
5942	20.3	22444
5945-5960		
5945	24.1	16548
5950	19.5	16794
5955	21.8	25124
5960	22.6	20346

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 11204

LOCATION: AREA: WATFORD CITY
COUNTY: MCKENZIE
SE1/4, NW1/4
SEC.17, T151N, R96W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5012 ft
BOTTOM: 5411 ft

PAY THICKNESS: 94 ft
AVE. POROSITY: 19.0%
WATER CHEMISTRY: 30110 mg/L
AVE. RESISTIVITY: 0.216 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5172	20.3	16586
5219	20.3	19918
5222-5230		
5225	22.6	70512
5230	18.0	120000
5234-5252		
5235	18.8	23225
5240	18.8	15696
5245	22.6	19803
5250	23.3	120000
5306-5310		
5308	12.7	75000
5317-5321		
5319	12.7	20252
5342-5400		
5345	18.8	75000
5350	12.7	75000
5355	18.8	17972
5360	18.0	69000
5365	18.8	95000
5370	16.5	120000
5375	19.5	45594
5380	18.8	53306
5385	16.5	73638
5390	19.5	76051
5395	23.3	60129
5400	25.6	19921

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 11228

LOCATION: AREA: WATFORD CITY
COUNTY: MCKENZIE
SW1/4, SW1/4
SEC.27, T152N, R96W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 4880 ft
BOTTOM: 5227 ft

PAY THICKNESS: 81 ft
AVE. POROSITY: 18.8%
WATER CHEMISTRY: 16324 mg/L
AVE. RESISTIVITY: 0.408 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
4883-4888		
4885	20.3	32070
4891-4893		
4892	20.3	23155
4906-4909		
4907	18.8	25610
4914	20.3	19182
4987-4990		
4988	18.8	15379
4996-5000		
4998	27.9	7488
5002	18.0	14625
5010-5013		
5011	18.8	15361
5015-5037		
5015	18.8	13075
5020	18.8	13072
5025	18.8	32971
5030	18.0	65885
5035	18.0	16455
5109-5112		
5111	13.5	23947
5117-5122		
5120	16.5	26925
5145-5152		
5145	16.5	23120
5150	16.5	18940
5154-5158		
5156	20.3	13160
5160-5164		
5162	14.2	18670
5169-5177		
5170	12.7	21625
5175	20.3	15936
5183-5186		
5184	15.0	15419

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5188-5222		
5190	18.8	12939
5195	16.5	23049
5200	18.0	16327
5205	18.8	18098
5210	16.5	33011
5215	26.4	22417
5220	29.4	22170

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 11322

LOCATION: AREA: MCKENZIE
COUNTY: MCKENZIE
SEC.1, T146N, R103W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5530 ft
BOTTOM: 5580 ft

PAY THICKNESS: 50 ft
AVE. POROSITY: 19.2%
WATER CHEMISTRY: 24655 mg/L
AVE. RESISTIVITY: 0.253 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5530-5580		
5530	14.6	31776
5540	18.0	57582
5550	18.8	14700
5560	18.4	43539
5570	22.0	18027
5580	23.3	43466

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 11416

LOCATION: AREA: WATFORD CITY
COUNTY: MCKENZIE
SW1/4, SW1/4, 1/4
SEC.36, T152N, R104W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5240 ft
BOTTOM: 5653 ft

PAY THICKNESS: 111 ft
AVE. POROSITY: 20.6%
WATER CHEMISTRY: 13074 mg/L
AVE. RESISTIVITY: 0.529 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5243-5250		
5245	23.0	15388
5250	23.0	13623
5254	23.8	7011
5260-5265		
5260	21.4	12092
5265	19.0	18210
5267	18.2	14193
5297	18.2	7708
5310-5319		
5310	21.4	6385
5315	15.8	11519
5326-5330		
5328	17.4	13423
5368-5380		
5370	18.2	14113
5375	13.4	31289
5380	21.4	9636
5382-5387		
5384	19.0	12935
5476	21.4	14745
5488-5490		
5499	19.0	28593
5500-5505		
5500	17.4	31766
5505	16.6	23166
5513-5523		
5515	15.8	39426
5520	15.0	87559
5529-5531		
5530	13.4	27171
5534-5544		
5535	11.0	115000
5540	11.8	95000
5550-5552		
5551	15.8	24555

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5569	27.0	8314
5599	19.0	13867
5603	21.4	11818
5618-5629		
5620	15.0	14049
5625	23.0	22809
5630-5636		
5630	17.4	26311
5635	20.6	19577
5638	23.8	13796
5647-5650		
5648	21.4	19359

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 11920

LOCATION: AREA: WILLISTON
COUNTY: MCKENZIE
NW1/4, NE1/4
SEC.10, T153N, R101W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5207 ft
BOTTOM: 5630 ft

PAY THICKNESS: 137 ft
AVE. POROSITY: 25.6%
WATER CHEMISTRY: 16238 mg/L
AVE. RESISTIVITY: 0.419 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5265	25.1	13626
5270	28.4	23061
5275	23.5	20314
5280-5296		
5280	15.3	23824
5285	23.5	21338
5290	21.8	34321
5295	21.8	54586
5370	16.9	71101
5436	17.8	14322
5451	21.8	9232
5471-5480		
5475	19.4	43462
5480	16.9	49585
5492-5497		
5494	12.0	92534
5508-5518		
5510	16.1	30152
5515	17.8	33252
5522	18.6	40874
5542-5622		
5545	34.1	5966
5550	25.1	13335
5555	25.9	21430
5560	27.5	26507
5565	30.0	12180
5570	30.0	13682
5580	30.0	13672
5585	30.8	12734
5590	27.5	15211
5595	31.6	15609
5600	34.9	10432
5605	32.4	13543
5610	30.0	21106
5615	16.1	55896
5620	28.4	19268
5630	23.5	29562

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 11963

LOCATION: AREA: WILLISTON
COUNTY: MCKENZIE
NW1/4, NW1/4
SEC.23, T153N, R101W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5462 ft
BOTTOM: 5890 ft

PAY THICKNESS: 113 ft
AVE. POROSITY: 23.2%
WATER CHEMISTRY: 20773 mg/L
AVE. RESISTIVITY: 0.301 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5507	31.7	12225
5524-5531		
5525	19.5	43378
5530	22.6	23978
5673-5694		
5675	22.6	14895
5680	22.6	16829
5685	22.6	17739
5690	14.2	58887
5735-5740		
5735	15.7	19147
5740	13.5	98343
5763-5774		
5765	13.5	136280
5770	13.5	64941
5776-5782		
5778	18.0	28271
5798-5819		
5800	16.5	95585
5805	18.8	93748
5810	24.1	54737
5815	29.4	31615
5824-5864		
5825	24.1	11353
5830	15.7	131205
5835	20.3	93538
5840	18.8	49530
5845	24.9	48222
5850	27.9	31953
5855	21.8	57900
5860	20.3	138522
5865	28.7	29429
5887	21.1	32658

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 11990

LOCATION: AREA: WILLISTON
COUNTY: MCKENZIE
SW1/4, SE1/4
SEC.36, T153N, R102W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5455 ft
BOTTOM: 5890 ft

PAY THICKNESS: 144 ft
AVE. POROSITY: 21.6%
WATER CHEMISTRY: 17079 mg/L
AVE. RESISTIVITY: 0.385 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5551	18.4	25771
5574	16.1	21963
5578	16.1	16668
5582-5590		
5585	18.4	31166
5590	18.4	21157
5599	15.3	22832
5604-5617		
5605	16.8	20019
5610	16.8	28700
5615	19.2	27555
5636-5646		
5640	16.8	34677
5645	18.4	11603
5649-5660		
5650	19.2	25033
5655	19.2	27444
5670	22.3	24382
5675	18.4	18802
5680	22.3	15143
5685	22.3	24351
5686-5696		
5690	19.2	28835
5695	23.0	12524
5760	20.7	20316
5800-5820		
5800	19.9	12315
5805	22.3	16139
5810	19.2	30166
5815	22.3	19546
5820	22.3	15006
5825-5856		
5825	25.4	11449
5830	23.0	13044
5835	23.0	6956
5840	45.5	8062

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5845	23.0	24878
5850	19.2	18066
5855	33.1	14902
5858-5871		
5860	20.7	33607
5865	24.6	14647
5870	26.9	18292
5873	26.9	16867

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 11995

LOCATION: AREA: MCKENZIE
COUNTY: MCKENZIE
SEC.8, T146N, R102W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5650 ft
BOTTOM: 5960 ft

PAY THICKNESS: 260 ft
AVE. POROSITY: 19.97%
WATER CHEMISTRY: 20908 mg/L
AVE. RESISTIVITY: 0.299 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5650-5700		
5650	18.0	16568
5660	18.4	66356
5670	18.2	24935
5680	20.1	16452
5690	18.4	43493
5700	18.2	275328
5710-5740		
5710	21.3	17891
5720	19.6	16780
5730	16.7	23538
5740	17.8	33507
5770-5880		
5770	20.3	18560
5780	22.2	9777
5790	24.1	14791
5800	20.3	19767
5810	16.5	23386
5820	18.0	19238
5830	18.8	97360
5840	18.2	48851
5850	19.5	21165
5860	18.6	23469
5870	16.9	106310
5880	39.3	16648
5930-5960		
5930	17.1	14218
5940	18.4	22375
5950	24.1	19433
5960	20.3	30319

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 12288

LOCATION: AREA: WATFORD CITY
COUNTY: MCKENZIE
SE1/4, SW1/4
SEC.4, T151N, R103W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5519 ft
BOTTOM: 5892 ft

PAY THICKNESS: 196 ft
AVE. POROSITY: 20.4%
WATER CHEMISTRY: 18407 mg/L
AVE. RESISTIVITY: 0.349 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5541-5569		
5545	18.0	36774
5550	21.8	17378
5555	15.7	35594
5560	21.8	21826
5565	25.6	19253
5572-5579		
5576	20.3	19072
5581-5585		
5583	18.8	22047
5630-5637		
5630	18.0	18550
5635	21.8	17785
5639-5712		
5640	27.1	14323
5645	24.1	15046
5650	21.1	27746
5655	21.1	29802
5660	22.6	23328
5665	21.8	25269
5670	21.8	31570
5675	20.3	36457
5680	21.8	31544
5685	22.6	34499
5690	21.8	16829
5695	21.8	21667
5700	22.6	28452
5705	18.8	90000
5710	23.3	26009
5713-5747		
5715	22.6	9379
5720	18.8	17256
5725	20.3	58563
5730	23.3	39290
5735	21.8	13187
5740	16.5	42863

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5745	24.1	75000
5761-5764		
5762	15.7	19456
5773-5778		
5776	13.5	24366
5782-5790		
5585	18.0	17897
5790	18.8	12080
5821-5823		
5823	17.3	16635
5832-5838		
5835	12.7	105000
5842-5850		
5846	17.3	19788
5870-5880		
5870	15.0	41177
5875	13.5	95000
5880	31.7	8336

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 12498

LOCATION: AREA: WATFORD CITY
COUNTY: MCKENZIE
SE1/4, NE1/4
SEC.21, T151N, R100W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5786 ft
BOTTOM: 6178 ft

PAY THICKNESS: 119 ft
AVE. POROSITY: 17.7%
WATER CHEMISTRY: 18832 mg/L
AVE. RESISTIVITY: 0.339 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5786-5792		
5789	17.5	19377
5809-5812		
5810	18.3	34118
5826-5842		
5830	19.8	30540
5835	20.6	27254
5840	22.9	27094
5869-5871		
5870	19.1	34114
5950-5952		
5951	26.0	3600
5956	26.8	4400
5965-5967		
5966	22.2	14238
5970-6022		
5970	19.1	33820
5975	18.3	29656
5980	18.3	24504
5985	19.8	30168
5990	20.6	26958
5995	19.8	15617
6000	18.3	33563
6005	16.0	32489
6010	16.8	30827
6015	16.8	49530
6020	17.5	56077
6070-6078		
6070	22.9	8748
6075	16.0	73051
6093-6100		
6095	16.0	65872
6100	18.3	38721
6123-6135		
6125	24.5	14266
6130	21.4	17051

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6135	21.4	17047
6139	19.8	15516
6152	16.8	18612
6172-6178		
6175	20.6	21060

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 9302

LOCATION: AREA: BOTTINEAU

COUNTY: BOTTINEAU

SEC.29, T161N, R78W

FORMATION: INYAN KARA

AGE: LOWER CRETACEOUS

DEPTH: TOP: 2150 ft

BOTTOM: 2190 ft

PAY THICKNESS: 40 ft

AVE. POROSITY: 39.96%

WATER CHEMISTRY: 2750 mg/L

AVE. RESISTIVITY: 2.374 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
2150-2190		
2150	39.7	2900
2160	37.4	2800
2170	41.2	1300
2180	38.5	5921
2190	43.1	3200

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 9747

LOCATION: AREA: BOTTINEAU
COUNTY: BOTTINEAU
SEC.36, T163N, R77W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 2060 ft
BOTTOM: 2267 ft

PAY THICKNESS: 97 ft
AVE. POROSITY: 43.56%
WATER CHEMISTRY: 2550 mg/L
AVE. RESISTIVITY: 2.556 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
2060-2120		
2060	43.1	2600
2070	41.2	2600
2080	40.8	2700
2090	39.7	2800
2100	41.4	2500
2110	43.1	2350
2120	50.7	1820
2230-2267		
2230	39.3	3020
2240	47.6	2600
2250	48.4	2450
2260	44.6	2420
2267	43.1	3020

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 10097

LOCATION: AREA: BOTTINEAU
COUNTY: BOTTINEAU
SEC.34, T164N, R78W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 2010 ft
BOTTOM: 2260 ft

PAY THICKNESS: 250 ft
AVE. POROSITY: 36.74%
WATER CHEMISTRY: 3450 mg/L
AVE. RESISTIVITY: 1.8 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
2010-2260		
2010	39.3	2900
2020	40.4	2800
2030	38.1	3200
2040	38.3	3200
2050	41.2	3200
2060	35.9	3000
2070	39.3	2300
2080	38.5	3200
2090	41.1	3000
2100	40.0	2800
2110	35.9	3400
2120	34.0	3400
2130	37.4	3172
2140	35.5	4365
2150	40.6	3450
2170	39.3	2900
2180	27.9	6190
2190	44.6	2900
2200	37.4	2100
2210	39.3	3670
2220	39.3	3660
2230	37.4	4277
2240	39.3	3641
2250	34.0	3633
2260	25.6	4414

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 10236

LOCATION: AREA: BOTTINEAU
COUNTY: BOTTINEAU
SEC.31, T163N, R77W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 2010 ft
BOTTOM: 2108 ft

PAY THICKNESS: 68 ft
AVE. POROSITY: 40.28%
WATER CHEMISTRY: 2750 mg/L
AVE. RESISTIVITY: 2.369 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
2010-2030		
2030	37.4	3300
2040-2070		
2040	35.1	3620
2050	37.4	3200
2060	43.8	2600
2070	38.5	3000
2080-2108		
2080	41.9	2550
2090	39.8	2800
2100	41.6	2700
2108	35.5	3000

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 10246

LOCATION: AREA: BOTTINEAU
COUNTY: BOTTINEAU
SEC.7, T163N, R78W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 2060 ft
BOTTOM: 2164 ft

PAY THICKNESS: 104 ft
AVE. POROSITY: 36.99%
WATER CHEMISTRY: 3400 mg/L
AVE. RESISTIVITY: 1.887 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
2060	38.7	3200
2070	38.9	3200
2080	37.8	2949
2090	40.8	3400
2100	41.6	3200
2110	37.0	3400
2120	33.2	3787
2130	31.7	4139
2140	37.4	3200
2150	37.0	3200
2160	39.3	2850
2164	30.6	3973

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 10251

LOCATION: AREA: BOTTINEAU
COUNTY: BOTTINEAU
SEC.34, T164N, R78W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 2000 ft
BOTTOM: 2177 ft

PAY THICKNESS: 177 ft
AVE. POROSITY: 40.4%
WATER CHEMISTRY: 3020 mg/L
AVE. RESISTIVITY: 2.089 mg/L

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
2000-2177		
2000	41.2	2800
2010	41.6	2900
2020	40.0	3200
2030	40.4	3300
2040	41.6	3200
2050	44.6	2900
2060	33.0	3460
2070	35.9	3300
2080	44.6	2900
2090	36.1	4080
2100	35.5	3300
2110	44.2	2750
2120	39.3	2900
2130	38.5	2750
2140	38.5	3100
2150	39.3	3300
2160	45.7	2850
2170	44.6	3100
2177	43.1	2700

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 10443

LOCATION: AREA: BOTTINEAU
COUNTY: BOTTINEAU
SEC.18, T163N, R78W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 2052 ft
BOTTOM: 2150 ft

PAY THICKNESS: 98 ft
AVE. POROSITY: 34.03%
WATER CHEMISTRY: 4095 mg/L
AVE. RESISTIVITY: 1.609 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
2052	20.3	9934
2060	28.7	3700
2070	38.5	4269
2080	39.3	3818
2090	33.6	4127
2100	39.7	4408
2110	37.4	4316
2120	28.7	3200
2130	27.9	4672
2140	41.2	2250
2150	39.3	4427

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 10452

LOCATION: AREA: BOTTINEAU

COUNTY: BOTTINEAU

SEC.29, T163N, R77W

FORMATION: INYAN KARA

AGE: LOWER CRETACEOUS

DEPTH: TOP: 1980 ft

BOTTOM: 2220 ft

PAY THICKNESS: 210 ft

AVE. POROSITY: 38.49%

WATER CHEMISTRY: 4362 mg/L

AVE. RESISTIVITY: 1.477 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
1980-2030		
1990	42.3	3300
2000	41.9	3450
2010	30.6	13664
2020	41.6	2900
2030	41.2	4612
2050-2150		
2050	35.5	2850
2060	24.1	4551
2070	26.4	2700
2080	24.9	5299
2090	26.8	4623
2100	35.5	5850
2110	26.2	3933
2120	40.0	4422
2130	41.2	4934
2140	43.1	4509
2150	41.2	7611
2160-2220		
2170	42.5	9974
2180	43.1	7391
2200	43.1	4223
2210	43.1	10920
2220	43.1	3859

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 11373

LOCATION: AREA: BOTTINEAU
COUNTY: BOTTINEAU
SEC.18, T163N, R78W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 2067 ft
BOTTOM: 2350 ft

PAY THICKNESS: 143 ft
AVE. POROSITY: 37.72%
WATER CHEMISTRY: 3732 mg/L
AVE. RESISTIVITY: 1.693 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
2067-2180		
2067	39.3	4437
2070	16.5	3508
2080	40.0	3599
2090	43.1	3100
2100	43.1	3000
2110	34.3	2300
2120	43.1	3350
2130	43.1	4457
2140	31.7	2300
2150	37.4	2000
2160	40.0	4375
2170	40.0	4500
2180	24.1	4546
2320-2350		
2320	39.3	10569
2340	40.8	5586
2350	38.5	5057

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 11448

LOCATION: AREA: BOTTINEAU
COUNTY: BOTTINEAU
SEC.28, T163N, R77W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 2020 ft
BOTTOM: 2200 ft

PAY THICKNESS: 150 ft
AVE. POROSITY: 35.73%
WATER CHEMISTRY: 4227 mg/L
AVE. RESISTIVITY: 1.56 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
2020-2050		
2020	43.1	2420
2030	40.8	3020
2040	27.1	6754
2050	29.0	17786
2080-2200		
2080	39.3	2350
2090	27.1	4881
2100	29.0	5049
2110	28.7	2800
2120	32.4	4515
2130	31.7	4641
2140	39.3	4054
2150	27.9	3300
2160	35.5	4154
2170	43.1	3550
2180	44.2	4380
2190	44.2	4379
2200	45.0	8459

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 11531

LOCATION: AREA: BOTTINEAU

COUNTY: BOTTINEAU

SEC.27, T163N, R77W

FORMATION: INYAN KARA

AGE: LOWER CRETACEOUS

DEPTH: TOP: 2020 ft

BOTTOM: 2280 ft

PAY THICKNESS: 90 ft

AVE. POROSITY: 39.38%

WATER CHEMISTRY: 3400 mg/L

AVE. RESISTIVITY: 1.671 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
2020-2070		
2020	40.0	3200
2030	41.2	4416
2040	36.6	4331
2050	37.4	9394
2060	37.4	4445
2070	41.2	4612
2170-2210		
2170	37.4	2800
2180	41.2	3400
2190	44.6	4348
2200	44.6	3823
2210	31.7	2300

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 11632

LOCATION: AREA: BOTTINEAU
COUNTY: BOTTINEAU
SEC.34, T163N, R79W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 2082 ft
BOTTOM: 2180 ft

PAY THICKNESS: 88 ft
AVE. POROSITY: 35.79%
WATER CHEMISTRY: 4329 mg/L
AVE. RESISTIVITY: 1.503 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
2082	39.3	4981
2090	35.5	6594
2100	38.1	4510
2110	34.0	4280
2120	42.5	4577
2130	36.2	4527
2140	33.8	5553
2150	31.7	1900
2160	33.0	2700
2180	33.8	10398

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 11940

LOCATION: AREA: BOTTINEAU
COUNTY: BOTTINEAU
SEC.17, T163N, R78W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 2043 ft
BOTTOM: 2200 ft

PAY THICKNESS: 127 ft
AVE. POROSITY: 35.98%
WATER CHEMISTRY: 4652 mg/L
AVE. RESISTIVITY: 1.22 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
2043-2120		
2043	27.9	4485
2050	41.6	2900
2060	37.6	5539
2070	37.0	4789
2080	37.8	5451
2090	39.3	4432
2100	42.3	4421
2110	37.2	4475
2120	42.7	9987
2150-2200		
2150	34.3	8442
2160	39.3	3744
2170	36.1	4763
2180	36.6	4664
2190	39.3	5730
2200	10.8	6739

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 5621

LOCATION: AREA: DICKINSON
COUNTY: DUNN
SEC.23, T142N, R97W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5700 ft
BOTTOM: 5840 ft

PAY THICKNESS: 110 ft
AVE. POROSITY: 23.59%
WATER CHEMISTRY: 17449 mg/L
AVE. RESISTIVITY: 0.374 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5700-5790		
5700	23.7	17956
5710	22.2	44575
5720	21.8	47599
5730	25.2	21591
5740	23.0	16442
5750	23.7	21563
5770	18.8	41732
5780	27.1	19776
5790	22.2	13712
5820-5840		
5820	19.4	6174
5830	30.0	14273
5840	26.0	16627

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 7360

LOCATION: AREA: DICKINSON
COUNTY: DUNN
SEC.31, T142N, R96W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5730 ft
BOTTOM: 5920 ft

PAY THICKNESS: 120 ft
AVE. POROSITY: 24.14%
WATER CHEMISTRY: 14488 mg/L
AVE. RESISTIVITY: 0.473 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5730-5780		
5730	23.3	12415
5740	25.2	30456
5750	24.1	12345
5760	24.1	20927
5770	20.3	20251
5780	18.4	112703
5850-5920		
5850	22.2	8921
5860	25.6	10383
5870	31.7	9134
5880	27.9	12422
5890	24.5	16920
5900	22.4	24243
5910	20.3	7077
5920	27.9	16161

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 8491

LOCATION: AREA: DICKINSON
COUNTY: DUNN
SEC.30, T142N, R96W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5700 ft
BOTTOM: 5925 ft

PAY THICKNESS: 225 ft
AVE. POROSITY: 22.23%
WATER CHEMISTRY: 28260 mg/L
AVE. RESISTIVITY: 0.226 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5700-5800		
5700	22.2	18895
5710	24.1	16250
5720	23.7	17939
5730	20.3	27301
5740	23.3	53096
5750	23.7	11929
5760	18.8	59534
5770	25.0	21871
5780	21.4	11825
5790	22.2	64911
5800	21.8	24535
5810-5925		
5810	20.7	10440
5820	17.3	16234
5830	24.1	34904
5840	21.8	20274
5850	12.7	20584
5860	21.4	15068
5870	24.1	16840
5880	20.3	20103
5890	24.1	28270
5900	22.2	13626
5910	23.3	27282
5920	30.7	20487
5925	24.1	11347

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 8754

LOCATION: AREA: DICKINSON
COUNTY: DUNN
SEC.25, T142N, R97W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5720 ft
BOTTOM: 5930 ft

PAY THICKNESS: 210 ft
AVE. POROSITY: 22.3%
WATER CHEMISTRY: 19539 mg/L
AVE. RESISTIVITY: 0.324 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5720-5930		
5720	23.3	31588
5730	23.3	24954
5740	21.1	16498
5750	23.6	21869
5760	23.0	17825
5770	23.9	21226
5780	24.1	16211
5790	22.4	15525
5800	23.0	20231
5810	18.6	24210
5820	16.5	25485
5830	21.6	48764
5840	20.3	23026
5850	23.0	18845
5860	20.3	20145
5870	18.6	19287
5880	19.5	86010
5890	22.4	27443
5900	26.2	13221
5910	29.8	12913
5920	25.8	15963
5930	20.3	16016

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 8896

LOCATION: AREA: DICKSINSON

COUNTY: DUNN

SEC.17, T142N, R96W

FORMATION: INYAN KARA

AGE: LOWER CRETACEOUS

DEPTH: TOP: 5620 ft

BOTTOM: 5770 ft

PAY THICKNESS: 150 ft

AVE. POROSITY: 22.17%

WATER CHEMISTRY: 13941 mg/L

AVE. RESISTIVITY: 0.494 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5620-5770		
5620	23.5	10665
5630	21.7	10301
5640	23.9	8862
5650	16.5	125011
5660	22.5	21937
5670	23.3	31447
5680	18.4	17331
5690	22.2	5757
5700	20.3	12109
5710	19.9	12623
5720	31.7	6095
5730	18.0	19251
5740	24.5	17490
5750	18.4	18925
5760	21.8	11288
5770	27.9	32192

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 4439

LOCATION: AREA: WATFORD CITY
COUNTY: MCKENZIE
SEC.18, T151N, R103W

FORMATION: RED RIVER
AGE: ORDOVICIAN
DEPTH: TOP: 13260 ft
BOTTOM: 13340 ft

PAY THICKNESS: 55 ft
AVE. POROSITY: 6.5%
WATER CHEMISTRY: 21514 mg/L
AVE. RESISTIVITY: 0.29 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
13260-13300		
13260	3.2	19857
13265	6.0	149074
13270	8.1	114897
13275	4.6	109960
13280	8.8	25600
13285	7.4	64761
13290	8.8	18638
13295	5.3	80993
13300	3.9	14422
13320-13340		
13320	4.6	4492
13325	14.5	70990
13330	3.2	49603
13335	6.0	32561
13340	8.8	16792

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 6775

LOCATION: AREA: WATFORD CITY
COUNTY: MCKENZIE
SEC.12, T150N, R104W

FORMATION: RED RIVER
AGE: ORDOVICIAN
DEPTH: TOP: 13050 ft
BOTTOM: 13120 ft

PAY THICKNESS: 30 ft
AVE. POROSITY: 6.27%
WATER CHEMISTRY: 66596 mg/L
AVE. RESISTIVITY: 0.137 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
13050-13060		
13050	5.3	189976
13055	6.7	364513
13060	3.9	26628
13100-13120		
13100	5.3	109986
13105	6.7	167702
13110	8.8	193362
13115	9.5	309517
13120	3.9	16437

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 9006

LOCATION: AREA: WATFORD CITY
COUNTY: MCKENZIE
SEC.23, T152N, R102W

FORMATION: RED RIVER
AGE: ORDOVICIAN
DEPTH: TOP: 13532 ft
BOTTOM: 13684 ft

PAY THICKNESS: 16 ft
AVE. POROSITY: 6.47%
WATER CHEMISTRY: 24297 mg/L
AVE. RESISTIVITY: 0.257 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
13532-13544		
13532	8.8	25621
13534	8.1	11872
13536	5.3	70771
13538	5.3	41272
13540	5.3	30952
13542	4.9	20407
13544	3.2	28929
13680-13684		
13680	5.3	18167
13682	8.8	29030
13684	9.5	93624

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 7422

LOCATION: AREA: WATFORD CITY
COUNTY: MCKENZIE
SEC.3, T151N, R103W

FORMATION: RED RIVER
AGE: ORDOVICIAN
DEPTH: TOP: 13235 ft
BOTTOM: 13330 ft

PAY THICKNESS: 55 ft
AVE. POROSITY: 9.13%
WATER CHEMISTRY: 45244 mg/L
AVE. RESISTIVITY: 0.167 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
13235-13245		
13235	11.7	362216
13240	11.0	207809
13245	3.9	250000
13285-13330		
13285	12.4	306792
13290	11.0	245589
13295	8.8	127808
13300	8.8	101312
13305	14.5	220708
13310	13.1	234668
13315	4.6	33837
13320	7.4	64466
13325	6.0	28096
13330	5.7	5592

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 7929

LOCATION: AREA: WATFORD CITY
COUNTY: MCKENZIE
SEC.14, T150N, R104W

FORMATION: RED RIVER
AGE: ORDOVICIAN
DEPTH: TOP: 13040 ft
BOTTOM: 13120 ft

PAY THICKNESS: 80 ft
AVE. POROSITY: 6.46%
WATER CHEMISTRY: 58002 mg/L
AVE. RESISTIVITY: 0.147 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
13040-13120		
13040	1.8	21232
13045	6.0	339090
13050	6.0	96382
13055	4.6	14715
13060	4.6	10154
13065	11.7	361737
13070	7.4	315108
13075	5.3	308834
13080	7.1	207696
13085	8.1	356010
13090	11.0	355119
13095	4.6	70298
13100	8.1	174923
13105	6.0	190403
13110	5.3	41101
13115	6.7	167463
13120	5.7	121850

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 8530

LOCATION: AREA: WATFORD CITY
COUNTY: MCKENZIE
SEC.3, T150N, R102W

FORMATION: RED RIVER
AGE: ORDOVICIAN
DEPTH: TOP: 13455 ft
BOTTOM: 13510 ft

PAY THICKNESS: 55 ft
AVE. POROSITY: 8.24%
WATER CHEMISTRY: 20476 mg/L
AVE. RESISTIVITY: 0.306 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
13455-13510		
13455	11.7	345041
13460	9.5	310346
13465	5.3	41266
13470	6.0	32674
13475	5.3	5256
13480	8.1	31857
13485	8.8	355163
13490	3.9	21855
13495	11.7	70548
13500	12.4	358775
13505	11.7	200349
13510	4.6	4492

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 9102

LOCATION: AREA: WATFORD CITY
COUNTY: MCKENZIE
SEC.2, T150N, R102W

FORMATION: RED RIVER
AGE: ORDOVICIAN
DEPTH: TOP: 13430 ft
BOTTOM: 13555 ft

PAY THICKNESS: 90 ft
AVE. POROSITY: 6.86%
WATER CHEMISTRY: 14007 mg/L
AVE. RESISTIVITY: 0.491 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
13430-13490		
13430	8.1	3020
13435	11.0	15037
13440	3.2	2100
13445	5.3	130765
13450	3.9	6065
13455	8.1	175353
13460	3.9	13229
13465	9.5	21770
13470	15.2	27335
13475	10.2	34155
13480	7.4	84228
13485	4.6	363319
13490	2.5	35727
13525-13555		
13525	6.7	61595
13530	6.7	12153
13535	8.1	219748
13540	6.7	358011
13545	6.0	66519
13550	6.0	28053
13555	3.9	34899

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 9377

LOCATION: AREA: WATFORD CITY
COUNTY: MCKENZIE
SEC.21, T151N, R103W

FORMATION: RED RIVER
AGE: ORDOVICIAN
DEPTH: TOP: 13300 ft
BOTTOM: 13380 ft

PAY THICKNESS: 80 ft
AVE. POROSITY: 7.4%
WATER CHEMISTRY: 56365 mg/L
AVE. RESISTIVITY: 0.149 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
13300-13380		
13300	7.4	239052
13305	8.1	114941
13310	7.4	162810
13315	11.0	128382
13320	4.6	236550
13325	4.6	69089
13330	8.1	242518
13335	5.3	308834
13340	8.8	355085
13345	6.7	96253
13350	8.1	45849
13355	10.2	19221
13360	5.3	271990
13365	9.2	225511
13370	8.8	215698
13375	5.3	12001
13380	6.7	15783

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 9403

LOCATION: AREA: WATFORD CITY
COUNTY: MCKENZIE
SEC.27, T152N, R103W

FORMATION: RED RIVER
AGE: ORDOVICIAN
DEPTH: TOP: 13395 ft
BOTTOM: 13480 ft

PAY THICKNESS: 55 ft
AVE. POROSITY: 6.6%
WATER CHEMISTRY: 108761 mg/L
AVE. RESISTIVITY: 0.107 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
13395-13415		
13395	7.4	239052
13400	9.5	310346
13405	5.3	189846
13410	6.7	96477
13415	4.6	124774
13445-13480		
13445	4.9	200385
13450	7.4	84195
13455	8.1	45817
13460	5.3	41115
13465	13.4	28149
13470	8.5	79829
13475	4.6	20910
13480	6.0	1000

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 9702

LOCATION: AREA: WATFORD CITY
COUNTY: MCKENZIE
SEC.24, T151N, R104W

FORMATION: RED RIVER
AGE: ORDOVICIAN
DEPTH: TOP: 13190 ft
BOTTOM: 13255 ft

PAY THICKNESS: 40 ft
AVE. POROSITY: 7.93%
WATER CHEMISTRY: 129124 mg/L
AVE. RESISTIVITY: 0.098 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
13190-13200		
13190	7.4	212124
13195	8.1	226950
13200	6.0	87815
13225-13255		
13225	8.1	153072
13230	9.5	76431
13235	8.1	173767
13240	8.1	87104
13245	5.3	17224
13250	6.7	83090
13255	6.7	47612

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 10186

LOCATION: AREA: WATFORD CITY
COUNTY: MCKENZIE
SEC.15, T151N, R103W

FORMATION: RED RIVER
AGE: ORDOVICIAN
DEPTH: TOP: 13225 ft
BOTTOM: 13325 ft

PAY THICKNESS: 75 ft
AVE. POROSITY: 8.06%
WATER CHEMISTRY: 27309 mg/L
AVE. RESISTIVITY: 0.233 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
13225-13250		
13225	8.8	364782
13230	7.4	212569
13235	5.3	143037
13240	8.8	43323
13245	6.0	245189
13250	6.0	118612
13275-13325		
13275	11.0	17326
13280	14.8	100684
13285	8.1	174923
13290	4.9	35716
13295	10.6	62045
13300	6.7	125023
13305	8.1	351398
13310	10.2	46267
13315	8.8	3300
13320	5.3	152977
13325	6.0	82076

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 10285

LOCATION: AREA: WATFORD CITY
COUNTY: MCKENZIE
SEC.2, T151N, R102W

FORMATION: RED RIVER
AGE: ORDOVICIAN
DEPTH: TOP: 13605 ft
BOTTOM: 13635 ft

PAY THICKNESS: 30 ft
AVE. POROSITY: 4.95 ft
WATER CHEMISTRY: 58483 mg/L
AVE. RESISTIVITY: 0.146 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
13605-13635		
13605	2.5	321163
13610	4.6	37930
13615	6.7	21020
13620	6.0	278270
13625	3.9	282146
13630	7.4	229535
13635	3.9	311462

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 11416

LOCATION: AREA: WATFORD CITY
COUNTY: MCKENZIE
SEC.36, T152N, R104W

FORMATION: RED RIVER
AGE: ORDOVICIAN
DEPTH: TOP: 12940 ft
BOTTOM: 13010 ft

PAY THICKNESS: 70 ft
AVE. POROSITY: 7.23%
WATER CHEMISTRY: 24290 mg/L
AVE. RESISTIVITY: 0.257 ohm-m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
12940-13010		
12940	7.4	239052
12945	19.4	21070
12950	3.9	166545
12955	6.7	11259
12960	5.3	41238
12965	3.9	6063
12970	4.6	19163
12975	6.7	16676
12980	6.0	18768
12985	8.1	45865
12990	9.5	343418
12995	6.7	361046
13000	6.7	101115
13005	6.7	75973
13010	6.7	125070

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 11980

LOCATION: AREA: WATFORD CITY
COUNTY: MCKENZIE
SEC.10, T151N, R100W

FORMATION: RED RIVER
AGE: ORDOVICIAN
DEPTH: TOP: 14200 ft
BOTTOM: 14235 ft

PAY THICKNESS: 35 ft
AVE. POROSITY: 6.18%
WATER CHEMISTRY: 10478 mg/L
AVE. RESISTIVITY: 0.647 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
14200-14235		
14200	4.6	20968
14205	8.1	10977
14210	8.1	31885
14215	3.9	2700
14220	5.3	6750
14225	7.4	12090
14230	8.8	82323
14235	3.2	135276

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 5548

LOCATION: AREA: DICKINSON
COUNTY: STARK
NE1/4,NE1/4
SEC.32, T140N, R92W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5530 ft
BOTTOM: 5800 ft

PAY THICKNESS: 108 ft
AVE. POROSITY: 20.7%
WATER CHEMISTRY: 31973 mg/L
AVE. RESISTIVITY: 0.2071 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5576	16.5	86000
5600	20.3	38657
5630	20.3	38543
5650	16.5	71368
5662	16.5	53625
5746	27.9	12841
5760	23.3	48220
5770	29.4	29799
5778	27.9	54708

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 5606

LOCATION: AREA: DICKINSON
COUNTY: STARK
660' FWL, 1060' FSL
SEC.21, T140, R96W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5602 ft
BOTTOM: 5910 ft

PAY THICKNESS: 130 ft
AVE. POROSITY: 23.36%
WATER CHEMISTRY: 20069 mg/L
AVE. RESISTIVITY: 0.3136 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5656	24.0	21188
5670	27.0	13784
5700	23.8	17174
5720	22.0	24148
5740	26.8	35981
5760	23.0	22995
5770	23.0	73685
5852	17.5	60625
5868	23.4	56372

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 5911

LOCATION: AREA: DICKINSON
COUNTY: STARK
NE1/4, NW1/4
SEC.31, T140, R98W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5532 ft
BOTTOM: 5880 ft

PAY THICKNESS: 157 ft
AVE. POROSITY: 18.471%
WATER CHEMISTRY: 41430 mg/L
AVE. RESISTIVITY: 0.1716 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5599	18.5	29205
5608	14.3	76782
5610	16.8	94000
5630	20.0	92000
5650	21.0	23050
5665	15.8	10000
5675	18.4	15418
5684	15.9	24336
5693	19.6	33386
5710	19.3	28655
5720	18.5	40690
5726	19.5	36691
5740	19.8	32183
5748	18.0	25782
5750	18.3	29786
5770	20.2	75000
5785	20.2	104000

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 6243

LOCATION: AREA: DICKINSON
COUNTY: STARK
SE1/4, NW1/4
SEC.26, T137N, R96W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 4570 ft
BOTTOM: 4892 ft

PAY THICKNESS: 181 ft
AVE. POROSITY: 33.9%
WATER CHEMISTRY: 8145 mg/L
AVE. RESISTIVITY: 0.7785 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
4600	25.6	12140
4630	25.6	10010
4650	32.4	15197
4658	32.4	9002
4724	27.9	21966
4730	27.9	11285
4740	18.8	20656
4768	39.3	4632
4800	34.0	10994
4828	31.7	8158
4836	43.1	46020
4845	43.1	46010
4848	43.1	4955
4868	43.1	6197
4872	31.7	14192
4890	43.1	6721

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 6307

LOCATION: AREA: DICKINSON
COUNTY: STARK
C, SE1/4
SEC.21,T138N, R99W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5480 ft
BOTTOM: 5862 ft

PAY THICKNESS: 93 ft
AVE. POROSITY: 11.67%
WATER CHEMISTRY: 19845 mg/L
AVE. RESISTIVITY: 0.317830 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5594	15.7	20134
5604	12.7	40857
5610	14.2	30056
5618	16.5	31836
5670	16.5	37289
5684	12.7	87593
5690	14.2	62075
5760	14.2	27947
5782	21.8	94252
5812	21.1	21132
5817	13.5	181540
5820	12.7	317985
5830	12.7	133793
5840	15.7	36444
5860	18.8	142883

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 6449

LOCATION: AREA: DICKINSON
COUNTY: STARK
SW1/4, NW1/4
SEC.8, T139N, R97W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5275 ft
BOTTOM: 5665 ft

PAY THICKNESS: 85 ft
AVE. POROSITY: 18.74%
WATER CHEMISTRY: 60982 mg/L
AVE. RESISTIVITY: 0.1428 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5431	17.3	97000
5440	23.3	33199
5443	22.6	22068
5450	23.3	59747
5454	16.5	141000
5466	22.6	156000
5470	22.6	77000
5494	17.3	232000
5496	17.3	113000
5500	17.3	180000
5504	17.3	36699
5510	18.0	113000
5533	9.7	175000
5536	20.3	38903
5550	15.7	83000

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 6476

LOCATION: AREA: DICKINSON
COUNTY: STARK
1700'FSL, 1100'FWL
SEC.9, T138N, R92W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 4700 ft
BOTTOM: 5070 ft

PAY THICKNESS: 160 ft
AVE. POROSITY: 24.799%
WATER CHEMISTRY: 7021 mg/L
AVE. RESISTIVITY: 0.860 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
4785	21.8	7282
4815	27.9	19440
4816	24.9	19838
4820	21.8	26217
4829	27.9	4665
4848	26.4	26916
4877	19.5	12094
4883	10.4	126366
4900	16.5	19174
4920	12.7	4312
4950	43.0	4587
4970	32.0	5134
4982	29.4	11460
4990	33.2	7700
5016	31.7	5119
5020	31.7	5429
5035	27.9	17536
5058	35.5	12459
5066	20.3	51071

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 6601

LOCATION: AREA: DICKINSON
COUNTY: BILLINGS
NW1/4, SE1/4
SEC.29, T138N, R100W

FORMATION: INYAN KARA
AGE: UPPER CRETACEOUS
DEPTH: TOP: 5560 ft
BOTTOM: 5895 ft

PAY THICKNESS: 108 ft
AVE. POROSITY: 23.0%
WATER CHEMISTRY: 16540 mg/L
AVE. RESISTIVITY: 0.4011 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5711	16.5	18444
5716	14.2	54212
5754	21.1	25333
5813	15.0	43717
5818	21.1	11639
5846	18.8	45600
5874	35.5	8957
5890	18.8	45391

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 6682

LOCATION: AREA: DICKINSON
COUNTY: STARK
NW1/4, NW1/4
SEC. 9, T139N, R97W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5340 ft
BOTTOM: 5750 ft

PAY THICKNESS: 122 ft
AVE. POROSITY: 24.0%
WATER CHEMISTRY: 30605 mg/L
AVE. RESISTIVITY: 0.2135 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5420	25.6	18286
5430	21.8	37421
5440	20.7	45700
5450	20.7	64161
5460	21.1	26614
5470	21.1	30431
5480	21.8	79147
5490	22.6	36931
5493	22.6	25932
5524	16.5	250000
5530	22.6	34794
5550	20.3	55039
5560	21.1	41986
5570	21.8	28258
5580	22.2	72656
5642	27.9	23253
5650	31.7	15883
5655	34.0	18630

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 6691

LOCATION: AREA: DICKINSON
COUNTY: STARK
1980'FSL, 660'FEL
SEC.27, T140, R94W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5128 ft
BOTTOM: 5488 ft

PAY THICKNESS: 139 ft
AVE. POROSITY: 21.5%
WATER CHEMISTRY: 12401 mg/L
AVE. RESISTIVITY: 0.5575 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5188	18.0	47497
5194	18.8	26186
5275	20.3	24596
5284	24.1	20488
5286	25.6	3396
5300	24.1	18269
5314	16.5	12717
5325	24.1	18896
5335	23.3	18035
5337	23.3	12040
5350	21.8	8681
5370	21.8	14829
5379	24.9	25408
5429	24.1	52528
5436	22.6	23171
5454	24.1	14721
5470	30.9	23526
5486	31.7	22299
5492	27.9	56501
5500	27.9	16465

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 6812

LOCATION: AREA: DICKINSON
COUNTY: STARK
NW1/4, NW1/4
SEC.1, T138N, R93W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 4925 ft
BOTTOM: 5310 ft

PAY THICKNESS: 122 ft
AVE. POROSITY: 28.80%
WATER CHEMISTRY: 19517 mg/L
AVE. RESISTIVITY: 0.3243 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5010	24.1	15055
5023	27.9	16182
5088	23.3	16279
5102	24.1	22837
5142	20.3	21240
5146	22.6	16707
5165	20.3	19973
5170	21.8	17654
5205	43.0	4548
5213	31.7	12595
5232	31.7	35770
5310	37.0	18494

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 7007

LOCATION: AREA: DICKINSON
COUNTY: STARK
SE1/4, SE1/4
SEC.26, T138N, R98W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5600 ft
BOTTOM: 6250 ft

PAY THICKNESS: 157 ft
AVE. POROSITY: 18.7%
WATER CHEMISTRY: 19930 mg/L
AVE. RESISTIVITY: 0.3162 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5658	16.5	64452
5664	16.5	128000
5677	18.0	171968
5682	20.3	47699
5685	12.7	105000
5970	12.7	20714
5978	12.7	66017
6028	16.5	18181
6030	15.7	19707
6036	14.2	20911
6058	15.7	58000
6067	16.5	75000
6090	18.8	15874
6097	18.8	19289
6102	19.5	32509
6104	21.8	17841
6110	20.3	13777
6114	20.3	12435
6138	18.8	17348
6149	20.3	12409
6161	14.2	43427
6176	13.5	248000
6189	18.8	12184
6206	15.7	310000
6210	27.9	15302
6223	24.1	24097
6242	20.3	18962
6556	20.3	18224

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 7247

LOCATION: AREA: DICKINSON
COUNTY: STARK
1980'FEL, 1980'FWL
SEC.5, T140N, R96W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5438 ft
BOTTOM: 5885 ft

PAY THICKNESS: 124 ft
AVE. POROSITY: 18.2%
WATER CHEMISTRY: 15483 mg/L
AVE. RESISTIVITY: 0.4363 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5550	20.3	5898
5554	12.0	97000
5628	20.3	30074
5640	21.8	36669
5660	20.3	15572
5690	16.5	31640
5700	18.8	38570
5705	21.1	7507
5730	18.8	14824
5745	12.7	118000
5752	8.9	184000
5767	20.3	61923
5774	20.3	17185
5785	20.3	31931

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 12341

LOCATION: AREA: DICKINSON
COUNTY: BILLINGS
660' FSL, 1000' FWL
SEC.8, T138N, R100W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5449 ft
BOTTOM: 5870 ft

PAY THICKNESS: 106 ft
AVE. POROSITY: 15.856%
WATER CHEMISTRY: 33007 mg/L
AVE. RESISTIVITY: 0.2027 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5570	17.0	48177
5574	17.0	21223
5576	15.0	28521
5580	19.0	22203
5614	15.0	28437
5619	15.0	44504
5620	15.0	44499
5627	17.0	82000
5629	14.0	125000
5637	18.0	33593
5646	15.0	28366
5653	15.0	47128
5660	15.0	22484
5666	15.0	28322
5719	17.0	15235
5732	17.0	47000
5738	24.0	43398
5775	15.0	28086
5780	14.0	25602
5787	19.0	21945
5797	15.0	33865
5810	23.0	15706
5843	15.0	67000
5850	16.0	160000

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 8132

LOCATION: AREA: DICKINSON
COUNTY: STARK
NE1/4, NE1/4
SEC.27, T140N, R98W

FORMATION: INYAN KARA
AGE: UPPER CRETACEOUS
DEPTH: TOP: 5511 ft
BOTTOM: 5822 ft

PAY THICKNESS: 220 ft
AVE. POROSITY: 21.9%
WATER CHEMISTRY: 35601 mg/L
AVE. RESISTIVITY: 0.193 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5556	15.7	60498
5564	15.7	39582
5566	17.3	66267
5580	18.8	76006
5586	21.1	90983
5590	21.1	41857
5630	16.5	131021
5650	16.5	127000
5672	18.8	65605
5675	21.8	18188
5690	16.5	143000
5709	18.8	86783
5715	24.1	20042
5736	15.7	200000
5741	22.6	17623
5750	20.3	47353
5758	22.6	55074
5761	20.3	42168
5780	26.4	27735
5800	24.1	50416
5806	26.4	31145
5810	22.6	65829
5822	26.4	68737

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 8665

LOCATION: AREA: DICKINSON
COUNTY: STARK
SEC.4, T137N, R92W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP 4532 ft
BOTTOM: 5030 ft

PAY THICKNESS: 260 ft
AVE. POROSITY: 23.3%
WATER CHEMISTRY: 20886 mg/L
AVE. RESISTIVITY: 0.2995 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
4610	23.0	49521
4618	26.0	73660
4623	27.0	19786
4650	25.0	24505
4700	28.0	16332
4721	26.0	28277
4727	20.0	23272
4740	17.0	52919
4750	43.0	5825
4760	38.0	12519
4761	35.0	12295
4765	24.0	6763
4774	22.0	20561
4779	17.0	41801
4790	18.0	34143
4814	24.0	21184
4815	18.0	26498
4823	23.0	24413
4825	15.0	48551
4858	22.0	25607
4870	23.0	19533
4888	37.0	4932
4936	28.0	13358
4958	28.0	9015
4970	14.0	63257
4974	11.0	22371
4982	16.0	67000
4995	23.0	73000

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 9244

LOCATION: AREA: DICKINSON
COUNTY: STARK
SW1/4, NE1/4
SEC.2, T136N, R98W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5468 ft
BOTTOM: 5810 ft

PAY THICKNESS: 94 ft
AVE. POROSITY: 18.8%
WATER CHEMISTRY: 17394 mg/L
AVE. RESISTIVITY: 0.3756 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5492	14.0	69308
5496	16.0	39883
5538	11.0	27645
5544	15.0	22194
5548	16.0	126000
5591	18.0	16071
5596	15.0	97775
5607	19.0	6191
5616	19.0	160000
5623	20.0	50960
5633	18.0	113000
5654	17.0	23402
5660	21.0	105000
5664	24.0	9488
5675	24.0	28892
5686	26.0	45911
5691	10.0	190000
5700	16.0	51457
5714	30.0	11314
5722	14.0	96985
5749	15.0	96029
5760	24.0	56067

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 9257

LOCATION: AREA: DICKINSON
COUNTY: STARK
1780' FSL, 1780'FWL
SEC.19, T139N, R92W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 4819 ft
BOTTOM: 5250 ft

PAY THICKNESS: 216 ft
AVE. POROSITY: 21.705%
WATER CHEMISTRY: 18031 mg/L
AVE. RESISTIVITY: 0.3584 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
4844	22.6	5396
4850	22.6	17861
4852	27.9	13527
4859	27.9	16310
4878	27.9	23423
4900	24.9	7838
4920	24.1	21900
4940	23.3	22245
4960	27.1	35406
4980	12.7	96000
5000	25.6	43363
5055	21.8	14096
5065	22.6	19323
5108	24.1	28139
5118	24.9	19534
5125	34.7	13817
5134	39.3	6934
5140	36.2	12639
5150	37.0	9012
5152	28.7	15361
5167	25.6	16081
5170	24.9	23979
5184	22.6	28513
5190	24.1	38949
5196	24.9	23938
5200	20.3	44729
5207	22.6	37973

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 9684

LOCATION: AREA: DICKINSON
COUNTY: STARK
NE1/4, NW1/4
SEC.34, T138N, R97W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5485 ft
BOTTOM: 6060 ft

PAY THICKNESS: 197 ft
AVE. POROSITY: 16.8%
WATER CHEMISTRY: 20472 mg/L
AVE. RESISTIVITY: 0.3064 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5485	16.5	147000
5499	16.5	43220
5510	16.5	46425
5530	15.7	25155
5540	16.5	33720
5570	21.1	180991
5810	16.5	15954
5819	21.1	28532
5859	14.2	27740
5873	16.5	31154
5879	16.5	19921
5886	16.5	15899
5898	12.7	75109
5903	21.1	11574
5919	16.5	18270
5925	16.5	16976
5939	16.5	16286
5953	17.3	14647
5959	15.7	19774
5965	16.5	13920
5971	18.0	12456
5979	16.5	15831
5986	16.5	15826
5998	16.5	13896
6042	19.5	12316
6046	24.1	98585
6060	27.9	53037

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 11913

LOCATION: AREA: DICKINSON
COUNTY: STARK
NW1/4, NW1/4
SEC.35, T139N, R96W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5528 ft
BOTTOM: 5965 ft

PAY THICKNESS: 158 ft
AVE. POROSITY: 23.0%
WATER CHEMISTRY: 17512 mg/L
AVE. RESISTIVITY: 0.3723 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5603	22.6	18827
5612	21.1	58371
5640	24.1	14583
5648	24.1	27001
5650	25.6	15209
5670	24.1	14561
5680	26.4	12980
5690	24.9	11021
5698	24.1	56159
5720	21.8	21377
5730	20.3	38057
5740	18.8	40085
5750	18.8	48484
5760	20.3	42172
5770	21.8	27829
5780	24.1	36757
5785	20.3	19371
5790	20.3	31917
5800	27.9	15598
5817	27.9	9208
5825	27.9	10424
5835	34.7	9573

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 11260

LOCATION: AREA: DICKINSON
COUNTY: STARK
1350' FNL, 1980' FEL
SEC.21, T140, R97W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5610 ft
BOTTOM: 6060 ft

PAY THICKNESS: 156 ft
AVE. POROSITY: 22.5%
WATER CHEMISTRY: 28934 mg/L
AVE. RESISTIVITY: 0.2224 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5690	22.6	36231
5710	22.6	20050
5730	22.6	66439
5750	20.3	85000
5770	21.1	41097
5790	20.3	74000
5800	23.3	67000
5811	24.1	10782
5817	20.3	29616
5858	27.9	29940
5867	31.7	17554
5885	21.1	14426
5895	23.3	16114
5905	27.9	29826
5916	31.7	50639
5980	21.1	26422
5990	20.3	29213

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 9322

LOCATION: AREA: DICKINSON
COUNTY: STARK
SE1/4, SE1/4
SEC.29, T139N, R96W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5622 ft
BOTTOM: 5910 ft

PAY THICKNESS: 111 ft
AVE. POROSITY: 20.3%
WATER CHEMISTRY: 22262 mg/L
AVE. RESISTIVITY: 0.2796 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5714	23.3	15807
5720	20.3	32110
5724	23.3	57904
5730	24.1	22009
5738	22.6	15844
5746	24.1	15816
5754	22.6	18695
5758	21.1	43648
5768	23.3	18246
5780	21.1	46361
5790	23.3	32188
5800	23.3	18219
5810	22.6	81116
5820	20.3	21913
5826	21.1	98000
5853	22.6	40306
5860	27.9	34966
5868	30.2	29661

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 10570

LOCATION: AREA: DICKINSON
COUNTY: STARK
1400' FSL, 1400' FEL
SEC.1, T138N, R96W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5150 ft
BOTTOM: 6000 ft

PAY THICKNESS: 136 ft
AVE. POROSITY: 17.96%
WATER CHEMISTRY: 30000 mg/L
AVE. RESISTIVITY: 0.223792 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5206	20.3	23640
5226	21.8	100695
5552	20.3	30263
5582	24.1	8136
5590	25.6	18143
5600	19.5	20962
5640	18.8	27874
5655	24.1	62639
5667	16.5	18482
5677	37.0	4188
5690	20.3	34948
5695	14.2	205710
5702	25.6	12884
5710	25.6	40274
5715	24.1	20042
5723	27.9	19593
5730	31.7	4909
5972	16.5	62180
5977	14.2	117025
5982	14.2	116959
5990	14.2	282186
6000	11.2	82042

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 12370

LOCATION: AREA: DICKINSON
COUNTY: STARK
1980' FSL, 660' FWL
SEC.20, T140N, R97W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5538 ft
BOTTOM: 5862 ft

PAY THICKNESS: 137 ft
AVE. POROSITY: 21.5%
WATER CHEMISTRY: 23415 mg/L
AVE. RESISTIVITY: 0.2659 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5576	20.3	32517
5580	21.8	21541
5600	21.1	41814
5620	20.3	38581
5640	19.5	49469
5660	22.6	32656
5663	22.6	75000
5667	23.3	15841
5672	21.1	25475
5678	24.1	95000
5699	20.3	12745
5704	21.8	69000
5748	22.6	13973
5758	20.3	22851
5768	24.9	18218
5778	31.7	18754
5782	33.2	18551

GEOTHERMAL RESERVOIR DATA

WELL NUMBER: 12453

LOCATION: AREA: DICKINSON
COUNTY: STARK
SE1/4, SW1/4
SEC.12, T138N, R96W

FORMATION: INYAN KARA
AGE: LOWER CRETACEOUS
DEPTH: TOP: 5500 ft
BOTTOM: 6119 ft

PAY THICKNESS: 160 ft
AVE. POROSITY: 20.0%
WATER CHEMISTRY: 20886 mg/L
AVE. RESISTIVITY: 0.2995 ohm•m

DEPTH (ft)	POROSITY (%)	WATER CHEMISTRY (mg/L)
5514	24.1	16968
5599	31.7	22154
5630	11.2	26200
5638	15.7	37151
5640	15.7	37144
5649	15.7	24954
5697	30.9	14220
5710	38.5	18603
5921	12.7	120000
5928	16.5	70000
6016	16.5	47518
6057	20.3	22458
6072	15.0	81000