CANADA
DEPARTMENT OF MINES
AND
TECHNICAL SURVEYS

GEOLOGICAL SURVEY OF CANADA

WATER SUPPLY PAPER No. 253

GROUND-WATER RESOURCES OF THE RURAL MUNICIPALITY OF WILTON NO. 472 SASKATCHEWAN

Records Collected by C. O. Hage
Compilation by G. S. Hume and C. O. Hage

OTTAWA
1947
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MINES AND GEOLOGY BRANCH
BUREAU OF GEOLOGY AND TOPOGRAPHY

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INTRODUCTION

Information on the ground-water resources of east-central Alberta and western Saskatchewan was collected, mostly in 1935, during the progress of geological investigations for oil and gas. The region studied extends from Edmonton in the west to Battleford in the east, and from township 32 on the south to township 59 in western Alberta, township 63 in eastern Alberta, and in part as far north as township 56 in western Saskatchewan.

This region is crossed by North Saskatchewan and Battle Rivers, and includes other more or less permanent streams. Most of the lakes within the area, however, are alkaline, and water is obtained in wells from two sources, namely, from water-bearing sands in surface or glacial deposits, and from sands in the underlying bedrock.

A division has been made in the well records, in so far as possible, between glacial and bedrock water-bearing sands. In investigations for oil and gas, however, the bedrock wells were used to trace the lateral extent of geological formations, with the result that the records deal more particularly with this type of well. No detailed studies were made of the glacial materials in relation to the water-supply, nor were the glacial deposits mapped adequately for this purpose. In almost all of the region investigated in Alberta, and in all but the northeast part of the region studied in Saskatchewan, water can be obtained from bedrock. In a few places, however, the water from the shallower bedrock sands is unsatisfactory, and deeper drilling may be necessary.

The water records were obtained mostly from the well owners, some of whom had acquired the land after the water supply had been found, and hence had no personal knowledge of the water-bearing beds that had been encountered in their wells. Also the elevations of the wells were taken by aneroid barometer and are, consequently, only approximate. In spite of these defects, however, it is hoped that the publication of these water records may prove of value to farmers, town authorities, and drillers in their efforts to obtain water supplies adequate for their needs.

In collecting this information several field parties were employed. These were under the direction of Professors R. L. Rutherford and P. S. Warren of the University of Alberta, C. H. Crickmay of Vancouver, and C. O. Hage, until recently a member of the Geological Survey. The oil and gas investigations of which these water records are a part were undertaken under the general supervision of G. S. Hume.

Publication of Results

The essential information pertaining to ground-water conditions is being issued in reports that in Saskatchewan cover each municipality, and in Alberta cover each square block of sixteen townships beginning at the 4th meridian and lying between the correction lines. The secretary treasurer of each municipality in Saskatchewan and Alberta will be supplied with the information covering that municipality. Copies of the reports will also be available for study at offices of the Provincial and Federal Government Departments. Further assistance in the interpretation of the reports may be obtained by applying to the Chief Geologist, Geological Survey, Ottawa. Technical terms used in the reports are defined in the glossary.

How to Use the Report

Anyone desiring information concering ground water in any particular locality will find the available data listed in the well records. These should be consulted to see if a supply of water is likely to be found in shallow wells sunk in the glacial drift, or whether a better supply may be obtained at greater depth in the underlying bedrock formations. The wells in glacial drift commonly show no regional level, as the sands or gravels in which the water occurs are irregularly distributed and of limited extent. As the surface of the ground is uneven, the best means of comparing water wells is by the elevations of their water-bearing beds. For any particular well this elevation is obtained by subtracting the figure for the depth of the well to the water-bearing bed from that for the surface elevation at the well. For convenience both the elevation of the wells and the elevation of the water-bearing bed or beds in each well are given in the well record tables. Where water is obtained from bedrock, the name of the formation in which the water-bearing sand occurs is also listed in these tables, and this information should be used in conjunction with that provided on bedrock formations, pages 4 to 8, which describes these formations and gives their thickness and sequence. Where the level of the water-bearing sand is known, its depth at any point can easily be calculated by substracting its elevation, as given in the well record tables, from the elevation of the surface at that point.

With each report is a map consisting of two figures. Figure 1 shows the bedrock formations that will be encountered beneath the unconsolidated surface deposits. Figure 2 shows the position of all wells for which records are available, the class of well at each location, and the contour line or lines of equal surface elevation. The elevation at any location can thus be roughly judged from the nearest contour line, and the records of the wells show at what levels water is likely to be encountered. The depth of the well can then be calculated, and some information on the character and quantity of water can be obtained from a study of the records of surrounding wells.

GLOSSARY OF TERMS USED

Alkaline. The term "alkaline" has been applied rather loosely to some ground waters that have a peculiar and disagreeable taste. In the Prairie Provinces, water that is commonly described as alkaline usually contains a large amount of sodium sulphate and magnesium sulphate, the principal constituents of Glauber's salt and Epsom salts respectively. Most of the so called alkaline waters are more correctly termed sulphate waters, many of which may be used for stock without ill effect. Water that tastes strongly of common salt is described as salty.

Alluvium. Deposits of earth, clay, silt, sand, gravel, and other material on the flood plains of modern streams and in lake beds.

Aquifer or Water-bearing Horizon. A porous bed, lens, or pocket in unconsolidated deposits or in bedrock that carries water.

Buried pre-Glacial Stream Channels. A channel carved into bedrock by a stream before the advance of the continental ice-sheet, and subsequently either partly or wholly filled in by sands, gravels, and boulder clay deposited by the ice-sheet or later agencies.

Bedrock. Bedrock, as here used, refers to partly or wholly consolidated deposits of gravel, sand, silt, clay, and marl that are older than the glacial drift.

Coal Seam. The same as a coal bed. A deposit of carbonaceous material formed from the remains of plants by partial decomposition and burial.

Contour. A line on a map joining points that have the same elevation above sea-level.

Continental Ice-Sheet. The great ice-sheet that covered most of the surface of Canada many thousands of years ago.

Escarpment. A cliff or a relatively steep slope separating level or gently sloping areas.

Flood Plain. A flat part in a river valley ordinarily above water but covered by water when the river is in flood.

Glacial Drift. The loose, unconsolidated surface deposits of sand, gravel, and clay, or a mixture of these, that were deposited by the continental ice-sheet. Clay containing boulders forms part of the drift and is referred to as glacial till or boulder clay. The glacial drift occurs in several forms:

(1) Ground Moraine. A boulder clay or till plain (includes areas where the glacial drift is very thin and the surface uneven).

(2) Terminal Moraine or Moraine. A hilly tract of country formed by glacial drift that was laid down at the margin of the continental ice-sheet during its retreat. The surface is characterized by irregular hills and undrained basins.

(3) Glacial Outwash. Sand and gravel plains or deltas formed by streams that issued from the continental ice-sheet.

(4) Glacial Lake Deposits. Sand and clay plains formed in glacial lakes during the retreat of the ice-sheet.

Ground Water. Sub-surface water, or water that occurs below the surface of the land.

Hydrostatic Pressure. The pressure that causes water in a well to rise above the point at which it is first encountered.

Impervious or Impermeable. Beds, such as fine clays or shale, are considered to be impervious or impermeable when they do not permit of the perceptible passage or movement of ground water.

Pervious or Permeable. Beds are pervious when they permit of the perceptible passage or movement of ground water, as for example porous sands, gravel, and sandstone.

Pre-Glacial Land Surface. The surface of the land before it was covered by the continental ice-sheet.

Recent Deposits. Deposits that have been laid down by the agencies of water and wind since the disappearance of the continental ice-sheet.

Unconsolidated Deposits. The mantle or covering of alluvium and glacial drift consisting of loose sand, gravel, clay, and boulders that overlie the bedrock.

Water-table. The upper limit of the part of the ground wholly saturated with water. This may be very near the surface or many feet below it.

Wells. Holes sunk into the earth so as to reach a supply of water. When no water is obtained they are referred to as dry holes. Wells in which water is encountered are of three classes:

(1) Wells in which the water is under sufficient pressure to flow above the surface of the ground.

(2) Wells in which the water is under pressure but does not rise to the surface.

(3) Wells in which the water does not rise above the water table.

BEDROCK FORMATIONS OF WEST-CENTRAL SASKATCHEWAN AND EAST-CENTRAL ALBERTA

The formations that outcrop in west-central Saskatchewan are an extension of similar formations that occur in east-central Alberta. They are of Upper Cretaceious age, and consist entirely of relatively soft shales and sands, with some bands of hard sandstone and layers of ironstone nodules. The succession, character, and estimated thickness of the formations are shown in the following table:

Formation	Character	Thickness Feet
Edmonton	Grey to white, bentonitic sands and sandstones with grey and greenish shales; coal seams prominent in some areas, as at Castor, Alberta.	1,000 to 1,150
Bearpaw	Dark shales, green sands with smooth black chert pebbles; partly non-marine, with white bentonitic sands, carbonaceous shales or thin coal seams similar to those in Pale Beds; shales at certain horizons contain lobster claw nodules and marine fossils; at other horizons are abundant selenite crystals.	300 to 600 thins rapidly to the north-west
Pale and Variegated Beds	Light grey sands with bentonite; soft, dark grey and light grey shales with selenite and ironstone; carbonaceous shales and coal seams; abundant selenite crystals in certain layers.	950 to 1,000 in Czar-Tit Hills area; may be thinner elsewhere
Birch Lake	Grey sand and sandstone in upper part; middle part of shales and sandy shales, thinly laminated; lower part with grey and yellow weathering sands; oyster bed commonly at base.	100 in west, but less to east and south
Grizzly Bear	Mostly dark grey shale of marine origin, with a few minor sand horizons; selenite crystals and nodules up to 6 or 8 inches in diameter	Maximum, 100
Ribstone Creek	Grey sands and sandstones at the top and bottom, with intermediate sands and shales; thin coal seam in the vicinity of Wainwright; mostly non-marine, but middle shale in some areas is marine.	Maximum, 325 at Viking; thins eastward
Lea Park	Dark grey shales and sandy shales with nodules of ironstone; a sand 70 feet thick 110 feet below the top of the formation in the Ribstone area, Alberta.	950 to 1,100

Edmonton Formation

The name Edmonton formation was first applied to the beds containing coal in the Edmonton area, and later to the same beds in adjoining areas. The formation has a total thickness of 1,000 to 1,150 feet, but is bevelled off eastward and the east edge of the formation follows a northwest line from Coronation through Tofield to a point on North Saskatchewan River about midway between Edmonton and Fort Saskatchewan. No Edmonton beds occur northeast of this line, but the formation becomes progressively thicker to the southwest due to the fact that the beds incline in that direction and the surface bevels across them.

The Edmonton formation consists of poorly bedded grey and greenish clay shales, coal seams, and sands and sandstones that contain clay and a white material known as bentonite. This material when wet is very sticky and swells greatly in volume, and when dry tends to give a white appearance to the beds containing it. Such beds are relatively impervious to water, and at the surface produce the "burns" of barren ground where vegetation is scanty or absent.

Water is relatively abundant in the Edmonton formation, which contains much sand, commonly in the form of isolated lenses distributed irregularly through the formation. Consequently, there is little uniformity in the depth of wells even within a small area. Water also occurs commonly with coal seams and, unlike the sand lenses, these beds are much more regular and persistent. In contrast with the water from the bentonitic sands, which is generally "soft", water from the coal seams, as the water from the shallow surface deposits, may be "hard". The basal beds of the Edmonton formation usually contain fresh water, but this may become brackish locally where the underlying Bearpaw beds contain highly alkaline or salty water.

Bearpaw Formation

In southern Alberta, where the Bearpaw formation is thickest, the beds composing it are mainly shales that have been deposited in sea water. In the area north of township 32 the formation thins to the northwest and becomes a shoreline deposit composed of shales containing bentonite, impure sands, and thin coal seams. In some areas, as at Ryley and near Monitor, and in the Neutral Hills, the Bearpaw contains pebble beds. At Ryley these are consolidated into a conglomerate, but mostly the pebbles are loosely distributed in shale or sandy beds.

In the area immediately north of township 32 the Bearpaw occupies a widespread belt beneath the glacial drift, but farther northwest the belt narrows, and at Ryley and northwestward it is only a few miles wide. This belt crosses North Saskatchewan River about midway between Edmonton and Fort Saskatchewan. Bearpaw beds form the main bedrock deposits of the Neutral Hills. Farther south, where they have an exposed thickness of at least 400 feet, they contain green sands, and beds of marine shale interfinger with the bentonitic shales and sands of the underlying formation. To the north, on the banks of North Saskatchewan River, the division between the Bearpaw and the overlying and underlying formations is indefinite, and the thickness of beds of Bearpaw age is relatively small.

The water in the Ryley area is from the Bearpaw formation, and is salty. In other areas to the south the marine Bearpaw formation carries green sand beds that yield fresh water, but commonly a much better supply is found by drilling through the Bearpaw into the underlying Pale Beds.

In Saskatchewan, Bearpaw beds occur southeast of Maclin and south of Luseland and Kerrobert. Only the basal beds are present, and these contain green sands that are commonly water-bearing.

Pale and Variegated Beds

Underlying the Bearpaw formation is a succession of bentonitic sands, shales, and sandy shales containing a few coal seams. The upper part of this succession, due to the bentonitic content, is commonly light coloured and has been described as the Pale Beds, whereas the lower part is darker, and is known as Variegated Beds. In part, dark shales are present in both Pale and Variegated Beds; others are greenish, grey, brown, and dark chocolate, carbonaceous types. The sands may also be yellow, but where bentonite is present it imparts a light colour to the beds. Both Pale and Variegated Beds are characterized by the presence of thin seams of ironstone, commonly dark reddish, but in part purplish, Selenite (gypsum) crystals are, in places, abundant in the shales.

The best sections of Pale Beds exposed in the region are in the Tit Hills, southwest of Czar. These hills carry a thin capping of Bearpaw shales, beneath which, and around Bruce Lake, more than 200 feet of Pale Beds are exposed. The total thickness of Pale and Variegated Beds in the Tit Hills area is about 970 feet. Variegated Beds outcrop near Hawkins on the Canadian National Railway west of Wainwright, but no area exposes the complete succession, which is considered to comprise about 200 feet of beds.

Records of wells drilled into the Pale and Variegated Beds do not, in general, indicate lateral persistence of sands for long distances, nor any uniform average depth to water-bearing sands in a local area. This points to the conclusion that the sands are mainly local lenses, but as such lenses are numerous, few wells fail to obtain water. In the Cadogan area many flowing wells have been obtained from sands about midway in the succession. In western Saskatchewan Paleland Variegated Beds occur over a wide area from Maclin and Kerrobert northeast through Wilkie to the Eagle Hills, south of Battleford. Numerous outcrops occur in the area south of Unity at Muddy Lake, but south and east around Biggar these beds are almost wholly concealed by glacial drift.

The water from the sands of the Pale and Variegated Beds is generally soft. The supply, apparently, is dependent in part on the size of the sand body that contains the water and in part on the ease with which water may be replenished in the sand. Small sand lenses surrounded by shales may be filled with water that has infiltrated into them, but when tapped by a well the supply may be very slowly replenished. In many instances such wells yield only a small supply, although this is commonly persistent and regular.

Birch Lake Formation

The Birch Lake formation underlies the Variegated Beds, but in many areas the division is not sharp. The type area of the formation is along the north shore of Birch Lake south of Innisfree, where a section 65 feet thick, composed mostly of sand, is exposed. The total thickness of the formation in this area is about 100 feet, and although this is dominantly sand a central part is composed of alternating thin sand and shale beds. At the base of the formation, in a number of places, is an oyster bed, and this is exposed in a road cut in a section 73 feet thick on the east side of Buffalo Coulée in sec. 3, tp. 47, rge. 7, W. 4th mer. In both upper and lower parts of the formation the sand is commonly massive and outcrops tend to consolidate into hard, nodular masses from a foot to a few feet in diameter. Apparently these are formed through the deposition of salts from the water that finds an outlet at the outcrops. In fact, in some areas the sand may be traced along the side of a hill by the presence of small springs or nodular masses of sandstone.

The Birch Lake formation occurs under the drift and in outcrops in a large area south of North Saskatchewan River and northeast of a line from Willingdon to Innisfree and Minburn. East of this area the southwest boundary is more irregular, but outcrops are persistent on the banks of Battle River from a few miles north of Hardisty to and beyond the mouth of Grizzly Bear Coulée in tp. 47, rge. 5. It is believed, too, that a large area near Edgerton and Chauvin is underlain by the Birch Lake formation and that it extends southeastward into Saskatchewan around Manitou Lake and southeast to Vera.

It is thought that the Birch Lake formation thins eastward from its type section at Birch Lake, and that it loses its identity in western Saskatchewan. Deep wells drilled at Czar, Castor, and elsewhere no longer show the Birch Lake as a clearly recognizable sand formation, so that its southern limit beneath younger formations is unknown. Wherever it occurs as a sand, however, it is water-bearing, although in some areas the sand is apparently too fine to yield any considerable volume of water. In other areas, however, it persistently yields good wells. There is no apparent uniformity in the character of the water, which is either hard or soft in different wells in the same general area. Direct contact with surface waters that contain calcium sulphates may in time change a "soft" water well to a "hard" water well, and many wells are not sufficiently cased to prevent the percolation of water from surface sands into the well, and hence into the deeper, soft water producing sands. In part this accounts for the change in character of the water in a well, a feature that has been noticed by many well owners.

Grizzly Bear Formation

The type locality for the Grizzly Bear formation, which underlies the Birch Lake beds, is near the mouth of Grizzly Bear Coulée, a tributary of Battle River with outlet in tp. 47, rge. 5. The formation is mainly composed of dark shales that were deposited in sea water. At the mouth of Grizzly Bear Coulée two shale sections, each about 100 feet thick, are separated by a zone of thin sand beds. It is now recognized that the upper section is the Grizzly Bear shale, and that the lower one, very similar in character and also deposited in sea water, occurs in the next lower formation, the Ribstone Creek. The Grizzly Bear shale contains a thin nodular zone about 50 feet above the base, that is, at about the centre of the formation. This zone is sandy, and is believed to yield water in various wells. Other thin sands, in places water-bearing, are also present. The impervious nature of the Grizzly Bear shales makes the overlying Birch Lake sand a strong acquifer, as water collects in the sand above the shale. The contact of the Birch Lake and Grizzly Bear formations can be traced in some places by the occurrence of springs issuing from the base of the Birch Lake sand even where this is not exposed.

Grizzly Bear shales occur in a road cut on the south side of Battle River near the highway bridge at Fabyan. The shales in this area are about 100 feet thick. It is thought they extend as far west as the Viking gas field, where they have been recognized in samples from deep wells. It is probable, however, that the shales thin westwardrand thicken eastward so that their general form is a wedge between both higher and lower sand beds. The position of the thin edge of the wedge to the west is unknown, but evidently the Grizzly Bear marine shale underlies a large area in east-central Alberta extending into Saskatchewan mainly in the area south of Battle River.

Ribstone Creek Formation

The type area of the Ribstone Creek formation is on Ribstone Creek near its junction with Battle River in tp. 45, rge. 1, W. 4th mer. At this place the lower sand beds of the formation are well exposed. The upper part of the lower sand member of this formation outcrops on the north side of Battle River, in the northeast part of sec. 26, tp. 47, rge. 5, near the mouth of Grizzly Bear Coulée. Above it, higher on the bank and at a short distance from the river, there is a 12 foot zone of carbonaceous and coaly beds in two layers, each about 2 feet thick, separated by 8 feet of shale. Above this are 90 feet of dark shales that are thought to have been deposited in sea water, that is, they are marine shales. These marine shales in turn are overlain by a sandy zone about 20 feet thick containing oysters in the basal part. This sandy zone is the upper sand member of the Ribstone Creek formation.

It thickens to the east and west from the Grizzly Bear area but is probably at no place much more than 50 feet thick.

The lower sand member of the Ribstone Creek formation also varies in thickness from a minimum of about 25 feet. On the banks of Vermilion Creek, north of Mannville, the basal sand is at least 60, and may be 75, feet thick. It is overlain by shaly sand and sandy shale beds, which replace the shale beds in the central part of the formation as exposed at the mouth of Grizzly Bear Coulée. In the Wainwright area, where the formation has been drilled in deep wells, the basal sand is 60 feet thick, with the central part composed of shale containing sand streaks. The upper sand member is about 20 feet thick in this area. The total thickness of the formation in the Wainwright area is 100 to 200 feet, but this increases to the west and in the Viking area exceeds 300 feet.

The Ribstone Creek formation is widely exposed in a northwest-trending belt in east-central Alberta. The southwest boundary of this northwest-trending belt passes through the mouth of Grizzly Bear Coulée in tp. 47, rge. 5, and beyond to the Two Hills area in tp. 54, rge. 12, whereas the northeast boundary crosses North Saskatchewan River southwest of Elk Point and extends northwest to include an area slightly north of St. Paul des Metis and Vilna to tp. 60, rge. 14. Within this belt water wells are common in the Ribstone Creek sands, which are almost without exception water-bearing in some part of the formation. The limits of the belt to the northeast determine the limits of water from this source, but to the southwest of the belt, as here outlined, water may be obtained in this formation by drilling through the younger beds that overlie it. The Ribstone Creek sands are a prolific source of water in many places and hence the distribution of this formation is of considerable economic importance. Where the formation consists of upper and lower sands with a central shale zone only the sands are water-bearing, although thin sand members may occur in the shale. Where the formation is largely sand the distribution of water may be in any part of the formation, although the upper and lower sands are perhaps the better aquifers. To the east of Alberta, along Battle River and Big Coulée in Saskatchewan, the Ribstone Creek sands are marine. Marine conditions apparently become more prevalent to the southeast and it is believed that in this direction the sands are gradually replaced by marine shales. Thus at some distance southeast of Battleford the Ribstone Creek formation loses its identity and its equivalents are shales in a marine succession.

Lea Park Formation

The Lea Park formation is largely a marine shale, and only in the upper 180 feet is there any water. In the Dina area south of Lloydminster the upper beds of the Lea Park consist of silty shales about 110 feet thick underlain by silty sands 70 feet thick. Below these sands are marine shales only, and these yield no fresh water either in east-central Alberta or west-central Saskatchewan. The sand in the upper Lea Park formation is thus the lowest freshwater aquifer within a very large area. The extent of this sand in the Lea Park, particularly to the northeast, is not known, but as the strata in east-central Alberta have a southwest inclination, progressively lower beds occur at the surface to the northeast. Thus at a short distance beyond the northeast boundary of the Ribstone Creek formation, as previously outlined, the sand in the upper Lea Park reaches the surface, and represents the last bedrock aquifer in that direction. Farther northeast water must be obtained from glacial or surface deposits only. In Alberta this area without fresh water in the bedrock includes the country north of North Saskatchewan River in the vicinity of Frog Lake and a large area extending to and beyond Beaver River. In this area, however, more fresh water streams are present than farther south, and bush lands help to retain the surface waters. The area northeast of North Saskatchewan River in Saskatchewan is almost wholly within the Lea Park formation, where water can be found only in surface deposits.

WATER ANALYSES

Introduction

Analyses were made of water samples collected from a large number of wells in west-central Saskatchewan. Their purpose was to determine the chemical characteristics of the waters from different geological horizons, and thereby assist in making correlations of the strata in which the waters occur. Although this was the main objective of the analyses, it was also realized that a knowledge of the mineral content of the water is of interest and value to the consumer. The analyses were all made in the laboratory of the Water Supply and Borings Section of the Geological Survey, Ottawa.

Discussion of Chemical Determinations

The dissolved mineral constituents vary with the material encountered by the water in its migration to the reservoir bed. The mineral salts present are referred to as the total dissolved solids, and they represent the residue when the water is completely evaporated. This is expressed quantitatively as "parts per million", which refers to the proportion by weight in 1,000,000 parts of water. A salt when dissolved in water separates into two chemical units called "radicals", and these are expressed as such in the chemical analyses. In the one group is included the metallic elements of calcium (Ca), magnesium (Mg), and sodium (Na), and in the other group are the sulphate (S04), chloride (Cl), and carbonate (CO_3) radicals.

The analyses indicate only the amounts of the previously mentioned radicals, thus neglecting any silica, alumina, potash, or iron that may be present. It will be noticed that in most instances the total solids are accounted for by the sum total of the radicals as shown by the analyses. Actually, the residue when the water is completely evaporated still retains some combined water of crystallization, so that the figures for the "total solids" are higher than the sum total of the radicals as determined. These radicals are also "calculated in assumed combinations" to indicate the theoretical amounts of different salts present in the water. The same method was followed in each analysis, so that the table presents a consistent record of the different compounds present.

Mineral Constituents Present

Calcium. Calcium (Ca) in the water comes from mineral particles present in the surface deposits, the chief source being limestone, gypsum, and dolomite. Fossil shells provide a source of calcium, as does also the decomposition of igneous rocks. The common compounds of calcium are calcium carbonate ($CaCO_3$) and calcium sulphate ($CaSO_4$).

Magnesium. Magnesium (Mg) is a common constituent of many igneous rocks and, therefore, very prevalent in ground water. Dolomite, a carbonate of calcium and magnesium, is also a source of the mineral. The sulphate of magnesia ($MgSO_4$) combines with water to form "Epsom salts" and renders the water unwholesome if present in large amounts.

Sodium. Sodium (Na) is derived from a number of the important rock-forming minerals, so that sodium sulphate and carbonate are very common in ground waters. Sodium sulphate (Na_2SO_4) combines with water to form "Glauber's salt" and excessive amounts make the water unsuitable for drinking purposes. Sodium carbonate (Na_2CO_3) or "black alkali" waters are mostly soft, the degree of softness depending upon the ratio of sodium carbonate to the calcium and magnesium salts. Waters containing sodium carbonate in excess of 200 parts per million are unsuitable for irrigation purposes[1]. Sodium sulphate is less harmful.

Sulphates. The sulphate (SO_4) salts referred to in these analyses are calcium sulphate ($CaSO_4$), magnesium sulphate ($MgSO_4$), and sodium sulphate (Na_2SO_4).

Chloride. Chlorine (Cl) is with a few exceptions, expressed as sodium chloride (NaCl), that is, common table salt. It is found in all of the analyses, most of the waters containing less than 200 parts per million, but some as much as 2,000 or 3 ,000 parts. These waters have a brackish taste.

Alkalinity. The alkalinity determined in these water analyses is based on the assumption that the only salts present in the samples that will neutralize acids are carbonates, and that, consequently, the degree of alkalinity is proportional to the amount of the carbonate radical (CO_3) present.

Hardness. The hardness of water is the total hardness, and has been determined by the amount of a standard soap solution required to form a lather that will stand up (persist) for 2 minutes. Hardness is of two kinds, temporary and permanent. Temporary hardness is caused by calcium and magnesium bicarbonates, which are soluble in water but are precipitated as insoluble normal carbonates by boiling, as shown by the scale that forms in teakettles. Permanent hardness is caused by the presence of calcium and magnesium sulphates, and is not removed by boiling. The two forms of hardness are not distinguished in the water analyses. Waters grade from very soft to very hard, and can be classified according to the following system[2]:

A water under 50 degrees (that is, parts per million) of hardness may be said to be very soft.

A water with 50 to 100 degrees of hardness may be said to be moderately soft.

A water with 100 to 150 degrees of hardness may be said to be moderately hard.

A water with more than 200 and less than 300 degress of hardness may be said to be hard.

A water with more than 300 degrees of hardness may be said to be very hard.

Hard waters are usually high in calcium carbonate. Almost all of the waters from the glacial drift are of this type, especially those not associated with sand and gravel deposits that come close to the surface.

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[1] "The extreme limit of salts for irrigation is taken to be 70 parts per 100,000, but plants will not tolerate more than 10 to 20 parts per 100,000 of black alkali (alkaline carbonates and bicarbonates)" Frank Dixey in "A Practical Handbook of Water Supply", Thos. Murby & Co., 1931, p. 254.

[2] The "Examination of Waters and Water Supplies", Thresh & Beale, page 21, Fourth Ed. 1933 .

In soft water the calcium carbonate has been replaced by sodium carbonate, due to natural reagents present in the sand and clays. Bentonite and glauconite are two such reagents known to be present. Montmorillinite, one of the clay-forming minerals, has the same property of softening water, owing to the absorbed sodium that is available for chemical reaction[1].

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[1] Piper, A. M. "Ground Water in Southwestern Pennsylvania", Penn. Geol. Surv., 4th series.

If surface water reaches the lower sands by percolating through the higher beds it may be highly charged with calcium salts before reaching the bedrock formations containing bentonite or glauconite. The completeness of the exchange of calcium carbonate for sodium carbonate will, therefore, depend upon the length of time that the water is in contact with the softening reagent, and also upon the amount of this material present. The rate of movement of underground water will, consequently, be a factor in determining the extent of the reaction.

The amount of iron present in the water was not determined, owing to the possibilities of contamination from the iron casings in the wells. Iron is present in most waters, but the amount may be small. Upon exposure to air a red precipitate forms, the water becomes acid, and, hence, has a corrosive action. When iron is present in large amounts the water has an inky taste.

WATER ANALYSES IN RELATION TO GEOLOGY

Glacial Drift

The quality of the water from glacial drift depends largely on the nature of the deposit from which it comes and on the depth of the aquifer below the surface. Glacial deposits may be divided roughly into three types.

(1). Sand and gravel beds that form the surface deposit, such as outwash material and glacial lake sands.

(2). Buried outwash and interglacial deposits between two tills of boulder clay.

(3). Pockets or lenses of sand and gravel irregularly distributed through the till.

Water from surface sand deposits is normally low in dissolved salts, the total being generally less than 1,000 parts per million. Where large amounts of limestone occur in the glacial sand and gravel beds a characteristic constituent of the glacial water is calcium carbonate, the amount present varying from 300 to 700 parts per million.

Water from buried outwash deposits contains more dissolved salts than the surface sands, as the water in order to reach them has to percolate through overlying till. Rain water contains carbonic acid, which acts as a solvent and dissolves a great deal of calcium, magnesium, and sodium from the rock-forming minerals. Sulphate salts are commonly present, though their proportions vary greatly in the different waters. The shales that are incorporated in the drift are high in calcium sulphate, so that the amount of shale present will modify the quality of the water. The oxidized upper part of the drift contains less sulphate than the deeper, less oxidized boulder clay. The character of the water in the buried outwash deposits will, therefore, depend largely on the composition and amount of till that overlies it.

Water from irregularly distributed sand and gravel beds will vary in its content of dissolved salts depending upon the character of the material surrounding the reservoir beds. As the water in this type of deposit does not flow to any marked extent, it is apt to be more highly impregnated with soluble salts than where the underground movement is more rapid. Soft water in the drift is mostly confined to shallow wells in sands low in calcium carbonate. Waters from glacial lake clays are sometimes high in soluble salts. The sample from a well in glacial lake clay on N.W. ¼ sec. 27, tp. 42, rge. 17, has 11,040 parts per million of soluble salts, largely magnesium sulphate and sodium sulphate. The sample from SE. ¼ sec. 13, tp. 42, rge. 16, which is believed to come from glacial lake silts, has a very different composition. The total solids in it are only 440 parts per million, of which 250 are calcium carbonate. The great difference in these waters is due to the high soluble salt content that is associated with the lake clays but absent in the silts. Average drift water contains between 1,000 and 3,000 parts per million of dissolved mineral salts.

Bearpaw Formation

The Bearpaw formation consists of dark marine shales and beds of green sand. Water from these sands has a total solid count ranging from 300 to 1,600 parts per million and a hardness of more than 300 degrees. Calcium carbonate is very marked in all samples, due, perhaps, to the proximity of the water sands to the glacial drift. Sodium sulphate is the chief salt present, followed by calcium carbonate, magnesium sulphate, magnesium carbonate, and sodium chloride in decreasing amounts. These waters are distinguished from the overlying drift waters by being relatively low in total dissolved solids, and in containing no calcium sulphate and only moderate amounts of sodium sulphate, magnesium sulphate, and magnesium carbonate.

Pale Beds

Pale Beds underlie the Bearpaw formation. Total solids in waters from these beds vary from 700 to 1,300 parts per million. The water is, in most instances, soft, as it contains sodium carbonate in excess of calcium and magnesium carbonates, but when mixed with surface water high in calcium carbonate, it will become hard. The high concentration of sodium salts, especially sodium carbonate, in contrast with the calcium and magnesium salts distinguishes this water from that in Bearpaw sands. The Pale Beds include much bentonite, and it is this mineral that acts as a water softener within the formation. The following analyses are typical of waters from the Pale Beds:

Salts	SE. sec. 16, tp.38, rge. 21	NE. sec. 3, tp.39, rge. 25,	SW. sec. 7, tp.37, rge.24,	SE. sec. 21 tp. 38,rge.23
$CaCO_3$	73	18	53	35
$CaSO_4$	-	-	-	-
$MgCO_3$	52	14	45	38
$MgSO_4$	-	-	-	-
Na_2CO_3	297	679	464	562
Na_2SO_4	297	158	266	437

NaCl	31	45	46	130
Total solids	760	1,020	940	1,260
Hardness	100	20	30	75

Variegated Beds

In Senlac Rural Municipality, Saskatchewan, are a number of wells that have water very similar in character to that found in the Bearpaw formation. These wells tap an horizon that corresponds with the Variegated Beds in Alberta, although they have not been separated from the Pale Beds. They are less bentonitic than the Pale Beds and darker in colour. The water is hard and has a low dissolved solid content. The three analyses given below show a great deal of similarity and suggest a common horizon.

Salts	NW. sec. 21, tp.41, rge.26	NW. sec. 3, tp.41, rge.28	SE. sec. 28, tp.40, rge.28
$CaCO_3$	250	305	125
$CaSO_4$	-	-	-
$MgCO_3$	1109	80	155
$MgSO_4$	149	104	69
Na_2CO_3	-	-	-
Na_2SO_4	98	132	386
NaCl	12	12	18
Total solids	640	640	780
Hardness	600	600	500

Ribstone Creek Formation

Chemical analyses of water from the Ribstone Creek formation vary more than in the Pale Beds, the reason being that at several different horizons the sediments show considerable lateral variation. The formation includes both marine and non-marine beds, thin coal seams being present in the basal part of the formation around Paynton, whereas south of Lashburn, on Battle River, marine fossils were found in strata considered to be at approximately the same horizon. The water analyses show similarities within limited areas, but long distance correlations cannot be made safely except for the saline waters that occur in the flowing wells at Vera, Muddy Lake, and at the south end of Tramping Lake. Analyses of these waters are given in the following table:

Salts	SE.sec.25, tp.41, rge. 24	SE.sec.22, tp.41, rge. 24,	NE.sec.36, tp.41, rge. 24,	SW.sec.7 tp.41, rge 24,	SE.sec.30, tp.38, rge. 22,	SW.sec10, tp.35, rge.20,
$CaCO_3$	73	73	73	198	108	90
$CaSO_4$	-	-	-	-	-	-
$MgCO_3$	38	38	38	52	69	52
$MgSO_4$	-	-	-	-	-	-

Na_2CO_3	129	119	129	11	106	125
Na_2SO_4	55	55	61	61	49	43
NaCl	2,929	3,036	2,690	2,863	3,531	3,861
Total solids	3,840	3, 460	3,120	3,200	3,860	4,460
Hardness	135	90	110	100	130	130

The similarity in these anlayses suggests a common source bed. The distance between the Tramping Lake well and the Vera wells is about 40 miles. This water, which is thought to come from the basal sand of the Ribstone Creek formation, is not typical of water from the same stratigraphical horizon in the vicinity of Battle River, one reason being, possibly, that at Battle River the stream has cut through the Ribstone Creek formation exposing the sand members along its banks. This may cause a more rapid movement of the underground water in this area than farther south, and it is known that the rate of flow is a controlling factor that governs the change of calcium carbonate to sodium carbonate when the softening reagents of bentonite or glauconite are present in the sand.

Some of the soft waters from the Ribstone Creek formation cannot be distinguished from those of the Pale Beds, whereas others are quite different. The following analyses illustratetsome of the different types of water from this formation:

Salts	Se.sec. 11, tp. 46, rge. 28	Ind.Agent Little Pine I.R.	SW.sec. 24, tp. 46, rge. 21	NE.sec. 36, tp. 43, rge. 18	Se.sec. 26. tp. 43, rge. 18	NE.sec. 36. tp. 41, rge. 24	NW.sec. 22. tp. 42. rge. 23
$CaCO_3$	90	90	410	73	35	73	125
$CaSO_4$	-	-	-	-	-	-	-
$MgCO_3$	97	59	168	38	31	38	97
$MgSO_4$	-	-	64	-	-	-	-
Na_2CO_3	217	392	-	283	592	129	196
Na_2SO_4	1,644	777	2,518	225	522	61	1,541
NaCl	249	63	76	12	83	2,690	71
Total solids	2,220	1,340	3,000	620	1,280	3,120	1,900
Hardness	280	160	750	110	35	110	600

The above chemical analyses show such a wide range in the dissolved salts present in the different waters in the Ribstone Creek formation that they cannot be used for correlation purposes over a large area.

Conclusions

(1) In most instances water from glacial drift is quite different from water from bedrock.

(2) Some of the bedrock horizons carry waters that show definite chemical characteristics.

(3) Most waters from glacial till carry total solids amounting to between 1,000 andn3,000 parts per million.

(4) Bedrock waters are commonly low in dissolved salts. Exceptions to this are to be found in water from the Ribstone Creek formation.

(5) Water from the Bearpaw formation is hard. An average of ten wells gave a total solid content of 1,100 parts per million.

(6) Water from the Variegated Beds resembles that from the Bearpaw formation.

(7) Waters from the Pale Beds is mostly soft. An average of ten wells gave a total solid of 1,000 parts per million.

(8) All soft waters contain sodium carbonate (Na_2CO_3), which is present in water from the Pale Beds and Ribstone Creek formations but absent from the Bearpaw formation and Variegated Beds.

RURAL MUNICIPALITY OF WILTON, NO. 472, SASKATCHEWAN

Physical Features

Battle River forms the southern boundary of the municipality. It is a small river meandering in a comparatively broad valley with banks from 150 to 200 feet high. Cutting across the northeastern part of the municipality is Big Gully Valley, more than 100 feet deep, trending generally in an east-west direction. Several small lakes and a creek carrying the overflow waters now occupy the bottom of the valley where once a large river flowed into the Saskatchewan, carrying the waters from the ice-sheet retreating to the northwest. From these two drainage channels the country rises gradually to form a gently rolling plain featured by several large hills or escarpments towards its western side. Six miles south of Marshall one of these, known locally as Fartown Hills, trends due east for about 6 miles and rises about 150 feet above the general level of the surrounding country. Glacial drift covers the surface of Fartown Hills, and moraines are very pronounced, but the well records reveal that the drift is underlain by bedrock higher stratigraphically than on the adjoining plain. This is proof that these hills were present in much the same form before the advance of the continental ice-sheet. The escarpment south of the town of Lone Rock is of a similar nature. On it outcrops of bedrock have been exposed by highway cuts indicating a very thin covering of glacial debris. Likewise the railroad cut north of Buzzard exposes a good section of the strata. A few small recessional moraines in the form of narrow, northwest-trending ridges and irregular hills and hollows are found in several places. One of these small moraines lies just south of the town of Lashburn, and several others west of Lone Rock.

Geology

The municipality is covered with ground moraine showing a few poorly developed recessional moraines. Battle River has cut through this overburden into the underlying sedimentary strata of sands and shales, which are exposed at various places along the banks. Some of the sand members are consolidated into sandstones that form ledges continuous for considerable distances. These ledges mostly form the tops of terraces, which are a common feature along the banks of Battle River. The lower part of the Ribstone Creek formation underlies the whole of the municipality with the exception of the two deep drainage channels of Battle River and Big Gully Creek and, possibly, one or more buried channels that were present before the advance of the ice and subsequently filled in by glacial material. These channels have been cut into the Lea Park shales. Wells encountering such a buried channel will not strike the Ribstone Creek sand, and dry holes will result unless water is encountered in the drift.

A more complete section of the Ribstone Creek formation is found on the higher areas. On the erosional remnants in the vicinity of Lone Rock, previously referred to, the Ribstone

Creek formation is overlain by Grizzly Bear shales and Birch Lake sandstone, the latter exposed in a highway cut on sec. 19, tp. 46, rge. 27.

The base of the Ribstone Creek formation along Battle River is at an approximate elevation of 1,860 feet, and, so far as could be determined, the strata are very nearly horizontal. On NW. sec. 11, tp. 47, rge. 27, test hole No. 33, drilled by Ribstone Oils, Limited, indicated the base of the formation to be at an elevation of 1,960 feet. Also, along the western part the contact between Ribstone Creek and Lea Park formations is uniformly high, dipping to the southwest into a syncline trending northwest across the south part of tp. 47, rge. 28. The dip to the east is quite marked in ranges 27 and 28, and then flattens to only a few feet to the mile.

Water Supply

About half of the water supply of the municipality comes from shallow wells in the drift. These are not confined to any one area, but are interspersed with the deeper wells that supply the rest of the water. The largest area of shallow wells is in the vicinity of Lashburn, where sand and gravel deposits in the drift are associated with a small moraine, and are more common. The drift has an average thickness of about 75 feet, thinning somewhat towards the west. The sand and gravel beds are present as irregular lenses and do not have any large lateral extent, so that wells within a very small area may strike different deposits at various depths. An exception to this is the buried gravel deposit in the southeast part of tp. 48, rge. 25. In this area the drift is a source of water, as the wells top a fairly extensive sand or gravel deposit. As the amount of water present is wholly dependent on the rainfall, the shallower wells are the first to reflect this deficiency. Locating these water-bearing beds when their lateral extent is, as previously stated, so limited, is a matter of chance determined only by digging. It can be stated, however, that they are more numerous in the upper 30 feet and again near the base of the drift.

Below the drift the Ribstone Creek formation, which extends over the whole of the municipality, is the source of a good supply of water. There are several sands in this formation, all of which carry water. As erosion prior to glaciation removed the upper part of the formation, the lower 50 feet remains as the chief source for water in this municipality. In this 50 feet there are two sands separated by shale. The lower sand produces soft water to the south and southwest, whereas to the north and northeast it is uniformly hard. The Ribstone Creek sands can thus be said to yield a dependable supply of good water over the whole municipality, except within the drainage channels that have been eroded below the base of the sand.

Township 45, Range 28. The deepest well for which records are available in this township is on NE. section 28. At a depth of 100 feet, or an elevation of 1,921 feet, this well got alkaline water in what is thought to be glacial clay. It is probable that this area is underlain by a little Ribstone Creek sand and that at a little additional depth the well on section 28 would have encountered water in this formation. The well on SE. section 16 obtained water at a depth of 15 feet in gravel at an elevation of 1,873 feet.

At this elevation it is probably below the Ribstone Creek formation, and if deepened would pass into Lea Park shale. In this area, however, there is known to be a 70-foot water-bearing sand 110 feet below the top of the Lea Park formation. This offers a further supply of water for this township should higher horizons yield insufficient amounts but this sand has a restricted distribution and does not carry water farther northeast.

Township 46, Ranges 27 and 28. At least two water-bearing horizons occur in the Ribstone Creek formation in this area. The higher of these is at an elevation of 1,880 feet and the lower at 1,825 feet. Another horizon, at an elevation of 1,918 feet, may also be in the Ribstone Creek formation, but is more probably a sand in the upper part of the Grizzly Bear formation. It is probable that in various places in this area the drift will prove to be water-bearing, although the few available records do not allow for definite conclusions. Throughout the area, except in the valleys of Buzzard Coulée and Battle River, the Ribstone Creek sands offer good water prospects.

Township 47, Range 25. Battle River, which forms the southern boundary of the municipality, has cut through the drift into the underlying sediments, exposing them at various places along its banks. The sands of the Ribstone Creek formation are cemented in places to form hard ledges that can be followed for considerable distances along the banks. The country to the north is a gently rolling plain covered with ground moraine and an occasional small recessional moraine trending in a northwesterly direction. The country slopes gently towards the river, and along its banks are terraces formed by the river in its early stages.

The well-water supply in this township is obtained from sand and gravel lenses in the glacial drift and from sand beds in the underlying bedrock. The drift contains many sand and gravel bodies, but these have a very limited lateral extent. Adjacent to some of the northwest-trending ridges the subsoil commonly contains more sand and gravel, and hence the chances of finding water in it are very good. The permanency of the supply will depend largely on the size of the sand body and the possibility of the surface waters coming in contact with it. A clay deposit above the gravel is apt to prevent water entering it, whereas clay below tends to prevent downward percolation and loss of water. There are several surface gravel deposits in sections 19, 27, and 28, and chances of finding similar buried deposits in the drift are fairly good. Commonly these deposits can be followed or traced for considerable distances with good results, as in many places they trend in a northwest-southeast direction. Some glacial gravel deposits, however, formed by streams flowing at the base of the ice mass, trend at right angles to this.

Underlying the drift the bedrock contains continuous sand beds that serve as very good water horizons. In this township two such horizons are separated by about 60 feet of shale. The upper horizon has an elevation of 1,942 to 1,964 feet, and the lower one is between 1,850 and 1,890 feet. The latter is the basal sand in the Ribstone Creek formation, and is encountered at a depth of 100 to 175 feet depending on the surface elevation. Bedrock sands close to the river may be dry, but elsewhere they contain a good supply of water. Where the sand is dry further prospecting in the drift is advised, although deeper drilling into the Lea Park shale will reach a sand 110 feet lower.

Township 47, Range 26. Post-glacial erosion has cut several deep gullies that provide a fairly good drainage system in this township. The largest one, with a broad, gently sloping valley, trends to the southeast almost diagonally across the area. The surface is a rolling plain of ground moraine, which is about 100 feet thick to the north and thins southward.

Ribstone Creek sand underlies the unconsolidated boulder clay and serves as a good aquifer in most places.

The water supply is obtained from both shallow and deep wells. The drift wells, which vary in depth from a few feet to 75 feet, yield about half of the required amount of water in this township. The greatest number of these wells occur in the west part, where sand and gravel lenses appear to be more numerous in the upper part of the drift. These can be separated, on a basis of elevations, into two groups, but definite proof is lacking that they represent two continuous beds. The upper group of aquifers is within the upper 30 feet of drift; the lower group lies at or close to the base of the drift, which varies in thickness from 50 to 90 feet. The elevation of the surface is between 1,980 and 2,000 feet.

The Ribstone Creek formation, which underlies the drift, is the deeper water source, but in three wells it has failed to yield water. One of these, on section 15, found that the sand below the drift was dry. One explanation for this is that the sand is an isolated body detached from the main water-bearing bed. The material from the well was not examined, but it was thought to be Ribstone Creek sand. On section 24, R. Craig drilled a well 230 feet deep without encountering a water-bearing sand. Another dry hole, drilled on section 36, is possibly in an erosion channel cut into the underlying shale. This channel is now filled with boulder clay. These deep drainage channels are not uncommon, as the land surface before the ice age must have been rolling, with drainage channels cut below the general level. These channels, subsequently filled with glacial material, would account for the absence of the Ribstone Creek sand in limited areas. Such is believed to be the case on SW. section 36. The presence of dry sand is more difficult to explain. If the dip of the strata had been to the north, away from the banks of Battle River, it could be explained by its proximity to the river bank, but as the dip is believed to be southeast it is expected that continuous sand beds would carry water in this area. As this is not the case, and as the sands are considered to belong to the Ribstone Creek formation, one explanation is that they are cut off from the main mass of sand by an old channel, as described above. In an area where this occurs the sand and gravel pockets in the drift will have to be relied upon for the water supply, as no lower water sands were encountered in the Lea Park formation in the deep test well on section 29.

The elevation of the producing water horizon in the bedrock is between 1,867 and 1,912 feet. The base of the Ribstone Creek is thought to be approximately 1,860 feet in this area. Drilling to depths of 200 feet on the higher land and 100 feet in the lower areas should reach this lower sand. Drilling into the Lea Park shale is not recommended.

Township 47, Range 27. This township is a gently sloping plain bounded on the north and south by two large hills. These hills are believed to be erosional remnants of the underlying strata covered with a mantle of drift of about the same thickness as on the intervening plain. The hill to the north, known locally as Fartown Hills, trends east and west, and another hill south of Lone Rock trends northeast and southwest. They rise about 150 feet above the general level of the country, and higher bedrock formations, equivalent to this thickness, are expected on these elevated areas. A mantle of glacial debris, up to 100 feet thick, covers the whole area. It contains numerous sand and gravel deposits of limited lateral extent. The drift is underlain by the Ribstone Creek sand and shale. Owing to the fact that its surface was exposed to erosion prior to glaciation the erosion remnants vary in thickness from place to place. The lower sand, however, is believed to underlie the whole of the township. On the higher land to the north and south a more complete section of the formation remains. These sands are not in the horizontal position in which they were laid down, but dip gently away from a northwest-trending fold that has its crest in sections 11, 15, 21, and 29.

The water supply is obtained from the sand and gravel pockets in the drift and from the underlying bedrock sands. Information on the shallow wells was not recorded owing to the great variability of material encountered and the uncertainty of striking water. It might be said, however, that the upper 30 feet contains numerous bodies of water-bearing sands, and if by chance one of fair lateral extent is struck a good supply of hard water is assured. At or close to the base there appears to be an horizon that will yield water with a greater degree of certainty. Wells on sections 6, 14, 16, and 18 range in depth from 60 to 80 feet, and the elevations of the aquifers lie between 2,000 and 2,014 feet. The water is hard and alkaline. Below this, one can be assured of a further supply in two sand members of the Ribstone Creek formation. These are both coarse water sands separated by 10 to 15 feet of shale. The lower one, which also forms the base of the formation, yields soft water almost without exception. Water from the higher one varies in character, depending on its proximity to the overlying drift. As mentioned above, the bedrock is slightly folded, resulting in variations in elevations of the base of the formation. The elevation of the contact between the lower sand and the underlying Lea Park shale has been well established from samples taken from test wells drilled by Ribstone Oils, Limited, at various localities, as well as in the deep test well of the Altoba Gas Exploration Company. The highest known contact is placed at an elevation of 1,960 feet in test hole 33 on section 11, and this high structural area trends northwest as described above. Elsewhere this contact is believed to be lower. The depth at which these sands will be struck will vary from 90 to 200 feet depending on the surface elevations and the depth drilled into the sand.

The wells on sections 2, 3, and 10 are in a higher sand than the wells on the lower land to the north. This sand member is believed to be about 130 feet above the contact with the Lea Park shale.

Drilling below the Ribstone Creek-Lea Park contact is not recommended, as a continuous shale section more than 1,400 feet thick was drilled through in the deep well on section 27.

Township 47, Range 28. The topography of this township is that of a gently rolling plain, with a few small east-west trending moraines. This surface deposit of ground moraine, which is about 100 feet thick, contains lenses of sand and gravel that yield a limited amount of water. Most of the deeper wells passed through varying amounts of sand and gravel in the surface deposit but continued to the lower bedrock sand for an assured supply. In this area, where recessional moraines are common, the amount of gravel and washed material lends greater porosity to the drift and increases the chances of finding water near the surface. Where only a limited supply of water is required it may be found in the drift, but when a large supply is required deeper drilling into the Ribstone Creek sand is recommended, and depths ranging from 100 feet in the north to 185 feet in the south will be necessary. The basal bed dips gently from an elevation of 1,940 feet at the north to 1,900 feet on NW. section 1 into a syncline trending northwest through this section. A more complete explanation of this is given in the discussion on the township to the east. Most of the wells produce soft water, especially from the basal sand. Care should be taken to case off the upper hard water to be assured of the soft water supply below.

Township 48, Range 25. The water supply does not constitute a very serious problem in this township as the greatest amount comes from relatively shallow wells in the glacial deposits. The drift is approximately 100 feet thick. Water is obtained from various horizons in this deposit and there appears to be some uniformity in these water levels. The upper horizon, at an elevation of between 1,974 and 1,994 feet, is struck in sections 4, 5, 8, 9, and 17, at depths ranging from 20 to 50 feet depending upon the surface elevations. In this part of the township small ridges trending northwest and southeast carry a considerable amount of gravel and sand.

In the southeast part of the township a good supply of water is obtained at depths of about 10 feet. On section 11 a flowing spring supplies the water. These wells are in gravel, and the uniformity of the water-table suggests an outwash gravel deposit sloping gently to the southwest.

In the northwest part of the township the drift does not carry as much sand and gravel, and finding water in this deposit is more a matter of chance. The Ribstone Creek sands, which are encountered in wells to the east and south, underlie the whole of the area. From the known facts, these are assumed to be flat-lying, being encountered at elevations of 1,894 and 1,890 feet on sections 28 and 26. Water should, therefore, be struck at a depth of not more than 110 feet where the surface elevation is 2,000 feet or less. The water problem of some of the farmers in this area might, therefore, be overcome by digging to this aquifer. As the land surface rises to the east it will be necessary to drill deeper to strike the same aquifer. As this is considered to be the lower sand the possibilities of striking higher aquifers in the formation are also increased, provided the rise is not due wholly to an increased thickness of the drift.

Township 48, Range 26. The relief in this township is about 200 feet, due to the Fartown Hills in the southwest corner, which slope gradually into the gently rolling plain marked by several recessional moraines trending parallel with the railroad track.

The water supply is mainly obtained from gravel and sand deposits irregularly distributed through the drift. The thickness of the boulder till is less than 100 feet, and appears to contain a considerable amount of sorted and washed material, the esker that trends southwest across sections 1 and 2 being evidence in support of this assumption. The few records of wells in the glacial deposits give limited information on this water source.

The black sand reported in a number of wells is thought to be Ribstone Creek sand. This sand when dry has a salt and pepper appearance and when wet has the appearance of a black sand, due to the high percentage of chert and ferromagnesian minerals in it. Several sand members in the formation are good water producers. Underlying this area are two such sands, with the possibility of a deeper one in the southwest, from which wells at an elevation of about 1,980 feet produce soft water within an area of 5 square miles. In tp. 47, rge. 27, the soft water horizon is in most places limited mostly to the lower sand, the second one being mostly hard. The water level also suggests a higher sand in this area, as otherwise wells on the lower land to the northeast should flow. The water level in wells on sections 5 and 8 stands at approximately 2,100 feet. In a well on NW. section 22, which has an intermittent flow, the water level is 1,997 feet. The difference in the water level of about 100 feet would suggest two different source sands. This corresponds very closely with the difference in elevations of the aquifers. The higher horizon is found in an area of 12 square miles in the southwest corner of the township. Soft water is produced from wells in the centre of the area, whereas the bordering wells are hard. The elevation of this sand lies between 1,975 and 1,990 feet, and can be reached at depths ranging from 50 to 200 feet depending on surface elevations.

Elsewhere in the township the bedrock sands are limited to the two horizons in the lower 50 feet of the formation. The well on NW. section 22 is believed to be in the lower sand bed, whereas those on sections 14, 23, and 32 are about 40 feet above the base. On the assumption that the strata are flat-lying, similar conditions could be expected elsewhere. Where the surface elevation is below the 2,000-foot contour there may be only one aquifer present, and it should be reached at a depth slightly in excess of 100 feet. The water should rise high, but flowing wells are not expected.

Township 48, Range 27. The elevated country known as the Fartown Hills lies almost wholly within this township. It rises about 150 feet above the gently rolling plain, and trends in an east-west direction. These hills have in some respects the appearance of a moraine, but well records show that the rise is due to a more complete section of the bedrock rather than an increased thickness of drift. On NE. section 10 the drift is more than 100 feet thick, as gravel was struck at that depth, but it thins northward to an average thickness of 75 feet.

The water supply in this township is derived mainly from sand and gravel lenses in the boulder till. Records of the glacial wells are incomplete, and information is limited mainly to logs from the deeper wells. From these it appears that there are two water-bearing horizons, the higher one in the upper 30 feet, and the lower horizon apparently close to the base of the drift.

Beneath the drift the area is everywhere underlain by the Ribstone Creek sand, which can be depended upon to yield a good supply of water. Soft water is limited to the southwest half of the township.

Deep wells have all encountered a good supply of hard or soft water, depending on their location, with the exception of two wells on section 36. The dry hole on the northwest quarter of this section was drilled to a depth of 120 feet, or an elevation of 1,938 feet. As the base of the Ribstone Creek is believed to lie between elevations of 1,875 and 1,900 feet it seems reasonable to expect that deeper drilling would have reached water. If, however, Lea Park shale is encountered at this lower elevation it is not to be expected that water will be found in it, as no sand beds are known in this formation, and deep drilling at Lloydminster has shown that the shale is more than 1,400 feet thick. It is, however, more difficult to explain the dry hole that was drilled on NE. section 36 to a depth of 346 feet without striking a water-bearing sand in the Ribstone Creek formation. If a good log of the well were available the interpretation would be more reliable; without it the following comments should only be considered as tentative. The explanation offered for the two dry holes in tp. 47, rge. 26, is that they were sunk in an old drainage channel that had been eroded through the Ribstone Creek sands into the underlying Lea Park shales. This channel was subsequently filled in with glacial debris. Below the glacial material only Lea Park shales are expected in these drainage channels. Such a channel might extend northwest and cut through section 36. Another possibility is that a local condition existed by which the sand became mixed with considerable clay, making it a very poor water horizon. The drill might pass through such sand without encountering an appreciable amount of water.

There are three water horizons in the Ribstone Creek sand. The highest of these, at elevations of 2,039 to 2,100 feet, is limited to the southeast part on the higher land of the Fartown Hills. The intermediate horizon lies between elevations of 1,971 and 2,000 feet, and the lowest one, at the base of the Ribstone Creek formation, ranges between 1,870 and 1,930 feet. The base of the Ribstone Creek sand is placed at 1,932 feet in the test well drilled on section 9 by Ribstone Oils, Limited. On sec. 6, tp. 49, rge. 26, the lowest aquifer presumably in the basal Ribstone Creek sand was reached at an elevation of 1,870 feet. The dip between the two wells is thus southwest at approximately 10 feet to the mile. Southwest of the test hole on section 9 no well shows a dip in that direction. Any dip that might be present would be caused by very minor folds, which can be considered negligible for calculating the depths to the water horizon in this area.

<u>Township 48, Range 28.</u> The water supply problem in this fractional township adjoining the 4th meridian is very similar to that in the township immediately to the east. The percentage of deep wells is greater, however, although this does not necessarily mean that the drift contains less sand and gravel. When a dependable supply of soft water is assured at depths slightly in excess of 100 feet it is considered an advantage well worth the extra cost. The base of the Ribstone Creek formation, which is also the base of the lower water-bearing sand, is placed at 1,941 feet above sea-level in section 2, at an elevation of 1,957 feet on NW. section 24, and at 1,931 feet on NE. section 24. Assuming a strike of 30

degrees west of north, the southwest dip would be about 8 feet to the mile. The base of the water-bearing sand can thus be considered to lie between 1,930 and 1,950 feet above sea-level. The producing aquifers of the present wells have elevations between 1,970 and 1,990 feet above sea-level, and are possibly in a sand about 40 feet above the base of the lower sand. This aquifer appears to contain a very satisfactory supply of water, and only when this supply shows signs of exhaustion is drilling to the lower horizon recommended. Drilling below the Ribstone Creek-Lea Park contact has mostly failed to produce water, although in some local areas a sand is present 110 feet below the contact.

Township 49, Range 25. The drainage in this township is towards Big Gully Valley, which trends almost due east and west across the northern part of the area. This valley, now almost dry, is about half a mile wide and more than 100 feet deep. It was formed by the waters of the melting ice-sheet. The retreating ice mass later receded from the old drainage channels, leaving this valley almost dry. The thickness of the surface deposit varies from less than 45 feet on SW. section 24 to 80 feet on SW. section 16 where gravel was encountered at that depth.

The water supply is obtained from the drift and in the underlying bedrock. The wells can be divided into two groups, those in the glacial drift and those definitely known to be in the bedrock. In the first group are wells less than 50 feet deep. They are quite uniformly distributed throughout the township. North of Big Gully Valley most of the wells are of this type. Their depths seem to follow the surface topography, and hence have elevations ranging from 2,073 to 1,974 feet. It does not follow, however, that this is a continuous aquifer, but it would appear that water-bearing beds are general at this depth. South of the gully wells of this group are on sections 6 and 9.

Bedrock sand outcrops on SW. section 24 close to the south bank of Big Gully Creek at an elevation of 1,938 feet. As many wells have aquifers close to this elevation, it is concluded that they must be near the top of the underlying strata or at the base of the drift. On SE. section 20 a well 65 feet deep reports gravel at an elevation of 1,927 feet. Likewise, on NE. section 10 gravel is encountered at 88 feet from the surface at an elevation of 1,935 feet, and at a depth of 80 feet on SW. section 16 at an elevation of 1,951 feet. It appears, therefore, that some wells at this horizon are in the drift whereas others are in bedrock.

The lowest horizon, which also can be considered the most reliable source, is the lowest sand in the Ribstone Creek formation. This sand underlies the entire township except where Big Gully Valley cuts through it into the Lea Park shales. From information available it appears to be nearly flat-lying, and slight variations in the elevations of the aquifers in different wells are probably due to drilling to various depths in the sands rather than to a dip of the strata. Elevations of the wells were also determined by means of the aneroid barometer, and can be considered accurate only within limits of 5 to 10 feet. The elevations of this horizon, as indicated by well records, range from 1,897 to 1,864 feet, a maximum variation of 31 feet, which can easily be accounted for by the thickness of the sands and the limit of accuracy of the readings. Drilling deeper into the shales is not recommended, as no suitable water sand is known to occur below this level.

Township 49, Range 26. The water supply for this township is obtained from wells ranging in depth from a few feet to more than 100 feet, the deepest one being 170 feet. The average depth is about 80 feet. The water horizons are in the drift and in the underlying Ribstone Creek formation, which underlies the whole area except along Big Gully Valley, where erosion has extended into the Lea Park shale.

The thickness of the drift in most places is estimated to be about 70 to 80 feet. An exception is found on NE. section 7 where a well 147 feet deep is said to have struck water in gravel and must, therefore, be in the drift. A well on SW. section 17, 94 feet deep, and another on NW. section 20, 70 feet deep, also encountered gravel at elevations of 1,890 and 1,900 feet respectively. An outcrop of bedrock sand occurs on section 26 at an elevation of 1,897 feet, which is thus presumed to be immediately below the drift. It seems logical to infer that these gravel deposits lie near the base of the drift, or may also represent channels or depressions that existed prior to glaciation.

By far the greater number of wells are from 60 to 80 feet deep and have elevations between 1,900 and 1,950 feet. It is very difficult to differentiate between drift wells and bedrock wells in this group, as it was only on rare occasions that the material from the lower part of the wells was available for examination. It is believed, however, that some are in the bedrock whereas others are in the drift near the bedrock surface. The character of the water would be very much the same from both sources.

The lowest aquifer, which is the basal sand of the Ribstone Creek formation, is a dependable source of water. Its base is placed at an elevation of about 1,870 feet.

The outcrop on NW. section 26 exposes about 11 feet of sand, the elevation of the top being 1,897 feet. The elevations of the wells in this formation have a range of 34 feet, lying between 1,865 and 1,899 feet. This difference is believed to be due to drilling to various depths in the sand rather than to a dip of the beds. It can be stated with some degree of certainty that there is at least one water-bearing horizon in the Ribstone Creek formation in this area and possibly another, higher one. Drilling for water below an elevation of 1,850 feet is not considered advisable, as a continuous shale section more than 1,400 feet thick was drilled in the deep wells at Lloydminster.

Township 49, Range 27. The water supply in this township, as in those adjoining, comes from wells at various depths in the drift deposit and the underlying bedrock. Most of the wells are more than 100 feet deep, with very few less than 50 feet; the deepest water well is 195 feet.

The thickness of the drift varies from only a few feet, around Colony Oil and Gas well No. 3, to approximately 75 feet or more in the northeast part of the township. Chances of finding water in the drift are fairly good if the surface deposit is morainal in character, as indicated by a rolling surface and long narrow ridges containing varying amounts of sand and gravel. Adjacent to these ridges sorted sand and gravel deposits are more abundant, and the amount of water in them will be directly proportional to their size and to the annual rainfall. The relatively few wells of shallow depth is indicative to a certain degree of the little water in these deposits.

A sample of material from the bottom of the well on NE. section 36 reveals a deposit of glacial lake clay of considerable thickness. The extent of this deposit was not determined, but is probably considerable. The elevation of the water horizon in the well on NE. section 36 is 1,916 feet, and the well on NE. section 34 is said to contain sand and silt at 1,927 feet. It is very probable that these are in the same deposit. The limited supply of water on SW. section 36 seems to indicate an extension of the deposit in that direction, as the Ribstone Creek formation usually yields a good supply of water. The amount of Ribstone Creek sand below the deposit of lake material cannot be very great, because on SW. section 24 shale was encountered at an elevation of about 1,907 feet. On NE. section 28 shale was struck below the sand at an elevation of 1,885 feet. An average of these two elevations would place the base of the Ribstone Creek at 1,895 feet. It seems, therefore, that the amount of Ribstone Creek sand below the glacial lake deposit would be very small, if any. Farther southwest the elevations of the aquifers rise very noticeably, due probably, in part at least, to a thickening of the water-bearing sediments in that direction. The southwest half of the township has a very uniform water horizon in a black sand between elevations of 1,970 and 1,990 feet. Soft water is limited to three wells, in sections 5, 6, and 9; all other wells produce hard water. It is very difficult to know whether this horizon is represented by one or more sands. The soft water area, as distinct from one giving only hard water, suggests two separate sands. Number 3 well of the Colony Oil and Gas Company encountered water horizons at elevations of 1,993, 1,983, and 1,918 feet. The water well on NE. section 18 has an elevation that corresponds to the upper water sand in the Colony well. From this information it seems logical to assume that there is a lower water sand underlying the southwest part of the township.

Township 49, Range 28. The water supply in this township resembles that of the one to the east in all respects. Well records are all of deep wells that obtain their water in the sand of the Ribstone Creek formation. As water was encountered at three horizons in Colony No. 3 well it seems reasonable to expect that more than one sand member is present in this area. The elevations of the aquifers range from 1,921 feet on section 27 to 2,016 feet on section 23. The lowest aquifer in the Colony No. 3 well has an elevation of 1,918 feet, which corresponds very closely with the lowest aquifer on section 27 at an elevation of 1,912 feet. Most of the wells have obtained water at a higher elevation in what is believed to be one of the higher sands. The water is hard except for the two wells on section 2. These wells occur within the soft-water belt, which extends to the south and southeast.

ANALYSES OF WATER SAMPLES FROM RURAL MUNICIPALITY OF **WILTON NO. 472, SASKATCHEWAN.**

						Constituents as Analysed							Constituents as Calculated in assumed Combinations							
No.	¼ Sec.	Tp.	Rge.	Depth in feet	Total dis-solved solids	Ca	Mg	Na	SO_4	Cl.	Alk.	Total Hardness	$CaCO_3$	$CaSO_4$	$MgCO_3$	$MgSO_4$	Na_2CO_3	Na_2SO_4	NaCl.	Source of Water
1	**SE** 11	46	28	250	2220	38	28	724	1111	151	410	280	90		97		217	1644	249	Ribstone Cree High Na_2SO_4
2	**NW** 26	46	28	170	1880	64	20	604	800	221	410	400	160		69		178	1184	365	"
3	**NW** 21	47	25	123	2180	29	20	767	980	30	755	400	73		69		636	1450	50	Ribstone Creek
4	SE 35	47	26	110	2280	86	39	707	1230	163	390	560	215		135		15	1820	269	Ribstone Creek
5	SE 10	47	27	130	520	86	50	43	66	5	440	500	215		174		19	98	8	Birch Lake ?
6	SW 15	47	27	95	1680	29	11	592	877	11	475	145	73		38		378	1298	18	Ribstone Creek
7	**SE** 36	47	28	118	880	122	59	98	328	8	410	750	305		88	168		287	13	Ribstone Creek
8	**NW** 28	48	25	123	1460	93	41	401	672	22	540	460	233		142		146	996	36	Ribstone Creek
9	**NW** 5	48	26	140	2620	43	20	844	1439	34	475	260	108		69		302	2130	56	Ribstone Creek
10	**NE** 2	48	27	124	2740	315	183	247	1386	13	615	2600	615	235		906		736	21	Glacial
11	**SW** 34	48	27	124	1200	143	70	107	525	22	300	1780	300	78		347		286	36	Glacial
12	**NW** 13	48	28	117	1340	14	9	460	595	37	400	90	35		31		348	880	61	Ribstone Creek
13	**NW** 11	49	25	110	1620	150	107	236	800	12	480	1150	375		88	406		705	20	Ribstone Creek
14	**NE** 14	49	25	100	1940	186	87	322	939	43	485	1000	465		17	406		908	71	Ribstone Creek

WELL RECORDS—Rural Municipality of Wilton No. 472, Saskatchewan.

WELL No.	LOCATION					TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE		PRINCIPAL WATER-BEARING BED			CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
	¼	Sec.	Tp.	Rge.	Mer.				Above (+) Below (−) Surface	Elev.	Depth	Elev.	Geological Horizon				
1	SW	10	45	28	3	Dug	9	1793			9	1784	Sand	hard		D.S.	Sufficient.
2	SE	16	45	28	3	Dug	15	1883	- 10	1878	15	1873	Gravel	hard Fe.		D.S.	Sufficient
3	NW	26	45	28	3	Dug	12	2021			12	2009	Sand	hard		D.S.	Sufficient.
4	NE	28	45	28	3	Bored	100	2021			100	1921	Clay	hard Alk.		D.S.	Sufficient.
5	NW	35	45	28	3	Bored	68	2076			68	2008	Clay	hard		D.S.	Sufficient.
1	SW	18	46	27	3	Bored	36	2083	- 7	2076	36	2047	Top of Shale	hard		D.S.	Limited
1	SE	11	46	28	3	Drilled	250	2075	-225	1850	250	1825	Ribstone Creek	soft		D.S.	Abundant supply.
2	SE	14	46	28	3	Drilled	325	2100	- 90	2010	275	1825	Ribstone Creek	soft		D.S.	Abundant supply.
3	SE	16	46	28	3	Drilled	160	2018	- 90	1928	100	1918	Ribstone Creek?	soft		D.S.	Limited supply.
4	NE	22	46	28	3	Drilled	124	2040			124	1916	Black sand				
5	SW	24	46	28	3	Bored	68	2128	- 60	2068	60	2068	Black sand	hard		D.S.	
6	NW	26	46	28	3	Drilled	170	2050	- 65	1985	170	1880	Ribstone Creek	soft		D.S.	Good supply

NOTE—All depths, altitudes, heights and elevations given above are in feet.

(D) Domestic; (S) Stock; (I) Irrigation; (M) Municipality; (N) Not used
(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of Wilton No. 472, Saskatchewan.

WELL No.	LOCATION					TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE		PRINCIPAL WATER-BEARING BED			CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
	¼	Sec.	Tp.	Rge.	Mer.				Above (+) Below (−) Surface	Elev.	Depth	Elev.	Geological Horizon				
	SW	14	47	25	3	bored	100	1960	- 70	1890	95	1865	Ribstone Creek	Alkaline		D.S.	Good supply
	NE	20				bored	120	1969			20	1949	glacial			D.S.	Seepage in yellow sand
	SE	20				bored	60	1961			60	1901	Ribstone Creek	Alkaline		S.	
	NE	20				bored	35	1969	- 20	1949	35	1934	glacial sand	hard		D.S.	Good supply of water
	NW	21				bored	123	1974			123	1851	Ribstone Creek	soda		D.S.	Bottom of drift at 60 feet
	NW	21				drilled	540	1974			540	1434	Lea Park shale	salty		N.	Drilled in shale between 135 and 540 ft
	NW	22				bored	93	1987	- 60	1927	93	1894	Ribstone Creek	hard, iron		D.S.	Water in blue sand
	NE	24				bored	90	1991	- 40	1951	80	1911	Ribstone Creek	hard		D.S.	Water in green sand
	NE	27				dug	75	2029	-65	1964	75	1954	Ribstone Creek?	hard, alk.		D.S.	Good supply below hard pan
	NE	28				bored	85	2029	- 75	1954	82	1947	Ribstone Creek?	hard, alk.		S.	Good supply below hard pan
	SE	29				bored	60	1989	- 45	1944	47	1942	Ribstone Creek	hard		D.S.	Water in blue sand below hard shell
	NE	29				bored	69	2009			67	1942	Ribstone Creek	hard		D.S.	Water in blue sand below hard shell
	SE	31				drilled	137	2019	- 15	2004	110	1909	Ribstone Creek	soft		D.S.	Good supply in dark sand
	NE	31				dug	100	2024			65	1959	glacial sand			D.S.	Water in fine sand
	NE	33				drilled	125	2019	- 65	1954	125	1894	Ribstone Creek	hard, iron		D.S.	Water in black sand
	SW	36				bored	36	2069	- 30	2039	33	2036	glacial gravel	hard, alk.		D.S.	
	NW	4	47	26	3	dug	74	1986	- 63	1923	74	1912	Ribstone Creek	soft		D.S.	Good supply in sandstone
	NE	8				bored	74	1981	- 30	1951	74	1907	Ribstone Creek	soft		D.S.	Good supply in black sand
	NE	14				bored	90	1957	- 60	1897	90	1867	Ribstone Creek?	hard alk.		D.S.	Water below blue clay
	SW	15				drilled	220	1960									Dry hole. Sand dry.
	NE	17				bored	42	2041	- 20	2021	42	1999	glacial	med. soft		D.	
	SW	21				bored	50	2031			50	1981	glacial	hard		D.S.	
	NW	24				drilled	230	2002									Dry hole
	SW	24				drilled	200	1982	- 90	1892	100	1882	Ribstone Creek	med. soft		D.S.	sufficient at present. supply limited
	NE	24				bored	138	1992			118	1874	Ribstone Creek	soft,soda		D.S.	Good supply
	SE	27				bored	90	2040			90	1950	glacial sand	hard		D.S.	Fine sand causes trouble
	NW	28				drilled	140	2051	- 110	1941	140	1911	Ribstone Creek	hard		D.S.	Character of water changes before a storm
	NE	28				dug	102	2021			102	1919	Ribstone Creek			S.	Large supply. Located in pasture
	SE	30				dug	65	2044	30	2014	65	1979	Ribstone Creek	hard		D.S.	Large supply in sandstone
	SW	32				bored	85	2079			85	1994	glacial sand	hard alk.		D.S.	Limited supply of water
	NE	33				drilled	73	2069			73	1996	glacial	hard		D.S.	Water in sand
	SE	33				bored	100	2052	- 75	1977	85	1967	glacial ?	hard alk.		D.S.	
	SE	34				bored	140	2037	-100	1937	140	1897	Ribstone Creek	hard alk.		D.S.	Good supply in black sand
	NW	34				bored	107	2059	high		107	1952	glacial ?	hard alk.		D.S.	Good supply in sand
	SE	35				drilled	110	2007			110	1897	Ribstone Creek	hard alk.		D.S.	Good supply in fine grey sand
	SW	36				drilled											Deep dry hole.
	NW	2	47	27	3	dug	40	2138	- 38	2100	40	2098	Ribstone Creek	soft		D.S.	Water comes through crack in sandstone
	NW	3				bored	100	2215	- 60	2155	100	2115	Ribstone Creek?	hard		D.S.	Good supply
	NE	6				dug	80	2090			80	2010	black sand			D.S.	
	SW	6				bored	80	2080			80	2000	sand	hard alk.		S.	Good supply. Sulphur odour
	SW	8				drilled	184	2128			184	1944	Ribstone Creek	hard		D.S.	Sufficient
	SE	10				bored	130	2204			130	2074	Ribstone Creek	soft		D.S.	Sufficient
	NE	11				bored	90	2080	- 50	2030	90	1990	Ribstone Creek	soft, soda		D.S.	Good supply
	NE	14				bored	74	2085	- 40	2045	74	2011	sand	hard		N.	New location for buildings

NOTE—All depths, altitudes, heights and elevations given above are in feet.

(D) Domestic; (S) Stock; (I) Irrigation; (M) Municipality; (N) Not used.
(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of Wilton No. 472, Saskatchewan.

WELL No.	LOCATION					TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE		PRINCIPAL WATER-BEARING BED			CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
	¼	Sec.	Tp.	Rge.	Mer.				Above (+) Below (−) Surface	Elev.	Depth	Elev.	Geological Horizon				
	SW	15	47	27	3	drilled	95	2087			95	1992	Ribstone Creek	soft		D.S.	Good supply in black sand
	NW	16				dug	66	2080	- 40	2040	66	2014	glacial sand	hard alk.		D.S.	Good supply
	SW	18				bored	61	2073			61	2012	glacial gravel	hard		D.S.	sufficient
	SE	21				bored	92	2093	- 60	2033	92	2001	Ribstone Creek	soft soda		D.S.	Excellent supply
	NE	22				bored	85	2092			85	2007	Ribstone Creek	soft		D.S.	
	NW	25				drilled	108	2089	- 60	2029	100	1989	Ribstone Creek	soft soda		D.S.	Excellent supply
	NW	26				drilled	100	2084	- 60	2024	100	1984	Ribstone Creek	soft		D.S.	Good supply. Leaves a white residue
	NW	30				drilled	150	2140			150	1990	Ribstone Creek	hard		D.S.	Sufficient supply
	NE	32				drilled	126	2166			126	2040	Ribstone Creek	hard		D.S.	Good supply
	SE	36				drilled	180	2144	- 140	2004	160	1984	Ribstone Creek	soft		D.S.	Good supply
	NW	1	47	28	3	drilled	220	2088			165	1923	Ribstone Creek				
											185	1903	Ribstone Creek	soft		D.S.	Good supply
	SE	2				drilled	168	2091	- 100	1991	168	1923	Ribstone Creek	soft		D.S.	Good supply
	NW	2				drilled	109	2061			109	1952	Ribstone Creek	hard		D.S.	Good supply
	NE	10				drilled	109	2071	- 74	1997	109	1962	Ribstone Creek	soft		D.S.	Abundant supply
	NW	12				bored	130	2065			130	1935	Ribstone Creek	hard		D.S.	Fine sand has caused trouble
	SW	13				drilled	178	2068	- 43	2025	178	1890	Ribstone Creek	soft		D.S.	Abundant supply in black sand
	NE	13				drilled	100	2061			100	1961				D.	Rugby School well
	NW	14				drilled	168	2066	- 100	1966	168	1898	Ribstone Creek	soft		D.S.	Abundant supply
	SE	14				drilled	110	2066			110	1956		hard		D.S.	Good supply
	NE	23				drilled	99	2094			99	1995	Ribstone Creek	med. soft		D.S.	Abundant supply
	SE	24				drilled	98	2095	- 68	2027	98	1997	Ribstone Creek	hard		D.S.	Good supply in black sand
	SW	24				bored	98	2099	- 35	2064	98	2001	Ribstone Creek	hard		D.S.	Good supply in blue sand
	NW	24				drilled	115	2112	- 30	2082	115	1997	Ribstone Creek	med. soft		D.S.	Abundant supply in black sand
	NW	35				drilled	112	2115	- 60	2055	112	2003	Ribstone Creek	soft		D.S.	Good supply
	SE	36				drilled	118	2123	- 60	2063	118	2005	Ribstone Creek	med. soft		D.S.	Abundant supply
	SW	4	48	25	3	dug	30	2024	- 15	2009	30	1994	glacial sand	hard		D.S.	Sufficient supply
	NW	4				dug	40	2025			40	1985	glacial gravel	hard		D.S.	Good supply
	NE	5				dug	22	2019	- 20	1999	22	1997	glacial sand	hard		D.S.	Good supply
	SE	5				dug	28	2020	- 8	2012	25	1995	glacial gravel	hard		D.S.	Sufficient supply
	SW	6				bored	75	2029	- 50	1979	75	1954		hard		D.S.	Sufficient supply
	SW	8				bored	26	2009	- 23	1986	26	1983	glacial sand	hard alk.		D.S.	Sufficient supply
	SE	9				bored	70	2024			50	1974	glacial sand	hard, iron		S.	Poor quality of water.
	SW	15				bored	70	2009	- 45	1964	35	1974	glacial sand	hard,iron		D.S.	Sufficient for present needs
	SE	18				bored	76	1979	- 6	1973	74	1905	Ribstone Creek	hard		D.S.	Good supply
	NE	25				bored	88	2170			20	2150	Glacial sand	hard		D.S.	Limited supply
	SE	25				bored	30	2180	- 12	2168	28	2152	Glacial gravel	hard		D.S.	Good supply
	NW	26				drilled	220	2110			220	1890	Ribstone Creek	hard		D.S.	
	NW	28				drilled	125	2012	- 55	1957	118	1894	Ribstone Creek	hard,iron		D.S.	Sufficient supply
	SW	36				bored	86	2125	- 79	2046	76	2049	glacial	hard,iron		D.S.	Seepage through blue clay

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of Wilton No. 472, Saskatchewan.

WELL No.	LOCATION					TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE		PRINCIPAL WATER-BEARING BED			CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
	¼	Sec.	Tp.	Rge.	Mer.				Above (+) Below (−) Surface	Elev.	Depth	Elev.	Geological Horizon				
	NE	1	48	26	3	dug	49	2029			49	1980	glacial	hard		D.S.	Limited supply
	SE	2				drilled	110	2039			110	1929	Ribstone Creek	hard alk.		D.S.	Sufficient supply in sand
	SE	3				bored	75	2057	- 71	1986	65	1992	glacial sand	hard		D.S.	Sufficient supply in sand
	SE	5				bored	140	2107	- 70	2037	140	1967	Ribstone Creek	hard		D.S.	Sufficient supply
	NW	5				drilled	150	2127	- 20	2107	150	1977	Ribstone Creek	soft		D.S.	Sufficient supply in black sand
	SW	5				drilled	167	2147	- 50	2097	167	1980	Ribstone Creek	soft		D.S.	Sufficient supply in black sand
	SE	6				drilled	198	2175			140	2035					
											198	1977	Ribstone Creek	soft		D.S.	Good supply
	SW	6				drilled	145	2209			145	2064				D.S.	Good supply
	NE	6				drilled	150	2127			150	1977	Ribstone Creek				Good supply
	NW	7				drilled	100	2085			100	1985	Ribstone Creek	hard		D.S.	Good supply
	NE	7				drilled	108	2085			108	1977	Ribstone Creek	soft		D.S.	Good supply. White residue
	SE	8				drilled	96	2097	- 12	2085	96	2001	Ribstone Creek	soft		D.S.	Good supply.
	NW	14				drilled	103	2005	- 75	1930	103	1902	Ribstone Creek	hard		D.S.	Sufficient supply
	NW	17				drilled	70	2057	- 25	2032	70	1987	Ribstone Creek	soft		D.S.	Sufficient supply
	SE	20				drilled	50	2047			50	1997	Ribstone Creek	trace sulphur		D.S.	Sufficient supply in black sand
	SW	21				bored	50	2040	- 25	2015	50	1990	Ribstone Creek	hard		D.S.	Good supply in black sand
	NW	22				drilled	118	1994	+ 3	1997	118	1876	Ribstone Creek	hard alk.		D.S.	Well flows during Feb. and March.
	SW	23				bored	110	2027	- 15	2012	110	1917	Ribstone Creek?	hard iron		D.S.	Good supply
	NE	32				drilled	91	2027	- 25	2002	91	1936	Ribstone Creek?	hard iron		D.S.	Good supply in black sand
	NE	1	48	27	3	drilled	160	2199			160	2039	Ribstone Creek?	hard iron		S.	Good supply, water poor.
	NE	2				bored	120	2235	- 114	2121	114	2121	Ribstone Creek?	hard		D.S.	
	NW	2				drilled	140	2248	- 20	2228	140	2108	Ribstone Creek?	hard		D.S.	Good supply
	SE	2				drilled	200	2169			200	1969	Ribstone Creek	soft soda		D.S.	Fair supply of good water.
	NE	3				drilled	192	2258			192	2066	brown sand			D.S.	Good supply [illegible].
	NE	4				bored	90	2181	- 70	2111	90	2091		hard		D.S.	Good supply in black sand.
	NE	10				drilled	120	2224	- 80	2144	120	2104	glacial sand	hard		D.S.	Good supply in fine sand
	SE	12				drilled	210	2174	- 75	2099	210	1964	Ribstone Creek	soft		D.S.	Abundant supply
	SW	14				drilled	112	2035			112	1923	Ribstone Creek	med.hard		D.S.	Fine sand causes sand trouble
	SE	15				bored	100	2119	- 75	2044	100	2019	glacial			D.S.	Limited supply
	NE	18				drilled	108	2117			108	2009	Ribstone Creek	soft		D.S.	
	NE	19				drilled	150	2138			150	1988	Ribstone Creek	soft		D.S.	Water in black sand
	SE	22				bored	84	2078	- 16	2062	84	1994	Ribstone Creek			D.S.	Good supply
	NW	23				bored	50	2088	- 43	2045	50	2038	glacial	hard		D.S.	Limited supply
	SE	28				bored	105	2079			105	1974	Ribstone Creek	med.hard		D.	Water in black sand
	NW	30				drilled	172	2123	- 70	2053	172	1951	Ribstone Creek	soft		D.S.	Good supply. Base of drift at 165 feet
	SW	34				drilled	118	2089			118	1971	Ribstone Creek			D.S.	Water in black sand
	NE	35				drilled	104	2083			104	1979	Ribstone Creek?	hard		D.S.	Water in fine sand
	NW	36				drilled	112	2058			105	1953	glacial	hard		D.S.	Water in sand
	NE	36				drilled	346	2085			346	1739	Lea Park	salty			Limited supply

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WELL RECORDS—Rural Municipality of Wilton No. 472, Saskatchewan.

WELL No.	LOCATION					TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE		PRINCIPAL WATER-BEARING BED			CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
	¼	Sec.	Tp.	Rge.	Mer.				Above (+) Below (−) Surface	Elev.	Depth	Elev.	Geological Horizon				
	SW	12	48	28	3	drilled	150	2106	- 75	2031	150	1956	Ribstone Creek	hard		D.S.	Good supply
	NW	12				drilled	110	2112	- 30	2082	110	2002	Ribstone Creek	soft		D.S.	Abundant supply of water
	NW	13				drilled	117	2111	- 52	2059	117	1994	Ribstone Creek	soft		D.S.	Abundant supply of water
	NW	23				drilled	117	2111	- 47	2064	117	1994	Ribstone Creek	soft		D.S.	Abundant supply white residue
	NE	24				drilled	135	2108			135	1973	Ribstone Creek			S.	Water has a very bad taste
	SE	24				drilled	140	2107			140	1967	Ribstone Creek	soft		D.S.	Good supply
	NW	26				bored	117	2120	- 60	2060	117	2003	Ribstone Creek	soft		D.S.	Good supply
	NE	35				drilled	160	2150	-100	2050	160	1990	Ribstone Creek	soft		D.S.	Good supply
	SW	36				drilled	153	2140	- 80	2060	153	1987	Ribstone Creek	soft		D.S.	Good supply
	SE	36				drilled	185	2152	- 89	2063	185	1967	Ribstone Creek	soft		D.S.	Well pumped dry in 30 minutes.
1	NE	4	49	25	3	drilled	145	2096	-100	1996	145	1951	Ribstone Creek	hard		D.S.	Good supply
2	SW	6				dug	20	1983	- 15	1986	20	1963	glacial	hard		D.S.	Good supply in clay
3	SE	6				dug	14	1992			14	1978	glacial	soft		D.S.	Good supply in sand
4	SW	7					60	1985			60	1925	glacial	hard		D.S.	Good supply in sand
5	NW	7					53	1991	- 25	1966	53	1938	glacial	hard		D.S.	Good supply in sand
6	SE	9				dug	20	2089			20	2069	glaciel	hard		D.S.	Limited supply in gravel
7	NW	9					12	2050	- 9	2041	12	2038	glacial	hard		D.S.	Good supply in sand
8	NE	10				bored	88	2023			88	1935	glacial	hard		D.S.	Good supply in gravel
9	SE	11					115	2065			115	1950	glacial	hard		D.S.	Good supply in fine sand
10	NW	11					110	2024	- 50	1974	110	1914	Ribstone Creek	hard		D.S.	Good supply in sand
11	SW	12				dug	16	2105	- 12	2093	16	2089	glacial	hard		D.S.	Good supply in sand
12	NW	12					109	2050			109	1941	Ribstone Creek	hard		D.S.	Good supply
13	SE	14				drilled	102	2038	- 78	1960	102	1936	glacial	hard		D.S.	Supply sufficient in sand
14	SW	14				drilled	90	2045			90	1955	glacial	hard		D.S.	Good supply in sand
15	NE	14				drilled	100	1996	- 70	1926	100	1896	Ribstone Creek	hard		D.	Good supply in fine sand
16	SE	15					80	2017			80	1937	glacial	hard		D.S.	Good supply
17	SW	15				bored	103	2034	- 66	1968	103	1931	glacial	hard		D.S.	Good supply in clay
18	SW	16					80	2031			80	1951	glacial	hard		D.S.	Good supply in gravel
19	NW	16				drilled	110	1993	- 80	1913	110	1883	Ribstone Creek	hard		D.S.	Good supply in sand
20	SE	17					90	2023			90	1933	glacial	hard		D.S.	Good supply in white sand
21	SE	19					97	1999	- 40	1959	97	1902	glacial	hard		D.S.	Good supply in sand
22	NW	19					98	1981	- 40	1941	98	1883	Ribstone Creek	hard		D.S.	Good supply in sand
23	SE	20					65	1992			65	1927	glacial	hard		D.S.	Good supply in gravel
24	SW	20				drilled	112	2007			112	1895	Ribstone Creek	hard		D.S.	Good supply in black sand
25	SW	21				drilled	83	2015	50	1965	83	1932	glacial	hard		D.S.	Good supply in sand
26	NW	21					65	1997			65	1932	glacial	hard		D.S.	Good supply in sand
27	SW	22					68	1988			68	1920	glacial	hard		D.S.	Good supply.
28	NW	22				drilled	102	1966			102	1864	Ribstone Creek	hard		D.S.	Good supply in sand
29	SW	24					45	1983			45	1938	Ribstone Creek	hard		D.S.	Good supply
30	NE	25					50	2068	- 47	2021	50	2018	glacial	hard		D.S.	Good supply in clay
31	NE	26					68	2064			68	1996	glacial	hard		S..	Good supply in sand
32	NW	27				bored	27	2033			27	2006	glacial	hard		D.S.	Insufficient in fine gravel
33	NW	28				drilled	105	2002	- 90	1912	105	1897	Ribstone Creek	hard		D.S.	Good supply in dark sand
35	NE	30				bored	50	2024			50	1974	glacial	hard		D.	Limited supply in gravel
36	NW	31				drilled	50	2127	- 25	2102	50	2077	glacial	hard		D.S.	Good supply in fine sand
37	NE	32				bored	65	2078	- 10	2068	65	2013	glacial	hard		D.S.	Poor supply in sand.
38	NW	32				drilled	191	2068	-171	1897	191	1877	Ribstone Creek	hard		D.S.	Good supply in sand
39	NW	34				bored	60	2124	- 30	2094	60	2064	glacial	hard		D.S.	Good supply in sand
40	SW	35				bored	50	2097	- 46	2051	50	2047	glacial	hard		D.S.	Insufficient in blue sand
41	SW	36				bored	60	2078	- 57	2021	60	2018	glacial	hard		D.S.	Limited supply in blue clay

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WELL RECORDS—Rural Municipality of Wilton No. 472, Saskatchewan.

WELL No.	LOCATION					TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE		PRINCIPAL WATER-BEARING BED			CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
	¼	Sec.	Tp.	Rge.	Mer.				Above (+) Below (−) Surface	Elev.	Depth	Elev.	Geological Horizon				
1	NW	1	49	26	3	bored	80	1979	- 10	1969	80	1899	Ribstone Creek	hard		D.S.	Good supply in sand
2	SW	2				drilled	105	1970	-100	1870	105	1865	Ribstone Creek	hard		D.S.	Good supply in sand
3	SE	3				bored	45	1994			45	1949	glacial			D.S.	Good supply in sand
4	NW	4				bored	85	2008	- 40	1968	85	1923	glacial ?	hard		D.S.	Good supply.
5	SW	6				drilled	170	2041	- 70	1971	170	1871	Ribstone Creek	hard		D.S.	Good supply in sand
6	NE	7				bored	147	2006	- 52	1954	147	1859	glacial	hard		D.S.	Good supply in gravel
7	NW	10				bored	64	1980	- 20	1960	64	1916	Ribstone Creek	hard		D.S.	Good supply in fine sand
8	SW	12				drilled	98	1971	- 20	1951	98	1873	Ribstone Creek	hard		D.S.	Good supply in black sand
9	NE	12				drilled	30	1986	- 25	1961	30	1956	glacial	hard		D.S.	Good supply.
10	SE	13					45	1984	- 40	1944	45	1939	glacial	hard		D.S.	Good supply in clay
11	NE	13					98	1975			98	1877	glacial	hard		D.S.	Good supply in gravel
12	SE	14				dug	15	1936			15	1921	glacial	hard		D.S.	Good supply in sand
13	NW	15				bored	76	1975	- 22	1953	76	1899	Ribstone Creek	hard		D.S.	Good supply in sand
14	NE	16				bored	72	1967	- 21	1946	72	1895	Ribstone Creek	hard		D.S.	Good supply in blue sand
15	SW	17				drilled	94	1984	- 50	1934	94	1890	Ribstone Creek	hard		D.S.	Good supply in gravel and sand
18	SE	18				drilled	95	1991	- 30	1961	95	1896	Ribstone Creek	hard		D.S.	Good supply in black sand
19	NE	18				drilled	76	1981			76	1905	Ribstone Creek	hard		D.S.	Good supply.
20	NW	20				drilled	70	1970	- 50	1920	70	1900	glacial	hard		D.S.	Limited supply in gravel and sand
21	NW	21				bored	60	1976	- 30	1946	60	1916	glacial	hard		D.S.	Good supply in clay
222	NW	22				drilled	70	1988			70	1918	glacial	hard		D.S.	Good supply.
23	SE	22				bored	58	1975	- 49	1926	58	1917	glacial	hard		D.S.	Limited supply in sand
	SW	23				drilled	103	1986	- 66	1920	103	1883	Ribstone Creek	hard		D.S.	Good supply.
24	SE	24					98	1992			98	1894	Ribstone Creek	hard		D.S.	Good supply in sand.
25	NE	24					83	1993			83	1910	glacial	hard		D.S.	Good supply
26	SW	29				drilled	70	1979	- 50	1929	70	1909	glacial	hard		D.S.	Good supply in sand and gravel
27	SW	29				drilled	85	1966	- 30	1936	85	1881	Ribstone Creek	hard		D.S.	Good supply in sand.
28	SW	30					100	2000	- 45	1955	100	1900	Ribstone Creek?	hard		D.S.	Good supply.
29	NE	31				bored	60	1997	- 59	1938	60	1937	glacial	hard		D.	Good supply in sand.
30	SE	32				drilled	114	1985	- 50	1935	114	1871	Ribstone Creek	hard		D.S.	Good supply in sand.
31	SE	35				bored	90	1966	- 16	1950	90	1876	Ribstone Creek	hard		D.	Good supply in sand.
32	NW	35				bored	50	2053	- 41	2012	50	2003	glacial	hard		D.S.	Good supply in black sand
33	NE	36					25	2119	- 18	2101	25	2094	glacial	hard		D.	Sufficient for domestic use.
1	SE	2	49	27	3	drilled	164	2071	- 60	2011	164	1907	Ribstone Creek	hard		D.S.	Good supply in black sand
2	SW	4				drilled	127	2102	- 60	2042	127	1975	Ribstone Creek	hard		D.S.	Good supply in sand.
3	NE	4				drilled	130	2108	- 40	2068	130	1978	Ribstone Creek	hard		D.S.	Good supply in sand.
4	SE	5				drilled	130	2098	- 70	2028	130	1968	Ribstone Creek	hard		D.S.	Good supply.
5	SW	6				drilled	147	2128	- 60	2068	147	1981	Ribstone Creek	soft		D.S.	Good supply in sand.
6	NE	6				drilled	150	2134	- 80	2054	150	1984	Ribstone Creek	soft		D.S.	Good supply in black sand.
7	NW	8				drilled	35	2115	- 29	2086	35	2080	glacial	hard		D.-	Limited supply in blue clay
8	NW	8				dug	20	2115	- 10	2105	20	2095	glacial	hard		--	Good supply in sand.
9	NW	9				drilled	130	2112	- 25	2087	130	1982	Ribstone Creek	soft		D.S.	Good supply.
10	SW	10				drilled	120	2105	- 35	2070	120	1985	Ribstone Creek	hard		D.-	Sufficient in sand. School well.
11	NW	10				drilled	112	2091	- 60	2031	112	1979	Ribstone Creek			D.S.	Good supply in sand.
12	NE	10				drilled	142	2074	- 28	2046	142	1932	Ribstone Creek	hard		D.S.	Limited supply in sand.
13	SW	12				drilled	160	2056	- 60	1996	160	1896	Ribstone Creek	hard		D.S.	Good supply.
14	NW	14				drilled	135	2057	- 60	1997	135	1922	Ribstone Creek	hard		D.S.	Good supply.
15	SW	15				drilled	114	2106	- 55	2051	114	1992	Ribstone Creek			D.S.	Good supply in black sand.
16	NW	16				drilled	96	2072	- 80	1992	96	1976	Ribstone Creek	hard		D.S.	Good supply.
17	SW	16				drilled	100	2086	- 30	2056	100	1986	Ribstone Creek	hard		D.S.	Good supply
18	NE	16				drilled	116	2087	- 56	2031	116	1971	Ribstone Creek	hard		D.S.	Good supply in black sand
19	SW	18				drilled	160	2135	- 30	2105	160	1975	Ribstone Creek	hard		D.S.	Good supply in black sand
20	NE	18				drilled	130	2133	- 45	2088	130	2003	Ribstone Creek	hard		D.S.	Good supply in black sand

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WELL RECORDS—Rural Municipality of Wilton No. 472, Saskatchewan.

WELL No.	LOCATION					TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE		PRINCIPAL WATER-BEARING BED			CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
	¼	Sec.	Tp.	Rge.	Mer.				Above (+) Below (−) Surface	Elev.	Depth	Elev.	Geological Horizon				
21	SW	19	49	27	3	drilled	195	2113			195	1918	Ribstone Creek	hard		B.	Good supply
22	NE	21				drilled	80	2048	- 20	2028	80	1968	glacial	hard		D.S.	Good supply
23	NE	22				bored	102	2018	- 40	1978	102	1916	Ribstone Creek	alkaline		D.S.	Good supply in sand
25	NE	23				drilled	150	2021	- 33	1988	150	1871	Ribstone Creek	hard		D.S.	Good supply in black sand
26	SW	24				drilled	100	2008	- 90	1918	100	1908	Ribstone Creek	hard		D.S.	Sufficient in fine sand
27	SE	25				bored	100	1999	- 27	1972	100	1899	Ribstone Creek	hard		D.S.	Good supply.
28	NW	25				drilled	108	1986	- 25	1961	108	1878	Ribstone Creek	hard		D.S.	Good supply in sand
29	SW	27				bored	135	2030	- 75	1955	135	1895	Ribstone Creek	hard		D.S.	Good supply.
30	NW	27				drilled	135	2005	- 20	1985	135	1870	Ribstone Creek	hard		D.S.	Good supply.
31	NW	27				bored	80	2025	- 76	1949	80	1945	Ribstone Creek?	hard		D.S.	Limited supply.
32	NE	28				drilled	135	2020	surface	2020	135	1885	Ribstone Creek	hard		D.S.	Good supply in sand
33	NW	29				dug	38	2089	- 17	2072	38	2051	glacial	hard		D.S.	Good supply in sand
34	SW	29				drilled	90	2096	- 30	2066	90	2006	glacial	hard		D.S.	Sufficient supply
35	NE	30				dug	24	2014	- 23	1991	24	1990	glacial	hard		D.	Sufficient for domestic use.
36	NE	30				dug	30	1997	- 18	1979	30	1967	glacial	hard		S.	Good supply
37	NW	32				dug	38	2055	- 12	2043	38	2017	glacial	hard		D.S.	Good supply in sand
38	SW	32				dug	28	2060	- 26	2034	28	2032	glacial	hard		D.S.	Good supply.
39	NW	33				bored	96	2058	- 52	2006	96	1962	Ribstone Creek?	hard		D.S.	Good supply in black sand
40	NE	34				drilled	92	2019	- 20	1999	92	1927	Ribstone Creek?	hard		D.S.	Good supply.
41	SE	34				drilled	117	1991	- 10	1981	117	1874	Ribstone Creek	hard		D.S.	Good supply in sand.
42	NE	35				bored	72	2006	- 21	1985	72	1934	Ribstone Creek	hard		D.S.	Good supply.
43	NW	35				bored	75	2011	- 25	1986	75	1936	Ribstone Creek	hard		D.S.	Good supply in sand.
44	SE	36				bored	75	1981	-12	1969	75	1906	Ribstone Creek	hard		D.	Good supply.
45	SW	36				drilled	100	2012	- 80	1932	100	1912	Ribstone Creek	hard		D.	Limited supply
46	NE	36				bored	88	2004	- 38	1966	88	1916	Ribstone Creek?	hard		D.S.	Good supply.
47	NW	36				bored	58	2009	- 40	1969	58	1951	glacial	hard		D.S.	Good supply in sand.
1	SW	2	49	28	3	drilled	170	2156	- 90	2066	170	1986	Ribstone Creek	soft		D.S.	Good supply in sand
2	NW	2				drilled	158	2140	- 70	2070	158	1982	Ribstone Creek	soft		D.S.	Good supply in black sand
3	NE	11				drilled	175	2142	- 60	2082	175	1967	Ribstone Creek	hard		D.S.	Good supply in dark sand
4	SW	12				drilled	165	2150	- 80	2070	165	1985	Ribstone Creek	hard		D.S.	Good supply in black sand
5	NW	12				drilled	168	2142	- 70	2072	168	1974	Ribstone Creek	hard		D.S.	Good supply in black sand
6	SE	12				drilled	187	2132	- 40	2092	187	1945	Ribstone Creek	hard		D.S.	Good supply in black sand
7	NE	12				drilled	165	2138			165	1973	Ribstone Creek	hard		D.S.	Good supply.
8	SE	13				drilled	200	2147	- 80	2067	200	1947	Ribstone Creek	hard		D.S.	Good supply.
9	NE	22				drilled	160	2155			160	1995	Ribstone Creek	hard		D.S.	Good supply in sand
10	NE	23				drilled	120	2136			120	2016	Ribstone Creek	hard		D.S.	Colony Gas Well No. 2.
11	SW	23				drilled	160	2150	- 60	2090	160	1990	Ribstone Creek	hard		D.S.	Good supply.
12	NW	25				drilled	157	2129			157	1972	Ribstone Creek	hard		D.S.	Colony Gas Well No. 1
13	SW	26				drilled	128	2139	- 60	2079	128	2011	Ribstone Creek	hard		D.S.	Good supply in sand
14	NE	27				drilled	200	2121			200	1921	Ribstone Creek	hard		D.S.	Good supply
15	NE	27				drilled	185	2161			185	1976	Ribstone Creek	hard		D.S.	Good supply in sand
16	NW	36				drilled	100	2084	- 45	2039	100	1984	Ribstone Creek	hard		D.S.	Good supply

NOTE—All depths, altitudes, heights and elevations given above are in feet.

(D) Domestic; (S) Stock; (I) Irrigation; (M) Municipality; (N) Not used.
(#) Sample taken for analysis.