CANADA
DEPARTMENT OF MINES
AND
TECHNICAL SURVEYS

GEOLOGICAL SURVEY OF CANADA

WATER SUPPLY PAPER No. 12

PRELIMINARY REPORT

GROUND-WATER RESOURCES OF THE RURAL MUNICIPALITY OF RECIPROCITY NO. 32 SASKATCHEWAN

By

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OTTAWA
1936

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CONTENTS

Illustrations

GROUND WATER RESOURCES OF THE RURAL MUNICIPALITY OF RECIPROCITY, NO. 32, SASKATCHEWAN

INTRODUCTION

Lack of rainfall during the years 1930 to 1934 over a large part of the Prairie Provinces brought about an acute shortage both in the larger supplies of surface water used for irrigation purposes and the smaller supplies of ground water required for domestic and stock-raising purposes by settlers, villages, and Indian reserves. The drought conditions resulted in repeated crop failures, and in a large number of farms in the acute drought areas of Saskatchewan and Alberta being abandoned. In an effort to relieve the serious situation a number of special studies of the water problem were begun by both Federal and Provincial Governments and allied organizations. The Federal Department of Agriculture undertook among other phases of the drought problem an investigation into the existing supplies of surface water, their conservation by means of dams and dug-outs, and how they could be made more generally available for irrigation. The Geological Survey of the Federal Department of Mines began an extensive study of the underground water conditions of southern Saskatchewan, this water being used principally for domestic and stock-raising purposes. For many years past the water problem in this and other provinces of Canada have engaged the attention of the Geological Survey, and considerable information had already been collected. A number of short reports dealing with the ground water conditions of special areas in Manitoba, Saskatchewan and Alberta have been published by both the Federal and Provincial Geological Surveys, but no systematic study of the ground water resources has been made up to the present.

Field Work

The senior author was in charge of this investigation and was instructed to cover as much of the territory as possible in the season. To effect this it was decided to maintain an

Publication of Results

The essential information pertaining to the ground water conditions is being published in reports, one being issued for each municipality. Copies of these reports are being sent to the secretary treasurers of the municipalities and to certain Provincial and Federal Departments, where they can be consulted by residents of the municipalities or by other persons, or they may be obtained by writing direct to the Director, Bureau of Economic Geology, Department of Mines, Ottawa. Should anyone require more detailed information than that contained in the reports such additional information as the Geological Survey possesses can be obtained on application to the director. In making such request the applicant should indicate the exact location of the area by giving the quarter section, township, range, and meridian concerning which further information is desired.

The reports are written principally for farm residents, municipal bodies, and well drillers who are either planning to sink new wells or to deepen existing wells. Technical terms used in the reports are defined in the glossary,

How to Use the Report

Anyone desiring information about ground water in any particular locality should read first the part dealing with the municipality as a whole in order to understand more fully the part of the report that deals with the place in which he is interested. At the same time he should study the two figures accompanying the report. Figure 1 shows the surface and bedrock geology as related to the ground water supply, and Figure 2 shows the relief and the location and type of water wells. Relief is shown by lines of equal elevation called "contours". The elevation above sea-level

is given on some or all of the contour lines on the figure.

If one intends to sink a well and wishes to find the approximate depth to a water-bearing horizon, he must learn: (1) the elevation of the site, and (2) the probable elevation of the water-bearing bed. The elevation of the well site is obtained by marking its position on the map, Figure 2, and estimating its elevation with respect to the two contour lines between which it lies and whose elevations are given on the figure. Where contour lines are not shown on the figure, the elevations of adjacent wells as indicated in the Table of Well Records accompanying each report can be used. The approximate elevation of the water-bearing horizon at the well-site can be obtained from the Table of Well Records by noting the elevation of the water-bearing horizon in surrounding wells and by estimating from these known elevations its elevation at the well-site.[1] If the water-bearing horizon is in bedrock the depth to water can be estimated fairly accurately in this way. If the water-bearing horizon is in unconsolidated deposits such as gravel, sand, clay, or glacial debris, however, the estimated elevation is less reliable, because the water-bearing horizon may be inclined, or may be in lenses or in sand beds which may lie at various horizons and may be of small lateral extent. In calculating the depth to water, care should be taken that the water-bearing horizons selected from the Table of Well Records be all in the same geological horizon either in the glacial drift or in the bedrock. From the data in the Table

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[1] If the well-site is near the edge of the municipality, the map and report dealing with the adjoining municipality should be consulted in order to obtain the needed information about nearby wells.

of Well Records it is also possible to form some idea of the quality and quantity of the water likely to be found in the proposed well.

GLOSSARY OF TERMS USED

Alkaline. The term "alkaline" has been applied rather loosely to some ground-waters. In the Prairie Provinces, a water is usually described as "alkaline" when it contains a large amount of salts, chiefly sodium sulphate and magnesium sulphate in solution. Water that tastes strongly of common salt is described as "salty". Many "alkaline" waters may be used for stock. Most of the so-called "alkaline" waters are more correctly termed "sulphate waters".

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 water-bearing bed, lens, or pocket in unconsolidated deposits or in bedrock.

Buried pre-Glacial Stream Channels. A channel carved into the 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 age.

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 struck.

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 the 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. These are called Flowing Artesian Wells.

(2) Wells in which the water is under pressure but does not rise to the surface. These wells are called Non-Flowing Artesian Wells.

(3) Wells in which the water does not rise above the water table. These wells are called Non-Artesian Wells.

NAMES AND DESCRIPTIONS OF GEOLOGICAL FORMATIONS, REFERRED TO IN THESE REPORTS

Wood Mountain Formation. The name given to a series of gravel and sand beds which have a maximum thickness of 50 feet, and which occur as isolated patches on the higher parts of Wood Mountain. This is the youngest bedrock formation and, where present, overlies the Ravenscrag formation.

Cypress Hills Formation. The name given to a series of conglomerates and sand beds which occur in the southwest corner of Saskatchewan, and rests upon the Ravenscrag or older formations. The formation is 30 to 125 feet thick.

Ravenscrag Formation. The name given to a thick series of light-coloured sandstones and shales containing one or more thick lignite coal seams. This formation is 500 to 1,000 feet thick, and covers a large part of southern Saskatchewan. The principal coal deposits of the province occur in this formation.

Whitemud Formation. The name given to a series of white, grey, and buff coloured clays and sands. The formation is 10 to 75 feet thick. At its base this formation grades in places into coarse, limy sand beds having a maximum thickness of 40 feet.

Eastend Formation. The name given to a series of fine-grained sands and silts. It has been recognized at various localities over the southern part of the province, from the Alberta boundary east to the escarpment of Missouri coteau. The thickness of the formation seldom exceeds 40 feet.

Bearpaw Formation. The Bearpaw consists mostly of incoherent dark grey to dark brownish grey, partly bentonitic shales, weathering light grey, or, in places where much iron

is present, buff. Beds of sand occur in places in the lower part of the formation. It forms the uppermost bedrock formation over much of western and southwestern Saskatchewan and has a maximum thickness of 700 feet or somewhat more.

Belly River Formation. The Belly River consists mostly of non-marine sand, shale, and coal, and underlies the Bearpaw in the western part of the area. It passes eastward and northeastward into marine shale. The principal area of transition is in the western half of the area where the Belly River is mostly thinner than it is to the west and includes marine zones. In the southwestern corner of the area it has a thickness of several hundred feet.

Marine Shale Series. This series of beds consists of dark grey to dark brownish grey, plastic shales, and underlies the central and northeastern parts of Saskatchewan. It includes beds equivalent to the Bearpaw, Belly River, and older formations that underlie the western part of the area.

WATER-BEARING HORIZONS OF THE MUNICIPALITY

The rural municipality of Reciprocity is an area of 270 square miles in southeastern Saskatchewan. It consists of nine townships described as townships 4, 5, and 6, ranges 32, 33, and 34, west of the first meridian. The town of Alida lies approximately in the centre of the municipality. The whole of the municipality is covered by a mantle of unconsolidated glacial drift, from 200 to 450 feet thick, the maximum thickness being attained in township 6, range 33. The upper 10- to 30-foot zone of this drift consists of yellow clay and deposits of sand and gravel that are either in the form of pockets, or as extensive strips of glacial gravels flooring the valleys. Underlying this zone is from 150 to 400 feet of blue clay that contains a few pockets of sand. In a few localities deposits of sand and gravel occur between the blue clay and the bedrock.

Water-bearing Horizons in the Unconsolidated Deposits

Three water-bearing horizons occur in the thick deposit of unconsolidated glacial drift. The most important is found in the upper 30-foot zone, where the porous sand and gravel deposits lying above the impervious blue clay collect and retain the water resulting from rainfall and the melting of the snow. This horizon is the source of water for all the shallow, non-artesian wells in the municipality. The approximate outlines of the areas in which the gravel deposits are extensive are shown on the accompanying map. In years of normal rainfall an abundant supply of hard, usable water can be obtained from shallow wells in these localities. Throughout the rest of the municipality the supply of water depends upon the size of the gravel pockets that the wells tap. The general elevation of this water-bearing horizon varies from 1,700 to 1,880 feet in the east and southeast and to 1,783 to 1,960 feet in the west and northwest, the rise corresponding to the rise in the surface elevation. A second water-bearing horizon in the glacial drift is

formed by a 10-foot sand bed in the blue clay. This horizon was encountered in one locality only, namely NW.¼, sec. 22, tp. 5, range 32, and it is apparently a pocket within the blue clay. Only a small supply of water was obtained from it. Similar pockets of sand may occur in the blue clay elsewhere in the municipality, but at best they will contain only a small supply of water which is uaully "alkaline" in character. The third water-bearing horizon in the glacial drift is composed of sand and gravel deposits that underlie the blue clay and which were apparently laid down in small depressions in the old bedrock land surface. This horizon is not continuous throughout the municipality, but it was encountered in the following three locations: SE.¼, sec. 16, tp. 4, range 32, at an elevation of 1,630 feet; SE.¼, sec. 16, tp. 4, range 34, at an elevation of 1,616 feet; and NW.¼, sec. 36, tp. 5, range 32, at an elevation of 1,588 feet. In each instance the water is hard in character and is under sufficient pressure to flow 6 to 10 feet above the surface, or to rise to within a few feet of it.

Water-bearing Horizons in the Bedrock

The Ravenscrag formation underlies the glacial drift throughout the municipality. It is composed of shale and sandy shale beds, the combined thickness of which decreases from 200 feet in the south of the municipality to 100 feet in the north. The sandy shale beds act as water-bearing horizons and there appears to be at least four of these horizons throughout the greater part of the municipality. The upper of these horizons occurs at an elevation of 1,600 feet, or at a depth of 270 feet, and it has been tapped by two wells in tp. 5, range 34. The water from it is soft and salty, and rises to within 15 feet of the surface. The second horizon is encountered at an elevation of from 1,500 to 1,550 feet and has been tapped by ten or more wells. The water from this horizon is soft and [illegible] and abundant, and the hydrostatic pressure is sufficient to cause it to flow in some wells, and to rise to within 6 to 40 feet of the surface in others. Sandy shale beds at

depths of 330 to 425 feet, or at elevations of from 1,400 feet to 1,455 feet, form a third water-bearing horizon. The water is soft and salty, and rises to within 40 to 80 feet of the surface. The fourth water-bearing horizon in the Ravenscrag formation is also a sandy shale bed, which is pierced at depths of from 440 to 625 feet, or at elevations of from 1,300 to 1,365 feet. The water from this horizon is also soft and salty, and the pressure is sufficient to cause it to flow in some areas and in others to rise to within 8 to 100 feet of the surface.

The areas in which flowing artesian wells occur, and which derive their water either from the Ravenscrag formation or the gravel and sand lying between this formation and the glacial drift, are shown on the accompanying map. Due to insufficient hydrostatic pressure or non-porosity of the Ravenscrag beds, non-flowing artesian wells are to be expected in the intervening localities.

GROUND WATER CONDITIONS BY TOWNSHIPS

Township 4, Range 32

In this township the gravel and sand deposits lying above the blue clay form the only water-bearing horizon in the glacial drift. The elevation of the horizon varies from 1,710 feet in the southeast of the township to 1,780 feet in the northwest. It is the water source for all the shallow wells. Along the creek in the eastern part of the block, the gravel deposits are quite extensive and an abundant supply of water can be obtained at depths of from 8 to 12 feet. A fair supply can be obtained from most shallow wells along the creek in the west-central part of the township, but here the gravel deposits are not so extensive. Elsewhere in the township, the gravel occurs as pockets, and the supply of water derived from them depends upon the amount of rainfall. During prolonged dry spells the supply from this water-bearing horizon is not always sufficient for local needs.

There is at least one water-bearing horizon in the Ravenscrag formation underlying the glacial drift. This horizon, formed

by sandy shale, has been tapped at a depth of 440 feet, or at an elevation of 1,290 feet, in SE.¼, section 12; at 434 feet, or at an elevation of 1,346 feet, in SE.¼, section 28; and at 484 feet, or at an elevation of 1,305 feet, in SW.¼, section 34. The water is medium hard and salty, and is under pressure, rising to within 9 to 150 feet of the surface. It is satisfactory for stock use but is not desirable for domestic purposes. The horizon where tapped yields a fairly abundant supply of water, sufficient for 30 to 80 head of stock, and should other wells be drilled into it sufficient water for local needs should be obtained.

Township 4, Range 33

There are three water-bearing horizons in the glacial drift in this township. Throughout most of the township the upper 25 feet of the drift lying above the blue clay consists of 15 feet of yellow clay underlain by 10 feet of gravel and quicksand. In sections 25, 35, and 36, however, the yellow clay extends to a depth of 35 feet. This layer of quicksand and gravel forms a water-bearing horizon from which all of the shallow wells produce an abundant supply of hard, usable water. Little difficulty should be encountered in obtaining a satisfactory water supply from shallow wells tapping this horizon.

In SE.¼, section 10 and SW.¼, section 14, a small seam of gravel lying within the blue clay at a depth of 40 feet, or at an elevation of 1,728 feet, forms a second water-bearing horizon. It produces only a very small supply of hard, slightly alkaline water, and it is doubtful if it is continuous throughout the township.

A third water-bearing horizon in the glacial drift was encountered in SE.¼, section 16, at a depth of 160 feet, or at an elevation of 1,630 feet, and it is formed by a sand deposit lying at the base of the blue clay. It produces an abundant supply of hard water, and the hydrostatic pressure was sufficient to cause the water to flow 1 foot above the surface when the well was first

drilled, and to rise to within 6 feet of the surface at the present time. This horizon is not extensive, as a number of wells drilled close by did not encounter it, but similar deposits may occur elsewhere in the township.

One water-bearing horizon occurs in the Ravenscrag formation. This horizon, a sandy shale, has been pierced: in section 4 at a depth of 370 feet, or at an elevation of 1,420 feet; in SW.$\frac{1}{4}$, section 16, at 282 feet, or at an elevation of 1,516 feet; and in NE.$\frac{1}{4}$, section 18, at a depth of 328 feet, or at an elevation of 1,492 feet. In each well the water is soft and salty, and flows, or used to flow, from 1 to 6 feet above the surface. Similar wells should be located in the western part of the township upon further drilling.

Township 4, Range 34

There are two water-bearing horizons in the glacial drift in this township. The gravel and sand deposits lying above the blue clay form the upper horizon, which occurs at an elevation of from 1,780 to 1,800 feet. All of the shallow wells derive their water supply from this horizon. Along Auburton creek the gravel is fairly extensive, and a good supply of hard, usable water can be obtained from shallow wells dug into these deposits. Elsewhere in the township the gravel occurs as pockets within yellow clay, and the supply is barely sufficient for local needs. In sections 25 and 36 a suitable supply cannot be obtained from this water-bearing horizon.

In SE.$\frac{1}{4}$, section 18, a second water-bearing horizon, which is a gravel bed lying between the blue clay and the bedrock, was tapped at a depth of 204 feet, or at an elevation of 1,616 feet. The water is hard and has a high iron content, and the hydrostatic pressure is sufficient to cause it to flow 18 feet above the surface. This horizon does not appear to be of large areal extent, as no water was obtained from it in the other deep wells.

The Ravenscrag formation in this township contains at least two water-bearing horizons. The upper horizon is a coal seam and its associated sandstone beds, and it occurs at depths of approximately 325 feet, or at an elevation of from 1,502 to 1,560 feet. The water rises to within 25 feet of the surface and is soft, slightly salty , tastes of "soda", and is abundant. The second or lower horizon is a sandy bed, and it is pierced at depths of 425 and 452 feet, or at elevations of 1,397 and 1,365 feet, respectively. The water from this horizon is soft, non-salty , and tastes of "soda", and the pressure is sufficient to cause it to flow 1 foot above the surface in SE.¼, section 24, and to rise to within 30 feet of the surface in SE.¼, section 10. Should other wells be drilled into these horizons an abundant supply of water, under sufficient pressure to flow, or to rise to within a few feet of the surface, should be obtained.

Township 5, Range 32

Three water-bearing horizons occur in the glacial drift in township 5, range 32. The sand and gravel deposits lying above the blue clay, at depths of from 5 to 20 feet, form the first horizon, and it is the source of water for all the shallow wells. Throughout most of the township the shallow wells are dug into gravel pockets and the supply of water from them is limited; in dry years the wells do not produce sufficient water for local needs. Two narrow bands of gravel occur, however, and wells dug into these deposits obtain an abundant supply of hard, usable water, at depths of from 5 to 15 feet. The location of these gravel strips is shown on the accompanying map of the municipality.

Throughout NW.¼, section 22, a 10-foot sand layer lying within the blue clay, is encountered at a depth of 90 feet and forms a second water-bearing horizon. At the present time no water is being obtained from this horizon, but one of the wells bored into it produced a fair supply during the years 1905 to 1925.

The water was hard and did not rise above the top of the sand bed.

The third water-bearing horizon in the glacial drift is a sand bed lying between the blue clay and the Ravenscrag formation. It was pierced at a depth of 265 feet, or at an elevation of 1,588 feet, in NE.¼, section 36, and produces an abundant supply of hard, slightly salty water, which rises to within 25 feet of the surface. Lack of information prevents the determination of its areal extent.

In SE.¼, section 10, and SE.¼, section 3, a sandy shale bed of the Ravenscrag formation, pierced at depths of 336 and 425 feet, or at elevations of 1,400 and 1,458 feet, respectively, constitutes a water-bearing horizon. The water rises to within 60 feet of the surface, is medium hard and slightly salty, and contains a high concentration of iron Salts that often settle out as an orange coloured, flocculent precipitate upon exposure to the air. This horizon, if tapped, should yield a fairly abundant supply of water throughout most of the township.

Township 5, Range 33

In this township the sand and gravel deposits occurring above the blue clay, at elevations of from 1,840 to 1,890 feet, form the only known water-bearing horizon in the glacial drift. An abundant supply of hard, usable water can be obtained from this horizon in three narrow zones, which are shown on the accompanying map. In each of these zones the gravel has been deposited as continuous strips, or as a series of gravel knolls. In the areas between these zones the gravel occurs as small pockets within the yellow clay, and it is almost impossible to obtain a supply of water sufficient for local needs.

In SE.¼, section 16, three wells were drilled to a depth of 385 feet without obtaining water, and in this locality there are no water-bearing horizons at depth in the glacial drift.

So far as known no drilled wells have penetrated the Ravenscrag formation in this township. In the adjacent townships an abundant supply of water is obtained from wells tapping the

water-bearing horizons of this formation, and this condition should hold true in township 5, range 33.

Township 5, Range 34

The sand and gravel deposits lying above the blue clay, at elevations of from 1,840 to 1,885 feet, form the only known water-bearing horizon in the glacial drift in township 5, range 34. Little trouble is experienced in obtaining an abundant supply of hard, usable water from shallow 10-foot wells dug into the extensive deposits of glacial sands and gravel that form this horizon.

In the Ravenscrag formation a sandy shale bed forms a water-bearing horizon at an elevation of 1,600 feet, or at a depth of 267 feet. The water from this horizon is soft and salty abundant, and rises to within 20 feet of the surface. This horizon has been tapped in NW.$\frac{1}{4}$, section 15, and in SE.$\frac{1}{4}$, section 23, and an abundant supply of water can doubtless be obtained from it at other localities within the township.

Township 6, Range 32

The sand and gravel deposits lying above the blue clay, at elevations of from 1,850 to 1,920 feet, form the only water-bearing horizon in the glacial drift in this township. Along two ravines that run in a southerly direction through sections 30, 19, 18, 7, and 6, and through sections 34, 27, 22, 15, 10, and 3, the gravel deposits are fairly extensive, and an abundant supply of water can be obtained from them. Elsewhere in the township the gravel occurs as small pockets and yields only a small amount of water. In drought periods, and some winter months, it is necessary for most farmers to haul water from neighbouring deep wells.

There are three water-bearing horizons in the Ravenscrag formation. The upper one is a sand bed, pierced in SE.$\frac{1}{4}$, section 28, at a depth of 360 feet, or at an elevation of 1,565 feet. The water is soft and salty, abundant, and rises to within 40 feet of the surface. The second water-bearing horizon has been tapped by

wells in sections 16, 20, and 29, at depths of 425 to 500 feet, or at elevations of 1,450 to 1,500 feet. It is a sandy shale bed and the water from it is medium soft and salty, and rises to within 40 to 200 feet of the surface. The supply from this horizon is not as abundant as that from the others, and one well located in NE.¼, section 16, went dry one year after it was drilled. The lowest water-bearing horizon encountered is a sandy shale bed, and it has been pierced at depths of 580 and 627 feet, or at elevations of 1,335 and 1,320 feet. The water from this horizon is soft and salty, and the hydrostatic pressure is sufficient to cause it to rise to within 40 feet of the surface in SW.¼, section 21, and to flow 6 feet above the surface in SW.¼, section 18. In the eastern part of the township a well was drilled to a depth of 500 feet without encountering any water, but in the western part a supply of water sufficient for local needs will be obtained from one of the three horizons mentioned above, should they be tapped by other deep wells.

Township 6, Range 33

One water-bearing horizon occurs in the glacial drift in this township. As in the other townships of the municipality, this horizon consists of the sand and gravel deposits lying above the blue clay within the upper 20 feet of the glacial drift. The best water supply can be obtained along Antler river, and in section 2, where there are extensive deposits of glacial gravels. Throughout the remainder of the township the gravel occurs as pockets within the yellow clay, and the water supply from the horizon is dependant on the amount of rainfall and the size of the gravel pocket tapped. As a rule some water has to be hauled in drought periods and the winter months.

In the Ravenscrag formation a sandy shale bed, occurring at an elevation of 1,440 feet in the southern part of the township, and at 1,500 feet in the northern part, constitutes a water-bearing horizon. The water from this horizon is soft and salty, and is under sufficient pressure to cause it to rise to within 10 feet of

the surface or to flow 3 to 6 feet above it. When first drilled practically all of the deep wells flowed, the water being accompanied by a combustible gas, but from 1927 to 1935 there was a decrease in the hydrostatic pressure and a cessation of the flow of gas, with the result that some of the wells ceased to flow. An abundant supply of water can be obtained from this horizon by further drilling and flowing artesian wells may be expected throughout most of the township.

Township 6, Range 34

The sand and gravel deposits occurring as pockets within the yellow clay that forms the upper 30 feet of the glacial drift constitute the only known water-bearing horizon in the unconsolidated deposits in this township. In years of normal precipitation, wells dug into this horizon yield a supply of water that is sufficient for local needs, but during the drought period many of them became intermittent or went completely dry. It is often necessary to dig a number of dry holes before a gravel pocket can be located.

In NW. ¼, section 24, a sandy shale bed of the Ravenscrag formation forms a water-bearing horizon. It was pierced at a depth of 600 feet, or at an elevation of 1,354 feet. The hydrostatic pressure is sufficient to cause the water to flow 1 foot above the surface. The water is soft and salty, and abundant. Should this horizon be tapped in other localities throughout the township, flowing artesian and non-flowing artesian wells are to be expected.

STATISTICAL SUMMARY OF WELL INFORMATION IN RURAL MUNICIPALITY OF Reciprocity No. 32, Saskatchewan

Township / Range / West of 2nd mer.	4 32	4 33	4 34	5 32	5 33	5 34	6 32	6 33	6 34	Total No. in Municipality
Total No. of Wells in Township	67	58	28	43	46	22	74	37	33	408
No. of wells in bedrock	7	7	5	3	1	2	8	7	3	43
No. of wells in glacial drift	60	51	23	40	45	20	66	30	30	365
No. of wells in alluvium	0	0	0	0	0	0	0	0	0	0
Permanency of Water Supply										
No. with permanent supply	43	39	16	31	35	22	30	31	20	267
No. with intermittent supply	3	5	1	1	5	0	8	5	3	31
No. dry holes	21	14	11	11	6	0	36	1	10	110
Types of Wells										
No. of flowing artesian wells	0	1	2	0	0	0	1	2	2	8
No. of non-flowing artesian wells	3	3	3	4	0	2	6	5	2	27
No. of non-artesian wells	43	40	12	28	40	20	31	29	20	263
Quality of Water										
No. with hard water	40	42	13	28	40	20	32	28	20	263
No. with soft water	6	2	4	4	0	2	6	8	3	35
No. with salty water	3	2	5	4	0	2	4	7	3	30
No. with "alkaline" water	0	3	2	9	3	0	0	0	5	22
Depths of Wells										
No. from 0 to 50 feet deep	60	48	23	37	42	20	65	29	30	354
No. from 51 to 100 feet deep	0	1	0	2	2	0	1	1	0	7
No. from 101 to 150 feet deep	0	1	1	0	0	0	0	0	0	1
No. from 151 to 200 feet deep	0	1	0	0	1	0	0	0	1	3
No. from 201 to 500 feet deep	7	6	5	3	1	2	7	7	0	38
No. from 501 to 1,000 feet deep	0	0	0	1	0	0	1	0	2	4
No. over 1,000 feet deep	0	1	0	0	0	0	0	0	0	1
How the Water is Used										
No. usable for domestic purposes	42	42	15	29	38	20	36	33	19	274
No. not usable for domestic purposes	4	2	2	3	2	2	2	3	4	24
No. usable for stock	46	43	17	32	40	22	36	36	22	294
No. not usable for stock	0	1	0	0	0	0	2	0	1	4
Sufficiency of Water Supply										
No. sufficient for domestic needs	46	43	17	32	40	22	38	36	23	297
No. insufficient for domestic needs	0	1	0	0	0	0	0	0	0	1
No. sufficient for stock needs	39	36	15	28	29	19	29	32	21	248
No. insufficinet for stock needs	7	8	2	4	11	3	9	4	2	50

ANALYSES AND QUALITY OF WATER

General Statement

Samples of water from representative wells in surface deposits and bedrock were taken for analyses. Except as otherwise stated in the table of analyses the samples were analysed in the laboratory of the Borings Division of the Geological Survey by the usual standard methods. The quantities of the following constituents were determined; total dissolved mineral solids, calcium oxide, magnesium oxide, sodium oxide by difference, sulphate, chloride, and alkalinity. The alkalinity referred to here is the calcium carbonate equivalent of all acid used in neutralizing the carbonates of sodium, calcium, and magnesium. The results of the analyses are given in parts per million--that is, parts by weight of the constituents in 1,000,000 parts of water; for example, 1 ounce of material dissolved in 10 gallons of water is equal to 625 parts per million. The samples were not examined for bacteria, and thus a water that may be termed suitable for use on the basis of its mineral salt content might be condemned on account of its bacteria content. Waters that are high in bacteria content have usually been polluted by surface waters.

Total Dissolved Mineral Solids

The term "total dissolved mineral solids" as here used refers to the residue remaining when a sample of water is evaporated to dryness. It is generally considered that waters that have less than 1,000 parts per million of dissolved solids are suitable for ordinary uses, but in the Prairie Provinces this figure is often exceeded. Nearly all waters that contain more than 1,000 parts per million of total solids have a taste due to the dissolved mineral matter. Residents

accustomed to the waters may use those that have much more than 1,000 parts per million of dissolved solids without any marked inconvenience, although most persons not used to highly mineralized water would find such waters highly objectionable.

Mineral Substances Present

Calcium and Magnesium

The calcium (Ca) and magnesium (Mg) content of water is dissolved from rocks and soils, but mostly from limestone, dolomite, and gypsum. The calcium and magnesium salts impart hardness to water. The magnesium salts are laxative, especially magnesium sulphate (Epsom salts, $MgSO_4$), and they are more detrimental to health than the lime or calcium salts. The calcium salts have no laxative or other deleterious effects. The scale found on the inside of steam boilders and tea-kettles is formed from these mineral salts.

Sodium

The salts of sodium are next in importance to those of calcium and magnesium. Of these, sodium sulphate (Glauber's salt, Na_2SO_4) is usually in excess of sodium chloride (common salt, NaCl). These sodium salts are dissolved from rocks and soils. When there is a large amount of sodium sulphate present the water is laxative and unfit for domestic use. Sodium carbonate (Na_2CO_3) "black alkali", sodium sulphate "white alkali", and sodium chloride are injurious to vegetation.

Sulphates

Sulphates (SO_4) are one of the common constituents of natural water. The sulphate salts most commonly found are sodium sulphate, magnesium sulphate, and calcium sulphate ($CaSO_4$). When the water contains large quantities of the sulphate of sodium it is injurious to vegetation.

Chlorides

Chlorides are common constituents of all natural water and are dissolved in small quantities from rocks. They usually occur as sodium chloride and if the quantity of salt is much over 400 parts per million the water has a brackish taste.

Iron

Iron (Fe) is dissolved from many rocks and the surface deposits derived from them, and also from well casings, water pipes, and other fixtures. More than 0.1 part per million of iron in solution will settle as a red precipitate upon exposure to the air. A water that contains a considerable amount of iron will stain porcelain, enamelled ware, and clothing that is washed in it, and when used for drinking purposes has a tendency to cause constipation, but the iron can be almost completely removed by aeration and filtration of the water.

Hardness

Calcium and magnesium salts impart hardness to water. Hardness of water is commonly recognized by its soap-destroying powers as shown by the difficulty of obtaining lather with soap. The total hardness of a water is the hardness of the water in its original state. Total hardness is divided into "permanent hardness" and "temporary hardness". Permanent hardness is the hardness of the water remaining after the sample has been boiled and it represents the amount of mineral salts that cannot be removed by boiling. Temporary hardness is the difference between the total hardness and the permanent hardness and represents the amount of mineral salts that can be removed by boiling. Temporary hardness is due mainly to the bicarbonates of calcium and magnesium and iron, and permanent hardness to the sulphates and chlorides of calcium and magnesium. The permanent hardness

can be partly eliminated by adding simple chemical softeners such as ammonia or sodium carbonate, or many prepared softeners. Water that contains a large amount of sodium carbonate and small amounts of calcium and magnesium salts is soft, but if the calcium and magnesium salts are present in large amounts the water is hard. Water that has a total hardness of 300 parts per million or more is usually classed as excessively hard. Many of the Saskatchewan water samples have a total hardness greatly in excess of 300 parts per million; when the total hardness exceeded 3,000 parts per million no exact hardness determination was made. Also no determination for temporary hardness was made on waters having a total hardness less than 50 parts per million. As the determinations of the soap hardness in some cases were made after the samples had been stored for some time, the temporary hardness of some of the waters as they come from the wells probably is higher than that given in the table of analyses.

Analyses of Water Samples from the Municipality of Reciprocity, No. 32, Saskatchewan.

LOCATION						Depth of Well, Ft	Total dis'vd Solids	HARDNESS			CONSTITUENTS AS ANALYSED						CONSTITUENTS AS CALCULATED IN ASSUMED COMBINATIONS								Source of Water
No.	Qtr.	Sec.	Tp.	Rge	Mer.			Total	Perm.	Temp.	Cl.	Alka-linity	CaO	MgO	SO_4	Na_2O	Solids	$CaCO_3$	$CaSO_4$	$MgCO_3$	$MgSO_4$	Na_2CO_3	Na_2SO_4	NaCl		
1.	SW.	24	4	32	1	14	1,540	865	500	65	253	225	140	130	336	180	985	225	34		387		4	335		x 1
2.	NE.	22	4	33	1	18	1,000	800	800		37	200	200	144	533	56	960	200	214		429		56	61		x 1
3.	SW.	21	6	33	1	11	2,700	2,000	2,000		260	400	120	601	1,037	97	2,051	214		157	1,296			183		x 1
4.	NW.	24	6	34	1	600	5,154															(2)		(1)		x 2

Water samples indicated thus, x 1, are from glacial drift.
Water samples indicated thus, x 2, are from bedrock, Ravenscrag formation.
Analyses are reported in parts per million; where numbers (1), and (2), are used instead of parts per million, they represent the relative amounts in which the five main constituents are present in the water.
Hardness is the soap hardness expressed as calcium carbonate ($CaCO_3$).

Analysis No. 4 by Provincial Analyst, Regina.
For interpretation of this table read the section on Analyses and Quality of Water.

Water from the Unconsolidated Deposits

In general the waters that are derived from the glacial drift in this municipality are reported to be suitable for drinking as well as for stock. The water from the upper part of the drift is of better quality than that obtained at depth, especially that which is obtained from the contact of the drift and the bedrock as it has a high iron content.

Three samples of water from the upper part of the drift were analysed and the results are given in the accompanying table. All the waters analysed are excessively hard, having a permanent hardness of 600 to 2,000 parts per million, and a total dissolved solid content ranging from 1,000 to 2,700 parts per million. Such a total solid content may not render the water unfit for domestic use unless it is composed almost largely of one or more harmful mineral salts. In the samples analysed, magnesium sulphate is the most abundant salt present, its content ranging from 387 to 1,296 parts per million. The waters analysed are suitable for stock and they may be used for drinking although their relatively high magnesium sulphate content may make the water laxative until one becomes accustomed to its use.

No samples of the water from the deeper water-bearing horizons in the drift were analysed, but the waters probably contain more salts in solution than those found near the surface, and may prove to be unsuitable for drinking.

Water from the Bedrock

No samples of water from the bedrock were taken for analysis. The results of one sample analysed by the Provincial Government are listed, however. It has a total dissolved solid content of 5,154 parts per million, but such a content appears to be much higher than that usually found in waters from the Ravenscrag formation. In the sample, sodium chloride (Common Salt) is the most abundant salt present, with sodium carbonate (black alkali)

being second in abundance. Most of the waters from the Ravenscrag formation are high in sodium salts and are soft and as a rule the water is too salty to be satisfactory for drinking, but it is suitable for stock. The water is not suitable for irrigation.

WELL RECORDS—RURAL MUNICIPALITY OF RECIPROCITY NO. 32 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	SE.	2	4	32	1	Dug	10	1,710	- 4	1,706	4	1,706	Glacial gravel	Hard, clear		D,	Sufficient for local needs.
2	NE.	2	"	"	"	"	16	1,715	- 10	1,705	11	1,704	" "	" "	48	D, S	Waters 30 head stock.
3	NW.	3	"	"		"	10	1,720	- 7	1,713	7	1,713	" "	" "		D,	Sufficient for domestic use.
4	SW.	4	"	"	"	"	8	1,725	- 4	1,721	6	1,719	" "	Soft, clear	47	D, S	Waters 100 head stock.
5	NW.	4	"	"	"	"	10	1,720	- 7	1,713	6	1,714	" "	Hard, clear	46	D, S	" 100 " " .
6	NW.	6	"	"	"	"	9	1,755	- 6	1,749	5	1,750	" sand	" "	46	D, S	" 50 " " .
7	SW.	7	"	"	"	"	29	1,752	- 9	1,743	12	1,740	" "	" "	46	D, D	Waters 100 head stock well needs cleaning.
8	SW.	10	"	"	"	"	12	1,728	- 8	1,720	8	1,720	" gravel	" "	48	D, S	Sufficient for local needs.
9	NW.	10	"	"	"	"	12	1,728	- 8	1,720	8	1,720	" "	" "		D, S	Strong supply.
10	NW.	11	"	"	"	"	12	1,735	- 9	1,726	12	1,723	" "	Soft, clear	46	D, S	Sufficient for local needs.
11	SE.	12	"	"	"	Drilled	440	1,730	- 8	1,722	440	1,290	Ravenscrag sand	Hard, clear, salty	50	S,	Sufficient for 30 head stock.
12	NW.	12	"	"	"	Dug	8	1,730	- 4	1,726	5	1,725	Glacial gravel	Hard, iron		D, S	Waters 50 head stock.
13	NE.	12	"	"	"	"	10	1,725	- 8	1,717	8	1,717	" "	Soft, clear		D, S	Waters 50 head stock.
14	NE.	14	"	"	"	"	8	1,745	- 5	1,740	5	1,740	" sand	Hard, clear		D,	Sufficient for local needs.
15	SW.	15	"	"	"	Bored	16	1,740	- 8	1,832	8	1,732	" gravel	" "	45	D,	Sufficient for domestic use only.
16	SE.	16	"	"	"	Dug	10	1,738	- 5	1,733	4	1,734	" "	" "	48	D, S	Waters 30 head stock. Supply freezes in winter
17	SW.	16	"	"	"	"	7	1,746	- 5	1,741	5	1,741	" "	" "			Good supply for short time, dry at present.
18	NW.	19	"	"	"	"	15	1,785	- 12	1,773	12	1,773	"	" "	46	D, S	Waters 100 head stock.
19	SW.	20	"	"		"	12	1,755	- 2	1,753	11	1,744	" sand	" "		D, S	Poor supply.
20	SW.	20	"	"	"	"	10	1,775	- 4	1,771	4	1,771	" clay	Soft, cloudy		D, S	Sufficient for local needs.
21	SW.	21	"	"	"	"	8	1,755	- 4	1,751	5	1,750	" gravel	Hard, clear	44	D, S	Waters 20 head stock.
22	NW.	22	"	"	"	"	20	1,760	- 8	1,752	8	1,752	" "	" "	44	D, S	Waters over 100 head stock.
23	SW.	24	"	"	"	"	8	1,740	0	1,740	6	1,734	" "	" "	47	D, S	Waters 100 head stock.
24	SE.	25	"	"	"	"	12	1,748	- 5	1,743	5	1,743	" "	" "	48	D, S	Sufficient for local needs.
25	SE.	26	"	"	"	"	10	1,755	- 6	1,749	4	1,751	" "	Soft, clear	46	D, S	Waters 60 head stock,
26	SE.	28	"	"	"	Drilled	434	1,780	-150	1,630	434	1,346	Ravenscrag sand in shale	Hard, salty, cloudy		S,	Waters 30 head stock only.
27	NW.	28	"	"	"	Dug	9	1,785	- 6	1,779	6	1,779	Glacial gravel	Hard, clear		D, S	Sufficient for local needs.

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 RECIPROCITY NO. 32 SASKATCHEWAN .

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
28	NW.	31	4	32	1	Dug	16	1,805	- 10	1,795	10	1,795	Glacial gravel	Hard, clear		D, S	Waters 120 head stock.
29	SE.	32	"	"	"	"	12	1,790	- 6	1,784	6	1,784	" "	" "		D, S	" 25 " " .
30	SW.	34	"	"	"	Drilled	484	1,785	- 19	1,766	484	1,301	Ravenscrag sand	iron Soft, salty, clear		S,	" 80 " " .
1	SW.	2	4	33	1	Dug	8	1,760	- 5	1,755	5	1,755	Glacial gravel	Hard, clear	44	D, S	Abundant supply.
2	NE.	2	"	"	"	"	10	1,765	- 6	1,759	10	1,755	" "	" "		D, S	Abundant supply.
3	SW.	4	"	"	"	"	25	1,780	- 12	1,768	10	1,770	" sand	" "	41	D, S, I	Waters 15 head stock.
4		4	"	"	"	Drilled	382	1,780	+ 14	1,784	370	1,410	Ravenscrag sand	Soft,		S,	Flows.
5	SW.	5	"	"	"	Dug	14	1,795	- 6	1,789	9	1,786	Glacial sand	Hard, clear	42	D, S	Waters 15 head stock in summer; haul water in winter.
6	SW.	6	"	"	"	"	20	1,790	- 6	1,784	6	1,784	" gravel	" "	42	D, S	Waters 25 head stock.
7	SW.	9	"	"	"	"	24	1,795	- 20	1,775	18	1,777	" sand	" alkaline	44	D, S	Waters 50 head stock.
8	SE.	10	"	"	"	"	60	1,785	- 56	1,729	57	1,728	" gravel in blue clay	Hard, clear		N,	Drilled to 1,400 and no water.
9	SE.	12	"	"	"	"	10	1,765	- 8	1,757	8	1,757	Glacial sand	" "	48	D, I	Sufficient for house use.
10	SE.	14	"	"	"	"	16	1,785	- 12	1,773	12	1,773	" "	" "	42	D,	Goes dry in winter; 218 foot dry hole.
11	SW.	14	"	"	"	Drilled	360	1,738					Ravenscrag s				Water possible sealed off by casings
11	SE.	16	"	"	"	"	160	1,790	- 7	1,783	160	1,630	" sand	Hard, clear	43	D, S, I	Flowed for awhile; waters 100 head stock.
13	SW.	16	"	"	"	"	282	1,798	+ 6	1,804	282	1,516	Ravenscrag sand	Soft, salty	44	D, S	Kills plants; flows, waters 50 head stock.
14	NW.	16	"	"	"	Dug	15	1,792	- 7	1,785	13	1,779	Glacial sand	Hard, clear	44	D, S	Poor supply.
15	SW.	18	"	"	"	"	18	1,820	- 10	1,810	11	1,809	" "	" "	43	D, S, I	Waters 50 head stock.
16	NE.	18	"	"	"	Drilled	328	1,820	- 6	1,814	328	1,492	?	Soft, salty soda	44	D, S	Flowed in 1906-1920.
17	SE.	19	"	"	"	Dug	22	1,825	- 19	1,806	12	1,813	Glacial sand	Hard, clear	43	D, S, I	Waters 25 head stock.
18	NW.	21	"	"	"	"	12	1,820	- 8	1,812	8	1,812	" "	" "	44	D, S, I	Sufficient for local needs.
19	NE.	22	"	"	"	"	18	1,808	- 15	1,793	15	1,793	" "	" "	42	D, S	Waters 40 head stock. #. 450 foot hole drilled.
20	NW.	24	"	"	"	"	15	1,805	- 8	1,797	8	1,797	" "	" "	43	S,	Waters 50 head stock.
21	SE.	25	"	"	"	"	8	1,790	- 5	1,785	5	1,785	" "	" "	42	D, S	Waters 20 head stock.
22	NE.	26	"	"	"	"	11	1,812	- 8	1,804	8	1,804	" gravel	" "	43	D, S	Abundant supply.
23	SW.	26	"	"	"	"	14	1,810	- 12	1,798	12	1,798	" "	" "	44	D, S	" " .
24	NW.	27	"	"	"	"	12	1,810	- 10	1,800	10	1,800	" "	" "	43	D, S	Waters 30 head stock.

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 RECIPROCITY NO. 32, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
25	SW.	28	4	33	1	Dug	16	1,820	- 14	1,806	16	1,804	Glacial gravel	Hard, clear	43	D,	Sufficient for house use; 2 permanent wells for stock.
26	NE.	28	"	"	"	"	16	1,825	- 10	1,815	6	1,819	" "	" "	44	D, S, I	Abundant supply.
27	SW.	30	"	"	"	"	16	1,825	- 4	1,821	5	1,820	" sand	" "		D, S, I	15 bbls. an hour.
28	SE.	30	"	"	"	"	12	1,830	- 6	1,824	6	1,824	" "	" "	43	D, S, I	Waters 15 head stock in summer; permanent well for winter use.
29	SE.	32	"	"	"	"	14	1,832	- 7	1,825	12	1,821	" "	" "	44	D, S	Waters 50 head stock.
30	NW.	36	"	"	"	"	16	1,808	- 14	1,794	12	1,796	" gravel	" "	44	D, S	Waters 30 head stock.
31	SE.	36	"	"	"	"	18	1,795	- 8	1,787	8	1,787	" "	" "	43	D, S	Waters 15 head stock.
1	SW.	2	4	34	1	Drilled	250	1,810	- 20	1,790	250	1,560	?	Soft, salty, clear	43	D, S	Waters 50 head stock.
2	SE.	10	"	"	"	"	425	1,812	- 30	1,782	415	1,397	Ravenscrag	Soft, soda cl clear	43	D, S	Over sufficient supply.
3	SE.	12	"	"	"	Dug	16	1,800	- 4	1,796	4	1,796	Glacial sand	Hard, clear	42	D, S	Waters 50 head stock.
4	SE.	13	"	"	"	"	19	1,814	- 12	1,802	6	1,808	" "	" "	43	D, S, I	Waters 40 head stock.
5	SW.	13	"	"	"	"	17	1,795	- 15	1,780	15	1,780	" "	" "	42	D, S	Waters 30 head stock.
6	NW.	14	"	"	"	"	16	1,793	- 8	1,785	13	1,780	" "	" "	43	D, S	Waters 7 head stock.
7	SE.	16	"	"	"	Drilled	204	1,820	+ 18	1,838	204	1,616	Gravel below blue clay	Hard, salty, cloudy		S,	Flows. Eats casings.
8	SE.	22	"	"	"	Dug	16	1,795	- 6	1,789	12	1,783	Glacial sand	Hard, clear	44	D, S, I	Water 16 head stock.
9	SW.	24	"	"	"	Drilled	452	1,817	- 10	1,807	452	1,365	Ravenscrag sand	Soft, soda, salty	43	S,	Flowed for a time; abundant supply.
10	NW.	25	"	"	"	Dug											Dry hole.
11	NE.	35	"	"	"	"	10	1,813	- 4	1,809	6	1,807	Glacial gravel	Hard, clear	44	D, S, I	Sufficient for local needs.
12	SE.	36	"	"	"	Drilled	328	1,828	- 25	1,803	326	1,502	Ravenscrag coal	Soft, soda, salty	44	D, S, I	Abundant supply, no shallow wells.
1	SW.	1	5	32	1	Dug	12	1,790	- 2	1,788	12	1,778	Glacial gravel	Hard, clear		D,	Sufficient for domestic use; w2 other wells used for stock.
2	SE.	3	"	"	"	Drilled	336	1,794	- 80	1,714	336	1,458	Ravenscrag sand	" salty		S,	Sufficient for stock; 600 foot well, little water at 325 feet.
3	SW.	6	"	"	"	Dug	8	1,840	- 3	1,837	5	1,835	Glacial gravel	Hard, clear		D, S	Waters 55 head stock.
4	NE.	6	"	"	"	"	8	1,825	- 5	1,820	5	1,820	" "	Soft, clear	45	D, S	Sufficient for local needs.
5	SE.	7	"	"	"	"	8	1,830	- 4	1,826	4	1,826	" "	Hard, clear	46	D, S	Abundant supply.
6	NE.	8	"	"	"	"	7	1,815	- 4	1,811	5	1,810	" "	" "		D, S	" " .
7	SE.	10	"	"	"	Drilled	425	1,800	- 60	1,740	400	1,400	Ravenscrag sand	Hard, iron, salty	45	S,	" " .
8	NW.	10	"	"	"	Dug	14	1,820	- 4	1,816	5	1,815	Glacial gravel	Hard, clear		D, S	Poor 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 RECIPROCITY NO. 32, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
9	SW.	14	5	32	1	Dug	65	1,822									Dry hole.
10	SE.	15	"	"	"	"	18	1,824	- 2	1,822	18	1,806	Glacial sand	Hard, clear		D, S	Fair supply.
11	NW.	17	"	"	"	"	22	1,820	- 6	1,814	11	1,809	" gravel	" "		D, S	Waters 50 head stock.
12	SE.	18	"	"	"	"	9	1,845	- 4	1,841	5	1,840	" "	" "		D, S	Abundant supply.
13	SW.	19	"	"	"	"	16	1,855	- 6	1,849	6	1,849	" "	" "		D, S	Dry in drought years.
14	NE.	19	"	"	"	"	19	1,855	- 2	1,853	5	1,850	" "	Soft, clear		D,	Very good supply.
15	SW.	20	"	"	"	"	21	1,848	- 9	1,839	8	1,840	" "	Hard, alkaline sulphur		S,	Abundant supply.
16	NW.	20	"	"	"	"	13	1,852	- 8	1,844	8	1,844	" "				Test hole; 8 dry holes.
17	NW.	22	"	"	"	Bored	100	1,850	- 90	1,760	90	1,760	" sand	Hard, clear		S,	Has gone dry; no water in this horizon.
18	NE.	22	"	"	"	Dug	16	1,838	- 6	1,832	6	1,832	Yellow clay	" "		D, S, I	Poor supply; haul water.
19	SW.	24	"	"	"	"	15	1,812	- 5	1,807	5	1,807	Glacial gravel	" "		D, S, I	Abundant supply.
20	SW.	25	"	"	"	"	12	1,825	- 2	1,823	9	1,816	" "	" "		D, S	140 bbls. a day.
21	SW.	28	"	"	"	"	10	1,843	- 4	1,839	5	1,838	" "	" "		D, S	Waters 300 head stock.
22	NW.	28	"	"	"	"	20	1,847	- 5	1,842	10	1,837	" "	" "		D, S	Sufficient with another similar well.
23	SW.	34	"	"	"	"	10	1,852	- 4	1,848	4	1,848	" "	Soft, clear		S,	Normally poor supply.
24	SE.	36	"	"	"	"	15	1,844	- 10	1,834	14	1,830	" "	Hard, clear		D, S	Waters 50 head stock.
25	NE.	36	"	"	"	Drilled	265	1,853	- 25	1,828	265	1,588	Glacial Sand	" salty		D, S	Abundant supply
1	NW.	2	5	33	1	Dug	10	1,847	- 4	1,843	4	1,843	Glacial gravel	Hard, clear		D, S	Waters 25 head stock.
2	NW.	4	"	"	"	"	14	1,852	- 10	1,842	10	1,842	" "	" "		D, S	Waters 100 head stock.
3	NE.	5	"	"	"	"	8	1,848	- 5	1,843	5	1,843	" " Sulphur.	" "		D, S	14 bbls tank in 5 minutes.
4	NW.	5	"	"	"	"	30	1,850	- 28	1,822	28	1,822	" sand	Hard, clear, sulphur		D, S	Poor supply.
5	NE.	6	"	"	"	"	20	1,852	- 16	1,836	16	1,836	" "	Hard, clear,		D, S	Small supply.
6	NE.	8	"	"	"	"	10	1,863	- 7	1,856	7	1,856	" gravel	Hard, clear		D, S	Waters 25 head stock.
7	NE.	10	"	"	"	Bored	65	1,860									Dry holes.
8	S½	10	"	"	"	Dug	14	1,850	- 7	1,843	7	1,843	Glacial gravel	Hard, clear		D, S	Sufficient for local needs.
9	NE.	11	"	"	"	Spring	12	1,850	+ 4	1,854			" "	Soft, clear		D, S	" " " " .
10	NW.	13	"	"	"	Dug	9	1,864	- 7	1,857	7	1,857	" sand	Hard, clear		S,	Waters 75 head stock.

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 RECIPROCITY NO.32, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
11	SE.	14	5	33	1	Dug	28	1,865	- 16	1,849	16	1,849	Glacial sand	Hard, clear		D, S	Waters 100 head stock.
12	SW.	14	"	"	"	"	23	1,862	- 14	1,848	16	1,846	" gravel	" "		D, S	Waters over 100 head stock.
13	NE.	14	"	"	"	"	30	1,865	- 24	1,841	24	1,841	" "	" "		D,	Waters 100 head stock.
14	SW.	15	"	"	"	"	15	1,867					" "	" alkaline		S,	Very poor supply.
15	SE.	16	"	"	"	Drilled	385	1,865									Dry hole.
16	SE.	16	"	"	"	"	90	1,865									" " .
17	SE.	16	"	"	"	"	186	1,865									" " .
18	SW.	16	"	"	"	Dug	18	1,864	- 14	1,850	14	1,850	Glacial gravel	Hard, clear		M, D, S	Supplies town of Alida.
19	SW.	16	"	"	"	"	10	1,863	- 6	1,857	6	1,857	" "	" "		D, S	Waters 50 head stock.
20	NE.	18	"	"	"	"	10	1,858	- 8	1,850	8	1,850	" "	Soft, clear		D, S	Abundant supply.
21	NE.	19	"	"	"	"	11	1,877	- 8	1,869	8	1,869	" "	Hard, clear		D, S	" " .
22	NE.	20	"	"	"	"	10	1,890									Dry hole.
23	SW.	22	"	"	"	"	12	1,878			12	1,866	Glacial clay	Soft, cloudy		D,S	Poor supply
24	NW.	24	"	"	"	"	6	1,870	- 2	1,868	2	1,868	Glacial gravel	Soft, clear		D, S	Waters 100 head stock.
25	NE.	24	"	"	"	"	20	1,875	- 18	1,857	18	1,857	" "	Hard, clear		D, S	Sufficient for local needs.
26	NE.	26	"	"	"	"	18	1,895	- 16	1,879	10	1,885	" "	" alkaline		S,	Po r supply.
27	SE.	28	"	"	"	"	14	1,880	- 11	1,869	14	1,866	" sand	Hard, clear		D, S	Sufficient for local needs.
28	SE.	30	"	"	"	"	12	1,870	- 10	1,860	10	1,860	" gravel	" "		D, S	Waters over 100 head stock.
29	NW.	31	"	"	"	"	14	1,870	- 10	1,860	10	1,860	Yellow clay	" "		S,	Sufficient except dry years.
30	SE.	32	"	"	"	"	22	1,904	- 16	1,888	9	1,895	Glacial sand	" "		D, S	Poor supply, hauled water 5 years.
31	NW.	32	"	"	"	"	30	1,905									Dry hole.
32	SW.	34	"	"	"	"	18	1,900	- 3	1,897	3	1,897	Glacial gravel	Hard, clear		D, S	Waters 50 head stock.
33	NE.	36	"	"	"	"	14	1,895	- 9	1,886	9	1,886	" "	Soft, clear		D, S	Waters 70 head stock.
1	NW.	1	5	34	1	Dug	10	1,845	- 2	1,843	5	1,840	Glacial gravel	Hard, clear		D, S	Waters 30 head stock.
2	NE.	10	"	"	"	"	12	1,858	- 7	1,851	7	1,851	" sand	" "		D, S	Abundant supply.
3	NW.	12	"	"	"	"	6	1,845	- 2	1,843	2	1,843	" gravel	Soft, clear		D, S	Waters 50 head stock.
4	SE.	14	"	"	"	"	12	1,855	- 6	1,849	8	1,847	" "	Hard, clear		D, S	Sufficient for local needs. 2 similar wells.

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 RECIPROCITY NO. 32, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horison	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
5	SW.	14	5	34	1	Dug	8	1,863	- 4	1,859	4	1,859	Glacial gravel	Hard, clear		S,	Abundant supply.
6	NE.	14	"	"	"	"	11	1,860	- 7	1,853	7	1,853	" "	" "		D, S	" " .
7	NW.	15	"	"	"	Drilled	269	1,865	- 20	1,845	260	1,605	Ravenscrag shale	Soft, salty	45	S,	Abundant supply, hauls water for house.
8	SE.	23	"	"	"	"	267	1,860	- 15	1,845	260	1,600	" "	" "	44	S,	" " .
9	SE.	26	"	"	"	Dug	17	1,870	- 15	1,855	15	1,855	Glacial gravel	Hard, clear		D, S	Sufficient for local needs.
10	NE.	26	"	"	"	"	18	1,875	- 16	1,859	12	1,863	" "	" "	44	D, S	" " " " .
11	SE.	35	"	"	"	"	10	1,890	- 8	1,882	8	1,882	" sand	Soft, sulphur		D, S	Waters 10 head stock in winter; several dry holes dug.
12	NW.	35	"	"	"	"	16	1,897	- 10	1,887	10	1,887	" gravel	Hard, clear		D, S,	Abundant supply.
13	NE.	35	"	"	"	"	12	1,896	- 10	1,886	8	1,888	" "	" "		D, S	Sufficient with aid of 1 similar well.
14	NE.	36	"	"	"	"	10	1,894	- 8	1,886	8	1,886	" "	" "	45	D, S	Sufficient for local needs. 2 similar wells.
1	NW.	3	6	32	1	Dug	11	1,860	- 3	1,857	2	1,858	Glacial gravel	Hard, clear	45	D, S, I	Waters 30 head stock.
2	NE.	4	"	"	"	"	11	1,855	- 4	1,851	6	1,849	" "	" alkaline	48	D, S, I	" 100 " " .
3	SW.	6	"	"	"	"	9	1,895					Clay				Dry hole.
4	NW.	7	"	"	"	"	14	1,940	- 10	1,930	10	1,930	Glacial gravel	Hard, clear	46	D, S	Waters150 head stock.
5	NW.	10	"	"	"	"	12	1,880	- 2	1,878	3	1,877	" "	" "	50	D, S	Abundant supply.
6	SW.	12	"	"	"	"	10	1,865	- 4	1,861	4	1,861	" "	" "	46	D, S	Waters 50 head stock. 40 dry holes dug.
7	SE.	14	"	"	"	"	12	1,875	- 10	1,865	10	1,865	" "	" "	50	D, S	Sufficient in 1935.
8	SE.	14	"	"	"	"	12	1,875	- 3	1,872	9	1,866	" "	" "	49	D, S	Sufficient in years of normal rainfall.
9	NW.	14	"	"	"	"	16	1,890	- 14	1,876			" clay	Soft, clear	50	D,	Very small supply.
10	NW.	15	"	"	"	"	12	1,900					" gravel	Hard, clear	50	D, S, I	Waters 30 head stock.
11	NE.	16	"	"	"	Drilled	455	1,905	- 15	1,890	250	1,655	Glacial At base of blue clay	" " iron		D, S	Pumped for 1 year then went dry.
12	SW.	18	"	"	"	Dug	9	1,950	- 4	1,946	4	1,946	Glacial gravel	Hard, clear	48	D, S	2 bbls. a pumping.
13	SW.	18	"	"	"	Drilled	627	1,940	+ 2	1,942	600	1,340	Ravenscrag sandy shale	Soft, salty, soda	43	D, S	Flows. Waters 200-300 head stock.
14	NE.	18	"	"	"	Dug	13	1,955	- 5	1,950	5	1,950	Glacial gravel	Hard, clear,	49	D, S	Waters 10 head stock.
15	NE.	20	"	"	"	Drilled	480	1,950	- 40	1,910	480	1,470	Ravenscrag shale	Soft, salty, soda	44	D, S	Abundant supply.
16	SW.	20	"	"	"	"	428	1,940	- 17	1,923	420	1,520	" "	Hard, salty	45	D, S	Waters 30 head stock.
17	SW.	21	"	"	"	"	580	1,915	- 70	1,845	580	1,335	" "	Soft, soda	43	D, S	" 50 " " .

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WELL RECORDS—RURAL MUNICIPALITY OF RECIPROCITY NO. 32, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
18	SE.	22	6	32	1	Dug	14	1,900	- 6	1,894	6	1,894	Glacial gravel	Hard, clear	49	D, S	Waters 75 head stock.
19	NW.	23	"	"	"	"	9	1,900	- 8	1,892	8	1,892	Yellow clay	" "	48	D, S	Very poor supply.
20	SW.	24	"	"	"	Drilled	500	1,900									Dry hole.
21	SE.	26	"	"	"	Dug	21	1,892	- 8	1,884	18	1,874	Glacial gravel	Soft, clear	50	D, S	Small supply.
22	SW.	27	"	"	"	"	10	1,900	0	1,900	5	1,895	" "	Hard, clear	49	D, S, I	Abundant supply.
23	SE.	28	"	"	"	Drilled	360	1,925	- 40	1,885	360	1,565	Ravenscrag sand	Soft, salty	47	D, S	Small supply. 60 shallow dry holes.
24	NW.	28	"	"	"	Dug	7	1,903	- 4	1,899	6	1,897	Glacial gravel	Hard, clear	48	D, S, I	Sufficient for local needs.
25	NE.	29	"	"	"	Drilled	500	1,955	?		500	1,455	Ravenscrag	" salty	44	D, S	Abundant supply; shallow wells poor.
26	SE.	30	"	"	"	Dug	12	1,960	- 8	1,852	8	1,852	Glacial gravel	" clear	45	D, S	" " .
27	NE.	30	"	"	"	"	10	1,960	- 6	1,954	6	1,954	" "	" "	50	D, S	Waters 25 head stock.
28	NE.	32	"	"	"	"	20	1,970					Glacial				Dry hole.
29	NE.	32	"	"	"	"	12	1,970									" " .
30	NE.	33	"	"	"	"		1,940									25 dry holes.
31	NW.	34	"	"	"	"	10	1,980	- 3	1,877	3	1,877	Glacial gravel	Hard, clear		D, S	Waters 35 head stock.
32	SE.	35	"	"	"	"	10	1,920	- 6	1,914	6	1,914	" "	" "	50	D, S	Sufficient except in drought.
33	NE.	35	"	"	"	"	12	1,915	- 4	1,911	4	1,911	" "	" "	44	D, S	Waters 35 head stock.
34	NW.	36	"	"	"	"	15	1,900	- 12	1,888	12	1,888	" sand	" "	48	D, S	Sufficient in years of normal rainfall.
1	SW.	2	6	33	1	Dug	6	1,905	- 3	1,902	3	1,902	" gravel	" "		D, S	Waters 30 head stock.
2	NW.	2	"	"	"	"	15	1,918	- 11	1,907	10	1,908	" sand	" "		D, S	" 30 " " .
3	SW.	4	"	"	"	"	10	1,920	- 6	1,914	6	1,914	" "	Soft, clear		D, S	Poor supply.
4	NE.	6	"	"	"	"	18	1,910	- 11	1,899	13	1,897	" gravel	Hard, clear		D, S	Waters 70 head stock.
5	NW.	8	"	"	"	"	7	1,906	- 4	1,902	3	1,903	" "	" "		D, S	" 65 " " .
6	SE.	9	"	"	"	"	15	1,925	- 10	1,915	10	1,915	" "	" "		D, S	" 25 " " .
7	SE.	10	"	"	"	Drilled	474	1,922	- 20	1,902	465	1,457	Ravenscrag sandy shale	Soft, salty, gas	42	D, S	Used to flow; waters 15 head stock.
8	SW.	11	"	"	"	Dug	14	1,925	- 9	1,916	10	1,915	Glacial gravel	Hard, clear		S,	Sufficient in years of normal rainfall.
9	SE.	12	"	"	"	"	16	1,920					Clay	Hard,		D, S	Seepage from slough.
10	NE.	14	"	"	"	"	10	1,840					Sandy clay	"		D, S	Sufficient for local needs.

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(#) Sample taken for analysis.

WELL RECORDS—RURAL MUNICIPALITY OF RECIPROCITY NO. 32, SASKATCHEWAN.

WELL No.	LOCATION ¼	Sec.	Tp.	Rge.	Mer.	TYPE OF WELL	DEPTH OF WELL	ALTITUDE WELL (above sea level)	HEIGHT TO WHICH WATER WILL RISE Above (+) Below (−) Surface	Elev.	PRINCIPAL WATER-BEARING BED Depth	Elev.	Geological Horizon	CHARACTER OF WATER	TEMP. OF WATER (in °F.)	USE TO WHICH WATER IS PUT	YIELD AND REMARKS
11	SW.	16	6	33	1	Drilled	493	1,930			485	1,445	Ravenscrag sandy shale	Soft, salty		N,	Flowed for 10 years, dry at present.
12	SW.	18	"	"	"	Dug	6	1,900	- 3	1,897	3	1,897	Glacial gravel	Hard, clear		S,	Waters 10 head stock at once.
13	SE.	20	"	"	"	"	10	1,915	- 2	1,913	8	1,907	" "	" "	45	D, S	Abundant supply.
14	SW.	21	"	"	"	"	11	1,922	- 5	1,917	5	1,917	" "	" yellow		D,	Laxative; fair supply.
15	NW.	22	"	"	"	Bored	33	1,955	- 10	1,945	30	1,925	" "	" clear		D, S	Poor supply. #
16	SW.	24	"	"	"	Dug	18	1,948	- 6	1,942	6	1,942	" "	" "		D, S	Abundant supply.
17	SE.	24	"	"	"	"	12	1,962	- 10	1,952	10	1,952	"	" "		D, S	Sufficient for local needs.
18	NE.	26	"	"	"	Drilled	485	1,971	+ 12	1,983	475	1,496	Ravenscrag sandy shale	Soft, salty	43	D, S	Abundant supply, yellow sediment.
19	SE.	31	"	"	"	Dug	9	1,960	- 8	1,952	8	1,952	Glacial gravel	Hard, sulphur		D, S	Sufficient for local needs.
20	NE.	32	"	"	"	Drilled	420	2,005	- 40	1,965	420	1,585	Ravenscrag sandy shale	Soft, salty, soda		S,	Fair supply.
21	SE.	33	"	"	"	Dug	10	1,925	- 5	1,920	9	1,916	Glacial gravel	Hard, clear	45	D, S	Sufficient for local needs.
22	SW.	36	"	"	"	Drilled	485	1,980	- 6	1,974	425	1,555	Ravenscrag sandy shale	Soft, salty		D, S	Abundant supply. Flowed for twelve years.
23	NE.	36	"	"	"	"	400	1,987	- 10	1,977	400	1,587	Ravenscrag	" "	45	D, S	" " .
24	SE.	36	"	"	"	"	495	1,980	+ 3	1,983	490	1,490	" sandy shale	" "		S,	Gas in solution ; abundant supply.
1	SE.	10	6	34	1	Dug	15	1,920	- 5	1,910	12	1,908	Glacial sand	Hard, clear		D, S	Abundant supply.
2	NW.	10	"	"	"	"	24	1,930	- 10	1,920	10	1,920	" "	" "	43	D, S	Fair supply.
3	NE.	11	"	"	"	"	9	1,925	- 6	1,919	6	1,919	" gravel	" "		D, S	Abundant supply.
4	SE.	12	"	"	"	"	8	1,900	- 6	1,894	7	1,893	" "	"	45	D, S	" " .
5	NE.	12	"	"	"	"	26	2,035	- 16	2,019	16	2,019	" "	" "		D, S	Sufficient for local needs.
6	SW.	14	"	"	"	"	30	1,940	- 10	1,930	9	1,931	" sand	" sulphur	46	S,	" " stock.
7	SE.	15	"	"	"	"	28	1,940	- 26	1,914	12	1,928	" "	" clear	42	D, S	Sufficient for local needs.
8	SW.	23	"	"	"	"	88	1,955	- 4	1,951	4	1,951	" gravel	" "		S,	Poor supply.
9	NW.	24	"	"	"	Drilled	600	1,954	+ 1	1,955	580	1,374	Ravenscrag sandy shale	Soft, slaty		S,	Flows 3 bbls. in 24 hours.
10	NW.	24	"	"	"	"	675	1,960	+ 1	1,961	480	1,480	Ravenscrag sandy shale	" "		S,	" 1 [illegible] in 12 hours.
11	NW.	25	"	"	"	Dug	25	2,075					Clay				Dry hole.
12	NW.	26	"	"	"	"	12	1,975	- 1	1,974	8	1,967	Glacial gravel	Hard, clear		D, S	Waters 30 head stock.
13	SE.	26	"	"	"	"	18	1,970					" clay	" "		D,	Sufficient for domestic use.
14	NW.	36	"	"	"	"	12	1,960	- 6	1,974	8	1,972	" gravel	2 alkaline	46	D, S	" " local needs. Dry holes on NE. 36 and SE. 36, in clay.

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(#) Sample taken for analysis.