CANADA
DEPARTMENT OF MINES
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PRELIMINARY REPORT

GROUND-WATER RESOURCES OF THE RURAL MUNICIPALITY OF THE GAP NO. 39 SASKATCHEWAN

By
B. R. MacKay, H. H. Beach and E. L. Ruggles

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GROUND WATER RESOURCES OF THE RURAL MUNICIPALITY OF THE GAP, NO. 39, 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 and the smaller supplies of ground water required for domestic purposes and for stock. In an effort to relieve the serious situation the Geological Survey began an extensive study of the problem from the standpoint of domestic uses and stock raising. During the field season of 1935 an area of 80,000 square miles, comprising all that part of Saskatchewan south of the north boundary of township 32, was systematically examined, records of approximately 60,000 wells were obtained, and 720 samples of water were collected for analyses. The facts obtained have been classified and the information pertaining to any well is readily accessible. The examination of so large an area and the interpretation of the data collected were possible because the bedrock geology and the Pleistocene deposits had been studied previously by McLearn, Warren, Rose, Stansfield, Wickenden, Russell, and others of the Geological Survey. The Department of Natural Resources of Saskatchewan and local well drillers assisted considerably in supplying several hundred well records. The base maps used were supplied by the Topographical Surveys Branch of the Department of the Interior.

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 IN THE MUNICIPALITY

The rural municipality of The Gap is an area of 324 square miles lying on the eastern slope of the Missouri coteau in the central part of southern Saskatchewan. The centre of the area lies approximately 70 miles directly south of Regina. The municipality consists of nine townships described as townships 4, 5, and 6, ranges 19, 20, and 21, W. 2nd mer. The Radville-Willowbunch branch line of the Canadian National Railways passes through the northern townships. A rolling plain occupies the northern and central parts of the municipality, and the surface is more irregular and hilly toward the southern boundary. The elevation of the ground surface increases gradually from 2,130 feet above sea-level in the northeast corner to approximately 2,400 feet in the central parts and reaches 2,500 feet in the southeast corner.

Ground water supplies of the municipality are derived from two sources, the glacial drift which covers the entire area, and the underlying Ravenscrag bedrock formation.

Water-bearing Horizons in the Unconsolidated Deposits

The continental ice-sheet which passed over Saskatchewan many thousands of years ago deposited a layer of ground moraine composed largely of glacial till or boulder clay, over this entire municipality. In places where the retreating ice front stopped for a time an additional deposit of more irregularly surfaced and generally more porous material, referred to as terminal moraine, was laid down. Such deposits cover extensive areas along the western, southern, and eastern boundaries of the municipality. Water issuing from the melting ice carried considerable amounts of Glacial outwash gravels and sands away from the ice front and deposited them as thin layers upon the till plain. In the extreme southwestern corner of the municipality the ground moraine covering the bedrock is less than 10 feet in thickness, but is 90 to 150 feet thick over the greater

part of the area. The areal extent in this municipality of these three forms of glacial drift is indicated on the accompanying map (Figure 1).

Glacial outwash sands and gravels cover a narrow belt 1 to 1½ miles in width extending from the west-central part of township 5, range 21, in a southeasterly direction to the southeast corner of township 4, range 21. Similar deposits occur in an area covering the southeast corner of township 5, range 20, the southwest corner of township 5, range 19, and the northeast corner of township 4, range 20. Water is obtained from these sand and gravel beds at depths generally not exceeding 15 feet. The water is of good quality and individual wells give a supply sufficient for 20 to 70 head of stock. These deposits are generally the most productive of the glacial drift.

Terminal moraine covers the western half of township 4, range 21, a belt averaging 3 miles in width extending from township 6, range 21, in a southeasterly direction to township 4, range 19, and an extensive area including the southeastern half of township 6, range 19, most of township 5, range 19, and the northeastern corner of township 4, range 19. Numerous pockets of water-bearing sand and gravel surrounded by boulder clay are found in these beds generally within 50 feet of the surface. These deposits are porous and rank next in water productivity to the glacial outwash sands and gravels. Soft water is found in a few wells, but the water is generally hard and in some cases "alkaline". The dissolved mineral salts are in sufficient concentration to render the water unfit for drinking in a few cases, but most of it is usable. Considerable variation is noted in the yields from individual wells. It is usually possible to obtain small supplies of water suitable for drinking. Shallow wells located beside sloughs or dugouts supply water when holes sunk into the boulder clay have not been sufficiently productive. Gravel or sand pockets encountered at shallow

depths in the terminal moraine, however, may be expected to produce sufficient quantities of water for 10 to 50 head of stock, and a few wells yield even larger supplies.

An extensive area in the northern and central parts of the municipality is covered by ground moraine or till plain. Similar conditions also prevail in the extreme southwestern part of the area and in the vicinity of Salt lake, as shown on the accompanying map (Figure 1). In these areas boulder clay is the chief constituent of the drift. Sand and gravel pockets of small areal extent are sparsely scattered through the clay. Since the presence of these more porous beds is not indicated on the surface several attempts may be made before adequate supplies of water, even for household requirements, are obtained. The small seepages derived from the clay are invariably hard and in many cases contain large amounts of dissolved mineral salts that render the water unsuitable for domestic use. Where more porous beds have been penetrated in the wells the water may be usable for domestic purposes and may be in sufficient quantities for a few head of stock. These porous beds, usually of sand or fine gravel, are found as a rule within 35 feet of the surface. The impervious nature of the boulder clay makes the excavation of dugouts practical in this part of the municipality. Natural sloughs hold their water for considerable periods of time. Wells sunk near these reservoirs and deriving their water by seepage from them form a dependable source of supply for at least a part of the year. The water, if uncontaminated by organic material, should be suitable for household use. Where larger supplies of water have been required for stock several residents in the till-covered areas have sunk wells into the underlying bedrock. The great depths to which it is necessary to drill, and the generally poor quality of the water, make it advisable to exhaust all reasonable possibilities of obtaining water in the drift before sinking deeper.

Water-bearing Horizons in the Bedrock

The Ravenscrag bedrock formation is believed to immediately underlie the glacial drift throughout the municipality. This formation is underlain locally at least by the Marine shale. The Ravenscrag is composed of a series of yellow to brown clays and shales, beds of blue-grey sands, and thin seams of lignite coal. Although both the sand beds and the coal seams form aquifers in many parts of the municipality, lack of detailed information has made it impossible to trace more than one productive horizon over any extensive area. The uppermost horizon, called in this report the "A" horizon, is either a coal seam or a bed of coarse sand that is found at elevations of 2,300 to 2,270 feet above sea-level. This horizon is productive in adjacent municipalities on the west and south, but is not believed to be productive north of the "A" line in this municipality. Lack of information prevented the tracing of the "A" horizon east of the central part of township 4, range 20. The glacial drift is thin in the southern parts of township 4, ranges 20 and 21, and the "A" horizon is encountered at depths of 10 to 60 feet from the surface. Farther north, however, the drift is thicker and in sec. 5, tp. 5, range 21, the horizon is 165 feet below the surface. Most of the wells sunk to this horizon are non-flowing artesian wells. The water is hard, but does not generally contain large amounts of dissolved mineral salts, and it is used for all farm requirements. The supply from individual wells is sufficient for 25, and in one instance 80, head of stock.

Throughout the remainder of the municipality there is a considerable range in the elevation of the aquifers tapped by the few wells sunk into bedrock. This condition may be due to one or both of two factors. The productive sand horizon in the Ravenscrag may be of small lateral extent but may occur at different elevations. It is more probable, however, that the same horizon may occur at different elevations at different places, because the bedrock is folded or broken by faults.

A well 445 feet deep in section 13, township 5, range 21, struck a bedrock aquifer at an elevation of 2,005 feet. A hole 400 feet deep was drilled to an elevation of 1,980 feet in the NE.$\frac{1}{4}$, section 19, of the same township, but did not strike water. Two wells located in the NW.$\frac{1}{4}$, sec. 20, tp. 5, range 20, and NE.$\frac{1}{4}$, sec. 13, tp. 5, range 21, sunk to depths of 475 and 445 feet respectively, derive their water supply from a fine, grey sand bed at an approximate elevation of 2,000 feet above sea-level. This bed is believed to be the basal sand bed of the Ravenscrag formation. This same horizon may be represented in a 270-foot well in the NE.$\frac{1}{4}$, sec. 23, tp. 6, range 20. The water from these wells contains such large amounts of soda in solution as to render it unsuitable for domestic use although it is used for stock. It seems probable that had the 240-foot dry hole on sec. 13, tp. 6, range 20, been sunk approximately 30 feet deeper it would have reached this horizon. In and immediately west of the town of Ceylon it has been found necessary to sink wells to depths of 370 to 450 feet where soft water containing soda is obtained from a fine pepper and salt coloured sand bed at elevations varying from 1,940 to 1,922 feet. This water, although not suitable for drinking, is being used for stock. In secs. 4, 5, 23, 24, and 34, tp. 5, range 19, wells penetrate a sand bed which generally is found immediately below a coal seam at elevations of 2,180 to 2,140 feet above sea-level. In sections 4 and 5 the horizon is struck at depths of 245 to 265 feet, but in the other sections mentioned the depths to the horizon are only 140 to 175 feet.

There appear to be two aquifers in the northeast corner of township 5, range 19, and the southeast corner of township 6, range 19. The upper is about 2,120 feet above sea-level and is struck in wells 150 to 170 feet deep. The lower horizon is about 1,970 feet above sea-level and is struck in wells about 340 feet deep. Water from both horizons contains large amounts of sodium carbonate in solution and is not generally suitable for household

use. The yields are sufficient for local stock requirements. It is to be noted that, apparently, no water was found at the upper horizon in those wells sunk to the lower horizon. Water in both horizons is under pressure and each horizon supplies one flowing artesian well. In two other wells in this area the water rises to within 20 feet of the surface. The extent of the artesian area is not known. Water rose to within 10 feet of the surface in the deep well on sec. 5, tp. 5, range 19, but in a well located less than one mile to the east and believed to be drawing from the same horizon the water-level is 117 feet from the surface. The dry hole on the NE.$\frac{1}{4}$, sec. 21, tp. 6, range 19, was not sunk deep enough to reach either of the horizons.

One well located at Ceylon was drilled to a depth of 700 feet and penetrated the dark grey marine shale. The shale is largely non-water-bearing. It is almost certain that no supplies of water suitable for farm use will be found at any location in this municipality at depths exceeding 450 feet from the surface.

GROUND WATER CONDITIONS BY TOWNSHIPS

Township 4, Range 19

The ground water supply of this township at the present time is being derived from the mantle of glacial drift covering the entire area. The supply was ample until the drought period, but during this period supplies have decreased materially, necessitating the excavation of dugouts for stock on many farms.

In the area covered by glacial till ground water is confined largely to the pockets of sand and gravel that are irregularly interspersed through the boulder clay. Most of the more productive wells have been located on the sides or near the bases of small hills. The water is found within 25 feet of the surface. Water from the sand and gravel pockets, although hard and slightly alkaline, is used in the households and is generally in sufficient quantities for watering 15 to 30 head of stock. Supplies obtained from the boulder clay itself in wells that did not penetrate sand pockets is hard and "alkaline" and the meagre supply is generally suitable for watering a few head of stock only. The dissolved mineral salts in the water make it unsuitable for household use. Wells in clay, where located beside sloughs and dugouts on some farms, supply water that if uncontaminated by organic material is suitable for drinking.

More porous terminal moraine deposits cover the north-eastern part and a strip across the south of the township. Sand and gravel pockets are more numerous in the belt of terminal moraine than in the till plain, but, due to the rougher topography typical of a moraine area, prospecting for water has been less extensive than in the till-covered area. Fairly soft water is obtained from a few very shallow wells. Generally, however, the water is hard, and slightly "alkaline", but usable for household purposes. The supplies from existing wells are ample for 20 to 50 head of stock. In those small areas in the northwest corner and in

the west-central part of the township where glacial outwash deposits occur, water-bearing pockets of sand and gravel, lying within 15 feet of the surface, should be located without great difficulty.

Very little information has been obtained in regard to the ground water horizons in the Ravenscrag bedrock formation. A single well, located in the SW.$\frac{1}{4}$, section 36, was drilled to a depth of 175 feet or to an elevation of 2,215 feet above sea-level. This well produced 50 barrels of water from a coal seam and then went dry. This is probably an exceptional case as wells sunk to depths of 200 to 300 feet in adjoining townships have produced sufficient water for stock requirements. It is probable that water will be found at 150 to 200 feet in the southwestern part of this township and at slightly greater depths in the northern part. It seems advisable, nevertheless, to exhaust the possibilities of obtaining water in the drift before going to the expense of sinking a bedrock well.

Township 4, Range 20

Both the glacial drift and the underlying Ravenscrag formation are producing ground water in this township. In section 5 the drift is only 20 feet thick, but the thickness increases toward the north and probably exceeds 100 feet along the northern boundary of the area. Figure 1 shows the areas covered by the different types of glacial debris. Wells in the boulder clay in the northeastern part of the township are yielding only very small quantities of hard, "alkaline" water, much of which is unfit for household use. Scattered sparingly through the boulder clay are water-bearing sand and gravel pockets. These pockets have been encountered generally within 25 feet of the surface and yield a hard and in some cases "alkaline" water. Supplies from this source are in a few places barely sufficient for household use, but are usually ample for 10 to 20 head of stock. Prospecting

for those pockets has not been extensive and it is to be expected that further testing at shallow depths will reveal the presence of better sources of water than are at present being utilized on some farms.

Very few wells have been sunk in the terminal moraine but as sand and gravel pockets are more numerous in the terminal moraine than in the boulder clay, the drift is much more porous and supplies of good water sufficient for at least 20 head of stock should be located with little difficulty at depths not exceeding 50 feet.

The most productive deposits of the glacial drift are the outwash sands and gravels that occur in the northeast corner of this township. Several wells are deriving large supplies of water from these deposits. The aquifers occur within 15 feet of the surface and yield hard, slightly mineralized, drinkable water in quantities sufficient for 10 to 60 head of stock.

Water is being derived from the Ravenscrag bedrock formation in two wells located in the southwest corner of the township. One well on the SW.$\frac{1}{4}$, section 5, yields a small supply of hard, drinkable water from a coal seam at a depth of 20 feet. The yield has decreased greatly during the drought period and at the present time is barely sufficient for household needs. The other well situated on the NE.$\frac{1}{4}$, section 6, and bored to a depth of 60 feet, encountered thin water-bearing coal seams at depths of 30, 45, and 60 feet from the surface. Sand has filled the lower 10 feet of the well sealing off the supply from the most productive aquifer so that the present yield is inadequate for farm requirements. This lower horizon occurs at an elevation of 2,300 feet above sea-level and is believed to be fairly continuous over the southern part of the township, as several wells in areas adjacent in the west and south have obtained adequate supplies of water for stock at this elevation. Toward the northern part of the township it will, undoubtedly, be necessary to sink wells to depths of 200 to 300 feet

before an adequate supply of water is obtained from the Ravenscrag. Except in the southwestern corner of this township where sufficient water for a few head of stock may be expected from the bedrock within 100 feet of the surface, it seems advisable to confine the search for water to the glacial deposits.

Township 4, Range 21

Due to the small population in this township the demand for ground water at the present time is not great. It is being adequately met by a small number of wells, some of which draw water from the glacial drift and others from the underlying Ravenscrag formation. Only four wells have been sunk in the glacial drift, but they reveal the possibilities of the various types of glacial deposits. An area of glacial outwash gravels and sands about one mile in width extends along the eastern side of the township in the vicinity of Salt lake, as shown on Figure 1. A small area of similar deposits occurs in the southwestern corner of the township. Water-bearing sand and gravel beds are commonly present in such deposits, and two wells, one located on the NE.$\frac{1}{4}$, section 27, the other on the SE.$\frac{1}{4}$, section 34, tap such aquifers within 10 feet of the ground surface. The water from both wells is hard and suitable for domestic purposes and supplies are ample for 35 and 15 head of stock, respectively. Similar water supplies may be expected throughout the area in which this type of deposit occurs.

Terminal moraine deposits in which occur isolated pockets of water-bearing sand and gravel cover most of the western half of the township and a small area in the northeast corner. A well on section 21 taps a sand bed at a depth of 14 feet and produces enough water for 35 head of stock. This well is situated close to a slough and may derive part of its supply as direct seepage from the slough. The water is hard and is used for domestic purposes. With a small amount of prospecting it should be possible to locate other water-bearing pockets in the area of terminal moraine.

Glacial till or boulder clay, in which sand and gravel pockets occur sparingly, covers the remainder of the township in a narrow strip lying between the hilly belts of terminal moraine. A well on the SE.$\frac{1}{4}$, section 27, struck a gravel pocket at a depth of 3 feet, from which it derives a good supply of soft, drinkable water. The water-bearing pockets will doubtless be more difficult to locate in the area of boulder clay than in the area of moraine or outwash gravels.

A water-bearing horizon in the Ravenscrag bedrock formation, occurring at elevations between 2,300 and 2,270 feet above sea-level, is believed to extend throughout the greater part of the township. This horizon is reached at shallow depths in the southern sections, having been struck at depths of 4 and 8 feet in section 5. The thickness of the overlying drift increases to the north necessitating deeper drilling to reach this productive horizon. It was penetrated at 78 feet in section 17 and probably will not be struck at much less than 150 feet from the surface along the northern boundary of the township where the surface elevations are greater. A thin coal seam generally forms the water-bearing bed. The water is hard and is used for drinking. The supply from individual wells is sufficient for 25 to 80 head of stock. Farmers in the southern half of the township who experience difficulty in obtaining an adequate supply from the glacial deposits, would be well advised to sink wells in the bedrock.

Township 5, Range 19

The ground water supply of the township is derived in part from the glacial drift and in part from the underlying bedrock formation. The glacial drift, which mantles the entire township, is in three forms, glacial outwash sands and gravels, terminal moraine, and boulder clay or till plain.

The outwash sands and gravels occupy the southwestern part of the township (See Figure 1). Four wells have been sunk in this area, each one of which found good water in gravel beds within 35 feet of the ground surface. Each well yields a supply sufficient for 20 to 70 head of stock. These deposits are the most productive of the glacial drift in the township and little difficulty should be experienced in obtaining adequate ground water supplies in the area.

As indicated on the map, the greater part of the township is covered by terminal moraine deposits. Numerous water-bearing sand and gravel pockets occur irregularly interspersed through the moraine and have been tapped by several wells within 10 to 30 feet from the surface. The yield from a number of wells is small and the supply is reinforced by seepage from nearby sloughs located in depressions of the rolling land. Where larger sand and gravel pockets have been penetrated they yield ample water for 30 to 40 head of stock. A well on the SE.$\frac{1}{4}$, section 32, is capable of watering 150 head. More prospecting should be done to locate sand and gravel pockets as they generally provide more satisfactory supplies than wells that rely on slough seepage. Water from the terminal moraine deposits is hard and in some cases "alkaline", but with few exceptions it is being used for household requirements.

The glacial drift over the remaining part of the township in the northeast corner is in the form of boulder clay or till plain. Water-bearing sand and gravel pockets occur sparingly through the impervious boulder clay. The existing wells in the area of till are largely seepage wells which yield small supplies of hard, "alkaline" water much of which cannot be used for drinking. Although the presence of the more porous phases of the boulder clay is not generally indicated on the ground surface, systematic prospecting should discover fairly productive water-bearing gravel pockets within 40 feet of the surface.

Eight wells in different parts of this township are deriving their water supply from the Ravenscrag bedrock formation. The water is found at two horizons. The uppermost, a bed of coarse, grey sand, in many places occurring beneath a thin coal seam, is believed to be productive over the greater part of the township at elevations ranging from 2,180 to 2,145 feet above sea-level. This horizon is penetrated in wells at depths of 245 to 265 feet from the surface along the southern border of the township and at 165 to 180 feet from the surface in the central and northern parts. The water from this horizon is hard and although often contaminated by small amounts of iron is being used in most cases for household purposes. Two of the wells in the northeast corner yield a "soda-bearing" water which, due to its flat taste, is not used for drinking. The supply is adequate for farm requirements, several of the wells yielding sufficient water for 50 head of stock. As has been noted in a previous section of this report water at this horizon is under hydrostatic pressure and rises in the wells above the aquifer, and in one well in the NE.$\frac{1}{4}$, section 35, flows above the ground level. It seems probable that should adequate supplies of water not be obtained from the glacial deposits, drilling or boring to this horizon will yield an adequate supply for stock although the water may not be found suitable for domestic use. One well sunk to a depth of 330 feet on the NW.$\frac{1}{4}$, section 36, produces a large supply of water containing soda from a coarse sand bed at an elevation of 1,970 feet. The upper aquifer was penetrated in this well, but was not productive. As this is the only well that has been sunk to this depth, the areal extent of the aquifer has not been determined. The water is under pressure and rises to within 10 feet of the surface.

Township 5, Range 20

The glacial drift covering the entire township forms the major source of ground water supply, although water is known to exist in the underlying Ravenscrag bedrock formation. With the exception of the eastern sections and the southwest corner, the whole township is covered by till, or boulder clay. Porous pockets of sands and gravels occur, but are scattered so sparingly through the drift as to be very difficult to locate. Wells that have penetrated such pockets yield small quantities of hard, usually drinkable water at depths not exceeding 25 feet. A few wells, however, are wholly in yellow boulder clay, from which very little water is to be expected. Many farms derive their household supply from seepage wells located beside sloughs. Such wells do not generally give sufficient water for stock requirements, and most of the residents have been obliged to construct dugouts or dams. In the southwest corner and along the southern sections of the township, beds of water-bearing sands and gravels become more numerous and many wells tapping them at depths of 15 to 30 feet produce sufficient water for household and stock requirements. One well, located in the NE.$\frac{1}{4}$, section 7, yields an adequate supply for 50 head of stock. In the southeast corner and in the sections along the eastern border of the township, fairly extensive beds of outwash gravels exist. These beds are generally penetrated within 15 feet of the surface, and contain soft to medium hard, drinkable water. Supplies from individual wells are sufficient for 20 to 50 head of stock and one well located in the NE.$\frac{1}{4}$, section 13, has supplied water for 130 head of stock.

Only one well in the township, located in NW.$\frac{1}{4}$, section 20, has been sunk into the underlying bedrock. This well, 475 feet deep, is drawing water from a 5-foot sand bed at an approximate elevation of 1,925 feet above sea-level. This aquifer is believed to be the basal sand bed of the Ravenscrag formation. The water is under pressure and rises in the well to a point 80 feet from the

surface and the yield is more than sufficient for 55 head of stock. The water is soft, but since it contains large amounts of common salt in solution it is unfit for domestic use or for irrigation.

It has been necessary to sink to similar depths into the bedrock in adjoining townships and it is probable that production from bedrock will not be obtained at depths less than 400 feet in any part of this township. As drilling to such depths is expensive, residents are advised to prospect the upper 25 feet of the drift and particularly along low, gravelly ridges before considering deeper drilling.

Township 5, Range 21

Both the glacial drift and the underlying Ravenscrag formation yield ground water in this township. More than eighty wells have been sunk in the glacial drift throughout the area, but the water supplies obtained in the majority of cases are inadequate for local farm requirements. The existence, however, of good supplies in some wells suggests the possibility of locating more water with further prospecting. Glacial outwash sands and gravels occur in a belt about 1½ miles wide, extending from sections 18 and 19 southeasterly to section 3. These deposits are quite porous and the sands and gravel beds act as reservoirs for water. Little difficulty has been experienced in locating these aquifers within 15 feet of the surface. Wells yield a drinkable water in sufficient quantities for household requirements and for at least 20 to 30 head of stock. It is impossible, however, to ascertain the exact location of these water-producing pockets except by systematic testing. Apparently they do not occur over most of the NW.¼, section 9, where a large number of dry holes have been dug.

Terminal moraine deposits in which occur numerous isolated pockets of water-bearing sands and gravels cover a small area in the southwest corner of the township, and a larger area of

approximately 3 miles in width extending from the northwest to the southeast corner of the township. The extent of these areas is shown on the accompanying map. Numerous wells have been dug in the terminal moraine, most of which have encountered water-bearing sand and gravel pockets. These pockets are sufficiently numerous to make it possible for a small amount of prospecting to determine their location. The water is hard and in a few instances "alkaline". Although suitable for stock requirements, water in some of the deeper wells is so highly charged with dissolved mineral salts as to be unfit for domestic use. The yield to be expected from individual wells depends to a large degree upon the areal extent of the productive aquifer. Hence some wells yield barely sufficient water for the household, whereas others supply enough water for 30 to 40 head of stock.

The northeast corner of the township is covered by deposits of till or boulder clay. The boulder clay itself cannot be considered as a source of more than small seepages of water, but the small pockets of sand and gravel that occur irregularly interspersed through it are water-bearing. These pockets, which generally occur within 35 feet of the surface, yield hard water with varying amounts of mineral salts in solution. These salts are often present in such concentration as to render the supply unsuitable for any domestic purposes. Supplies are not always sufficient for local requirements, but some wells produce ample water for 15 to 25 head of stock. Many residents have sunk wells near sloughs, or dugouts and dams so that the supply might be reinforced by seepage from these surface reservoirs.

Two horizons in the Ravenscrag formation are producing water in this township. On section 5 a well 165 feet deep is drawing water from the "A" horizon at an elevation of 2,305 feet above sea-level. The water is hard and usable and the supply is found to be ample for 25 head of stock. This aquifer, which

occurs throughout the townships to the south and west, is believed to be confined to the southwestern part of this township as it was not productive in wells drilled on sections 13 and 19. The approximate northern boundary of the area in which this horizon is believed to be productive is shown by the line "A" on the map, Figure 1. At any point south of this line the aquifer should be encountered in wells drilled to depths of 150 to 200 feet. The well on section 13, which is 445 feet deep, reached a lower horizon in the Ravenscrag formation at an elevation of about 2,000 feet above sea-level. The aquifer is a fine sand that yields a good supply of hard water. As the well is not being used at the present time, information in regard to the character of the water or of the beds penetrated is not known. Wells drilled to this depth at other points in the township will probably encounter this water-bearing horizon, but it is advisable to first thoroughly explore the overlying glacial drift for water-bearing sand and gravel pockets before drilling into the bedrock.

Township 6, Range 19

The ground water supply of the township is being derived from the glacial drift and from one well in the underlying bedrock. The northwestern half of the township and a small area in the southeast are covered by deposits of glacial till or boulder clay, as shown on Figure 1. Very little water can be expected from the compact boulder clay, but the sand and gravel pockets that occur sparingly in it are water-bearing. These pockets, which generally lie within 35 feet of the ground surface, have been tapped at several points. They yield hard, in some cases "alkaline", water, which is being used for drinking in all but one or two places. Supplies are generally adequate for local requirements and may be large enough to water 20 to 50 head of stock.

The remaining part of the township is mantled by terminal moraine deposits in which water-bearing sand and gravel pockets are more numerous than in the till plain. Those pockets that have been

tapped in this area occur generally within 25 feet of the surface, but are scattered through the drift to depths of 50 feet. The water from one shallow well is fairly soft, but from others it is hard and occasionally "alkaline". Only one well, however, is reported as producing undrinkable water.

A well on section 2 is the only one in the township that is producing water from the bedrock. This well, which is 338 feet deep, is drawing hard water that is being used for domestic purposes from above a seam of coal near the base of the Ravenscrag formation at an elevation of 1,975 feet above sea-level. The water is under sufficient hydrostatic pressure to cause it to flow above the ground surface. Since no other wells in the township have been drilled deep enough to strike water in the bedrock, it is impossible to postulate the areal extent of this aquifer. In the southern sections of the township it is probable that this aquifer will be found to be productive at depths ranging from 300 to 400 feet from the surface. A lack of information makes it impossible to suggest at what depths water will be encountered in the bedrock in the central and northern parts of the township. The quality of the water derived from the bedrock well mentioned above is discussed under the section dealing with analysis of water.

Township 6, Range 20

A mantle of glacial till or boulder clay covers the entire township. In the central part of the area, particularly, the clay is compact and the few thin beds of gravels or sands that are irregularly interspersed through it do not form large reservoirs for water. A few wells dug to depths not exceeding 35 feet in the boulder clay have penetrated productive pockets and yield enough water for a few head of stock. In all but the very shallow wells the amount of dissolved mineral salts derived from the clay renders the water unsuitable for household use. As there is generally little or no evidence of the existence of these productive

lenses at the surface it has been necessary in some localities to dig several holes before even a household supply has been secured. Dugouts excavated in the boulder clay hold their water for considerable periods of time and form the most dependable source of water for stock where farmers are financially unable to sink deep wells into the bedrock. Several residents have sunk wells on the tops of slight elevations of the ground surface. Such low hills or rolls are often composed of sand and gravel and contain fairly large amounts of drinkable water. A search for any indications of gravel beds as a well site is well repaid in the quality and quantity of the water usually obtained. Such a gravel ridge has been traced through sections 6 and 7 and wells situated along it yield a satisfactory supply of water for local requirements, one well supplying enough water for 200 head of stock. These gravel occurrences appear to be more extensive in the sections along the boundaries of the township than in the central part. Residents in the boundary sections and particularly in the northwest, northeast, and southeast, corners of the area, have been able to locate productive beds at depths less than 30 feet from the surface and obtain sufficient quantities of drinkable water for their farm requirements. In the central part and near the town of Ceylon where the glacial deposits have proved so sparingly productive, several residents have sunk wells into the underlying bedrock. Water from this source is generally too highly mineralized to be used for drinking and therefore cannot be considered as a water supply for town use other than fire protection. It has not been determined definitely whether or not the bedrock wells are all drawing from the same aquifer. Two wells in section 5, sunk to depths of 300 and 330 feet, encounter the aquifer, which is believed to be the basal coarse sand bed of the Ravenscrag formation, at an elevation of 2,000 feet above sea-level. Farther to the northeast, in section 10, it was necessary to sink 428 feet to approximately an elevation of 1,900 feet above sea-level, and a 270-foot deep well on section 23 is producing from a similar

elevation. Along the northern boundary it was necessary to sink wells to 400 feet to obtain water at an elevation of 1,850 feet. It may be assumed from these observations that the aquifer, if it is continuous, dips slightly to the north. The water in all instances is under hydrostatic pressure, rising to within 80 feet of the surface in the southern wells and within 40 feet of the surface in the more northerly ones. The supply from individual wells is sufficient for at least 20 head of stock and in some cases 50 head or more. Sand flowing into the bottoms of the deep wells is an objectionable feature, necessitating cleaning at intervals to prevent diminution of the supply. One well in the town of Ceylon was sunk to a depth of 700 feet encountering blue-grey Marine shale. It is extremely improbable that water suitable for any farm use will be found at depths exceeding 450 feet in any part of the township.

Township 6, Range 21

The entire ground water supply of this township is obtained from the glacial drift that mantles the whole area. The deepest wells in the district have shown the drift to have a thickness of not less than 140 foot. In the eastern half and the northwest part of the township the glacial deposits are composed largely of boulder clay or till. A number of holes have been sunk into the impervious boulder clay, but little or no water was found. Some of the shallower wells located beside sloughs or dugouts derive seepage water from these sources. There are, however, pockets of water-bearing sands and gravels scattered through the till. Such pockets are generally found within 30 feet of the surface, but also occur sparingly at depths ranging from 40 to 80 feet. In three shallow wells water from these pockets was reported to be soft, but generally it is hard and contains varying amounts of dissolved mineral salts. In many wells the water is not suitable for household use and in three instances the water is unfit

even for stock. The greater number of the wells produce enough water for household use, but the yield is in many cases insufficient for stock requirements. In a few places sand and gravel pockets supply water sufficient for 15 to 50 head of stock and a well on section 35, believed to be drawing from an extensive gravel bed, yields an ample supply for 100 head.

The remainder of the township is covered by terminal moraine deposits. The moraine is more porous than boulder clay and pockets of sand and gravel in it are more numerous. Due to the more rolling land surface of this part of the area less prospecting for water has been done than in the till-covered plains and most of the wells have been located near sloughs where a supply of seepage water is assured. Little difficulty should be experienced, however, in finding supplies of hard, usable water in the sand and gravel pockets of the terminal moraine, particularly if wells are located on or near gravel knolls and ridges.

Only one well, on section 10, has penetrated the bedrock and this 400-foot hole failed to locate a water supply. Very little information is available regarding the bedrock in surrounding townships, so that no water horizon can be traced through this area. It is possible that such a horizon does exist, which would be encountered in this township by wells from 450 to 500 feet deep. The water at this depth would be, in all probability, highly mineralized and fit only for stock. The only possibility of augmenting the present ground water supply seems to be in an intensive and systematic prospecting of the upper 50 feet of the glacial drift for water-bearing sand and gravel pockets.

STATISTICAL SUMMARY OF WELL INFORMATION IN RURAL MUNICIPALITY OF THE GAP, NO.39, SASKATCHEWAN.

West of 2nd meridian — Township / Range	4 19	4 20	4 21	5 19	5 20	5 21	6 19	6 20	6 21	Total No. in Municipality
Total No. of Wells in Township	29	24	12	51	40	85	47	68	113	469
No. of wells in bedrock	1	4	8	9	1	3	3	9	1	39
No. of wells in glacial drift	28	20	4	42	39	82	44	59	112	430
No. of wells in alluvium	0	0	0	0	0	0	0	0	0	0
Permanency of Water Supply										
No. with permanent supply	26	18	7	48	39	43	46	60	50	337
No. with intermittent supply	1	3	0	2	0	13	0	4	36	59
No. dry holes	2	3	5	1	1	29	1	4	27	73
Types of Wells										
No. of flowing artesian wells	0	0	0	1	0	1	1	0	0	3
No. of non-flowing artesian wells	1	2	3	7	1	2	0	10	3	29
No. of non-artesian wells	26	19	4	42	38	53	45	54	83	364
Quality of Water										
No. with hard water	20	16	6	47	34	51	43	60	83	360
No. with soft water	7	5	1	3	5	5	3	4	3	36
No. with salty water	0	0	0	0	1	0	0	0	0	1
No. with "alkaline" water	10	2	0	12	11	9	7	6	29	86
Depths of Wells										
No. from 0 to 50 feet deep	28	24	11	43	39	74	44	58	107	428
No. from 51 to 100 feet deep	0	0	1	0	0	8	2	1	2	14
No. from 101 to 150 feet deep	0	0	0	1	0	0	0	0	3	4
No. from 151 to 200 feet deep	1	0	0	4	0	1	0	0	0	6
No. from 201 to 500 feet deep	0	0	0	3	1	2	1	8	1	16
No. from 501 to 1,000 feet deep	0	0	0	0	0	0	0	1	0	1
No. over 1,000 feet deep	0	0	0	0	0	0	0	0	0	0
How the Water is Used										
No. usable for domestic purposes	19	16	6	44	31	37	43	48	57	301
No. not usable for domestic purposes	8	5	1	6	8	19	3	16	29	95
No. usable for stock	25	21	7	50	39	52	45	63	83	385
No. not usable for stock	2	0	0	0	0	4	1	1	3	11
Sufficiency of Water Supply										
No. sufficient for domestic needs	27	21	7	49	39	48	46	63	81	381
No. insufficient for domestic needs	0	0	0	1	0	8	0	1	5	15
No. sufficient for stock needs	24	10	6	45	15	29	28	33	18	208
No. insufficient for stock needs	3	11	1	5	24	27	18	31	68	188

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 The Gap, No. 60, 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.	2	6	19	2	338	2,220	450	375	75	253	665	60	97	558	845	2,004	107		203		450	826	418	⁎2

Water samples indicated thus, ⁎2, are from bedrock, Ravenscrag formation.
Analyses are reported in parts per million.
Hardness is the soap hardness expressed as calcium carbonate ($CaCO_3$).
For interpretation of this table read the section on Analyses and Quality of Water.

WATER FROM THE UNCONSOLIDATED DEPOSITS

No samples of ground water from the unconsolidated deposits of the municipality were collected for analysis. The few generalizations here given are drawn from observations made at the wells or from descriptions by residents of the quality of the water and from analyses of waters from adjoining municipalities in which water conditions are nearly similar. The waters from the glacial drift as a rule contain calcium and magnesium salts in solution as carbonates and sulphates, and therefore are hard. They also contain sodium salts, especially sodium sulphate. Ground water derived from porous beds of sands and gravels within 25 feet of the surface in the areas of outwash gravels in this municipality is hard but generally not so highly mineralized as to be unfit for use in the household. At greater depths in the glacial drift the water found usually contains greater amounts of salts in solution. The concentration of salts at greater depths in the glacial deposits seems to depend upon two factors: the areal extent of the porous bed forming the aquifer, and the thickness of the clay that overlies the aquifer. Wells sunk entirely in boulder clay yield small quantities of highly "alkaline" water which is generally unsuitable for household use and in some places is not being used even for stock. Highly mineralized water is often found near the surface in places where porous beds lie in depressions in the boulder clay. Surface waters slowly percolating through the sediments take salts into solution. These salts gradually become concentrated in the natural basins. Shallow wells located near sloughs or dugouts and deriving their supply as seepage from this source naturally yield a water that is similar in mineral character to the source water, but its general character may be greatly improved by the filtering action of the clay. The water as a rule is fairly soft and in many places contains only small amounts of the salts that prove so objectionable in many

of the waters from the deeper wells in the glacial drift. Such well waters, however, are easily contaminated by organic matter. The possible variations in the character of the glacial deposits both laterally and at different depths should be kept in mind when a search is being made for an adequate supply of drinkable ground water. Because one well is producing a highly mineralized water does not mean that a well a few hundred feet away sunk to a similar depth, must of necessity yield a similar type of water.

Waters from the Bedrock

The content of dissolved salts in the ground waters derived from the bedrock is generally sufficiently high to render the water unsuitable for domestic use. This water, however, is used for stock with apparently no ill-effects. Two distinct types of water are obtained from the Ravenscrag bedrock formation in this area. The first type is generally found in the shallower bedrock wells at depths less than 250 feet from the surface. The water is hard and contains Glauber's salt, Epsom salts, and often considerable amounts of iron in solution. The second type of water found in the deep wells contains sodium carbonate (black alkali), which if present in large amounts makes the water soft and gives it a flat "soda" taste. Common salt (NaCl) may be present in sufficient quantities to give the water a distinctly salty taste. Although usually the shallow bedrock wells yield sulphate waters and the deeper bedrock wells yield sodium carbonate waters exceptions to these are by no means uncommon. Several wells less than 250 feet deep yield water with a characteristic flat, "soda" taste, whereas several of the deep wells give a hard water that contains sulphate salts in solution. The analysis given on the accompanying table is of water from a 338-foot well that is believed to be deriving its supply from the basal coarse sands of the Ravenscrag formation. This water is hard, has a bitter, salty taste, and due to the presence of large amounts of sodium carbonate and common salt in solution would be injurious to vegetation.

WELL RECORDS—Rural Municipality of THE GAP NO. 39, 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
1	NE.	9	4	19	2	Dug	15	2,440	- 7	2,433	15	2,425	Glacial sand	Hard, clear, "alkaline"		S	Sufficient for 20 head stock.
2	SE.	14	"	"	"	Dug	10	2,410			10	2,400	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
3	NE.	14	"	"	"	Dug	22	2,420	- 16	2,404	22	2,398	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 15 head stock.
4	SE.	16	"	"	"	Dug	20	2,460	- 10	2,450			Glacial clay	Hard, clear, "alkaline"		D, S	Sufficient for local needs.
5	NW.	16	"	"	"	Dug	22	2,460					Glacial clay	Hard, clear, "alkaline"		D	Sufficient for household needs only.
6	SW.	17	"	"	"	Dug	10	2,450			10	2,440	Glacial sand	Hard, clear		S	Sufficient for local needs.
7	NW.	21	"	"	"	Dug	30	2,450					Glacial clay	Hard, clear		D	Sufficient for household needs.
8	SE.	22	"	"	"	Dug	18	2,430	- 13	2,417	12	2,418	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
9	NW.	22	"	"	"	Dug	10	2,400	- 6	2,394	5	2,395	Glacial sand	Soft, clear		D, S	Sufficient for 30 head stock.
10	SW.	24	"	"	"	Dug	17	2,400	- 14	2,386	17	2,383	Glacial sand	Hard, clear		D, S	Sufficient for 15 head stock.
11	NE.	24	"	"	"	Test auger	35	2,370					Glacial blue clay				Dry hole.
12	NW.	31	"	"	"	Dug	12	2,400	- 9	2,391	9	2,391	Glacial sand	Hard, clear		D, S	Sufficient for 12 head stock.
13	NW.	32	"	"	"	Dug	14	2,370	- 9	2,361	9	2,361	Glacial gravel	Hard, clear, "alkaline"		D, S	Sufficient for 10 head stock.
14	SE.	33	"	"	"	Dug	30	2,400					Glacial clay	Hard, clear		D, S	Sufficient for 4 head stock.
15	SW.	33	"	"	"	Dug	12	2,400	- 7	2,393	8	2,392	Glacial sand	Soft, clear		S	Sufficient for 50 head stock.
16	NW.	34	"	"	"	Dug	25	2,390					Glacial clay	Hard, clear, "alkaline"		D, S	Sufficient for household needs only.
17	NE.	35	"	"	"	Dug	30	2,450	- 18	2,432	25	2,425	Glacial sand	Soft, clear		D, S	Sufficient for 30 head stock.
18	SW.	36	"	"	"	Drilled	175	2,390					Ravenscrag coal				Dry hole.
1	SW.	3	4	20	2	Dug	20	2,465	- 19	2,446	20	2,445	Glacial sand	Hard, clear		D, S	Insufficient for local needs.
2	SE.	4	"	"	"	Dug	20	2,485	- 16	2,469	18	2,467	Glacial gravel	Hard, clear	42	D, S	Sufficient for local needs.
3	SW.	4	"	"	"	Test auger	40	2,485					Glacial brown clay				Dry hole.
4	SW.	5	"	"	"	Dug	20	2,450	- 8	2,442	17	2,433	Ravenscrag coal	Hard		D, S	Insufficient for local needs.
5	NE.	6	"	"	"	Bored	50	2,350	- 42	2,308	50	2,300	Ravenscrag sand	Hard, clear		D, S	Insufficient for local needs.
6	NE.	13	"	"	"	Dug	14	2,425					Glacial sand	Hard, clear		D, S	Insufficient for local needs.
7	SE.	13	"	"	"	Bored	50	2,425	- 46	2,379	47	2,378	Glacial sand	Hard, iron, red		S	Sufficient for local needs.
8	NE.	15	"	"	"	Dug	15	2,410	- 10	2,400	10	2,400	Glacial sand	Soft, clear		D, S	Insufficient for local needs.
9	SE.	22	"	"	"	Dug	15	2,420	- 10	2,410	10	2,410	Glacial sand	Soft, clear		D, S	Sufficient for local needs.

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of THE GAP NO. 39, 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
10	SE.	24	4	20	2	Dug	12	2,450	- 10	2,440	10	2,440	Glacial sand	Soft, clear		D, S	Sufficient for local needs.
11	NW.	24	"	"	"	Dug	24	2,400	- 19	2,381	19	2,381	Glacial clay, sand	Soft, clear		D, S	Insufficient; waters 12 head stock.
12	SW.	25	"	"	"	Dug	14	2,400	- 10	2,390	10	2,390	Glacial sand	Hard, clear		D, S	Sufficient for 60 head stock.
13	SE.	26	"	"	"	Spring		2,380	0	2,380	0	2,380	Glacial sand	Soft, clear			Sufficient for local needs.
14	NE.	28	"	"	"	Dug	10	2,400	- 9	2,391	9	2,391	Glacial gravel	Hard, clear		D	Sufficient for household needs.
15	NW.	31	"	"	"	Dug	10	2,400	- 7	2,393	7	2,393	Glacial sand	Soft, clear		S	Sufficient for 30 head stock.
16	NW.	33	"	"	"	Dug	8	2,400	- 4	2,396	6	2,394	Glacial sand	Hard, clear, "alkaline"		D, S	Insufficient for local needs.
17	SE.	36	"	"	"	Bored	50	2,360	- 38	2,322	50	2,310	Glacial sand	Hard, red, "alkaline" iron		D, S	Sufficient for local needs.
1	SE.	5	4	21	2	Dug	50	2,300					Ravenscrag clay				Dry hole.
2	SW.	5	"	"	"	Dug	4	2,270	- 1	2,269	4	2,266	Ravenscrag coal	Hard, clear, iron		D, S	Sufficient for 80 head stock.
3	SW.	5	"	"	"	Dug	8	2,280	- 5	2,275	8	2,272	Ravenscrag coal	Hard, oily, iron		S	Sufficient for 25 head stock.
4	NE.	17	"	"	"	Bored	78	2,340	- 38	2,302	62	2,278	Ravenscrag yellow clay	Hard, clear		D, S	Sufficient for local needs.
5	SE.	21	"	"	"	Dug	14	2,340	- 10	2,330	10	2,330	Glacial grey sand	Hard, clear, iron, "alkaline"	44	D, S	Sufficient for 35 head stock.
6	SE.	27	"	"	"	Dug	3	2,450	0	2,450	0	2,450	Glacial gravel	Soft, clear		D	Only used for washing.
7	NE.	27	"	"	"	Dug	8	2,450	- 3	2,447	3	2,447	Glacial gravel	Hard, clear		D, S	Sufficient for 35 head stock.
8	SE.	34	"	"	"	Dug	6	2,380	- 4	2,376	4	2,376	Glacial yellow sand	Hard, clear	44	D, S	Sufficient for 15 head stock.
1	NE.	1	5	19	2	Dug	18	2,400	- 15	2,385			Glacial clay	Hard, clear	45	D, S	Sufficient for local needs.
2	NE.	2	"	"	"	Dug	18	2,400	- 12	2,388			Glacial gravel	Hard, clear	45	D, S	Sufficient for 30 head stock.
3	SW.	2	"	"	"	Dug	22	2,400	- 17	2,383			Glacial clay	Hard, clear, "alkaline"	45	S	Sufficient for 20 head stock.
4	SE.	3	"	"	"	Dug	17	2,400	- 6	2,394	17	2,383	Glacial gravel	Hard, clear		D, S	Sufficient for local needs.
5	NE.	4	"	"	"	Drilled	245	2,400	-117	2,283	245	2,155	Ravenscrag gravel	Hard, clear	45	D, S	Sufficient. 3 gallons a minute.
6	NE.	5	"	"	"	Drilled	266	2,400	- 10	2,390	266	2,134	Ravenscrag coarse gravel	Hard, clear	45	D, S	Sufficient for 17 head stock.
7	SE.	5	"	"	"	Dug	15	2,400	- 9	2,391			Glacial yellow clay	Hard		D, S	Sufficient for local needs.
8	SW.	5	"	"	"	Dug	25	2,380	- 22	2,358			Glacial yellow clay	Hard, clear	45	D, S	Sufficient for local needs.
9	NW.	9	"	"	"	Dug	28	2,400	- 20	2,380	28	2,372	Glacial sand	Hard, clear	42	D, S	Sufficient for 12 head stock or more.
10	SE.	10	"	"	"	Dug	18	2,400	- 6	2,394			Glacial sandy clay	Hard, clear, "alkaline"	45	D, S	Sufficient for local needs.

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WELL RECORDS—Rural Municipality of THE GAP NO. 39, 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.	11	5	19	2	Dug	20	2,400	- 10	2,390			Glacial yellow clay	Hard, clear		D, S	Sufficient for local needs.
12	SE.	13	"	"	"	Bored	27	2,300	- 22	2,278			Glacial fine sand	Hard, clear		D, S	Sufficiemt for 100 head stock.
13	NW.	14	"	"	"	Dug	20	2,400	- 16	2,384			Glacial sand	Hard, clear	45	D, S	Sufficient for 30 head stock.
14	SE.	15	"	"	"	Dug	18	2,400	- 8	2,392			Glacial sand	Soft,		D, S	Insufficient for local needs.
15	SW.	15	"	"	"	Dug	14	2,400	- 9	2,391			Glacial gravel	Hard, "alkaline"		D, S	Sufficient for 5 head stock.
16	SW.	16	"	"	"	Dug	18	2,380	- 13	2,367			Glacial sand	Hard		D, S	Sufficient for needs in wet season.
17	SW.	17	"	"	"	Dug	35	2,300	- 25	2,275			Glacial gravel	Hard, clear		D, S	Sufficient for 20 head stock.
18	N½.	18	"	"	"	Dug	15	2,400	- 10	2,390			Glacial gravel	Soft, clear	45	D, S	Sufficient for 30 head stock.
19	SW.	18	"	"	"	Dug	12	2,400	- 9	2,391			Glacial gravel	Hard, clear, iron		D, S	Sufficient for 17 head stock.
20	SW.	23	"	"	"	Drilled	165	2,350	-138	2,212	142	2,188	Ravenscrag coal	Hard, clear		D, S	Sufficient for 50 head stock.
21	SE.	24	"	"	"	Drilled	172	2,350	- 82	2,268	172	2,178	Ravenscrag	Hard, iron		D	Sufficient for local needs.
22	SW.	25	"	"	"	Dug	15	2,350	- 7	2,343			Glacial yellow clay	Hard, clear, "alkaline"	48	D, S	Sufficient for 7 head stock.
23	NE.	25	"	"	"	Dug	15	2,350	- 14	2,336			Glacial yellow clay	Hard, "alkaline"			Practically dry.
24	NE.	26	"	"	"	Spring		2,300	0	2,300			Glacial clay and gravel	Hard, clear, iron, "alkaline"		S	Sufficient for local needs.
25	SW.	30	"	"	"	Spring	9	2,400	- 2	2,398			Glacial gravel	Soft, clear		D, S	Sufficient for 70 head stock.
26	NE.	31	"	"	"	Dug	14	2,400	- 12	2,388			Glacial yellow clay	Hard		D	Sufficient for household needs only.
27	N½.	32	"	"	"	Dug	10	2,350	- 8	2,342			Glacial fine sand	Hard, clear	42	D, S	Sufficient for 8 head stock.
28	SE.	32	"	"	"	Dug	14	2,400	- 10	2,390			Glacial gravel	Hard, clear, iron	42	D, S	Sufficient for 150 sheep, 12 head cattle.
29	NE.	34	"	"	"	Drilled	146	2,300	- 16	2,284	146	2,154	Ravenscrag coal and gravel	Hard, brown, iron	43	D, S	Sufficient for local needs.
30	SW.	35	"	"	"	Drilled	166	2,400	- 6	2,394	166	2,234	Ravenscrag fine sand	Hard, clear, "alkaline"		D, S	Sufficient for local needs.
31	NE.	35	"	"	"	Drilled	180	2,300	+ 3	2,303	180	2,120	Ravenscrag sand	Soft, clear	42	S	Sufficient for 50 head stok.
32	NE.	35	"	"	"	Dug	18	2,300	- 14	2,286			Glacial yellow clay	Hard, clear	48	D	Sufficient for household needs.
33	NW.	36	"	"	"	Drilled	330	2,300	- 6	2,294	330	1,970	Ravenscrag gravel	Hard, clear, soda, "alkaline"		S	Sufficient for local needs.
1	SW.	2	5	20	2	Dug	22	2,400	- 15	2,385	22	2,378	Glacial yellow clay	Hard, clear	42	D	Sufficient for household needs only.
2	NE.	3	"	"	"	Dug	8	2,400	0	2,400			Glacial gravel	Hard, clear, "alkaline"	45	D, S	Sufficient for 14 head stock or more.
3	NW.	4	"	"	"	Dug	12	2,400	0	2,400			Glacial sand	Hard, clear, "alkaline"	42	D, S	Sufficient for 11 head stock.

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WELL RECORDS—Rural Municipality of THE GAP NO. 39, 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
4	SW.	4	5	20	2	Dug	18	2,400	- 13	2,387	18	2,382	Glacial sand and gravel	Hard, clear		D, S	Sufficient for 12 head stock.
5	NE.	7	"	"	"	Dug	8	2,400	- 1	2,399	8	2,392	Glacial gravel	Hard, clear, "alkaline"	48	D, S	Sufficient for 50 head stock.
6	NE.	9	"	"	"	Dug	10	2,400	- 5	2,395	10	2,390	Glacial sand	Soft, clear	48	D, S	Sufficient for 30 head stock.
7	SW.	13	"	"	"	Dug	7	2,400	0	2,400			Glacial sand	Soft,		D, S	Sufficient for local needs.
8	NE.	13	"	"	"	Dug	12	2,400	- 9	2,391			Glacial gravel	Soft,		D, S	Sufficient for 132 head stock.
9	SE.	14	"	"	"	Dug	14	2,400	- 10	2,390	14	2,386	Glacial sand	Hard, clear		D, S	Sufficient for 20 head stock.
10	SE.	15	"	"	"	Dug	14	2,400	- 11	2,389	14	2,386	Glacial yellow clay	Hard, clear	42	D, S	Sufficient for household needs.
11	NE.	17	"	"	"	Dug	16	2,400	- 10	2,390	16	2,384	Glacial clay	Hard, clear		D	
12	SW.	18	"	"	"	Dug	10	2,400	- 6	2,394	10	2,390	Glacial yellow clay	Hard, clear	45	D, S	Sufficient for 5 head stock.
13	SE.	18	"	"	"	Dug	11	2,400	- 9	2,391	10	2,390	Glacial clay and sand	Hard, clear, "alkaline"	42	D	Sufficient for household needs only.
14	NE.	19	"	"	"	Dug	20	2,400	- 16	2,384	20	2,380	Glacial yellow clay	Soft, clear, salty	42	S	Sufficient for 55 head stock.
15	NW.	20	"	"	"	Drilled	475	2,400	- 80	2,320	475	1,925	Ravenscrag sand	Soft, clear	45	D	Sufficient for household only.
16	NE.	24	"	"	"	Dug	46	2,400	- 42	2,358	46	2,354	Glacial gravel	Hard, clear		D, S	Sufficient for 500 people a day.
17	SW.	24	"	"	"	Dug	8	2,400	0	2,400			Glacial yellow clay	Soft,		D	Sufficient for household needs only.
18	SW.	26	"	"	"	Dug	24	2,400	- 22	2,378	24	2,376	Glacial yellow clay				Dry hole.
19	SE.	27	"	"	"	Dug	30	2,400					Glacial clay			D	Sufficient for household needs only.
20	NW.	28	"	"	"	Dug	16	2,400	- 13	2,387	16	2,384	Glacial yellow clay	Hard, clear	42	D	Sufficient for household needs only.
21	NE.	30	"	"	"	Dug	15	2,400	- 12	2,388	15	2,385	Glacial sand	Hard, clear		D, S	Sufficient for 6 head stock or more.
22	SE.	32	"	"	"	Dug	21	2,400	- 16	2,384	21	2,379	Glacial yellow clay	Hard, clear		D, S	Sufficient for 6 head stock.
23	SE.	33	"	"	"	Dug	25	2,400	- 15	2,385	25	2,375	Glacial yellow clay	Hard, clear	42	D, S	Sufficient for 10 head stock in winter.
24	NW.	34	"	"	"	Dug	16	2,400	- 6	2,394	14	2,386	Glacial gravel	Hard, clear	45	D	Sufficient for household needs.
25	NE.	34	"	"	"	Dug	18	2,400	- 8	2,392			Glacial yellow clay	Hard, clear		D, S	Sufficient for household needs.
26	NE.	35	"	"	"	Dug	20	2,400	- 16	2,384	20	2,380	Glacial yellow clay	Hard, clear, "alkaline"	42	D	Sufficient for household needs.
27	SE.	35	"	"	"	Dug	18	2,400	- 12	2,388	18	2,382	Glacial yellow clay	Hard, clear	45	D	Sufficient for household needs.
28	NW.	36	"	"	"	Dug	25	2,300	- 15	2,285	25	2,275	Glacial yellow clay	Hard, clear		D	Sufficient for household needs.
29	SE.	36	"	"	"	Dug	16	2,400	- 12	2,388	16	2,384	Glacial yellow clay			D	Well filled in now.
1	SE.	1	5	21	2	Dug	35	2,390	- 29	2,361	29	2,361	Glacial gravel and blue clay	Hard			

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WELL RECORDS—Rural Municipality of THE GAP NO.39, 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
2	SW.	1	5	21	2	Dug	10	2,430	- 5	2,425	10	2,420	Glacial gravel	Hard, clear		D, S	Sufficient for 8 head stock.
3	SW.	2	"	"	"	Dug	5	2,400	0	2,400	5	2,395	Glacial	Hard, clear, iron		S	Sufficient for 34 head stock.
4	NE.	2	"	"	"	Dug	10	2,440					Glacial clay	Hard, clear		S	Insufficient for local needs.
5	SE.	4	"	"	"	Dug	12	2,420	- 9	2,411	9	2,411	Glacial gravel and rocks	Hard, clear, iron		D, S	Sufficient for local needs.
6	NE.	5	"	"	"	Drilled	165	2,460	-101	2,359	155	2,305	Ravenscrag coarse gravel	Hard, clear, iron	42	D, S	Sufficient for 25 head stock.
7	NE.	6	"	"	"	Dug	24	2,410	- 22	2,388	8	2,402	Glacial gravel and sand	Hard, clear		D	Sufficient for household needs.
8	SE.	9	"	"	"	Dug	8	2,420	- 7	2,413	7	2,413	Glacial gravel and stones	Hard, "alkaline"		S	Insufficient; waters 30 head stock.
9	NW.	9	"	"	"	Dug	65	2,430					Glacial stony clay				Dry hole.
10	SE.	12	"	"	"	Dug	15	2,430	- 9	2,421	9	2,421	Glacial clay	Hard, clear, "alkaline"		S	Sufficient for 10 to 15 head stock.
11	SW.	12	"	"	"	Dug	10	2,420	- 4	2,416			Glacial	Hard		N	Place deserted.
12	NE.	12	"	"	"	Dug	18	2,460	- 14	2,446	14	2,446	Glacial gravel	Hard, clear		D, S	Sufficient for 10 head stock.
13	NE.	13	"	"	"	Drilled	445	2,450					Ravenscrag? fine sand	Hard, iron		N	Place deserted.
14	SW.	15	"	"	"	Dug	13	2,380	- 4	2,376	13	2,367	Glacial sand and gravel	Hard, clear, "alkaline"		D, S	Sufficient for local needs.
15	SE.	17	"	"	"	Dug	12	2,410	- 6	2,404	12	2,398	Glacial sand	Hard, clear, "alkaline"		D, S	Sufficient for 22 head stock.
16	SW.	17	"	"	"	Dug	7	2,420	- 5	2,415	5	2,415	Glacial gravel	Soft, iron		D, S	Insufficient; enough for 8 head stock.
17	SE.	18	"	"	"	Dug	5	2,420	- 2	2,418	5	2,415	Glacial gravel and stones	Soft, clear	48	D, S	Sufficient for 7 tanks a day.
18	NE.	19	"	"	"	Drilled	400	2,380					Ravenscrag coal				Dry hole.
19	SW.	20	"	"	"	Dug	10	2,440	- 2	2,438	10	2,430	Glacial gravel	Hard, clear, "alkaline"		S	Sufficient for 35 head stock.
20	NE.	20	"	"	"	Dug	10	2,480	- 2	2,478	10	2,470	Glacial sand	Hard, clear		D, S	Sufficient for local needs.
21	NW.	21	"	"	"	Dug	14	2,500	- 12	2,488	12	2,488	Glacial gravel	Hard, clear, "alkaline"		D, S	Sufficient for 4 horses.
	NE.	22	"	"	"	Dug	14	2,460	- 10	2,450	14	2,446	Glacial gravel	Hard, clear	43	D, S	Sufficient for 15 head stock.
23	SW.	23	"	"	"	Dug	20	2,430	- 16	2,414	16	2,414	Glacial gravel	Hard, clear	43	D, S	Sufficient for 40 head stock.
24	NW.	23	"	"	"	Dug	12	2,430	- 6	2,424	10	2,420	Glacial gravel	Soft, clear		S	Sufficient for 12 head stock.
25	SW.	24	"	"	"	Dug		2,440					Glacial	Hard, clear		D	Sufficient for household needs.
26	NW.	24	"	"	"	Dug	20	2,430	- 18	2,412			Glacial blue clay	Soft, clear		D, S	Sufficient for 4 horses.
27	NW.	25	"	"	"	Dug	20	2,435	- 18	2,417	18	2,417	Glacial sand	Hard, clear	43	D, S	Sufficient for 15 head stock.
28	N	25	"	"	"	Dug	12	2,415	- 9	2,406	9	2,406	Glacial gravel	Hard, clear	43	D, S	Sufficient for 15 head stock.
29	SW.	27	"	"	"	Dug	16	2,515	- 12	2,503	12	2,503	Glacial fine sand	Hard, clear		D	Sufficient for household needs.

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30	SE.	28	5	21	2	Dug	30	2,510	- 28	2,482	28	2,482	Glacial clay with stones	Hard, clear		S	Insufficient; enough for 8 head stock only.
31	SE.	29	"	"	"	Dug	9	2,490	- 7	2,483	7	2,483	Glacial sand	Hard, clear		D, S	Sufficient for 15 head stock.
32	NE.	29	"	"	"	Dug	8	2,530	- 6	2,524	7	2,523	Glacial sand and gravel	Hard, clear		N	Well caved in.
33	SE.	31	"	"	"	Dug	14	2,530	0	2,530			Glacial yellow clay	Hard, clear		D, S	Insufficient for local needs.
34	NE.	32	"	"	"	Bored	40	2,560	- 30	2,530			Glacial sandy clay	Hard, clear, "alkaline"		D	Sufficient for household needs.
35	NE.	33	"	"	"	Dug	14	2,525	- 4	2,521			Glacial sand and clay	Hard, clear		D, S	Hardly sufficient for local needs.
36	NW.	33	"	"	"	Dug	21	2,540	- 13	2,527	13	2,527	Glacial sandy clay	Hard, clear, iron	45	D, S	Sufficient for local needs.
37	NW.	34	"	"	"	Dug	16	2,510	0	2,510			Glacial grey and yellow clay	Soft,		D	Insufficient for local needs.
38	NE.	34	"	"	"	Dug	18	2,490	- 16	2,474			Glacial blue clay	Hard		S	Insufficient for local needs.
39	SE.	35	"	"	"	Bored	30	2,425	- 24	2,401	24	2,401	Glacial sand and gravel	Hard, clear, "alkaline"		S	Insufficient for 70 head stock.
40	NE.	35	"	"	"	Bored	146	2,450					Glacial	Hard, clear, iron		S	Sufficient for 15 head stock.
41	NE.	35	"	"	"	Dug	18	2,420	- 16	2,404			Glacial blue clay	Hard, oily, "alkaline"		S	Insufficient for local needs.
42	NE.	36	"	"	"	Dug	24	2,440					Glacial clay	Hard, clear		D	
43	NW.	36	"	"	"	Dug	20	2,450	- 17	2,433	17	2,433	Glacial sand	Hard, clear, iron		S	Insufficient; used for 6 head stock.
1	SW.	2	6	19	2	Drilled	338	2,300	+ 4	2,304	325	1,975	Ravenscrag coal	Hard, brown iron		D, S	Sufficient for local needs. #
2	NE.	3	"	"	"	Spring	2	2,250	0	2,250	2	2,248	Glacial gravel	Hard, "alkaline"		D, S	Sufficient for local needs.
3	SE.	3	"	"	"	Dug	20	2,250	- 16	2,234	20	2,230	Glacial clay	Hard, cloudy		D, S	Insufficient for local needs.
4	NW.	5	"	"	"	Dug	16	2,300	- 14	2,286			Glacial yellow clay	Hard, clear, "alkaline"		D, S	Sufficient for household needs.
5	SW.	5	"	"	"	Dug	19	2,350	- 14	2,336	19	2,331	Glacial yellow clay	Hard, clear		D, S	Sufficient for house and 12 head stock in wet season.
6	NW.	5	"	"	"	Dug	20	2,300	- 12	2,288			Glacial yellow clay	Hard, clear		D, S	Sufficient for local needs.
7	SW.	6	"	"	"	Dug	12	2,400	- 9	2,391	12	2,388	Glacial clay and gravel	Hard, clear		D, S	Sufficient for local needs.
8	NE.	6	"	"	"	Dug	22	2,350	- 16	2,334			Glacial sandy clay	Hard, clear, "alkaline"	42	D, S	Sufficient for 15 head stock.
9	SW.	7	"	"	"	Dug	17	2,300	- 10	2,290	10	2,290	Glacial gravel	Hard, clear	42	D, S	Sufficient for household except in winter.
10	NW.	8	"	"	"	Dug	16	2,300	0	2,300	10	2,290	Glacial clay	Soft, soda		N	
11	NW.	10	"	"	"	Dug	10	2,330	- 7	2,323	10	2,320	Glacial gravel	Soft, clear	47	D, S	Sufficient for 13 head stock.
12	SW.	12	"	"	"	Dug	23	2,250	- 19	2,231			Glacial gravel	Hard, clear	45	D, S	Sufficient for house and 4 head stock.
13	SW.	15	"	"	"	Dug	12	2,330	- 8	2,322	12	2,318	Glacial gravel and sand	Hard, clear, "alkaline"	47	D, S	Sufficient for 3 head stock.

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of THE GAP NO.39, 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
14		16	6	19	2	Dug	12	2,275	- 8	2,267	12	2,263	Glacial gravel	Hard, clear		D, S	
15	SW.	18	"	"	"	Dug	12	2,300	- 6	2,294	12	2,288	Glacial sand and gravel	Hard, clear		D, S	Sufficient for 20 head stock in wet season.
16	NW.	18	"	"	"	Dug	10	2,390	- 2	2,288	10	2,280	Glacial gravel	Hard, clear	42	D, S	Sufficient for local needs.
17	SE.	19	"	"	"	Dug	20	2,250	- 7	2,243	20	2,230	Glacial gravel	Hard, clear	42	D	Sufficient for local needs.
18	NE.	20	"	"	"	Dug	18	2,250	- 8	2,242			Glacial clay	Hard, clear	48	D, S	Sufficient for household needs.
19	NW.	20	"	"	"	Dug	14	2,250	- 10	2,240	14	2,236	Glacial sand	Hard, clear	45	D, S	Sufficient for 20 head stock.
20	NE.	21	"	"	"	Spring	3	2,250	+ 4	2,254			Glacial sand	Hard, clear		D, S	Sufficient for local needs. #
21	NE.	21	"	"	"	Bored	80	2,250					Ravenscrag shale				Dry hole.
22	SW.	22	"	"	"	Dug	16	2,200	- 14	2,186	16	2,184	Glacial gravel	Hard, clear	45	D, S	Sufficient for local needs.
23	SW.	25	"	"	"	Spring		2,200	0	2,200			Glacial sand	Hard, rusty		D, S	Sufficient for local needs.
24	SE.	26	"	"	"	Dug	12	2,200	- 7	2,193			Glacial gravel	Hard, clear		D, S	Sufficient for local needs.
25	NW.	28	"	"	"	Dug	14	2,200	- 8	2,192	14	2,186	Glacial gravel	Hard, oily		D, S	Sufficient for 50 head stock in winter.
26	NW.	30	"	"	"	Dug	13	2,250	- 10	2,240	13	2,237	Glacial gravel	Hard, clear	42	D	Sufficient for household needs.
27	NW.	31	"	"	"	Bored	40	2,250	- 35	2,215			Glacial clay	Hard, clear, iron	42	D, S	Sufficient for stock.
28	SW.	32	"	"	"	Dug	16	2,200	- 12	2,188			Glacial yellow clay	Hard, clear, "alkaline"	44	D	Sufficient for household needs only.
29	NE.	32	"	"	"	Dug	28	2,200	- 16	2,184			Glacial gravel	Hard, clear		D, S	Sufficient for local needs; dam for stock.
30	NE.	32	"	"	"	Dug	25	2,200	- 23	2,177			Glacial yellow clay	Hard, clear, "alkaline"		D	Hauls water for stock when slough drys.
31	NW.	34	"	"	"	Dug	28	2,175	- 22	2,153			Glacial sand	Hard, clear	45	D, S	Sufficient for local needs.
32	NE.	36	"	"	"	Dug	16	2,200	- 10	2,190			Glacial yellow clay	Hard, clear, "alkaline"	45	D, S	Sufficient for 30 head stock and 40 sheep.
1	NE.	2	6	20	2	Dug	14	2,350	- 10	2,340	14	2,336	Glacial gravel	Hard, clear	45	D	Sufficient for 15 families.
2	SE.	2	"	"	"	Dug	14	2,400	- 10	2,390	14	2,386	Glacial yellow clay	Hard, clear		D, S	Sufficient for local needs.
3	SE.	4	"	"	"	Dug	13	2,350	- 8	2,342	13	2,337	Glacial yellow clay	Hard, clear		D	Sufficient for household needs in winter.
4	NE.	5	"	"	"	Drilled	300	2,400	-100	2,300	280	2,120	Ravenscrag coal	Hard, soda		S	Sufficient for 20 head stock. #
5	SE.	5	"	"	"	Drilled	331	2,400	- 80	2,320	325	2,075	Ravenscrag coal	Hard, clear, "alkaline"	42	S	Sufficient for 50 head stock.
6	NW.	6	"	"	"	Dug	20	2,400	- 15	2,385	20	2,380	Glacial sand	Hard, clear	45	D, S	Sufficient for 200 head stock.
7	SW.	7	"	"	"	Dug	10	2,400	- 6	2,394	10	2,390	Glacial gravel	Hard		D, S	Sufficient; 12 to 16 barrels a day.
8	NW.	7	"	"	"	Dug	12	2,400	- 9	2,391	12	2,388	Glacial yellow clay	Hard, clear	42	D, S	Sufficient for household needs. only.

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of THE GAP NO.39, 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.	7	6	20	2	Dug	20	2,400	- 15	2,385	20	2,380	Glacial sand	Hard		D, S	Sufficient for local needs.
10	SE.	9	"	"	"	Dug	16	2,400	- 10	2,390	16	2,384	Glacial clay	Hard, clear	42	D, S	Sufficient for 7 head stock and 9 pigs.
11	SW.	10	"	"	"	Dug	12	2,300	- 6	2,294	12	2,288	Glacial yellow clay	Hard, clear	43	D, S	Sufficient for 4 head stock.
12	SE.	10	"	"	"	Drilled	428	2,350	- 65	2,285	418	1,932	Ravenscrag sand	Soft, clear, soda		D, S	Sufficient for local needs.
13	NW.	11	"	"	"	Drilled	700	2,357					Ravenscrag coal	Soft, brown soda		S	Sufficient for stock only.
14	NE.	12	"	"	"	Dug	10	2,300	- 4	2,296	10	2,290	Glacial gravel	Hard, clear	45	D	Sufficient for household needs only.
15	NW.	13	"	"	"	Dug	16	2,275	- 13	2,262	16	2,259	Glacial gravelly clay	Hard, clear, "alkaline"		D, S	Sufficient for 10 head stock.
16	NW.	13	"	"	"	Drilled	240	2,275					Ravenscrag sand				Dry hole.
17	SW.	14	"	"	"	Dug		2,400					Glacial yellow clay	Hard, "alkaline"		N	Not fit for use so filled in.
18	NE.	15	"	"	"	Dug	15	2,300	- 7	2,293	15	2,285	Glacial yellow clay	Hard		D, S	Sufficient for 15 head stock.
19	NW.	15	"	"	"	Dug	16	2,300	- 8	2,292	16	2,284	Glacial . clay	Hard, clear	42	D	Sufficient for household needs only.
20	SW.	18	"	"	"	Dug	14	2,400	- 11	2,389	14	2,386	Glacial clay	Hard, clear	42	D	Sufficient for household needs only.
21	NW.	19	"	"	"	Dug	8	2,250	- 2	2,248	8	2,242	Glacial sand and gravel	Hard		D, S	Sufficient for 45 head stock in winter.
22	SE.	20	"	"	"	Dug	18	2,350					Glacial yellow clay	Hard		N	Filled in because supply too small.
23	NW.	23	"	"	"	Dug	18	2,275	- 6	2,269	18	2,257	Glacial clay	Hard, clear	42	D	Sufficient for household needs only.
24	NE.	23	"	"	"	Drilled	270	2,300	- 10	2,290	270	2,030	Ravenscrag fine sand	Hard, soda		S	Sufficient for local needs if cleaned.
25	NE.	24	"	"	"	Dug	14	2,300	- 7	2,293	14	2,286	Glacial gravel	Hard, clear	45	D, S	Sufficient for local needs.
26	NE.	25	"	"	"	Dug	9	2,250	0	2,250			Glacial sand	Hard, "alkaline"		S	Sufficient for 60 head stock.
27	SW.	25	"	"	"	Dug	10	2,250	- 6	2,244	10	2,240	Glacial yellow clay	Hard, clear		D, S	Insufficient for stock.
28	SE.	27	"	"	"	Bored	21	2,275	- 15	2,260	21	2,254	Glacial clay	Soft, clear	44	D, S	Insufficient for local needs.
29	N½	28	"	"	"	Dug	25	2,250	- 10	2,240	25	2,225	Glacial yellow clay	Hard, clear		D, S	Sufficient for 15 head stock in wet season.
30	SW.	30	"	"	"	Dug	14	2,400	- 11	2,389	14	2,386	Glacial yellow clay and gravel	Hard, clear	45	D, S	Sufficient for 10 head stock.
31	NE.	30	"	"	"	Dug	14	2,400	- 10	2,390	14	2,386	Glacial gravel	Hard, clear	45	D, S	Sufficient for 15 head stock.
32	SW.	31	"	"	"	Dug	25	2,300	- 11	2,289	25	2,275	Glacial gravel	Hard, cloudy	45	S	Sufficient for 10 head stock.
33	SE.	32	"	"	"	Dug	12	2,300	- 10	2,290	12	2,288	Glacial yellow clay	Hard, clear		D, S	Sufficient for stock in wet season.
34	SE.	34	"	"	"	Dug	20	2,250	- 18	2,232	20	2,230	Glacial yellow clay	Hard, clear		D, S	Insufficient for local needs.
35	NE.	34	"	"	"	Drilled	400	2,250	- 60	2,190	400	1,850	Ravenscrag sand and gravel	Hard, red, iron		D, S	Insufficient for local needs.

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of THE GAP NO. 39, 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
36	SW.	34	6	20	2	Dug	18	2,250	- 11	2,239	18	2,232	Glacial gravel	Hard, clear, "alkaline"	42	D	Sufficient for household needs only.
37	SE.	36	"	"	"	Dug	20	2,250					Glacial clay				Dry hole.
38	NW.	36	"	"	"	Dug	18	2,300	- 5	2,295	18	2,282	Glacial gravel	Hard, clear	42	D, S	Sufficient for 70 head stock.
39	NE.	36	"	"	"	Drilled	700	2,400	- 50	2,350	100	2,300	Glacial sand	Hard, clear, iron	42	D, S	Sufficient for local needs.
1	SW.	1	6	21	2	Dug	22	2,450	- 18	2,432	18	2,432	Glacial sand	Hard, clear	44	D, S	Insufficient for 3 head stock.
2	SW.	2	"	"	"	Bored	65	2,500	- 30	2,470	60	2,440	Glacial gravel	Hard, clear		D, S	Sufficient for 20 head stock.
3	SW.	2	"	"	"	Dug	14	2,490	- 10	2,480			Gladial clay	Hard, clear		S	Sufficient for 7 head stock.
4	NE.	2	"	"	"	Dug	30	2,490	- 28	2,462			Glacial sandy clay	Hard, clear		D, S	Insufficient for local needs.
5	SW.	3	"	"	"	Bored	40	2,520	- 20	2,500	40	2,460	Glacial gravel	Hard, clear, lime		D, S	Insufficient for local needs.
6	SW.	4	"	"	"	Dug	18	2,535	0	2,535			Glacial grey clay	Hard, clear		D, S	Insufficient for local needs.
7	NW.	4	"	"	"	Bored	130	2,520					Glacial	Hard, "alkaline"			Filled in now.
8	NW.	4	"	"	"	Dug	18	2,520	0	2,520			Glacial grey clay	Hard, clear		D, S	Insufficient for local needs.
9	NE.	5	"	"	"	Dug	14	2,505	- 9	2,496	9	2,496	Glacial blue sand	Hard		D, S	Sufficient for 20 head stock.
10	NE.	6	"	"	"	Dug	24	2,500	- 17	2,483			Glacial sandy clay	Hard, clear		D, S	Sufficient for 10 head stock.
11	NE.	10	"	"	"	Dug	20	2,450	- 15	2,435	15	2,435	Glacial sand	Hard		D	Sufficient for household only.
12	NE.	10	"	"	"	Bored	400	2,450					Ravenscrag coal				Dry hole.
13	SW.	12	"	"	"	Dug	18	2,480	- 14	2,466	14	2,466	Glacial sand	Hard, clear, "alkaline"	44	D, S	Insufficient for 8 head stock.
14	NW.	12	"	"	"	Dug	26	2,460	0	2,460			Glacial sandy clay	Hard, clear		D, S	Sufficient for local needs in wet years.
15	NE.	12	"	"	"	Dug	25	2,450	- 21	2,429			Glacial grey clay	Hard, clear, "alkaline"		D, S	Insufficient for local needs.
16	NE.	14	"	"	"	Dug	20	2,450	- 10	2,440	10	2,440	Glacial clay	Hard, clear, soda, iron		S	Sufficient for 20 head stock.
17	SE.	20	"	"	"	Dug	23	2,460					Glacial clay	Hard, clear, "alkaline"		S	Insufficient for local needs.
18	SE.	21	"	"	"	Dug	14	2,440	- 9	2,431	9	2,431	Glacial yellow clay	Hard, clear		D, S	Sufficient for 24 head stock.
19	NE.	21	"	"	"	Dug	25	2,450					Glacial clay	Hard, clear		D	Sufficient for household needs only.
20	NE.	22	"	"	"	Dug	16	2,460	- 12	2,448	12	2,448	Glacial gravel	Hard, clear		D, S	Sufficient for 20 head stock.
21	NE.	22	"	"	"	Dug	24	2,465	- 20	2,445			Glacial sandy clay	Hard		S	Sufficient for 20 head stock.
22	SE.	22	"	"	"	Dug	18	2,430	- 13	2,417	18	2,412	Glacial clay	Soft, clear		D	Sufficient for local needs.
23	SE.	23	"	"	"	Dug	24	2,430	- 18	2,412			Glacial gravelly clay	Hard, clear		D, M	Insufficient for town needs.

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of THE GAP NO. 39, 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
24	SE.	23	6	21	2	Dug	20	2,430	- 16	2,414	17	2,413	Glacial gravelly clay	Hard, clear		D	Insufficient for town needs.
25	NE.	23	"	"	"	Dug	24	2,420	- 20	2,400	20	2,400	Glacial sand, gravel and clay	Hard		D, S	Sufficient for house use and a few head stock.
26	SW.	24	"	"	"	Dug	18	2,440	- 4	2,436	14	2,426	Glacial sand	Hard, clear		D, S	Sufficient for 15 head stock.
27	NE.	24	"	"	"	Dug	25	2,400	- 22	2,378	22	2,378	Glacial gravel	Hard, clear, "alkaline"	46	D, S	Insufficient for 12 head stock.
28	SW.	25	"	"	"	Dug	12	2,420	0	2,420			Glacial clay	Hard, clear		D, S	Insufficient for local needs; hard water.
29	NE.	25	"	"	"	Bored	80	2,390	- 40	2,350	35	2,355	Glacial gravel	Hard, clear, "alkaline"		N	Not fit for use.
30	NE.	25	"	"	"	Dug	14	2,370	- 12	2,358			Glacial clay	Hard, clear, "alkaline		D, S	Insufficient for 30 head stock.
31	SE.	26	"	"	"	Dug	20	2,430			20	2,410	Glacial sand	Hard, clear, "alkaline"		N	Not fit for use. Filled in.
32	NW.	27	"	"	"	Dug	10	2,370	0	2,370	10	2,360	Glacial sand	Hard, clear, "alkaline"		S	Insufficient; 3 barrels a day.
33	SE.	28	"	"	"	Dug	16	2,400					Glacial				Dry hole.
34	SE.	30	"	"	"	Dug	16	2,440	0	2,440	14	2,426	Glacial gravel	Hard, clear		D, S	Sufficient for local needs.
35	SW.	30	"	"	"	Dug	12	2,390	- 10	2,380	10	2,380	Glacial clay	Hard, clear, "alkaline"		D	Insufficient; enough for house only.
36	NW.	31	"	"	"	Dug	15	2,440	- 12	2,428			Glacial sand	Hard, clear		D, S	Sufficient for local needs.
37	NE.	31	"	"	"	Dug	16	2,420	- 6	2,414			Glacial greyish red clay	Soft		D, S	Sufficient for local needs.
38	SW.	33	"	"	"	Dug	20	2,390					Glacial clay	Hard, "alkaline"		S	Sufficient for stock needs.
39	SE.	34	"	"	"	Dug	20	2,420	- 16	2,404	16	2,404	Glacial gravel	Hard, clear, iron		D, S	Sufficient for 50 head stock.
40	NE.	34	"	"	"	Dug	16	2,390	0	2,390			Glacial grey clay	Hard, clear		S	Sufficiency depends on rainfall.
41	NE.	34	"	"	"	Dug	16	2,390	- 8	2,382	10	2,380	Glacial coarse gravel	Hard, clear		D, S	Sufficient for 15 head stock.
42	SW.	35	"	"	"	Dug	23	2,415	- 18	2,397	23	2,392	Glacial gravel	Cloudy "alkaline"		S	Insufficient for local needs.
43	NW.	35	"	"	"	Dug	14	2,380	- 8	2,372	14	2,366	Glacial gravel and rock	Hard,		D, S	Sufficient for 100 head stock.
44	NE.	35	"	"	"	Dug	22	2,380	- 18	2,362	18	2,362	Glacial red sand	Soft, clear		D, S	Sufficient for 20 head stock.
45	SW.	36	"	"	"	Dug	16	2,360	- 12	2,348			Glacial clay	Hard		S	Sufficient for 12 horses.
46	NW.	36	"	"	"	Dug	15	2,400	- 12	2,388			Glacial blue clay	Soft, clear		D, S	Insufficient for local needs.
47	NE.	36	"	"	"	Dug	15	2,370	- 12	2,358	12	2,358	Glacial sand	Hard, clear		S	Insufficient for local needs.
48	NE.	36	"	"	"	Dug	23	2,380	- 15	2,365			Glacial clay	Hard, clear		D, S	Insufficient for 26 head stock.

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