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PRELIMINARY REPORT

GROUND-WATER RESOURCES OF THE RURAL MUNICIPALITY OF GRIFFIN NO. 66 SASKATCHEWAN

By

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GROUND WATER RESOURCES OF THE RURAL MUNICIPALITY OF GRIFFIN, NO. 66 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 OF THE MUNICIPALITY

The rural municipality of Griffin is an area of 324 square miles in the southeastern part of Saskatchewan. It consists of nine townships, described as townships 7, 8, and 9, ranges 10, 11, and 12, west of the second meridian. The village of Griffin, situated 20 miles east of the city of Weyburn, lies approximately in the centre of the municipality.

The southwestern and northwestern corners of the municipality are located in a glacial lake bed, and the topography of these districts is very flat.

A small terminal moraine, that was deposited by the glacial ice sheet, occurs in the central part of the municipality. This moraine is approximately 2 to 3 miles in width, and trends in a northwest to southeast direction paralleling the Canadian National railroad 2 miles to the south. Its presence is not readily detected since it rises gradually above the plain level to a maximum height of 20 to 25 feet. The ground surface covered by the moraine is more undulating, and contains more sloughs than the surrounding plain. Two small intermittent streams which flow into the Souris river have their headwaters in township 7, range 12.

Water-bearing Horizons in the Unconsolidated Deposits

The entire municipality is overlain by a mantle of glacial drift which is approximately 60 to 250 feet thick. This glacial drift is composed of a mixture of clays, sand, and gravel. Red, yellow, brown, grey, or chocolate-coloured boulder clay lies immediately below the top soil. The depth of this boulder clay varies greatly, but averages about 25 feet. Blue clay forms the bulk of the remaining glacial deposit. Sand and gravel occurs in layers and pockets at no fixed elevation all through the glacial drift, and these sand and gravel formations are the aquifers in every existing well, with the exception of one, in the municipality. The one exception is a well located in SW.¼, sec. 7, tp. 7, range 12, which was drilled through a

15-foot coal seam belonging to the Ravenscrag formation to a white sand aquifer.

Townships 7 and 8, range 11, and township 9, range 10, are underlain by a fairly continuous layer of sand and gravel. The latter township has the most uniform layer, but unfortunately the supply of water contained in it is small. The sand layers are found at an average depth of 25 to 35 feet from the ground surface and to a considerable extent are dependent on the rainfall for the supply of water. In general, a better supply of water is obtained from this horizon when it occurs at depths of at least 35 feet. The water is only slightly "alkaline". since the seepage does not come into contact with the blue clay, which underlies the sand. It is suitable for human use, but there is not a sufficient quantity to water more than 10 to 20 head of stock.

The remainder of the municipality is not underlain by continuous sand layers of any great extent, the sand and gravel being in the form of pockets. In districts of the municipality where this condition exists, it is recommended that before digging a well a large number of test holes be made with a 2-inch auger. Isolated sand pockets in the blue clay have been tapped by wells at a depth of 80 feet, so it is advised that test borings be made to a depth of at least 60 feet.

In township 7, range 10, "alkaline" water in large quantities has been located in four different horizons of quicksand at levels of 70 to 90 feet, 130 to 140 feet, 175 feet, and 210 to 235 feet from the surface. A heavily "alkaline" flow was located in one well at a depth of 400 feet. These aquifers, apparently, are confined to this one township and considerable trouble has been experienced with fine sand clogging the screens. Sections 3, 4, 9, 10, 11, 14, 15, 16, 21, 22, 23, 25, 26, 27, 28, and, possibly, 33, 34, and 35 are in this region.

Water-bearing Horizons in the Bedrock

Water in large quantities exists in the Ravenscrag formation, but there are no water-bearing horizons in the Marine Shale formation. The Ravenscrag formation may be recognized by one or more lignite coal seams contained in it. Coal was encountered in one well in township 7,

range 12, at a depth of 60 feet from the surface. Coal seams were reported at a depth of 100 feet from the surface in township 7, range 11, but no coal was reported in wells 235 feet deep in township 7, range 10. From this information it is inferred that the Ravenscrag formation dips towards the northeast. It is possible then, that drilled wells will encounter water in the bedrock at depths of: 60 to 100 feet in the south of township 7, range 12; 100 to 200 feet in township 7, range 11; and at depths in excess of 200 feet in township 7, range 10, and the southern part of township 8, range 10.

North of the line shown on the map that marks the boundary between the Ravenscrag and Marine Shale formation, it is impossible to secure water from the bedrock. The shale is encountered at a depth of 180 feet in the well sunk in the village of Froude, and also at a depth of 136 feet in a well in SE.¼, sec. 2, tp. 8, range 12. In sec. 20, tp. 9, range 11, a dry hole 900 feet deep has been drilled, and in the northern part of township 7, range 12, a dry hole 400 feet deep.

In view of the above information, drilling operations north of the line should be confined to the glacial drift overlying the shale. South of the line it is possible to strike water in the Ravenscrag bedrock formation at comparatively shallow depth in the western part of the municipality, and greater depths in the eastern part.

The water from the Ravenscrag formation is usually soft, has a soda content, and may be salty. The supply is abundant.

The municipality constructed dugouts to alleviate the water situation in the drought years of 1930-1934. One of them is located in sec. 19, tp. 8, range 10, and another in sec. 10, tp. 9, range 10, their size being 100 by 40 by 12 feet. A number of farmers have made their own dugouts and those who have made them deep enough have been well repaid for their efforts.

GROUND WATER CONDITIONS BY TOWNSHIPS

Township 7, Range 10

There are only three wells in this township, dug to depths less than 40 feet, that yield a sufficient supply to water over 20 head of stock. These wells are located in NW.¼, section 2, SE.¼, section 32, and NE.¼, section 31. The first well is the only one of the three that yields a "non-alkaline" water that is suitable for both human and stock use. All other shallow wells supply alkaline water that is not potable for humans, and the quantity is insufficient for stock purposes.

Red or yellow clay, with the former predominating, lies beneath the top soil to depths of 12 feet to 25 feet, followed by blue clay. A small sand layer may be found separating the red clay from the blue clay. Sand streaks that yield a small supply of "alkaline" water occur in the blue clay up to a depth of 70 feet from the surface. Due to the absence of sand and gravel beds in appreciable thicknesses up to this depth of 70 feet, the results of shallow well digging are very unsatisfactory in this township.

A number of wells have been drilled to depths ranging from 70 to 400 feet in order to obtain a permanent and abundant supply of water. Within this range, there are five water-bearing horizons.

The first water-bearing horizon is a 15-foot layer of quicksand underlying the blue clay at depths of 70 feet to 90 feet from the surface. The water derived from this quicksand bed is very hard, "alkaline", and contains iron. It is usable for stock, but not for humans. The hydrostatic pressure is low, the water rising only 20 feet to 30 feet above the source. Wells that have been drilled to this aquifer have experienced difficulty with the quicksand clogging the screens, thus rendering the well useless.

The second water-bearing horizon is located at a depth of 120 feet to 140 feet from the surface, and is separated from the first horizon by a sandy gravel bed 10 feet thick. The water

obtained from it is under a high hydrostatic ~~pressure and~~ rises to within 12 feet of the surface. The water is not so "alkaline" as that found in the first horizon and has been used for irrigation purposes with a fair amount of success. It is not used for household purposes, and trouble is caused by the sand particles plugging the screens.

A drilled well in NW.¼, section 3, tapped the third water-bearing horizon at 175 feet from the surface. This aquifer is a sand bed of unknown thickness. The water contained in it has a high proportion of dissolved salts which render it unfit for human use, but suitable for stock. The water is milky in colour and on being boiled it turns black. The hydrostatic pressure causes the water to rise within 20 feet of the surface. Wells drilled to this aquifer would be suitable for stock on account of the abundance of water, but sand plugging difficulties must be overcome.

The fourth, and most satisfactory water-bearing horizon, is struck at 210 feet to 235 feet from the surface. The aquifer is a blue sand and gravel bed 40 feet thick. Two wells, one in SE.¼, section 23, and the other in NE.¼, section 26, apparently strike the same aquifer, but the character of the water is totally different. In the former well the water is hard, "alkaline", and contains iron, and it is not usable for humans. The latter well provides a soft water with a soda content, and it has been found excellent for both house and stock use. The hydrostatic pressure is fairly high in each well; the water rises to within 70 feet of the ground surface and pumping cannot lower this level. Sand plugging has not troubled these wells.

A well was drilled 400 feet in NE.¼, section 27, but the water obtained was too heavily "alkaline" for stock use and it was abandoned.

Water suitable for stock can be obtained in abundant quantities at any one of the four horizons if sand plugging difficulties can be overcome. The water-bearing horizon that occurs at a depth of 230 feet provides the best water, and the chances of

obtaining a soft water suitable for house as well as stock use are good.

As an alternative to drilling, small deep dugouts are recommended for farmers who cannot obtain a sufficient supply of stock water at shallow depths. The possibilities of striking a good supply of water at shallow depths are small.

Township 7, Range 11

Within a depth of 90 feet from the surface, water-bearing horizons occur at irregular intervals anywhere in the township.

In the southern and central parts of the township a bed of fine, white or bluish sand is the aquifer in the majority of the wells. This bed of sand is 3 to 10 feet thick and underlies 15 feet to 20 feet of yellow boulder clay. This aquifer, as a rule, can be depended on to yield a supply of water that will be sufficient for at least 25 to 30 head of stock. Rainfall conditions affect these wells to some extent, but prolonged drought does not cause them to become entirely dry.

The water, unfortunately, is heavily "alkaline", hard, and contains iron. It is suitable for stock, but cannot be used for domestic purposes. The water is under little or no hydrostatic pressure. Sand or gravel beds occur in varying thicknesses, at irregular intervals, up to a depth of 90 feet from the surface. The supply of water is variable; one well may give an abundant supply, whereas another dug a short distance away may yield very little water. However, water is not difficult to obtain at shallow depths in this township, but in nearly every case its character is such that it cannot be used for household purposes.

The deepest well reported was 90 feet. Coal is said to occur at 100 feet below the surface in a seam 1 foot to 2 feet thick. If the report is correct, water of excellent quality may be obtained at depths greater than 100 feet in the Ravenscrag bedrock formation.

Township 7, Range 12

The glacial drift in this township consists of a mixture of yellow clay, sand, gravel, and blue clay.

In the northern half of the township sand and gravel layers are located beneath the yellow clay at depths of 7 feet to 20 feet. These layers of sand and gravel yield a limited supply of highly mineralized water that cannot be used for household purposes. The supply depends largely on rainfall conditions. Farmers have been using three or four wells in an effort to obtain sufficient water to supply their stock. Drinking water for human use is very difficult to find.

Water has been located at a depth of 40 feet in two wells but is heavily "alkaline" and salty, and the quantity is small.

An attempt to obtain water at depth has been made in NW.¼, section 33, without success. The depth of the dry hole was 400 feet and there was solid blue clay to the bottom, after the few small sand layers at the surface had been pierced.

In the southern half of the township there were no shallow wells reported. It is probable that the same condition exists here as in the northern half of the township.

Three drilled wells, located in SE.¼, section 6, SW.¼, section 7, and SW.¼, section 8, strike a bluish white sand aquifer at a depth of 110 to 130 feet from the surface. The water is soft, "non-alkaline", salty, and contains soda and iron. It is palatable and can be used for domestic purposes. The water in these wells acts under sufficient pressure to cause it to rise to within 30 feet of the ground surface. A 15-foot coal seam was reported in the well in SW.¼, section 7, at a depth of 60 feet, but there was no coal in the other two wells. In SW.¼, section 8, five dry holes were drilled to a maximum depth of 450 feet before water was obtained.

A well located in SE.¼, section 2, struck the same aquifer at 80 feet from the surface, but the water is slightly hard and "alkaline." It is usable for both humans and stock.

The only reliable source of water in the township occurs in the sand bed located 80 to 120 feet from the surface. Drilling to depths over this amount has proved futile.

Township 8, Range 10

The entire township is covered with a glacial deposit consisting of yellow clay, a little red, grey, and white clay, sand and gravel, and blue clay. This glacial deposit is approximately 180 feet thick and overlies the Marine Shale formation.

There are two water-bearing horizons which are tapped by existing wells in the township. The first water-bearing horizon occurs at a depth of 18 feet to 30 feet below the ground surface and generally underlies the yellow boulder clay. In some wells a strip of blue clay 5 feet to 10 feet thick separates the yellow clay from the yellowish sand that forms the water-bearing horizon. Farmers experience difficulty in securing a good yield of water from this aquifer, and many dry holes have been dug to a depth of 30 feet. This aquifer, therefore, does not run continuously through the township, but is made up of sand pockets. The size and depth of the pockets determine the quantity of water yielded when it is tapped by a well. The water from these sand pockets is hard and, in a few cases, slightly "alkaline." Two wells, located in SE.¼, section 8, and NE.¼, section 9, have water that is under a slight hydrostatic pressure, but the remainder of the wells contain water that is without pressure. The drought of 1930 to 1934 has lowered the level of the water in these wells, but 10 to 20 head of stock could be still watered without difficulty.

The second water-bearing horizon appears in a 6-foot bed of sand occurring at an approximate depth of 15 to 60 feet below the surface. Apparently this bed is not continuous either, because many dry holes have been dug or bored over 60 feet in depth. Three wells in the township receive their supply from this source. They are located on NW.¼, section 2, NE.¼, section 10, and SW.¼, section 32. The water obtained in these wells acts under a

hydrostatic pressure, causing it to rise to within 15 feet of the surface. Between 50 and 100 head of stock may be watered at any one of these wells without difficulty. The water is hard, slightly "alkaline", and usable for humans. The drought has not affected the supply of water in these wells.

Farmers who possess a well that yields an abundance of water have obtained it after digging many holes. Approximately one-half of the farmers in the township are still without a permanent supply of water.

Other horizons have been tapped in the township. Heavily "alkaline" water was in a gravel bed at a depth of 110 feet in a bored well located in NW.¼, section 19. In SE.¼, section 33, a 160-foot drilled well is at the present time plugged with sand. A number of dry holes have been made to depths of 120 to 200 feet. In 1915, a 500-foot drilled well was sunk in the town of Froude and water was found in a limited quantity at 180 feet, immediately above the bedrock shale, but the well has been abandoned. Water will not be obtained from the Marine Shale bedrock formation. The municipality has constructed a dugout in section 19 that has been of great value to many farmers for stock purposes. These dugouts have been very satisfactory and their construction is recommended where shallow well digging is not successful.

Township 8, Range 11

This township is overlain entirely with a deposit of glacial drift which is at least 100 feet thick. It is composed of yellow-brown boulder clay, sand, gravel and quicksand, and blue clay.

There are two water-bearing horizons that are tapped by the existing wells in the township. The first water-bearing horizon consists of a bed of quicksand, and it immediately underlies the yellow boulder clay. In digging a well this yellow clay is encountered beneath the top soil and will extend to a minimum depth of 8 feet and to a maximum depth of 35 feet. The coarse sand layers underlie the

shallower deposits of yellow clay and the finer sand or quicksand serves as the aquifer beneath the deeper deposits of yellow clay. In general, the water supply from the 30-foot and 40-foot wells is greater than the supply from the 20-foot wells. The water in the deeper wells acts under a slight hydrostatic pressure, for instance, the wells in SE.¼, section 33, which are approximately 40 feet in depth, yield water that rises to within 15 feet and 20 feet of the surface. The water is hard and "alkaline", and there is a sufficient supply to water 50 head of stock without difficulty. The water is not so "alkaline" that it cannot be used for household purposes. The shallower, 20-foot, wells are not so dependable in drought years as the deeper wells. The water is hard, very slightly "alkaline", and does not act under pressure. The lack of rainfall affects these wells and they cannot be depended upon to yield a supply that will water more than 10 to 20 head of stock.

The second water-bearing horizon lies at a depth of 80 feet below the ground surface and is separated from the first water-bearing horizon by blue clay. Two wells, located in NE.¼, section 5, and SE.¼, section 7, have tapped this aquifer. The hydrostatic pressure causes the water to rise to within 40 to 50 feet of the surface and the supply is not affected by a decrease in the amount of rainfall. The water is hard, and in one of the wells it is too "alkaline" to be usable for humans.

Water suitable for human use is more apt to be found in the shallower, 15- and 20-foot, wells. Direct rainfall seepage, which has not been in contact with the blue clay, is not "alkaline." Wells over 20 feet in depth contain a certain amount of underground water as well as rainfall seepage water, and the result is an "alkaline" type of water.

A well in NE.¼, section 9, tapped a third horizon at a depth of 107 feet and the water rose to within 65 feet of the surface. The water was too heavily mineralized and was abandoned.

In sections 15, 16, 21, 22, 23, 24, 25, 26, 27, 28, 32, and

part of 33 a better supply of water is more readily obtained than in the remainder of the township. However, it is probable that a good supply of stock water may be obtained at the 80-foot level anywhere in the township, particularly in the southern sections.

Township 8, Range 12

The initial 40 feet of glacial deposit in this township consists of a mixture of yellow, grey, and chocolate-coloured clay, sand, gravel, quicksand, blue clay, and layers of boulders. There is not definite thickness or continuity of any one type of material. Usually the upper 10 to 20 feet is composed of yellow and chocolate-coloured clay. Gravel, sand, or quicksand may or may not underlie the boulder clay. If it does, a layer of boulders 1 foot in thickness usually separates the yellow or chocolate clay from the sand or gravel. The depth of this aquifer that is formed by the sand and gravel deposits varies from 1 foot to 10 feet. Blue clay generally is found at a depth of 30 feet and may extend without interruption until bedrock is reached. In other places quicksand is struck at a depth of 40 feet and 60 feet.

There is no continuous water horizon. The sand and gravel deposits occur as pockets and this is the explanation of the fact that one farmer will possess a well 20 feet in depth yielding an abundant supply of water, whereas his neighbour will sink a large number of dry holes to blue clay without striking an aquifer. An excellent supply of usable water, acting under a hydrostatic pressure, has been obtained up to a maximum depth of 60 feet. Before digging a well, it is suggested that numerous borings be made with a 2 inch auger. In this manner, the possibilities of striking a suitable aquifer are greater, and a minimum amount of effort is expended. After a sand lens has been tapped by the auger, the well may be dug. Borings should be made to a maximum of 60 feet.

Water will probably not be found at depths in excess of 60 feet. A dry hole was drilled 136 feet to shale in SE.$\frac{1}{4}$, section 2, and a second dry hole in NW.$\frac{1}{4}$, section 2, was 365 feet deep. The

shale struck at 136 feet in the first dry hole belongs to the bedrock Marine Shale formation. This formation contains no water-bearing horizons, and it is useless drilling farther after the shale has been encountered.

Township 9, Range 10

A glacial deposit of grey or yellowish brown clay underlies the top soil. It varies in depth from 10 feet to a maximum of 35 feet. Underlying the grey clay is the water-bearing horizon for every existing well but two in the township. This water-bearing horizon consists of a layer of buff-coloured sand, and it has an average thickness of 3 feet. Occasionally gravel is substituted for the sand. Blue clay invariably underlies the sand to a depth of 50 feet from the surface where a 5-foot sand bed is struck by two wells in section 18. Blue clay underlies the second sand bed to an unknown depth.

The first sand layer is struck at almost any point in the township. The water contained in it is hard and varies in character, being slightly "alkaline" and usable for humans to heavily "alkaline" and not suitable for humans or stock. Approximately 25 per cent of the existing wells that strike this aquifer contain water that is under a slight hydrostatic pressure which causes the water to rise 4 and 5 feet above the water-bearing horizon.

These wells were affected by the drought of 1930 to 1934, but not to such an extent that they became dry. In general, these wells can be depended upon to supply a sufficient amount of water for no more than 15 to 20 head of stock.

The two 50-foot wells located in section 18 were found to be unreliable in the drought years, both of them being classed as intermittent wells. The water contained in them is "alkaline" and is not under pressure. This township is characterized by the comparatively large number of dugouts contained in it. Twelve dugouts were counted by the field party, including a municipal dugout in section 10. The dugouts if constructed in a suitable place have proved to be a successful method of conserving a supply of water

for stock use. The municipal dugout was used by many farmers when their own wells did not meet the demands of their stock.

No deep wells were reported. A dry hole in NW.¼, section 1, was dug to a depth of 75 feet without penetrating the blue clay. It is doubtful if water can be obtained by drilling operations.

Township 9, Range 11

The township is overlain by a mantle of glacial deposits which consists of yellow clay, coarse and fine sand streaks, and blue clay.

Yellow sandy clay extends beneath the top soil to depths of 10 to 25 feet. With the exception of sections 24, 25, and 36, a very small layer of fine sand occurs beneath the yellow clay. In sections 24, 25, and 36 the thickness of this sand bed is increased to 5 feet. A small layer of boulders in some places is struck at the same level as the sand. Blue clay underlies the sand to an unknown depth and small sand streaks have been located in the upper 40 feet of the blue clay.

Wells that have struck the thick fine sand in sections 24, 25, and 36 yield an abundance of hard, "non-alkaline" water which is suitable for human use. The dry period of 1930 to 1934 has caused the level of the water in these wells to be lowered, but, in spite of the decrease, each well will yield sufficient water for 75 head of stock. The sand aquifer is struck at a depth of 25 feet from the surface and the water contained in it is not under pressure.

In the remainder of the township small sand streaks 2 inches to 1 foot thick are found beneath the yellow clay, and the supply of water yielded by them is very limited. In seasons of average precipitation a substantial supply of water is obtained from the wells, but in periods of drought the wells are not dependable. A supply of water sufficient for household needs is all that can be expected in these wells.

Wells dug 50 feet to 60 feet deep into the blue clay strike small sand beds which yield small quantities of heavily alkaline water.

It is very doubtful if water can be obtained at depths of over 60 feet in this township. The Marine Shale formation underlies the blue clay of this township, and contains no water-bearing horizons. A dry hole 900 feet deep has been reported to have been drilled in the northwestern part of the township.

A municipal dugout is located in SW.¼, section 29. Farmers who cannot obtain substantial quantities of water before striking the blue clay are advised to dig small, deep dugouts. These dugouts have proved satisfactory as a source of water for stock use.

Township 9, Range 12

A glacial lake bed occurs in the northwest corner of the township and it is distinguished from the glacial till deposits of the remainder of the township by its flat topography.

A yellow clay bed 10 to 25 feet thick is found underlying the top soil. In the glacial lake region the yellow clay is of a sandy nature and its thickness is not so great as in the glacial till section. The formation underlying the yellow clay varies greatly within short distances. In some places a sandy gravel bed 20 feet thick is found, whereas in others the sand bed may be only 2 feet thick. A 15-foot blue or greyish clay often occurs beneath the yellow clay, followed by small gravel beds. In any case, blue clay is generally struck at a depth of 30 to 35 feet from the surface and extends to a depth of at least 100 feet. A second sand bed is found in the blue clay at approximaterly 50 to 60 feet from the surface.

Water-bearing horizons may occur at any depth up to 70 feet, but, generally speaking, the aquifers that yield the greatest supply of water occur at the 25-foot and 50-foot levels.

The water from the sand at the 25-foot level is medium hard, and "alkaline", but not so "alkaline" that it cannot be used for household purposes. There are exceptions, as example, in a well in SW.¼, section 16, where the water is not usable for humans and even the stock do not care to drink it. The drought period of 1930 to 1934 has affected the supply in the 25-foot wells considerably, but as a rule they can be

depended upon to yield sufficient water for 10 to 20 head of stock. The water is not under pressure.

The water-bearing sand horizon located in the blue clay at the 50-foot level yields a more abundant supply and 30 head of stock can be watered at these wells without difficulty. Since the water is in close contact with the blue clay it can be expected that it is heavily "alkaline" and unsuitable for human use. It also contains iron and leaves a brown sediment in the pail. The water may or may not be under hydrostatic pressure, and the drought has affected the supply very slightly. A good example of this type of well is located in SW.¼, section 24, where the water rises to within 19 feet of the ground surface. This well will water 100 head of stock. A second well of this same type is located in NW.¼, section 8.

The well water supply is quite variable in the township. Apparently the supply depends not only on rainfall condition, but also on the manner in which the aquifer has been laid down by the glaciers. If the sand bed is concave and covers a large area it contains large quantities of water. If the sand layer is flat or convex the supply contained is relatively smaller.

No definite statement can be made as to the exact location of a substantial water source, but it is known from existing wells that sand pockets do occur in this township, and if they are tapped will yield a good supply of water.

It is unlikely that water horizons will be found at depths greater than 100 feet in this township.

Statistical Summary of Well Information in Rural Municipality of Griffin, No. 66, Saskatchewan

West of 2nd Mer. Township / Range	7 10	7 11	7 12	8 10	8 11	8 12	9 10	9 11	9 12	Total No. in Municipality
Total No. of Wells in Township	61	34	77	67	49	57	49	32	36	422
No. of Wells in bedrock	0	0	2	1	0	2	0	1	0	6
No. of wells in glacial drift	61	34	35	66	49	55	49	31	36	416
No. of wells in alluvium	0	0	0	0	0	0	0	0	0	0
Permanency of Water Supply										
No. with permanent supply	30	34	30	35	38	30	38	19	30	284
No. with intermittont supply	5	0	1	6	7	16	6	3	0	44
No. dry holes	26	0	6	26	4	11	5	10	6	94
Types of Wells										
No. of flowing artesian wells	0	0	0	0	0	0	0	0	0	0
No. of non-flowing artesian wells	7	3	3	5	14	13	12	0	1	58
No. of non-artesian wells	28	31	28	36	31	33	32	22	29	270
Quality of Water										
No. with hard water	32	30	21	39	45	46	39	20	27	299
No. with soft watef	3	4	10	2	0	0	5	2	3	29
No. with salty water	0	0	4	0	0	0	0	1	0	5
No. with "alkaline" water	13	16	14	5	24	17	15	9	13	126
Depth of Wells										
No. from 0 to 50 feet deep	51	32	26	58	45	50	48	28	31	369
No. from 51 to 100 feet deep	4	2	3	5	3	5	1	3	5	31
No. from 101 to 150 feet deep	3	0	4	2	1	1	0	0	0	11
No. from 151 to 200 feet deep	1	0	3	1	0	0	0	0	0	5
No. from 201 to 500 feet deep	2	0	1	1	0	1	0	0	0	5
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	17	17	21	29	33	33	36	15	18	219
No. not usable for domestic purposes	18	17	10	12	12	13	8	7	12	109
No. usable for stock	32	29	25	37	42	41	44	20	27	297
No. not usable for stock	3	5	6	4	3	5	0	2	3	31
Sufficiency of Water Supply										
No. sufficient for domestic needs	35	30	29	41	44	45	44	22	29	319
No. insufficient for domestic needs	0	4	2	0	1	1	0	0	1	9
No. sufficient for stock needs	18	14	17	23	31	21	30	10	18	182
No. insufficient for stock needs	17	20	14	18	14	25	14	12	12	146

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 Griffin, No. 66, Saskatchewan.

NO.	LOCATION					Depth of Well, Ft.	Total dis'vd solids	HARDNESS			CONSTITUENTS AS ANALYSED						CONSTITUENTS AS CALCULATED IN ASSUMED COMBINATIONS								Source of Water
	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.	SE.	18	7	11	2	28	6,180	2,500	2500		280	575	430	436	3,739	1,869	6,180	575	258		1,299		3,724	462		x 1
2.	SW.	7	7	12	2	130	2,760	55	15	40	865	715	30	14	500	1471	2,760	54		29		670	740	1427		x 2
3.	NW.	21	9	10	2	19	2,029												(2)		(3)	(4)	(1)	(5)		x 1
4.	SW.	14	9	11	2	24	7,580	3,000-	3000-		215	250	450	803	4436	1359	6,680	250	996		2,393		2,686	355		x 1

Water samples indicated thus, x 1, are from glacial drift or other unconsolidated deposits.
Water samples indicated thus, x 2, are from bedrock, Ravenscrag formation.
Analyses are reported in parts per million; where numbers (1), (2), (3), (4), and (5) are used instead of parts per million, they represent the relative amounts in which the five main constituents are present in the water.
Hardness is the soap hardness expressed as calcium carbonate ($CaCO_3$).
Analysis No. 3, by Provincial Analyst, Regina.
For interpretation of this table read the section on Analyses and Quality of Water.

Water from the Unconsolidated Deposits

Three samples of water taken from wells in the glacial drift were analysed and the results are given on the accompanying table of analyses.

Samples from two wells, one in SE.¼, sec. 18, tp. 7, range 11, and the other in SW.¼, sec. 14, tp. 9, range 11, were collected because the water in these wells was obviously very highly mineralized. The analyst reported a total dissolved content of 6,180 parts per million in one sample and 7,580 in the other. These results are extremely high, and do not give a true representation of the quality of the water in most of the wells in the glacial drift in the municipality. The amount of dissolved mineral salts is approximately three times the limit that is considered the maximum allowable content in water used in the Prairie Provinces for household purposes. Therefore, these two wells should not be used as a source of water for human consumption.

In some countries water having a content in excess of 1,000 parts per million of dissolved salts is considered to be not suitable for human use. On the Canadian Prairies a total dissolved salt content of 2,000 parts per million in water in not thought to be excessive, or injurious to health, provided, of course, that one salt, such as $MgSO_4$ (Epsom Salts), does not occur in a relatively high proportion in comparison to the other dissolved salts.

The well in NW.¼, sec. 21, tp. 9, range 10, yields water that shows a total dissolved content of 2,029 parts per million. This figure probably represents approximately the amount of salts that is generally found in well water of glacial origin in this municipality. Such water appears to produce no ill effects on people who habitually use it, but persons unaccustomed to its use would consider this water objectionable.

The main constituents of the total dissolved solids in this sample are the sulphates, Na_2SO_4, $MgSO_4$, and $CaSO_4$, and the magnitude in which they appear is in the order named. Sodium

sulphate (Na_2SO_4) is commonly known as Glauber's Salts. It is practically tasteless and produces a slight laxative effect on the human system. The presence of Na_2SO_4 in water is not injurious to the human system unless it is present in large quantities. Magnesium sulphate ($MgSO_4$), commonly termed Epsom Salts, is the constituent in the water from these wells that has the most harmful effect on people who are not used to drinking water of this character. Since its proportion relative to the total solid content is second only to Glauber's Salts, water from wells with a content as high as was found in the well in SW.$\frac{1}{4}$, sec. 14, tp. 9, range 11, probably would have a scouring effect on stock. Epsom Salts, besides imparting a strong laxative effect, also causes water to taste bitter. Calcium sulphate ($CaSO_4$) is the third highest salt in proportion to the total dissolved solids. This salt as well as calcium and magnesium carbonate produces scale on boilers and causes "furring" on the inside of kettles. It is not harmful to the human system. The presence of $MgSO_4$ and $CaSO_4$ in water from the glacial drift causes it to be permanently hard. Sodium chloride (NaCl), common salt, although it is fourth in magnitude to the other combined salts, is present in fairly high amounts. Quantities of NaCl much in excess of 400 parts per million will cause water to have a brackish taste and to be unfit for human use, not because it is injurious to the body but the water will not quench one's thirst.

Water from the Bedrock

One well in SW.$\frac{1}{4}$, sec. 7, tp. 7, range 12, is in the bedrock, and a sample of the water from it was analysed. It will be seen from the table of analyses that the mineral character of the water from this well is widely different from that of the waters from the glacial drift. Differences in the quantities of the salts contained in the ground water are due to the differences in the composition of the rocks and soils through which it has passed, and the length of time it has been in contact with these rocks and soils.

This sample has a total dissolved mineral content of 2,760 parts per million. Practically the entire content is made up of the sodium salts, in the following order of magnitude, NaCl, Na_2SO_4, and

Na_2CO_3. The small proportion of $MgCO_3$ and $CaCO_3$ is practically negligible. Common salt (NaCl) forms one-half of the total dissolved solids. NaCl in such large quantities causes the water to be unfit for domestic purposes, and stock are apt to drink too much of it in order to quench their thirst. Sodium carbonate, (Na_2CO_3) black alkali, is the most harmful for irrigation purposes of all the salts found in ground water. This water contains 670 parts per million of Na_2CO_3, and therefore would be harmful to vegetation.

The absence of carbonates in the sample accounts for the soft character of the water in spite of the high mineral content.

WELL RECORDS—Rural Municipality of GRIFFIN NO. 66, 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	NW.	2	7	10	2	Dug	20	1,970	- 14	1,956	4	1,966	Glacial sand	Hard, clear		D,	Sufficient for 14 head stock, and 9 horses.
2	NW.	3	"	"	"	Drilled	174	1,970	- 20	1,950			" fine sand	"Alkaline" Cloudy		S,	" " 70 " " , 230 sheep.
3	NE.	4	"	"	"	Bored	73	1,965	- 68	1,897			" sand	Hard, clear, iron, "alkaline"		S,	Insufficient for 20 head stock.
4	SE.	9	"	"	"	"	90	1,970	- 72	1,898	75	1,895	" "	Hard, cloudy, iron, "alkaline"		S,	" on account of sand clogging screens
5	SW.	10	"	"	"	Drilled	137	1,975	- 12	1,963	137	1,838	" gravel	Hard, clear, iron		S,	" after becoming clogged with sand in 1930.
6	NE.	11	"	"	"	Dug	25	1,970									Dry hole. Another dry hole 12' deep.
7	SE.	12	"	"	"	"	12	1, 970	0	1,970	11	1,959	Glacial fine sand	Soft, clear,		D, S	Sufficient for 5 head stock.
8	SW.	14	"	"	"	Bored Drilled	128	1,975	- 13	1,962	124	1,851	Glacial gravel stones	Hard, " "alkaline"		D, S, I	" " 40 " " .
9	NW.	16	"	"	"	Drilled	120	1,970	- 30	1,940	100	1,870	Glacial sand, gravel	Hard, clear, iron		S,	" " 50 " " .
10	NE.	19	"	"	"	Dug	52	1,975	- 44	1,931	51	1,924	Glacial sand gravel	Hard, clear, iron		D, S	Insufficient for 35 head stock.
11	SE.	22	"	"	"	"	16	1,970	0	1,970			Glacial yellow clay	Hard, clear		D, S	Intermittent well.
12	SE.	23	"	"	"	Drilled	235	1,980	- 75	1,905	195	1,785	Glacial sand	"		S,	Sufficient for 50 head stock.
13	NE.	26	"	"	"	"	216	1,980	- 60	1,920	176	1,804	" gravel	iron, "alkaline" Soft, clear, soda		D, S, I	" " 50 " " .
14	NE.	27	"	"	"	Dug	14	1,970	- 5	1,965	4	1,966	" sand	Hard, clear		D, S,	" " 14 " " .
15	NW.	27	"	"	"	"	20	1,970	- 4	1,96			" blue clay	" "		D, S	Intermittent well.
16	SW.	28	"	"	"	Bored	30	2,010	- 12	1,998	29	1,981	" sand	Hard, cloudy, iron, "alkaline"		S,	Insufficient for 25 head stock.
17	NW.	30	"	"	"	Dug	13	1,975	- 7	1,968	9	1,966	" "	Hard, clear, "alkaline"		S,	Intermittent well.
18	NE.	31	"	"	"	Bored	40	1,970	- 36	1,934	36	1,934	" "	Hard, clear, "alkaline"		S,	Sufficient for 80 head stock.
19	SW.	32	"	"	"	Dug	14	1,975	- 8	1,967	7	1,968	" "	Soft, clear		S,	Intermittent well.
20	SE.	32	"	"	"	"	24	1,970	- 22	1,948	20	1,950	" gravel	Hard, " "alkaline"		S,	Sufficient for 22 head stock.
21	NE.	32	"	"	"	"	30	1,980	- 8	1,972	30	1,950	" sand	Hard, clear, iron		D, S	Insufficient for 12 head stock.
22	NW.	33	"	"	"	"	15	1,980	- 9	1,971			" yellow clay	Hard, clear, iron		D, S	Intermittent well.
1	NE.	1	7	11	2	Bored	36	1,973	- 18	1,955	36	1,937	Glacial sand	Hard, clear, iron, "alkaline"		S,	Sufficient for 25 head stock.
2	SE.	4	"	"	"	Dug	25	1,996	- 11	1,985	18	1,978	" fine white sand	Hard, clear, "alkaline"		S,	" " 60 " " .
3	SW.	5	"	"	"	"	35	1,970	- 31	1,939	29	1,941	Glacial fine white sand	Hard, clear, iron, "alkaline"		S,	" " 16 " " . Bitter taste.
4	SW.	6	"	"	"	"	17	1,963	- 7	1,956	9	1,954	Glacial sand and gravel	Hard, clear, iron, "alkaline"		D, S	" " 8 " "" .
5	SW.	9	"	"	"	"	23	2,015	- 14	2,001			Glacial sand	Soft, clear	44	D,	Abundant supply, but only used for house.

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

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

WELL RECORDS—Rural Municipality of GRIFFIN NO.66, 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
6	SW.	10	7	11	2	Dug	23	2,008	- 12	1,996	17	1,991	Glacial fine blue sand	Hard, clear, soda		S,	Sufficient for 55 head stock. 20 bbls. a day Laxative effect on humans.
7	SE.	15	"	"	"	"	28	1,998	- 25	1,973			Glacial fine sand	Hard, clear,		D, S	Sufficient for household needs only and 1 team
8	SE.	17	"	"	"	"	25	2,010	- 15	1,995	25	1,985	Glacial sand	" " "alkaline"	47	S,	" " 30 head stock.
9	SE.	18	"	"	"	"	22	2,033	- 12	2,021			" "	Hard, clear, iron, "alkaline"		N,	Not fit for man or beast. #
10	NW.	18	"	"	"	Bored	25	2,018	- 15	2,003			" "	Hard, clear, iron		D, S	Insufficient for 5 head stock.
11	NW.	21	"	"	"	"	20	2,018					" "	Hard, clear, "alkaline"	46	S,	Waters 10 head stock.
12	NE.	22	"	"	"	Dug	20	2,003	- 5	1,998			" fine white sand	Hard, clear, "alkaline"		S,	Sufficient for 8 head stock.
13	NW.	27	"	"	"	Bored	90	2,001	- 85	1,916			Glacial sand	Hard, clear, iron, "alkaline"		S,	Insufficient, waters only 5 head stock.
14	SE.	28	"	"	"	"	76	1,998	- 36	1,962	67	1,931	" "	Hard, clear, iron, "alkaline"		S,	" for local needs. Only 1 bbl. a day.
15	NW.	33	"	"	"	Dug	20	1,989	- 16	1,973	14	1,975	" gravel	Hard, clear		D, S	" waters only 5 head stock.
16	SW.	34	"	"	"	Bored	30	2,002	- 10	1,992			" "	" yellow colour, iron		D, S	Sufficient for 25 head stock.
1	SE.	2	7	12	2	Bored	80	1,948	- 10	1,938			Glacial	Hard, cloudy, "alkaline", salty		D, S	Abundant supply.
2	SE.	6	"	"	"	Drilled	100	1,892	- 90	1,802			" quick-sand	Soft, clear, salty		D, S	Abundant supply, never pumps dry.
3	SW.	7	"	"	"	"	130	1,900	- 15	1,885			White mud sand?	Soft, clear, soda, salt, iron		D, S	Supplies 20 head stock at least. #
4	SW.	8	"	"	"	"	112	1,912	- 30	1,882	109	1,803	Glacial fine blue sand	Soft, clear, soda, iron		D, S	" 25 " " " " .
5	SE.	13	"	"	"	Dug	23	2,004	- 13	1,991	23	1,981	Glacial gravel	Hard, clear, "alkaline"		D, S	Cannot be pumped dry.
6	NE.	19	"	"	"	Bored	36	1,920	- 22	1,898			" "	Hard, clear, salty, "alkaline"		S,	Limited supply, laxative effect on humans.
6a2	SW.	21	"	"	"	Dug	18	1,951	- 10	1,941			" clay	Hard, clear		D, S	Insufficient for local needs.
7	NW.	22	"	"	"	"	10	1,952	- 4	1,948	10	1,942	" "	Soft, clear		D,	Intermittent well.
8	SW.	23	"	"	"	Drilled											Refused information.
9	NE.	23	"	"	"	Dug	7	2,019	- 4	2,015	7	2,012	Glacial sand	Soft, clear		D,	Sufficient for household needs.
9a	SW.	25	"	"	"	"	20	1,991	- 14	1,977	17	1,974	" clay	" "		D, S	" " local needs.
10	NE.	27	"	"	"	"	24	1,999	- 8	1,991	8	1,991	" gravel	" " "alkaline"		D, S	Insufficient, waters only 8 head stock.
11	SE.	28	"	"	"	"	20	1,981	- 15	1,966			" clay	Soft, clear		D,	Sufficient for domestic needs only.
12	SW.	30	"	"	"	Bored	40	1,938	- 15	1,923			" fine sand	Hard, clear "alkaline"		S,	Insufficient for 12 head stock.
13	SE.	32	"	"	"	Dug	14	1,978	- 10	1,968			" " "	Hard, clear		D, S	Sufficient for 6 head stock, and house.

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

WELL RECORDS—Rural Municipality of GRIFFIN NO.66, 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	NE.	32	7	12	2	Bored	45	1,963					Glacial	Hard, milky, iron, "alkaline"		D, S	Sufficient for 6 head stock.
15	NW.	33	"	"	"	Dug	20	1,968	- 9	1,959	18	1,950	" fine grey sand	Hard, clear, soda		D, S	Has watered 20 head stock. 400 foot drilled dry hole.
16	SW.	35	"	"	"	Bored	26	1,997	- 13	1,984			Glacial gravel	Hard, clear, "alkaline"		D, S	Sufficient for 22 head stock.
17	NW.	35	"	"	"	Dug	22	1,998	- 14	1,984	18	1,980	" "	Hard, clear, iron		S,	" " 12 " " .
1	NE.	2	8	10	2	Dug	13	2,000	- 5	1,995	7	1,993	Glacial sand	Hard, clear		D, S	Sufficient for 30 head stock.
2	SW.	2	"	"	"	"	35	1,970	- 30	1,960	34	1,936	" fine sand	" " "alkalir "		S,	Intermittent well.
3	NW.	2	"	"	"	Bored	61	2,000	- 21	1,979	55	1,945	" sand	Hard, clear		S,	Sufficient for 50 head stock.
4	SW.	5	"	"	"	Dug	28	1,985	- 18	1,967	26	1,959	" "	" "		D, S	" " 28 " " .
5	SE.	6	"	"	"	Bored	24	1,985	- 20	1,965	18	1,967	" sand, gravel	" "		D, S	Insufficient for 4 head stock.
6	NW.	6	"	"	"	Dug	18	1,985	- 1	1,984	14	1,971	Glacial yellow sand	"		D, S	Sufficient for 22 head stock.
7	SE.	7	"	"	"	"	28	1,990	- 13	1,977	23	1,967	Glacial sand	" " iron,"alkaline"		S,	Sufficient for 25 head stock.
8	SE.	8	"	"	"	"	30	1,985	- 21	1,964	27	1,958	" "	Hard, clear, "alkaline"		S,	Sufficient for 30 head stock.
9	NE.	9	"	"	"	Bored	26	1,995	- 18	1,977	24	1,971	" "	Hard, clear		D, S	Sufficient for 10 head stock.
10	NE.	10	"	"	"	Dug	40	2,005	- 12	1,993	40	1,965	" "	" " "alkaline"		D, S	Abundant supply.
11	NW.	12	"	"	"	"	24	2,010	- 15	1,995	23	1,987	" gravel	Hard, clear, iron,"alkaline"		S,	Sufficient for 18 head stock.
12	SW.	14	"	"	"	"	15	2,010	- 8	2,002	12	1,998	" sandy clay	Hard, clear, "alkaline"		D, S	Insufficient for 21 head stock.
13	NE.	17	"	"	"	"	20	2,000	- 6	1,994	16	1,984	" yellow sand	Hard, clear, iron		D, S, I	Sufficient for 11 head stock.
14	NE.	18	"	"	"	"	25	1,990					" yellow clay	Hard, clear		D, S	Intermittent well.
15	NW.	19	"	"	"	"	15	2,000	- 3	1,997	13	1,987	" " sand	Soft, "		D, S	Insufficient for 35 head stock.
16	SE.	20	"	"	"	"	20	2,000	- 14	1,986	6	1,994	" sand and gravel	Hard, "		D,	" " 10 " " .
17	NE.	20	"	"	"	Bored	24	2,005	- 18	1,987			Glacial sand	" "		D,	" " 30 " " , used for house only.
18	NE.	21	"	"	"	Dug	18	2,010	- 14	1,996	15	1,995	" gravel	" " "alkaline"		D, S	Insufficient for 30 head stock.
19	SE.	22	"	"	"	"	20	2,000	- 6	1,994	3	1,997	" sand	Hard, clear, "alkaline"		D, S	Sufficient for 15 head stock.
20	SW.	24	"	"	"	"	20	2,000	- 11	1,989	18	1,982	" sand and gravel	Hard, clear, "alkaline"		D, S	Abundant supply, for 8 head stock.
21	NE.	24	"	"	"	"	25	2,000	- 18	1,982	18	1,982	Glacial sandy clay	Hard, clear, iron		S,	Insufficient for 13 head stock.
21a		27	"	"	"	?	500	2,010					Marine shale				Dry hole.
22	SW.	28	"	"	"	Bored	27	2,000	- 25	1,975			Glacial clay	Hard, clear		D, S	Insufficient for 36 head stock.

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of GRIFFIN NO.66, 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
23	SW.	30	8	10	2	Dug	15	2,000	- 13	1,987	13	1,987	Glacial clay	Hard, clear		D, S	Dry after 3 months of use.
24	NW.	31	"	"	"	"	26	2,005	- 11	1,994			" "	" "alkaline"		D, S	Sufficient for 35 head stock.
25	SW.	32	"	"	"	Bored	48	1,995	- 18	1,977	48	1,947	" sand	Soft, clear		D, S	" " 42 " " .
26	SE.	33	"	"	"	"	30	2,010	- 26	1,984	20	1,990	" sandy gravel	Hard, clear		D, S	Intermittent well.
27	NE.	33	"	"	"	Dug	30	2,010	- 15	1,995			Glacial clay	" "		D, S	" " .
28	NE.	34	"	"	"	"	20	2,015	- 8	2,007	16	1,999	" sand	" "		D,	Sufficient for household only.
29	NW.	35	"	"	"	"	22	2,010	- 16	1,994	21	1,989	" "	" "		D, S	Intermittent well.
30	SW.	36	"	"	"	"	28	2,010	- 18	1,992	18	1,992	" yellow sand	" "		D, S	Sufficient for 45 head stock.
31	NE.	36	"	"	"	"	22	2,010	- 13	1,997	21	1,989	" sand	" "alkaline"		S,	" " 32 " " .
1	SW.	2	8	11	2	Dug	15	1,980	0	1,980			Glacial clay	Hard, clear, "alkaline"		S,	Insufficient for local needs.
2	SE.	2	"	"	"	"	30	1,985	- 25	1,960	25	1,960	" sand	Hard, clear, "alkaline"	43	D, S	Sufficient for 40 head stock.
3	NW.	2	"	"	"	"	25	1,990	- 15	1,975			"	Hard, clear, "alkaline"	42	D, S	" " 8 " " .
4	SE.	4	"	"	"	"	15	2,000	- 13	1,987	13	1,987	" "	Hard, clear	44	D, S	Can be bailed dry.
5	NW.	4	"	"	"	"	10	2,005	- 2	2,003	8	1,997	" "	" "	45	D, S	Will water 50 head stock for 4 months.
6	NE.	5	"	"	"	Drilled	80	2,015			70	1,945	" "	" "	42	D, S	Sufficient for local needs.
7	NE.	6	"	"	"	Dug	25	2,005	- 20	1,985	20	1,985	" "	" "alkaline" Hard, clear	48	D,	Insufficient for local needs.
8	SE.	7	"	"	"	Bored	85	2,010	- 50	1,960	80	1,930	Glacial clay	" "	41	S,	Sufficient, stock do not like it.
9	SE.	8	"	"	"	Dug	22	2,005	- 17	1,988	22	1,983	" gravel	"alkaline" Hard, clear	43	D, S, I	Insufficient for 10 head stock.
10	SE.	9	"	"	"	"	27	1,995	- 15	1,980	17	1,978	" sand	" "		D,	" " local needs.
11	NE.	9	"	"	"	?	48	1,990	- 15	1,975	30	1,960	"	" "alkaline"		S,	Sufficient for stock.
12	NE.	9	"	"	"	Dug	28	1,990	- 15	1,975	25	1,965	" sand	" clear	42	D, S	" " local needs.
13	NE.	9	"	"	"	?	107	1,990	- 65	1,925			"	" " "alkaline"		N,	Too "alkaline" for use.
14	NE.	9	"	"	"	?	60	1,990	- 13	1,977			" hard sand	Hard, alkaline		S,	Sufficient for stock.
15	NW.	13	"	"	"	Dug	23	1,990	- 17	1,973	17	1,973	" sand	Hard, clear, "alkaline"		D, S	Limited supply.
16	SE.	16	"	"	"	"	40	1,990	- 20	1,970	36	1,954	" "	Hard, clear, "alkaline"	41	D, S	Sufficient for 50 head stock.
17	NE.	16	"	"	"	Bored	18	1,985	- 13	1,972	13	1,972	" "	Hard, clear	42	D,	Sufficient for household needs only.
18	NE.	19	"	"	"	Dug	30	1,998	- 23	1,975	28	1,970	" "	" " "alkaline"		D, S, I	" " 25 head stock.

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of GRIFFIN NO.66, 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
19	SE.	21	8	11	2	Dug	26	1,990	- 20	1,970	25	1,965	Glacial sand	Hard, clear, "alkaline"	42	D, S, I	Sufficient for 10 head stock.
20	NE.	21	"	"	"	"	28	1,989	- 24	1,965	26	1,963	" " gravel	Hard, clear	43	D, S, I	Over supply.
21	SW.	22	"	"	"	"	16	1,990	- 7	1,983	14	1,976	Glacial gravel	" " "alkaline"	40	D, S,	Sufficient for 100 headstock.
22	NE.	24	"	"	"	"	16	1,985	- 8	1,977	13	1,977	" " sand	Hard, clear	43	D, S, I	" " 30 " "
23	NE.	26	"	"	"	Bored	28	1,995	- 18	1,977	20	1,975	Glacial sand	" " "alkaline"	42	D, S	" " 50 " " .
24	NW.	27	"	"	"	Dug	35	1,990	- 30	1,960	30	1,960	" "	Hard, clear, "alkaline"	42	S,	" " 30 " " .
25	NW.	30	"	"	"	Bored	29	1,990	- 4	1,986	23	1,967	" clay	Hard, clear, "alkaline"	43	S,	Insufficient for 9 head stock. Intermittent well.
26	NW.	32	"	"	"	Dug	20	2,000	- 16	1,984	19	1,981	" sand	Hard, clear, "alkaline"	43	D, S	Sufficient for 30 head stock.
27	SE.	32	"	"	"	"	16	1,995	- 12	1,983	16	1,979	" gravel	Hard, clear	41	D,	" " domestic needs.
28	NE.	32	"	"	"	"	20	2,000	- 15	1,985	19	1,981	" sand	" " "alkaline"	42	S,	" " 50 head stock.
29	NE.	33	"	"	"	"	28	1,997	- 24	1,973	25	1,972	" "	Hard, clear		D, S	Insufficient for 4 head stock. Intermittent well.
30	SE.	33	"	"	"	Bored	42	1,995	- 15	1,980	37	1,958	" "	" " "alkaline"		D, S	Over sufficient for local needs.
31	NE.	35	"	"	"	Dug	20	2,015	- 17	1,998	18	1,997	" "	Hard, clear,	42	D, S	Sufficient for local needs.
32	NW.	36	"	"	"	"	14	1,990	- 6	1,984	13	1,977	" "	" "	44	D, S, I	Intermittent well.
1	NE.	2	8	12	2	Dug	14	2,000	- 1	1,999			Glacial clay	Hard, clear, "alkaline"	49	D, S	Intermittent well.
2	NW.	2	"	"	"	"	10	1,985	- 7	1,978			" "	Hard, clear,		D,	" " . A 365 foot dry hole.
3	SE.	2	"	"	"	Drilled	136	1,980					Bedrock, shale				Dry hole.
4	NE.	3	"	"	"	Dug	20	1,980	- 10	1,970	13	1,967	Glacial gravel	Hard, clear, "alkaline"	49	D, S, I	Intermittent well.
5	NW.	5	"	"	"	"	26	1,965	- 9	1,956	18	1,947	" "	Hard, clear,	42	D, S, I	Oversufficient for 20 head stock.
6	NE.	6	"	"	"	"	18	1,970	- 13	1,957	18	1,952	" blue clay	" "		S,	Sufficient for 6 head stock.
7	NE.	8	"	"	"	"	14	1,985	- 7	1,978	10	1,975	" sand	" "		D, S, I	Good supply.
8	SW.	9	"	"	"	"	15	1,990	- 11	1,979	15	1,975	" "	" "		D, S, I	Pumps 3 bbls. a hour.
9	NE.	9	"	"	"	"	16	2,000	- 11	1,989	15	1,985	" sand rocks	" "		D, S,	Insufficient supply.
10	NW.	10	"	"	"	"	40	2,000					Glacial sand				Dry hole.
11	NE.	10	"	"	"	"	12	1,998	- 5	1,993			" "	Hard, clear		D,	Intermittent well.
12	NE.	10	"	"	"	"	22	1,998	- 4	1,994			"	" "		S,	" " .
13	NW.	11	"	"	"	Drilled	60	1,995	- 16	1,979	60	1,935	" sand	" "	42	D, S, I	Over supply.
14	SE.	12	"	"	"	Dug	40	1,990	- 20	1,970	40	1,950	" "	" " "alkaline"		S,	Pumps dry refills in one day.

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of GRIFFIN NO.66, 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
15	NW.	12	8	12	2	Dug	14	1,990	- 4	1,986	10	1,980	Glacial clay	Hard, clear		D, S	Insufficient for stock in winter.
15a	SE.	13	"	"	"	Bored	60	1,990					" sand	" brown iron, "alkaline"	40	D, S	Sufficient for local needs.
16	NE.	14	"	"	"	Dug	28	2,005	- 26	1,979	16	1,989	" "	Hard, clear, "alkaline"		S,	Insufficient for 10 head stock.
17	SW.	14	"	"	"	"	21	2,000	- 6	1,994	17	1,983	" "	Hard, clear	40	D, S, I	" " 30 " " .
18	SW.	14	"	"	"	"	14	2,000	- 4	1,996			" "	" "		D, S	Well now filled in.
19	SW.	14	"	"	"	"	35	2,000					"				Dry hole. 2 other dry holes 23' and 15'.
20	NW.	16	"	"	"	"	80	2,000					"				Dry hole.
21	NW.	17	"	"	"	"	18	2,000	- 8	1,992	17	1,983	" sand	Hard, clear	41	D, S, I	Sufficient for 25 head stock.
22	SE.	18	"	"	"	"	18	1,990	- 3	1,987	17	1,973	" clay	" "		D, S,	Insufficient for house and 4 horses.
23	SW.	18	"	"	"	"	20	1,990	- 5	1,985			" "	" "	48	D, S	Intermittent well.
24	NE.	19	"	"	"	"	26	2,011	- 13	1,998	22	1,989	" sand	" "	42	S,	Sufficient, but poor quality.
25	NW.	19	"	"	"	"	28	2,005	- 20	1,985	28	1,977	" "	"alkaline" Hard, clear	41	D, S	" for 50 head stock.
26	NW.	20	"	"	"	"	30	2,011	- 21	1,990	30	1,981	" gravel	" "		D, S, I	" " 50 " " .
27	NE.	21	"	"	"	Bored	20	2,015	- 17	1,998	17	1,998	"	" "		D, S	Intermittent well.
28	SE.	22	"	"	"	"	40	2,020	- 8	2,012	37	1,983	"	" "		S,	Insufficient for 9 head stock.
29	SW.	23	"	"	"	Dug	25	2,025	- 10	2,015	21	2,004	" sand	"alkaline" Hard, clear, "alkaline"		D,	Insufficient supply.
30	SE.	24	"	"	"	Bored	37	2,010	- 12	1,998	37	1,973	" gravel	Hard, clear, iron	42	D, S, I	Sufficient for 50 head stock.
31	SE.	25	"	"	"	Dug	28	2,000	- 18	1,982	26	1,974	" sand	Hard, clear, soda		D, S	" " 25 " " .
32	SE.	27	"	"	"	"	22	2,020	- 10	2,010	18	2,002	" "	Hard, clear	46	D, S	" " domestic needs only.
33	SW.	28	"	"	"	"	17	2,030	- 12	2,018	14	2,016	" gravel clay	" "	42	D, S	" " 50 head stock.
34	NE.	28	"	"	"	"	30	2,020	- 11	2,009	29	1,991	Glacial sand	" " "alkaline"		S,	" " local needs.
35	SW.	30	"	"	"	"	20	2,010	- 10	2,000			" clay	Hard, clear, "alkaline"	40	D, S	" " 20 head stock.
36	NW.	30	"	"	"	"	35	2,010	- 33	1,977	34	1,976	" sand	Hard, clear, "alkaline"		D, S	Intermittent well.
37	NW.	32	"	"	"	"	20	2,020	- 10	2,010			" clay	Hard, clear,	51	D, S	" " .
38	NW.	34	"	"	"	"	30	2,000	- 18	1,982	29	1,971	" sand	" " "alkaline"	42	S,	Sufficient for 25 head stock.
1	NW.	1	9	10	2	Bored	38	2,020	- 23	1,997	35	1,985	Glacial sand	Hard, clear, soft		S,	Intermittent well. 75 foot dry hole.
2	SE.	2	"	"	"	Dug	26	2,015	- 20	1,995	24	1,991	" "	Iron, clear		D, S	Sufficient for 18 head stock.

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of GRIFFIN NO.66, 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
3	SW.	2	9	10	2	Dug	26	2,020	- 10	2,010	17	2,003	Glacial sand	Hard, clear		S,	Intermittent well.
4	NW.	3	"	"	"	"	24	2,010	- 14	1,996	22	1,988	" "	" "		D, S	Sufficient for 28 head stock.
5	NE.	5	"	"	"	Bored	24	2,005	- 12	1,993	24	1,981	" "	"alkaline",iron Hard, clear, "alkaline"		D, S	Was sufficient for 20 head stock, now caved in.
6	NW.	10	"	"	"	Dug	30	2,015	- 15	2,000	29	1,986	" gravel	Hard, clear, "alkaline",iron		S,	Well caved in recently.
7	SE.	10	"	"	"	"	26	2,005	- 16	1,989	23	1,982	" "	Hard, clear		D, S	Waters only 6 head stock.
8	NW.	11	"	"	"	"	21	2,020	- 16	2,004	19	2,001	Glacial sand, rocks	" " "alkaline"		S,	Sufficient for 25 head stock.
9	SE.	13	"	"	"	"	30	2,030					"				Dry hole
10	NE.	14	"	"	"	"	28	2,025	- 19	2,006	28	1,997	Glacial sand gravel	Hard, clear		D, S	Abundant supply for 15 head stock.
11	SE.	16	"	"	"	Bored	24	2,010	- 5	2,005	20	1,990	Glacial sand	" "		D, S	Abundant supply
12	NE.	16	"	"	"	"	20	2,025	- 12	2,013	20	2,005	" "	" "		D, S	Insufficient for 8 head stock.
13	NW.	16	"	"	"	Dug	22	2,010	- 12	1,998	19	1,991	" gravel	" "		D, S	Sufficient for 30 head stock.
14	SW.	16	"	"	"	Bored	22	2,010	- 16	1,994	21	1,989	" sand	iron Hard, clear		D, S	" " 40 " " .
15	SE.	18	"	"	"	"	50	2,005	- 20	1,985	45	1,960	" "	" "		D, S	" " 35 " " .
16	NE.	18	"	"	"	Dug	40	2,005	- 28	1,977			" "	iron,"alkaline" Hard, clear		D, S	Intermittent well.
17	SW.	20	"	"	"	"	30	2,010	- 26	1,984	26	1,984	" "	" " "alkaline"		D, S	Sufficient for 23 head stock. Pumps dry.
18	NW.	21	"	"	"	"	19	2,015	- 11	2,004	18	1,997	" gravel	Hard, yellow cloudy		D, S, I	" " 16 " " . #.
19	NW.	23	"	"	"	"	24	2,060	- 19	2,041	19	2,041	" sandy clay	Hard,clear, iron,"alkaline"		S,	" " 25 " " .
20	NW.	26	"	"	"	"	15	2,040	- 13	2,027	13	2,027	" sand	Soft, clear		D, S, I	" " 12 " " at least.
21	SE.	27	"	"	"	"	24	2,020	0	2,020	21	1,999	" "	Hard, clear, "alkaline"		D, S	" " 40 " " .
22	SE.	28	"	"	"	"	28	2,025	- 17	2,008	27	1,998	" "	Hard, clear, "alkaline"		S, I	" " 22 " " .
23	SW.	28	"	"	"	"	27	2,010					" "	Hard, clear, "alkaline"		S,	" " 15 " " . Laxative effect on man.
24	NW.	28	"	"	"	Bored	25	2,020	- 10	2,010	24	1,996	" "	Hard, clear, iron		D, S, I	Sufficient for 20 head stock.
25	SE.	29	"	"	"	Dug	25	2,020	- 8	2,012	23	1,997	" "	Hard, clear		D, S	" " 10 " " .
26	SE.	32	"	"	"	"	27	2,020	- 8	2,012	27	1,993	" "	" "		D,	Went dry in 1934 winter.
27	NE.	32	"	"	"	Bored	16	2,020			16	2,004	" "	" " "alkaline"		S,	Sufficient for 35 head stock, heavily alkalin
28	NW.	33	"	"	"	Dug	28	2,020	- 13	2,007	27	1,993	" "	Hard, clear, "alkaline"		D, S	" " 15 " " .
29	NE.	34	"	"	"	"	16	2,025	- 10	2,015	10	2,015	" gravel	Hard, clear		D, S	" " 30 " " .

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of GRIFFIN NO.66, 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
30	SW.	35	9	10	2	Bored	27	2,045	- 7	2,038	22	2,023	Glacial sand, gravel	Hard, clear		D, S, I	Sufficient for 43 head stock. Abundant supply
31	SW.	36	"	"	"	Dug	30	2,040	0	2,040	28	2,012	Glacial gravel	" " iron, alkaline		D, S	" " 30 " " .
32	NE.	36	"	"	"	"	20	2,035	0	2,035	19	2,016	" sand	Hard, clear, alkaline		D,	" " 20 " " . With dugout.
1	SW.	2	9	11	2	Dug	30	2,000					Glacial blue clay				Dry hole. 10 other dry holes.
2	SW.	6	"	"	"	"	34	1,986	- 26	1,960	34	1,952	" sand	Hard, clear, iron, alkaline		D, S	Sufficient for 25 head stock.
3	SW.	10	"	"	"	Bored	60	1,904			60	1,844	"	Soft, clear		S,	" " 5 " " .
4	SW.	14	"	"	"	Dug	24	2,004	- 12	1,992	20	1,984	" sand	Hard, clear, salty, alkaline		S,	" " 30 " " . #.
5	NW.	19	"	"	"	"	20	2,007	- 4	2,003	20	1,987	" clay	Soft, clear		D,	Well is dry in winter.
6	SE.	20	"	"	"	"	20	2,004	- 5	1,999	20	1,984	" sand	Hard, "		D,	Sufficient for house use only. 900 foot drilled dry hole in Bedrock Marine shale.
7	SW.	20	"	"	"	"	23	2,000	- 8	1,992	23	1,977	"	" " alkaline		D,	Sufficient for house use only.
8	NW.	22	"	"	"	"	27	2,000					" blue clay				Dry hole.
9	SE.	23	"	"	"	"	25	1,996	- 20	1,976	25	1,971	" sand, gravel	Hard, clear, alkaline		D,	Sufficient for household needs only. Poor well.
10	SW.	24	"	"	"	"	30	2,000	- 16	1,984	25	1,975	Glacial sand	Hard, clear		D, S	Sufficient for 75 head stock.
11	SE.	25	"	"	"	"	28	2,018	- 10	2,008	28	1,990	" "	" "		D, S	" " 50 " " .
12	NE.	26	"	"	"	"	24	1,991	- 16	1,975	24	1,967	" yellow clay	" "		S,	Insufficient for local needs.
13	SW.	27	"	"	"	Bored	22	2,012	- 2	2,010	20	1,992	Glacial sand	" "		D, S	" " " " .
14	NE.	29	"	"	"	Dug	25	2,003	- 3	2,000	25	1,978	" "	" " iron, alkaline		D, S	Sufficient for house and 4 head stock.
15	NE.	30	"	"	"	Bored	43	2,005	- 20	1,985	43	1,962	" "	Hard, clear, iron, alkaline		D, S	" " 30 head stock.
16	SE.	31	"	"	"	"	32	1,991	- 28	1,963	32	1,959	" "	Hard, clear		D,	" " household needs only.
17	SW.	31	"	"	"	Dug	14	2,000					"				Dry hole.
18	NW.	33	"	"	"	"	35	1,995	- 25	1,970	35	1,960	" yellow clay	Hard, black, alkaline		N,	Not fit for use.
19	NW.	34	"	"	"	"	20	1,988	- 8	1,980	20	1,968	Glacial sand	Hard, clear		D,	Intermittent well.
20	SW.	36	"	"	"	"	30	1,987	- 8	1,979	20	1,967	" "	" "		D, S	Waters 20 head stock and house.
1	SW.	2	9	12	2	Dug	20	1,985	- 14	1,971			Glacial sand	Soft, clear		D, S	Sufficient for 23 head stock.
2	SW.	5	"	"	"	"	30	2,017	- 10	2,007	23	1,994	" sandy clay	Hard, clear		D, S	Insufficient; waters obly 3 head stock in winter.
3	SE.	6	"	"	"	Bored	30	2,013	- 24	1,989	24	1,989	Glacial sand gravel	" " iron		D,	Sufficient for household needs only.
4	NW.	7	"	"	"	Dug	30	2,020	- 12	2,008			Glacial gravel	Hard, clear		D, S	" " 130 head stock.

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(#) Sample taken for analysis.

WELL RECORDS—Rural Municipality of GRIFFIN NO.66, 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
5	NW.	8	9	12	2	Dug and Bored	70	1,980	- 20	1,960			Glacial gravel	Hard, clear, "alkaline"		S,	Sufficient for 50 head stock.
6	NW.	9	"	"	"	Bored	26	1,984	- 20	1,964			" " yellow clay	Hard, clear, "alkaline"		S,	Sufficient for 12 head stock.
7	NE.	10	"	"	"	Dug	20	1,987	- 18	1,969			Glacial gravel	Hard, clear		S,	" " 2 " " and house.
8	SE.	15	"	"	"	Bored	37	1,993	- 18	1,975			" sand	" "		D, S	" " 20 " ".
9	SW.	16	"	"	"	"	24	1,984	- 22	1,962			" "	" " alkaline		S,	Insufficient; waters only 8 head stock. Laxative effect on stock.
10	NE.	16	"	"	"	Dug	52	1,987	- 48	1,939	52	1,935	" "	Hard, clear, "alkaline"		S,	Sufficient for 20 head stock.
11	SW.	17	"	"	"	"	21	1,971	- 9	1,962			" clay	Hard, clear, "alkaline"		D, S	Limited supply for 20 head stock.
12	SE.	18	"	"	"	"	40	1,980	- 38	1,942			" fine sand	Hard, clear, iron		S,	Waters 50 head stock.
12a	SE.	20	"	"	"	"	16	2,000	- 12	1,988	16	1,984	" sand	Hard, clear		D, S	Sufficient for local needs.
13	NE.	20	"	"	"	"	20	1,968	- 12	1,956	12	1,956	" clay	" "		D, S	" " 50 head stock.
14	NE.	22	"	"	"	Bored	23	1,999	- 18	1,981			" coarse sand	" " "alkaline"		S,	Insufficient for local needs.
15	SW.	24	"	"	"	" "	51	2,007	- 19	1,988			Glacial	Hard, clear, iron, "alkaline"		D, S	Sufficient for 100 head stock.
16	NW.	30	"	"	"	Dug	15	1,987	- 4	1,983	8	1,979	" sand	Soft, clear		D,	" " household needs only.
16a	NW.	31	"	"	"	Bored	50	2,000	- 30	1,970	50	1,950	" "	Hard, red sediment, iron, "alkaline"		D, S	Intermittent well.
17	NW.	32	"	"	"	Dug	18	1,976	- 6	1,970			" gravel	Hard, clear		D,	Sufficient for household needs only.
18	NE.	32	"	"	"												No well. Dry holes.
19	NE.	33	"	"	"	Dug	25	1,967					" fine sand	Hard, clear "alkaline"		D, S	Waters 2 head stock only.
20	SE.	34	"	"	"	Dug and Bored	18	1,986	- 2	1,984			" yellow clay	Soft, clear		D,	Sufficient for house use only in winter.
21	SW.	34	"	"	"	Dug	40	2,000					Glacial blue clay				Dry hole.

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(#) Sample taken for analysis.